

**Use of Drawing as a Communication
Tool for alleviating digital anxiety:
Exploring digital anxiety in smart mobile users**

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DECLARATION

I, Bo Ram Lee confirm that the work presented in this thesis is my own research. Where information has been derived from other sources, I confirm that this has been acknowledged by giving explicit references. A full bibliography is appended.

Signature: 

Date: 21 January 2017

Abstract

The ever-present smart mobile device has changed the everyday life of users in both positive and negative ways, and connects users' lives online and offline. The existence of fewer gaps between online and offline worlds has shaped a new form of social relationship, new ways of thinking, and had sparked changes in smart mobile users' behaviour. This thesis investigates the problem of digital anxiety among smart mobile users. The aim of this research project is to investigate how digital drawing affects digital anxiety in the smart mobile user. The research is based on the premise that drawing is a communication tool, and it investigates what types of digital drawing content help the smart mobile user relieve their digital anxiety.

This research proposes guidelines for the use of drawing to help the smart mobile user who is experiencing digital anxiety. First, I established digital anxiety as a theoretical construct, and then conducted exploratory studies to investigate the practical problems faced by the smart mobile user. I determined the meaning of digital anxiety, and the precise symptoms experienced by the user suffering from digital anxiety, through a theoretical framework and an exploratory study. Lastly, I conducted empirical studies aimed at designing a method of measuring the level of digital anxiety. This method was tested with hundreds of participants, and was used for conducting the digital drawing experiment at the end of my research project.

Overall, this thesis establishes the scope for determining digital anxiety, provides a method of quantifying digital anxiety, and demonstrates the use of digital drawing to relieve digital anxiety in the smart mobile user. I conclude that my research investigates the use of drawing as a communication tool for smart mobile users as a way of improving their memory, emotional wellbeing, and social relationships. I hope my research can serve as a guideline or a methodology in the design of an educational programme or high-tech industries on the basis of a cognition-mediated model.

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CHAPTER 1 BACKGROUND, PROBLEMS, POTENTIAL

1.1. Problems and Potential

The ubiquity of smart mobile devices has changed users' everyday lives in both positive and negative ways. The core feature of a smart mobile device is its ability to reduce the gap between online and offline communication through the use of a broadband communication network. A smart mobile user is connected twenty-four hours a day, and users' social lives have expanded to include online social accounts such as Facebook, Instagram, and Twitter. These social networking sites and smart mobile devices provide a quick and convenient way for users to interact socially. Having such a highly developed mobile phone service has shaped our modern social relationships so that we are "connected, but alone" and "always on" (Turkle, 2013). These terms have been used since people began owning their own personal smart devices, which create a powerful synergy with social networking sites.

The combined ripple effect of smart mobile devices and social networking sites is bipartite. Firstly, our new culture of collectivity creates a new form of social construction and new relationships. An example of this is Wikipedia. Wikipedia is an online encyclopedia that represents a collective intelligence. People now actively share their intelligence and information in a form of talent donation for other people online. It is a new culture that generates powerful results. However, this new culture of sharing knowledge, information, and interests is one reason why people access the Internet, which in turn causes digital anxiety. This thesis will address digital anxiety in the form of smart mobile addiction, social network addiction, fear of miscommunication, and social anxiety online. Digital anxiety also affects users' offline lives because of the blurry boundary between their online and offline lives. There have been many previous studies of social anxiety but I will address its current incarnation as a result of smart mobile devices and social networking sites, which creates emotional difficulties as a result of users sharing their personal information, online, such as their name, age, education, place of residence, home town, job, and their list of friends. Users now put their whole identities online, whereas in the past, the Internet provided anonymity.

Having one's identity available online affects users' behaviour whilst using their smart mobile devices and social media. For example, Turkle points out that people today display the most attractive aspects of their everyday lives on social networking sites. This is because people are afraid of being judged by their online acquaintances. This phenomenon presents a change in users' thinking and lives, and it shows that users' actual social lives are deeply engaged with their lives online. People now actively share their intelligence, information, and their lifestyles with other people online. However, this becomes a cause of social anxiety. Social anxiety often comes from a fear of judgment by online acquaintances.

Some people who use their mobile very frequently — for many different purposes — feel that they have digital anxiety. This could have many causes, but my discussion will mainly focus on the following: smart mobile addiction, social network addiction, fear of miscommunication, and social anxiety online. These exist in a cycle that causes digital anxiety.

Social scientists are divided, with opposing viewpoints on media and communication including smart mobile devices and social networking sites, into a utopian group and a dystopian group. Research has shown that the usability of smart mobile devices is highly improved nowadays. All physical interactions are designed as to be as simple as possible, for smart mobile users' convenience, helping to increase accessibility (Benyon, 2013). User behaviour, user experience, and high reliance on a smart mobile device can no longer be separated. Thus, Nicolas Carr (2011) points out that reliance on devices and media can result in memory loss.

Memory loss is generated from digital anxiety (Carr, 2011). Linke also indicates problems in relation to changes in the way people interact, focusing on physical co-presence, communication, and mental processes (Linke, 2013). Hence, research on mobile communication necessitates an approach that takes into account sophisticated questions about what social phenomena affect smart mobile users and how they relate to user behaviour, health, and emotions.

This research targets smart mobile users of all ages who have latent digital anxiety, and is aimed at improving smart mobile users' wellbeing. Thus, this research is particularly important for young people who are referred to as "Generation Net" (Tapscott, 2008) or the "App. Generation" (Howard and Davis, 2013). This generation has been "of intense interest to researchers seeking to understand the nature of mobile communication" (Goggin is cited in Bertel, 2013). Castells, Fernandez-Ardevol, Qiu, and Sey (2007) for instance, argue that young people may embrace the potential uses of technology more quickly than people of other ages. They use these technologies more frequently, better, and faster (Bertel, 2013). Young people remain at the forefront of smartphone use, including the use of mobile Internet (Bertel, 2013). Young smart mobile users are an important age group in this research project; however, it is aimed at all ages that are troubled by digital anxiety generated by smart mobile devices.

Smart mobile users do not recognise that they have digital anxiety. Digital anxiety is generated unconsciously while using smart mobile devices in everyday life. Before exploring how user behaviour, communication, social constructs, health, and emotions are interlinked, this research begins by asking what the motivation is for using smart mobile devices. The strongest motivation for using smartphones has been to search for information on the move (Bertel, 2013). However, searching for information or reading a text on the move results in memory problems. People do not read a text properly, but rather scan the digital screen for facts. They skip around in the text and quickly scan information to find a point that is of interest to them (Turkle, 2013). This is due to an information overload that contributes to digital anxiety. Referring to information overload, Shaviro makes a case for "information pollen" that results in "continual-cognition-damage" (Shaviro, 2003).

Forming social communities over the smart mobile screen is one of the key aspects of shaping a theory of digital anxiety. This is because the smart mobile device is the main device used to connect to social networking sites. Users' social lives have expanded from offline social connections to include social networking sites, where users share personal backgrounds such as place of residence, language, religion, education, birthday, interests, a list of friends, and contact details. Therefore, on social

networking sites, users build “ego-centric networks” on the Web (Boyd and Ellison, 2007). Facebook is representative of such an egocentric network. Facebook users update details of their physical everyday activities to his/her Facebook newsfeed in order to share it with online friends. Reasons for accessing Facebook could be identified as seeking information and seeking a social life. Crawford uses the term ‘listening mode’ in this context (Crawford, 2011). A person in this mode displays the following features: checking the Facebook app frequently, scanning for interesting social information and briefly “listening in” to the ongoing conversation (Bertel, 2013). Turkle points out that high frequency mobile users suffer from mobile addiction (Turkle, 2013). This will be discussed further in the literature review, where I will describe clearly the link between smart mobile addiction, social networking sites, smart mobile communication, and digital anxiety.

The key term “ego-centric networks”(Boyd and Ellison, 2007) is linked to a high level of social engagement through social networking sites. People display images of their daily activities on social networking sites (Turkle, 2013). That happens because users are aware of potential attention from the ego-centric networks. Sharing their lifestyles on social networking sites affects users’ emotions and state of mind. I conducted interviews in order to explore how users of social networking sites react when they scan others’ lifestyles on social networking sites. I found that social network users feel frustration when they view a friend’s attractive-looking lifestyle. This is because they compare their own life with that of their friend. Measuring their own life with their friends’ affects the formation of social relationships both online and offline. According to Don Tapscott (Tapscott, 2008), in some cases Generation Net users do not accept a Facebook friend request if the person doesn’t have more than a few hundred Facebook friends. This is a case of social rejection. Also important are cases of ignorance in communication, which I explore in an interview regarding the key term ‘social rejection’. Social network users feel afraid of social rejection, and thus carefully select the best, most attractive, aspects of his or her life to flaunt what he or she has. Social networking sites are an extension of a users’ physical life.

In this thesis, I map out the problems related to digital anxiety. I then move on to study how communicating through digital drawing on a smart device can enable communication, improve a relationship, and enhance users' self-awareness and memory. The reason for choosing to study drawing is that it has traditionally been used as a tool to improve memory, relieve anxiety, improve relations, and develop artists' creative thinking. However, my focus is more on finding how digital drawing might alleviate digital anxiety than on art therapy. The reason why I chose to combine digital drawing with a communication tool is that in my master's thesis I researched how smart mobile devices might be a useful tool to create artworks. I reviewed aspects of drawing that have a positive impact on memory, emotion, social interaction, ideation, and doodling. The themes of memory, emotion, and social interaction are explored as problems related to digital anxiety. Ideation is a useful practice to enhance memory. Lastly, I reviewed the literature on doodling. This is because I found that many smart mobile users are not skillful when using their devices to draw. Another reason, which I identified during my pilot studies, is that many adults are more comfortable with doodles or scribbles than drawings. As demonstrated by the first international exhibition of iPhone art in 2009, curated by Mike Nourse (Leibowitz *et al.*, 2013), smart mobile devices have become a powerful art-making tool that allows the user to experience sharing art in new ways, providing new ways for artists to reach their audiences: direct communication between individuals, posting to social networking, sharing through new apps such as "Instagram", and uploading to specific sites such as YouTube, Flickr, and Vimeo (Leibowitz, 2013 p.6). Although I have focused more on the use of drawing for mobile communication, smart mobile devices are a popular drawing tool among professionals and artists. Throughout my thesis, I present a number of artists who use their smart mobile devices daily to create their works. Moreover, mobile manufacturing companies like Apple, LG, and Samsung have researched drawing communication between users, and have released a number of smart mobiles or wearable smart devices that might support the importance of my study. I found that the predominant type of communication on smart mobile devices is currently text messaging. However, the type of communication will evolve and change as technology develops. Technology such as artificial intelligence may take over or affect more areas of human activity in the future, but I believe that the realm of creative thinking will remain be one of the last to require human ability. Thus, my

study of how digital drawing on smart mobile devices can enable communication, help build relationships between users, and enhance users' self-awareness and memory will be useful in allowing users to find balance between a high reliance on digital technology and active thinking performance.

This research project proposes that digital anxiety is a problem caused by the use of smart mobile devices. Digital anxiety negatively affects memory and causes anxiety. Therefore, this research looks for a communicative tool that works positively on memory and emotions. Through pilot studies, drawing was chosen as a possible means of alleviating the symptoms of digital anxiety. In Chapter 3, I will discuss how it was established that drawing relieved digital anxiety and why.

1.2. Research Aims and Questions

This research aims to determine how communicating through digital drawing on smart mobile devices helps to alleviate digital anxiety in users. In this section I will clarify my use of the term digital anxiety. Digital anxiety is not the term I originally used. It derives from work by Cox and Onuf that explored a fear of obsolescence (Robert Cox and Rachel Onuf, 2003). These authors put more focus on data loss through format changes from an original form to a digital form. This is an issue to do with digital preservation that became popular among researchers in the late 1990s and the early 2000s.

My research focuses only on digital anxiety as the result of the use of smart mobile devices. Thus, I attempt to establish new ways of thinking about digital anxiety that can be applicable to smart mobile users and which will ultimately aim to provide insights into how such anxiety can be relieved through the use of smart mobile devices themselves, linking their use to drawing communication.

My research has two dimensions: to explore the concept of digital anxiety in smart mobile devices, and to explore if and how communicating through digital drawing on smart mobile devices might relieve digital anxiety.

In order to research these two dimensions I will:

- 1) Establish what I mean by digital anxiety.

- 2) Determine the theoretical dimensions of digital anxiety to bring other together academic understandings of the term.
- 3) Demonstrate the symptoms of digital anxiety.
- 4) Identify current phenomena relating to digital anxiety, and research how art mobile applications enable social interactions through pilot studies.
- 5) Develop a way of measuring smart mobile addiction, the Smart Mobile Addiction Test (SMAT), on the basis of psychology.
- 6) Propose a method of quantifying digital anxiety.
- 7) Determine the theory behind how drawing has traditionally affected memory, social relationships, and wellbeing.
- 8) Explore how communicating through digital drawing on smart mobile devices affects digital anxiety and what kind of digital drawing content helps to alleviate digital anxiety.

Through this, the following research questions are addressed:

- 1) How has media interaction affected users' cognition and behaviour through the use of mobile phones, the Internet, smart mobile devices, and social networking sites? How does this link to digital anxiety?
- 2) How are smart mobiles, social media, and social interaction interlinked?
- 3) What are the symptoms of digital anxiety and how can smart mobile users become aware of their digital anxiety?
- 4) How does communicating through digital drawing/doodling on smart mobile devices affect digital anxiety?
- 5) How can my research support smart mobile users' wellbeing even while they are carrying and using mobile devices? I do not propose simply taking away smart mobile devices for a certain period to prevent digital anxiety, because that hardly amounts to an everyday solution. Instead I suggest a type of communication that might enable active thinking, one that differs from the predominant means of communication by smart mobile users today.

Throughout this research, I will discuss the theoretical framework for digital anxiety and related literature on various types of drawing, in an attempt to understand the

context before moving onto the exploratory phase. The contextual sections include, firstly, the history of mobile interactions and media studies, and secondly, theories of drawing.

The exploratory phase consists of four pilot studies. These studies are presented in chronological order of the experiments: a study combining art and meditation, a data analysis of digital arts content and how it is created through collaboration, a study of synchronous collaborative drawing, and a study exploring digital anxiety. From these studies, I explored the factors involved in designing content to relieve digital anxiety.

This research explores the human perspective in mobile interaction through qualitative studies: self-exploration, observation, interviews, psychological tools, and open-ended questionnaires. Moreover, the research involved developing the Smart Mobile Addiction Test. This is used to quantify the level of digital anxiety in order to conduct the main part of this research project, which analyses how creative activity has positive effects when it meets technology and social media.

1.3. Outline of the Thesis

Chapter 1 is the introduction to this thesis. I establish the problems experienced by smart mobile users at the beginning of this section. I then clarify the research aims and research questions.

Chapter 2 reviews the literature, in two parts. Part 1 recounts the theoretical dimensions of digital anxiety. The ultimate device for this research is a smart mobile device, but contextual studies of other relevant digital devices and media were conducted in order to review issues to do with text-based communication, smart mobile addiction, and social anxiety. Part 2 is a contextual study to determine the theoretical dimensions of using drawing as a communication tool that relieves negative emotions, supports social relationships, and enhances memory. Digital anxiety causes memory loss and anxiety (including social anxiety). Therefore, my review covers drawing, memory, emotion, and social interaction in order to find links between them.

Chapter 3 outlines my research design, data collection methods, and the research process, and describes what was done in the pilot study and why. Four pilot studies were conducted to identify design issues, a research plan, and methods.

Chapter 4 is an exploratory phase that comprises the pilot studies. I refined the research questions through conducting the pilot study called 'Exploration of Digital Anxiety'. My pilot studies initially explored insights into digital anxiety and the possibilities drawing offered for relieving digital anxiety. The research design was reshaped after reviewing the pilot studies.

Chapter 5 outlines my research design, data collection methods and instruments, and how the data were analysed. A mixed-methods approach was used, intertwining both qualitative and quantitative methods into the main study. In this chapter, I explain why I mixed methods and how.

Chapter 6 explains the data analysis framework for my main research. This chapter analyses both my quantitative and qualitative research.

Chapter 7 brings together the findings from the pilot studies and the main study. This chapter includes my overall thoughts about digital anxiety, and explains how communicating through digital drawing on smart mobile devices can alleviate digital anxiety. This section also explains the possible limitations of this research project, and my plans for future research.

CHAPTER 2 LITERATURE REVIEW

2.1. Introduction

I briefly wrote about digital anxiety in the previous chapter. Chapter 2 will establish a theoretical framework for digital anxiety and for drawing, focusing on memory, emotions, social interaction, ideation, doodling, and mobile drawing. The first part, focusing on digital anxiety, discusses the appearance of problems during the use of smart mobile devices. The second part, focusing on drawing, comprises my suggestions for alleviating some aspects of digital anxiety through the use of drawing as a communication tool.

A discussion of digital anxiety in the context of smart mobile devices is this project's contribution to original research. The word 'digital anxiety' was used by Cox and Onuf in 2003, but I will be using the term in a distinct way. Cox and Onuf focused on the issue of digital preservation when using the term 'digital anxiety'. My research uses the term 'digital anxiety' to reflect on how smart mobiles have changed users' thoughts and behavior, and on the problems that have emerged from those changes. I use the term 'digital anxiety' to refer to a number of problems, including '[1] smart mobile addiction, [2] social network addiction, [3] social anxiety, [4] fear of miscommunication, [5] text addiction, and [6] information overload'. These six are explored as representative of problems experienced by users of smart mobile devices. I do this by reviewing literatures and theories, and by conducting in-depth interviews and questionnaires.

Why is digital anxiety an issue for smart mobile users? How does digital anxiety affect smart mobile users? What are the ultimate problems for smart mobile users? I will review other literature on this subject to find ways of finding insights into my research questions in this chapter.

2.2. Theoretical Framework for Researching Digital Anxiety

The smart mobile device has become a powerful communication tool. However the problem is, according to Goggin (Goggin is cited in Hjorth *et al.*, 2012), that the literacy of mobile communication has developed unevenly. Within a large body of literature that has addressed and critically analysed communicative practices surrounding mobile phone use, more recent texts have turned their attention to the

mobile as an online, networked media device for game, video, music, and various other forms of everyday creativity (Hjorth *et al.*, 2012). My research focuses on the risk of digital anxiety. Memory loss and anxiety occur if smart mobile users use their mobiles excessively. This literature review explores how smart mobile users' behaviour and emotions have changed through the use of smart mobile devices and social media. I also review close connections between smart mobile devices and social media to discover how these have shaped the new social contexts of users.

2.2.1. Digital Anxiety –Memory Loss and Anxiety Generated by Smart Mobile Addiction

In the Oxford English Dictionary, a smartphone is described as a mobile phone that is able to perform many of the functions of a computer, typically having a relatively large screen and an operating system capable of running general-purpose applications (Waite, 2012). Modern people use many types of smart mobile device such as a smart pad, phablet, or smartphone. 'Phablet' is a compound word made up of the words 'phone' and 'tablet' that first appeared in 2012 and entered the *Oxford English Dictionary* the following year. The *Wall Street Journal* defined phablets as "hybrids of smartphones and small tablets with a screen size of five to seven inches" (Kim, 2013). Phablets and smartphones are mobile phones that can perform the functions of a computer and use the Internet with good mobility. This device is more popular in Asian markets such as South Korea, Hong Kong, Singapore, China, and India (Curtis, 2013) than in Europe (Arthur, 2014). A smart pad is a mobile device with computer features that enable it to interact with heavy software.

Smart mobile devices are increasingly being used as the main device for accessing social networking sites, to use the Web, and, more broadly, to access and produce information (Lathia *et al.*, 2013). People use them in telephonic communication, as a personal assistant, and as a way of being connected to the screen (Turkle, 2013).

The text is the primary form of communication via smart mobile devices (Turkle, 2013). Sherry Turkle argues that people prefer texting and messaging on their smartphone for the following reason: it allows them to reflect, retype, and edit (Turkle, 2013). Text-based communication makes smart mobile users check what messages

they have received with high frequency because text-based communication has continuity and durability. The expansion of the text chat environment in smart mobile devices, such as in free mobile chat services, encourages smart mobile users to send and receive texts. Smart mobile users feel that it is more acceptable to send messages late at night than it would be to make a voice call. This is an example of how users' behaviour and thinking has changed through the use of smart mobile devices. Thus, text-based communication can hardly be unrelated to the issue of smart mobile addiction.

Turkle also argues that smart mobile users feel protected and less burdened by expectation on a screen. Although a user is alone, the potential for almost instantaneous contact gives the impression of already being together (Turkle, 2013). Unconsciously expecting potential communication over the digital screen results in smart mobile addiction, anxiety, and social anxiety that occur while carrying a smart mobile device in one's pocket. Turkle argues that smart mobile users prefer to write rather than to make a call, because they are afraid of making mistakes during social interaction. I will add to this assessment another factor: a practiced hand. Now that people have been using computer-aided media for a few decades, they have adapted to keypad use. They are accustomed to communicating with text processed by a computer. However users' habits become new social customs, such as a high preference for text-based communication. Shirky describes how the increased options for communication in groups doesn't just mean we will get more of the patterns we already recognise; they also mean we will also get more new kinds of patterns (Shirky, 2010). They create a new culture in the smartphone era (Hjorth *et al.*, 2012).

The new culture is led by Generation Net (Tapscott, 2008) and the App Generation (Howard and Davis, 2013). Generation Net refers a young group who were born between 1982 and 1991 (Sandars and Morrison, 2007). For the App Generation, smart devices are nearly ubiquitous; social rites happen via text message and the currency of popularity is traded in likes and comments on social-sharing apps (Wortham, 2013). These groups in particular claim exhaustion and lack of time; always on call, with their time highly leveraged through multitasking, they avoid voice communication

outside of a small circle because it demands their full attention when they don't want to give it (Tapscott, 2008).

Reading a large quantity of texts results in information overload, but also multitasking (Carr, 2011). Smartphone users listen to music, access the web, and send chat-messages while they are on move. Performing these tasks at the same time split one's interest. People believe they are able to pay attention to two different things at once, but a double consciousness does not properly work. This is a paradox. Ferrara illustrates a mood of free-floating melancholic disillusion that is quite different from the existential anguish of the classical noir protagonist, as well as from the nihilistic "cyberpunk" attitude (Shaviro, 2003 p. 157). Split attention will be magnified and multiplied while multitasking. This results in distraction.

Distraction is key in this issue of the use of smart mobile devices. Smart mobile devices were designed to receive many notifications. In *Noir* (Shaviro, 2003 p. 23), those notifications are described as swarms of e-mails buzzing around users' heads. Jeff Noon writes that they are "blurb flies", artificial insects whose buzzing songs transmit advertising messages (Shaviro, 2003 p. 23). Notifications are one of the keys that links to smart mobile addiction. We are simultaneously connected but alone (Shaviro, 2003 p. 29). People find it hard to ignore frequent interruptions (Howard and Davis, 2013). Answering all the buzzing songs is becoming smartphone users' invisible duty.

Smart mobile applications are a new feature in smartphones (Howard and Davis, 2013). Smart mobile applications (apps) are operation shortcuts in the use of smartphones. Gardner points out that users allow apps to restrict or determine our procedures, choices, and goals. Users become app-dependent (Howard and Davis, 2013). Smartphones today place more digital memory and processing capabilities in individuals' pockets than computers of decades past placed on people's desktops (Lathia *et al.*, 2013). This smartphone dependency can result in addiction. According to Dr. Byun, a South Korean expert in cognitive problems linked to high usage of smartphones at the Balance Brain Center in Seoul, the high incidence of digital dementia in Korea is a side effect of the fact that the country has one of the world's

best developed and fastest networks with a very high rate of usage of digital devices by its citizens (Ryall, 2013). The *Telegraph* reports that young people have become heavily reliant on digital technology (Alleyne, 2011). Carr predicted human memory loss from the use of media (Carr, 2010).

2.2.2. Digital Anxiety—Memory Loss Generated by Excessive Use of Text-based Communication

As I have discussed above, text-based communication is the main form of communication via smart mobile devices. Today, smart mobile users spend many hours reading and writing text rather than in other types of communication. Online free communication services encourage consuming text-based communication. However, scholars like Carr and Shaviro highlight the problem of text-based communication through a digital device. They argue that users do not properly read text over the digital screen, as demonstrated by the image below.



Figure 1 Digital Reading Habits, Missing Information (J. Y. Lee, 2015)

These images illustrate how smart mobile users scan text over the smart mobile screen. Smart mobile users read full sentences at first, but for less than the first paragraph. The common point of those three images is ‘missing information’. Turkle points out that the problem of reading digitally is that the reader skips around and scans only the pertinent sections of the text (Turkle, 2013). Karp disagrees with Turkle’s argument. He describes digital reading behaviour as follows: “calm, focused, undistracted, the linear mind is being pushed aside by a new kind of mind that wants and needs to take in and dole out information in short, disjointed, often overlapping bursts – the faster, the better” (Karp quoted in Carr, 2010). Karp’s argument is interesting. Unlike older

generations, today children grow up using their digital devices for many purposes, including education and entertainment. The meaning of improper reading behaviour may change as these young people grow up.

Abbreviation is a characteristic of text-based communication. Using abbreviations in digital media is seen in two ways; one view is that it is creative, the other that it is informal language. Some argue that abbreviated language affects one's language ability. However, one study suggests that regular use of the abbreviated language of text messages can improve children's ability to spell correctly (Coughlan, 2010). However Professor Kakabadse raises concerns about the text-messaging abbreviation to which young people have grown accustomed, and so use in their assignments (BBC, 2009). Kakabadse suggests these people will have difficulty communicating with others and making themselves understood. I partially agree with her statement that "language should evolve but maybe not so quickly" (BBC, 2009). In my view, she ought to specify that she is talking about 'verbal language' in that statement. Non-verbal language such as drawing, image, and sound can have influences on communication even though they might evolve quickly. Net culture and smartphone culture change rapidly, and so does web language.

Instant forms of communication such as Twitter and other social networking sites change users' thinking, behaviour, and culture. Smart mobile users write and send messages regardless of the occasion, whether they are walking, doing other tasks, or talking with someone. Excuses are becoming less necessary; this is the new culture. People nowadays are not ashamed to write or use their smart mobile device while talking to friends who are physically co-present (Turkle, 2013). Many smart mobile users give online friends and physical friends equal importance. In my personal experience, I had an argument with a friend while I was traveling in Italy for a week. I was lonely despite her companionship. Her smartphone became a third companion. She stayed with me for two further weeks after we returned from travelling. We discussed why she had been using her smartphone so much. She argued that friends she could communicate with on her mobile are just as important as I am. Messaging and chatting online are as important as a person who is physically with her. Although

perhaps partly due to cultural difference, I was so lonely while I was with her. I experienced what is known as being “alone and together” (Turkle, 2013).

Scanning surplus text can cause “information overload”. Subscriptions, notifications, and hypertext generate “information overload”. Hypertext is the electronic linking of texts, images, sounds, and moving pictures. The pioneers of hypertext once believed that hypertext would provide a richer learning experience for readers, deepen comprehension and strengthen learning. People believed the more input the better (Carr, 2010). However, the result was that hypertext has strained our cognitive abilities, diminishing our learning and weakening our understanding (Carr, 2010).

More can be less. Whilst users read passages on the web, their brains buzz with neural activity such as problem solving and decision-making. Reading practice is like working out a puzzle (Carr, 2010). However the size of the digital screen possibly makes a difference when reading texts. Recent smartphone users skim long texts on a tiny screen. Smart mobile reading services have been designed to suggest other reading content that is related to the current text being read. This service is a new type of hyperlink now, trapping users into continuous interaction with their smart mobile device.

Sociologists like Nicholas Carr have researched memory loss. The human brain is a biological storehouse, but people today do not make any effort to memorise things; they store it on their digital devices instead (Carr, 2010). Internet users become less dependent on the contents of their own memory. Digital devices replace memory. Smart mobile users remember where they saved the contents, texts, and images on their device. Clive Thompson, the *Wired* writer, refers to the Net as an “out-board brain” that is taking over the role previously played by inner memory (Thompson quoted in Robbins, 2012). David Brooks, the popular *New York Times* columnist, makes a similar point that receiving information from the web, rather than allowing people to know more, actually allows people to know less (Carr, 2010). The web, as an external cognitive servant, works as a silicon memory system with collaborative online filters, consumer preference algorithms and networked knowledge. People burden the web with the entire process, and liberate themselves (Carr, 2010).

On the other hand, utopians emphasise the new opportunities afforded by technologies, which expand the limits of human cognition by offering virtually unlimited memory and processing power (Amichai-Hamburger, 2005). Tapscott explains: “we are looking up anything with a search on Google, and also memorising long passages or historical facts is obsolete”. Memorization is “a waste of time” (Tapscott, 2008). Human memory is marvelous. Its powers and its foibles are overwhelming (Norman, 1982). Utopians argue that artificial intelligence cannot replace a human brain. High reliance on the use of a digital device definitely impacts negatively on the human brain (Ryall, 2013).

2.2.3. Digital Anxiety — Addiction to Smart Mobile Device and Social Networking Sites Resulting in Social Anxiety

Location talk is an obvious feature of mobile technologies (Laursen and Szymanski, 2013). Mobile phones that combine connectivity with mobility allow us to communicate with people in real time regardless of how far apart they are physically (Lee, 2013). Mobile communicability has been referred to as “ambient virtual co-presence” (Ito and Okabe, 2005), “perpetual contact” (Katz, 2007), and “connected present” (Licoppe and Smoreda, 2005). These terms describe users’ ability to continue social exchanges without being physically co-present (Lee, 2013). Today, smart mobile devices have exemplified the meaning of co-presence, and have become the current most powerful communication tool (Howard and Davis, 2013).

Smart mobile users are simultaneously connected (Shaviro, 2003), always on their device (Turkle, 2013). Smartphone users are situated in a double space. One is the online connection; the other is a physical place. The border between an online environment and a physical location can become blurred for a smart mobile user. Shaviro highlights the interruption caused by smartphone notifications (Shaviro, 2003). High frequency communication interrupts a person physically co-present with the user of the device. Smart mobile users’ companions are now in the position of being disturbed while talking with the smart mobile user. Therefore, it is important to study interaction between humans and devices, and also to understand social interaction among people and smart mobile users.

It was once thought that a person with poor social skills could become more socially involved through the use of media such as a mobile phone, the so-called “poor get richer theory” (Amichai-Hamburger, 2005). This theory was complemented by the subsequent “rich get richer theory” (Amichai-Hamburger, 2005). Sociologists believed media-technology could help users reduce feelings of loneliness by, for example, making a phone call. The effect of the mobile-voice communication on social skills has been studied. Scholars expected that face-to-face and mobile communication would prove similar, and help reduce loneliness (Jin and Park, 2013). Sociologists therefore assumed that a person with less-developed social skills would make more phone calls. However it was recently discovered that a person with rich social connections used media more (Amichai-Hamburger, 2013).

Thus, people with better social skills make more phone calls, indicating very little difference in the social skills of those who have face-to-face interactions and those who use voice calling (Jin and Park, 2013). Ironically, smart mobile users make fewer calls but write more texts. Smart mobile devices have increased communication, but made social relationships shallow. Smart mobile devices changed users’ everyday communication techniques, and the meaning of the connection between a mobile device and a user. Indeed, the App Generation are more or less constantly hearing notifications; it is a life dominated by digital devices (Gardner and Davis, 2013). Although you are alone, the potential for instantaneous contact creates a feeling of being together (Turkle, 2013). Meyrowitz also describes a feeling of being together as the “doubling of places” (as cited in Moores, 2012). This results in an addiction to the smart mobile device (Ryalls, 2013). However, before the appearance of smart mobile devices, the exchange of information was generated through person-to-person communication on a mobile phone (Bertel, 2013). Smart mobile devices allow people to extend their mobile communicability to the online social space, reconfiguring the forms and scopes of mobile communication practices and thereby the conditions of people’s sociality.

Today social networking sites make up the biggest part of social communities; they connect the world network. Users are therefore always located on the network’s grid.

Their online activities, works, words, images will have been recorded, and that will have been anticipated somewhere in the chain of discourse (Shaviro, 2003).

In the past, the Internet was an extreme example of an unbounded network (Wellman, 1997). However, social networking sites changed an unbounded network to an extreme bounded network. Users of social networking sites are positioned at the centre of their social groups and make decisions about their online friends and groups. Becoming a ‘friend’ consists of agreeing to share new updates with a person. Personally, my worst experience of that agreement was when hundreds of Facebook friends’ mobile numbers were automatically downloaded and saved on my smartphone after updating to a new version of Facebook. Subsequently those people also appeared as contacts on my mobile chat app. That experience was an example of an extreme bounded network.

Creating something new with collaboration is characteristic of the new Internet culture; this new culture brings energy, motivation, and talent (Shirky, 2009). Awareness of the ability to share allows otherwise uncoordinated groups to begin to work together more quickly and effectively (Shirky, 2009). Social networking sites empower, creating the motivation to create something new through collaboration. Today people create impressive work with collaboration on a large scale via social networking sites such as YouTube, Twitter, and Facebook (Lee, 2015). For example, thousands of people around the world uploaded videos to YouTube as part of the ‘Life in a Day’ project, a historic cinematic experiment to create a documentary film about a single day on earth (Macdonald *et al*, 2011), from Oscar winning director Kevin Macdonald. Similarly, the Royal Opera House in London staged a Twitter opera to give everyone the opportunity to become involved with the inventiveness of opera as the ultimate form of storytelling (Otto, 2009).

On the other hand, social networking sites broaden a users’ life outside of their immediate physical surroundings; thus it can be called an egocentric network. Consequently, users make their daily lives appealing to online friends by sharing select images. Online ‘friends’ are personal connections online rather than friends in a traditional sense. Users therefore display the most attractive aspects of their lives on

social networking sites such as Facebook, Instagram, and Twitter (Turkle, 2013). As I mentioned in the introductory chapter, Tapscott wrote about social rejection that can occur via social networking sites, when, for example, a user rejects another user's friend request because that person has less than a few hundred Facebook friends (Tapscott, 2008). This social rejection foments digital anxiety on social networking sites.

Amichai-Hamburger studied social interactions in an online environment. In 2002, he developed the 'poor get richer theory' (Amichai-Hamburger, 2005). This theory states that people who have a poorer social life offline prefer social relationships on the Internet. Amichai-Hamburger, Kaplan, and Dorpatcheon considered the 'poor get richer theory' and also the 'rich get richer theory' as complementary explanations. These scholars conclude that two different orientations have developed online (Amichai Hamburger, Kaplan, and Dorpatcheon are cited in Amichai-Hamburger, 2013, p. 8). One consists of people who enjoy a high degree of anonymity. Being anonymous helps them to recreate themselves online, to avoid to being identified by others. This may be observed in fantasy games, anonymous chats, and blogs. The other consists of people allowing themselves to be identified. The author argues these people do not aim to recreate themselves online, but rather, to duplicate their offline identity online (Amichai-Hamburger, 2013).

2.3. Summary

Sherry Turkle and Nicholas Carr were the main theorists underpinning my research. Turkle concluded that an over-reliance on digital communication can result in feelings of real-world isolation and loneliness, emotional disconnection, anxiety, and mental exhaustion (Turkle, 2013). I named that digital cultural phenomenon 'digital anxiety', then later discovered a researcher who had already used that term. I would like to make clear what I mean by digital anxiety. Robert Cox and Rachel Onuf first used the term, but they focused more on the issue of digital preservation, such as data loss through format changes from an original form to a digital form. I use the term very differently. I thought that smart mobile users were exhibiting problematic behaviour and experiencing certain emotions as the result of excessive usage of their digital devices. These problematic emotions are loneliness, emotional disconnection, social anxiety, and oversensitivity, among others. The problematic behaviours include

constantly checking their smartphones, using their smartphones when they should not (for example, in class or in a meeting), checking social networking sites immediately after waking up, etc. Therefore, 'digital anxiety' is used as a generic term to denote the appearance of different kinds of problems resulting from the use of smart mobile devices.

2.4 DRAWING

2.4.1. Introduction of Drawing

What is the definition of drawing? The *Oxford Universal Dictionary* defines drawing as "delineation by pen, pencil or crayon" (Mendelowitz, 1980 p. 8). Drawing is a matter of lines that delineate with brush, silverpoint, pastel or anything else capable of making a mark (Malins, 1981). The *Encyclopedia of World Art* informs us that "the word drawing covers in general all those representations in which an image is obtained by marking whether simply or elaborately upon a surface which constitutes the background" (Mendelowitz, 1980 p. 8).

A drawing is a representation (Malins, 1981). What does representation mean here? Representation is the action or fact of exhibiting in some visual image or form (Malins, 1981). Here is the theory that explains the connection between drawing and representation in one's memory: "The human visual system still interprets the drawing as a representation of a face, so there is, in drawings of this kind, a conflict between the representation of surface shape actually provided by the lines in the drawing, and our knowledge of the surface shapes of faces stored in long-term memory" (Willats, 1997).

Here are the extended meanings of drawing and the influences on artists. Drawing has been described in the following ways: the most fundamentally spiritual of all visual artistic activities; a visual form of a human imagination (Hanks and Belliston, 1992). Oriental drawing also presents the artist's inner mind, and finds an equilibrium between body and mind (Potash *et al*, 2012). Drawing helps to create, visualize, structure, and classify ideas (Hanks and Belliston, 1992). A person examines the visual world around them, and remembers it in pictorial form (Norman, 1982). It is a process of transforming abstract thoughts and ideas into reality, whereby people

understand complex concepts and ideas (Hanks and Belliston, 1992). This process is called thinking-in-action or action-as-thinking (Rosenberg, 2008). It relates not only to cognition and a process of receiving information but also to social interaction. People interact with the world around them by sensing and perceiving the stimuli presented to them, making sense of the information perceived, deciding if a response is needed, and then executing the response (Rau *et al*, 2012).

Drawing is a thinking-activity with a physical-hand movement. Derrida suggests that the act of drawing has something to do with blindness, because “blindness is slippery and irresolute in its fluid status” (Petherbridge, 2008). Norman suggests that abstract thought has a fluid status, and that it can be understood through the act of drawing (Norman, 1982). Petherbridge contests Derrida’s statement. Drawing attempts to make tangible something slippery and irresolute through a performative act; as sign, symbol and signifier, as conceptual diagram as well as medium, process and technique (Petherbridge, 2008). The act of drawing makes thought processes tangible and clarifies them. Rosenberg conforms to this view, referring as he does to ideational drawing (Rosenberg, 2008). He describes ideational drawing as a thinking space – not a space in which thought is presented but rather a space where thinking is presented. Derrida conveys the importance of imagination to drawing. Imagining, in drawing, corresponds to thinking, not thought. From that process of thinking, the artist enables therapy for memory loss.

Digital anxiety is presented as a potential problem facing global smart mobile users in this research. These users have grown up in different cultures worldwide. Culture affects people’s values and attitudes, and can affect people’s cognition as they interact with the world around them (Rau *et al*, 2012).

Here are the social aspects of drawing that possibly influence multicultural users’ social lives online: “conveying some aspect of our experience of the world, expressing our attitude or mood regarding our experience, positioning the receiver in terms of mood and attitude, structuring these two into a coherent, perceptible form” (Riley, 2008 p. 158). As already mentioned, drawing is an indirect language. It will be interesting to investigate how indirect language will work with the social aspects of

drawing. Riley explains social interactions between an artist and a viewer in the following way: “both producers and viewers of drawing take up positions, adopt attitudes and points of view which are influenced by their positions within their sets of social relations” (Riley, 2004 p. 300). “The way the producer selects and combines the compositional elements of the drawing, and how the viewer relates to that drawing, are both functions of the social contexts in which the work is (re)produced” (Riley, 2004 p. 300).

Drawing is a visual language that not only conveys the drawer’s experience, reflecting his or her cultural background, but also recreates a drawer’s thoughts. “Drawing processes, where one thinks with and through drawing to make discoveries, find new possibilities through thinking-in-action” (Rosenberg, 2008 p. 109). Thinking-in-action is a noticeable way of finding a connection between drawing and improving memory.

In the following sections, I will review these theories on the basis of the following themes: [1] drawing and memory, [2] drawing and emotion, [3] drawing and social interaction, and [4] drawing and ideation. I decided to focus on these themes even though the scope for research into drawing is very large, because they relate to the appearance of problems related to digital anxiety.

2.4.2. Drawing and Memory

As previously mentioned, drawing is an active thinking process that possibly affects human memory. Drawing attracts a viewer’s prolonged attention; this makes the person concentrate for a certain time. In modern art, the casual stroke invites a spectator’s prolonged attention. Gray argues that folk writing has greater pictorial impact on human memory than regular writing. Folk writing in any form retains a pictorial impact. Furthermore, these alphabets, with their unfamiliar structures, halt the reading somewhat and have a slower effect (Gray, 1982).

My previous research studied the effect of an audio-visual fairy tale program on the linguistic intelligence of elderly people. During that research, I found that using visual images maximizes the effect of tracing an image in the brain, and also helps seniors to

remember and concentrate on the linguistic intelligence program (Lee and Choe, 2011).

I refer to the scholars who researched the ways drawing affects cognition. According to Matthews, drawing may have meta-communicative and meta-cognitive elements (Matthews cited in Hall, 2008). Freeman's analysis (1972) makes clear that drawing production implies a level of self-engagement – both physical and cognitive – unparalleled by relatively passive engagement with another's finished product (Lange-Küttner and Vintner, 2008). We may infer that this meta-cognitive element of drawing positively affects memory because a drawer's physical movement contains his or her thinking process. The drawer first thinks of what to draw and then they think about how they will begin to draw lines. For example, objective drawing demands a drawer's analytical skills and expressiveness. Faber sketches out a way of recording marks in order to remember a concept until it can be developed further; the act of drawing can help us to recall a memory (Faber, 2009). John Ruskin had a unique view of a drawer's ability, which he called "innocence of the eye". Innocence of the eye is a sort of childish perception of flat stains of colour, merely as such, without consciousness of what they signify (Rosenberg, 1964 p. 12). Ruskin also wrote that "everything that you can see, in the world around you, presents itself to your eyes only as an arrangement of patches of different colours variously shaded (Ruskin, 1857 p. 5). "*Objective drawing* has come to refer to drawings which are viewer-centered, a term derived from the investigations of David Marr into the recognition and representation of the spatial orientation of objects" (Riley, 2008 p. 156).

The following experiment, carried out by O'Connor and Hermelin, explores connections between drawing and intelligence. According to O'Connor and Hermelin, some degree of Intelligence Quotient independence is the testing tool of spatial ability (Thistlewood, 1994). O'Connor and Hermelin conducted two different experiments, one verbal and one non-verbal. They tested two different types of gifted children, one extremely good at mathematics, and the other very good at art. They concluded that mathematically and artistically gifted children are better than other children in IQ matched controls at these sorts of tasks. However, mathematically able children

converted verbal codes into spatial images better than the other group. The researchers explained their results in the following way: artistic or graphic ability is independent of intelligence; graphic output is independent of visual memory; visual memory and visual comparative judgment may be related to intelligence and may therefore be less related to graphic ability than is often believed (Thistlewood, 1994). O'Connor and Hermelin concluded that there is some small relationship between drawing and intelligence.

Riley discussed the pedagogy of drawing and the process of “enabling people to put sense into drawings and to make sense out of drawings through a process of intelligent seeing” (Riley, 2008 p. 151). He introduces five methods of teaching drawing: [1] seeing and believing, [2] levels of perception, [3] functions of drawing, [4] strategies of creative communication, and [5] drawing as a process of transformation. In this section, I will review the first two of these methods, ‘seeing and believing’ and ‘levels of perception’, with regard to drawing and memory.

Seeing and believing (Riley, 2008 p. 160)

A drawer needs to manipulate the balance between the conceptual and the perceptual in drawing and artworks. The drawer should understand that perception is “culturally-conditioned” and ‘capable of being tuned to different levels of attention’ (Riley, 2008 p. 160). Drawing expresses how we see the world, and our drawings are conditioned by what we believe. Showing the variety of ways students from different cultures, with differing belief-systems, and different conceptions of space and time, express themselves through drawing, is a teaching method along the lines of Riley’s ‘seeing and believing’. He explained this teaching method in a chapter called ‘Drawing: Towards an Intelligence of Seeing’ (Riley, 2008 p. 161), as a way of representing a relationship in pictures. I thought that focusing on the relationship as expressed in pictures in order to see the differences between them would be a useful practice for memory, especially if the pictures represent a drawer’s memories of their life experiences.

Levels of perception (Riley, 2008 p. 161)

Gibson discussed how the eye-head-brain-body system receives information (Gibson, 2014). Riley explains how our eyes receive the world, identify the structure, and understand the information, and he also discusses how these processes are related to drawing:

“Drawing exercises designed to focus perceptual attention on the haptic level, at which information about surface qualities such as texture and colour may be accessed; the distal level, to do with information about relative distance, size, scale and depth of field; and the proximal level, which provides information about the overall pattern and rhythm relationships in the visual field as a whole.” (Riley, 2008 p. 161)

In order to draw, an artist perceives visual information such as texture and colour, analyses measurable information such as distance, size, scale, and depth of field, and imagines the overall view of the information. This process explains how the eyes work with the brain to draw the information.

Additionally, Rawson points out the importance of analytical observation in drawing to the process of transforming what is seen (Rawson, 1987). Gardner defines eight different types of intelligence in his book, *Multiple Intelligence*, which are linguistic, logical-mathematical, musical, bodily-kinesthetic, spatial, naturalist, interpersonal, and intrapersonal (Gardner, 2006). Spatial intelligence is the ability to perceive the world accurately and to recreate or transform aspects of that world (Gardner, 1993). Spatial cognition refers to a process through which individuals gain knowledge of objects and events situated in or linked to space (Gauvain cited in Matsumoto, 2001 p. 129).

To summarise this discussion of drawing and memory, drawing can aid the activity of thinking via a physical-hand movement. It can become a useful method to enhance memory by encouraging a drawer to recall certain images, visualize them, and transform them into lines and structures. Through reviewing the literature on this topic, I learned that drawing may express aspects of a drawer’s cultural background and life experiences. Thus it may become a useful communicative tool, allowing an

artist to share something with a viewer using visual language. One difference between drawing and other types of communication is that drawing may support both artist and a viewer by encouraging thinking, perception, and paying close attention to an object and a subject.

Some understanding of how different cultural backgrounds might affect our learning experiences and the way we think may be useful. Thus, I will review a Rod-and-Frame test to see how Westerners and Easterners perceive space differently, depending on their background. Ji, Peng, and Nisbett (2000) conducted Rod-and-Frame tests to compare the field dependence of Chinese and Americans (Rau *et al*, 2012). A Rod-and-Frame test is an assessment employed to research the function of optical and gravitational signals, involving estimating the visual vertical, and it is the preferred way of measuring field dependence and independence (Pam, 2011). Peng and Nisbett found that Chinese participants made more mistakes on the Rod-and-Frame test, reported stronger associations between events, and were more responsive to differences in co-variation, whereas American participants made few mistakes on the Rod-and Frame test, indicating that they were less field dependent than the Chinese counterparts (Rau *et al*, 2012). These results can be explained by their opposing reasoning styles, which relate to fundamental philosophical differences between East and West: Aristotelian versus Confucian.

Western Analytical-Logical Thought	Eastern Holistic-Dialectical Thought
Focus on objects, attributes, categories	Focus on the field surrounding objects; sensitive to co-variation in the field; little relevance seen in categories
Apply rules based on categories to predict and explain the objects' behavior	Little use of universal rules; behavior of an object is explained by situational forces and factors in the surrounding field
Find category learning easy	Find category learning difficult
Organize things functionally (focus on what an object "does")	To the extent they use categories, they prefer to organize things thematically (e.g., use the context or environment as a basis for identifying similarities)
Use formal logic for reasoning, making categories, and applying and justifying rules	Not much use of formal logic; prefer dialectical reasoning such as synthesis, transcendence, and convergence
Eager to resolve contradictions (logic); when logic	Less eager to resolve contradiction; prefer a logic

and experiential knowledge are in conflict, adhere to formal logical rules	that accepts contradiction
Interpret individuals' behaviour as a result of their disposition or personality	Interpret people's behaviour as the result of situational pressures

Table 1 Western and Eastern Reasoning Styles (Rau *et al* 2012)

The above table shows Western analytical-logical thought and Eastern holistic-dialectical thought as they relate to drawing or art philosophy. The table explains how Aristotelian philosophical and Confucian philosophical approaches are different. I find a paragraph from *Book is Hatchet* (Park, 2011) useful in understanding the differences between those two philosophies:

“An apple fell”

A Westerner will understand that the apple fell due to the law of universal gravitation.

But an Easterner will understand that the apple fell because it was time for it to fall.

(Park, 2011)

The Westerner uses a scientific approach to explain why the apple fell, relying on analytical thinking. In contrast, the Easterner took a holistic approach and believed the fall of the apple was a natural phenomenon.

I believe these different philosophical approaches have, over many years, led to the creation of different drawing styles. The development of Western and Eastern drawing styles are underpinned by these cultural differences. The influence of culture indicates that participating in different social practices leads to both chronic and temporary shifts in perception (Nisbett and Miyamoto, 2005). According to Riley, objective drawing in the Renaissance era helped the development of Euclidean geometry and the codification of artificial perspective (Riley, 2008). Eastern drawing emphasises the equilibrium of the human body and mind through simple drawing strokes, where the term ‘stroke’ describes a line in a drawing. In the next section, I will make references to Eastern drawing in connection to emotions.

2.4.3. Drawing and Emotion

In this section, I will review further literature regarding Eastern drawing on the basis of holistic philosophy and mind control, such as meditation. I will focus more on Western drawing in the next section, 'Drawing and Social Interaction'. This is because Eastern drawing is generally performed alone as a means of finding a healing state for the artist, and also because this type of drawing requires high concentration in order to train oneself to control the mind. Moreover, a viewer watches each stroke whether it is clearly drawn or not. The viewer values the drawer's ability to control his or her mind more than the ability to communicate to the viewer. However, Western drawing values social interaction and communication more, even though drawing is still performed alone. This will be discussed in the next section.

It is clear, however, that whatever the impetus toward a drawing, the act of drawing itself is a directed thought or "mind" process and, though covert in nature, is open for inquiry and description" (Beittel, 1972 p. 15). Drawings and other artistic creations have always been an extension of personal expression" (Oster and Crone, 2004 p. 14). For example, intellectual status can be ascertained from details in the drawing, while emotionality can be seen in expansiveness or shading of the figure (Koppitz, 1968). Drawing has an advantage if it is used for communication. The constructed mental image and uncoded "reality," however, are similar enough that the internal meaning which images possess cannot easily be communicated (Beittel, 1972).

As I have previously stated, drawing itself is a way of directing thought or the mind. Eastern drawing emphasizes the importance of understanding holistic philosophy. This is because the drawer can find stability only if he or she understands the links between philosophy and drawing. Oriental drawing, including calligraphy, helps to find an equilibrium between the human body and mind via the five elements, which are: water, fire, metal, wood, and earth (Potash *et al.*, 2012). The ancient Chinese believed that the world was created using those five elements. Thus, these elements became the basic energy that has been part of Eastern philosophy for thousands of years.

Chinese drawing and philosophy spread to and inspired many other parts of Asia. As I mentioned above, calligraphy is a type of drawing. This graceful, serene art form, calligraphy, derives from a Greek word that means “beautiful writing” (Wong, 2013). Calligraphy is the art of creating beautiful characters in order to explore the inner mind (Olive and He, 2012). Asian societies developed different calligraphic styles (Gray *et al.*, 2010). Chinese calligraphy is an ancient art form stemming back almost 3,000 years (Wong, 2013). Asian calligraphy more generally is a visual art form related to writing, that enables meditation via the brush stroke.

As I mentioned, a stroke refers to a line of drawing. A calligrapher mediates by touching, flicking or blobbing with the brush tips, or pressing with the whole surface of the brush, and uses either a loaded brush or one which is almost dry (Gray, 1982). The calligrapher determines the result by the quantity of ink and water, then by the pressure and direction of the brush stroke (Potash *et al.*, 2012). Their writing will reflect the speed, touch, and direction of the writing movement, the flow and texture of ink (Gray, 1982). The order of strokes gives the “spirit” to the characters by influencing their final shape (Potash *et al.*, 2012). Rawson describes calligraphy as an oriental drawing style, arguing that there might be “scholars in nature” who are quite “unaware” of the existence of an observer (Rawson, 1987).

Again, an important difference between Western and Eastern healing approaches is that in Eastern cultures drawing is not limited to the ill, but is seen as an important ‘everyday practice’ to maintain health and wellbeing (Potash *et al.*, 2012). Western drawing values communicative interactions, while Eastern drawing values self-understanding through the theory of the five elements.

The five elemental energies are water (水 shui), wood (木 mu), fire (火 huo), earth (土 tu), and metal (金 jin). The Chinese believe the five elemental energies are key to the interrelationships between the human body and the natural environment; they connect the organs within the body, and are also related to both the language and the practice of art healing (Potash *et al.*, 2012). Each element has a direction and colour that aims for wellbeing, and together they make up every living thing, vegetable or

animal. Humans have the five elements within their minds; these make up a personality (Zhu, 2012).

Element	Symbol	Colour	Meaning of Element
 Wood (木 mu)	Money, Spring, Abundance, Privileges, Health, Vitality, Advantages, East, South-East	Green, Red, Silver	Wood determines how we react A wood person is active, emotional, outgoing, and spontaneous. They do as they please, are outgoing Is lively in the early morning Likes changes and movement Is very social but independent A wood person acts and speaks little A creative person, often spiteful, who cannot bear routine
 Fire (火 huo)	Reputation, Illumination, Fame, Social Life, Summer, South	Red	An enthusiastic pioneer Includes interaction with the Fire of Universe A Fire person is energetic, social and outgoing, passionate, communicative and very curious They will cultivate beauty Seducing and optimistic Creative but not emotional Frank and full of humor Knows how to be diplomatic Dynamic and full of energy Can have a post with responsibilities
 Earth (土 tu)	Love, Beginning of Fall, Mother, Couple, Sexuality, Knowledge, Spirituality, Contemplation North-East South-West	Pink, Green, Black	Earth determines the way we take care of ourselves and treat others The Earth person is without excess Loves harmony inside the home Is close to nature, with a strict dress-code A person you can talk to, who hates conflict In love with life and gastronomy Logical, rational and practical Down to earth, serious and industrious A perfectionist, methodical
 Metal	Children, Fall, Projects, Studies, Father, Connection, Fortune, Creativity, West, North-	White, Grey	Golden is the color symbolizing abundance and wealth. Metal draws the borderline between human and the rest of the world. The Metal person is emotional and discrete Hates conflicts and seeks a quiet and balanced life A romantic poet Fragile and idealistic, does not bear critics A good fighter in Ancient China A perfect collaborator and a fine strategist

(金 Jin)	West,		A big sleeper, this quiet soul likes silence and peace. When success smiles at them, it is welcomed with modesty A humble person in glory
	Movement, Efforts, Power, Career, Winter, North	Black	The human being's genetic inheritance The water person is a great sleeper. Discreet and introverted. Conventional and diplomatic, likes strict and quality clothing Takes decisions alone, the master of their own choices, projects and future. Likes to organize and foresee Respects the rules and hierarchy Fights with all his or her heart for things he or she believes in. Logical and rational
 Water (水 shui)			

Table 2 Five Elements (Zhu, 2012)

I practised calligraphy for some years during my youth. Practising calligraphy was one of my parents' educational strategies to cultivate a healthy mind and body. In my experience, calligraphy definitely impacts not only on the inner mind, but is also effective in maintaining a healthy body. Having good posture is important, in order to be relaxed before starting calligraphy. Good posture involves sitting up straight, keeping your feet flat on the ground, your backbone never resting against the chair, your belly never touching the table, your arms on the desk, taking a few deep breaths and relaxing your arms, shoulders, and body. While maintaining that good posture, the calligrapher learns 'Qigong'. Qigong is made up of the two words 'Qi' (meaning breath or gas in Mandarin) and 'Gong' (meaning technique or work); thus Qigong basically means 'breath work' (Wong, 2013). Qigong was developed when it became clear that certain breathing techniques used in conjunction with mental concentration greatly improved bodily functions. Qigong has also borrowed heavily from Taoism and Buddhism (Wong, 2013).

In China, a calligrapher gives energy to the strokes, and to make them beautiful the brush needs to 'take a running start.' The attack—the beginning of the stroke—is that running start. It's a tiny movement, like a loop that just barely turns the point of your brush back over on itself. And the end is when the brush, at the end of the stroke, pulls back a little to stop the energy (Olive and He, 2012). Calligraphers pay close

attention to each stroke because you cannot erase a mistake in calligraphy; if they miss a stroke, they have to redo the whole character (Olive and He, 2012).

Instead of using paints, the Chinese have used an assortment of inks to create pieces of art that are cultural and exquisitely contrasted through the use of artful brush strokes that make the images vivid and enjoyable to look at (Wong, 2013). People can devise their own brush stroke styles to use in painting and people will comprehend those strokes as “a form of personal expression” (Wong, 2013).

Calligraphy established a strong role for itself in the martial arts of ancient China where people had to mobilise energy and stamina in coordination with the physical act of breathing. This Chinese healing art is an effective form of alternative medicine that uses a series of gentle focused exercises to coordinate the mind and the body (Wong, 2013).

I have focused mainly on eastern approaches to emotional healing in this chapter, and have briefly discussed how Western and Eastern approaches and emotions differ. Western drawing allows a drawer and viewer to communicate by expressing what is in the drawer’s mind. Then, the viewer analyses the drawer’s thoughts and emotions. In this case, analytical skill is required to understand the drawer’s mind. In contrast, Eastern drawing has the role of self-training, allowing the drawer to explore their own inner mind. An Eastern drawer has full knowledge of oriental philosophies that relate to healing minds.

2.4.4. Drawing and Social Interaction

Communication is fundamental to social relations. The definition of communication is “the imparting or exchanging of information by speaking, writing, or using some other medium” (Adeyinka, 2014 p. 202). As previously explained, drawing is a form of visual communication conveying one’s expression. ‘Expression’ refers to the conveying of moods, affects, emotions, or allied properties (Ellis, 1982). Language is key to meaningful communication between people; and is perhaps “the most profound indicator of the power of human cognition” (Salvendy, 2012 p. 168).

As I mentioned, drawing is a universal and soft-visual language. As Rau *et al* remark, there are ‘between 3,000 and 4,000 spoken languages, with numbers ranging from many millions of speakers down to a few dozen or even fewer; there are hundreds of different written languages represented by scripts in use around the world’ (Rau *et al.*, 2012 p. 19). There are hundreds of different languages used online that create a gap between people from different cultures. Cross-cultural research on decision-making finds that people from different cultural groups may use different types of decision-making strategies (Rau *et al*, 2012 p. 18). However, artistic expression is a universal language (Rollins, 2005). The visual artistic language is easier to learn than verbal language (Rawson, 1987), and is a form of vocabulary for children just like regular verbal language (Thistlewood, 1994). A person who cannot express his opinion in verbal language finds deeper and more fundamental communication through drawing (Thistlewood, 1994). Drawing not only expresses the social context but is part of a more complex dialectic in which drawings actively symbolize the social system, thus producing, as well as being produced by, the ideological framework of a society (Riley, 2004). Drawing may bridge the gap between cross-cultural users online.

Drawing is a social form of communication because it conveys some aspects of our experiences of the world, expresses our attitude or mood regarding our experiences, and structures these two into a coherent, perceptible form (Riley, 2008). Drawing is a participatory tool of non-verbal exchange for communication (Petherbridge, 2008). Consequently, drawing is a form of social interaction. All features in drawing form a structure. Rawson argues that a good drawing does not present a collection of separate items, it presents the unified whole (Rawson, 1987). The structured features in drawing represent the level of generality and system (Rawson, 1987).

It is possible that social communication expands when drawing meets communication technology. In this paragraph, I will describe a study of how social and technological contexts can shape communication and collaboration when drawing is combined with the new ubiquitous communication technologies. The study was conducted by a research team at Nokia Research Center. They designed and implemented two interactive multi-touch tables, where people could communicate over a distance using drawings (AAkerman *et al.*, 2010 p. 193). They placed the tables in social, public

places to investigate how people use drawing to communicate socially, and also focused their research on nonverbal chat between users in physical places. It is expected that the primary function of such chat, in addition to creativity or artwork, is communication (AAkerman *et al.*, 2010 p. 195). In their discussion, the research team included a sub-heading called ‘rapid and lightweight communication’. They were able to observe a unique type of communication of which one of the strongest characteristics they observed was speed. This research team concludes that the results highlight the following (AAkerman *et al.*, 2010 p. 200):

1. “The actual experience raised the interest and level of ‘fun’. Our results showed that talking with strangers is fun, even though only little information is exchanged about them.”

In my opinion, this is a strong social aspect of drawing as a communication tool. People were entertained while exchanging some information by drawing.

2. “People wanted to communicate, and they were able to communicate, even if the communication channel was very limited.”
3. “A stereotypic self-image as well as a stereotypic image of the remote person was commonly created. This was affected by the fast pace and short duration of the communication intervals.”

The research team highlighted the phrases ‘stereotypic self-image’ and ‘stereotypic image’, and also analyzed the reasons for the fast pace and short duration of the communication intervals. I have an additional opinion about the stereotypic image. The stereotypic image can involve some reflection on a drawer’s life experiences and cultural background. I think that there could be different versions of stereotypic images if the experiment was conducted at two different cities, for example in London and Beijing. This experiment was conducted at two local nightclubs in a city.

4. “Locally, the use of the table was collaborative (drawing). Remotely, communication through the interactive tables dominated clearly over collaboration.”

The research team mainly wants to see what kind of synchronous communication can be observed between strangers. They found very little actual collaboration was present when communicating remotely. People rarely continued others' drawings.

Asynchronous and synchronous communication is an interesting area of digital communication to discuss. The research team explored very little actual collaboration in a synchronous environment for this digital drawing experiment. This issue will be discussed more in my pilot studies.

To summarize, the social aspect of drawing involves sharing a drawer's experiences of the world and expressing their mood. Playing with drawings may enable the drawer and the viewer to feel positive about establishing a social relationship.

2.4.5 Drawing and Ideation

Rosenberg used the term 'ideational drawing' as follows: "ideational drawing is a type of drawing, and indeed, drawing processes, where one thinks with and through drawing to make discoveries, find new possibilities" (Rosenberg, 2008 p. 109).

Polanyi defines 'emergence' as the action producing the next higher level; the mind thus makes "ever new sense of the world by dwelling in its particulars with a view to their comprehension" (cited in Pinnegar and Hamilton, 2009 p. 19).

It is what Polanyi calls 'emergence', a thrust producing the next level of reality, that is the 'creative' or innovative aspect of mind, and the outcome of its exercise in knowing 'comprehensive entities' (Polanyi cited in Beittel, 1972). Rosenberg also describes the importance of mental processes in ideation: "In ideational drawing, physical and mental processes are linked isomorphically and crimped together. The process of drawing is at one and the same time mental and physical" (Rosenberg, 2008 p. 109). Thus, ideational drawing is 'thinking' and not 'thought'. Rosenberg emphasises that the distinction between 'thinking' and 'thought' is important. He describes 'thinking', in drawing, as 'an ongoing creation, a continuing emergence of

meaning, produced in the way the drawing is taken up by a spectator' (Rosenberg, 2008 p. 105). Rosenberg goes on to explain in the conclusion to his essay:

“Moreover, the ‘knowledge’ that is used in ideational drawing, and also that which it produces, is a knowledge-in-potential or potential – knowledge for and in becoming. In this, knowledge returns to have a critical purchase on the world-as-it-is. ‘What might be’ (the ‘becomings’ the drawing articulates) is help in diacritical relationship with ‘what is’. It therefore inevitably produces a critique of the world-as-it-is. By showing ‘prospects’ (all that might be) there is of course a critique of ‘what is’, but there is also additionally the opportunity to critically engage with ‘what might be’, i.e. the prospects themselves. In other words there is opportunity to develop critiques of the future (possible).” (Rosenberg, 2008)

2.4.6. Doodling as a form of drawing

In this section, I will review literature regarding doodling. A doodle is a simple drawing that is usually made to pass the time during a boring meeting, classroom lecture, or a prolonged telephonic conversation (Gupta, 2016). I focus on doodling as a simple drawing because my drawing research will be conducted using digital devices. Some of my participants may have digital drawing experience, but some others may not.

Daydreaming and mind wandering are common phenomena that use mental energy and can be seen as a distraction (Singh and Kashyap, 2014). A common strategy employed against daydreaming is doodling (Singh and Kashyap, 2014). Doodling is often viewed as nothing more than mindless drawing people do when bored, but it actually reflects unconscious thinking. Sigmund Freud believed that the automatic way in which people doodle revealed something about their psyche: that the scribbles were a window into the subconscious (Lange, 2012).

People with high spatial intelligence often enjoy doodling, painting or drawing; to create three-dimensional representations; looking at or creating maps and diagrams; taking things apart and putting them back together (Hoerr, 2004). In addition to

drawing and doodling, visual storytelling (Thistlewood, 1994) helps develop spatial intelligence, and is a good way of tracking one's memory. A person must think of a starting point and track images back from that point in order to recall a memory.

There are three stages to remembering: the acquisition, retention, and retrieval of information (Norman, 1982). Singh and Kashyap evaluated the hypothesis that the benefits of doodling vary across retrieval strategies (recall versus recognition). They found that doodling benefits memory retrieval using recognition over recall (Singh and Kashyap, 2014).

Research has shown how doodling affects human memory. Andrade began with the assumption that people are continually using their brains, even if they have no particular task at hand, for example when daydreaming (Andrade, 2010). She studied how unconscious drawing activity might intersect with cognitive psychology. This experiment aimed to find out whether doodling improves or hinders attention to the primary task. Results showed that the doodling group performed better on the monitoring task and recalled 29% more information on a memory test than the group that wasn't doodling (Andrade, 2010). This research indicates that unconscious scribbling and drawing funny lines on a piece of paper positively affects cognitive ability. Like Andrade, Sunni Brown, author of the book *The Doodle Revolution*, also asserts that doodling helps us to remember more information (Brown, quoted in Lange, 2012).

Doodling also helps people to relax and relieves stress; Winston Churchill and the hairdresser Vidal Sassoon are two well-known doodlers (Cooper, 2007). Brown writes that doodling helps people deal with depression (Brown, quoted in Lange, 2012). Zen doodling is a well-known form of meditation. In *Zen Doodle* (Jenny and Jones, 2013), the authors describe Zen as a way of working toward enlightenment through meditation. Zen is a school of Mahayana Buddhism (Dumoulin *et al*, 2005) that developed in China during the sixth century, known as 'Chan'. Chan spread south to Vietnam, northeast to Korea and East to Japan. The word Zen is derived from the Japanese pronunciation of Chan, and is called 'Seon' in Korea. Zen doodling creates a sense of awareness and intention, melting away one's anxieties with each squeak of the felt tip (Jenny and Jones, 2013).

Doodling is unconscious scribbling, but a Zen doodle begins with a designed shape, such as in the art of Mehndi. Mehndi, known as henna in Western culture, is the application of a temporary form of skin decoration. Mehndi originated in ancient India as a ceremonial form of art (Arzoo Magazine, 2009). It is difficult to pinpoint the common philosophy between Zen and Mehndi because Zen is grounded in the Chinese philosophy of Taoism. But Zen and Mehndi are connected by the shared aim of awakening the inner light (Jenny and Jones, 2013).

A Zen doodle works in the following way: the Zen doodler finds many intertwining circles in his or her work, similar to the delicate Mehndi decorations. The circle is one of the most common shapes used in Zen doodling. The 'Zendala', inspired by the ancient form of the Mandala, offers a slightly more structured approach for those who find that helpful (Jenny and Jones, 2013). Mandala is another connection between Zen and Mehndi. According to Buddhist scripture, Mandalas constructed from sand transmit positive energies to the environment and to the people who view them (BBC, 2009). Different countries in Asia developed various styles of Buddhist art but they all have the Mandala in common. According to *Zen Doodle*, the Mandala is a process of finding your heart's desire and is at the centre of one's heart's desire (Jenny and Jones, 2013).

2.4.7. Mobile Drawing and the Mobile Drawing App

I researched types of mobile digital drawing apps in my second pilot study, 'data analysis of digital arts content which is created through collaboration'. Therefore, in this section, I will discuss how digital drawing compares with traditional drawing on paper and what the value of smart mobile drawing might be. Faber researched what her students who take a studio class thought about using digital tablets to draw. She found that most students commented on the time factor but that it depended on their experience. For example, students with less experience working with a digital tablet believed they took more time drawing on the digital tablet than with traditional means, but experienced students observed they could correct their mistakes more quickly on the tablet (Faber, 2009). This is one important advantage of digital drawing that is often mentioned as one of the main reasons why artists use smart mobile devices as a

drawing tool. The introduction of the iPad further established this mobile platform as a tool for content creation because its size makes it more acceptable to a greater range of artists (Leibowitz *et al.*, 2013). Newsom describes what he thinks of using the iPad as an art-making tool in the following way:

“I saw the June 1, 2009, cover of *The New Yorker*. That cover had been created entirely on an iPhone with “Brishes”, “SketchBook Mobile”, and some other apps. I got rid of all the music on the iPod Touch. It would become my mobile studio. As iPhone and an iPad later, apps and devices and Wi-Fi and Bluetooth and swiping and iOS are all part of my art vernacular” (Newsom, 2013 p. 7).

Newsome also includes a discussion of ‘collaboration’:

“From prehistoric people working together in caves to the Surrealists sitting in their smoke-filled parlors making exquisite corpses together, artists have been collaborating for ages. It’s different on an iPhone, though, because you can collaborate immediately with another artist on the other side of the globe.” (Newsom, 2013 p. 8)

As he pointed out, a smart mobile device is a powerful and easy-to-use art tool that connects people around the globe, allows easy sharing, and encourages high engagement. Nourse writes how smart mobile devices are a useful tool to connect artists with audiences. Mobile devices allow the user to experience sharing art in new ways, which provide options for artists to reach their audiences: direct communication between individuals, posting to social networking, sharing through new apps such as Instagram, uploading to specific sites such as YouTube, Flickr, and Vimeo (Nourse, 2013 p. 6). He also makes the point that using smart mobile devices for art creation saves money:

“With so many apps, the artist can spend time customizing the tool for his/her needs without spending hundreds or thousands of dollars on full-blown software packages. I’ve personally spent about \$25 total on apps since acquiring my iPhone in 2009: that’s a fraction of what most creatives spend on

desktop software. Even as a part-time iPhone artist I've made more than twenty-five times that selling some of my iPhone art." (Nourse, 2013 p. 6)

The economical advantage of smart mobile devices has changed the way we communicate. For example, smart mobile users communicate more using chat application services than mobile message services in order to save money. Palekar's research team investigates how mobile apps are signaling radical change in traditional mobile communication. This research team concludes that low cost, simplicity and convenience create value and change (Palekar *et al.*, 2013).

In this paragraph, I will discuss another advantage of smart mobile use: convenience. Grant wrote an article about David Hockney's iPad art for the BBC. In the interview, David Hockney, a British artist, said that 'it is a real privilege to make these works of art through digital tools which mean you don't have the bother of water, paints, and the chore of clearing things away' (Grant, 2010). Like Nourse, he describes the basic advantage of using a smart mobile device as an art making tool. Faber also describes the advantages as follows: [1] students remarked that they could keep their hands clean and could represent the forms more accurately because of this and other tools provided in the software program, [2] One student with three years of experience stated that the digital drawing tablet gave more freedom than traditional drawing because traditional drawing had a great deal of cost wrapped up with different media, where the digital process was just one medium with different effects (Faber, 2009). However, an opposite case, a student who has very little experience with the tablet complained that her arm was sore or tender from drawing, where paper and pencil did not have this effect (Faber, 2009).

In Faber's research, students felt more apt to experiment with color and mark making because they could easily delete their mistakes without wasting material or having to start over from the beginning (Faber, 2009). Moreover, for many sketching was not as necessary in digital drawing and they were more interested in working in shapes and areas of color, rather than with the quality of lines (Faber, 2009). Faber found that one major difference between digital drawing and traditional drawing was that digital drawing offered more possibilities in terms of size and application:

“With traditional drawing, the size and paper was the same from start to finish, whereas digital drawings could change in size and paper, or even other materials. What bothered many students was the fact that their digital prints did not always match their screen images in color and texture.” (Faber, 2009 p. 4)

In regard to digital color and texture, Hockney did not print out his iPhone/iPad paintings but displayed them on digital devices such as smartphones, smart pads, and projectors when he had exhibitions. He understood that presenting his iPhone/iPad artworks on digital devices is the best way to show them to audiences. This is not unrelated to the differences in colour and texture that students mentioned in Faber’s experiment.

Faber concluded the experiment as follows: there is a blurring of lines from traditional to digital, which inspires each process to new concentrative efforts with multifaceted forms of interpretation. The addition of this new technological tool does not threaten traditional drawing, but strengthens it instead to develop a greater understanding of how we see the world and express ideas through drawing (Faber, 2009 pp. 10).

2.5. Summary

In part one, I determined the theoretical dimensions of digital anxiety. Digital anxiety is a collective term that refers to the following problems: [1] smart mobile addiction, [2] social network addiction, [3] social anxiety, [4] fear of miscommunication, [5] text addiction, and [6] information overload. These problems are interlinked in a cycle. To summarise, the main problem is that overuse of smart mobile devices results in smart mobile addiction and text addiction. Text addiction refers to being addicted to reading and writing text not only for communication but also when searching for information. Since people have adopted smart mobile devices, text based communication has become the dominant method of communication; thus, the overuse of smart mobile devices brings about information overload. This in turn causes memory loss. Today, many smart mobile users feel anxious when they are not able to use their mobile.

Social networking sites have become a popular form of media which is accessed using a smart mobile device; moreover, it powerfully connects users' online and offline lives. People have come to prefer texting and messaging on their smartphones because it increases the frequency of communication, but smart mobile users ironically feel that social relationships mediated by smart mobile devices are weakened. The number of people with whom users share light conversation has increased, but the kind of friendship established over the digital screen is shallow. Although users are alone, the potential for almost instantaneous contact creates the illusion that they are already together. This results in smart mobile addiction and social network addiction. Therefore, the six problems are interlinked in a cycle that results in memory loss and anxiety, including social anxiety.

In part two, I reviewed literature on memory, emotion, social interaction, ideation, doodling, mobile drawing, and mobile drawing apps, to understand how these studies enable and support smart mobile users' wellbeing. Thus, my understanding of these areas will be use useful in my discussion of my pilot studies and the further experiments undertaken for my thesis. The basic understanding of drawing is that it is an active thinking process with hand movements. Drawing has traditionally been used as a supportive tool to enhance memory, relieve anxiety, help social relations, and develop artists' creative thinking. Also, I reviewed the literature on doodling because doodling is a simple drawing that may be useful for smart mobile drawing. Moreover, I found studies that refer to doodling, and these suggest that doodling supports memory, emotion, and creativity, findings that will be useful in the next stage of my research. Finally, I reviewed theories about mobile drawing and mobile drawing apps to compare how this type of drawing might perform differently or similarly to traditional drawing.

I also mapped the problems resulting from digital anxiety. The predominant type of communication today is text-based communication. Users experience digital anxiety as a result of addictive use and addictive social interaction. Users receive a massive volume of digital information, which causes memory loss. I hypothesise that drawing is a useful communication tool to help relieve digital anxiety. Therefore, in the rest of this study, I will investigate how communicating through digital drawing on a smart

mobile device can alleviate digital anxiety in the following ways: [1] helping communication, [2] supporting relationships, and [3] improving memory. I expect to find some other ways in which digital drawing can relieve digital anxiety when it is used as a form of communication.

CHAPTER 3 RESEARCH METHODOLOGY – PART 1 PILOT STUDY

3.1. Introduction

This chapter reviews a number of research paradigms in order to situate my research in the wider field. Four paradigms are popularly discussed, outlining basic beliefs about traditional ways of designing research. These include positivism, post-positivism, critical theory, and constructivism (Denzin and Lincoln, 2011). With the publication of a new edition of Denzin and Lincoln’s book, the participatory paradigm has been added to these four basic research paradigms.

However, my research takes a mixed methods approach. As Denzin and Lincoln remark, ‘mixed methods have emerged in the last few years as a research approach popular in many disciplines and countries, and supported through diverse funding agencies’ (Denzin and Lincoln, 2011 p. 269). I think that understanding the basic paradigms is important when explaining mixed methods research. Thus, I am including a table outlining the four original research paradigms plus the participatory paradigm in this section, in order to understand its parameters of ontology, epistemology and methodology. I then review mixed methods research to explain why it is appropriate for the investigation of my research question.

Issue	Positivism	Post-positivism	Critical Theory <i>et al.</i>	Constructivism	Participatory
Ontology	Naïve realism - ‘real’ reality but apprehensible	Critical realism - ‘real’ reality but only imperfectly and probabilistically apprehensible	Historical realism -virtual reality shaped by social, political, cultural, economic, ethic, and gender values; crystalized over time	Relativism - local and specific co-constructed realities	Participative reality - subjective-objective reality, co-created by mind and given cosmos

Epistemology	Dualist/ Objectivist; findings true	Modified dualist/ objectivist; critical tradition/ community; findings probably true	Transactional/ subjectivist; value-mediated findings	Transactional/ subjectivist; so- created findings	Critical subjectivity in participatory transaction with cosmos; extended epistemology of experiential, propositional, and practical knowing; co-created findings
Methodology	Experimental/ manipulative; verification of hypotheses; chiefly quantitative methods	Modified experimental/ manipulative; critical multiplism; falsification of hypotheses; may include qualitative methods	Dialogic/ dialectical	Hermeneutical/ dialectical	Political Participation in collaborative action inquiry; primacy of the practical; use of language grounded in shared experiential context

Table 3 Basic Beliefs of Alternative Inquiry Paradigms (Denzin and Lincoln, 2011 p.100)

Each research paradigm is defined on the basis of ontology, epistemology, and methodology. My research uses a mixed methods approach, therefore, some parts rely on constructivism, to investigate my research questions but some parts rely on positivism, to assess whether my quantitative analysis is reliable or not.

The following quotation presents a useful viewpoint, describing some of the basic research paradigms and opening up possibilities for crossing these paradigms:

“Positivists and post-positivists alike still occasionally argue that paradigms are, in some ways, commensurable; that is, they can be retrofitted to each other in ways that make the simultaneous practice of both possible. We have argued that at the paradigmatic or philosophical level, commensurability between positivist and constructivist worldviews is not possible, but that within each paradigm, mixed methodologies (strategies) may make perfectly good sense (Denzin and Lincoln, 2011 p. 116).”

Using different methodologies (strategies) means crossing paradigms. This has emerged and become popular in the last few years. However, there are still some controversies regarding mixed methods research:

“Having demonstrated that we were not then (and are not now) talking about an antiquantitative posture or the exclusivity of methods, but rather about the philosophies of which paradigms are constructed, we can ask the question again regarding commensurability: Are paradigms commensurable? Is it possible to blend elements of one paradigm into another, so that one is engaging in research that represents the best of both worldviews? The answer, from our perspective, has to be a cautious *yes*. This is so if the models (paradigms, integrated philosophical systems) share axiomatic elements that are similar or that resonate strongly.”

(Denzin and Lincoln, 2011 p. 117)

This paragraph describes how a researcher can blend elements of one paradigm into another. Eleven key controversies and questions were raised in mixed methods research at the Economic & Social Research Council (ESRC) seminar series sponsored by the Health Services Research Unit at the University of Aberdeen in March 2009 (Denzin and Lincoln, 2011). I selected two key controversies to use as a reference for my research. These are: [1] the changing and expanding definitions of mixed methods research, [2] the wide variety of confusing design possibilities for mixed methods procedures.

The changing and expanding definition of mixed methods research

Greene, Caracelli, and Graham were referenced in the SAGE Handbook of Qualitative Research. They emphasized the mixing of methods and the disentanglement of methods and paradigms when they said the following:

“In this study, we defined mixed-method designs as those that include at least one quantitative method (designed to collect numbers) and one qualitative method (designed to collect words), where neither type of method is

inherently linked to any particular inquiry paradigm (Denzin and Lincoln, 2011 p. 271).”

According to Greene, Caracellit, and Graham, mixed-methods research is not linked to any particular inquiry paradigm. Ten years later, mixing two methods was common in all phases of the research process, and mixed methods was being seen as a methodology (Denzin and Lincoln, 2011 p. 271). Tashakkori and Teddlie are also referenced in the SAGE Handbook of Qualitative Research. These authors write that mixed methods research has evolved to the point where it is a separate methodological orientation with its own worldview, vocabulary, and techniques (Denzin and Lincoln, 2011 p. 271). If the traditional research design has been based on five research paradigms with their parameters of ontology, epistemology and methodology, mixed methods research puts more weight on methodology.

Are there often many confusing design possibilities for mixed methods procedures?

Researchers might have some difficulties designing their research using mixed methods. Triangulation (now called convergent) designs are suggested to prevent researchers’ confusion.

“Triangulation designs involved one phase of qualitative and quantitative data collection gathered concurrently. Explanatory or exploratory designs required two phases of data collection, quantitative data collection followed sequentially by qualitative data collection (or vice versa).” (Denzin and Lincoln, 2011 p. 279)

Triangulation designs will be discussed more in section 5.1., which concerns the research methodology of the main study. As I wrote earlier in Chapter 2, my thesis is largely an overview of investigations into digital anxiety, coupled with a discussion of the effects of my digital drawing task on digital anxiety. In this section, which is an introductory description of my research methodology, I present an overview table to help readers understand what my research methods are and in what order.

Overview of Investigations of Digital Anxiety throughout my Research

There were six steps to my investigation of digital anxiety. These were: [1] theoretical framework, [2] self-exploration, [3] in-depth interview, [4] pre-questionnaire, [5] survey, and [6] post-questionnaire.

	Method	How it was applied to find digital anxiety
Step 1	Theoretical Framework	I reviewed the contextual background of the history of mobile interactions, the history of media studies, and drawing theories to investigate the potential problems related to using smart mobile devices.
Step 2	Self-Exploration	I explored how my day changed without my smart mobile devices, in order to develop my research questions and the interview questions.
Step 3	In-depth Interview	I interviewed smart mobile users who live in different countries and belong to different generations. I focused on investigating what makes smart mobile users addicted to their mobile devices.
Step 4	Pre-Questionnaire	I conducted the pre-questionnaire, checking how smart mobile devices affect their users' memories and social relationships. The respondents answered in writing.
Step 5	Survey	I conducted the survey of the Smart Mobile Addiction Test and the State-Trait Anxiety Inventory to determine what factors create problems for smart mobile users and to quantify the level of digital anxiety in a user.
Step 6	Post-Questionnaire	I conducted the post-questionnaire in order to check how my drawing experiment had affected the participants' memories, emotions, and social relationships.

Table 4 Six methods of investigation into digital anxiety throughout my research

The research methods that correspond to my pilot study appear in Step 2 and Step 3. In Section 3.3 I describe in detail how each method is used in my research.

Overview of the Efficacy of Drawing as a Treatment for Digital Anxiety

My investigation into the relationship between drawing and digital anxiety comprised eight steps, which were as follows: [1] theoretical framework, [2] self-exploration, [3] observation, [4] in-depth interview, [5] study references, [6] workshops, [7] experiment, and [8] questionnaire.

	Method	How it was applied to find digital anxiety
Step 1	Theoretical Framework	I reviewed the contextual background of drawing with regard to the topics of memory, emotion, social interaction, ideation, and doodling. This review was conducted in order to gain an understanding of drawing as a treatment for digital anxiety.
Step 2	Self-Exploration	I attended a healing art class to gain practical experience of using drawing as a form of relaxation.
Step 3	Observation	I observed both an instructor and attendees to understand how they found the healing process throughout the class.
Step 4	In-depth Interview	I interviewed the instructor to learn how drawing can heal and to establish what points would be important for my research.
Step 5	Study Reference	I researched existing artwork that had been created through collaboration. I studied two digital platforms, the web and mobile devices.
Step 6	Workshops	I was originally interested in synchronous arts collaboration, and planned to use this in order to conduct my research, but I found that more cases of synchronous art collaboration failed to achieve active cooperation between participants than asynchronous art collaboration. I researched why synchronous art collaboration failed to allow users to integrate their artistic abilities.
Step 7	Experiment	I conducted the drawing experiment to investigate how drawing affects digital anxiety. Participants were paired up and conducted the drawing tasks.
Step 8	Questionnaire	I collected the questionnaire after the drawing experiment to understand how drawing affected them. I also collected their drawings and conversations.

Table 5 Eight methods of investigating the effect of drawing on digital anxiety

The research methods corresponding to my pilot study appear in Steps 2 to 6. Details on the various methods used in my research are described in Section 3.3.

3.2. Designing Research Aims and Methods through Pilot Studies

My pilot studies were used to pursue exploratory research. Multiple pilot studies were conducted to verify the research plan and the methods. The initial research questions were proposed throughout the literature review. These were refined through the pilot

studies, as I reflected on the explorations I was making. My pilot studies are presented with the titles as follows: [1] combining art and meditation, [2] data analysis of digital arts content, [3] synchronous collaborative drawing, and [4] exploring digital anxiety.

The first pilot study, ‘combining art and meditation’, was conducted in order to refine the questions that emerged from the literature review and to learn about using art to improve wellbeing. I discovered how theory and practical activity are interlinked; for example, “drawing and creation improve memory through physic-cognitive activity” (Garner, 2012), a drawing activity that encourages active thinking: “drawing impacts positively on the inner mind” (Potash *et al*, 2012). Potash also remarks how “the daily practice of oriental drawing creates equilibrium between body and mind” (Potash *et al*, 2012). I attended the class as a learner, an observer, and an interviewer. As a learner, I understood how I changed during the class. As an observer, I saw how other attendees established a peaceful mind through the class. As an interviewer, I investigated what type of art is important to achieving wellbeing, what makes people relax during the class activities, and what roles the instructor takes on to support them.

The second pilot study, ‘the data of digital arts content’, was conducted to document the digital arts content created through collaboration on the web and on mobiles. This was done because the idea of ‘sharing’ or ‘collaboration’ has successfully created the new paradigm of production and culture, as for example in Wikipedia. Therefore, I identify not only a different meaning of ‘sharing’ and ‘collaboration’, but also investigate social interactions through the study of digital arts content, which is created by sharing and collaborating.

The third pilot study, ‘synchronous collaborative drawing’, is an early research interest of mine. I conducted the workshops to explore if and why asynchronous collaboration was more successful than synchronous collaboration. The meaning of asynchronous collaboration and synchronous collaboration will be explained in section 3.4. This workshop ran in a university setting. Participants were set into two groups, undergraduate students and postgraduate students. I explore what factors successfully lead a collaborative drawing, how participants draw together, and how they share the drawing area.

The last pilot study was conducted to explore how a smart mobile device changes a users' everyday life, how it shapes that users' behaviour and thought, and what their motivations are for its use. I analysed my everyday life to understand how my day might change and how it would affect me if I did not use my smart mobile devices. This self-exploration was used as a reference to develop the questions for the in-depth interview. I then interviewed four smart mobile users. They live in different countries: the UK, South Korea, Australia, and China. This is because smart mobile users who live in different countries have different user-experiences and cultural backgrounds.

3.3. PILOT STUDIES

PILOT STUDY 1: Combining Art and Meditation

The methods of this study are direct observation, self-exploration, and in-depth interview. These methods were selected in order to understand how I and other participants established a peaceful mind during the class. In reality what I wanted to find out from the pilot study 1 is whether art can be useful in helping people achieve a sense of wellbeing. I joined the class with the intention of learning about the healing potential of art, which may be usefully applied to my main research. Also, I observed how people attempted to find positive feelings during the class. In Chapter 2 I reviewed some theoretical perspectives on the interaction between drawing and the mind. I was also interested in looking at the synergy of art and meditation. An in-depth interview was conducted to investigate what the instructor thought about linking art and meditation.

Throughout the self-exploration, my diary and drawings constituted the data. This study progressed through direct observation alongside self-exploration. By 'direct observation', I mean when a researcher creates the opportunity for direct observation by making a field visit to the case study 'site'. Yin explains, "environmental conditions will be available for direct observation like meetings, activities, factory work, and classrooms" (Yin, 2013 p. 92).

I explored the following research questions through direction observation:

[1] Who will attend the class, and why?

[2] How does a professional art therapist encourage attendees to find a healing state through the activities in the class?

[3] What helps the attendees establish peaceful mind?

[4] What reactions do the attendees have?

Throughout the direct observation, I compiled field notes describing how the attendees reacted during the class and how those reactions changed. “Observation was often combined with other qualitative methods such as in-depth interview in order to provide complementary data to understand issues from different perspectives” (Hennink *et al.*, 2010 p. 170). I interviewed the instructor to strengthen the self-exploration and the direction observation. “In-depth interview is a one-to-one method of data collection that involves an interviewer and an interviewee discussing a specific topic in depth; this captures people’s individual voices and stories” (Hennink *et al.*, 2010 p. 110). I investigated her thoughts about the research questions that are written in this section. Here, the script of the in-depth interview constitutes my data.

PILOT STUDY 2: Data Analysis of Digital Arts Content created through Collaboration

In Pilot Study 2, I attempted to document the existing digital arts content on the web, mobile, and social media, in order to understand social interactions in digital arts content created through collaboration. I also studied the technical functions of digital art. According to Yin, “Documentation is a source of collecting evidence for data analysis such as news clippings and other articles appearing in the mass media or in community newspapers” (Yin, 2013 p. 103).

This documentation is done in order to understand what user-generated content is and how it works as the new collective movement in web 2.0. A socio-culture of sharing and collaboration has arisen through the increasing use of smart mobile devices and social networking sites. The rationale for this data analysis is to identify a different meaning of the words ‘sharing’ and ‘collaboration’, and to focus the understanding of contemporary digital arts content, which is generated by sharing and collaboration. I have identified research questions as follows:

[1] How are ‘sharing’ and ‘collaboration’ different on web 2.0?

[2] What is a collaborative arts application?

[3] What is the motivation for participating in digital arts creation through collaboration?

[4] How does digital arts content differ when established using different media such as a smart mobile device, the web, or social networking sites?

[5] What factors emerging from this data analysis can be used in the main study?

I collected the data sources such as news clippings and other articles appearing in the mass media or in community newspapers. The criteria for data selection are as follows: arts content created through digital devices, arts content expressed visually instead of through text, and arts content made through user collaboration.

The selected data are analysed with two types of communication system: synchronous communication and asynchronous communication. The analysis will be carried out in the main research, which is covered in the next chapter.

PILOT STUDY 3: Synchronous Collaborative Drawing

The rationale behind this pilot study lies in synchronous collaborative drawing, which was a very early research interest of mine, in combination with a new issue that has arisen from the previous section. The new issue is as follows: the motivation for participating in collaboration is that collaboration guarantees social interactions and other participants' attention. If that theory is correct, then a synchronous collaborative arts creation will be more successful in popular use than an asynchronous collaborative arts creation. This image illustrates how asynchronous and synchronous content differ:

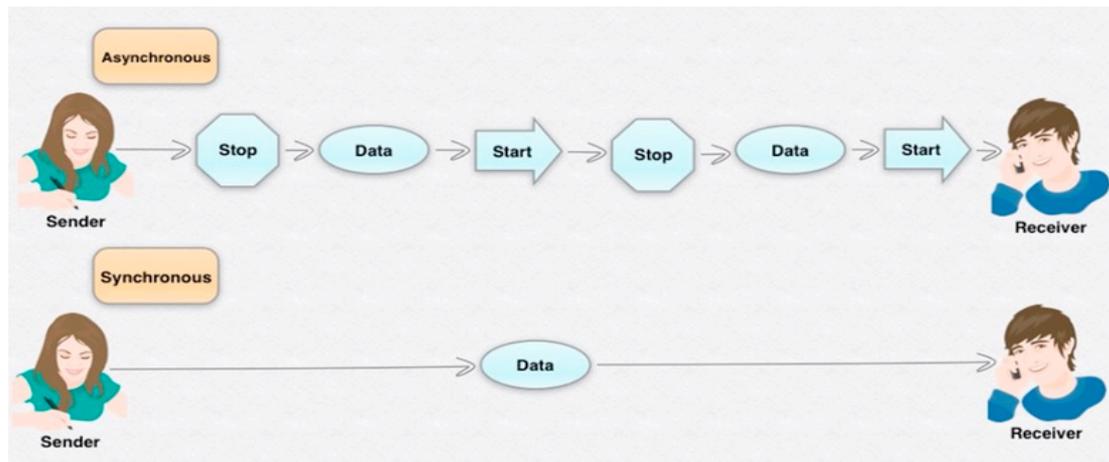


Figure 2 The systemic difference between asynchronous and synchronous content

The study of synchronous collaborative drawing fits into constructivism, like Pilot Study 1. In reality, what I was attempting to find in the pilot study is why synchronous collaborative arts content is less popular than asynchronous collaborative arts content. What is happening, what kind of knowledge production is taking place? My belief is that the arts can help people to reach a healing state. What is the relevant context and how can I understand it? I ran workshops (participant observation) to contribute to an understanding of why synchronous collaborative arts content fails. Participant observation is a way of understanding “interpersonal behaviour and motives” (Yin, 2015 p. 102). I conducted the workshops with two focus groups, undergraduate students and postgraduate students, in a university setting. I gave each group free topics to draw together with crayons on a sketchbook. I filmed their activity. I reviewed theories of asynchronous and synchronous communication systems in the literature review and found it to be an important consideration in the study of digital-based communication.

The methods in Pilot Study 3 are participant observation and visual methods. I ran workshops with two groups, undergraduate and postgraduate students. I used standard art materials like a sketchbook and pencil crayons. This is because digital drawing tools with synchronous communication contain only basic drawing features like colour selection, simple drawing lines, and an eraser. The simple drawing line was the main reason why I did not use digital media. It looked like marker drawings on a whiteboard. Thus, I would have preferred LG Optimus Vu2 if I had chosen to conduct my drawing experiment on the basis of synchronous communication because this

device contains luxurious drawing features. However, this too posed problems for the pilot study and main study. The hand drawing communication system in LG Optimus Vu2 works when two mobile users are talking on the phone. This means that the participants must make a phone call. My research interests do not lie in voice communication via mobile devices. I am more interested in communication by hand using drawing and some supportive text based communication. Therefore, I conducted my workshops with standard drawing tools for synchronous collaboration.

Two data collection techniques are used in my research: an overview of theoretical sources, and participant observation. I collected their drawings after completing the workshops and the video recordings of how they draw together; these constitute the data for this pilot study. My analytic strategies are to rely on theoretical propositions and developing a case description. My explanation builds on the research rationale behind this pilot study, and analytic techniques use a sequence of video recordings. The analysis then shifts toward key explorations for designing the main research.

PILOT STUDY 4: Exploration of Digital Anxiety

Digital anxiety is the main keyword in this research. In the theoretical framework, here, I define digital anxiety as addiction to smart mobile devices, including social networking sites, information overload, online social rejection, and fear of making mistakes in communication over the digital screen. These issues have, broadly, two effects: memory loss and emotional disturbance. The aim of this pilot study is to access factors affecting digital anxiety. My research questions are as follows:

- How does a smart mobile device change a users' everyday life?
- How does the use of a smart mobile device influence a users' behaviour?
- How does a smart mobile user think he or she changes through the use of smart mobile device?
- What are the motivations for continually accessing a smart mobile device?
- What is the predominant means of communication via the smart mobile screen?

The methods in this pilot study were self-exploration, such as keeping a diary, and in-depth interview. I explored how my day changed without my smart mobile devices, in

order to develop my research questions and the interview questions. And then I interviewed smart mobile users who live in different countries and belong to different generations. This is to understand how cultural background or age may affect users' behaviour and thinking.

What I attempted to find from the pilot study was whether smart mobile users might have digital anxiety. If they do, what symptoms do they have, what do they think about their user behaviour, what makes them feel anxious, and what use patterns do they have on their smart mobiles. What methods are appropriate to answer these questions? I used the three following methods: an overview of theoretical sources, focus group interviews, and self-exploration. Self-exploration was conducted in order that I could myself answer the research questions, and contribute to developing the interview questions. I then conducted the in-depth interviews.

I interviewed four smart mobile users who live in different countries. The countries are Australia, South Korea, the United Kingdom, and China. The reason I selected these four countries is that I wanted to focus mainly on the difference between Western culture and Eastern culture. I understood that the Chinese government blocks a number of global online services like Facebook and Google. It is therefore interesting to see how the different online culture in China may affect digital anxiety. The interviews were conducted through Facebook chat except for with the person who lives in London. The interviewee in London was interviewed face to face. The outline of the interview questions is as follows:

Opening questions:

- [1] Do you use a smartphone or any other type of smart mobile device?
- [2] What types of smart mobile devices do you use?

Questions about smart mobile addiction:

- [1] Do you carry that device with you everyday?
- [2] How often do you use and check your mobile?
- [3] Can you estimate the frequency of the use?
- [4] Do you think you are addicted to the use of your smartphone?

[5] Do you know someone who is addicted to the use of a smartphone?

Questions about digital anxiety and social anxiety:

[1] Do you have an account with any type of social networking site (SNS)?

[2] Do you access it with your smart mobile device?

[3] What makes you want to access a SNS?

[4] What are your interests in SNSs?

[5] How do you feel when you see a friend's seemingly happy life on a SNS?

[6] Have you worried about social rejection via SNSs?

Questions about text-based communication:

[1] What is your predominant means of communication on your smartphone?

[2] If the interviewee answers that they are mainly occupied with text-based communication, then I would ask: why do you prefer that?

[3] Do you read texts or information on your mobile?

[4] Can you estimate how long you spend on digital reading?

[5] Do you skim text when you read on your smart mobile?

[6] Do you remember texts or information well after reading on your smart mobile?

Questions about user behaviour and memory:

[1] How long do you hold the contents of what you read in you memory?

[2] Do you have any experience of saving a text or saving a web link on your mobile?

[3] Do you take notes when you read texts on your digital device?

[4] Are you a person who is good at multi-tasking?

[5] Do you have any experience of multi-tasking on your mobile?

[6] If you have such experience, what do you do normally with your mobile?

My two analytic strategies are to rely on theoretical propositions and to develop a case description. My explanation builds on the research questions identified in this study. My analytic techniques use the logic model, and data from the interviews and self-exploration. The data resource for the self-exploration is a video recording.

Data analysis begins with the description of my self-exploration. I then outline how my day changes if I do not use my smart devices. This lived experience is coded with the interview data to explore the categories and concepts. These codes are bracketed with the philosophical underpinnings of digital anxiety to conduct narrative analysis. The analysis shifts to key explorations for designing the main research.

Data analysis began with the description of the healing content of the class on the basis of the review, and the record of my thoughts from the class. After writing how the class progressed, I coded interview data, observational notes, and self-exploration to point to the key themes. These can be divided into two categories: ‘arts activity’ and ‘meditation’. I strengthened my analysis with the use of the philosophical underpinnings of healing arts. The analysis shifts to key explorations for designing the main research.

3.4. Ethical Issues and Gaining Access

My research gained formal ethical approval from the department’s research ethics committee (see Appendix 6: Research Ethics Approval Form). The ethical principles were released by the World Medical Association (WMA) in 1964, and the *Belmont Report* was created in 1979 by the National Commission for the Protection of Human Subjects of Behavioral Research (Hennink *et al.*, 2010 p. 62).

The *Belmont Report* identifies three core principles for the ethical conduct of research as follows: *respect of persons, beneficence, and justice*.

The application of these principles to the conduct of research leads to the following important considerations:

Informed consent. Individuals should be provided with sufficient information about the research, in a format that is comprehensible to them, and make a voluntary decision to participate in a research study.

Self-determination. Individuals have the right to determine their own participation in research, including the right to refuse participation without negative consequences.

Minimization of harm. Researchers should not do any harm to participants or put them at risk.

Anonymity. Researchers should protect the identity of research participants at all times.

Confidentiality. Researchers should ensure that all data records are kept confidential at all times. (Hennink *et al.*, 2010 p. 63)

For conducting the pilot studies, I designed my ethical strategies as follows: [1] providing the information about my research, [2] introducing those conducting the research, [3] describing which participants would be involved in the study, [4] informing the period of study, [5] notifying them of their authority to withdraw from the study, [6] explaining that no risk or harm is involved in the study, [7] accounting for how their data would be collected and secured, and [8] informing them of their authority to ask about the results, or for further information. More details of my management of ethical issues are attached in an Appendix (see Appendix 2: Consent).

3.5. Summary

In this chapter, I have discussed my research design and methods. I have described the background of the pilot studies, and explained what the rationale for the research aims was, the ethical issues, and the selection of data. I have described how I accessed the data and how they were analysed.

Each pilot study represents a case study intended to clarify and refine my main research. I learnt about the meaningful contexts of arts and meditation, analysed the existing digital arts contents, investigated how people collaborate on a drawing together, and explored what makes people have digital anxiety within an in-depth account that reflects a social phenomenon and real contexts throughout the pilot studies.

CHAPTER 4 ANALYSIS AND FINDINGS, PART 1 PILOT STUDY

4.1. Introduction

This chapter draws on the literature review in Chapter 2 and the careful and thoughtful posing of research questions, and is split into the following sections: ‘art and meditation,’ ‘social structure,’ ‘synchronous collaborative creation’, and ‘digital anxiety’. The aim of this exploratory phase is to identify drawing content that will impact positively on digital anxiety, and to explore how we might move from the exploratory phase towards a design for smart mobile users’ wellbeing. The exploratory phase considers factors affecting three topics, as follows: current digital mobile content, the experimental investigation of digital anxiety, the combined activity of drawing and meditation, and the social structure of collaboration in drawing activity. Thus, this chapter comprises four main headings, as follows: a pilot study combining art and meditation, data analysis of digital arts content created through collaboration, a pilot study of synchronous collaborative drawing, and a pilot study exploring digital anxiety.

4.2. PILOT STUDY 1: Combining Art and Meditation

I will start by exploring the combination of art and meditation in Eastern drawing, which emphasises the equilibrium of the human body and mind, rather than illustrating through observation and ideation. Asians use diagnosis and interpretation in a holistic fashion to explore the artist’s own energy and self-understanding. What does Eastern holistic-dialectical thought consist of? Firstly, there is “a focus on the field of surrounding objects, sensitivity to co-variation in the field, and little relevance seen in categories” (Salvendy, 2012 p. 166). Secondly, there is “little use of universal rules, and the behaviour of an object is explained by situational forces and factors in the surrounding field” (Salvendy, 2012 p. 166). The third is “little use of formal logic, and a preference for dialectical reasoning such as synthesis, transcendence, and convergence” (Salvendy, 2012 p. 166). The fourth important notion is “the interpretation of people’s behaviour as the result of situational pressures” (Salvendy, 2012 p. 166).

Two types of drawing, Zen doodling (see section 2.4.6.) and Chinese calligraphy (see section 2.4.3.), based on Eastern holistic-dialectical thought, are reviewed in chapter 2.

It shows how the Zen doodler incorporates many intertwining circles and delicate Mehndi elements into his work, which is a process of finding one's heart's desire. As indicated earlier, Chinese calligraphy is the art of drawing beautiful characters in order to explore the inner mind. The everyday practice of calligraphy is based on the notion of the five energies: water, wood, fire, earth, and metal (see section 2.4.3). Like Zen doodling and Chinese calligraphy, the class I attended for this pilot study is grounded in the concept of the seven major chakras. A chakra represents energy, like Mehndi in Zen doodling. The aim of this pilot study is to assess factors that alleviate anxiety through activities combining art and meditation, and to contribute to an understanding of how an art therapist would lead people to find a peaceful mind through art and meditation.

4.2.1. Description of Healing Content in the Class

According to the class description, this class was designed with the theme of seven major chakras. The word 'chakra' originates from a Sanskrit word that means wheel. It is reminiscent of Buddhist culture and represents energy. The seven major chakras are the root chakra, the sacral chakra, the solar plexus chakra, the heart chakra, the throat chakra, the third eye chakra, and the crown chakra. In the literature review, Buddhist culture is described in the following way: a person can become the Bodhisattva if he has attained the highest state of enlightenment through steady practice (Tsong and Maitreya, 2013). Chakra, energy, also continuously revolves or rotates through meditation. Like the five elemental energies in Chinese calligraphy, the Chakra energies represent the colours red, orange, yellow, green, blue, indigo, and violet. The size and brightness of energy change with physical condition, energy level, disease, and stress; therefore, practicing meditation has a positive effect on one's energy. This is the class's central theme, but the main purpose is not to understand the context. The main purpose is to learn how a professional art therapist runs this class, to observe how attendees approach healing, and to discover different aspects of healing arts.

The class description noted that "absolutely no artistic experience or talent [was] necessary". This statement encourages people to join in the class. Since I began this research, I've heard "I'm not good at art" from people.

I witnessed attendees smiling bashfully when they introduced themselves, and explaining how they weren't good at art. Actually, neither the art therapist nor client has to worry whether they are good at art or not. The British Association of Art Therapists presents art therapy as follows:

Art therapy is the use of art materials for self-expression and reflection in the presence of a trained art therapist. Clients who are referred to an art therapist need not have previous experience or skill in art. The art therapist is not primarily concerned with making an aesthetic or diagnostic assessment of the client's image.

(Godwin-Jones, 2005 p. 24)

Thus, I chose 'drawing' rather than 'art' as a keyword for this research, because drawing connotes a range of easy expression including squiggles or doodles. The use of the word 'drawing' might also encourage people to be more involved.

4.2.2. Process of the Healing Art Class

As I wrote in section 1.1., my research focuses on some aspects of digital wellbeing resulting from the arts, not from a therapeutic approach. Thus, my research is concerned with this class's focus on wellbeing. I called this section 'Healing Art Class' because that was the official title of the class.

I learnt aspects of running a healing art class. The class begins with self-introductions in order to get to know other attendees, and as a starting point for communication. After the introductions, art activities and meditation are repeated. The process followed in the healing art class is presented in the diagram below:

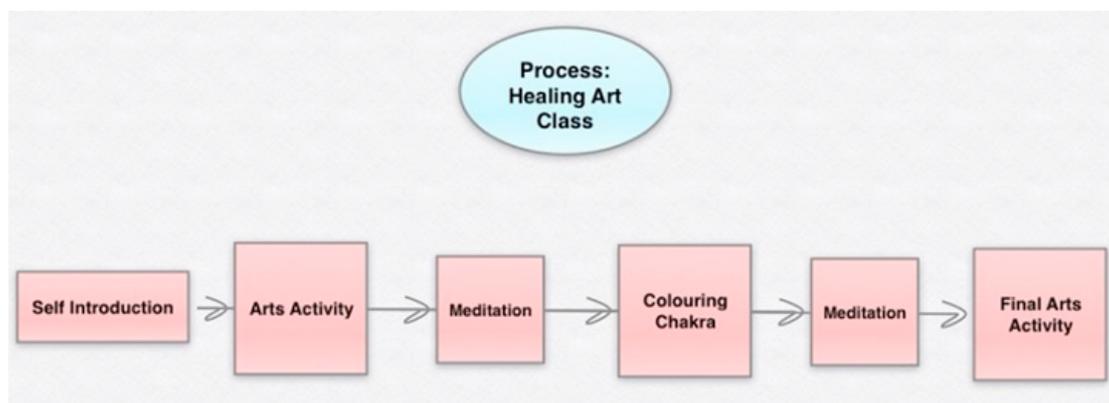


Figure 3 The process of the Healing Art Class

4.2.3. Analysis of Arts Activity

After the attendees have been introduced, the instructor hands out a piece of paper to attendees for a drawing activity. This paper has the role of “transitional space” (Malchiodi, 2011 p. 187) where one can illustrate one’s thinking and emotions. Winnicott (1953) presents “transitional space” as an intermediate area of experience where there is no clear distinction between inner and outer reality. Attendees start drawing using pencils, crayons and pastels. In this activity, I drew a pyramid surrounded by a forest, and drew an ant clinging to the middle of the pyramid, as in the below image:



Figure 4 An image of my drawing

After this drawing activity, the instructor began to discuss my drawing, guessing at enigmatic meanings and the reason behind my use of colours, before asking other attendees for their opinions on my drawing. To begin with her talk is an important aspect of this conversation. She guides the group conversation, and influences other attendees’ comments. In this way a relationship is created between the client and therapist. In my interview with the instructor, she remarked that she wanted attendees to feel safe, relaxed, and free of judgment during that conversation:

Researcher: What are the conditions essential for relieving people’s anxiety and stress in your class?

Instructor: I have found that meditation is really important... other conditions are feeling safe and supported. And this space has no judgment. (see Appendix 7: The Script of the Instructor Interview)

According to Robbins (2001), a therapist must use the art process to communicate: “I am with you, will help you and teach you, but I am also separate and must promote in you, regardless of your pleasure or pain, your own independence and autonomy” (Robbins cited in Malchiodi, 2011 p. 72). The instructor of this class participates in a drawing activity, presenting her life story in order to build up trust or sympathy and to indicate that “she is one of us”.

Through their conversation, the instructor and attendees try to determine what my drawing represents, by looking at the use of colour, composition and lines. No one discovers any enigmatic meaning in my drawing, but they understand my mood when drawing it. In Figure 4, the green areas might represent a jungle. Many difficult situations and dilemmas were depressing me at the time. I felt afraid of living in a vast society. The vast society seemed to me like the jungle. The ant represents me as a small drop in a big ocean. The ant corresponds to Mahler’s stage in art therapy that mirrors interpersonal communication and potential difficulties with object relations (Malchiodi, 2011 p. 72).

Conversations about my drawing helped to relieve me of a burden. Attendees, including myself, expressed their thoughts and emotions through their drawings, talked about what they thought of others’ drawings, and shared their thoughts and moods. This is part of the healing process. In drawing, people can express hidden meanings more honestly than in regular communication. Expressing hidden thoughts encourages a feeling of existence. Rollo May (1961) is a key figure who brought existential theory into the practice of therapy and who is important to the development of an existential approach to art therapy. He supports the idea of having the “courage to create” and of the creative process as an expression of the self and the dilemmas of human existence (Malchiodi, 2011 p. 76). The instructor points out the importance of encouragement in her interview. It is her view that encouragement motivates people to finish their art projects and to approach a healing state.

4.2.4. Analysis of Meditation

Listening to a peaceful music is an important aspect of meditation. In this healing arts class, turning on peaceful music is a sign that the meditation is beginning. Attendees

close their eyes and listen the instructor’s whispered words. She whispers the practice of chakras for meditation. This meditation aims to release blockages in the mind and body. During her talk, attendees practice breathing in and out. This process helps relaxation and brings attendees into presence before moving on to the next stage. The instructor argues that peaceful music helps relaxation and also changes brain waves. She explains that alpha brain rhythm waves come first, then theta brain waves, when people listen to peaceful music.

Researcher: In your class, I listened to peaceful music while doing meditation. Is that important for meditation?

Instructor: That kind of music helps relaxation. I think relaxation is important in the creative process. Because when we relax, our brain changes. Relaxation helps more alpha rhythm brain wave... meditation music is very important. (see Appendix 7: The Script of the Instructor Interview)

Many studies have researched the neurological effects of sound by observing brain wave data. The electroencephalogram (EEG) is a mixed-frequency signal recorded from the scalp (Empson, 1986 p. 10). Rhythmic activity is defined in terms of its frequency in cycles per second, or as it is conventionally expressed, Hz (Empson, 1986 p. 10).

Name	Defining Frequencies	Principal characteristics
Alpha	8-12 Hz	Dominates occipital scalp when eyes closed, relaxed
Beta	13<Hz	Precentral, frontal, rare except during sleep (13-15 Hz spindles) or with barbiturates
Theta	4-7 Hz	Young children, and normal adults during light sleep. Clinically, typical of space occupying foreign bodies or tumors in brain
Delta	0.5-3.5 Hz	Ubiquitous on scalp during deep (stage 4) sleep
Mu	7-11 Hz	Central, left and right, blocked by contralateral movement
Lambda	Sharp waves	Low-amplitude single spikey waves, sometimes in association with visual stimulation

Table 6 nomenclature of rhythmic activity

The factors affecting our brain waves are: musical intensity, emotion, and rhythm, or different qualities of sound, for example, loud, soft, high pitch, low pitch, audible,

inaudible etc. (Bhoria *et al.*, 2012 p. 121). According to Renu *et al.*, the absolute power of the alpha band is frequently found in music at a sound level of less than 100 dB (Bhoria *et al.*, 2012 p. 124).

In the healing arts class, meditation consisted of: listening to soft music, listening to the instructor talking, and breathing in and out. These activities help to unblock mind and body. Anand *et al.* (1961) reported that the EEG of meditators showed a slowed alpha rhythm, of high amplitude, which gradually spread from the occipital to the frontal areas (Empson, 1986 p. 29). As the instructor points out in her interview, Banquet (1973) confirmed the preponderance of alpha activity during meditation, and also more adept practitioners, when theta frequencies suffused from frontal to posterior channels, appearing in short trains, could attain the second and third stages of meditation (Empson, 1986 p. 29).

Breathing exercises help physically to release blockages in the mind and body. Wallace and Benson (1972), for instance, reported rapid changes in a number of physiological parameters with the onset of meditation.

“Oxygen consumption dropped, and so did the production of carbon dioxide, which indicates a lowering of metabolic rate. Benson argues that the physiological phenomena accompanying meditation are part of what he calls the ‘relaxation response’, which is, he says, is naturally embedded in our nervous systems as the startle reaction.” (Empson, 1986 p. 29)

Muscle cells also respire effectively because redistribution activity increases the blood flow rate while meditating.

After the breathing exercise, the instructor hands out chakra patterns to be coloured in with pencil crayons and pastels. I recall the related literature of Zen doodles, which is reviewed in Chapter 2. The ancient shape of the Mandala inspires patterns of Chakra and Zen doodling. The basic form of Hindu and Buddhist Mandalas is a square within a circle with a centre point, which often exhibits radial balance (Jenny and Jones, 2013 location 284).¹

¹ ‘Location’ refers to the page number in the Kindle e-book reader.

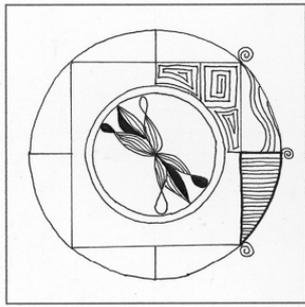


Figure 5 an example of Zendala
(Jenny and Jones, 2013)

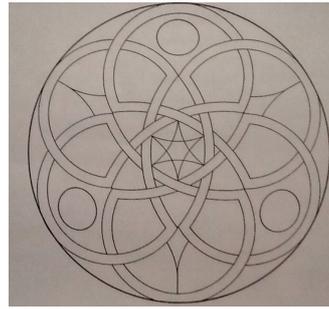


Figure 6 an example of Chakra pattern from the class

People relieve their anxiety by colouring in patterns. This is part of the process of discovering relaxation and a meditative state. The instructor points out in her interview that drawing is a type of meditation because art and meditation cannot be separated.

“Florence Cane (1951), who developed the “scribble technique”, combined art activities with meditative awareness, also articulating theories that became the basis for a transpersonal approach to art therapy. Later, Garai (1976), who pioneered the humanistic approach to art therapy, also explored how art expression led to self-transcendence” (cited in Malchiodi, 2011 p. 81).

“Joan Kellogg (1978) noted the value of artistic expression in accessing transpersonal aspects of the self through mandala drawings. Others have connected art expression with spirituality (Allen, 1995; Malchiodi, 2002; Moon, 1997), have linked it to models of shamanic healing (McNiff, 2009), and have looked at the relationship between spiritual beliefs and the practice of art therapy (Chickerneo, 1993; Farelly Hansen, 2009)” (cited in Malchiodi, 2011 p. 82).

Mandala drawing serves as a metaphor for existential dilemmas, and acts to melt away anxieties. Mandala drawing aims to discover a state of awareness. However, after colouring the Mandala, the instructor guides us as follows: hold up the chakra patterns in front of your face, shout loudly at the chakra patterns, rip off the coloured Mandala, and then sprinkle the pieces about. Shouting at the mandala refreshes me; ripping the paper dissipates my anxiety, and then it blows away. Bullying or being shouted often evokes a feeling of powerlessness and other people’s denial of their

adult status (Rees, 1998 p. 18); applying that reversely, shouting encourages people to seize power.



Figure 7 image of the final drawing

After releasing blockages in the mind and body, the instructor runs the last drawing activity.

Figure 7 is my last drawing, representing the East Sea coast where I spent my youth. The sunrise over the East Sea represents good luck and a new beginning. All my stress and anxiety melted away at that moment, as a result of this healing art journey. I could observe that other attendees expressed positive thoughts and emotions in their drawings during this activity.

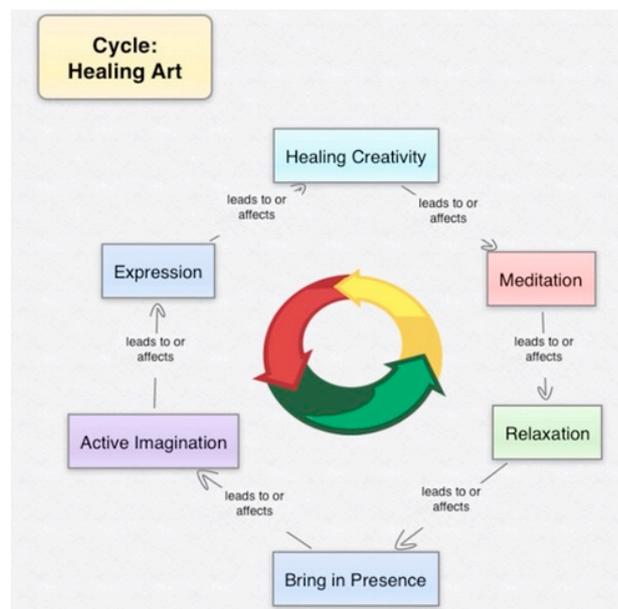


Figure 8 Cycle of Healing Art

I learnt from this study that healing creativity comes after training in meditative activity. Meditation helps people find relaxation, and brings them presence of mind. Expression and creativity are factors of healing itself. A synergy of meditation and creativity has a positive impact on anxiety. Von Franz (in Keyes, 1983) describes active imagination in the following four stages (cited in Malchiodi, 2011p. 67):

1. Emptying one's mind in a similar way to meditation.
2. Allowing images to enter one's field of attention and focusing on them without holding on with too much concentration or allowing images to pass by without observation; this balance between the relaxation required to allow images to emerge and the tension necessary to attend to the images can be difficult to achieve and may require both patience and practice.
3. Recording what has been seen in writing or in an art form such as paint, to give form to the experience.
4. Reflecting on the messages received from the experience.

Sharing is an important aspect of this healing art class. The instructor points out that aspects of sharing are: making connections, promoting interaction, and encouraging each other. When people share expression, feeling, and heart, people can see not only others' insights but also something they perhaps had not noticed themselves.

The limitations of this experiment for my research lie in the fact that online and offline environments are different. For example, instructions can help users to use digital content. Those instructions could be a type of recorded video, sound, or text. However, those instructions do not exist in a live format; they are not a two-way interaction or a two-way communication. The art therapist has the main role in the healing art class. This person makes decisions and mediates clients. The therapist's involvement in the work, choosing and initiating art activities, assisting the person in finding meaning in the creative process, and facilitating the sharing of the experience of the image are aspects of therapeutic needs (Malchiodi, 2011 p. 1).

The role of an art therapist is important, but there are many different types of art therapy. A transpersonal approach to art therapy explores points of anxiety and relief in the client-self; the client explores how artistic expression can lead to self-transcendence. I consider problems in human communication if no one is in control. It

is difficult to predict online users' attitudes when they communicate with unknown users. In fact, bullying is an issue on social networking sites today. However, sharing is an important keyword in healing arts. Sharing will be a key issue in my remaining research. Again, I will define my research goals and categories precisely. My research is not related to art therapy. However, drawing, one of the art techniques, is used as a communication tool in my research. I also assume that it will have a positive impact on digital anxiety when used as a communication tool.

4.3. PILOT STUDY 2: Data Analysis of Digital Arts Content Created through Collaboration

The analysis of data here will frame the preliminary design, which is explored in the next chapter. First and foremost, theoretical constructs in this section are discussed: how 'sharing' and 'collaboration' have different meanings in web 2.0, what digital arts collaborations are, what the motivations are for participating in collaborative arts projects, and how these questions can contribute to my preliminary design.

Digital anxiety is a live phenomenon through the use of smart mobile devices, and is an important area of my research. Thus, secondary sources such as news clippings and other articles appearing in the mass media or in community newspapers are used as a source of evidence. The criteria for data selection are as follows: art content created through digital devices, art content expressed visually instead of through text, and art content made through user collaboration. The selected data is analysed with two types of communication system: synchronous communication and asynchronous communication.

4.3.1. Theoretical Framework: 'Sharing' and 'Collaboration'

Since the early 2000s, an increase in individual access online via many types of digital devices has generated a collective online movement. Many terms like 'sharing,' 'openness,' 'user-generated content,' and 'participation' have become so ubiquitous that too often they tend to be conflated and misused (Mandiberg, 2012 p. 53). The terms 'sharing' and 'collaboration' are often misinterpreted in the context of user-generated content and social media. Sharing content alone does not constitute collaboration. For example, texting on a message board, writing audience-driven

review sites, blogging and commenting, photo and video sharing, bookmark sharing, micro blogging, and social networking – these tell us what a user is doing at a particular moment, or who a user is. For collaboration, intention is essential; people aggregate to create a new entity (Mandiberg, 2012 p. 57). Collaboration also requires goals; the intentional practice is different from the intentional goal (Mandiberg, 2012 p. 58).

Individual digital devices support cooperative working among users who are geographically separated. There are two systemic views in cooperation, which are synchronous collaboration and asynchronous collaboration. Synchronous collaboration assists the remote sharing of workspace between participating individuals involved in common tasks; this sharing tool provides a joint viewing of the workspace in the sense of “what you see is what I see” (Li and Hopper, 1998). Asynchronous collaboration successfully works by sharing with an awareness of a greater context with intentions. For example, the strongly collaborative Wikipedia deemphasizes the tight content-author link; while the attribution of each contribution made by each author is logged on the history tab of each page, attribution is primarily used as a moderation and accountability tool (Mandiberg, 2012 p. 53).

The data analysis presented here aims to explore the meaning of collaboration in arts mobile applications, to discover social interactions in collaborative arts applications, and to understand the motivation behind participation. The data has been extracted from the web, mobile applications, and social media. This data analysis is used to design the main research.

I’ve researched different types of collaborative artistic content including social drawing, social movie making, social architecture, social singing, social opera, and social music videos.

The appearance of new social media, such as micro-blogs and social networking sites, has changed the role of the user from receiver to creator. Users of social media become an active audience. A user nowadays is both a media producer and media consumer. The invention of new social platforms such as photo-and video-sharing

sites and micro-blogs enables self-creation through ‘amateur media’ (Mandiberg, 2012).

There are two groups of users of web 2.0: amateurs and professionals. Amateurs and professionals are on a more equal footing compared to the past. But, professionals have greater impact than amateurs. For example, only few non-professionals are ranked in the YouTube top-twenty; most high ranked users are professionals and celebrities. This phenomenon also applies to collaborative artistic content. When a professional instigates a collaborative artistic creation, it has a more powerful impact than similar amateur-led projects.

4.3.2. Resources for Collaborative Artistic Content

Name of content

A brief description

The Johnny Cash Project



The Johnny Cash Project is a global collective art project. People can create a unique portrait of Johnny through the interactive website. The interactive website combines uploaded drawings of Johnny Cash. A collective drawing is made into a music video for “Ain’t No Grave” which is Johnny’s final record. This music is inspired by the themes of mortality, resurrection, and everlasting life. To reflect that theme, the music video transforms and evolves, incorporating new drawings and contributors. This project of a living portrait plays endlessly, and yet never plays the same music video twice. It changes every second.

A Virtual Choir



A composer, Eric Whitacre, created the concept of a Virtual Choir in 2009. A fan of Eric’s music, Britlin Losee, shared a self-recorded video of himself singing ‘Sleep’ on YouTube. Eric responded by calling for other fans to do the same; he then recorded ‘Lux Aurumque’ himself and advertised it to his fans. After receiving the recordings, his helper, Scott Haines, edited the audio and video to create a virtual choir. This project grew into a global phenomenon. Thousands of participants

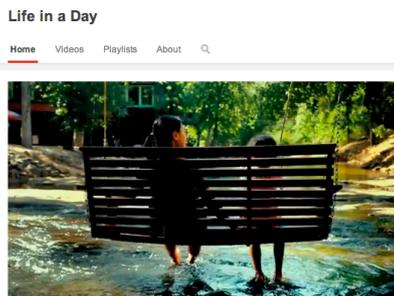
Twitter Opera



were involved in the recent version.

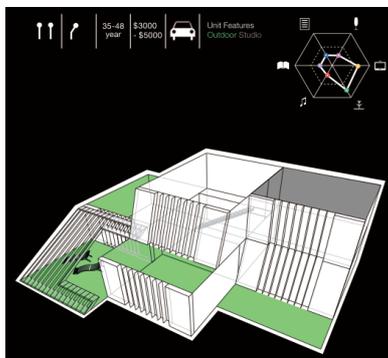
The Royal Opera House produced an opera, whose plot was created using "tweets" from the micro-blog Twitter. Everyone can become a storyteller in the writing of this opera. However, the stories in 140-characters result in a low quality of plot structure. The story begins: "One morning, very early, a man and a woman were standing, arm-in-arm, in London's Covent Garden. The man turned to the woman and he sang..." "Hans has promised to rescue him. The Woman With No Name is off to her biochemistry laboratory to make a potion to let people speak to the birds." (Otto, 19:22). This event was experimental, encouraging people to participate in creating high literary genres.

Life in A Day



Life in a Day is a collective film about the planet on a single day. Kevin Macdonald compiled 80,000 movie clips for the film. Life in a Day begins with three themes. What do you love? What do you fear? What's in your pocket? All 80,000 movie clips were recorded on the same day, 24 July 2010. Contributors uploaded their films to YouTube, where the movie 'Life in a Day' was also released.

Differential Life Integral City



This project is for an exhibition. Participants download an application named 'integrated city' from the App store, and create a personalized residential unit by inputting information about their lifestyle, such as a number of family members, place of work, preferred entertainment, degree of education, whether they enjoy parties at home or not. This project aims to use collective intelligence to create a city through participation. During the project's exhibition, it continuously changes from a homogenous to an integral city.

Low-key Karaoke



Low-Key Karaoke is the YouTube project in which Devon Sproule splices videos of herself and others singing duets together. People send her their self-recorded song by email or upload it to <http://youtu.be/c2CNbxhZ6f8> to become her duet partner. This duet project began with songwriter Mike O’Neill. After this partnership was successful, she expanded the experimental project to all.

Drawing Talk for Kakao



DrawingTalk for Kakao is a drawing mobile app. This was developed by Hyeonguk Sun. This mobile app helps users to draw on Kakao Talk. Kakao Talk is a multifaceted messaging mobile app. Users can draw with Drawingtalk for Kakao and send it to friends using the Kakao Talk chat mobile app. These two mobile applications are interlinked.

Draw Something



The mobile application ‘Draw Something’ is a way of communicating via shared drawings. A user draws a certain word, and sends it to someone to guess what it is. This application aims to be “a place to hang out, play free online multiplayer games, and make friends”. Draw Something 2 launched in 2012. A new updated feature is a social networking system in which users can follow each other and click ‘like’.

Flockdraw



Flockdraw is a collaborative drawing tool mobile application. Unlimited people can join in through the mobile application or the website. Flockdraw aims to be the king of digital whiteboards for multiple users. However, for the mobile version, some functions do not work properly. The concept of FlockDraw is to “draw in real time with others”. One user commented that you can “collaboratively sketch your next big idea

and share it with the world”.

NetSketch App



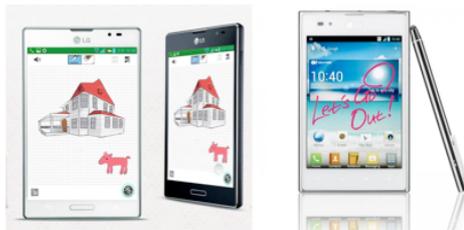
NetSketch was developed for the iPhone and iPad. This mobile application runs only with Wi-Fi service. The developer calls it “drawing for artists on the go, draw with friends, and share with the world.” This mobile application provides two types of sharing service: you can save drawings to your phone, or send them via email. NetSketch enables two users to scribble and doodle together in real time.

Whiteboard: Collaborative Drawing



This mobile application allows collaborative drawing using iPhones and iPads. The developer, GreenGar Studio, envisions a whiteboard as “the next revolution of visual communication on mobile devices”. The drawing interface uses markers instead of brushes. This mobile application is only available with a Wi-Fi connection. Users can share via Facebook, Twitter, iCloud, Photo Album, and Email.

LG Optimus Vu2



LG Optimus Vu2 dares you to live spontaneously. Vu: Talk and Action Memo are the main features of this smartphone. Vu: Talk allows users to share their mobile screen and to communicate with drawings, but this feature only works between LG Optimus Vu2 users. They can share maps and notes in real time while phoning each other. Action memos generate from the Air Command popup, allowing you to take notes quickly. Action Memo reads users’ handwriting, and then converts it into digital data. For example, it can convert a handwritten-name and phone number into contact details in the device.

Table 7 Collaborative Artistic Content

A user has an active role in collaborative artistic creation. Being able to contribute motivates users to participate. In the context of an arts application, collaboration constitutes “self-presentation, observer or observed, and taking roles” (Argyle, 2007 p. 191). Collaborative creation enables users to do something more actively. Participants become potential watchers and contributors. Shared intentions and goals become strong motivations to join in a collaborative project. These motivations are related to social structure because people have certain expectations of how a person should behave; the perceptions of these role-expectations is one of the determinants of a person’s behaviour (Argyle, 2007 p. 191). This expectation shapes the act of creation.

One motive for participating in an arts application is to gain someone’s attention. People present “who I am” and display “what I’m doing” on social networking sites because they desire others’ attention. As I have mentioned, professionals have a more powerful impact on collaborative artistic content than amateurs. The first reason is that professionals present it as an ‘official announcement’. A star composer leads Virtual Choir, a famous director leads Life in a Day, and the team at the Royal Opera House leads Twitt-Opera. These collaborative arts projects guarantee public attention; professionals therefore exercise greater cultural influence than amateurs (Mandiberg, 2012).

One motive of content led by amateurs is sympathy; examples include Low-key karaoke and Facebook Singing videos. These attract less attention compared to those led by professionals, but a small group has the advantage of conveying more empathy and sympathy. Finally, motives behind content led by a computer-programme will depend how the content is designed. The Johnny Cash project is designed as a memorial of his final record. Differential Life Integral City exhibits content. A smartphone, LG Optimus Vu2, was launched as a form of hand drawing communication. The concept of Drawingtalk for Kakao is similar to LG Optimus Vu2, but there are certain differences: Drawingtalk for Kakao adopts an asynchronous communication system and LG Optimus Vu2 is based on a synchronous communication system. The mobile application Draw Something functions as a drawing quiz.

Positive interactions in collaborative arts applications are: the creation of a new paradigm, endless sustainable content, mass appeal, increased exposure for the amateur voice, and an increase in social interaction. Virtual Choir satisfies participants' desire to become a member of a star conductor's choir or a famous church choir, and to publicise their voice in the media. Life in a Day meets participants' desire to become an actor in a famous director's movie – to become a movie star. The Johnny Cash project is an everlasting music video, which is sustained by fans' digital drawings. Draw Something is a drawing quiz, sending and receiving hand written words. All these collaborative artistic projects have in common that they guarantee social interaction and attention. This motivates active work.

4.3.3. Synchronous Collaboration and Asynchronous Collaboration

In previous studies the difference between synchronous collaboration and asynchronous collaboration has been reviewed. Two systemic views in cooperation, synchronous collaboration and asynchronous collaboration, identify different forms of communication. When two communication systems employ collaborative artistic creation, a joint viewing of the workspace (“what you see is what I see”), becomes important. Synchronous collaboration assists the remote sharing of workspace between participants; they share the same view of the workspace. Asynchronous collaboration successfully works by sharing, with users aware that their contribution will become part of a larger context.

Figure 2 shows that there is a time lapse between sending and receiving information in asynchronous systems, whereas data is delivered immediately in synchronous systems. Thus, a shared view of the workspace in which participants can cooperate is categorised as synchronous in the digital environment. The following table groups these projects by synchronous and asynchronous collaboration.

Asynchronous collaboration	Synchronous collaboration
Virtual Choir	Flockdraw
Low key Karaoke	NetSketch App
The Johnny Cash project	Whiteboard
Twitt-Opera	LG Optimus Vu2
Draw Something	

Differential Life Integral City

Life in a Day

Drawingtalk for Kakao

Table 8 List of asynchronous and synchronous applications

A new criterion used to separate asynchronous and synchronous artistic creation, shown in Table 8, is re-creation. Except for Draw Something and Drawingtalk for Kakao, the other asynchronous applications are recreated. A professional leader, an amateur leader, or a computer programme recreates the final outcome after collecting resources from contributors; this results in an impressive output with a powerful impact. For example, this generation adopts new media technologies; the web provides a powerful new distribution channel for amateur cultural production (Mandiberg, 2012 p. 204). *Star Wars* fans have been making parodies for decades; these homemade films are going public, sold in DVD format.

However, ironically, synchronous collaboration impacts only marginally on people worldwide. At one point, I considered using the smartphone LG Optimus Vu2 to conduct my continuous study. LG Optimus Vu2 was launched with the fascinating aim of daring its users to live spontaneously. One of its features, Vu:Talk, provides a joint viewing service between two LG Optimus Vu2 owners that enables them to draw each other pictures while on the phone. However, this smartphone failed to secure many customers; not many people know of this fascinating feature. Other synchronous collaborative artistic applications, Flockdraw, NetSketch App and Whiteboard, are aimed at a collaborative drawing or business talk. If one criterion determining success is popularity, then synchronous collaborative artistic creation has failed. I concluded that applying an asynchronous art collaboration system to my main research would be the best approach in order to achieve meaningful research results. My focus is on hand drawing communication as a means of alleviating digital anxiety, and thus the Drawingtalk for Kakao with the Kakao talk chat app may be used for further research. Before deciding to use the digital drawing tool for my main study, I wanted to investigate synchronous collaborative drawing further through workshops.

4.4. PILOT STUDY 3: Synchronous Collaborative Drawing

In the early stages of this research, I thought that if smart mobile users draw and paint together via a joint viewing system then positive interaction would occur. However, data analysis of digital arts content showed that asynchronous collaborative artistic creation was more popular. However, taking into account my previous research into the motivations behind collaborative projects, synchronous collaborative artistic projects ought to be more successful because they guarantee more social interaction and attention. I planned to investigate how participants would work together for synchronous collaborative drawing.

4.4.1. Research Interest deriving from Pilot Study 2

It was possible that synchronous collaboration would maximize contributors' motivation to participate in collaboration; this was my hypothesis in the previous study (see section 4.3.1.). However, the synchronous collaborative applications that were studied, Flockdraw, NetSketch App, Whiteboard, and LG Optimus Vu2, were not popular. These applications provide a basic drawing tool for artistic creation and a joint view in real time.

In section 4.3.1., I explore the meaning of collaborative artistic creation via smart mobile devices and social media. Electronic media enable cooperative working across geographical distances by online access via an individual device. This computer communication system can be either synchronous or asynchronous. In collaborative artistic creation, the joint workspace is a facet of both asynchronous and synchronous communication. In the previous study, the motive for collaborative artistic creation is identified as being guaranteed attention and shared sympathy, achieved by working together for the same goal.

4.4.2. Describing the Workshop and Explaining the Methodology

This workshop explored factors of collaborative drawing and participants' approaches to synchronous collaboration. I set up the workshop under conditions similar to Flockdraw, NetSketch App, and Whiteboard: Collaborative Drawing. The process was as follows:

1. Participants share a piece of paper, establishing a joint view in real time.
2. A set of pencil crayons is used as a basic drawing tool for collaborative drawing.
3. There is no instructor in this workshop, as in the above examples.
4. Participants will make their own decisions throughout the process in this workshop.
5. The data resources and evidence are photos, video recordings, and drawings.

This workshop ran in a university setting. Participants were separated into two groups, undergraduate students and postgraduate students. They knew each other. Flockdraw and Whiteboard: Collaborative Drawing are a web service for business people or child education. NetSketch App and LG Optimus Vu2 promote good communication by allowing users to share drawings. These four services are designed for people who have some social interaction. The undergraduate students were aged between 18 and 19 years old. The postgraduate students were aged between 23 and 29 years old. Participants clearly understood that they had the authority to make decisions throughout the process. My instructions were: [1] this workshop is about drawing and collaboration, [2] the participants should share a piece of paper for drawing, and [3] it is a free setting. I did not mention words like ‘topic’ because I wanted to leave it up to the participants whether or not they wanted to clarify a topic for their drawing.

4.4.3. Analysis of Participant Observation

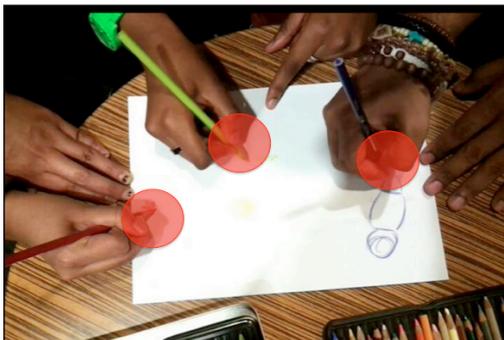


Figure 9 Undergraduate group



Figure 10 Postgraduate group

I observed approaches to synchronous collaborative artistic creation, as shown in the above images. I found more commonalities than differences between the two groups. Both groups began to draw from the corners of the piece of paper. After beginning, they tried not to disturb each others’ drawings. They didn’t discuss how they would share, what they would draw, or what their goals would be during the workshop.

They didn't talk about how they would share the piece of paper, but quietly assumed a space for each participant, each taking a corner of the piece of paper. This constitutes sharing, not collaboration. This happens because they didn't have a shared goal in this activity. When this process is replicated in an online environment, participants will find it even more difficult to share a goal.

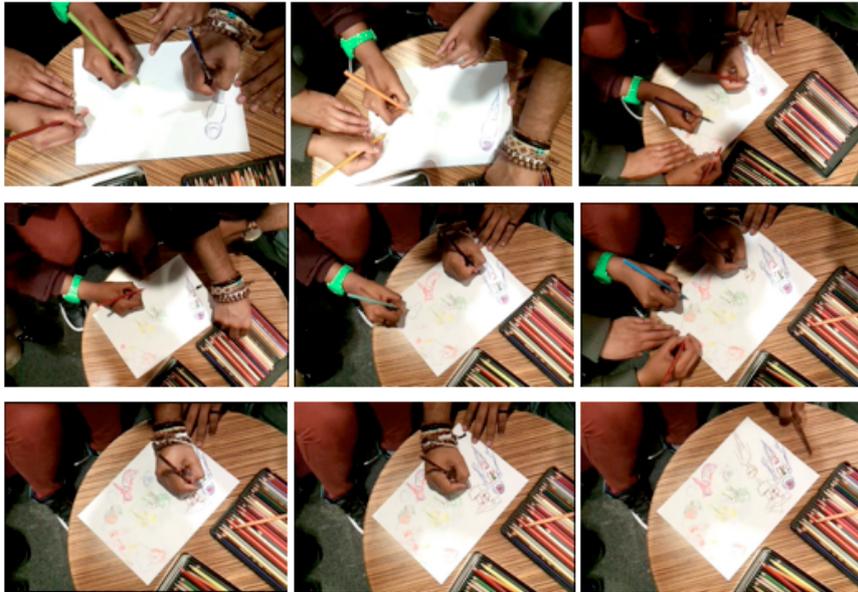


Figure 11 Undergraduate group

The above images show the collaborative drawings of the undergraduate group. A section of the participants' observations appears below, demonstrating guaranteed attention as a result of this exercise:

Participant1: What is that?

Participant2: It's a robot.

Participant3: Is that shoe?

Participant1: Trying to be. (Question to participant 2) That's quite good. Is that Wall-E?

Participants keep asking each other what they plan to draw, but they do not establish a common goal. As explored in the previous study, in order for this to constitute collaboration, intention is essential, with people working together to create a new entity (Mandiberg, 2012 p. 57), and so are goals (Mandiberg, 2012 p. 58). These participants have separate activities but they share a piece of paper.

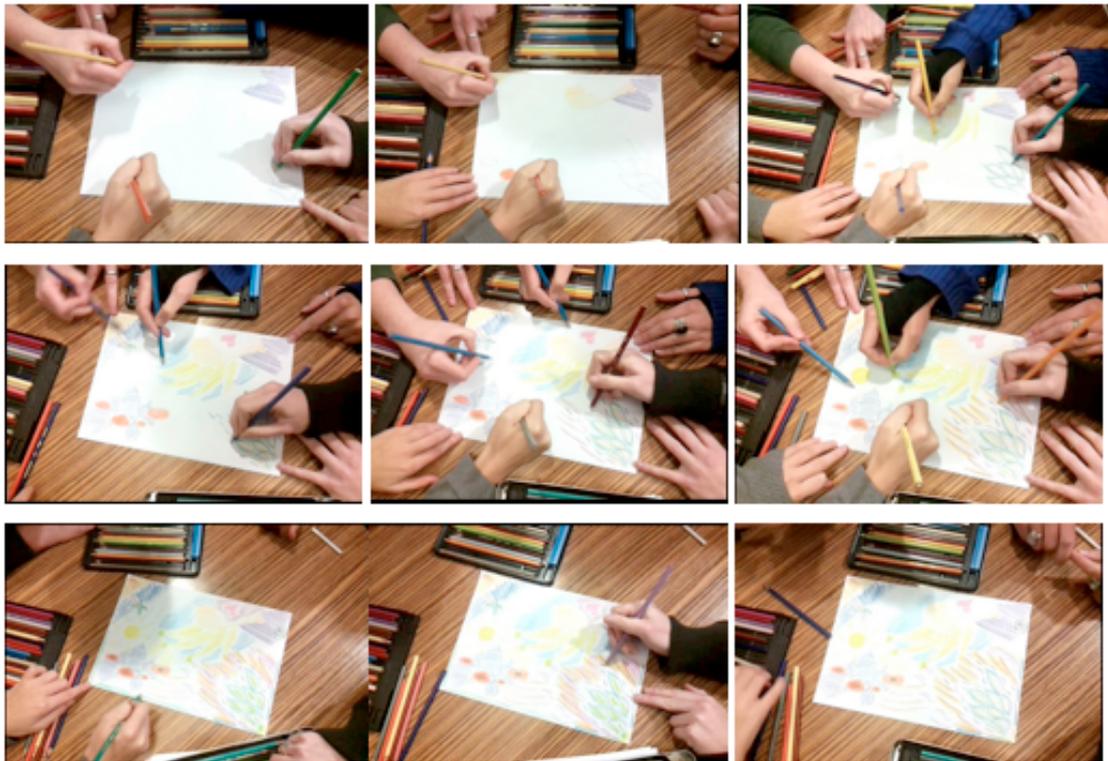


Figure 12 Postgraduate Group

The above images show the collaborative drawing of the postgraduate group. The fact that they paid attention to each other's drawings is observed in their conversation. They discuss memories of holidays when one participant draws a beach and a coconut tree. However, there were differences between the two participant groups. The postgraduate group shared their moods in their drawing. The undergraduate group drew characters or figures, such as Wall-E and a shoe. These characters or figures are not associated with personal issues or episodes in the drawer's lives. The postgraduate group began with an episode about holidays. They started with a palm tree and some abstract images of how they felt while on holiday, but these changed once they found another topic to talk about. However, this group shares sympathy by commending colours and shapes. They share their moods in drawing, but don't have a shared goal. Thus, it is not collaboration. They merely shared a piece of paper.

The groups operate through verbal communication. The undergraduate group shared questions and answers to figure out what they were trying to draw, therefore there are some associations among their drawings. The postgraduate group shared some anecdotes and some images of these appear in their drawings. The participants praise

one another's use of colours a few times and laugh about their drawings. This was not the kind of social interaction I expected to find in synchronous collaborative drawing. In the workshops, I expected that they would contribute to one another's drawings, adding to them creatively.

I learnt from these two experimental workshops in the following way: [1] people do contribute to other people's drawings in order to prevent interruptions, [2] people do not establish an overall topic for their drawing, [3] people draw individual characters or images onto a piece of paper, [4] it is hard to find associations between the drawings, but there was a certain degree of mood-sharing in the postgraduate drawings, [5] it is important to give instructions to the participants so they know what their goal is in the collaboration exercise.

For a group activity, Homans (1953) distinguished between the 'primary system' of activity concerned with the task, and the 'secondary system' of additional social interaction for purely social purposes (Argyle, 2007). Two groups in the workshop had the task of collaborative drawing, but it did not work as expected. Three main aspects of the social system are: the norms of behaviour, representing agreed solutions to tasks and interpersonal problems; the hierarchical structure of leadership power and social influence; the affective, or sociometric, structure of liking and disliking, corresponding also the frequencies of interaction or communication between members (Argyle, 2007). In neither group did anyone lead the task. All members in both groups shared the same level of authority in managing the task; this is partly due to attempts to avoid drawing on others' sections of the page or changing others' creations.

As in the healing art class, if an instructor leads the group then collaborative arts creation needs a goal. Asynchronous collaborative artistic content can be impressive because a professional or amateur leader recreates the final piece after having received the contributors' artistic input. Designed programmes like the Jonny Cash Project or Draw Something enable good collaboration. In a web environment, including on social media, a leader can recreate a collective source with his artistic talent. But this is difficult to do in a mobile environment. A good design scenario will require the preliminary design for smart mobile devices to be like a drawing quiz.

4.5. PILOT STUDY 4: Exploration of Digital Anxiety

4.5.1. Introduction

Digital anxiety is the main keyword in this research as a whole. In chapter 1.1, I have defined digital anxiety as “addiction to smart mobile devices (including social networking sites), information overload, online social rejection, and fear of making mistakes in communication over the digital screen”. These issues have, broadly, two effects: memory loss and emotional disturbance. The rationale of this pilot study is to access factors affecting digital anxiety; that is, how a smart mobile device changes a users’ everyday life, how it influences a users’ behaviour, how a user perceives themselves to be changed by it, what their motivations are for continuously using the device, and what their main means of communication over the smart mobile screen is.

One of this study’s major research methods is ethnography, which produces qualitative data. I have used two data collection techniques. The first is self-exploration, which involved making a film of a single day in my life in which I did not use a smart mobile device, in order to understand how its absence might change me. Self-exploration is a type of autoethnography. Autoethnography is an approach to research and writing that seeks to describe and systematically analyse personal experience in order to understand cultural experience (Ellis *et al.*, 2010). The second was to interview smart mobile users in different regions. I’ve interviewed smart mobile users who are living in the United Kingdom, South Korea, China, and Australia. The reason for collecting data from different regions is that cultural differences and different environments might impact smart mobile users’ thinking or behaviour.

The analytic strategy relies on theoretical propositions, which are compared to the data gathered from the interviews and self-exploration. The explanation will build on the research questions identified for this study, and my analytic technique will be the logic model, and data from the interviews and self-exploration. The data resource for the self-exploration is a video recording. The data resource for the interview is the conversation scripts. The analysis will be shifted to key explorations for the preliminary design.

4.5.2. Self-exploration Data

From this self-exploration, I attempt to investigate the role my smart mobile device plays in my life. I have used a series of smart mobile devices since 2009. Nowadays, a smart mobile device is my constant companion. The reason for deciding to use this method of living without my devices for a short time, is that I am more likely to understand how I rely on it by identifying the difficulties posed by its absence. I analyse this data in chronological sequence. When using my smart mobile devices, my morning would be as below:

- The smartphone alarm will wake me up.
- I will check my notifications after turning off the alarm.
- I will play music via iTunes or a YouTube video on my iPad while taking a shower.
- I will watch a drama or film on my iPad while cooking or cleaning my home.

These are roughly four things I currently do with my smart mobile devices in the morning. Recalling days before I moved to London, when I lived with my family, I would normally check my smartphone for notifications, but would not play YouTube or watch films while doing something at home. My lifestyle appears to have changed since, but a feeling of loneliness has intensified. Receiving and responding to alerts or from my smart mobile devices has become a way of relieving my loneliness.

At what moment did I most miss the smart mobile devices? I strongly wanted to use my smartphone while waiting for public transport. While waiting for the tube, I thought back to a time before I adopted smart mobile devices, but astonishingly couldn't remember what I used to do to kill time.

How did my social interaction change? Being disconnected from the device motivates me to look for people who I can talk to or meet in the campus area such as the library or café. The smart mobile devices normally connect me to people through social networking sites or mobile chatting applications, so I usually feel less need to look for people. From this experiment, I realised that receiving information about online activities like social events on Facebook is useful because less effort is required to

search for information. For me, mobile applications which allow me to make international calls for free are a useful mobile function.

4.5.3. Narrative Approaches: How a Smart Mobile Device Changes a Users' Everyday Life

A smart mobile device is a handy computer with good mobility, and a smart phone provides a telecommunication service. The capabilities of smart mobile devices grow; they play an increasing role in users' everyday lives. A smart mobile device replaces many life tools and other digital devices, so is more than just a telecommunication tool. During my day without the devices, I realized that a smart mobile device replaces an alarm clock, a music player, a video player, a television, and other communicative devices. This device is deeply connected to my everyday life. My iPad plays a short film while taking a shower in the morning, and during that time it receives notifications from web pages I am subscribed to, or from Facebook.

This multi-tasking splits subjects, and causes a double consciousness; distraction is caused by attention being split (Shaviro, 2003). In in-depth interviews, (see section 4.1) interviewees respond to questions as they multitask: they listen, read, and write through opening many webpages in different subjects, while checking their social networking chats if they receive notifications from online friends. In the literature review, notifications are conceived as constantly buzzing songs (Shaviro, 2003).

From this interview, receiving notifications is explored as the reason why people continuously access the Internet via smart mobile devices. All online activities are recorded like users' footprints. Today people might check other users' day-to-day activities online. Smart mobile users nowadays have compulsory social interaction over the digital screen because others are watching.

4.5.4. Narrative Approaches: Motivation for Access via a Smart Mobile Device: Seeking Social Interaction

The motivation for accessing the Internet via a smart mobile device is a desire to seek social interaction. That motivation results in an active digital culture of collectivity, which creates a new form of social construction and new relationships, but also

generates digital anxiety through a culture of sharing. The most popular social networking site, Facebook, is the representative social media where interviewees spend hours every day. Interviewees access Facebook for communication, and Facebook chat is easiest for friends to use while they are working. In the literature review I discussed the concept of being “always on”, whereby the potential for instantaneous contact encourages a feeling of being together although a user is alone (Turkle, 2013). This assurance of social interaction is a good motivation for using social networking sites; notifications from social networking sites enable a synchronous feature that approximates non-stop use.

Assured attention is a good motivation for displaying one’s daily activities on Facebook. Sherry Turkle writes that people nowadays display the attractive aspects of their lives on social networking sites (Turkle, 2013). Interviewees responded that they don’t believe that the aspects of people’s lives shared on Facebook are representative or honest. One interviewee mentioned that some people judge him based on what he has uploaded to Facebook, so it is necessary to upload selective images and texts. In the literature review, I discussed social networking sites as “egocentric networks” (see section 2.2.3.) and how they “are structured as personal” (Boyd & Ellison, 2007, cited in Lankshear and Knobel, 2008 p. 251). Thus, people are conscious of others’ judgment depending on what they exhibit in their online space. Interviewees complained that some people post to show off to the world everything that they do, or to boast about food they had eaten, and said that looking at others’ everyday lives makes them feel tired or jealous. Social networking sites definitely extend and double users’ social structures.

Today, Facebook empowers smart mobile users’ social relations, connecting their lives online and offline in a process of “doubling space (see chapter 2.2.3)”. One of the reasons why Facebook has become so popular globally is that it is a reliable networking site. Users perceive Facebook friends’ personal details such as their education, job, mutual friends, and common communities. One interviewee responded that his Facebook friends are his reference group, therefore social events on Facebook connect his online and offline lives. He also remarked that organising a social event on Facebook or checking others’ events is one of the main reasons for accessing

Facebook. One interviewee responds that her friend helps her boyfriend to organise a social event every Friday in Melbourne. This blurred boundary between life on Facebook and offline (see chapter 2.2.3.) hurts social media users when they experience social rejection. From the interviews, I examined the following cases of social rejection: de-friending, lack of invitation to a social event, and being ignored in a group talk.

During my day free of all smart mobile devices I complained about my curiosity over what was on my Facebook newsfeed or what mobile chats or Whatsapp messages I might have received. At certain moments, as when I was waiting at the tube station, I badly wanted to use my smartphone to kill time. I tried to cast my mind back to the past in order to remember what I used to do when waiting for public transport before owning a smartphone, but could remember nothing. This self-exploration exercise showed me that playing with mobile applications, surfing the web, chatting with online friends, or doing all of these things at once is now my way of killing time. From this self-exploration, I discovered that I'm addicted to using a smart mobile device. Except for one interviewee in China, all other interviewees complained that they are addicted to using a smart mobile device. Smart mobile users nowadays have global social connections; a smart mobile device and social media enable their users to communicate synchronously with global friends in different time zones. All interviews were conducted via social networking sites, which enable synchronous communication, except for one interviewee in China. This interviewee has trouble connecting to social networking sites because access is blocked in China. Thus only this person completed the interview through asynchronous communication. China has a different social media environment; users are only allowed to use social media that is developed by Chinese companies. I presume this is why the Chinese interviewee did not speak of feeling addicted to social media.

During the twenty-four hours of my self-exploration, news updates from global users in different time zones refreshed continuously on my social media newsfeeds. While I was completing the self-exploration, I had expectations of my online friends' news updates regardless of the time. Social media grows and changes endlessly.

4.5.5. Narrative Approaches: Motivation for Using a Smart Mobile Device: Seeking Information

Up until now I have discussed the motivation for accessing the Internet through a smart mobile device as a desire to seek social interaction. I will now discuss another motivation for using a smart mobile device: the desire to seek information. Seeking information is due to “information overloads” (Bunt cited in Shaviro, 2003), which are a key cause of digital anxiety. Because of good mobility, a smart mobile device enables you to search for information or to read texts while moving around. Smart mobile users may think they are reading texts, but they are actually skimming them. Interviewees responded that they skim the text over the digital screen, and comprehend the general idea rather than specific facts. Giving their full attention to a text depends on their interest. Searching for information on Google or skimming information on Facebook pages are the main channels discussed in interviewees’ responses. In the self-exploration, I was anxious to know about updates on Facebook; I am currently subscribed to one hundred and fifty pages on my Facebook account. From the self-exploration and interviews, I explored the idea that checking newly updated information is not just part of my everyday life but also the interviewees’ invisible job. One interviewee remarked that subscribed information from Facebook is important for his academic research. When interviewees find interesting content on Facebook, they archive it in their email account or save it in their smart mobile devices.

As one interviewee mentioned, the smartphone nowadays has replaced the personal computer, which means a users’ behaviour has extended past the Net period. Digital reading involves skipping around and scanning only pertinent items over the screen (Turkle, 2013), which has been linked to cognition damage (Shaviro, 2003). This continual cognition damage results in memory loss. The calm, focused, undistracted, linear mind is being pushed aside by a new kind of mind that wants and needs to take in and dole out information in short, disjointed, often overlapping bursts – the faster, the better (Karp quoted in Carr, 2011). Today children are growing up with smart mobile devices; they easily learn to use smart media, thus many educational mobile applications are being launched for children. The meaning of an ‘improper’ way of reading will have changed by the time this young generation has grown up.

Interviewees are different ages, in their twenties, thirties, and forties. One interviewee finds reading over a screen harder than reading a hard copy, in terms of concentration. She also responds that she is able to concentrate less when reading over the screen, because she is old-fashioned, born before personal computers appeared. One interviewee, in their thirties, argued that reading texts over the digital screen is no different to hard copy reading; he only prefers to read hard copies if he needs to take notes. Thus, he generally reads journal articles on his smart mobile device, and reads books in hard copy. Another interviewee, in their twenties, uses a Kindle. The Kindle is Amazon's digital reading and publishing platform, an e-reader device. This person responded that the Kindle is a useful device for his current research, during which he has to read books, journals, and articles. Interviewees, in their thirties and forties, mentioned that the screens of mobile devices are too small and do not allow full concentration. However for those in their twenties, an e-reader device is very useful and doesn't impact on concentration. If a user is not able to concentrate, the reason is that the content is not interesting. For those in their thirties and forties, the reason they prefer hard copy is that they are more likely to read in detail and underline texts. For those in their twenties, not only are they accustomed to reading over the digital screen, but also they find it easier to archive the highlighted text and make notes on their Kindle. Today, children and teenagers may more be accustomed to reading on smart mobile devices. For example, an interactive eBook of *Alice in Wonderland* provides interactive content. Children can read and understand in a more dynamic way by experiencing enjoyable interaction on each page. For that age group, as Karp argues, the linear reading process will be changed.

As I explained earlier, my interviewees have different cultural backgrounds, coming from Australia, the United Kingdom, South Korea, and China. The interviewees from Australia, the United Kingdom, and South Korea made considerable use of social media and their smartphones to collect information everyday, but the interviewee from China was prevented from accessing global social media like Facebook, Instagram, Twitter, and YouTube. This is because the Chinese government keeps strict regulations on Internet access. The interviewee was able to access social media serviced by Chinese media companies. Social media platforms allow global users to

present their opinions and interests, including international issues. Users also share news articles on social media. The interviewee from China had restricted access to his acquaintances' opinions through global social media. Receiving information is important in establishing one's view of the world. He used to live in London for a few years before returning to China. This means he now appreciates the difficulty of accessing global information in China, in comparison to his previous life in London.

Being afraid of making a mistake in communication is one of the key reasons for digital anxiety. In the interviews, smartphone users said they preferred texting rather than making a call. However, they normally phone people they are close to, instead of texting. One interviewee put forward the opposite view to Turkle's. Texting is not a good way to communicate because the meaning of what is written can be misconstrued and cause problems, and text-based communication seems much less personal. However, she also has been around other people who spend ages writing a text message. She has also experienced miscommunication many times in text messaging, occurring because of the lack of tone of voice and facial expression. However, sending a text is considerate when a sender is unsure what the receiver is occupied with at that moment. And also, for young people, communicating via text is a live phenomenon at their age. Feeling afraid of making a mistake in communication occurs not only in text-based communication but also in in face-to-face communication. On the other hand digital anxiety in communication occurs because communicating over the screen, even if there is little gap between online and offline communication, gives rise to a feeling of shallow relationship (Carr, 2011). Interviewees think their relationship with Facebook friends is shallow. Social communication on Facebook is addictive and attractive, but it is shallow; interviewees answered that chatting is mostly used in online communication.

4.5.6. Summary

This chapter has identified current phenomena relating to digital anxiety. Two motivations for using smart mobile devices and social networking sites have been identified: the desire to seek social interaction and the desire to seek information. The reason for interacting via social media is to communicate; they guarantee social interaction. One representative social media platform, Facebook, is a global social

network on the basis of educational background or an acquaintance. Both asynchronous and synchronous communication occurs on Facebook. I have identified the meaning of synchronous communication on Facebook as being attention; the meaning of asynchronous communication is potential attention. I explore, in the self-exploration and interviews, how potential attention becomes a strong motivation to act. Facebook is an “egocentric network” because it increasingly absorbs but also causes emotional disturbance like addiction or social rejection. Indeed, smart mobile users need content to relieve their anxiety.

Users are also addicted to seeking information. Smart mobile users are accustomed checking information instantly to establish a general idea about something. This causes an information overload, but that information does not remain in the users’ brain. People do not read a whole text; they read at random to collect points of interest. Three different age groups, people in their twenties, thirties, and forties, all skim text when they read on their smart mobile devices. However, one interviewee in their twenties didn’t find much difference between an e-reader and a hard copy. The users in their thirties and forties are not used to highlighting or making notes on their e-reader device. However, those in their twenties felt more comfortable archiving their reading on their smart mobile devices. However, all interviewees’ reading-habits on electronic texts involve skimming, and they are addicted to skimming a vast amount of information every day. Educators once believed that a hyperlink is an efficient means of interaction because it endlessly connects us to other relevant information. However the result has been that students cannot remember much of what they read; more can be less (Carr, 2011). For helping to improve human memory, smart mobile users need content that exercises the memory while devices are being used.

4.6. Discussion

My Findings from the Pilot Studies

My pilot studies were carried out in order to understand how drawing could be used as a form of communication for relieving digital anxiety. In my self-exploration, I found that my morning began with me touching my smart mobile devices. That habit began when I moved to the UK, away from my family. My previous life did not begin with the multiuse of several digital devices when I was with my family, even though I

owned different types of smart mobile devices. As I described in section 4.5.2., receiving and responding to alerts from my smart mobile devices has become a way of relieving my loneliness. Throughout the self-exploration, I found that loneliness caused high usage of my smart mobile devices. I studied the academic contexts that related to my perception of the relationship between loneliness and a high frequency of smart mobile device use. Neuroticism is one of the five main factors that have been examined regarding excessive use of mobile phones (E. B. Lee, 2015). I found that outgoing people used their social media to make events or groups relating to their offline social lives. This made people stressed about whether they were invited to the event or the group. Users who are able to powerfully promote themselves had social power both online and offline. Users keep watch over how others are living via their social networking sites; moreover, they felt that their life was boring in comparison with others' lives, as recorded on social media.

My research focuses on smart mobile users' mental health and digital wellbeing. I investigated the degree to which anxiety, including stress, affects smart mobile addiction. Neuroticism was strongly related to heavy use of mobile phones (Butt and Phillips, 2008). Major negative health effects of smartphone addiction were associated with anxiety (Billieux *et al.*, 2008). I strongly wanted to use my smartphone while waiting for public transport. This is because I desired to be connected with someone online; I disliked being alone. Social interaction anxiety was positively related to overuse of the mobile phone (Becker *et al.*, 2013). I agree with the relationship between social interaction anxiety and overuse of the mobile phone. Smart mobile devices normally connect me to people through social networking sites or mobile chatting applications, so I usually feel less need to look for people in real time. I was an example of being "alone and together"(Turkle, 2013)'.

Throughout in-depth interviews, I explored the ways that smart mobile users lose concentration. This is because they do not focus on one task for a long period of time. Smart mobile users enjoy multitasking. They listen, read, and write by opening many webpages in different subjects, while checking their social networking chats if they receive notifications from online friends. E. Bun Lee's research quantifies the heavy use of smartphones and Facebook; Lee explored the way multitasking significantly

and positively correlated with excessive smartphone and Facebook use (Lee, 2015). I think that smart mobile users need to be aware that multitasking hurts their concentration; I suggest that they find a mobile activity that demands a high focus and creativity. Vu: Talk (see section 4.3.2.) was an interesting smart mobile device that allowed users to share drawings through their mobiles while talking on the phone. In my view, people think for a certain time when they face a blank piece of paper for drawing. This thinking requires high concentration in order to decide what to draw, design how the image will appear, think what colour will be used, and evaluate how it conveys what they wanted to say. As previously stated, the paper has the role of a “transitional space” (see section 4.2.2.) where one can illustrate one’s thinking and emotions. Throughout my first pilot study, I found that “transitional space” is a meaningful word in art therapy. The paper is an intermediate area of experience where there is no clear distinction between inner and outer reality (see section 4.2.2.). My perception is that it is important that smart mobile users need a space to express their inner mind rather than displaying the ways in which their life is good. The pilot study investigated the ways that social networking site users were stressed by others’ judgment or by their reputation. It was interesting to observe that people want other people see their drawings and hear about what they have drawn. This is the same reason that I wanted to be connected with someone. If someone listens to you and understands what has been drawn and why, drawing makes you feel more positive than drawing alone. A desire for social interaction is a common theme linking drawing communication and smart mobile addiction. In section 4.5.4., I discussed how assurance of social interaction is good motivation for using social networking sites; notifications from social networking sites enable synchronicity approximating non-stop use. In social networking sites, people are conscious of others’ judgment depending on what they exhibit in their online space. Interviewees were stressed by some people’s posts that showed off exaggerated images of their lives. These images make them feel tired or jealous. I thought that drawing perhaps delivers the veracity of one’s life story in a better way than the well-designed life appearing in photos.

‘Sharing’ and ‘collaboration’ have become powerful themes, as the increase in individual online access via many types of digital device has generated a collective online movement. Social media is a big market system for digital users to share their

individual or personal information. I explored how motivation for the use of social networking sites was the desire to seek social interaction and information. Masur, Reinecke, Ziegele, and Quiring (Masur *et al.*, 2014) carried out research in order to understand why people use social networking sites. “They have identified a number of basic motive dimensions for using social networking sites as follows: entertainment, social information seeking, self-presentation, escapism, and meeting new people (Lee, 2015 p. 46).” Here, the interesting point is that people access social media as a form of escapism from real life. They will face texts, images, or short videos of someone’s life, which were selected and refined in order to show off. People are stressed by this, but “return to use Facebook to satisfy the same needs again and again; this continuing gratification seeking might slowly turn into compulsive and habitual usage (Lee, 2015 p. 46)”. I was interested in using ‘drawing’ to satisfy smart mobile users displaying those characteristics: desire for entertainment, social information seeking, self-presentation, escapism, and communication. Smart mobile device technology supports two systemic views in communication, synchronous communication, and asynchronous communication. Synchronous arts collaboration is relatively new, but it failed to have success on a commercial scale. Causes of its failure included an absence of someone to lead collaborative projects, and an absence of a shared goal for each creation. Asynchronous arts collaboration was successful in harnessing digital users’ creativity with a goal in mind. I studied several cases of asynchronous arts collaboration (see section 4.3.2.), then decided to adopt the case of ‘Vu: Talk’ for my further research, although this is a form of asynchronous communication.

My Reflections on Continuous Research

Through the pilot studies, I established positive aspects of the use of drawing in communication as a way of relieving digital anxiety. The drawings contained metaphors and implications that are difficult to express in words. It is important to talk about the drawings, but the drawer can decide whether to divulge what it was about and why it was drawn. Interpreting the hidden meanings in drawing will be left to the viewer if the drawer decides not to share this. Playing with the use of colour, composition, and lines was enjoyable, enabling drawers to use their imagination. Discovering one’s hidden thoughts in one’s drawings made viewers highly concentrated. The sympathetic mood in the room helped to fill the emptiness.

Encouragement was another way of approaching a healing state. In my next study, I wanted to observe whether, in the absence of an instructor, people encourage each other or not when they talk using drawing. This is because, during the pilot study, the instructor asked the participants to encourage one another in the class when they told a story about one of their drawings. In the interview, the instructor pointed out that encouragement helps people to finish their drawings and reach a state of relaxation. The instructor explained that drawing is a type of meditation because art and meditation cannot be separated. Garai (1976), who pioneered the humanistic approach to art therapy, explored how art expression led to self-transcendence (cited in Malchiodi, 2011 p. 82). In the pilot studies, I investigated how drawing positively affects anxiety by enabling conversations about drawing; also I found that expressing one's inner mind through drawing helped one to reach a healing state. But I have doubts about whether drawing can be considered a type of meditation itself if it is used as a form of daily communication rather than specially designed as art therapy. People in the drawing class had a shared goal: to reach a state of relaxation. The instructor had a healing art programme that included colouring a Mandala. Again, the purpose of my research is to investigate how drawing can perform as a form of communication while a smart mobile user is using a mobile. In further research, I will put my focus more on the phrase "while a smart mobile user is using a mobile" and investigate how drawing helps smart mobile users achieve digital wellbeing.

CHAPTER 5

RESEARCH METHODOLOGY – PART 2 MAIN RESEARCH

5.1. Introduction

In Chapter 3, I reviewed theoretical paradigms influencing my research, offered explanations of ontology, epistemology, and methodology, and discussed triangulation designs. Triangulation (now called convergent) designs can prevent confusion in mixed methods procedures. There are two different methods of collecting data in qualitative and quantitative research. Triangulating designs allows for the collection of qualitative and quantitative data concurrently. Another method would be for quantitative data collection to follow qualitative data collection sequentially or vice versa.

What I attempted to establish in the main study is whether digital drawing could have a positive effect on digital anxiety. How was I able to establish this? I tested the primary group of participants with SMAT to extract factors (subscales) of digital anxiety. I then ran the digital drawing experiment with the second group on the basis of the triangulation designs. I presented what my research was about, and also notified research ethics regarding participants' rights. I collected data from the SMAT and STAI tests, the two digital anxiety questionnaires, digital drawings, and images of the chats between pairs of participants in the digital drawing experiment. The participants were matched according to the results of the SMAT. I will write more about the logic of sharing the participants in section 5.4. The data from the SMAT and STAI were used to identify participants who inherently feel digital anxiety. The digital anxiety questionnaires, one completed before and one after the experiment, were used to collect the participants' thoughts about the digital drawing experiment. Digital drawings and images of chats between the pairs were used to fill in the gaps in the data from the digital anxiety questionnaires, or to investigate hidden viewpoints in the drawings and the chat images.

To sum up, this chapter outlines my research design, data collection, the choice of methods and instrument, and how the data were analysed. I begin with a rationale of the research aims in next section.

5.2. Rationale of the Research Aims

I determined the meaning of digital anxiety, and its effect on the user, through a theoretical framework and exploratory study. In this chapter, I recount how I conducted empirical studies to design a method of measuring levels of digital anxiety, and how I conducted exploratory studies to reach the ultimate goal of this research. The ultimate goal of my research is to investigate two things: the kinds of digital anxiety arising from smart mobile devices, and if and how digital drawing can be used to alleviate that digital anxiety. Here the word 'alleviate' denotes the following: how digital drawing works positively on memory and emotion, how digital drawing can be used as a social tool, what digital drawing content is useful in lessening digital anxiety, and how smart mobile users find a state of wellbeing throughout the digital drawing experiment.

My first research aim was to determine the theoretical dimensions of digital anxiety. As I wrote in the first chapter, digital anxiety is not the term that I originally used. This term was used to denote anxiety caused by a fear of obsolescence (Robert Cox and Rachel Onuf, 2003). These authors put more focus on the issue of digital preservation, such as data loss through format changes from an original form to a digital form. This study was popularly researched in the late 1990s and the early 2000s. I use the term digital anxiety in a different way in my research because the perspectives and speculations of digital media studies have changed along with the development of digital devices and digital media. Thus, I reviewed the theories and studies to identify the current existing problems in the use of smart mobile devices, and then framed those explorations to determine the theoretical dimensions of digital anxiety.

My second research aim was to determine the theoretical dimensions of the use of drawing as a communication tool. This research has expanded and modified my previous research into the use of smartphones as a tool for media art. I began to explore connections between ‘creativity’, ‘communication’, and ‘collaboration’ via smart mobile devices. I then studied the themes and characters in drawing along the lines of those three key themes.

My third aim was to identify current phenomena relating to digital anxiety. This was done throughout pilot study 4. My fourth research aim was to establish the meaning of digital anxiety, to demonstrate what factors contribute to digital anxiety, and to explore the ultimate condition of the user experiencing digital anxiety. This was initially explored throughout the literature review and the pilot studies. I strengthen and discuss those initial explorations throughout the main research.

As already noted, I used a mixed-method approach. My investigation into digital anxiety began with qualitative research. The information from the qualitative study was used to conceptualize an instrument that would enable me to quantify the level of smart mobile addiction. This instrument was used to quantify the level of digital anxiety at a later stage. I conducted the factor analysis to determine what the factors

of smart mobile addiction are, with reference to a group of random people who use smart mobile devices. I then used the same instrument with the experiment group to sort their level of smart mobile addiction from the highest to the lowest. The analysis of those data linked to the open-ended questionnaire on digital anxiety.

The last research aim is to explore how digital drawing affects digital anxiety, how it can be used as a communication tool, and what kinds of digital drawing content help to relieve digital anxiety. As I explained above, I measured the level of digital anxiety using the Smart Mobile Addiction Test (SMAT) and the State-Trait Anxiety Inventory for Adults (STAI). The detail of these instruments will be described in the next section. Participants were asked to self-evaluate their drawing ability in order to establish their interest and confidence in drawing, in presenting their thinking. This data is used to link to the analysis of the open-ended questionnaire about digital anxiety. I collected an open-ended questionnaire about digital anxiety before and after the digital drawing experiment. The pre-data of the digital anxiety questionnaire were used to understand subjectively how the participants' lifestyles and memories changed whilst using smart mobile devices. The post-data of the digital anxiety questionnaire were used to investigate how their memory, emotion, lifestyle, and social lives were affected by the digital drawing experiment.

5.3. Ethical Issues and Gaining Access

This research received formal ethical approval from department research ethics committee (see Appendix 6: Research Ethics Approval Form). I applied the same ethical strategies as were explained in my analysis of the pilot studies, and which are recapped here. My ethical strategies are: [1] providing information about my research, [2] introducing those conducting the research, [3] describing which participants will be involved in the study, [4] informing participants of the period of study, [5] notifying them of their authority to withdraw from the study, [6] explaining that no risk or harm is involved in the study, [7] accounting for how their data will be collected and secured, and [8] informing them of their authority to ask about the results or for further information (see Appendix 2: Consent).

My main research target is a smart mobile user who inherently feels digital anxiety. Thus, I first selected general smart mobile users between the ages of 18 and 54 years. This is the initial group in which I sought to identify factors of smart mobile addiction that are the basis of the Smart Mobile Addiction Test (SMAT), and which prove the validity of SMAT. SMAT is an amendment of an existing test for use with a different population. The name of the test is the Smartphone Addiction Scale, a scale to diagnose smartphone addiction developed by Kwon and five other researchers (Kwon *et al.*, 2013). I then used the test to conduct the drawing experiment with the experiment group. Therefore, two sets of subjects are involved in the main research. These subjects are the respondents of the Smart Mobile Addiction Test, and the participants in the digital drawing experiment. As I set up the ethical strategies, I informed them about my research and received their agreement via the online link to SMAT, email, and a hard copy of SMAT from people involved in my research (see Appendix 2: Consent).

To recruit the respondents and participants, I sent the invitation email to 68 different departments in the universities and colleges in the UK, recruiting participants in the digital drawing experiment. Also, I put the advertisements on Facebook groups asking for volunteers for my research.

A number of participants involved in the digital drawing experiment withdrew because their involvement took longer than they expected. This was the main reason for people withdrawing from the experiment. Some others withdrew after learning who their experiment partner was.

However, I had explained the time commitment involved, in the following way:

You may need to spend a few hours per week - around four weeks. You may communicate with your experiment partner through Kakao Talk, which means that you do not have to come to a specific place for this experiment. The length of your involvement depends on how you communicate with your experiment partner.

This is because the digital drawing experiment is designed on the basis of communication between two people. As I will explain in detail later, the important point is their three daily drawing assignments. The participants are required to complete three drawing tasks every day. The drawing assignments will be explained in the next section.

The participants were informed that the digital drawing experiment is completely voluntary and they have authority to withdraw from the experiment if they decide to do so. I notified them that they should inform me of their withdrawal by a certain date. This is to prevent delays to the schedule of the experiment. However, a number of the participants withdrew after that date. I therefore had to find new experiment pairs for the next round of the experiment.

As I mentioned, this experiment was conducted with pairs; thus, I asked their agreement to share the Kakao Talk ID with their experiment partner only, not their mobile number or any other personal details. Kakao Talk is a mobile chat application that enables drawing talks. I contacted my participants individually to protect their contact details. If the participant decided to share his/her personal contact details or information with their experiment partner during the experiment, this was the participant's decision.

5.4. Selection of Data Collection Methods and Instruments

In this section, I discuss what methods and instruments were selected to collect data and why they are appropriate to my main research. My research consists of designing guidelines to help smart mobile users who experience digital anxiety. I use drawing as a communication tool to improve smart mobile users' wellbeing. As I mentioned in section 5.1, I integrated qualitative and quantitative methods in conducting my main research. The quantitative method was first used to measure the level of smart mobile addiction. This was done with the random group in order to establish the validity of the test. I then conducted the smart mobile addiction test (SMAT), the State-Trait Anxiety Inventory for Adults (STAI), and the Self-Evaluation of Drawing Ability with the experiment group. I will explain which qualitative methods were used and why, after writing up the quantitative analysis.

Smart Mobile Addiction Test (SMAT)

As I explained above, the Smart Mobile Addiction Test (SMAT) is an instrument to measure to what degree a smart mobile user is addicted to a smart mobile device. This test comprises modification of an existing test, the Smartphone Addiction Scale (Kwon *et al.*, 2013). I revised the Smartphone Addiction Scale on the basis of the literature about digital anxiety; therefore, the questions focus on social aspects of the use of smart mobile devices, and information overload.

The Smart Mobile Addiction Test (SMAT) is a 40-item, six-point Likert-type self-rating scale that I revised myself. I will explain which original questions were revised, and why, in the next paragraph. The options on this scale range from 1= “Never / Almost Never”, 2= “Seldom / Rarely”, 3= “Sometimes”, 4= “Often”, 5= “Usually / Most of the time”, 6= “Always / Almost Always”. Higher scores indicate the higher risk of addiction to smart mobile devices including social networking sites.

I revised the Smartphone Addiction Scale (Kwon *et al.*, 2013) on the basis of relevant theory, such as perspectives on digital anxiety. I will also discuss which aspects of the pilot study were incorporated into the design of the test. In this section, I only recount how the Smart Mobile Addiction Test was initially revised. The final version of the Smart Mobile Addiction Test was designed after conducting the factor analysis. The method of analysis and the final version of the test are presented in Chapter 6 (Quantitative Analysis).

Here is the Smart Mobile Addiction Test that was initially revised on the basis of the theoretical framework and the previous results of my pilot studies. I will explain how the questions in SMAT were revised from the SAS questions.

1	2	3	4	5	6
Never / Almost Never	Seldom / Rarely	Sometimes	Often	Usually / Most of the time	Always / Almost Always

Table 9 Options on the scale (SMAT)

I mostly changed the questions of the Smartphone Addiction Scale (SAS) to make the sentences as clear and concise as possible. Here is the table that shows how the questions were changed from the Smartphone Addiction Scale (SAS).

#	SAS	SMAT
1	Having a hard time concentrating in class, while doing assignments, or while working due to smartphone use	I lose focus in class / at work due to my smartphone
2	Experiencing lightheadedness or blurred vision due to excessive smartphone use	I experience blurred vision due to excessive smartphone use
3	Feeling pain in the wrists or at the back of the neck while using a smartphone	I feel pain in my wrists and / or in back of neck whilst using my smartphone
4	Feeling tired and lacking adequate sleep due to excessive smartphone use	I feel tired and lack adequate sleep due to excessive smartphone use
5	Being incapable of doing anything without a smartphone as all schedules and personal stuff are saved in the smartphone	I am incapable of doing anything without my smartphone, as all schedules and personal items are saved on it
6	Neglecting matters other than smartphone use even when there are many other things to be done	I procrastinate and / or neglect tasks at hand due to my smartphone
7	Experiencing auditory hallucinations of smartphone sound while not using a smartphone	I hallucinate smartphone sounds (or feel vibration) when I am not using it
8	Feeling calm or cozy while using a smartphone	I feel calm and comforted whilst using my smartphone
9	Having my smartphone in my mind even when I'm not using it	I keep my smartphone in mind even when I am not using it
10	Being stressed out when I am not in a hot zone (Wi-Fi area)	I feel stressed when my smartphone is not connected to the Internet
11	Feeling pleasant or excited while using a smartphone	I feel pleasant / excited whilst using my smartphone
12	Always preparing my charging pack to make sure that my smartphone charged all the time	I carry a battery charger so my smartphone battery never goes out
13	Getting irritated when bothered while using my smartphone	I get irritated when someone bothers me whilst using my smartphone
14	Feeling more relieved with my smartphone by my bedside when going to bed	I feel comfortable when I have my smartphone by my side when going to bed
15	Constantly checking my smartphone so as not to miss conversations between other people on Twitter or Facebook	I constantly check my smartphone so as not to miss updates on Twitter or Facebook
16	My life would be empty without my smartphone	My life would be empty without my smartphone
17	Feeling great meeting more people via smartphone use	I feel great meeting people through my smartphone
18	Feeling impatient and fretful when I am not holding my smartphone	I feel impatient and fretful when I am not holding my smartphone
19	Checking SNS (Social Networking Service) sites like Twitter or Facebook right after waking up	I check SNS (Social Networking Sites) like Twitter or Facebook right after I wake up
20	Preferring to talk with my smartphone buddies to hanging out with my real-life friends or with the other members of my family	I prefer talking to my friends / family via my smartphone rather than talking face-to-face

21	Bringing my smartphone to the toilet even when I am in a hurry to get there	I carry my smartphone even when going to bathroom
22	Always thinking that I should shorten my smartphone use time	I have tried to shorten the time I spend with my smartphone
23	Feeling depressed, anxious, or oversensitive when I am not able to use my smartphone	I feel depressed, anxious, or oversensitive when I am not able to use my smartphone
24	Feeling that my relationships with my smartphone buddies are more intimate than my relationships with my real-life friends	I think I tend to develop friendships and relationships mostly through my smartphone communication rather than through face-to-face to communication
25	Not minding spending money on paid smartphone applications	I do not mind paying for smartphone applications
26	Not being able to use my smartphone would be as painful as losing a friend	I would consider being unable to use my smartphone to be as painful as losing a friend
27	Trying to hide what I have been up to in relation to my smartphone	I tend to hide what I do with my smartphone from others
28	Having used my smartphone when I am not supposed to (in class, during a meeting, etc.)	I use my smartphone when I should not (e.g. in class, during a meeting, etc.)
29	Preferring searching from my smartphone to asking other people	I prefer finding a solution (e.g. googling) by using my smartphone rather than by asking people
30	Using my smartphone longer than I had intended	I tend to use my smartphone longer than I first intended
31	Feeling the urge to use my smartphone again right after I stopped using it	I feel some urge to use my smartphone again straight after I put it away
32	The people around me tell that I use my smartphone too much	I have been told I use my smartphone too much
33	Preferring Web surfing on my smartphone to doing so on computers	I prefer surfing the web on my smartphone rather than on a laptop / computer

Table 10 The changes of the questions from SAS to SMAT

I pre-tested the Smartphone Addiction Scale (SAS) with a few people before revising the questions. Firstly, I checked how long it takes to complete. I thought that the survey should take between 5 and 8 minutes to complete. Moreover, I checked whether they understood the questions clearly. It emerged that the participants were confused by question #20. They had difficulties with the phrases ‘my smartphone buddies and my real-life friends’ and ‘talk and hang out’. Here, it is important to establish a preference for the type of communication. In my previous studies, the literature review and the pilot studies, I discovered that text-based communication is dominant in smart mobile users’ social lives. Thus, the question was revised as shown in the table 10.

20	Preferring to talk with my smartphone buddies to hanging out with my real-life friends or with the other members of my	I prefer talking to my friends / family via my smartphone rather than talking face-to-face
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	family	
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Table 11 The changes to question #20 from SAS to SMAT

I also revised question #21 to make it clear and concise. The question is not changed much, but I removed the phrase “a hurry to get there”. This is because I wanted to make the question general, rather than narrow its scope.

21	Bringing my smartphone to the toilet even when I am in a hurry to get there	I carry my smartphone even when going to bathroom
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Table 12 The changes to question #21 from SAS to SMAT

As with question #24, I thought that it was important to emphasise the means of communication more. Thus, I made a comparison between the type of communication (‘smartphone communication and face-to-face to communication’) rather than the subject (‘smartphone buddies and real-life friends’).

24	Feeling that my relationships with my smartphone buddies are more intimate than my relationships with my real-life friends	I think I tend to develop friendship and relationships mostly through smartphone communication rather than through face-to-face to communication
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Table 13 The changes to question #24 from SAS to SMAT

Throughout the previous study, I established that the factors contributing to digital anxiety are [1] smart mobile addiction, [2] social network addiction, [3] social anxiety, [4] fear of miscommunication, [5] text addiction, and [6] information overload. These factors are interlinked and affect each other.

The Smartphone Addiction Scale (SAS) does not have questions asking about text addiction and information overload; thus, I added 7 more questions to the Smart Mobile Addiction Test (SMAT).

These questions are as follows:

[1] *I prefer reading digital copies on my smartphone rather than hard copies*

In Pilot Study 4, exploration of digital anxiety, I found that smart mobile users who feel comfortable using digital devices like Kindle prefer digital reading to hard copy

reading. This is because they think it is convenient, and because they are experienced users.

[2] *I frequently check information using my smartphone*

[3] *I read news mostly on my smartphone*

In Pilot Study 4, exploration of digital anxiety, I concluded that the motivation for accessing a smart mobile device continuously is 'seeking information'. The interesting point was that smart mobile users thought searching or reading information was a productive activity, and that this therefore means they are not addicted to their smart mobile device despite accessing it frequently.

[4] *I read and write on my smartphone for as many hours as I do on my laptop / computer*

I added this question because I am drawn to the thought that the main difference between smartphones and laptops / computers is mobility. Smart mobile devices occupy a double space in smart mobile users' lives: online and offline. Today, smart mobile users' lives are synchronously connected through broad Internet networks, including Wi-Fi.

[5] *I often use my smartphone to communicate with friends on SNSs*

In the previous study, I established that smart mobile users frequently access their smart mobile devices because they are seeking social interaction. Social networking sites are mainly used as a way of coming into contact with people. As a result, social networking sites increase the amount of time users spend on their online communication.

[6] *I regularly check my smartphone for no clear reason*

I noticed how smart mobile users check their smartphones out of habit, without a clear reason. Thus, I added this question to the Smart Mobile Addiction Test (SMAT).

[7] *I am encouraged to use my smartphone due to the smartphone notifications and alerts.*

During my literature review, I learned how smartphone notifications and alerts encourage smart mobile users to check their mobiles more often. Thus, I added this question to the Smart Mobile Addiction Test (SMAT).

The Smart Mobile Addiction Test (SMAT) was initially revised along these lines. The test was also updated after conducting the factor analysis. At the end, the number of items changed from 40 to 26. Therefore, the total score in the test can vary between 26 and 156. The validity and reliability analysis of the Smart Mobile Addiction Test (SMAT) was conducted. The factors of the Smart Mobile Addiction Test (SMAT) were extracted and grouped by six sub-scales. They were named as follows: [1] HIGH USAGE, [2] ADDICTIVE REACTION, [3] DIGITAL PREFERENCE, [4] SOCIAL ANXIETY, [5] ADDICTED TO SOCIAL NETWORKING SITES, and [6] PHYSICAL SYMPTOM. I write about the factor analysis in the next chapter.

Open-ended Questionnaire (Digital Anxiety Questionnaire)

An open-ended questionnaire is a method of self-completion. Self-completion methods, whether paper-based or electronic, remove a major source of potential bias from the responses, and make it easier for respondents to be honest about sensitive subjects (Brace, 2008). With little time pressure on them, they can write lengthy and full answers to open questions if they wish to do so; for photographs and drawings, as well as written materials, a level of production quality can be achieved that is appropriate to the study (Brace, 2008).

The digital anxiety questionnaire is designed on the basis of the keyword 'digital dementia'. Digital dementia is a side effect of highly developed smart mobile technology. This word was first used in South Korea. The country is one of the most digitally connected nations in the world. More than 67 percent of South Koreans have

a smartphone, the highest in the world, with that figure standing at more than 64 percent in teenagers, up from 21.4 percent in 2011, according to the Ministry of Science, ICT and Future Planning (Ryall, 2013).

Byun Gi-Won, a doctor at the Balance Brain Centre in Seoul, notes that “Heavy digital users are likely to develop the left side of their brains, leaving the right side untapped or underdeveloped” (cited in Jarrett, 2014). The right side of the brain is linked with concentration and its failure to develop will affect attention and memory span, which could in as many as 15 percent of cases lead to the early onset of dementia (Ryall, 2013).

I conclude that the meaning of digital dementia is a deterioration in cognitive abilities suffered as a result of addictive use of smart mobile devices. My research covers from mild digital anxiety to digital dementia. Thus, I refer to doctors who develop the digital dementia self-test and Dr Manfred Spitzer, a German neuroscientist, who published a book titled “Digital Dementia” in 2012, when designing the questionnaire for my main study.

Doctors in South Korea created a “digital dementia self-test” for the public. Here is their self-diagnosed test:

- [1] The only phone numbers you have memorized are your work and home.
- [2] Cannot remember what you had for dinner last night.
- [3] 80% of your communication is by email.
- [4] No handwriting except signing your bill.
- [5] A stranger is actually a person you have met in the past.
- [6] Keep repeating same things over and over.
- [7] Do not read maps anymore after having a GPS Navigator.
- [8] Cannot recall your home phone number which you used for many years.
- [9] Cannot remember the spelling of certain words.
- [10] Hard to sing your favorite song without looking at the lyrics.

(Lotte, 2014)

If the person answered “yes” 3 out of 10, the person has to check his/her health care in relation to digital dementia.

I designed the digital anxiety questionnaire on the basis of the digital dementia self-test. A few questions were changed to apply it to my research, as follows:

- Firstly, I changed the type of question from a yes / no question to a subjective question. The subjective method is useful to collect in-depth data from the participants.
- In question [5], I expanded the scope of the subject from a stranger to someone online and offline. This is because smart mobile users’ social lives have been expanded online, for example in social networking sites.
- With regard to question [7], many of my potential participants do not own a car. Thus, I revised the question to refer to difficulties in reading a paper map.

Here is the digital anxiety questionnaire I used before conducting the digital drawing experiment.

Pre-Digital Anxiety Questionnaire
<ol style="list-style-type: none">1. What is your name?2. How many phone numbers do you memorise? Whose are they?3. What percentage of text-based communication (emails, text messages, and mobile chat application) occupies your communication?4. What did you have for breakfast, lunch, and dinner yesterday?5. Do you use handwriting day-to-day?6. Have you any experience forgetting someone who you have met or seen either online or offline?7. Have you ever been told that you are repetitive when speaking?8. Do you have any difficulty reading a paper map?9. Do you have ever any incidence of difficulties recalling your mobile number? If you have, please explain about your experience.10. Do you have any experience of being unable to remember a familiar English word?11. Can you sing without looking up the lyrics?

Table 14 Pre-Digital Anxiety Questionnaire

I also designed the post-digital anxiety questionnaire to conduct after completing the digital drawing experiment. The pre-data from the digital anxiety questionnaire were useful for an initial understanding of the condition of the participants' everyday memories. The participants were unknown to me. The post-data from the digital anxiety questionnaire were important in investigating how the participants were changed or not changed through conducting the digital drawing experiment.

Here is the digital anxiety questionnaire after conducting the digital drawing experiment.

Post-Digital Anxiety Questionnaire
<ol style="list-style-type: none">1. What is your name?2. How many phone numbers do you have memorised? Whose are they? Regarding Q2, I gave you the task of designing numbers as drawings or doodles with your partner. Please, explain how the task has (or hasn't) helped you to remember numbers during the experiment.3. What percentage of text-based communication (emails, text messages, and mobile chat application) occupies your communication? Please explain how this has changed during the experiment.4. What did you have for breakfast, lunch, and dinner yesterday? With regard to Q4, I gave you the daily 'doodle the food you had today' task to carry out with your partner. Please explain how the daily task has (or hasn't) helped you to remember or recall the food you (or your partner) ate during the experiment.5. Do you use handwriting day-to-day? Please explain how this has (or hasn't) changed during the experiment.6. Have you any experience forgetting someone who you have met or seen either online or offline? With regard to Q6, I gave you the task of doodling your portrait and drawing an abstract image of something you had forgotten with your partner. Please explain how this task has (or hasn't) helped you to recall someone or

something throughout the course of the experiment.

7. Have you ever been told that you are repetitive when speaking? Please explain whether drawing/doodling has helped you to remember that you have already talked about something.
8. Do you have any difficulty reading a paper map? With regard to Q8, I gave you the daily task of doodling where you have been today, to share the moment with your partner. Please explain how the task has (or hasn't) helped you to recall the places and the route over the course of the experiment.
9. Do you ever have any difficulty recalling your mobile number? If you have, please explain your experience. Please explain how the drawing-doodling tasks have (or haven't) helped you to recall numbers throughout the experiment.
10. Do you have any experience of being unable to remember a familiar English word? With regard to Q10, I gave you the task of drawing an abstract image of a word you suddenly cannot remember. Please explain how the task has (or hasn't) helped you to recall those words throughout the experiment.
11. Can you sing without looking at the lyrics? With regard to Q11, I gave you the task of designing an abstract image of your favourite song or a piece of music. Please explain how this has (or hasn't) helped you to remember the song.
12. I gave you the daily task of doodling an interesting moment from today, to share with your partner. Please explain how this has (or hasn't) helped you to recall the moment.
13. I gave you the task of introducing yourself in drawings or doodles. Please explain your experience of doing this.
14. I gave you the task of designing emoticons to use when you talk with your partner. Please explain how this has (or hasn't) helped you to build social relationship with your partner.

Table 15 Post-Digital Anxiety Questionnaire

The post-digital anxiety questionnaire includes the context of the drawing assignments. Therefore, the Digital Anxiety Questionnaires were completed before and after the digital drawing experiment to investigate how the participants may or may not have changed during the experiment.

State-Trait Anxiety Inventory for Adults (STAI)

State-Trait Anxiety Inventory for Adults (STAI) is an instrument that quantifies adult anxiety. I did not revise or change this measurement. This particular instrument is used to simplify the separation between state anxiety and trait anxiety, feelings of anxiety and depression (“State-Trait Anxiety Inventory (STAI),” n.d.). This psychological tool was developed by Charles D. Spielberger in collaboration with R.L. Gorsuch, R. Lushene, P.R. Vagg, and G.A. Jacobs. It was published by Mind Garden. I was granted permission to use five sample items from the instrument in my thesis, as shown in the below image.

For use by Bo Ram Lee only. Received from Mind Garden, Inc. on March 4, 2015

SELF-EVALUATION QUESTIONNAIRE STAI Form Y-1

Please provide the following information:

Name _____ Date _____ S _____
 Age _____ Gender (Circle) M F T _____

DIRECTIONS:

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel *right now*, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

VERY MUCH SO
 MODERATELY SO
 SOMEWHAT
 NOT AT ALL

- | | | | | |
|--------------------------|---|---|---|---|
| 1. I feel calm | 1 | 2 | 3 | 4 |
| 2. I feel secure | 1 | 2 | 3 | 4 |
| 3. I am tense | 1 | 2 | 3 | 4 |
| 4. I feel strained | 1 | 2 | 3 | 4 |
| 5. I feel at ease | 1 | 2 | 3 | 4 |

Figure 13 The sample - five questions from STAI

I used the STAI scores to cross-map with the SMAT scores, thereby allowing me to see who has digital anxiety. I put the STAI score on the X-coordinate and the SMAT score on the Y-coordinate. This will be explained in Chapter 6.

Self-Evaluation of Drawing Ability

Participants were asked to self-evaluate their drawing ability by their range of interest in drawing, confidence in drawing, and interest in presenting thoughts. Responses were indicated on a 5-point Likert-type scale ranging from “Not at All” to “Absolutely Yes”, and also from “Not interested at All” to “Very Interested”. Participants were asked about their experience using a drawing / doodling mobile application. However, I did not find a use for these data, so that question was removed from the analysis. The self-evaluation of drawing ability was useful when examined alongside participants’ drawings and their responses to the open-ended questionnaire. Sometimes this data explains why the participants said something or acted in a particular way.

Images of Drawing and Mobile Conversation

I collected a large number of drawings from the digital drawing experiment, and also collected the images from the participants’ conversations. These data were collected through emails, Facebook chats, and Kakao talks. The participants sent all their digital drawings, including the images of the drawing tasks. They also captured a number of images of the conversations between experiment partners.

5.5. Digital Drawing Experiment Design

I designed the drawing experiment with the following aims in mind: [1] to explore how digital drawing affects digital anxiety, [2] to find what kind of digital drawing content helps to relieve digital anxiety, and [3] to investigate how my research might improve smart mobile users’ wellbeing. I designed the drawing experiment on the basis of my previous explorations.

The participants were paired, and each pair shared their drawings through the drawing mobile application. This is because I found that sharing powerfully encouraged people to conduct creative activities. I found that participants need instruction if they are to create collaborative works. Thus, pairing up the participants and providing guidelines for the digital drawing experiment are important, so they actively engage with the drawing communication and drawing creation. The participants were matched based on their SMAT scores. These participants were given the eleven

drawing assignments, but many participants did not complete the drawing task asking them to design numbers as drawings / doodles. This was therefore removed after completing the data collection.

Digital Drawing Tools

Before conducting the digital drawing experiment, I tested or reviewed various types of drawing mobile application that enabled communication via drawing, in Pilot Study 2. I looked into how asynchronous communication supports active social interaction. In the end, I decided to use DrawingTalk for Kakao alongside Kakao Talk mobile application for my experiment. Drawingtalk for Kakao (Drawingtalk for Kakao, 2013) was developed by Hyeonguk Sun, and helps users to draw on Kakao Talk. Kakao Talk (KakaoTalk, 2010) is a multifaceted messaging mobile app.



Figure 14 Example Images of the Apps

Participants would draw something as per the instructions with the use of Drawingtalk for Kakao, and send it to their partner through Kakao Talk. These two mobile applications are interlinked. Thus, participants are able to send their drawings directly through Drawingtalk for Kakao, and their partner will receive the drawing via Kakao Talk.

Digital Drawing Tasks

Another key learning from Pilot Study 3 is that clear instructions or a list of assignments is important to make the participants share the same goal in their drawing talk. In total ten drawing tasks were given to the participants. The drawing tasks were

categorized into five topics, as follows: [1] Emotion, [2] Social Relationship, [3] Daily memory, [4] Spatial Memory, and [5] Conceptual Visualisation.

As I discussed in Chapter 2, digital anxiety can result in memory loss and anxiety.

People are more likely to remember information if it is encoded following an emotionally charged response like fear or exhilaration, over everyday stimuli that has little emotional relevance; emotionally overwhelming events are frequently the best-remembered experiences (Williams cited in Fennell, 2015).

As William argues, I found that memory and emotion are interlinked in our memory of certain everyday things or occasions. Therefore, I analysed the data on the basis of five topics, as shown in the image below. The topic ‘Spatial Memory’ is part of the topic of ‘Daily Memory’. Firstly, ten drawing tasks were categorized into the five topics as shown in the table below:

EMOTION	Design emoticons of the following emotions: funny, sad, happy, angry, sick, tired Design emoticons of the following words: hi, good morning, good night
SOCIAL RELATIONSHIP	Introduce yourself in drawings Draw your portrait
DAY MEMORY	Doodle the food you had today Doodle an interesting moment from today
SPATIAL MEMORY	Doodle where you have been today
CONCEPTUAL VISUALISATION	Draw an abstract image of a word you suddenly cannot remember Draw an abstract image of something you suddenly cannot remember Design an abstract image of your favourite song / a piece of music

Table 16 10 Drawing Assignments and Five Topics

The diagram in Figure 15 presents how the drawing tasks and the five topics are interlinked.

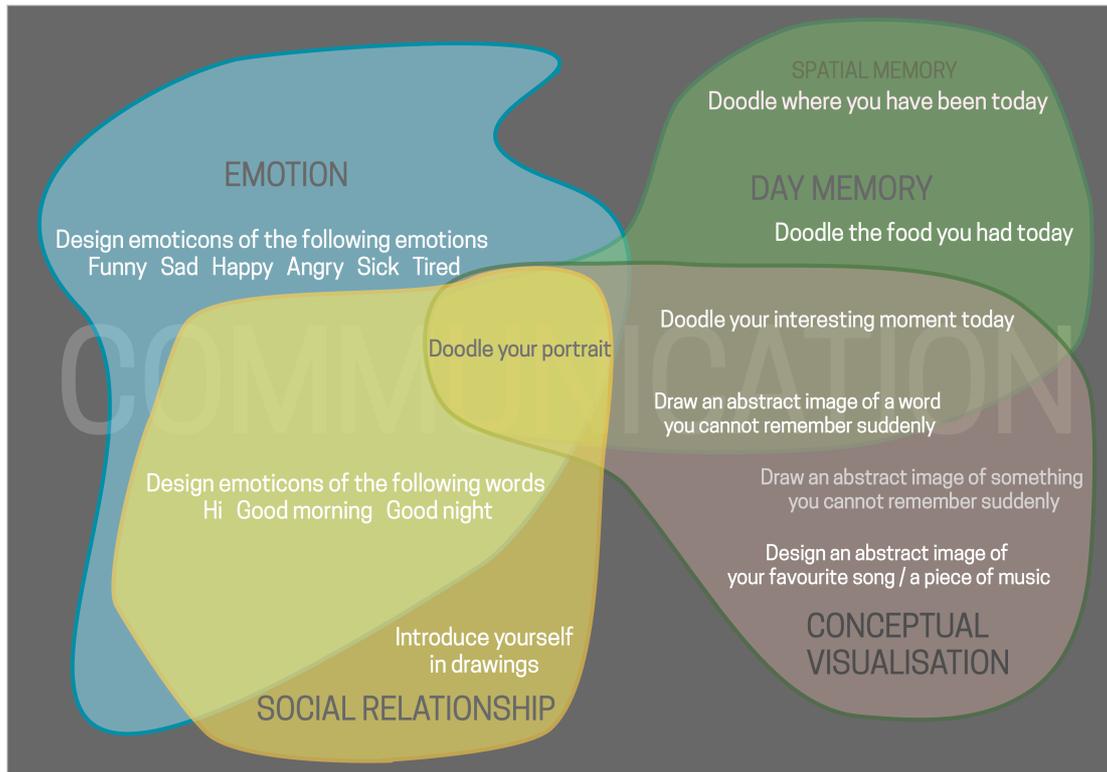


Figure 15 The Drawing Tasks and The Five Topics

Participants

The research target is the smart mobile user who inherently suffers from digital anxiety. In this study, there are two groups of participants. One group is used to establish the standard record of Smart Mobile Addiction Test (SMAT) because SMAT is a modification of SAS (Kwon *et al.*, 2013). Thus, I need to prove the validity of SMAT and also to decide to which SMAT factors to extract for this group. I call this the primary group. They are the general smart mobile user. Ages ranged from 18 to 54 years.

This primary group was recruited from several universities and online university groups in the UK, and ran for a period of 2 months from February to April 2015. Conducting the research intervention took 3 months from May to July 2015. As a result, the responses to the Smart Mobile Addiction Test (SMAT) were collected from 210 people. Factor analysis was conducted with the primary group (210 participants) to determine the number and nature of common factors in the Smart Mobile Addiction Test (SMAT) that account for interrelations among a set of participants.

I proved the validity of SMAT, and used it with the second group to conduct the drawing experiment. The respondents to the Smart Mobile Addiction Test (SMAT) were drawn at first from 54 people. The participants in this group expressed their interest in participating in the drawing experiment. They were divided into two groups on the basis of the Smart Mobile Addiction Test score for pairing the participants depending on their level smartphone addiction. These groups are divided, according to the median score on the Smart Mobile Addiction Test, into a slightly addicted group and a highly addicted group. I paired the experiment participants according to the logic expressed below.

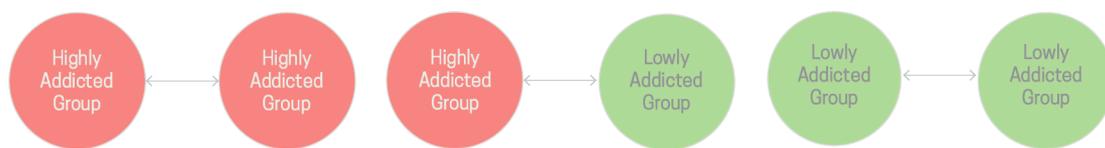


Figure 16 The Method of Pairing the Participants

In the first case, both participants from the highly addicted group are paired. In the second case, one participant is from the highly addicted group but the other one is from the lowly addicted group. In the last case, both are from the lowly addicted group.

Out of 54 participants, 50 submitted their responses to the State-Trait Anxiety Inventory (STAI). I began with 50 participants to conduct the drawing assignments. As I explained, the experiment contains daily assignments so some of them did not manage to complete the experiment. Unfortunately, my experiment only works with pairs. If one participant leaves the experiment, then their partner's data is also invalidated. If I had had a larger budget, then I might have been able to recruit more participants to run a second experiment. However, I made an email list of departments at Universities and Arts Colleges in London and Oxford. I sent more than a hundred emails to departments to ask them to forward my email to their students. I also joined University groups on social media to advertise my experiment. This was the best way to find participants during the digital drawing experiment.

The participants were asked to submit the post digital anxiety questionnaire, the drawings, and the images of their conversations after completing the drawing

assignments for four weeks. 32 Participants (15 pairs and 2 individuals) successfully completed the study. By successful completion, I mean not only reaching the end of the period of the digital drawing experiment but also submitting the questionnaire and the drawing materials. Therefore, the number of valid data from the drawing experiment was ultimately collected from 32 participants for analysis.

CHAPTER 6 ANALYSIS OF THE EXPERIMENT

6.1. Introduction

In order to refine a method of measuring smart mobile addiction, I developed the Smart Mobile Addiction Test (SMAT), which allows me to quantify levels of digital anxiety, and to investigate the symptoms of addiction to smart mobile devices. In this section, I will explore how communicating through digital drawing or doodling on smart mobiles affects digital anxiety. I will also study what kind of digital drawing content helps to alleviate digital anxiety, and seek to understand how my research can support smart mobile users and improve their wellbeing even while they are using their mobiles. I have looked for symptoms of digital anxiety and asked how participants might become aware of it by reviewing their answers to the questionnaires.

From the next paragraph, I will detail what I learned through the pilot study. I will write about what I learned and how my findings are linked to my main research.

First, I will outline what I have learned through carrying out the pilot study, and how my findings are linked to my main research. In the first pilot study, I learnt that conversations are important to discovering the ameliorative effects of drawing activities. This allows one to speculate, for example, about the possible reasons why a person chose to use a particular colour or figure in their drawings. Thus, I designed my experiment to involve communication between two smart mobile users. They used a drawing mobile app that enables people to chat, draw, send, and receive. Users play two roles at the same time. They become viewers as well as artists. I want to make it clear that drawing is not the main communicative tool in these conversations. Voice was the main method of communication in the healing arts class, but drawing was the medium that sparked that communication. In the app experiment, drawing became the

communicative medium for the partners, and text replaced speech. I observed whether or not the participants encouraged each other as they were drawing. I wanted to know what kind of conversations the participants would have using the mobile chat app, and how they would be expressed in their drawings. I paid attention to whether people praised each other's drawings and gave positive evaluations. The instructor of the healing arts class commented that encouragement motivates people to finish their art projects and to approach a healing state (see section 4.2.3.). I also wished to investigate whether the participants were able to approach a peaceful mind without the help of the instructor.

In the second pilot study, I learnt that one motive for using an arts mobile application is to ensure someone's attention. The existence of potential viewers becomes the motivation for creative activities. Another motive for using content led by amateurs is the desire for sympathy. Through studying collaborative artistic projects using digital devices or digital media, I have found that what all collaborative artistic projects have in common is that they guarantee social interaction and attention. Thus, these findings led me to design my experiment using pairs. This ensures that each participant has someone's attention, a viewer, a chance to be sympathised with, and guaranteed social interaction. It was interesting to see how the participants responded to each other's drawings and how they were useful in developing relationships. My original plan, before conducting the second pilot study, was to use a synchronous type of collaborative drawing. I thought that synchronous collaborative art projects were creative activities that have only become possible with the development of the smartphone. In my view, the biggest advantage of comparing smartphones with other digital devices is that they are small and easy to use on the go. However, to quote the results of my second pilot study, many synchronous collaborative artistic projects attracted little interest. On the other hand, asynchronous collaborative arts projects made people more engaged and were more popular. Thus, I changed my research plan to involve asynchronous drawing conversations on smart mobile devices. However, I remained curious about why there was such little interest in synchronous collaborative arts projects, so I investigated this in the third pilot study. I found that no one takes the lead in synchronous drawing tasks because all participants share the same level of authority; it is also partly due to attempts to avoid drawing on other people's sections

of the paper or changing others' creations (see section 4.4.3.). Collaborative artistic projects, including my digital drawing experiment, should be designed so that one leader is at the center of the cooperative project or collaborative creation. This can be seen, for example, in the instructor in the first pilot study, or in the well-designed asynchronous artistic projects in the second pilot study. I therefore decided to design my drawing experiment in detail, and developed useful drawing assignments for the participants rather than giving them the freedom to draw whatever topics or themes they liked. This makes me the main authority, managing the drawing in the experiment. Asynchronous communication supports the exchange of drawings. This also helps participants to exchange roles, so that both take on the roles of artist and viewer at different moments.

The fourth pilot study was useful in developing the list of drawing assignments that relate to the core study of my research. I discovered what motivates users to access their mobile and social networking sites. Finding these motivations was useful in designing my experiment because my focus is on finding drawing content that supports users by enhancing their memory, relieving their feelings of anxiety, and helping to build relationships while they are using their mobiles. I will now highlight some positive aspects of addressing digital anxiety via mobile devices themselves. Some may argue the users would not have digital anxiety if they were using their devices; for example, there is a digital detox camp in Japan designed to address this issue. People who realise they are addicted to their smartphones participate in the camp. They learn Japanese calligraphy and tea ceremony culture to escape from their addiction. The participants cannot use smartphones or digital devices during the digital detox camp (Masangkay, 2014). In contrast, my research goal is to find a routine practice or method that can relieve digital anxiety without recourse to such extremes. It is not a one-time event or an intermittent method.

In the fourth pilot study I returned to address the reasons for addiction. There were two main reasons for using smartphones continuously and repeatedly. The first was craving social relationships, and the second was a desire to access information that is constantly being updated online (see section 4.5). I considered these reasons when designing my digital drawing experiment, because it was important to incorporate

users' interests into the digital drawing activities to encourage them to complete them on a daily basis. The desire to seek social interaction is related to social anxiety, fear of miscommunication, social networking site addiction, and smart mobile addiction (see section 2.2.3). I had little expectation about the positive effect digital drawing might have on addiction, but expected it to positively affect social anxiety and fear of miscommunication. The desire to seek information was linked to text addiction and information overload. It also led to smart mobile addiction and social network addiction because smart mobile users gained other users' subscribed information through social networking sites. At this stage, I cannot clearly write about my expectations regarding text addiction or information overload. However, I will take into account users' desire to seek information when designing my experiment, and will investigate how the participants might think in a different way if they receive information in the form of drawings.

6.1.1. Quantitative Data Analysis Framework

In this section, I explain how the quantitative data were analysed, and on the basis of what strategies. Three types of quantitative data were collected in the main part of the research project. These were:

- The scores of the Smart Mobile Addiction Test (SMAT) taken by the random group
- The scores of the Smart Mobile Addiction Test (SMAT) taken by the experiment group
- The scores of the State-Trait Anxiety Inventory for Adults (STAI) taken by the experiment group

The random group's Smart Mobile Addiction Test (SMAT) scores

In total, data were collected from 210 participants (79 males, 128 females; 3 no designated gender), with ages ranging from 18 to 54 years. This data established the reliability and validity of the instrument, which was revised for my research. This also helped me to understand the factors of smart mobile addiction and explore its variables.

The factor analysis is normally conducted on a minimum of five but preferably up to ten times the number of people as there are variables in the test. The SMAT, with 40 variables, would need a factor analysis conducted on a minimum of 200 people but preferably 400 people. The SMAT is a modification of an existing test, designed to fit my research. Therefore, there is no need to suspect the validity of factor analysis derived from 210 samples.

I used SPSS software to manage the statistical data. I conducted a factor analysis, a reliability analysis, and One-Way ANOVA.

Firstly, I decided to conduct the factor analysis to prove the reliability and the validity of the Smart Mobile Addiction Test (SMAT), which is the revised version of the Smartphone Addiction Scale (SAS). Moreover, I investigated the factors of smart mobile addiction through grouping the SMAT questions. This was done by factor analysis.

“Factor analysis has its origins in the early 1900s, with Charles Spearman’s interest in human ability and his development of the Two-Factor Theory; this eventually led to a burgeoning of work on the theories and mathematical principles of factor analysis” (Harman cited in Yong and Pearce, 2013 p.79). Factor analysis uses mathematical procedures for the simplification of interrelated measures to discover patterns in a set of variables. A larger sample size will diminish the error in your data and so Exploratory Factor Analysis (EFA) generally works better with larger sample sizes. However, Guadagnoli and Velicer (1988) proposed that if the dataset has several high factor loading scores ($> .80$), then a smaller size ($n > 150$) should be sufficient (Yong and Pearce, 2013).

After extracting the subscales (factors) of the Smart Mobile Addiction Test (SMAT) through conducting the factor analysis, I tested the reliability analysis with the use of SPSS. In the statistical analysis, reliability refers to when a scale consistently reflects the construct it is measuring (Field, 2013).

“One way to think of reliability, ‘is that, things being equal’, a person should get the same score on a questionnaire if they complete it at two different points in time (test-retest reliability). Another way to look at reliability is to say that two people who are the same in terms of the construct being measured, should get the same score. In statistical terms, the usual way to look at reliability is based on the idea that individual items (or sets of items) should produce results consistent with the overall questionnaire.”

(Field and Miles, 2010 p.582)

After testing the reliability of the subscales, I then moved to conduct One-way ANOVA. Analysis of Variance (ANOVA) is a test of the statistical significance of the differences among the mean scores of two or more groups on one or more variables or factors (Vogt and Johnson, 2011). I attempted to find which one has a single quantitative dependent variable and one or more categorical independent variables. In my research, the independent variables were the subscales, which were extracted from the factor analysis. These were tested by gender, age, ethnic group, and level of education.

The experiment group’s Smart Mobile Addiction Test (SMAT) scores

In total, data were collected from 54 participants. However, only 32 participants completed the drawing experiment and submitted all the data. I also removed 2 participants after analysing the data from the drawing experiment. Therefore, valid data was collected from 30 (9 males, 21 females) participants.

After testing the factor analysis, 26 items were remaining, therefore the total SMAT score can vary from 26 (minimum) to 156 (maximum). I calculated the total score of each participant and listed the participants in order of highest to lowest. I then separated them into a high group and a low group.

The experiment group’s State-Trait Anxiety Inventory for Adults (STAI) scores

In total, data were collected from 50 participants. However, only 30 participants' data were used. This is for the same reason as was given for reducing the size of the SMAT experiment group. The STAI provides the scoring key to quantify the level of anxiety in numbers; the total STAI score can vary from 40 (minimum) to 160 (maximum). I calculated the total score of each participant and listed the participants from the highest to the lowest scores.

Each participant's SMAT and STAI scores were mapped in order to quantify the level of digital anxiety. This was done by putting their SMAT score on the y-coordinate and their STAI score on the x-coordinate.

6.1.2. Factor Analysis of Smart Mobile Addiction Test

In total data was collected from 210 participants (79 males, 128 females; 3 no designated gender), with ages ranging from 18 to 54 years.

Measurement

The SMAT test is to measure the level of smart mobile addiction. The SMAT has been revised by me.

THE SMART MOBILE ADDICTION TEST					
For the 40 statements listed below, please rate them on a scale of 1-6:					
1	2	3	4	5	6
Never / Almost Never	Seldom / Rarely	Sometimes	Often	Usually / Most of the time	Always / Almost Always
1. I lose focus in class / at work due to smartphone use					
2. I experience blurred vision due to excessive smartphone use					
3. I feel pain in my wrists and / or in back of neck whilst using smartphone					
4. I feel tired and lack adequate sleep due to excessive smartphone use					
5. I am incapable of doing anything without my smartphone, as all schedules and personal items are saved on it					
6. I procrastinate and / or neglect tasks at hand due to smartphone use					
7. I hallucinate smartphone sounds (or feel vibration) when I am not using it					
8. I feel calm and comforted whilst using my smartphone					
9. I keep my smartphone in mind even when I am not using it					
10. I feel stressed when my smartphone is not connected to the Internet					

11. I feel pleasant / excited whilst using my smartphone
12. I carry a battery charger so my smartphone battery never goes out
13. I get irritated when someone bothers me whilst using my smartphone
14. I feel comfortable when I have my smartphone by my side when going to bed
15. I constantly check my smartphone so as not to miss updates on Twitter or Facebook
16. I prefer to read digital copies on my smartphone rather than hard copies
17. My life would be empty without my smartphone
18. I feel great meeting people through my smartphone
19. I frequently check information from my smartphone
20. I feel impatient and fretful when I am not holding my smartphone
21. I check SNS (Social Networking Sites) like Twitter or Facebook right after I wake up
22. I read and write on my smartphone for as many hours as I do on a laptop / computer
23. I prefer talking to my friends / family via smartphone rather than talking face-to-face
24. I carry my smartphone even when going to bathroom
25. I have tried to shorten the time I spend with my smartphone
26. I feel depressed, anxious, or oversensitive when I am not able to use my smartphone
27. I think I tend to develop friendships and relationships mostly through my smartphone communication rather than through face-to-face to communication
28. I read news mostly on my smartphone
29. I do not mind paying for smartphone applications
30. I would consider that being unable to use my smartphone is as painful as losing a friend
31. I tend to hide what I do with my smartphone from others
32. I use my smartphone when I should not (e.g. in class, during a meeting, etc.)
33. I prefer finding a solution (e.g. googling) by using my smartphone rather than by asking people
34. I tend to use my smartphone longer than I first intended
35. I feel some urge to use my smartphone again straight after I put it away
36. I often use my smartphone to communicate with friends on SNSs
37. I have been told I use my smartphone too much
38. I prefer surfing the web on my smartphone rather than on a laptop / computer
39. I regularly check my smartphone for no clear reason
40. I am encouraged to use my smartphone due to the smartphone notifications and alerts

Table 17: The initial design of the SMAT

6.1.3. Statistical Analysis

For the examination of structure validity, the Kaiser-Meyer-Olkin (0.899) and Bartlett's tests ($p < 0.001$) were used; therefore factor analysis is appropriate with this data. The factor analysis of the scale was completed by using principal components analysis and Varimax Rotation with the Kaiser Normalization method.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.899
Bartlett's Test of Sphericity	Approx. Chi-Square	3752.051
	df	780
	Sig.	.000

Table 18 The result of KMO and Bartlett's Test

Cronbach's alpha coefficient was calculated using reliability analysis. A One-Way ANOVA was conducted to determine how sociodemography may relate to the SMAT scores. The important mean differences were mutually compared using the Duncan test. Statistical significance was set at a value of $p < 0.05$ (see Appendix 5: Data of Statistics).

6.1.4. Validity Analysis

As the outcomes of the first to fourth analysis were not acceptable, I will recount how I managed to extract the final six factors that can be proven with validity and reliability.

Before interpreting the outcome of the factor analysis, I will explain my guidelines for interpretation:

- [1] Avoid being guided by factor loadings only
- [2] Be guided by theory and common sense in selecting factor structure
- [3] Understand and interpret a factor if I am going to extract it

In the first factor analysis:

- [4] Each variable loads strongly ($> \pm .40$) on only one factor
- [5] At least 3 items are recommended per factor
- [6] Meaning of item (face validity)
- [7] Contribution it makes to the factor

(Neill, 2008)

SUBSCALE ONE (10 items) – can be named as USAGE
<p>Q39 I regularly check my smartphone for no clear reason</p> <p>Q32 I use my smartphone when I should not (e.g. in class, during a meeting, etc.)</p> <p>Q34 I tend to use my smartphone longer than I first intended</p> <p>Q21 I check SNS (Social Networking Sites) like Twitter or Facebook right after I wake up</p> <p>Q35 I feel some urge to use my smartphone again straight after I put it away</p> <p>Q15 I constantly check my smartphone so as not to miss updates on Twitter or Facebook</p> <p>Q37 I have been told I use my smartphone too much</p> <p>Q40 I am encouraged to use my smartphone due to the smartphone notifications and alerts</p> <p>Q26 I feel depressed, anxious, or oversensitive when I am not able to use my smartphone</p> <p>Q33 I prefer finding a solution (e.g. googling) by using my smartphone rather than by asking people</p>
SUBSCALE TWO (6 items) – can be named as DIGITAL PREFERENCE
<p>Q29 I do not mind paying for smartphone applications</p> <p>Q18 I feel great meeting people through my smartphone (eliminated)</p> <p>Q38 I prefer surfing the web on my smartphone rather than on laptop / computer</p> <p>Q24 I carry my smartphone even when going to the bathroom</p> <p>Q28 I read news mostly on my smartphone</p> <p>Q22 I read and write on my smartphone for as many hours as I do on a laptop / computer</p>
SUBSCALE THREE (4 items) – can be named as SOCIAL ANXIETY
<p>Q27 I think I tend to develop friendships and relationships mostly through smartphone communication rather than through face-to-face to communication</p> <p>Q23 I prefer talking to my friends / family via my smartphone rather than talking face-to-face</p> <p>Q30 I would consider that being unable to use my smartphone is as painful as losing a friend</p> <p>Q20 I feel impatient and fretful when I am not holding my smartphone (eliminated)</p>
SUBSCALE FOUR (5 items) – can be named as ADDICTIVE REACTION
<p>Q8 I feel calm and comfort whilst using my smartphone</p> <p>Q11 I feel pleasant / excited whilst using my smartphone</p> <p>Q6 I procrastinate and / or neglect tasks at hand due to my smartphone</p> <p>Q1 I lose focus in class / at work due to my smartphone</p> <p>Q9 I keep my smartphone in mind even when I am not using it</p>
SUBSCALE FIVE (3 items) – can be named as DEPENDENCE
<p>Q5 I am incapable of doing anything without my smartphone, as all schedules and personal items are saved on it</p> <p>Q19 I frequently check information on my smartphone</p> <p>Q10 I feel stressed when my smartphone is not connected to the Internet</p>
SUBSCALE SIX (3 items) – can be named as PHYSICAL SYMPTOM
<p>Q2 I experience blurred vision due to excessive smartphone use</p>

Q3 I feel pain in my wrists and / or in back of neck whilst using my smartphone
Q4 I feel tired and lack adequate sleep due to excessive smartphone use

Table 19 The first trial of factor analysis

The first factor analysis has 10 subscales but question 7, question 25, and question 36 each had one factor which does not conform to rule number [5]: ‘at least 3 items are recommended per one factor’. Nevertheless, this factor analysis explains 63.29% of the whole scale, and the overall sampling adequacy of the 40-item scale was tested using Kaiser-Meyer-Olkin, and a high value of 0.899 was reported. The P-value of the Bartlett test was .000, which indicated that the factor analysis was appropriate.

However, item 7, item 25, and item 36 were eliminated. Item 14 and item 31 are missing a variable that does not belong to any factors. Thus, those two variables were also eliminated.

The second factor analysis has 9 subscales but two factors have only two items each; therefore, item 12, item 13, item 16, and item 17 were eliminated. Those four items belong to subscale 7 and subscale 8, two each.

I re-ran the factor analysis. In my results, I found wording patterns in each of the subscales. Here are the results of the third factor analysis.

Except for item 18 and item 20 (highlighted in red in Table 19), all items could be grouped into subscales one to six, as named in Table 19. However, item 18 and item 20 are not guided by theory and common sense in selecting factor structure. Thus, those two items were eliminated.

I re-ran the fourth factor analysis, and item 5 did not belong to any factors. Item 5 is a missing item. There were little changes in each factor appearing in the results. I conducted the fifth factor analysis after removing item 5. This time, item 26 and item 33 are missing variables. I re-ran the final factor analysis having removed item 26 and item 33. The result of this was that I extracted six clear factors. Here is Table 20 showing the six factors in the final outcome.

HIGH USAGE (7 items)
Q39 I regularly check my smartphone for no clear reason
Q32 I use my smartphone when I should not (e.g. in class, during a meeting, etc.)
Q34 I tend to use my smartphone longer than I first intended
Q35 I feel some urge to use my smartphone again straight after I put it away
Q37 I have been told I use my smartphone too much
Q40 I am encouraged to use my smartphone due to the smartphone notifications and alerts
Q24 I carry my smartphone even when going to the bathroom
ADDICTIVE REACTION (6 items)
Q8 I feel calm and comforted whilst using my smartphone
Q11 I feel pleasant / excited whilst using my smartphone
Q6 I procrastinate and / or neglect tasks at hand due to my smartphone
Q1 I lose focus in class / at work due to my smartphone
Q9 I keep my smartphone in mind even when I am not using it
Q10 I feel stressed when my smartphone is not connected to the Internet
DIGITAL PREFERENCE (4 items)
Q29 I do not mind paying for smartphone applications
Q38 I prefer surfing the web on my smartphone rather than on a laptop / computer
Q28 I read news mostly on my smartphone
Q22 I read and write on my smartphone for as many hours as I do on a laptop / computer
SOCIAL ANXIETY (3 items)
Q27 I think I tend to develop friendships and relationships mostly through smartphone communication rather than through face-to-face to communication
Q23 I prefer talking to my friends / family via smartphone rather than talking face-to-face
Q30 I would consider that being unable to use my smartphone is as painful as losing a friend
ADDICTED TO SOCIAL NETWORKING SITES (3 items)
Q19 I frequently check information on my smartphone
Q21 I check SNS (Social Networking Sites) like Twitter or Facebook right after I wake up
Q15 I constantly check my smartphone so as not to miss updates on Twitter or Facebook
PHYSICAL SYMPTOM (3 items)
Q2 I experience blurred vision due to excessive smartphone use
Q3 I feel pain in my wrists and / or in back of neck whilst using my smartphone
Q4 I feel tired and lack adequate sleep due to excessive smartphone use

Table 20 Final Outcomes - Six Subscales

These six factors explain 66.30% of the whole scale. The overall sampling adequacy of the 26-item scale is tested using Kaiser-Meyer-Olkin, and a high value, 0.888 is

reported. The P-value of the Bartlett's Test is 0.000, which indicates that factor analysis is appropriate. The Cronbach's alpha for the total scale is 0.826, and those for the six factors were 0.764, 0.776, 0.806, 0.819, 0.788, and 0.826, respectively.

6.1.5. SMAT Participant Scores

There was not a significant difference between the genders, the ethnic groups, and levels of education. However, there was a statistically significant difference between the different ages as determined by one-way ANOVA ($F(4,200) = 3.235, p = .013$). The age ranges were 18 to 24 years, 25 to 34 years, 35 to 44 years, and 45 to 54 years.

AVERAGE SMAT SCORES				
		Ages	Mean	Std. Deviation
	18 to 24 years	67.49	16.106	
	25 to 34 years	68.17	17.586	
	35 to 44 years	74.33	17.836	
	45 to 54 years	43.60	17.813	

Table 21 Average SMAT scores

It is interesting to note that the 35 to 44 year old group shows the highest SMAT score. I had predicted that the 18 to 24 year olds or the 25 to 34 year olds would record the highest score, but the highest score was found among the 35 to 44 year olds. The total score of the SMAT can vary from 26 (minimum) to 156 (maximum).

I also found a nearly significant difference between the ages with 'high usage', as determined by one-way ANOVA ($F(4,205) = 2.395, p = 0.052$).

		HIGH USAGE
	18 to 24	The scores of the 'high usage' subscale can vary from 7 (minimum) to 42 (maximum). The mean of the 18 to 24 year old group is calculated as 20.69±7.022. The 25 to 34 year old group is recorded as 19.06±7.676. The 35 to 44 year old group shows 20.89±6.201. Lastly, the 45 to 54 year old group shows the lowest score, 11.20±4.438.
	25 to 34	The usage among the 18 to 44 year old group does not show a large difference.
	35 to 44	
	45 to 54	

Table 22 'High Usage' Subscale Scores - Age

Additionally, there was a nearly significant difference between the different ethnic groups as determined by one-way ANOVA ($F(13,189) = 1.727, p = .058$).

AVERAGE SMAT SCORES		
Ethnic	Mean	Std. Deviation
White-English, Welsh, Scottish, Northern, Irish, British	70.32	16.780
Any other White background	60.04	15.474
Asian – Indian	68.50	18.745
Asian – Chinese	72.77	14.776
Any other Asian background	73.10	14.272
Black – African	69.83	30.459
Black – Caribbean	62.50	26.715
Any other Mixed background	59.83	22.445
Any other ethnic group	70.67	22.489

Mean of Total Scores	
Any other Ethnic Group	70.67
Any other Mixed Background	59.83
Black-Caribbean	62.50
Black-African	69.83
Any other Asian Background	73.10
Asian-Chinese	72.77
Asian-Indian	68.50
Any other White Background	60.04
White-English, Welsh, Scottish, Northern, Irish, British	70.32

The Asian groups, especially 'Chinese' and 'Any other Asian background', show the highest scores. Additionally, in the data, the participant who ranked top in the SMAT score is Asian. 'White-English, Welsh, Scottish, Northern, Irish, British' and 'Black – African' groups follow after the Asian groups.

Table 23 Average SMAT Scores - Ethnic Groups

6.2 Quantitative Analysis of Experiment Group

6.2.1. Experiment Participants' SMAT Scores

In Table 24, a blue box marks a participant who gained the lowest score. Red marks the participant who gained the highest score.

#	GENDER	TOTAL SCORE	HIGH USAGE	ADDICTIVE REACTION	DIGITAL PREFERENCE	SOCIAL ANXIETY	ADDICTED TO SNS	PHYSICAL SYMPTOM
1	MALE	88	29	19	16	6	12	6
2	FEMALE	54	14	13	10	7	7	3
3	MALE	53	18	14	8	3	5	5
4	MALE	57	19	12	6	5	12	3
5	FEMALE	64	18	18	12	3	9	4
6	FEMALE	51	20	7	6	3	12	3
7	FEMALE	81	25	16	11	8	14	7
8	FEMALE	95	28	25	13	8	13	8
9	MALE	91	25	19	15	11	14	7
10	FEMALE	60	16	15	7	4	10	8
11	FEMALE	57	14	17	9	4	9	4
12	MALE	42	10	14	7	3	5	3
13	FEMALE	78	21	17	16	7	12	5
14	FEMALE	60	15	17	10	5	9	4
15	FEMALE	80	29	18	10	6	14	3
16	FEMALE	67	23	23	7	4	7	3
17	MALE	61	18	11	11	4	10	7
18	FEMALE	92	27	23	12	5	17	8
19	MALE	93	18	31	8	15	18	3
20	FEMALE	58	14	14	10	7	6	7
21	FEMALE	72	20	17	7	9	11	8
22	FEMALE	107	31	22	20	13	18	3
23	FEMALE	86	24	17	20	7	12	6
24	FEMALE	54	13	11	12	5	11	2
25	MALE	74	23	18	10	3	13	7
26	FEMALE	66	23	21	8	3	8	3
27	MALE	87	28	19	18	6	11	5
28	FEMALE	80	24	19	11	4	14	8
29	FEMALE	61	16	16	8	4	10	7
30	FEMALE	84	26	20	7	10	13	8

Table 24 SMAT scores of the 30 participants

To conduct the experiment, there were a total of 54 participants, but only 32 participants completed the drawing experiment and submitted all data. The experiment was conducted with pairs of the participants. Thus, if one participant

withdrew, so did their pair. Moreover, I removed two participants from the Digital Anxiety Questionnaire because their data were not useful. They are the partners of participant #23 and participant #10 (see Appendix 8: Qualitative Analysis of Sixteen Cases). Valid data was therefore collected from 30 participants.

The analysis of the drawing experiment is based on mixed methodologies. The quantitative data derives from the Smart Mobile Addiction Test (SMAT) and the State Trait Anxiety Inventory (STAI). Those data were to be combined with the qualitative data; therefore, I used the quantitative data only from those 30 participants.

I calculated each participant's total SMAT score, and calculated the scores of the six subscales: [1] HIGH USAGE, [2] ADDICTIVE REACTION, [3] DIGITAL PREFERENCE, [4] SOCIAL ANXIETY, [5] ADDICTED TO SOCIAL NETWORKING SITES, and [6] PHYSICAL SYMPTOM.

As seen in Table 24, Participant #22 has the highest SMAT score and Participant #13 has the lowest score. Thus, as planned and explained in the methodology, Participant #22 and Participant #12 were paired together for the experiment. Participant #22 got the highest scores in 'high usage', 'digital preference', and 'addicted to Social networking sites'. Participant #12 got the lowest scores in 'high usage', 'social anxiety', and 'addicted to Social Networking Sites'. Participant #19 scored third-highest on the SMAT, and this person got the highest scores on 'addictive reaction', 'social anxiety', and 'addicted to Social Networking Sites'. Participant #6 scored second-lowest on the SMAT, and this person got the lowest scores in 'addictive reaction', 'digital preference', and 'and social anxiety'. Participant #3 got the lowest scores in two subscales, 'social anxiety' and 'addicted to Social Networking Sites'. This analysis was later combined with the qualitative analysis.

I visualised the SMAT scores. The coloured area represents the group of participants who are highly addicted to smart mobile devices and Social Networking Sites.

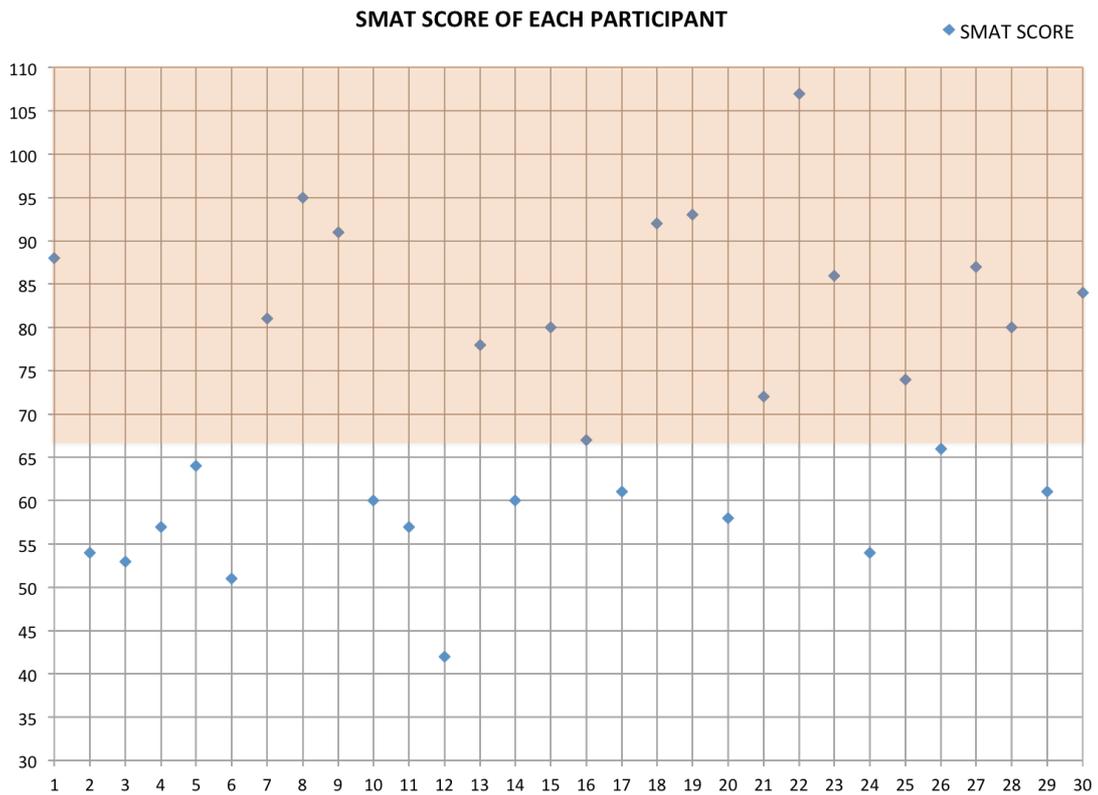


Figure 17 SMAT Score of 30 Participants

I separated the participants into two groups, the high score group and the low score group. The SMAT score median was 67, Participant #16.

HIGH GROUP	LOW GROUP
#1, #7, #8, #9, #15, #16, #18, #19, #21, #22, #23, #25, #27, #28, #30	#2, #3, #4, #5, #6, #10, #11, #12, #13, #14, #17, #20, #24, #26, #29

Table 25 SMAT Score - High Group and Low Group

6.2.2. STAI Scores of The Experiment Group

As I explained in the methodology, State-Trait Anxiety Inventory for Adults (STAI) is an instrument to measure the level of anxiety. The STAI provides the scoring key to quantify the level of anxiety as a number. I collected the STAI data from 50 participants, but only 30 participants' data were combined with the results of the SMAT.

STAI SCORES					
#1	60	#11	53	#21	109
#2	78	#12	53	#22	80
#3	72	#13	73	#23	90
#4	134	#14	60	#24	81
#5	81	#15	60	#25	67
#6	104	#16	93	#26	120

#7	79	#17	66	#27	71
#8	81	#18	62	#28	79
#9	59	#19	75	#29	60
#10	74	#20	120	#30	85

Table 26 STAI scores of 30 participants

As seen in Table 26, Participant #4 is ranked top. Participants #11 and #12 are ranked lowest of all the participants. I coloured participants #6, #20, #21, and #26 in pale red because their scores are above 100.

6.2.3. Mapping the Digital Anxiety Scores

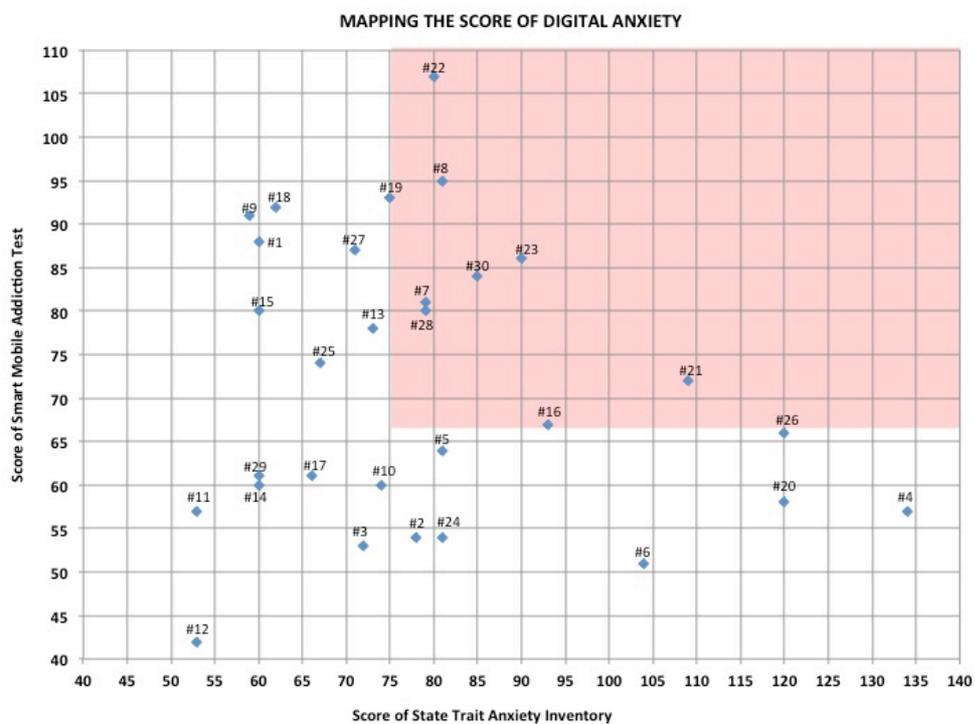


Figure 18 Mapping Digital Anxiety Scores

The coloured area with the pale red in the graph represents the participants (9 people) who have digital anxiety. These are participants #19, #22, #7, #28, #8, #30, #23, #16, and #21. The median of the x-coordinate is 75, and the median of the y-coordinate is 67. This analysis will be compared with the qualitative analysis for discussion in Chapter 6.4.

6.3. Qualitative Analysis of the Experiment Group

6.3.1. Introduction

Digital anxiety is a form of anxiety that can affect memory loss. Digital anxiety has multiple causes, as discussed in the literature review. In this section I will intertwine the theory of digital anxiety with my analysis of the drawing experiment to explore what effect the digital drawing might have on digital anxiety. I will also investigate what kind of digital drawing content might help to relieve digital anxiety; moreover, I will discuss how my research can help improve a smart mobile user's wellbeing.

Having digital anxiety refers to overuse of smart mobile devices, a preference for digital interaction, addictive reactions to smart mobile devices, addition to Social Networking Sites, and physical symptoms as a result of this high usage. These causes were examined in the SMAT factor analysis. In addition, the participants who appeared to have digital anxiety were identified in the results of the SMAT and STAI tests. These are participants who scored above average in comparison with the other participants.

I found that smart mobile communication through the day is dominated by text. As I discussed in section 2.2.2, memory loss can be generated by overuse of text-based communication. Text-based communication has become the primary means of communication for smart mobile users (Turkle, 2013). However, the importance of drawing has gradually grown with the increase in the size of smart mobile devices. In September 2015, Apple released the first Apple Pencil, a stylus designed for technical drawing. Drawing and handwriting will take a greater part in smart mobile communication due to the increased size of the smart mobile screen.

Thus, research into how digital drawing affects digital anxiety will be useful to frame the foundation of digital drawing communication, and may contribute to an increase in smart mobile users' wellbeing.

I have focused on the nine participants who have digital anxiety according to the quantitative analysis. As I explained in the methodology, the drawing experiment was conducted with pairs of participants. Firstly, I analysed each pair; a total of sixteen

cases. Through analysing these sixteen cases, I found insights for the three research questions that were introduced in the first paragraph of this chapter. Those questions are: [1] how does digital drawing affect digital anxiety? [2] what kind of digital drawing content helps to relieve digital anxiety? and [3] how can my research improve smart mobile users wellbeing? Secondly, I conducted a comparative analysis between one half of the cases and the other (eight cases in each). In the first eight cases, either one or both participants in each pair showed indications of suffering from digital anxiety. In the second eight cases, neither showed indications of suffering from digital anxiety. The analysis of each of the sixteen pairs will form one sub-chapter (see section 6.3.3). I will use my insights to develop research questions and discussion in a further sub-chapter (see section 6.4).

6.3.2. Qualitative Data Analysis Framework

I used data from 30 participants in the qualitative analysis. This was done for the same reasons as were explained in section 6.1.2. For this analysis, I collected the pre-digital anxiety questionnaire, the post-digital anxiety questionnaire, the images of the digital drawings, and the screen shots of the conversations between each pair. The qualitative analysis is informed by the theories and the previous investigations throughout the literature review, the pilot studies, and the quantitative analysis. The theory of digital anxiety was built throughout the literature review and in Pilot Study 4. I designed a method that enables me to quantify the level of digital anxiety through the quantitative analysis.

In this section, I investigate how digital drawing might help a smart mobile user who is suffering from digital anxiety, and which digital drawing assignments might help them. Moreover, I focus on how drawing helps smart mobile users improve their wellbeing.

As I explained in section 5.4 (selection of data collection methods and instruments), firstly, I collected the pre-digital anxiety questionnaire for the qualitative study. This data illustrates the participant's day-to-day memory. I attempted to understand their daily memories using a subjective, self-reported questionnaire that asks people to rate their functioning in day-to-day situations. This is because people who use their smart

mobile devices very frequently – for lots of different purposes — feel that their day-to-day memory is poor. People who overuse smart mobile devices are quite likely to be poorer than ‘light’ mobile users at remembering normal daily events and activities. I am using the response from one participant (Participant #14) to illustrate what data was collected.

Response No : 14	
1. What is your name?	
2. How many phone numbers do you have memorised? Who are they?	5 numbers, Parents home Mum mobile, sister mobile Brother mobile, Dad mobile
3. What percentage of your communication is text-based (emails, text messages, and mobile chat application)?	70%
4. What did you eat (breakfast, lunch, and dinner) yesterday?	All 3 meals
5. Do you use handwriting on a daily basis?	Not always on to make notes at work or write a birthday card
6. Do you have any experience forgetting someone who you have met or seen either online or offline?	This happens all the time, sometimes I think I've met someone in real life but it's only a photo on facebook and vice versa
7. Has anyone ever told you that you are repeating yourself?	Yes very often, as I online date donetimes I tell people the same thing and don't realise it
8. Do you have any difficulty reading a paper map?	I read one many years ago (15 years ago) and never required to read s paper map again
9. Have you ever had any difficulty recalling your mobile number? If you have, please explain your experience.	No
10. Have you ever had trouble remembering an English word that you are usually familiar with?	Sometimes but not very often
11. Can you sing without looking at the lyrics?	Yes :)

Table 27 A sample of answering the pre-digital anxiety questionnaire

As I explained, the pre-digital anxiety questionnaire is conducted in order to understand the participant’s daily memory. This data is used to profile the character of each participant in general, and to compare with the post-digital anxiety questionnaire.

I will explain what coding method is used to conduct the first cycle of coding after presenting an example of the post-digital anxiety questionnaire (Participant #14).

Response No : 14
1. What is your name?
2. How many phone numbers do you have memorised? Whose are they? Regarding Q2, I gave you the task of designing numbers as drawings or doodles with your partner. Please, explain how the task has (or hasn't) helped you to remember numbers during the experiment.
I memorised numbers when I was younger and you'd see the persons phone number when sidling on the mobile. The new operating systems on phones now mean you never see the numbers only the names of people so the task has not helped with numbers BUT I would be better at remembering numbers if they were in a picture form
3. What percentage of your communication is text-based (emails, text messages, and mobile chat application)? Please explain how this has changed during the experiment.
I would say about 50% text and 50% drawings as sometimes we weren't sure the other person u set stood the drawing so would text to explain. Also as time went on we build a good online rapport and we started texting more as friends about our lives, our work, relationships etc so towards end more texts as if I was texting a friend
4. What did you eat (breakfast, lunch, and dinner) yesterday? With regard to Q4, I gave you the daily 'doodle the food you had today' task to carry out with your partner. Please explain how the daily task has (or hasn't) helped you to remember or recall the food you (or your partner) ate during the experiment.
The images definitely help me remember the good I ate as well as what food my partner met as I remember events based on faces and images - I recall dumplings and soup and laughing over Indian food drawings and the drawings about crying about putting on too much weight but still eating chocolate whilst crying about weight!
5. Do you use handwriting day to day? Please explain how this has changed during the experiment.
I drew a few words but as it was faster to type so I typed/texted words and drew pictures so kept text and numbers separate to drawing images
6. Have you any experience forgetting someone who you have met or seen either online or offline? With regard to Q6, I gave you the task of doodling your portrait and drawing an abstract image of something you had forgotten with your partner. Please explain how this task has (or hasn't) helped you to recall someone or something throughout the course of the experiment.
Drawing does help as I identify the main features - in this case my own features for the self portrait such as hair and skin colour. Highlighting these features would solidly a persons existence in my memory With the word I forgot, by drawing it it helped me look deeper in my memory to figure out the word based on emotions I had related to the forgotten word and eventually I remembered the forgotten word
7. Have you ever been told that you repeat yourself? Please explain whether drawing/doodling has helped you to remember that you have already talked about something.
Yes sometimes I'd forget if I told my partner what u had to eat so when I went to chat and saw the drawing it would remind me that I had already doodled my meal
8. Do you have any difficulty reading a paper map? With regard to Q8, I gave you the daily task of doodling where you have been today, to share the moment with your partner. Please explain how the task has (or hasn't) helped you to recall the places and the route over the course of the experiment.
I have terrible memory and special awareness so drawing where i had been solidified my memory of events and sometimes recalling what I'd done that day is picture the image I drew as opposed to remembering the actual event so sometimes the memory of the drawing actually replaced the memory itself
9. Do you have ever any difficulty recalling your mobile number? If you have, please explain your experience. Please explain how the drawing-doodling tasks have (or haven't) helped you to recall numbers throughout the experiment.

I have had the same number for 7 years so if anything it's hard to forget Unless I form an image of the number in my head e.g when people ask my home address number I visage the number as a picture in my memory to remember them
10. Do you have any experience of being unable to remember a familiar English word? With regard to Q10, I gave you the task of drawing an abstract image of a word you suddenly cannot remember. Please explain how the task has (or hasn't) helped you to recall those words throughout the experiment.
By dwelling on the emotional side of the word I couldn't remember it helped me link emotion and be able to remember the word easily
11. Can you sing without looking the lyrics? With regard to Q11, I gave you the task of designing an abstract image of your favourite song or a piece of music. Please explain how this has (or hasn't) helped you to remember the song.
I have a talent of remembering song lyrics very well as the tune plays in my head first and then the lyrics slot into the music Drawing the image of the song - I was singing the song in my head with lyrics the entire time I was drawing so it made the lyrics more solid in my memory
12. I gave you the daily task of doodling an interesting moment from today, to share with your partner. Please explain how this has (or hasn't) helped you to recall the moment.
It helped me remember as drawing the memory means thinking of the event and solidifying the memory in my head so rather than remember the event ur members the event through the memory of drawing the actual event
13. I gave you the task of introducing yourself in drawings or doodles. Please explain your experience doing this.
It was my chance to show im fun I'm bright and happy so I drew a big smile and a hi to be as welcoming as possible
14. I gave you the task of designing emoticons to use when you talk with your partner. Please explain how this has (or hasn't) helped you to build social relationship with your partner.
We had a good laugh over the emoticons and helped us bond better as we both shared in the joke. However having an on screen emoticon keyboard the emoticons were used much more frequently due to their speed and convenience

Table 28 sample answers from post-digital anxiety questionnaire

The post-digital anxiety questionnaire contains data regarding what each participant thinks about how the digital drawing experiment has changed them. In addition, the participant describes what has been useful in the digital drawing experiment for their wellbeing.

I used NVivo coding method to analyse words or phrases repeatedly appearing in the participants' answers.² I printed out all pre- and post- digital anxiety questionnaires, read the questionnaires to find words and the phrases that repeatedly appeared, highlighted those words and phrases, and took analytic notes on paper. I explored important findings, removed unimportant information, and refined ideas, thoughts, and questions for further data searches. I made versions of the data analysis to

² NVivo coding uses words or short phrases from the participant's own language in the data record as codes. NVivo coding is appropriate for studies that prioritize and honor the participant's voice. Phrases that are used repeatedly by participants are good leads; they often point to regularities or patterns in the setting (Miles et al., 2013: 74)

document my searches and outcomes even though some of the data were not useful. I then roughly derived the following general topics: drawing and social relationship, self-introduction, drawing and emotion, emoticons, drawing and memory, daily life, drawing and memory, food, place, abstract drawing, phone numbers, handwriting, remembering meals, forgetting someone, repetition when speaking, difficulties in reading paper maps, difficulties recalling mobile numbers, trouble remembering English words, and singing without looking at the lyrics. I divided the words, phrases, and sentences from the participants' answers by topic.

This was done to conduct evaluation coding in order to understand the general reaction, such as positive or negative thoughts, toward the digital drawing experiment.³

I then divided all data, including the images and the drawings, by topic, in order to profile each participant on the basis of those topics. In this profile, I added their drawing ability scores, their smart mobile addiction test scores, and the State-Trait Anxiety Inventory for Adults scores (see section 5.4). These quantified data were compared with the subjective data in the form of the participants' written answers. The table on the next page shows how I extracted and arranged the data for profiling. This is the profile of Participant #8. I deleted a number of the images and the data to protect the participant's information, and to save space.

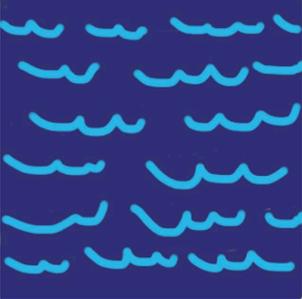
³ This method applies primarily non-quantitative codes onto qualitative data that assign judgments about the merit, worth, or significance of programs or policy (Miles et al., 2013: 76).

Participant #8

Self Introduction	
Emoticons	

Day Life



<p>Food</p>	
<p>Place</p>	
<p>Abstract Image</p>	

Screen shot

I am such a terrible drawer, so I apologize in advance 🙏🙏🙏 15:54



19:18
This looks soooo creepy!! I was Tryna say I'm at the nail bar!

08:20
father in law look to be holding hands 🙄🙄



08:25
This is my emoticon for angry



08:46
eat it all day / did u go for man bread or rice?

08:54
Nan*

14:36
Yesterday went out for drinks in Canary Wharf then to Leicester Square!



09:59
Last night I went out with some friends to a bar called bar salsa also in Leicester Square



10:02

10:03
This is me dancing in the bar! It was good fun but because I am so tall (I am 5'11/ 181cm) so many men were too short!

10:06
Some men were very creepy they were pressing themselves against ur bum from behind in the club it was so creepy when they do that this is how I feel when creepy men do that



10:17
This is an abstract doodle of one of my fave songs-u think u can guess what it is? It may give u more clues to the song!



10:21
This is my emoticon for Good Morning!



10:22
(I'm going through our task list as there's things we need to doodle n design as part of this experiment!)



22:03

09:52
Glad u had a good night and is the tofu juggae vegetarian? Could u give me a recipe id love to learn a new way to cook tofu!



09:55
Last night was the first night I hadn't been out in a long time so instead I put my headphones on and danced around for a bit - I love my headphones I carry them everywhere!



10:00

00:42
Oh i didn't know about that benefit! I will definitely try it later 😊



Guess what I saw yesterday (it is over 12am)

21:14
Today I made a lovely curry!



It looked lovely but it tasted so bad I ended up ordering from the local Indian 🙄🙄



22:37
Today i had a soft tofu jiggae as dinner. I don't know how to explain jiggae in English, but anyway it is Korean food and something like stew hehe

Drawing Abilities	<ul style="list-style-type: none"> Interested in drawings / doodling: Neutral (3) Experience of using any type of drawing / doodling apps: Yes (2) Interested in presenting ideas or thoughts to others: Interested (4) Confidence in drawing / doodling skills: Not Sure (3) 				
Smartphone Addiction Test	<ul style="list-style-type: none"> Average: 3.4 / 6 (Highest group) Comment: 'As my job is a mobile analyst it's encouraged at work which increases the time I use my device' 				
STAI Score	<ul style="list-style-type: none"> Pre Score: 81 Post Score: 63 				
(Pre data) Digital Anxiety	Phone number	Text-based Communication	Remembering meals	Handwriting	Forgetting someone
	5, parents home, mum mobile, sister mobile, brother mobile, dad mobile	70%	All 3 meals	Not always on to make notes at work or write a birthday card	This happens all the time, sometimes I think I've met someone in real life but it's only a photo on facebook and vice versa
	Repetition when speaking	Difficulty reading a paper map	Difficulties recalling mobile number	Trouble remembering English words	Sing without looking at lyrics
	Very often, as I online date donetimes I tell people the same thing and don't	Read one many years ago (15years ago) and never required to read a paper map again	No	Sometimes but not very often	Yes

	realise it				
(Post data) Digital Anxiety	Phone number	Text-based Communication	Remembering meals	Handwriting	Forgetting someone
	I memorised numbers when I was younger and you'd see the persons phone number when sidling on the mobile. The new operating systems on phones now mean you never see the numbers only the names of people so the task has not helped with numbers BUT I would be better at remember numbers if they were in a picture form.	I would say about 50% text and 50% drawings as sometimes we weren't sure the other person u set stood the drawing so would text to explain. Moreover as time went on we build a good online rapport and we started texting more as friends about our lives, our work, relationships etc so towards end more texts as if I was exting a friend.	The images defibately help me remember the good I ate as well as what food my partner met as I remember events based on faces and images – I recall dumplings and soup and laughing over Indian food drawings and the drawings about crying about putting on too much weight but still eating chocolate whilst crying about weight!	I drew a few words but as it was faster to type so I typed/texted words and drew pictures so kept text and numbers separate to drawng images.	Drawing does help as I identify the main features – in this case my own features for the self portrait such as hair and skin colour. Highlighting these features would solidly a persons existence in my memory With the word I forgot, by drawing it helped me look deeper in my memory to figure out the word based on emotions I had related to the forgotten word and eventually I remembered the forgotten word.
	Repetition when speaking	Difficultiy reading a paper map	Difficulty recalling mobile number	Trouble remembering English words	Sing without looking at lyrics
	Yes sometimes I'd forget if I told my	I have terrible memory and spacial	I have had the same number for 7 years so if	By dwelling on the emotional side of the	I have a talent of remembering song lyrics

<p>partner what u had to eat so when I went to chat and saw the drawing it would remind me that I had already doodled my meal.</p>	<p>awareness so drawing where I had been solidified my memory of events and sometimes recalling what I'd done that day is picture the image I drew as oppsed to remembering the actual event so sometimes the memory of the drawing actually replaced the memory itself.</p>	<p>anything it's hard to forget Unless I form an image of the number in my head e.g. when people ask my home address number I visage the number as a picture in my memory to remember them.</p>	<p>word I couldn't remember it helped me link emotion and be able to remember the word easily.</p>	<p>very well as the tube plays in my head first and then the lyrics slot into the music Drawing the image of the song – I was singing the song in my head with lyrics the entire time I was darwing so it made the pyrics more solid in my memory.</p>
<p>Daily life</p>		<p>Introduce yourself</p>		<p>Design emoticons</p>
<p>It helped me remember as drawing the memory means thinking of the event and solidifying the memory in my head so rathe rthan remember the event ur members the event through the memory of drawing the actual event.</p>		<p>It was my chance to show im fun I'm bright and happy so I drew a big smile and a hi to be as welcoming as possible.</p>		<p>We ahd a good laugh over the emoticons and helped us bond better as we both shared in the joke. However having an on screen emoticon keyboard the emoticons were used much more frequently due to their speed and convenience.</p>

Table 29 The profile of participant #8

I then reused NVivo coding and Evaluation coding to investigate insights about each participant, not the general mood of each topic from all participants. As I did in the first cycle coding, I printed out each profile to highlight words and the phrases. I wrote my thoughts on the paper and marked positive and negative signs for each topic. These signs indicate how the participant felt about those topics.

In section 6.2., I quantified the scores from the Smart Mobile Addiction Test, the State-Trait Anxiety Inventory for Adults, and participants' assessment of their drawing abilities. These data are visualised with a radar chart and a table to compare each participant's score against the average. As I explained in section 5.5., this experiment was conducted in pairs. Thus, I compared the data from each of the pairs. This is an example of how I visualised the data of each pair (Participant #1 and Participant #6). The blue line is the average for the 30 participants. The red line is the participant in question.

<p>A radar chart comparing the scores of Participant #1 (red line) against the average of 30 participants (blue line) across three metrics: STAI (top), SMAT (right), and DRAWING (left). The STAI axis ranges from 0 to 80. The SMAT axis ranges from 0 to 156. The DRAWING axis ranges from 0 to 5. The average scores are approximately 79.3 for STAI, 71.21 for SMAT, and 3.46 for DRAWING. Participant #1's scores are 60 for STAI, 88 for SMAT, and 3 for DRAWING.</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 1	60	88	3
	Convert into %	37.5	56.41	60.0
<p>A radar chart comparing the scores of Participant #6 (red line) against the average of 30 participants (blue line) across three metrics: STAI (top), SMAT (right), and DRAWING (left). The STAI axis ranges from 0 to 80. The SMAT axis ranges from 0 to 156. The DRAWING axis ranges from 0 to 5. The average scores are approximately 79.3 for STAI, 71.21 for SMAT, and 3.46 for DRAWING. Participant #6's scores are 104 for STAI, 51 for SMAT, and 3.67 for DRAWING.</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 6	104	51	3.67
	Convert into %	65	32.69	73.4

Table 30 Sample Data Analysis

I then described those data in words. Participant #1 and Participant #6 were described in the following way:

Participant #1 is a 24 year old male. He belongs to the high SMAT group. His partner #6 is a 22 year old female. She belongs to the low SMAT group. Participant #6 got the lowest scores on three subscales. These are ‘addictive reaction’, ‘digital preference’, and ‘social anxiety’. But she got a high score (104) on the STAI in comparison to other participants.

After writing the description of the data search, the topics were condensed into four categories. These are ‘daily memory’, ‘conceptual visualisation’, ‘emotion’, and ‘social relationship’ (see section 5.5). I wrote the description and the annotation using a participant’s profile on the basis of those four categories. I then made the tables for a comparison between the pair. Here is an example of how I displayed the table.

Daily Memory – Participant #1	
	
Description	Annotation
<p>Participant #1 thinks that drawing the food he eats on a daily basis is good way to describe it. He responded that ‘visualising the food using images is a good way to describe it. It’s very easy to work out what food is using a simple drawing.’</p> <p>He described drawing his in the following way: ‘the moment was easy to remember using the doodle. I rode into work for the first time and the simple image of me on my bike brought back the memories instantly. I just checked it now, two weeks after it was posted.’</p> <p>In his drawing, he did not use many colours but used a certain colour like yellow for the sun or sky blue for the river.</p>	<p>The use of a simple drawing helped him communicate with his partner. He used a simple line, a few colours, and letters or words to clarify what he wanted to represent. For example, in the first image, the letter ‘T’ represents the word ‘tea’.</p> <p>He responded that describing the moment through drawing made it easy to remember. He also said that he remembered the moment even two weeks after he drew it. He could remember or imagine the scene of riding the bike to his workplace because the process of drawing it works as a ‘rehearsal’.</p> <p>The interesting point in the second image is that he wrote the word ‘bike’ to give exact information about what he had drawn, even though he drew the bike well. I think this is because he had little confidence in his drawing ability, as he had previously suggested.</p>
Daily memory – Participant #6	
	
Description	Annotation

<p>Participant #6 expressed the most negative views about the drawing assignments. In response to the question about how drawing helped her to remember her daily life, she wrote that 'drawing the experience of buying books did not help me recall the moment, since I felt like actually holding and flipping through the books was a better way for me to remember.'</p> <p>Additionally, she responded that remembering her food was not a pleasant experience. She wrote that 'I really did not enjoy doodling the food I ate that day. It made the food I ate feel more real when I had to tell someone about it, and drawing the food made me hyper aware of how I was not making healthy choices with my body.'</p>	<p>I will discuss this participant's complaints further with regard to other topics (conceptual visualisation, spatial memory, emotion, and social relationship). However, I will say here that she does not like how her drawings turned out in general. She feels that she was unable to properly communicate her thoughts through drawing. Even though she gave herself a high score for drawing ability in comparison to other participants, not only was she not satisfied with her drawings, but also her drawings were not useful for communicating with her partner.</p> <p>Given these are her general feelings about drawing, she said that holding and flipping through the books helps her to remember the experience better than drawing it. This is to do with remembering a touch. Touch is another kind of stimuli that affects memory.</p> <p>She also mentioned sending the drawings of her food to her partner. She points out that she disliked this activity because it made her hyper aware of what food she had eaten. She was ashamed at having eaten unhealthy food and having to share that with her partner. This may have seemed like an encroachment on her privacy.</p>
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Conceptual Visualisation – Participant #1	
 <p>The image shows two hand-drawn sketches. The left sketch features a red heart, a cloud, and the text 'Higher Love' written in a stylized font. The right sketch depicts a landscape with a yellow sun, a blue sky with birds, and a green field.</p>	<p>The topic of 'Conceptual Visualisation' relates to drawing something, someone, or an experience that can be barely remembered or had been forgotten. Alternatively, drawing an image of a song.</p>
Description	Annotation
<p>Participant #1 describes his experience as follows: <i>could draw very simple and childlike drawings very easily then can describe and explain a picture, a scene or an event. Drawing helped me to remember movies better. Drawing an image of a song helped me to remember its lyrics as I can associate and almost hear the song in my mind when I see the drawings.</i></p>	<p>Because of drawing the images of movie, he could remember movies better. Not only Participant #1 but many other participants mentioned the word 'associate'. Drawing the image of a song inscribed some kinds of images. Thus, he could almost hear the song in his mind. This drawing assignment is optional. Participant #6 did not do this task.</p>

Emotion and Social Relationship – Participant #1



Description	Annotation
<p>Participant #1 answered that 'designing emoticons were good and fun.' The first image was used to say good night to Participant #6. The second image was used to say good morning. He said, 'I think I have a good mental image of my partner. I would not be able to recognise the person from the images, but it is fun to send doodling and pictures.'</p>	<p>Participant #1's emoticon 'good night' depicts a crescent moon hanging in the sky with glittering stars at night. The buildings are grey. He imagined midnight, and based the emoticon on that. From the image, I can see he had less time to draw a morning greeting. Therefore, he drew a green tree that may represent something fresh in the morning. Like my interpretation, drawing is an indirect language that gives me an opportunity to think creatively how the images might relate to the words 'good morning'. The third and fourth images are doodles of the self-introduction. I will discuss this at the very end.</p>

Emotion and Social Relationship –Participant #6



Description	Annotation
Participant #6 did not mention 'emotion' or 'social relationships' regarding the experiment. Her responses show a negative mood in general.	These eight images were received from Participant #6. Even though Participant #6 passed on the images of their conversation, it can be observed that Participant #6 sent only 4 drawings while her partner sent 12 drawings to her.
Discussion	
As seen in the images, Participant #1 put more effort into communicating through drawing than Participant #6. As a result, Participant #1 had a more positive mood during their discussion. Participant #1 pointed out that he liked the food and activity pictures. On the other hand, Participant #6 did not enjoy the drawing activities.	

Table 31 Sample Data Analysis of Participant #1

As seen in Table 31, I wrote discussions under each category. These are my notes about the comparison between the pairs.

After comparing the participants, I wrote some reflections to identify the core 'headline' and a 'storyline' that concisely captures the issues, outcomes and implications of my data (Hennink *et al.*, 2010 p. 256). Here is an example of my reflections.

My reflections – Participant #1 and Participant #6
<p>Participants #1 and #6 are in the same age group. In all aspects, Participant #1 responded with positive views of the drawing assignments with regard to the topics of 'Daily Memory', 'Conceptual Visualisation', and 'Emotion and Social Relationship'. On the other hand, Participant #6 responded with negative views of the drawing assignments with regard to the topics of 'Daily Memory' and 'Emotion and Social Relationship'. She did not conduct the optional drawing tasks like 'Conceptual Visualisation'.</p> <p>Participant #1 thinks that the drawing task has helped him to remember his daily activities like the scene of riding the bike to his workplace which was remembered two weeks after the event. He also thinks that drawing has had a positive effect with regard to the topic of 'Conceptual Visualisation', for example, remembering images from movies better. Drawing his favourite song was a useful assignment because the the song was described using images; therefore, he could almost hear the song in his mind.</p> <p>However, Participant #6 did not enjoy doodling her daily life, especially her food. Moreover, she thinks drawing her day was not helpful for memory. That is because she disliked her drawings which were sent to her partner even though she has above average confidence about her drawing ability. The drawing assignment she disliked most was drawing her food because drawing made her too aware of what unhealthy food she had eaten, and also looked like real food. In contrast to her opinions, many other participants mentioned that they could change their lifestyle for the better through awareness of eating unhealthy food.</p> <p>I think her negative opinions about most of the drawing tasks may relate to her having the lowest</p>

score for digital preference, which was explored in the quantitative analysis. She also mentioned that she preferred holding and flipping through the books to remember her day rather than drawing those scenes.

Participant #1 put more effort into drawing his emoticons. To design 'good night', he drew a crescent moon hanging in the sky with glittering stars at night, with buildings in grey. He may have imagined midnight and turned this into the emoticon. Designing the emoticon may convey the creator's mind to the receiver, but the creator may also have a positive feeling while visualising it.

Regarding the topic 'Emotion and Social Relationship', Participant #1 answered that designing emoticons were good and fun; Participant #6 did not mention this. But I can observe in their conversations that Participant #6 did not respond often to Participant #1's drawings. I think a high level of participation yields better results.

Table 32 My Reflections on Case One

At the end, I brought together all earlier components of the analysis to draw a conclusion for each pair. As I explained in section 5.5., the participants are paired depending on their level of smart mobile addiction. I then used my investigation of the participants who appear to be inherently suffering from digital anxiety to draw my overarching conclusions.

6.3.3. Qualitative Analysis of Sixteen Cases

In this section, I will give two cases as examples of my approach to qualitative analysis. I then draw from the remaining fourteen cases to further illustrate findings identified in the two exemplar cases. The full details of all cases can be consulted in Appendix 8: Qualitative Analysis of Sixteen Cases. I will then discuss these findings in section 6.4.

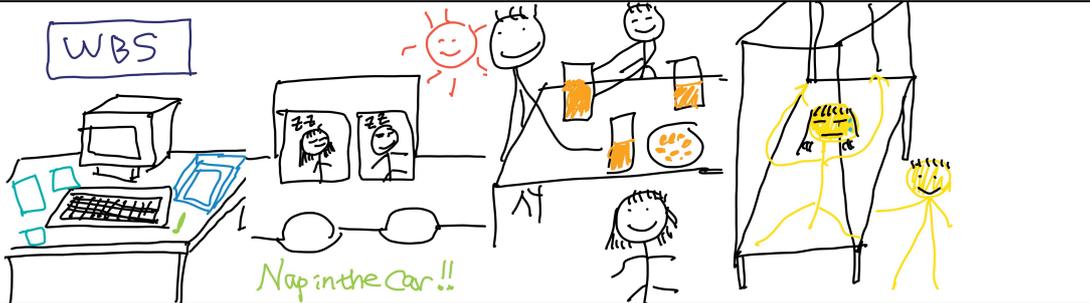
This pair is of particular importance in my research because they are the only case in which both participants were identified as having digital anxiety. Both were females and they scored highly for physical symptoms. Participant #21 got a high STAI score of 109 (scores are 'high' when over 100).

6.3.3.1 Case One

Participant #8 is paired with Participant #21

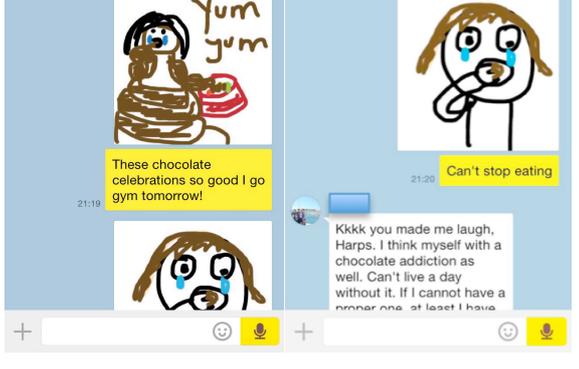
<p>Average of 30 Participants # 8 Participant</p> <p>STAI (Score=160) SMAT (Score=156) DRAWING (Scale=5)</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 8	81	95	3.33
	Convert into %	50.63	60.90	66.6
<p>Average of 30 Participants # 21 Participant</p> <p>STAI (Score=160) SMAT (Score=156) DRAWING (Scale=5)</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 21	109	72	3
	Convert into %	68.13	46.15	60
<p>Participant #8 is a 29-year-old female. She belongs to the high SMAT group. Her partner Participant #21 is a 26-year-old female. She also belongs to the high SMAT group. Both of them have the highest possible score for physical symptoms. Participant #21 got a high STAI score of 109, which is well over 100. I began the drawing analysis with this pair because both have identified as smart mobile users who have digital anxiety. Participant #21 is less confident of her drawing ability, as seen in the graph. She remarked several times in the questionnaire that she is not good at drawing. I could identify this lack of confidence in her drawing ability in the conversations between this pair.</p>				
Day Memory – Participant #8				
<p>The sketches show a person with large eyes and tears, a bowl of food with a spoon, a hand with pink nails, and a sun with rays over wavy blue water with a stick figure.</p>				

Description	Annotation
<p>Participant #8 described the effect of drawing on her memory as follows:</p> <p>'The images definitely help me remember the food I ate as well as what food my partner had. I remember events based on faces and images – I recall dumplings and soup and laughing over drawings of Indian food and the drawings about crying about putting on too much weight but still eating chocolate whilst crying about weight!</p> <p>'Drawing helped me to remember, as in order to draw a memory I had to think of the event and solidify the memory in my head. So rather than just remembering the event, I remembered it through the memory of drawing it.'</p>	<p>Drawing images of food helped inscribed it into her memory. It is interesting that she remembers not only what she ate but also what her partner ate. Their drawings contain a story, as she said. She was laughing about her drawings of Indian food and about her drawings of her awareness of diet. These became a form of memory.</p> <p>The first drawing above is the image in which she tried to express a desire to stop eating chocolate in order to lose weight, and her inability to do so.</p> <p>Drawing an interesting event made her remember her thoughts of the event rather than the event itself. This is because a drawing is a representation of a drawer's memory. The drawer's eyes capture information, and then the information is recreated depending the drawer's viewpoint and thinking. Participant #7 explained this in terms of 'thinking of the event' and 'solidifying the memory'.</p>

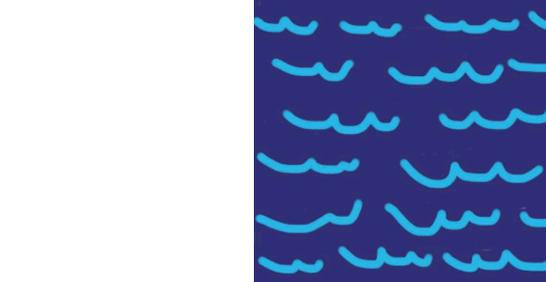
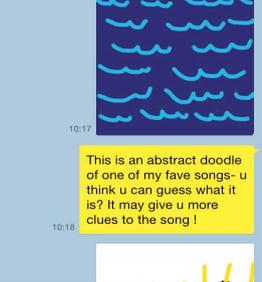
Day Memory – Participant #21	
	
Description	Annotation
<p>Participant #21 describes the way drawing affects her memory as follows:</p> <p>'I could obviously recall the food I ate during the experiment because of the drawings. I could put more effort into thinking and remember to draw.</p> <p>The drawing was very helpful. I would forget meaningless everyday happenings and life events. But drawing made me practice to recall what I had done that day to draw and send it to my partner. It was fun and meaningful, so it stayed in my memory.'</p>	<p>Participant #21 clearly recalled what she had eaten, as a result of her drawings. She explains that she remembered her food because thinking about it is a step toward drawing.</p> <p>Her phrase, 'meaningless everyday happenings', is interesting. Drawing inspired her to find more meaning in her ordinary daily life. The drawing task was fun and meaningful and made her recall how her day had passed. I think that sharing her drawings with her partner encouraged her to draw more.</p>
Discussion	

 <p>Today i had a soft tofu jigae as dinner. I don't know how to explain jigae in English, but anyway it is Korean food and something like stew hehe</p> <p>22:37</p>	<p>Participant #21 explains the food she drew after sending it to Participant #8. Participant #21 thought that her partner may not understand what she had drawn.</p>	 <p>After two weeks of family trip, I finally went back to my office. Can you see what I do? I am a PhD student in business management, and I am at</p> <p>17:41</p>	<p>This image is one scene from Participant #21's day. I found that Participant #21 liked to make Participant #8 guess what she had drawn.</p>
<p>Haha I thought you hurt your hand... hehe</p> <p>19:40</p>  <p>I am on my way back home from heathrow airport. My</p>	<p>In the beginning, Participant #21 used text in her images to help her partner interpret what she had drawn. However, this changed later on, when she stopped including text in her drawings.</p>	<p>hehe. If you haven't tried pilates, i really really recommend it to you!</p>  <p>23:00</p>	<p>Participant #21 drew a flower she found on her evening walk. She wanted to show her partner how much she loved that flower.</p> <p>This action is like a little greeting.</p>
 <p>Had brunch at toms kitchen</p> <p>18:35</p> <p>Went to hairdresser!</p> <p>15:57</p> <p>Now going for a massage!!</p> <p>The last drawing was terrible as I'm running late!</p> <p>15:59</p> <p>Friday, 1 May 2015</p>			<p>Participant #8 recorded what she had done that day in chronological order. She had a drink at the pub, had brunch, went to the hairdresser, and said, "now going for a massage". She apologized that her final drawing was terrible because she was in a rush. Her partner then immediately drew what she had done.</p>
 <p>And there was a WBS PHD party tonight. (It doesnt sound interesting I know kk)</p> <p>22:39</p>	<p>This image explains how to play beer pong. The arrows indicate the direction.</p>	<p>Oh i didn't know about that benefit! I will definitely try it later 😊</p>  <p>Guess what I saw yesterday (it is over 12am)</p> <p>00:42</p>	<p>This is another image that Participant #21 asks her partner to guess.</p>

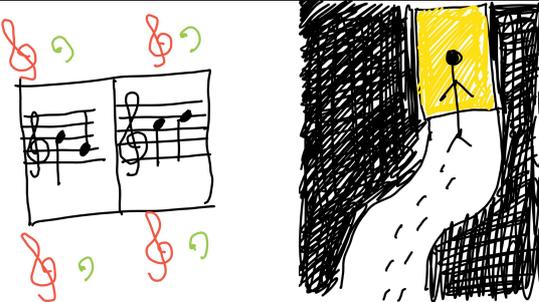
	<p>This image is an example of what Participant #8 called 'meaningless everyday happenings'. She said that drawing drawing made a mundane day memorable.</p>		<p>This image explains what Participant #8 thinks of the taste of her food. Participant #8 not only drew the image of the food, but also drew her reaction to the taste.</p>
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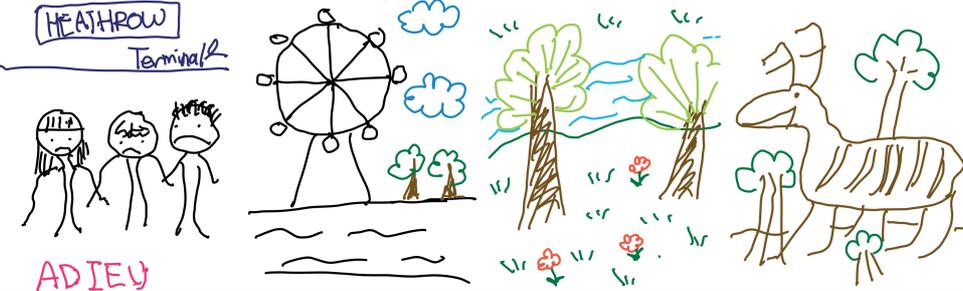
	<p>These two images show the conversation which Participant #8 said she could remember, in which she discussed eating chocolate.</p> <p>The drawings demonstrate that chocolate was make her gaining weight but she continues to eat it while crying.</p>
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Conceptual Visualisation – Participant #8

	
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Description	Annotation
<p>Participant #8 describes her conceptual visualisation as follows:</p> <p>'By dwelling on the emotional side of the word I couldn't remember it helped me link emotion and be able to remember the word easily.</p> <p>I have a talent for remembering song lyrics very well as the tune plays in my head first and then the lyrics slot into the music. Drawing the image of the song – I was singing the song in my head with lyrics the entire time I was drawing so it made the lyrics more solid in my memory.'</p> <p>She also describes how she could solidify the unclear image to draw through conducting the drawing tasks as follows:</p> <p>'Drawing does help as I identify the main features – in this case my own features for the self portrait such as hair and skin colour.</p>	<p>She had difficulties illustrating the unclear images. I gave her the task of drawing the word she could not remember or the person she had forgotten.</p> <p>She has a talent for remembering song lyrics. She sang a song in order to draw and it made the storyline of the song solidify in her memory.</p> <p>Drawing was helpful to identify the main features. She used the example of how she illustrated her self-portrait. She used her hair colour and skin colour to make herself recognisable.</p> <p>Her memory was strengthened by looking deeper into her memory to create an image of a word she was unsure of. She examined her emotions surrounding that word in order to illustrate it.</p>

<p>Highlighting these features would solidify a person's existence in my memory with the word I forgot, by drawing it helped me look deeper in my memory to figure out the word based on emotions I had related to the forgotten word and eventually I remembered the forgotten word.'</p>	
<p>Conceptual Visualisation – Participant #21</p>	
	
<p>Description</p>	<p>Annotation</p>
<p>Participant #21 describes her experience of conceptual visualisation as follows:</p> <p>'Still I cannot match someone's face and his/her name. There was no experience I could remember better.</p> <p>It happens very often to me. At least, doodling was helpful as it had a visual impact on my memory so I would not forget the word I had doodled.</p> <p>I liked doodling songs.'</p>	<p>She did not find that drawing helped her recall a forgotten person. She has difficulty matching people's faces and names.</p> <p>However, with regard to remembering a word, she often had trouble remembering English words because it is not her native language. The interesting point is that she found doodling helped prevent her from forgetting the word again.</p>

Design Number – Participant #8	
Description	Annotation
<p>As previously explained, the task involving designing a number was completed by only few participants. Participant #8 responded that ‘this drawing task has not helped remembering the numbers.’ However, she suggests that she would be better able to remember numbers if they were in picture form.</p> <p>She also discussed a feature of modern mobile devices:</p> <p>‘I memorised numbers when I was younger and you’d see the person’s phone number when sliding on the mobile. The new operating systems on phones now mean you never see the numbers, only the names of people.’</p>	<p>As Participant #8 mentions, smart mobile users do not have many chances to see someone’s mobile number, only the name of the person. This is a quite important point that the researcher should consider more.</p>
Spatial Memory – Participant #21	
	
Description	Annotation
<p>Participant #21 describes spatial memory as follows: ‘I had difficulty reading a paper map. I am not usually good at finding directions, and am especially very bad at reading paper maps. This task helped me to capture specific places I had been to.’</p>	<p>Participant #21 also is a person with poor spatial awareness. She simply describes how the drawing assignment helped her to remember specific places she had been.</p>
Emotion and Social Relationship – Participant #8	
	
Description	Annotation
<p>Participant #8 describes her response to the emoticon design task as follows: ‘we had a good laugh over the emoticons and helped us bond better as we both shared in the joke. However</p>	<p>Participant #8 explains how she and her partner interacted by drawing emoticons. They had fun creating their own emoticons. The emoticon helped them to develop a social relationship by</p>

having an on screen emoticon keyboard the emoticons were used much more frequently due to their speed and convenience.'	sharing jokes. However, the screen emoticon keyboard was used more often because of its speed and convenience.
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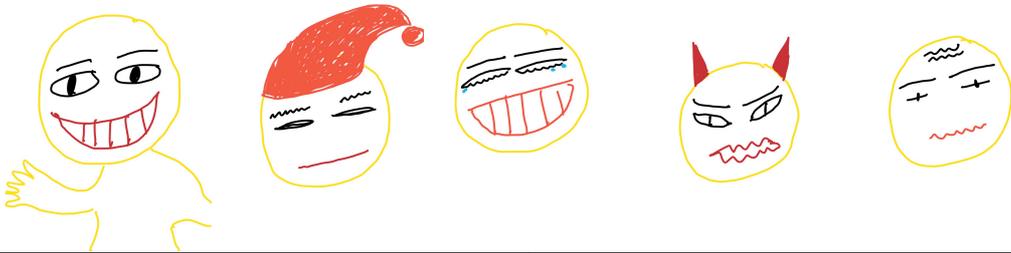
Emotion and Social Relationship – Participant #21	
	
Description	Annotation
Participant #21 describes how she responded to the emoticon design talk as follows: 'we liked each other's emoticons. I have never seen my partner but I could imagine she might look like her emoticons (expressions of anger, sadness, and other facial expression). That helps me to build up a closer relationship with my partner. I could guess her character through looking at her emoticon drawings.'	Participant #21 describes how her partner's emoticons helped her to imagine what she looked like, which made her feel closer to her.

Table 33 data analysis of the case one

This pair was one of most actively engaged, and participated fully in the drawing experiment. With this in mind, it is possible that people who have digital anxiety will have a considerable interest in digital drawing if they are used as a supportive communication tool for their conversations on mobile devices.

6.3.3.1.1 Daily Memory

The drawing assignment on the topic of 'daily memory' involved drawing an aspect of one's day. I expected from that this drawing task would consolidate the participants' memory, with the effect possibly maximized if the participants actively take part in the practice. For example, Participant #8 explained that drawing helped her to remember the food she ate as well as what food her partner had eaten. This happened even though her drawings – of Indian food, for example, or of her eating chocolate and crying because she is worried about getting fat – often made her laugh. Examples such as these led me to conclude that drawings often represent an episode, and remembering that episode may allow users to recall the sequence of events, why it was important, and how it was drawn. This is one way in which daily digital drawing practice can enhance memory. 'Laughing' is another interesting point that

can be discussed. Philosophers and scientists have puzzled for centuries over how the brain and mind are related; thus a new field, called cognitive neuroscience, explores a more comprehensive synthesis of the mind and brain (Posner and Raichle, 1994). This will be discussed through analysing more cases.

Here are the images of Participant #8 eating chocolate:



Figure 19 The Images of Eating the Chocolate

She made a point about ‘memory’: “drawing helped me to remember, as in order to draw a memory I had to think of the event and solidify the memory in my head. So rather than just remembering the event, I remembered it through the memory of drawing it.”

First, she explains how certain images are firmed up in her memory. She imagined the event and solidifies it into an image. She comments that this process did not simply involve remembering the event, it also involved remembering how she drew it.

Her partner, Participant #21, also gave a similar answer on the memory topic. She used the word ‘obviously’ to answer the task of remembering a meal that was a daily task. It is said that the drawing task helped her to make the memory clear. She also said that she would attempt to recall the image several times in order to memorise it through the digital drawing task. She also says that things in her everyday life that would otherwise pass by meaninglessly gain meaning through the drawing task. Drawing pushed her to practice recalling what she had done and sending the drawing to her partner was not only fun but also meaningful. Thus, it stayed in her memory. From this I can conclude that drawing can make some changes to ordinary daily occurrences. It is also worth mentioning that she felt positive having shared her

drawing with her partner. This suggests that a positive aspect of the drawing tasks is that they can be used for communication. As I discovered in the pilot studies, users want someone's attention and artistic creations can work better if there is a guarantee of an audience.

6.3.3.1.2 Spatial Memory

Participant #21 mentioned that she had poor spatial awareness. She simply says that the 'spatial memory' drawing task was useful in capturing specific places she had been.

6.3.3.1.3 Social Relationships

Regarding the topic of 'social relationships' Participant #8 said that drawing emoticons was helpful in developing their relationship, as it led to them having a good laugh over the emoticons. Sharing in the joke helped them bond better. This indicates that one positive aspect of drawing is that it supports building social relationships. However, she preferred using emoticons that existed in her device's keyboard because they were speedy and convenient. In my view, these two things – speed and convenience – can lead to symptoms of digital anxiety such as 'high usage', 'high addictive reactions, and 'high digital preference'. I think that sometimes users need to slow down their thinking and communication in order to enhance their digital wellbeing. Returning to the topic of 'social relationships', Participant #21 mentioned that she had never seen her partner but imagined what she looked like based on her emoticon drawings. This does not necessarily indicate that drawing helped them to develop a relationship, because they sent many texts as well as drawings, but she nevertheless imagined how her partner might look based on her emoticons. This indicates that the reflection of a person's images in drawing may help people feel closer.

This example is not an emoticon but one of Participant #21's drawings that shows how they developed their social interaction.



Figure 20 The example image of the drawing emoticon

Participant #21 drew this flower to convey how much she liked it, and to share with Participant #8 her plan to do some gardening. This action is like a little greeting. A further example of this can be seen in another partnership – Participant #24 used the word ‘greeting’ with regard to the topic of ‘social relationships’ (see Case Fourteen in Appendix 8). Participant #24 answered that exchanging greetings everyday through their digital drawings made her happy because she thought it was sweet.

6.3.3.1.4 Conceptual Visualisation

On the topic of ‘conceptual visualisation’, Participant #8 found that this task was helpful in reminding them of a general mood, but not exact images. Drawing an image of a song was helpful to solidify the visual concept in the participant’s memory. Participant #8 was aware that drawing made her to look deeper into her memory. Drawing formatted her fluid thinking which embodied her emotions. Participant #21 found that conceptual visualisation was helpful to keep the image in her memory. English is not Participant #21’s native language, and she had difficulty with a few words, which were repeatedly forgotten. Thus, she drew a word that was frequently forgotten. As a result, the drawing inscribed the word in her memory; therefore, she did not forget that word after drawing it.

I was interested in finding out whether decorating an alphabet or a number might have a positive affect on users’ ability to remember words or numbers. I read the literature on decorating alphabets or numbers in, for example, folk writing, some aspects of which I will summarise here. In modern art, the casual stroke invites a spectator’s prolonged attention (Thistlewood, 1994). Gray argues that folk writing has a pictorial impact. Furthermore, pictorial alphabets, with their unfamiliar structures, halt the reading somewhat and have a slower effect (Gray, 1982). So I gave the participants a

drawing task called ‘express numbers beautifully with drawings’. It was not a required task, but an optional one. Most of the participants did not carry out this task, or if they did, they did not use it when talking to a partner. A few participants, including Participant #8, tried it but mentioned that it did not help with her memory. She pointed out the reason why she was less likely to remember numbers while using her mobile device. She said she used to be able to memorise people’s mobile phone numbers before smartphones were invented. This is because people’s mobile numbers were seen on the screen when they made or received calls. But smartphones’ new operating systems do not show people’s mobile numbers. They only show the names of people who are calling.

6.3.3.2 Case Two

Case Two comprises Participant #12 and Participant #22. It has been chosen as a contrast to Case One. It is interesting as it comprises a pair where one had the lowest score on the SMAT while their partner had the highest score. Participant #12 is male and got the lowest score on the SMAT. He also ranked the lowest for usage, social anxiety, and addiction to social networking sites. Moreover, he got the lowest STAI score. This means that he does not use his smartphone much when compared with other participants. There is a close connection between social anxiety and addiction to SNS (see section 2.2.3). He also is identified as having less anxiety through the STAI test. Thus his drawings are an interesting example of how he behaves and thinks. I paired him with his opposite to investigate what impact their different characters would have on the drawing experiment. In case one, both participants showed signs of having digital anxiety. They were highly engaged with one another and actively participated in the experiment. To return to Case Two, Participant #22 (the experiment partner of participant #12) is the person who got the highest score in the SMAT. She also received the highest scores in high usage and addiction to SNS. She is therefore the exact opposite of Participant #12. She also received the highest score in the digital preference category.

Participant #12 is paired with Participant #22

<p>Average of 30 Participants # 12 Participant</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 12	53	42	3.33
	Convert into %	33.13	26.92	66.6
<p>Average of 30 Participants # 22 Participant</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 22	80	107	3.67
	Convert into %	50	68.59	73.4
<p>Participant #12 is a 20-year-old male. He not only belongs to the low SMAT group, but also he is the participant who got the lowest SMAT score. He ranked the lowest for high usage, social anxiety, and addiction to SNS. Moreover, he got the lowest STAI score.</p> <p>Participant #22 is a 36-year-old female. She not only belongs to the high SMAT group, but also she is the participant who got the highest SMAT score. She ranked the highest for high usage, digital preference, and addiction to SNS.</p>				

Day Memory – Participant #12



Auto save



Description	Annotation
<p>Participant #12 described how drawing may affect her memory: 'we talked about our favourite food but not what we ate each day. I got too busy with all of the deadlines.</p> <p>Usually the moments I drew from my day were fairly stressful, memorable, or beautiful moments that I would naturally remember. Things that I wanted to share with someone else.'</p>	<p>Participant #12 and Participant #22 began to introduce themselves by sharing their favourite foods, but not the food they ate on a daily basis.</p> <p>Participant #12 drew interesting moments from his day, moments he found stressful, memorable, or beautiful. He explains that he would naturally remember these moments, which is his reason for selecting them.</p> <p>I have observed that his drawings look like comic book illustrations. The second image indicates that he was on the computer when a file he was working on disappeared unexpectedly. The third image indicates that he realised the file had auto-saved so he did not lose his work after all.</p> <p>As Participant #12 explained, he draw moments that aroused strong emotions in him. I find that emotion and memory must be discussed together.</p>

Day Memory – Participant #22	
	
Description	Annotation
<p>Participant #22 described how drawing may affect her memory in the following way: 'drawing assignments may have helped me to remember what I ate. I don't normally remember what I ate for dinner.</p> <p>It narrowed my day down to one moment which wasn't as inclusive as the whole day.'</p>	<p>She simply responded that this task may have helped her to remember what she had eaten.</p> <p>I would like to focus on the word 'narrowed'. I think this word is similar to the term 'selection', used in this experiment. However, the participant may also be concerned about the importance of expressing her entire day.</p>
Conceptual Visualisation – Participant #12	
Description	Annotation
<p>Participant #12 described the conceptual visualisation task as follows:</p> <p>'I think it's impossible to draw an image of something you've forgotten because if you have forgotten something then you can't recall it to draw it. If something that you've drawn sparks a memory then I guess it's an incidental abstraction of that memory though...hmm yeah I guess you could. Anyhow I drew an old memory if that's close enough. Of when my headteacher from my secondary school/6th form called me up and we presented my drawing to everyone. I forgot the lighting. I can recall everything else about that evening apart from the light. Odd.</p>	<p>Participant #12 has a negative view of conceptual visualisation, suggesting that it is an impossible task. He thinks that something forgotten cannot be recalled and therefore cannot be drawn.</p> <p>However, he changed his mind while writing his answer, suggesting that it may be possible after all.</p> <p>He recalled a memory from his youth: a scene in which he was presenting his drawing to classmates. He remembered that he could not draw the lighting. That experience has stayed in his memory and the lighting which should be in the drawing but wasn't has become the visual metaphor element. Therefore, he could associate it with the day when he was presenting his drawing to people.</p>
Spatial Memory – Participant #12	
Description	Annotation
<p>Participant #12 described how drawing may affect her spatial memory in the following way: 'I excel in orienteering and my day to day life revolves around understanding space in 3D. So it hasn't helped me now but I remember when I went on school trips years ago and doodled in my seat. For this task now it didn't help me remember a place or route but when I was young it helped me remember a lot.'</p>	<p>The task, which was to draw where he had been, did not help this participant to retain memories of certain places. However, he remembered drawing when he was young. He also described a similar experience in his response to the 'conceptual visualisation' task. This is an interesting point that needs to be reviewed with the literature about how drawing affects short term and long term memory differently.</p>
Emotion and Social Relationship – Participant #12	

Description	Annotation
<p>Participant #12 described his response to the drawing emoticon task in the following way: 'I didn't really design emoticons, I instead drew an emotion or a comic with a story that had an emotion attached to it. So in this case I built a social relationship by talking about my situation and commenting on my doodle partner's situation.'</p> <p>Participant #22 simply responded to this task as follows: 'it seemed like we had a good relationship.'</p>	<p>As previously mentioned, Participant #12 drew in a comic book style rather than designing emoticons of facial expressions or physical characteristics. He thinks his comic-book drawings express his emotions, and that talking about their daily lives or commenting on their drawings helped to develop a relationship between the participants. It seems that he is saying that drawing stories help the participants to explore who they are; drawing contains emotions itself.</p> <p>Participant #22 simply said that he and his partner had a good relationship.</p>

Table 34 data analysis of case two

6.3.3.2.1 Daily Memory

This pair made some changes to the drawing assignment. In response to the 'daily memory' task, they shared their favourite foods. Participant #12 did not conduct the daily task of drawing food, but Participant #22 did. She described that experience as follows: "drawing assignments may have helped me to remember what I ate. I don't normally remember what I ate for dinner." She did not elaborate on the process of remembering. However, based on her answers from the questionnaire, I conclude that the digital drawing exercises did help to enhance her memory. When Participant #12 described the task of drawing an interesting moment in his day, he said he was able to remember without difficulty because the moments that he drew were fairly stressful, memorable, or beautiful. He put his ability to remember more down to the events he selected rather than the process of drawing it.

They also made some changes to other tasks. I gave them the task of drawing an interesting moment from their day, but Participant #22 responded as follows: "it narrowed my day down to one moment which wasn't as inclusive as the whole day." The drawing task I gave to the participants was to remember the interesting events

and moments that occurred during their day. She seems to have taken this as a request to draw an entire day's events in a single scene. Her attempt to pack the day into one scene is worth mentioning because only she conducted the drawing assignment in that way. Participant #12 drew an emotion or a comic with a story that had an emotion attached to it rather than drawing emoticons. This is another example of the ways this pair changed the drawing assignments. However, Participant #12 explained that he built a social relationship by talking about his situation and commenting on his doodle partner's situation. Here we can identify the importance of 'commenting', which was touched on in the pilot study. His partner simply answered that it seemed like they had a good relationship.

6.3.3.2.2 Conceptual Visualisation

Regarding conceptual visualisation, Participant #12 changed his mind from an impossible event to a possible action. Firstly, he suggested that drawing an image of something he has forgotten would be impossible because you cannot recall something if it has been forgotten; but then, he mentioned that drawing can spark a memory. He explained a case that is close to conceptual visualisation. He drew an old memory from his time at secondary school. He remembered the experience of presenting his drawing to classmates. He explained another example from an old memory. He remembers when he went on school trips years ago and doodled on his seat. He explained that remembering these drawing experiences from when he was young is helpful but that the drawing experiment did not have much effect on his memory.

The participants in Case Two did not engage as much as the participants in Case One. Although they made a slight modification to the digital drawing task, they did not deviate so much that they are not useful in studying the relationship between drawing and memory enhancement or the influence of drawing on emotions. Participant #12, was able to revive childhood memories through drawings. This is an example of long-term memory enhancement that is not relevant to my research but is nevertheless an interesting discovery. The reason he wrote his childhood memories is probably because he is less interested in using smartphones than any other participant. The quantitative tests revealed that he was the participant who used smartphones and social networking sites the least. He is not accustomed to rapid information

acquisition and the fast consumption culture of smartphones. I suggest that this is why he was inspired to draw images from old memories or accumulated over a long period of time.

To summarise the themes and findings presented in the above two cases, I decided on the following themes: daily memory, spatial memory, social relationships, and conceptual visualisation. The results from Case One are particularly positive, as they suggest that the digital drawing experiment helped the participants to improve their memory and establish a friendship, and allowed them to carry out conceptual visualisation. In the materials for Case One, the word 'laugh' appears several times. I would infer from this that emotion and memory are mutually influential (Posner and Raichel, 1994). The participants believe that their drawing dialogue helped them develop a friendship. For example, the self-portraits show what kind of character each participant has, and what they look like. This helped them feel emotionally close to one another. On the contrary, Case Two is unique among these experiment pairs. Rather than carrying out the tasks given to them, they transformed them in certain ways. Only this pair made changes to the tasks. It is noteworthy that Participant #12 found drawing useful for recalling childhood memories. This experiment encouraged participants to briefly draw from memory something that happened that day. In a future study it will be useful to conduct a drawing experiment related to long-term memory instead.

The description and annotation of the tables for the remaining cases can be found in Appendix 8: Qualitative Analysis of Sixteen Cases.

6.3.3.3 Development of Insights from the Exemplar Cases

This section describes and analyses the results of the digital drawing experiments. The table below describes how the participants were matched. Table 35 summarises the characteristics of each participant, including gender, age, SMAT result, STAI scores, and whether or not they exhibit digital anxiety. I include it in order to avoid repeatedly describing each participant's information in my analysis.

After the table, the experiment results are divided into themes. These are: Engagement, Daily Memory, Spatial Memory, Social Relationships, Conceptual Visualisation, and Technical Aspects. Discussion of the experiment can be found in section 6.4.

Case #	Experimental Couple Characteristics
1	(Digital Anxiety + Digital Anxiety)
Participants 8 & 21	Participant #8 is a 29-year-old female. She belongs to the high SMAT group. Her partner Participant #21 is a 26-year-old female. She also belongs to the high SMAT group. Both of them have the highest possible score for physical symptoms. Participant #21 got a high STAI score of 109, which is well over 100. I began the drawing analysis with this pair because both have been identified as smart mobile users who have digital anxiety. Participant #21 is less confident of her drawing ability. She remarked several times in the questionnaire that she is not good at drawing. I could identify this lack of confidence in her drawing ability in the conversations between this pair.
2	(Digital Anxiety + Lowest SMAT Score)
Participants 12 & 22	Participant #12 is a 20-year-old male. He not only belongs to the low SMAT group, but he is also the participant who got the lowest SMAT score. He ranked the lowest for high usage, social anxiety, and addiction to SNS. Moreover, he got the lowest STAI score. Participant #22 is a 36-year-old female. She not only belongs to the high SMAT group, but also she is the participant who got the highest SMAT score. She ranked the highest for high usage, digital preference, and addiction to SNS.
3	(Digital Anxiety + High SMAT Group)
Participants 9 & 16	Participant #9 is a 40-year-old male. He belongs to the high SMAT group. His partner #16 is a 32-year-old female. She also belongs to the high SMAT group. Participant #16 was identified as having digital anxiety through the quantitative analysis.
4	(Digital Anxiety + Low SMAT Group)
Participants 3 & 28	Participant #3 is a 24-year-old male. He belongs to the low SMAT group. His partner Participant #28 is a 22-year-old female. She also belongs to the low SMAT group. Participant #3 got the lowest scores for social anxiety and addiction to SNS. On the other hand, Participant #28 got the highest scores for physical symptoms. Also, Participant #28 is one of the participants (in total 9 participants) who have digital anxiety as identified by the quantitative analysis. Participant #3 got lower than average STAI and SMAT results; however, he has higher confidence in his drawing ability. Participant #28 shows a slightly higher SMAT result and also has a little more confidence when drawing.
5	(Digital Anxiety + Low SMAT Group)
Participants 7 & 14	Participant #7 is a 24-year-old female. She belongs to the high SMAT group. Her partner Participant #14 is a 27-year-old female. She belongs to the low SMAT group. Participant #7 is one of the participants (in total, 9 participants) who have digital anxiety as identified in the quantitative analysis.
6	(Digital Anxiety + Low SMAT Group)
Participants 11 & 19	Participant #11 is a 24-year-old female. She belongs to the low SMAT group. Her partner #19 is a 33-year-old male. He got the highest scores for addictive reaction, social anxiety, and addiction to SNS, and also has digital anxiety as identified in the quantitative analysis. Participant #11 got the lowest STAI score.
7	(Digital Anxiety + Low SMAT Group)
Participants	Participant #20 is a 31-year-old female. She belongs to the low SMAT group. Participant #30 is a 22-year-old female. She not only belongs to the high SMAT group,

20 & 30	but also she has been identified as having digital anxiety through the quantitative analysis. Participant #20 got a high STAI score of 120.
8	(Digital Anxiety)
Participants 23	Participant #23 is a 32-year-old female. She belongs to the high SMAT group, and has been identified as having digital anxiety through the quantitative analysis. She got the highest score for digital preference.
9	(High SMAT Group + Low SMAT Group)
Participant 1 & 6	Participant #1 is a 24-year-old male. He belongs to the high SMAT group. His partner #6 is a 22-year-old female. She belongs to the low SMAT group. Participant #6 got the lowest scores on three subscales. Those are 'addictive reaction', 'digital preference', and 'social anxiety'. But she got a high score (104) on the STAI when compared to other participants. Participant #1 has less confidence in his drawing ability compared to Participant #6, who has higher than average confidence in her drawing ability.
10	(Low SMAT Group + High SMAT Group)
Participants 2 & 27	Participant #2 is a 35-year-old female. She belongs to the low SMAT group. Her partner, Participant #27, is a 27-year-old male. He belongs to the high SMAT group. This pair does not have any distinct characteristics identified by the quantitative analysis.
11	(Low SMAT Group + Low SMAT Group)
Participants 4 & 13	Participant #4 is a 24-year-old male. He belongs to the low SMAT group. His partner #13 is a 30-year-old female. She also belongs to the low SMAT group. As seen in the graphs, Participant #4 tips over a score of 100 on the STAI. This participant got the highest STAI of all the other participants. However, he got the lowest score for digital preference. Participant #13 does not have any notable characteristics.
12	(Low SMAT Group + High SMAT Group)
Participants 5 & 18	Participant #5 is a 21-year-old female. She belongs to the low SMAT group. Her partner #18 is a 27-year-old female. She also belongs to the high SMAT group. Participant #5 got the lowest score for social anxiety. Participant #18 got the highest score for physical symptoms.
13	(High SMAT Group + High SMAT Group)
Participants 15 & 25	Participant #15 is a 34-year-old female. She belongs to the high SMAT group. Participant #25 is a 19-year-old male. He also belongs to the high SMAT group. Participant #25 got the lowest score for social anxiety.
14	(Low SMAT Group + Low SMAT Group)
Participants 17 & 24	Participant #17 is a 30-year-old male. He belongs to the low SMAT group. Participant #24 is a 29-year-old female. She also belongs to the low SMAT group. Participant #24 got the lowest score for physical symptoms.
15	(Low SMAT Group + Low SMAT Group)
Participants 26 & 29	Participant #26 is a 24-year-old female. She belongs to the low SMAT group. Participant #29 is a 26-year-old female. She also belongs to the low SMAT group. Participant #26 got the lowest score for social anxiety, but she ranked second top in the STAI test. Her score was 120.
16	(Low SMAT Group)
Participant 10	Participant #10 is a 23-year-old female. She belongs to the low SMAT group. However, she got the highest score for physical symptoms.

Table 35 Characteristics of the Experiment Pairs

From now on, I will identify participants with digital anxiety using the abbreviation 'DA', to indicate digital anxiety, in parentheses after the participant number. Cases One through Eight include participants who were identified as having digital anxiety.

However, in Cases Nine to Sixteen, no participants were identified as suffering from digital anxiety.

6.3.3.3.1 Engagement

Case One is one of the most actively engaged pairs in the main study, which showed through how they participated in the drawing experiment. From this I would suggest that people who have digital anxiety may have considerable interest in digital drawing if it is used as a supportive communication tool for their conversations on mobile devices. The participants from Case Two show less active participation in the experiment.

Case Three (Digital Anxiety + High SMAT Group) comprises a participant with digital anxiety and a participant who belongs to the high SMAT Group. I received limited data from Participant #9; nevertheless, I found that this pair actively participated in the drawing experiment by reviewing their drawings and conversations, which I received from his partner. Participant #9 had good drawing ability; his drawings not only look interesting but some of his works are fascinating.

Case Four (Digital Anxiety + Low SMAT Group) involves participants who are as tightly linked as in Case One, even though only one participant, Participant #28, was identified as having digital anxiety. For example, Participant #3 responded that he has strongly positive images of his partner; furthermore, he wanted to meet his partner. Participant #28 used the term 'we', not 'I'. Participant #3 got the lowest scores for social anxiety and addiction to SNS. I found some useful links between their scores and the digital drawing experiment. Both participants in this pair scored themselves highly for drawing ability. This suggests that they like to present their thoughts in visual form and have high confidence in their drawing ability.

Participant #3 had high confidence in his drawing ability, and expanded my drawing experiment with further steps to create a better-looking image. He drew an image of paradise on his smartphone when he was very stressed. He transferred his digital drawing to Photoshop to edit it and set it as the background image on his smart mobile device. These actions strongly embedded the image in his mind. It is worth noting that the participants expand the digital drawing tasks in an attempt to improve their

wellbeing. This includes the participants who made some changes to their lifestyle after becoming more aware of beneficial behaviours. For instance, Participant #28 found that drawing her food reminds her of whether she has eaten healthily or not, and encourages her to eat healthier food.

Case Five (Digital Anxiety + Low SMAT Group) conducted the drawing experiment even though Participant #14 was away traveling during the period of the experiment. Because of Participant #14's holiday schedule, this pair could not participate in the drawing experiment as actively as other participants.

Case Six (Digital Anxiety + Low SMAT Group), Participant #19 (DA) is the only male who has digital anxiety, out of 30 participants. He also got the highest scores on three subscales. These are 'addictive reaction', 'social anxiety', and 'addicted to Social Networking Sites' (see section 6.2.).

Participant #11 conducted the drawing experiment more actively than Participant #19 (DA). I did not receive enough drawings from Participant #19 (DA) to observe how he conducted the drawing experiment. However, I could observe the general mood with which this pair conducted the drawing experiment by looking at the data from Participant #11.

Case Seven (Digital Anxiety + Low SMAT Group), Participant #20 complained about difficulties in drawing, even though she identified her drawing ability as above average before conducting the drawing experiment. She had particular difficulty drawing her food. She also mentioned that she often skipped drawing her food if she had had it before. She also complained that she had a regular routine in life. Like Participant #20, her partner, Participant #30 (DA) drew only new events or things that she had newly acquired. Participant #30 (DA) also had a routine in her days; she therefore skipped drawing things if they had been drawn before. Therefore, there are not many mentions of the topic of 'Daily Memory'.

Case Eight (Digital Anxiety) comprises only Participant #23. Participant #23 and her partner completed the process of the drawing experiment. However, her partner's data

was not really useful because he responded to the tasks using only a single word or with a very simple phrase, saying things like ‘I don’t have problems’ or ‘no changes’; therefore, I removed his data from both the quantitative analysis and the qualitative analysis. However, this pair did complete the drawing experiment and Participant #23’s data remains valuable. She is a participant who identified as having digital anxiety and also got the highest score on the subscale ‘digital preference’ (see section 5.2.).

In Case Nine (High SMAT Group + Low SMAT Group), neither of the participants were identified as suffering from digital anxiety. Participants #1 and #6 had precisely opposite opinions. Even though Participant #1 had less confidence in her drawing ability than Participant #6 before participating in the experiment, Participant #1 was satisfied with his drawing assignments. I consider this is the result of two different circumstances. One is explained by the key word ‘child-like’, mentioned by Participant #1. This is a positive view of his unskillful drawing. The second is their different approaches to the drawing assignments. Participant #6 thought drawing was hard or too much of a challenge to deliver the information she wanted. However, Participant #1 approached the task more as a form of entertainment.

Case Ten (Low SMAT Group + High SMAT Group), despite neither of them having digital anxiety, were very active. They have faithfully carried out each digital drawing assignment and made progress in creating a drawing style together. Moreover, I found an interesting idea expressed in their digital anxiety questionnaire. For example, Participant #2 said that a ‘moment’ is difficult to draw because it contains a narrative – a cause and effect – rather than a single image. There were also other remarkable responses. I will discuss this further in later sections.

Case Eleven (Low SMAT Group + Low SMAT Group) comprises Participant #4 and Participant #13. Participant #4 is male and Participant #13 is female. Participant #4 had a positive view of the drawing experiment even though he belongs to the low SMAT group. The point was that Participant #4 got the lowest digital preference score and the highest STAI score. This indicates that participant #4 might have experienced

some anxiety when he began the drawing experiment. I received simple comments from Participant #13.

Case Twelve (Low SMAT Group + High SMAT Group) comprises Participant #5 and Participant #18. This pair conducted the drawing experiment with enthusiasm. Their drawings are playful and child-like; for example, a smiling man gives a thumb up to his food. There is a dialogic aspect to their drawings.

In Case Thirteen (High SMAT Group + High SMAT Group) there was nothing distinctive to remark on.

Case Fourteen (Low SMAT Group + Low SMAT Group) comprises Participant #17 and Participant #24. Both belong to the low SMAT group (see section 5.2.). Participant #24 got the lowest score for physical symptoms. This pair needs attention. They actively conducted the drawing experiment even though both are in the low SMAT group. What is distinctive about their drawing is that they drew an emoticon or a character onto photos.



Figure 21 Example images of how they drew on photos

In Case Fifteen (Low SMAT Group + Low SMAT Group) there was nothing distinctive to remark on.

Case Sixteen comprises Participant #10. Participant #10 is female and she belongs to the low SMAT group (see section 6.2.). Participant #10 and her partner completed the whole drawing experiment. However, her partner did not submit his drawings nor the digital anxiety questionnaire. In this case, therefore, I will only analyse Participant #10's data.

6.3.3.2 Daily Memory

The drawing assignment called ‘daily memory’ involved daily drawing practice. I expected that drawing practice would enhance the participants’ memories and the effect might be maximized if the participants actively conducted the practice.

Regarding the topic of ‘daily memory’ Participant #8 (DA) explained that drawing helped her to remember the food she ate as well as what food her partner had. This was the case even though her drawing of Indian food made her laugh, and even when she drew how she was feeling at that precise moment, for example, drawing an image of herself eating chocolate and crying because she was worried about getting fat.

I found that the drawings often represent an episode, and that remembering often involves not just the sequence of events, but also why it was important, and how it was drawn. This is one a positive way in which daily digital drawing practice can enhance memory. ‘Laughing’ is another interesting point that can be discussed.

As in my discussion of the synthesis of the mind and brain (Posner and Raichle, 1994) in the previous section, it is interesting that the concept of ‘laughing’ appeared several times in Participant #8’s answer. This leads me to the idea that memory is connected to emotion. Drawing brings back memories as well as the emotions associated with them.

Here are the images of her eating chocolate:



Figure 22 The Images of Eating the Chocolate

She said the following regarding ‘memory’: “drawing helped me to remember, as in order to draw a memory I had to think of the event and solidify the memory in my

head. So rather than just remembering the event, I remembered it through the memory of drawing it.”

First, she explains how certain images are firmed up in her memory. She imagined the event and solidifies it into an image. She comments that this process did not simply involve remembering the event, it also involved remembering how she drew it.

Her partner, participant #21 (DA), also gave a similar answer on the memory topic. She used the word ‘obviously’ to answer the task of remembering a meal that was a daily task. It is said that the drawing task helped her to make the memory clear. She also said that she would attempt to recall the image several times in order to memorise it through the digital drawing task. She also says that things in her everyday life that would otherwise pass by meaninglessly gain meaning through the drawing task. Drawing pushed her to practice recalling what she had done and sending the drawing to her partner was not only fun but also meaningful. Thus, it stayed in her memory. From this I can conclude that drawing can make some changes to ordinary daily occurrences. It is also worth mentioning that she felt positive having shared her drawing with her partner. This suggests that a positive aspect of the drawing tasks is that they can be used for communication. As I discovered in the pilot studies, users want someone’s attention and artistic creations can work better if there is a guarantee of an audience.

Case Two (Digital Anxiety + Lowest SMAT Score) is the pair that made some changes to the ‘daily memory’ drawing assignment. One participant drew his favourite foods instead of drawing what he could remember of what he had eaten that day. Participant #22 (DA) performed the given digital drawing task as it was, and she explained her experience of the experiment as follows: “the drawing assignments may have helped me to remember what I ate. I don’t normally remember what I ate for dinner.” She did not explain how the drawing task helped to enhance her memory, but she concluded that it was helpful. Participant #12 remarked that, regarding the task of drawing an event or interesting moment from his day, he was able to remember them anyway as these moments were either stressful, memorable, or beautiful. He

explained that the process of remembering and choosing specific scenes to draw helped to enhance his memory, but the act of drawing did not.

This pair also made a change to another drawing task. The task was to draw the most interesting or impressive moments in their day. Participant #22 (DA) complained that the drawing task seemed to compress her day into one image. She said, “It narrowed my day down to one moment which wasn’t as inclusive as the whole day.” I did not expressly ask her to compress her day into one image, but she interpreted it that way. Examples such as these can only be found in this experimental pair, and it is doubtful whether they were intimately engaged in this experiment.

Participant #16 (DA) explained that she found some aspects of the drawing practice helpful in relieving her anxiety. She described how some drawing assignments had a positive effect on her memory. One interesting point that arises from her data is that some drawing tasks made her focus on her lifestyle. Becoming more aware of problems in her lifestyle motivated her to change it.

On the topic of ‘daily memory’, participant #16 (DA) said that she usually does not remember what she ate, but doodling changed this in two ways. The first change is that it forced her to think about the food she was eating. This suggests that daily practice may be useful for enhancing memory; however, not only drawing, but many other types of practice can affect memory if it happens on a daily basis. The second change is that doodling forced her to take time to eat. The daily assignment of drawing her food was helpful in making her aware that she had missed a meal while working. She also realised that there is a set routine to her day, because she found herself drawing the same events every day. This motivated her to find some new activities.

This paragraph deals with how digital drawing helped relieve her anxiety. Her anxiety was not caused by a smart mobile device. She was under pressure to prepare for her PhD upgrade. She found two ways in which digital drawing could alleviate her negative moods. She drew things that happened during her day, and things she did to get rid of stress, such as going for a walk, having a glass of wine, and enjoying a run

in the rain. These drawings helped put her in a positive mood. She also returned to her drawings to remind herself how she felt while doing the activities in the drawings. Seeing drawings of the stress-relieving activities reminded her of those moments. Seeing the drawings refreshed her, and gave her a positive mindset. She concluded that doodling her daily life could be ‘a very therapeutic activity’.

This was one participant who actively made links between the drawings and her real life. The results of the tests indicated that she might have digital anxiety. This means that she may have a high digital preference. Regarding mobile handwriting, she responded that the experiment encouraged her to start pencil drawing again, perhaps once a week. Doodling reminded her of her first experiences with pencil drawing and that drawing nature can help her to relax. It is an important point that digital drawing made her aware that she had good memories of pencil drawing; moreover, it made her return to pencil drawing at least once a week. I would not say that this necessarily reduces her high digital preference, but the task has nevertheless supported her return to non-digital drawing.

Participant #28 (DA) used the term ‘clearly’ or ‘clear’ quite often. She said that drawing helped her to recall a place, atmosphere, events, or particular moments. She remembers some moments very clearly when she sees her drawings. She could also remember some situations before and after a particular moment through seeing her drawings. She suggested that drawing took a snapshot of a moment in the same way a photo does, but the effect on one’s memory is stronger than a photo’s. She explains that she had to recall every single detail of a moment otherwise she could not draw it properly. A number of participants felt positive when they saw their past drawings. Participant #28, for example, expresses strongly that seeing her drawings had a very positive effect on her when it was used as a communication tool for memory practice.

Participant #7 (DA) wrote that she drew the most impressive moments of her days. And her drawings became memories. Drawing the moment was quite an effective way to remember. Participant #14 mentioned that drawing was helpful in reminding her not only of the food she had eaten but also to remember what her partner ate. Their drawings look fun and vivid.



Figure 23 Example images of drawing food

Participant #11 mentioned that it allowed her to look back on her lifestyle. She described how it is important to remember a moment in order to visualise it on paper; therefore, this would help her to recall the moment. She is another participant who included simple text in her drawings. Participant #19 (DA) explained how he could draw a memory from his day in the following way: [1] he imagined the moment in order to decide what to draw, [2] he simplified the image into a quick drawing, [3] he evaluated whether it conveyed the meaning or not, and [4] he explained what he had drawn after sending it to his partner.

Participant #23 (DA) explained, using three key phrases, that the task had a positive effect on her memory. These phrases are ‘the exact image’, ‘detailing the image’, and ‘colouring the food’. The term ‘exact image’ describes an aspect of an observational drawing. The term ‘detail’ describes a process of solidifying her images. She highlighted that colouring the food was especially fun, and that it was directly printed in her mind. The importance of the use of colour often appears in the participants’ data. Recording her daily activities as drawings made her days more special, as though she was writing a ‘personal diary’, and had more impact than taking a photo would have done.



Figure 24 Example images of her drawings as a 'personal diary'

Participant #6 was the participant who reacted most negatively to this task. Participant #6 put less effort into presenting symbolic play, which is an interesting aspect of the participants' drawings. Both drawer and audience member can identify some hidden meanings in a drawing. She decided to use more text in her drawings in order to deliver the information she wanted. She was the only one who had a mostly negative view of the drawing assignments. I think the reason for that may relate to 'addictive reation' and 'digital preference'. She got the lowest scores for those factors.

Regarding daily memory, she remarked that drawing the experience of buying books did not help her recall the moment, since she felt like actually holding and flipping through the books was a better way for her to remember. This may be because she has little interest in digital use. Additionally, she responded that remembering what she had eaten was not a pleasant experience. This is because drawing the food, and especially telling someone else about it, made it feel more real. Moreover, drawing the food made her hyper-aware of how she was not making healthy choices with her body. Even though she disliked the drawing task because of becoming hyper-aware of having unhealthy food, it is useful to highlight this reaction.

Participant #1 had the opposite view to Participant #6. On the topic of 'Daily Memory', Participant #1 mentioned that the memory of one of his drawings lasted until he answered the questionnaire. He described his experience in the following way: "the moment was easy to remember by doodling it. I rode into work for the first time and the simple image of me on my bike brought back the memories instantly. I just checked it now, two weeks after it was composed." The use of a simple drawing was a useful way of communicating what he wanted to say. He used a simple line drawing accompanied by a few colours, letters, or words to clarify what he wanted to represent. But he wrote text under his drawing to explain what it showed, even though

it might be recognizable already. This may relate to his lack of confidence in his drawing ability.

Participant #2 describes her experiences and thoughts about the drawing experiment as follows: “whenever I had food, I often thought ‘how can I draw this food’ or ‘oh, I will draw this later on when I talk with my partner’.” It is clear from this that there is a thinking process involved in the tasks that may affect some aspects of memory. It is also clear that she had some concern about sending her drawings to her partner. Sharing has the value of motivating participants to take part, as I found in the pilot study. In the beginning, she did her best to describe the food as realistically as possible but later her drawings became more abstract and were intended only to deliver the bare facts. She also explained how she would imagine an event. An interesting event consists of a series of moments, stories, or cause-and-effects. So she had to sort out one specific moment among many images. In this way the image could represent an interesting event.

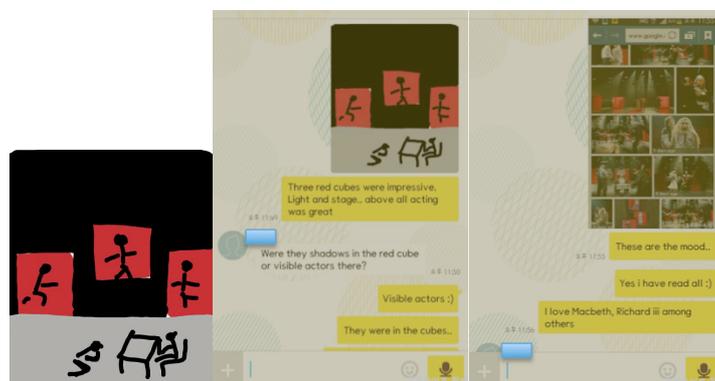


Figure 25 Moments consist of cause and effect

The above images are her story of a performance. She had to select a specific moment from the performance that she had watched in order to draw it.

Her drawing does not really represent the moment she had in mind, because it consisted of the whole performance. That is what she meant when she talked about a series of moments, stories, or cause-and-effects. Therefore, after she sent her drawing, she also sent some photos of the performance to give a better sense of the general mood, and some information about the performance.

Participant #2 and Participant #27 are one of the pairs who actively participated in the drawing experiment even though neither one was identified as having digital anxiety. Participant #2 discussed her in-depth thinking on how a moment can be shaped. Participant #2 put more focus on delivering the facts and information in drawings. It seems that Participant #27 generally enjoyed the drawing experiment.

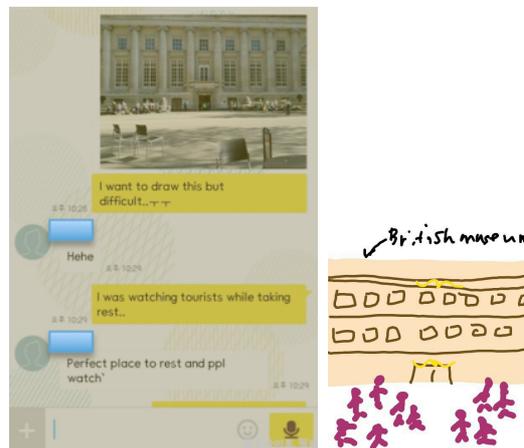


Figure 26 Participant #2 had difficulty drawing the British Museum

Participant #2 thinks that her drawing ability is below average; thus drawing assignments were a challenge for her. As seen in Participant #2 and her partner's conversation, she sent a photo of the British Museum to explain what she had wanted to represent in her drawing. She wanted to draw the scene of watching tourists while taking a rest. Therefore, she drew the figures of people in front of the British Museum building. As with these two images, many participants mentioned that their conversations had increased because of their explanations of their drawings. This is because she put emphasis on the dialogic function when conducting the drawing experiment. Therefore, she explained that texts were more dominant for her because she feels that using text is much easier than drawing, which was not actually comfortable. Here, I find that drawing is an inconvenience because it presents certain challenges to thinking and depicting. These challenges can be useful for smart mobile users who suffer digital anxiety. Participant #2 had some concerns about the possibility of miscommunication through drawing. I value digital drawing as a communication tool, but do not believe it can become the predominant method of communication on mobile devices.

It was interesting to observe how colour may improve memory. Participant #4 pointed out the importance of the use of colours in drawing to enhance recall. He described

himself as having a goldfish mind. He could not remember what food he drew, but ironically remembered his partner's drawings. That was because of the vivid colours in her drawing. Participant #4 used the term 'reinforced'. He thought that the drawing assignment had reinforced his memory. Moreover, he mentioned that he looked into his mind to think about what the most interesting moment in his day was, then the moment became a scene like an image. I have learned that selecting the scene is a useful step for recall.

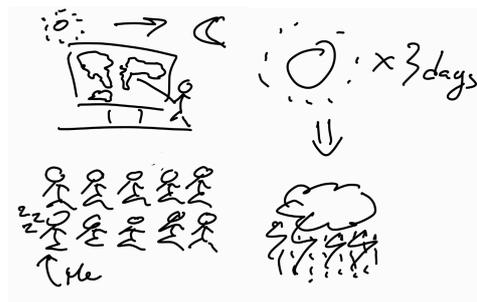


Figure 27 Examples of Participant #4's drawings - black lines



Figure 28 Examples of Participant #13's drawings - vivid colours

Participant #5 described the process of drawing as comprising the following steps: “it was nice to express some of the inner images not through words but through images. It was easier when I thought about it less and difficult when I tried purposely to think of an image describing something particular.” There are two points of view here. Drawing was easy if she approached it by thinking very little about accuracy in depiction, but was difficult if she put too much focus on detail. However, she found drawing was helpful to express certain ‘inner images’, in comparison with words.

Many participants, including Participant #5, enhanced their self-awareness through drawing aspects of their daily life. By drawing, her attention was drawn to her eating behavior; for example, she would often eat several little things instead of a proper main meal. The experience of drawing touched her: she described it as “really lovely seeing what stuck out to us and to remember that exact thing”. Her partner, Participant

#18, wrote that she always remembered what meals she had eaten because she had had to draw them; also, having the image fresh in her head did help her remember the food. Regarding another drawing task, that of drawing an interesting moment from her day, she drew the moment she wanted to share as soon as it had happened. Here she describes herself as being 'selective with the moments'.

Participant #15 did not find that drawing affected her memory even though she enjoyed it. On the other hand, Participant #25 explained that drawing positively affected his memory by allowing him to recall his food or his daily activities. He introduced himself as a person who often forgets daily activities. However, the drawing task made him practice remembering. He pointed out that he could remember the drawing conversation, which would not have been remembered if it had been text-based communication.

Participant #17 mentioned that drawing his food was the most enjoyable assignment. He described how the assignment helped him to improve his short-term memory; for example, he recalled what he had eaten in the morning and drew that to send to his partner. He used the interesting term 're-living'. He felt that he was re-living through drawing what he had done or eaten during the day.

Participant #24 described herself as a person who often forgets her daily activities even though they might have happened only yesterday. However, she found that drawing her daily life was useful to recollect what she had done. She also said that drawing made her pay more attention to and remember more details of what she had seen or experienced; for example, she could remember the eye colour of a cat that often appeared at her accommodation. She did not know this before conducting the drawing experiment. She could also remember the person who she had briefly met at the cinema, as a result of drawing her daily activities. She explained that she could remember his physical appearance even though her drawing did not include details of his appearance. Her drawing becomes a visual metaphor to explore how he looked.

Participant #26 said that she does not think that drawing was helpful for her memory even though she remembered drawing what she had to eat, and sending them to her

partner. However, she thought that drawing what she had done was helpful in improving her memory. I suspect that Participant #26 had more interest in drawing a scene in which something occurred, rather than simple images of objects.

It is worth noting with regard to this pair that they reflected their appearance in most of their drawings, including the emoticons they designed, which is rarely seen in the other participants' emoticons. Other participants generally drew only facial expressions using the eyebrows, eyes, or a mouth.



Figure 29 Examples of how they reflected their appearance in their drawings

However, on the topic of 'Daily Memory' again, Participant #29 pointed out that drawing not only improved her memory, but also changed her lifestyle in a positive way. This contrasts with her partner. She explained that there were three steps to change her lifestyle through drawing: she recalled the food she had eaten, explored what made her happy when she was eating, decreased the amount of food she was eating and increased the amount she was drinking. She became aware that drinking more fluids helps her to be healthy. Drawing became a way of motivating her to increase her fluid intake.

Participant #10 thought that drawing her food was the easiest assignment to conduct. Therefore, talking about what they ate was a frequent topic in their conversation. However, she thought that drawing her food did not have an effect on her memory. Doodling her daily activities was helpful to solidify her memory, though. It is clear to me that doodling a daily activity involves a sequence of stories. Thus, participants had to think of an event, how the event looks, and how to describe the event in images. These steps helped Participant #10 to solidify her memory.



Figure 30 Drawings of daily activities from Participant #10

6.3.3.3 Spatial Memory

Regarding the topic of ‘spatial memory’ Participant #21 (DA) mentioned that she had poor spatial awareness. She simply says that this drawing task was useful to capture specific places she had been.

On the topic of ‘spatial memory’, Participant #16 (DA) explains that drawing was useful to remind her not only where she had been but also where her partner had been. She could share in his memory of the place through his drawing. I think this indicates an area of drawing: imagination. She writes that drawing was also a great way to communicate where she was. She drew an image of Miami Beach where she was. In the image, she drew three different layers of blue sky, a sun in the top right corner, a deep blue sea, sandy beach, and a pink beach parasol. Describing the elements of her drawing in this way make it clear that an audience can imagine the same view by looking at the image.

Participant #11 explained that the drawing assignment was helpful in capturing the physical landscape, not the route. I think this indicates a different approach to conducting this task. Some people drew what they viewed, but some others drew how they got to the place.

Participant #18 was traveling during the experiment but engaged well with the drawing experiment. Thus, she had many memories of places where she had been on that trip. She explains her experience as follows: “having to draw where I was did help me remember a lot of places that I had seen when it came to drawing the task. I was traveling during the experiment so I would remember places so that I could draw

them for my partner.” There was another participant who was traveling during the experiment, but she responded very differently to Participant #18. Participant #14, in Case Five, was not really engaged with the drawing experiment while she away. It is interesting point to understand the difference between them, so I returned to check Participant #14’s quantitative analysis. It reminded me that she belongs to the low SMAT group, while Participant #18 belongs to the high SMAT group. It is understandable that the more frequent smart mobile user might have better results in the drawing experiment. The reason is that my drawing experiment is designed for smart mobile users, to investigate whether I can alleviate their digital anxiety while they are carrying or using their phones.

6.3.3.3.4 Social Relationships

Regarding the topic of ‘social relationships’ Participant #8 said that drawing emoticons was helpful in developing their relationship, as it led to them having a good laugh over the emoticons. Sharing in the joke helped them bond better. This indicates that one positive aspect of drawing is that it supports building social relationships. However, she preferred using emoticons that existed in her device’s keyboard because they were speedy and convenient. In my view, these two things – speed and convenience – can lead to symptoms of digital anxiety such as ‘high usage’, ‘high addictive reactions, and ‘high digital preference’. I think that sometimes users need to slow down their thinking and communication in order to enhance their digital wellbeing. Returning to topic of ‘social relationships’, Participant #21 (DA) mentioned that she had never seen her partner but imagined what she looked like based on her emoticon drawings. This does not necessarily indicate that drawing helped them to develop a relationship, because they sent many texts as well as drawings, but she nevertheless imagined how her partner might look based on her emoticons. This indicates that the reflection of a person’s images in drawing may help people feel closer.

This example is not an emoticon but one of Participant #21’s (DA) drawings that shows how they developed their social interaction.



Figure 31 The example image of the drawing emoticon

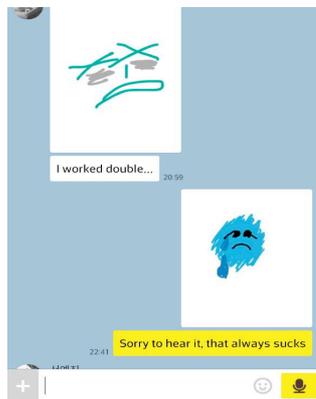
Participant #21 (DA) drew this flower to convey how much she liked it, and to share with participant #8 (DA) her plan of gardening. This action is like a little greeting. In another example of using the word ‘greeting’, Participant #24 (DA) answered that exchanging greetings everyday through their digital drawings made her happy because she thought it was sweet.

Again, as with other themes, Case Two made some changes to this task. Participant #12 said he focused on drawing cartoons instead of designing his emoticons. He mentioned that he was communicating to his partner what he was doing, what his emotional state was, and what was happening, through the cartoon drawings. What was important in the conversation was their comments and feedback to each other, which is the same as what I found in the pilot study. When asked about their social interaction, his partner responded simply that she had a good relationship with him.

Participant #16 mentioned that drawing emoticons was a ‘very welcoming’ or ‘ice breaking experience’. She thought drawing emoticons not only conveyed feelings but also reflected how they acted on those feelings. Therefore, she avoided drawing the emoticon that represented ‘anger’.

Case Four built a strong relationship. Participant #3 wrote about his feelings toward Participant #28 after completing the experiment in the following way: “I actually feel fairly close to my partner through the experiment and would like to meet her at some point. Perhaps part of it is being forced to talk throughout the day without it naturally occurring. I admired some of her sketches and ideas.” He got the lowest scores for social anxiety and addiction to SNS. This means that he may prefer to socialise with people offline instead of using SNS. His partner also used the term ‘we’ instead of ‘I’. She also thinks that drawing the emoticons helped them to communicate better, in

comparison to only using texts. This pair managed to build a friendship through the drawing experiment.



This image is the conversation between Participant #3 and Participant #28 (DA). Participant #28 (DA) is telling her about how tired she is due to her heavy workload. Her emoticon expresses well how tired she felt. Participant #3's emoticon follows up to show his sympathetic gesture with her.

Figure 32 Conversation between Participant #3 and Participant #28

Their drawings indicate shared sympathy. These emoticons work as what Participant #28 (DA) called 'seeing through drawing'. Sharing emotions is one of the reasons why Participant #3 wants to meet her partner.



Figure 33 Conversation between Participant #3 and Participant #28

Here is another image that indicates how they strengthened their social relationship. Participant #3 is throwing himself on the ground. The heavy burden of 'work' is pressing on his back. Participant #28 (DA) then sent a drawing of a cup of coffee, a caffeine drink called Red Bull, and a piece of chocolate cake. These caffeine and sweets are intended to give him energy. Her written text follows with the words "cheer up".

These conversations through drawings are positive, and contribute to creative thinking and interpretation.

Participant #28's (DA) drawings communicate indirectly what she wants to say. The coffee, the Red Bull, and chocolate cake are things that people have when they feel tired.



Participant #3 and Participant #28 (DA) support each other to develop their drawings. Participant #3 explains that he remade one image, which he had sent to her in the previous day, using Photoshop. He drew an image of cloud under the mountain. Participant #28 (DA) praised his work, and also suggested another type of cloud texture that she likes.

Figure 34 Conversation between Participant #3 and Participant #28

Participant #3 and Participant #28 (DA) is the ideal pair I was hoping for. They not only conducted the drawing assignments, but also actively expanded their drawing tasks.

The most interesting thing to mention about this pair is that Participant #3 remarked that he admired her drawings; moreover, he wants to meet her in person. This is because they actively engaged in the drawing experiment. Participant #3 is not usually a person who has social anxiety or who seeks social life over Social Networking Sites.

Participant #14 thought that they built up a good social relationship by drawing emoticons even though they were not that close.

Participant #11 did not respond to this topic even though she answered discreetly to other topics. It seems likely, from observing their conversations, that she hardly established a relationship with Participant #19 (DA). Participant #11 completed all the drawing tasks with difficulty. Participant #19 (DA) also pointed out that she put a lot of effort into her drawings. On the other hand, he said that he put more focus on effectiveness and speed in his drawings. Here are the example images that explain how their drawing styles were different.

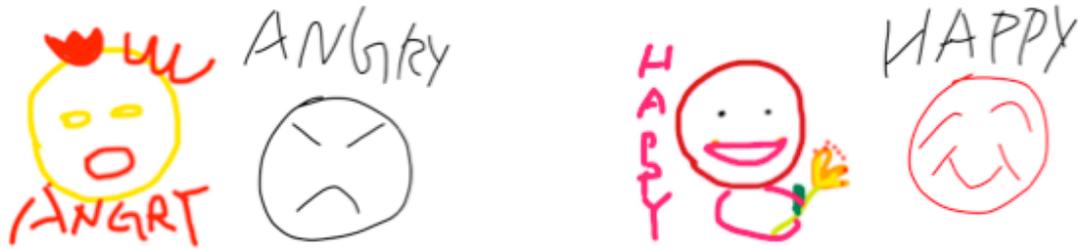


Figure 35 Different Styles of Drawing Emoticons

The first two images represent a feeling of anger. The left hand image is Participant #11's design of the emoticon. Her design looks more expressive and descriptive. As Participant #19 (DA) explained, the right hand image looks simple and as though it was done quickly. The second two images present a feeling of happiness. In the left hand image, the character holds a flower. The flower may represent a good feeling. In the right hand image, the character simply smiles, which put more focus on effectiveness and speed, as Participant #19 (DA) said. He got the highest score for addictive reaction. This may indicate that he is accustomed to using smart mobile features that enable effectiveness, speed, and convenience. Moreover, he is the participant who gave himself the lowest score for drawing ability. This may be a reason why he preferred a speedy line drawing.

Participant #11 sent many of her drawings to Participant #19 (DA). However, he did not send many back to her. Participant #19 (DA) did not engage with this experiment well, in comparison to Participant #11. In my view, again, this may be because of his drawing ability and interest in drawing. Here are the example images. The drawings and yellow text boxes were sent by Participant #11. I could find only two responses from Participant #19 (DA), as seen in the images.

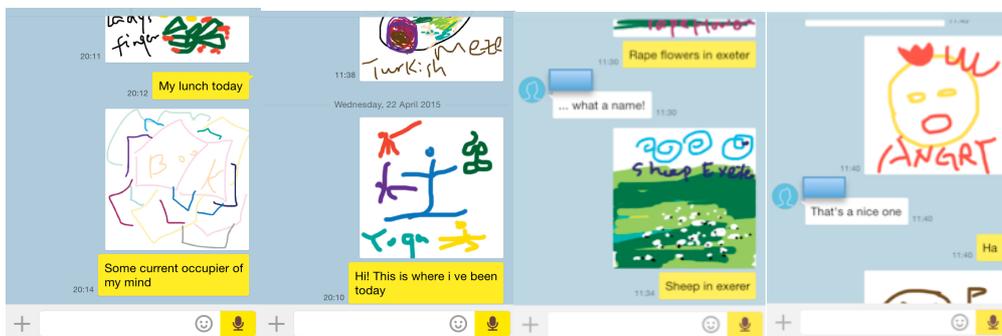


Figure 36 Images of the conversation between Participant #11 and Participant #19

Participant #20 preferred to use her doodles to convey an emotion. Therefore, she used the emoticon not only with her partner but also to other friends she was chatting with.

Participant #20 explained about the limitations of her drawing abilities, but enjoyed using the drawing emoticon to express her emotions. Moreover, she had one more positive view of the drawing experiment. Drawing helped her to sort out her complicated feelings when she was facing a difficult moment. During the drawing experiment, she drew her emoticons in a way that changed the way she communicated over the digital screen. I could observe the reason for her positive feelings regarding ‘emotions’ in their conversation. Participant #20 and Participant #30 (DA) had a similar experience. Thus, sympathizing with, for example, a feeling of restlessness, helped them to recover their emotions in positive ways. They sent emoticons to say things like ‘good luck’ or ‘relax’, or to cheer each other up.



Figure 37 Images showing the forming of a social relationship via drawings

Participant #23’s (DA) responses can be summarized with two main points. One is that the drawing emoticon was helpful to enrich her imagination and develop her drawing skills. The other one is that she did not find it very helpful in building a social relationship, even though she enjoyed designing the emoticons. From the images of their conversation, it is clear why she thought it was not. She did not receive feedback or any reactions to her drawings from her partner. In addition, I removed her partner’s data because he submitted Participant #23’s drawing as his own work. I discovered this from reading their conversation.

On the topic of ‘Social Relationships’, the participants in Case Nine had opposite opinions. Participant #1 described that he has a good mental image of his partner. His partner did not mention anything regarding social relations but she had a negative view of the drawing experiment in general. Participant #1 put more effort into

designing the emoticon. He drew a crescent moon hanging in the dark grey sky with glittering stars at night, and the buildings in grey. He may have imagined midnight and reflected this in the drawing. Even though Participant #1 did not receive enough feedback about his drawing from Participant #6, he had positive view of this topic. My perception is that the process of designing the emoticons not only conveyed the creator's mind to the receiver, but also gave the creator a positive feeling.



Figure 38 Participant #1's emoticon designs

The participants in Case Ten found that the use of emoticons made them feel good. Participant #2 mentioned that she thinks as their relationship became closer and developed, drawings became less important and text messages became more dominant. She pointed out that it is hard to make drawing a dominant method of communication, but that drawing emoticons is very useful, because she has often used emoticons in text messages. Her designs are quite close to expressing the same atmosphere or feelings of the emoticons she has used previously. Her designs focus on the message (angry/ tired/ happy) rather than conveying the general atmosphere. She created the emoticons on the basis of facial expressions by drawing eyes, a mouth, and eyebrows. She used her drawing emoticons when she was talking to other friends. Participant #27 also designed emoticons based on facial expressions. He also mentioned that he too used his new emoticons to communicate with other friends. Both said that they felt more special using their own emoticons instead of the ones provided by the messenger service.



Participant #2 discussed this image. After she sent her drawing emoticons, Participant #27 copied her emoticon style and sent it to her. She was fun and thought his gesture was cute. The brown coloured emoticon is Participant #27's drawing which is the copy of Participant #2's design. The multi-coloured emoticon is Participant #2's design, which is sent to her partner often.

Figure 39 An Example Image

Participant #4 wrote that his emoticons did not really look like emoticons but a standard person-like figure with different facial/physical expressions. He explained that the drawing emoticon opened up dialogue because his drawing was so poor, which resulted in extra chatting to clarify what he meant. On the other hand, Participant #13 simply answered “maybe not”. This suggests that drawing the emoticons may not have helped her to build a relationship with Participant #4. Moreover, Participant #4 only described the process of drawing the emoticons. He mentions that the use of the emoticons lengthened their conversations, in order to explain the drawings. This does not mean that the drawing was having a positive impact on their relationship.

Participant #5 mentioned an important feature of smart mobile devices that increases the value of digital drawing. This pair drew a range of often quite abstract images communicating emotions, but what was interesting was that each of them got it instantly regardless of how far off they were. This is an advantage of digital drawing: good mobility. Smart mobile devices enable users to share their drawings instantly, regardless of where they are or what time it is. For example, this pair shared their expressions or emotions instantly through digital drawing. One drew a ‘good luck’ image to support her partner. This includes a four leaf clover, a rainbow, and thumbs up to mean ‘good luck’. David Hockney was once interviewed on this topic, and said that smart mobile devices provide users with the opportunity to paint his morning quickly and send it to a friend right after he has finished (Gayford, 2010). This pair took that opportunity to heart during the experiment.

Participant #15 thought that drawing an interesting moment was helpful in forming a good relationship with Participant #25. This was the only topic for which she found the drawing experiment useful. She used the term ‘insight’. Sharing their interesting moments was helpful in giving her insights about Participant #25 and the kind of thing he was doing.

Participant #17 used the word ‘personal’ which has also appeared in other participants’ responses. My perception is that sharing ‘personal’ things or ‘personal’ emotions with someone sounds like they are exchanging something deeper.

Participant #24 mentioned that exchanging greetings everyday by using the emoticons made her happy. The use of the emoticons gave her a feeling of sweetness. I found that she made several versions of her emoticon designs. She used many different materials to draw with, such as a neon drawing tool. She designed several types of emoticons, that reflected the way she looked or her character. She also made a series of images using a character: a blue bear saying ‘good weekend’ and giving a gift, studying hard, watching a film, singing and playing guitar to say ‘enjoy your dinner’, feeling angry, and cooking a sausage.

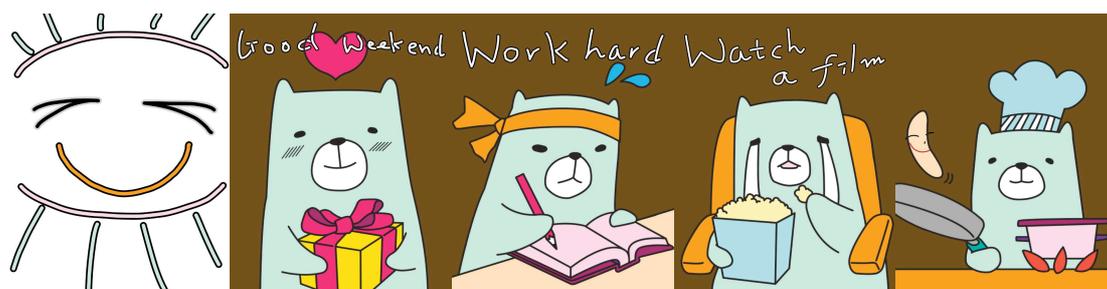


Figure 40 Examples of Participant #24's drawing emoticons

One of the most interesting aspects of this pair is that they were very actively involved in the experiment even though both belong to the low SMAT group. Moreover, the pair made impressive progress, enabling me to see some of the value of digital drawing. They used the cameras on their phones and drew on the photos; for example, a grain of rice holding a heavy chopstick, his face beaded with sweat. The grain of rice is her drawing and the heavy chopstick is a part of a photo that she took

of her sushi lunch boxes. Participant #24 designed various versions of a character. The character had begun by reflecting her physical appearance, and then this evolved into new character, the blue bear. She was strongly engaged with the drawing experiment. As result, she had a positive view of how drawing could enhance memory and make associations between images in her mind. She used terms such as ‘positively’, ‘very positively’, and ‘definitely’ in describing what she thought of my questions.

Participant #26 thought the use of emoticons helped her a little bit to develop a relationship with Participant #29. She mentioned that her partner seems to like Vietnamese food, and has cool round glasses. Moreover, Participant #29 mentioned this at the end of the experiment when she was more comfortable expressing herself. She explained that she generally conveyed what she had done rather than what she had felt.

Participant #10 answered as follows: ‘we both had similar reactions to the same thing which built a commonality’. Here are the images of the conversations between Participant #10 and her partner.

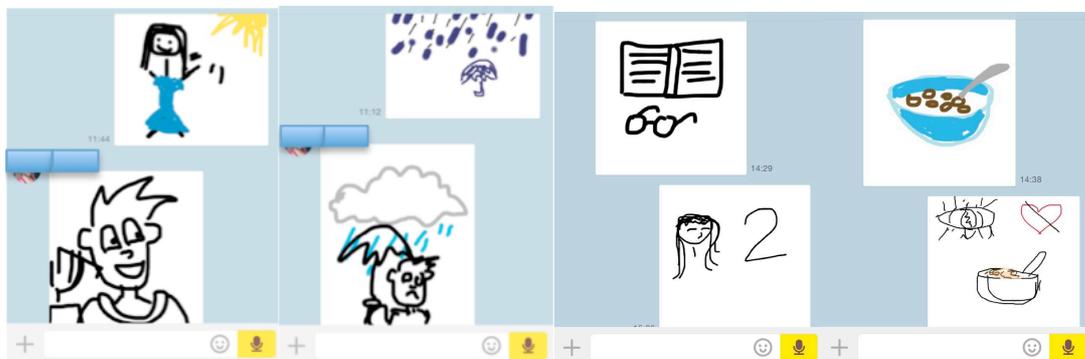


Figure 41 Drawing conversations between Participant #10 and her partner

In their conversations I discovered that they used only drawings, no words. Participant #10 mentioned ‘similar reactions’, and ‘commonality’. Here, again, I found that showing reactions and giving feedback are important in building a relationship.

6.3.3.3.5 Conceptual Visualisation

On the topic of ‘conceptual visualisation’, Participant #8 (DA) found that this task was helpful in reminding them of a general mood, but not exact images. Drawing an image of a song was helpful to solidify the visual concept in the participant’s memory. Participant #8 (DA) was aware that drawing made her to look deeper into her memory. Drawing formatted her fluid thinking which embodied her emotions. Participant #21 (DA) found that conceptual visualisation was helpful to keep the image in her memory. English is not Participant #21’s (DA) native language, and she had difficulty with a few words, which were repeatedly forgotten. Thus, she drew a word that was frequently forgotten. As a result, the drawing inscribed the word in her memory; therefore, she did not forget that word after drawing it.

I was interested in investigating whether decorating an alphabet or a number might have a positive effect on memory. So I gave the participants a drawing task that asked them to ‘express numbers beautifully with drawings’. It was not an obligatory task, but an optional one. Most of the participants did not undertake it, or if they did, they did not use their drawings in conversation with their partner. A few participants, like Participant #8 (DA), tried it but responded that it did not help her remember. She pointed out the reason she was less likely to remember numbers while using her mobile device. She said she used to be able to memorise people’s mobile phone numbers before using smartphones. This is because people’s mobile numbers were seen on the screen when they made or received calls. But smartphones’ new operating systems do not show people’s mobile numbers. They only show the names of people who are calling. Participant #16 (DA) also mentioned that she does not try to memorise mobile numbers anymore. She tried to doodle numbers that she did not see often in her everyday life; however, as most participants agreed, doodling numbers did not have much effect on memory.

Participant #18 conducted the drawing task of designing a number, and had a similar experience to the others: drawing numbers did not help him to remember them. This pair is another example of participants using the term ‘we’ to describe their experiences through the drawing experiment.

Participant #12 described how his opinion about conceptual visualisation changed. At first he thought it was impossible, but then he thought it could be possible after all. At first he thought that drawing an image of something he has forgotten was impossible, because you cannot draw something that you have forgotten; but then, he mentioned that drawing sparks a memory. He explained his experience of closely engaging in conceptual visualisation. He drew an old memory from his time at secondary school. He presented his drawing to classmates, and this incident was inscribed in his memory. He explained another example of an old memory. He remembers when he went on school trips years ago and doodled on his seat. He explained that his youthful drawing experiences were helpful to remember but that the drawing experiment did not have much effect on his memory.

Participant #16 (DA) did not find that drawing a song helped her to remember its lyrics. However, it made her think about the meaning of the lyrics while creating a visual representation of the song. She is a native English speaker so does not have trouble remembering the words, but she nevertheless had feelings or experiences that she could not explain in words. Thus, she tried to communicate the image she found difficult to talk about by using drawings. She drew two words, 'worry' and 'reading'. She is closing her eyes in her drawing. In another image, she drew a pile of books.

Participant #11 had an important view of this task. She began with one question: "How can I?" She said that this is an *aporia*. According to Farmer and Radford, *aporia* can be described as 'a state of being at a loss, of recognizing philosophical problems without any clear-cut solutions' (Farmer and Radford, 2010, p 367). She explored the question further: the key thing she learnt through this exercise is that drawing something which has been forgotten can be done if the thing has been only forgotten temporarily or if the fluid image can be associated with a previous occasion. However, if she still cannot visualise it for a certain period, then that image is just forgotten. The topic of 'Conceptual Visualisation' was more like looking at an artificial space for reflection rather than helping with memory. The phrase 'an artificial space' is interesting because she used it instead of memory. Her point will be discussed later alongside other participants' thoughts about conceptual visualisation. Drawing a song was another assignment on the topic of conceptual visualisation. She

describes that drawing a piece of music could recall the theme and the aura surrounding the music.

Participant #23 (DA) says the following: “I tried to express the weather or experiences or places I have been by using my portrait and drawings. But still I think the text explanation is necessary to get across the exact meaning to my partner.” This reminds me that drawing can be used as a communication tool to support other methods of communication on mobile devices. Users will run into difficulties if drawing becomes the primary method of communication. However, drawing influences users’ emotions in a positive way. Participant #23 (DA) wrote that “drawing the image of a word that I could not remember was fun, but it did not help me to recall the word really. Whenever I try to remember the word I recall the image not the word.” This may connect with the idea of ‘artificial space’. She drew together a collection of unclear images by searching the ‘artificial space’; then these became the image. But she knows that the image is not the same as the word she was looking for.

Participant #23 (DA) briefly mentioned some associations between drawing and spatial memory. She said that it was possible to remember where she had been and what she had done there by imagining those places.

Participant #1 responded that he could remember images from a movie he watched better. Also, drawing his favourite song was a useful assignment because the drawing of a song inscribed it as an image in his mind; therefore, he could almost hear the song in his mind.

Participant #27 answered that her drawing explained a new coinage of hers, ‘some’. That word represents both the theme and the title of the song. She wrote the simple phrase ‘something between them’ under her drawing. She explained her drawing successfully described the meaning of ‘some’.

Participant #5 found that she really struggled to pick one thing out. She tried to search her mind and imagine a single image, but it was still unclear. If Participant #5 had

some difficulties picking out a single image from several overlapping images, her partner, participant #18, in contrast successfully found a word that she could not remember by associating some relevant images with that word. Here is the case.



Participant #18 has trouble remembering English words sometimes because she is bilingual. She had the experience of forgetting the word ‘flattery’. She drew a person saying ‘oh stop’ to express the word.

Drawings such as these may become a kind of visual metaphor for the word. Another example is that her experience of drawing her favourite song was helpful for recalling the place where she had listened to the music.

Figure 42 Participant #18's Drawing of Conceptual Visualisation

6.3.3.3.6 Digital Technical Aspects

Almost none of the participants were concerned about how digital handwriting might affect their user ability. Only Participant #23 (DA) mentioned this issue: “in most of the experiment, I used a bigger device such as an ipad mini for better and much more accurate drawings. And I transferred the drawings to my cellphone, and then sent them to the partner. Now I can write quite well on the ipad with my fingers. But I feel the necessity of stylus pen for the device. Using my finger is still uncomfortable.” This is interesting and an especially important aspect of digital drawing. I will write about this in the discussion section

6.4. Discussion

In this section, I discuss my research findings with regard to communication, how the level of digital anxiety affected the results of the digital drawing experiment, how digital drawing influences social interactions, how digital drawing enhances memory, what aspects of digital drawing support self-awareness, and what the advantages are of digital drawing on smart mobile devices.

Research Findings with regard to Communication

This is an introductory section that describes how I came to design my research and how I encountered some common points across the different research areas.

Changes in the basic functions and communication of smart phones

The basic function of a smartphone is telephony. A smart mobile device is a next generation mobile phone, and a mobile phone is a next generation landline phone. First, mobile phones free people from the limitations of time and place, allowing communication with good mobility. Therefore, for smart mobile users, the time and the place of communication are not as important as the type of mobile phone one has. A smartphone adopts many of the same features as a computer. Smartphones can be described as mini computers that enable telecommunication with good mobility. Thus, smart mobile devices have been adopted very widely, allowing people to communicate around the world using texting, mobile apps, social networking sites, emails, etc. The expansion into different types of communication via smart mobile devices results in high involvement, and it also makes smart mobile users feel that there are fewer boundaries between their online and offline lives. However, as a result of this, text-based communication has become more popular. Users become familiar with writing text and reading information on a small screen rather than on a computer screen. They become accustomed to short texts, and become addicted to reading text due to the frequent acquisition of online information. According to my research, texting has become the predominant method of communication on smart mobile devices. The participants in my experiment mostly answered that they made voice calls to only a few close friends, members of family, and colleagues. They prefer sending texts to calling, because they think that they may feel some discomfort if they need to call someone they do not know intimately. To return to the discussion of text-based communication, this includes texting, chatting, reading information, and skimming updates on social networking sites such as one's personal newsfeed. My hypothesis is that these activities may link to information overload and lead to a number of addictions. Different symptoms of digital anxiety affect memory. Addictions result in anxiety. Social anxiety in particular is generated from social networking sites.

Smartphone and online information addiction

In the literature review, I summarised how smart mobile addiction, social network addiction, social anxiety, fear of miscommunication, text addiction, and information overload generate digital anxiety. These digital problems link to one another in a cycle, leading smart mobile users to have digital anxiety. Some users resort to attending a digital detox camp in order to break their smart mobile addiction and to ease their anxiety, but I am attempting to find a sustainable solution that can relieve digital anxiety even while users are carrying or using their devices.

In the pilot studies, I explored users' motivations for using smart mobile devices, such as a desire to seek social interaction or information. As I discussed in the literature review, my studies operated on the understanding that the predominant method of social communication on smart mobile devices is text-based communication. The interviewees thought that spending time collecting information was time well spent, even though this increases the time they spend on their devices. This information is collected using text-based communication on smart mobile devices.

In the quantitative analysis, I identified six factors of digital anxiety. I argued that five of these factors have some relationship to text-based communication. Those five factors are high usage, addictive reaction, digital preference, social anxiety, and addiction to social networking sites. I will not repeat how these factors are connected to text-based communication, except in the case of digital preference. Digital preference means that people prefer to use their smart devices for working, meeting online, collecting information, and reading for entertainment.

I intended to find another method of communication on smart mobile devices that would alleviate digital anxiety and possibly support the current predominance of text-based communication among smart mobile users. I used my background knowledge of smart mobile art, which was the main focus of my master's research, and linked it to the topic of communication. I researched different models of smart mobile device which specialized in drawing features like LG View Talk or Galaxy Note, drawing mobile applications, and digital drawing content or projects. It was interesting that

larger smart mobile devices like phablets come with stylus pens and specialize in drawing features. I would suggest that the predominant method of communication will change with the development of smart technology. I believe that hand gestures, handwriting, and simple drawings might make up a larger slice of communication with the development of wearable technology. I write with confidence on this point. Hand gestures may take on an important role along with large screens. However, I researched a systemic view of communication on smart mobile devices and studied arts content on based synchronous and asynchronous communication. I found that asynchronous communication was preferable when designing my drawing research project.

Drawing is an important part of the background of this study and has a long history; however, my focus on drawing is with a view to alleviating digital anxiety; therefore, it is linked to communication, memory, emotion, social functions, and digital drawing. In this paragraph, I will discuss only drawing and communication. When I searched for the keywords “communication” and “drawing”, I discovered a wealth of literature on art therapy. A large number of those references focused specially on particular cases; for example, people who have trouble expressing themselves verbally, children who find it easier to express themselves through drawing, and people suffering from trauma who find it difficult to discuss their experiences. In these cases, a special instructor or an art therapist is necessary, making them inappropriate test cases for my approach to digital drawing. However, while attending the healing art class I found that dialogue alongside drawing can be useful. People are encouraged to reach a healing state by talking. Their drawings are a representation of their inner mind. People value their own drawings more when others express some interest in them. I believe drawing has healing potential. However, I learnt that sharing, watching, talking, and encouraging combine to create a synergy that allows people to approach a healing state through drawing. Thus, I hypothesize that digital drawing may improve the lives of users who are inherently suffering from digital anxiety if the drawing occurs as part of conversations between two people. This meets users’ desire to socialize, share information, express their emotions, and have a guaranteed audience. These pilot experiments support the digital drawing experiment regarding the theme of communication.

How the Level of Digital Anxiety Affects the Results of the Digital Drawing Experiment

In the previous section, I discussed how digital anxiety might be generated by high usage of the predominant communication method on smart mobile devices, and I expected to find that some aspect of digital drawing would have a positive effect on digital anxiety as a supportive communication tool through my main study.

It is interesting to investigate whether digital drawing has a greater influence on digital anxiety if it is combined with text-based communication. It is also useful to discuss how the participants with different levels of digital anxiety reported different results in the digital drawing experiment. By different results I am referring to their different level of involvement with and interest in the task, depending on their level of digital anxiety. In my experiment, eight pairs included at least one participant with digital anxiety. In Case One both were identified as suffering digital anxiety. In Case Two neither were. It was not clear whether a greater number of women suffer from digital anxiety than men; however, in my experiment I found that only one male was identified as having digital anxiety and all the others were female. This would be a useful area of future research. I did, however, discover that the participant who got the lowest score for digital anxiety was also male. Again, I do not mean to conclude that more women are suffering digital anxiety than men, but it is useful to note this nevertheless for my future research.

Overarching levels of engagement in the experiment

In my analysis, it became clear that the participants who were identified as suffering digital anxiety tended to show a high involvement with and high interest in the digital drawing experiment. Case One was one of the most active pairs, which was highly engaged; as a result, this pair was strongly bonded together and developed a relationship during the experiment. Ironically, Case Two did not seem to be actively engaged even though Participant #22 got the highest SMAT score. I think the reason for their lack of engagement might have been her partner, Participant #12, who got the lowest SMAT score. This participant also ranked the lowest for high usage, social anxiety, and addiction to SNS. Moreover, she got the lowest STAI score. While both members in Case One were very actively engaged with the experiment, in Case Three,

Participant #16, who showed signs of suffering from digital anxiety, showed greater interest in the experiment, and she took part more actively in the drawing assignment than her partner did.

In Case Nine neither of the participants showed signs of suffering digital anxiety. The participants in Case Nine were an interesting pair because Participant #1 belongs to the high SMAT group but got a low score on the STAI which suggests he has a stable mind. His partner belongs to the low SMAT group but got a high score (104) on the STAI, which suggests she had unstable emotions when she began the experiment. I don't think they were particularly engaged even though Participant #1 said he had a good mental image of his partner. This is because his partner was the person who had the most negative opinion of the digital drawing experiment. She was the participant who got the lowest scores for 'addictive reaction', 'digital preference', and 'social anxiety'. To cite an example, she stated that her preference during the experiment was to hold and flip through a book in order to remember it, rather than drawing an image of her holding the book. She seems prefer physical experiences involving real touch or real signs. Case Ten consists of one participant from the high SMAT group and one from the low SMAT group. This pair showed a high involvement and built a friendship. The important point about this pair is that the participant from the low group was concerned about the possibility of miscommunication through drawing. She said that texting was their main method of communicating through the drawing mobile app. However, my intention was not to replace text-based communication with drawing communication. As I have mentioned several times, I believe drawing can be a supportive communication tool that aids creative thinking and relieves anxiety. The participants in Case Eleven belong to the low SMAT group. They had a positive view of the experiment in general, although there are no distinctive aspects of their responses. Case Twelve comprises one participant in the low SMAT group and one in the high SMAT group. This pair played with the drawing tasks to communicate with each other, displaying creative thinking in trying to convey what they wanted to say. Case Thirteen comprises two participants in the high SMAT group. This pair had both a positive and a negative opinion of the experiment, but there is nothing else particular to remark on. I have focused in some detail on Case Fourteen. Both participants in this pair belong to the low SMAT group. However, as a result, they

showed a high interest in digital drawing, used some other features of smart mobile devices to make their drawings better, built a friendship, and made a good progress with their drawing creations. Case Fifteen comprises participants who both belong to the low SMAT group. They had low involvement in the experiment. In contrast with the digital anxiety group, it is difficult to identify how the digital drawing experiment was affected by participants' SMAT and STAI scores. I found both cases that confirmed my hypothesis, such as Case Nine, and cases that disproved it, such as Case Fourteen.

Engagement through drawing

It is useful to analyse Case Five alongside Case Twelve. Even though the participants of Case Five reported that they built up a good social relationship, I found that they were not as engaged as Case Twelve. One of the members in each case was away during the experiment. Participant #14 in Case Five belonged to the low SMAT group, and she did not actively participate in the experiment as much as Participant #18 in Case Twelve. Participant #18 belonged to the high SMAT group, and she drew pictures of places she had been on her holidays and sent them to her partner. Actually, Case Five was identified as having digital anxiety so I imagined that they would show more involvement. But from those two cases, I understand that the character of the person who is away can affect the result more than the character of his or her partner. Participant #19 was the only male participant who showed signs of having digital anxiety, but he was not very actively engaged in the experiment. He put more focus on the effectiveness and speed of his digital drawings. The reason for his drawing style may derive from low interest and low confidence in drawing. His partner was more actively engaged with the drawing activities. The participants who showed signs of having digital anxiety in Cases Seven and Eight focused more on completing the drawing assignments, especially Participant #23 who conducted her drawing tasks even though her partner did not respond well to her drawings. But she considered her daily drawings as a personal diary and thought it was more useful than taking a photo for remembering things. She used a stylus to increase the precision of her drawings. In general, my investigations can be concluded in the following way: participants who showed signs of digital anxiety were more actively involved, made some unique

progress with their digital drawings, and had more interest in digital drawing on their smart mobile devices than those who were not identified as having digital anxiety.

Creating Friendships

Case Four is a very interesting pair, in that the participant who was not identified as having digital anxiety wanted to meet his partner in person after conducting the experiment. He explained that he missed some of her drawings. It was his partner who was identified as having digital anxiety, not him. It is possible that this influenced the score that he got. He was the person who ranked lowest for social anxiety and addiction to SNS. This may explain why he wishes to meet his partner face to face. In their conversations, they were highly engaged and made considerable progress toward drawing well together.

Impact on Lifestyle

Participant #16 found that the experiment was useful in increasing her awareness of her lifestyle and she tried to make some changes as a result; furthermore, she went back to drawing with a pencil once a week after she was reminded that she enjoyed pencil drawing in the past. This happened while she was conducting the digital drawing experiment. Participants realised the need for good eating habits and some of them tried to make changes to their diet. This was an unexpected finding, and an example of a positive impact on participants' lifestyles.

How Digital Drawing helps form Social Relationships

In this section I will discuss some of the positive effects of digital drawing using smart mobile devices, especially regarding social interaction.

Creating a positive self image

Drawing allows a smart mobile user to present an image of themselves so that an audience can imagine them more clearly. I found that the participants were aware that their drawings reflected their looks and personalities; therefore, they made an effort to deliver positive images of themselves to their partners. Moreover, a few participants avoided sending their drawings altogether, possibly because they thought they would present a negative image of themselves. In general, the participants reported that

digital drawing helped them bond better because it allowed them to imagine what their partner was like. In a number of cases participants responded that they had never seen their partner but could imagine how they looked and what they were like from their drawings. For example, one participant in Case Four wanted to meet his partner in person because not having his partner's drawings anymore made him miss her. In Case Thirteen, Participant #15 did not find digital drawing to be useful in other respects, but she did find it useful for forming a social relationship. She thinks that digital drawing was helpful in giving her an insight into what her partner was like and the kind of thing he was doing. Another participant said that drawing added a personal touch to communication. It seems to me that she is suggesting, by referring to a 'personal' thing or a 'personal' emotion, that they exchanged something deeper. To conclude this paragraph, drawing one's own image allowed the participants to feel closer to one another.

Enhancing emotional responses

Drawing enhances an aspect of emotion for communication. The participants think drawing was helpful in developing their relationship with their partner through some emotional touches, for example, laughing over drawings or sharing feedback. Digital drawing on smartphones allows a user to send a drawing of a flower she sketched during an evening walk. This person wanted to share her enjoyment of the flower with her partner. The participants expressed their thoughts and feelings with an interesting combination of elements in their drawings. For example, one participant sent his drawing of him having a hard day to his partner, so that his partner drew a composition of a cup of coffee and a piece of chocolate cake and then this sent it back to cheer him up. They also sent many different images to share sympathy. A useful aspect of digital drawing can be seen in Case Twelve. Smart mobile drawing enables you to share each other's drawings instantly regardless of place and time. This may strengthen the emotional value of drawing.

Use of Emoticons

Digital drawing is useful for opening a conversation. All participants designed emoticons with a certain amount of creativity. A few participants felt that they wanted to use them not only with their partner but also with other friends or connections

using smart mobile devices. This is because the drawn emoticons not only conveyed feelings but also reflected how they acted on those feelings. Some of them explained their experience of using drawing emoticons as ‘very welcoming’, or as an ‘ice breaking experience’. One participant found that drawing an emoticon opened up a dialogue because his drawing was so poor, which meant he had to get chatting with his partner in order to clarify what he meant. It is difficult to affirm whether this recourse to further text-based communication is good or not; however, the intention of the digital drawing experiment was to encourage slow communication on smartphones.

Positive aspect: Collaboration

When users develop a digital drawing creation together, this is a form of collaboration. I found a few pairs who supported each other to develop their drawings. The participants made some suggestions on how to improve the drawings. In other cases, the participants copied each other’s drawing styles. Many pairs had similar styles of drawing; this also includes the use of digital drawing materials. This is one valuable aspect of digital drawings on smart mobile devices on the basis of asynchronous communication.

Negative aspects: Potential for Miscommunication

In this paragraph, I will outline some negative aspects of digital drawing that emerged from the experiment. A few participants were reluctant to use drawing as a means of communication because they felt they needed to explain what they had drawn and why by using text. One participant in Case Ten was particularly worried that there was some potential for misunderstanding if she were to use only pictures to communicate. Others thought drawing was inconvenient and slow in comparison to the existing emoticons in their keyboards. My opinion is that users sometimes need to slow down communication on their smartphones in order to prevent high usage, high addictive reaction, and high digital preference.

Another negative aspect of using digital drawing on smart mobile devices as a method of communication is that the participants lose interest if their partner does not react well to their drawings. One participant pointed out that he built a social relationship

by commenting on his partner's doodles. Some participants focused on the drawing assignments like the self-portrait; for example, if their partner did not provide enough feedback on their drawings in the tasks to do with daily memory or conceptual visualisation. Also, drawing ability may lead to low engagement with the drawing tasks. The male participant who was identified as having digital anxiety did not really engage with the experiment even though his partner actively participated. As a result, she focused more on the drawing tasks as a way of enhancing memory. An exceptional case was Case Nine, in which one participant had a mostly negative opinion of what she had drawn during the experiment. On the other hand, her partner said that he had a good mental image of her. This is ironic, and is an exceptional case.

How Digital Drawing Can Enhance Memory

The practice of remembering something on a daily basis is a useful way to enhance one's memory, even if this practice does not involve drawing. In this section, I will discuss which particular aspects of drawing can enhance memory if carried out on a daily basis. I broke up the drawing assignments into four categories on the topic of memory: [1] drawing what food what they had eaten that day, [2] drawing an interesting moment from their day, and [3] drawing something they cannot remember. I will begin with a discussion of the first task.

Drawing what they had eaten that day

Sometimes, people find it hard to remember what they ate yesterday or even the same day if they have been very busy. A number of my participants reported they do not have a very good short term memory. I am quite confident that this drawing assignment will prove a useful practice as a way of improving one's memory of the day by making digital drawings on smart mobile devices. A significant number of my participants found this drawing task helped them to remember the food they had eaten as well as what their partner had eaten. The case of one participant is interesting because he could not remember what food he had eaten but was able to remember what his partner ate yesterday. My analysis of the issue is that his partner used vivid colours on her drawings but he used only simple black lines in his own. This might be one reason why he remembers only his partner's drawing. The act of drawing makes people recall what they have drawn, and firms up certain images in their minds.

People think about composition when they are drawing. They draw lines and erase mistakes. If that process is the first stage of how drawing inscribes an image in one's memory, this is the second stage: participants send their drawings, and then talk about them with their partner. This becomes another part of their memory. Here is an example. One participant drew an image of her eating chocolate and crying because she is afraid of getting fat. The story behind this is the first stage of remembrance. After sending her drawing to her partner, they laughed over the drawing, leading her to remember the scene. I think drawing one's food involves an aspect of observational drawing. As I mentioned about colour, I found it interesting that this participant used the phrases like 'the exact image', 'detailing the image', and 'colouring the food'. The phrase 'exact image' describes an aspect of observational drawing. The word 'detail' describes a process of solidifying her images. She made a point of using colour in the experiment. Colouring her food was especially fun and fixed the image in her mind. Remembering their food made participants aware of their eating habits, and most of them were concerned with healthy eating habits. On the other hand, one participant felt discomfort with the task. She disliked it because it made her hyper-aware of eating unhealthy food, and was ashamed of sending her drawings to her partner. This is because it looked unhealthy and realistic. A participant in Case Ten described her experience of 'realistic' drawings: she did her best to describe the food as realistically as possible but later the drawings became more abstract and were intended only to deliver the bare facts. A member of Case Fourteen highlighted that drawing her food was the most enjoyable assignment of them all. I will conclude this paragraph by noting that that a significant number of the participants had a positive view of this task's ability to enhance memory in general. There was one participant who strongly disliked the task but the reason was that her drawings were too realistic. On the other hand, more participants suggested that inscribing a realistic image in their mind still helped them to remember.

Drawing an interesting moment from their day

The task of drawing an interesting moment from their day involves drawing a sequence, story or episode. This makes it a little different to the task of drawing one's food. To draw a moment or an event, people must imagine a story and solidify it into an image. For this reason, the participants said that they remembered an image from a

recreated memory. A few participants mentioned that drawing made their day more meaningful. They used terms like ‘re-living’ or ‘remembering’ what otherwise seemed like meaningless everyday occurrences that would not have been remarked on. Some participants pointed out that digital drawing alleviated their negative mood by getting rid of their stress. One more useful aspect of drawing is that reminding themselves of pleasant moments renews participants’ good moods. The drawing refreshes them and relieves negative feelings. Some participants compared the impact of drawing on memory with the use of photos. They asserted that drawing inscribed the image of a moment in their mind in the same way as a photo, but that effect on one’s memory is stronger. These people explained that the reason was that they needed to recall every single detail of the moment otherwise they would not be able to draw it properly. To draw the moment, the participants had to think of a series of moments, stories, or causes and effects, imagining the moment in order to decide what to draw, simplifying a sequence of images into one image, thinking about how they would structure the lines and colours, drawing it, and then evaluating whether it is a good representation or not. Also, drawing involves an aspect of visual depiction. Drawing encourages users to pay more attention to what they had seen or experienced and to remember more detail. For example, one participant put more effort into remembering the eye colour of a cat that often appeared at her accommodation or remembering a man she had briefly met at the cinema.

Drawing something they suddenly cannot remember or frequently forget

Conceptual visualisation involves drawing something you cannot remember suddenly. This drawing task was not undertaken on a daily basis; however, many participants did try to conduct this drawing task. They had different opinions and useful thoughts about it. One participant found the task was helpful in reminding them of a general mood, but not of exact images. Drawing an image of a song was useful to solidify the visual image of the song in one’s memory. One participant is not a native English speaker so she had difficulty remembering certain words. She drew an image of the word, and as a result the image inscribed the word in her memory and helped her not to forget it again. One participant recalled a childhood memory of drawing an image and presenting it to his classmates. What is interesting here is that he said drawing helped him remember times when he drew in his youth but that the drawing

assignment itself did not improve his memory. One participant did not find any connection between drawing a song and remembering its lyrics. She is a native English speaker so does not have trouble remembering the words to songs, but had some feelings or thoughts that she struggled to express in words. Thus, she expressed these difficult feelings or situations through drawing. This was the participant who wrote most interestingly about this task. She described conceptual visualisation as a state of being at a loss. She thinks this drawing exercise can be achieved if the thing has been only forgotten temporarily or if a fluid image can be associated with a previous occasion. However, if she still cannot visualise it for a certain period, then that image is just forgotten. Conceptual visualisation was more like an artificial space for reflection rather than something that helped with memory. This participant also had difficulty transforming the word into a clear image. Drawing the image of a word did not really help her to recall the word, but was fun. Whenever she tried to remember the word she recalled the image not the word. This comment may connect with what she has to say about ‘artificial space’. She held some unclear images in her memory and puzzled over the images to create something she could draw. This may be not an exact image of what she drew but there may be some associations between the two. One participant successfully remembered a word which she had forgotten by using conceptual visualisation. She is bilingual in English and Spanish. She had the experience of forgetting an English word suddenly, so tried to search her mind and imagine a single image. She describes how the image was still unclear, but drew an image of a person saying ‘oh stop’ with a particular gesture. She then recalled some images that were associated with her drawing. Finally, she could successfully remember the word ‘flattery’. In this theme, there is not a common point to discuss. The participants had different opinions and the results of its effect on their memories varied.

What Aspects of Digital Drawing Support Self-awareness

Self-awareness is not a topic that I originally expected to explore alongside the drawing experiment, but the analysis has led me to new findings in this area. I will discuss here two aspects of self-awareness: awareness of one’s lifestyle, including eating habits, and awareness of how to improve one’s happiness. I will begin with the awareness of the participants’ lifestyle.

In my investigation, drawing proved to change some aspects of participants' lifestyles. The drawing assignments to do with food and interesting moments from one's day made the participants focus on their lifestyles, and gain an awareness of certain problems, motivating them to change. Not every participant changed their lifestyle after becoming more aware, but a number of the participants did change or felt the need to change. More participants had their attention drawn to an unhealthy eating habit as a result of the experiment. They mentioned things such as how the experiment 'forced me to think about the food', 'forced me to take time to eat', 'reminded me whether I was eating eat healthy food or not', 'reminded me that I should eat properly or eat healthier food', 'made me hyperaware of how I was not making healthy choices with my body', and 'reminded me I was not having a proper main meal'. Moreover, some participants noticed a set routine in their daily lives through doing the experiment. A number of participants tried to find some new interesting activities in order to refresh their body and mind.

I would also highlight that drawing is a useful way to refresh the participants' minds. A number of participants thought drawing encouraged them to avoid letting days pass by meaninglessly. Their daily activities could pass without any special meaning, but drawing helped make it something more special. Moreover, when the participants saw their drawings, it encouraged them to return to think about the time when they were drawing it. If the drawing is of a happy moment, then the participants were reminded of the good feelings they had at that time. Seeing their drawings refreshes the participants and it gives them a positive mindset.

What are the Advantages of Digital Drawing on Smart Mobile Devices

As I wrote in the literature review, drawing involves an aspect of communication. Digital drawing intensifies that aspect of communication because of some features of smart mobile devices such as drawing applications, chat applications, mobile cameras, stylus pens, etc.

Having a potential audience on smart mobile devices motivates people to draw things and send them, either immediately or later; for example, one participant drew a flower

while she was walking. This was sent to the partner in order to share her good mood. This could happen easily because her drawing was digital. Also, a number of the participants were situated a long distance from their partners because, for example, they were on holiday or attending a conference. Using digital devices means there are no limitations of time or distance. One participant returned to pencil drawing because digital drawing reminded her how she had enjoyed pencil drawing in the past. She mentioned that she started drawing with a pencil at least once a week. Smart mobile device users can use multiple options such as a Camera or Photoshop. A few participants used these options to make their drawings better. One participant preferred a bigger device like a smart pad, which allowed her to do a much more accurate drawing. This participant also found it necessary to use a stylus pen for digital drawing. There are many possibilities open to smart mobile users to expand their options, and many digital materials to allow them to make better creations depending on their taste or preference.

CHAPTER 7 FINAL CONCLUSIONS

7.1. Introduction

My research is largely divided into the field of technology, to which smartphones belong, and the field of creative activity, to which drawing belongs. The common ground between these two fields is communication. My main research subjects were smart mobile users. I became interested in smartphone addiction and social networking sites by studying reference books on smart phones and communication technologies. My goal was to propose, at the end of the research, a plan that could have a positive effect on smartphone users. My master's thesis was a study of arts projects created by two people using a smartphone. This is why I have been studying artists who draw on smartphones, such as David Hockney or Jorge Colombo. This naturally influenced my doctoral research.

At the early stage of this research, I determined the theoretical dimensions of digital anxiety. I studied the scholarly literature on smartphones and reviewed the problems or problematic behaviours of smartphone users. In this regard, Sherry Turkle and Nicholas Carr were the main theorists underpinning my research. Smart phones have free Internet access and function as mini computers. For this reason, my literature

research has expanded to smart phones, mobile, web, and social networking sites. The problems encountered when using such devices and media and their correlations are discussed in section 2.2. For instance, Turkle concluded that an over-reliance on digital communication can result in feelings of real-world isolation and loneliness, emotional disconnection, anxiety and mental exhaustion (Turkle, 2013). Problematic behaviours include constantly checking your smartphone, using your smartphone when you should not (for example, in class or in a meeting), checking social networking sites immediately after waking up, etc. These issues are symptoms of digital anxiety. These behaviours are persistently demonstrated by users, and lead to the following problems: memory loss, anxiety, and social anxiety.

While reviewing the literature related to digital anxiety, I wanted to learn whether drawing might have a positive effect on memory, emotion, and relationship. In section 2.4, I hypothesized that drawing could alleviate digital anxiety. I had been studying digital arts steadily, but I lacked knowledge about the emotional impact of drawing on people, their perceptions, and their social relationships. Therefore, I embarked on an exploration of the literature related to drawing and emotion. I participated in lessons held by people doing professional activities in this field. I gained practical experience of using drawing as a form of relaxation. I observed both an instructor and attendees to understand how they found relaxation through attending the healing arts class. They found that expressing their emotions through drawings helped them to find peace of mind. I also observed the participants' communication, encouragement, interest in others' drawings, and their attitudes toward one another. My observations were reaffirmed during the interview with the instructor (see section 4.2).

I interviewed smartphone users about the concept of digital anxiety. I compared the problems they identified or implied. I focused on investigating what makes smart mobile users addicted to their mobile devices, and chose two specific motivations: the desire to seek social interactions, and the desire to seek information (see section 4.5). A survey was conducted to determine what factors create problems for smart mobile users, and was used as a tool to quantify their level of digital anxiety. The subdivisions of digital anxiety were 'high usage, 'addictive reaction, 'digital

preference’, ‘social anxiety’, ‘addicted to social networking sites’, and ‘physical symptoms’ (see section 6.1.2.).

Collaboration is one of the many advantages of smart mobile devices. Since their development, research into synchronous and asynchronous communication has begun. I researched existing artwork that had been created through collaboration, and studied the digital platforms of the web and mobile devices. My original interest was in synchronous arts collaboration, but I found more successful cases of asynchronous art collaboration. I was not convinced by the results at first because I still thought synchronous arts collaboration was a meaningful project that could be realised on a smartphone. Thus, I ran drawing workshops and discovered for myself some of the difficulties of synchronous collaborative drawing projects (see section 4.4). I will explain this further in later sections.

In the final stage of this research, I designed themes and drawing tasks aimed at smart mobile users, with a view to conducting a digital drawing experiment. In the first step of the experiment, participants completed a smart mobile addiction test (SMAT). I matched pairs of participants according to their results. The STAI test was also conducted before and after the experiment. The SMAT and STAI test results were input into x and y coordinates to identify the level of digital anxiety. I suggest this method as a way of checking digital anxiety. I have found a reference point (median) based on the number of participants in my experiment, but there is a need for further research if anyone else wishes to apply this method. I also collected a questionnaire after the drawing experiment in order to understand how drawing affected the participants. I also collected their drawings and conversations. The conclusions I drew from my experiments appear in other sections, so I will not repeat them here.

7.2. My Conclusions in relation to my research questions

7.2.1. How has media interaction affected users’ cognition and behaviour through the use of mobile phones, the Internet, smart mobile devices, and social networking sites?

Frequent media interaction through the use of mobile phones, the Internet, smart mobile devices, and social networking sites negatively affects users’ cognition. Users’

behaviour is addictive when they use smart mobile devices and social networking sites. Smart mobile devices provide Internet and telecommunication services. Thus, these media and devices are interrelated. The most notable behaviours that negatively affect cognition are addictive reactions.

In my thesis, I identified six aspects of addictive reaction: smart mobile addiction, social network addiction, social anxiety, fear of miscommunication, text addiction, and information overload. Each of these is both a cause and an effect, and they are all constantly connected to one another, rotating in a cycle. To be more specific: a user wants to access social networking sites (SNS), and this makes the user addicted to smart mobile devices. Social networking sites are online social places where users can interact. They also act as a form of media, providing information. Not only in the literature review, but also in the interviews, I established that SNS users were desperate to see pictures of other people's fun, and felt lonely when they saw images of friends' parties (see section 4.5.4). Nevertheless, they repeatedly connected to SNS to observe the lives of others. There are differences in the way the Internet and SNS provide information. The information displayed on the SNS is selected and provided by the user, and is either related to the user or is likely to be preferred by the user. For example, interviewees responded that they don't believe that the aspects of people's lives shared on Facebook are representative or honest (see section 4.5.4). One interview mentioned that some people judge him based on his updates on Facebook, so he is concerned with choosing images and text that make him stand out (see section 4.5.4). As a result, information on SNS is more addictive than the information provided by the Internet portal site.

Information overload results from the acquisition of a large amount of information. More can be less: if users continue to acquire a large amount of information, that information will not be remembered (see section 2.2.2). Information lost in the process of reading when users read on a smart mobile device. Many reasons for this have been identified. First, users skim the text rather than reading it in full (see figure 1). This is because they want to acquire a lot of information very quickly, their attention is distracted because they are multitasking, or because they are searching for information while on the move. As a result, all of these factors negatively affect the

user's memory and emotions. However, it is predicted that it will not be easy to escape from this addiction, because the desire to acquire information and the desire to have social interaction are unlikely to disappear. Users often do not recognize that they are addicted to using smart mobile devices. For example, the average SMAT score of the 18 to 24 year old group was 67.49; the average score of the 25 to 34 year old group was 68.17; the average score of the of the 35 to 44 year old group was 74.33; and the average score of the 45 to 54 year old group was 43.60. The total SMAT score can vary from 26 (minimum) to 156 (maximum). The group with the highest score is 74.33, which is less than half the maximum score of 78 (see section 6.1.3). This result is contrary to the information gathered in interview. All my interviewees, except for one in China, complained that they are addicted to using a smart mobile device (see section 4.5.3). The survey suggests that the use of smartphones has become routine, and that people do not realise how often they are using them. Therefore, I would suggest a yes or no answer method instead of the six-point Likert-type self-rating scale used in my smart mobile addiction test (see section 5.4). I think a dichotomous Yes or No formula would prevent the survey respondents from choosing the middle ground of 1 to 6. I suggest adopting a scoring system to indicate the level of smart mobile addiction in respondents of SMAT. If a respondent answers 'yes' to a question, then this counts as a score of 1. If the test consists of 40 questions and a respondent answers 'yes' to 17 questions, then he or she gets a score of 17. It may be useful to divide the scores into sections thus: 1-10, 11-20, 21-30, 31-40 scores. For example, 30-40 indicates that the respondent may likely be addicted a smart mobile device. This makes it easier to identify the level of smart mobile addiction.

7.2.2. How does this link to digital anxiety?

As seen in the previous section, telecommunication, Internet, smart mobile devices, and social media are interrelated. In addition, there are potential problems with each device or medium, for example smart mobile addiction or addiction to social networking sites, but all these problems are closely related to each other. Also, I found that these problems are cyclic. For example, an interviewee received notifications of someone's Facebook updates (see section 4.5.3), and so accessed Facebook in order to socialize or communicate (see section 4.5.4). Having checked

the notification, the user nevertheless stayed on Facebook, skimming information (see section 4.5.5). Receiving notifications is a feature of smart mobile devices and a data service of telecommunication. They encourage users to access their social media. The user connected to a SNS is more likely to skim new information and interesting content. This is because users have a need for social interaction and information, as I explained in the subtitles in Pilot Study 4.

7.2.3. *How do smart mobiles, social media, and social interaction interlink?*

Smart mobile devices, social media, and social interaction are interlinked by convenient features, an expanded platform of personal media, and human desire.

First, smart mobile devices are convenient. At this point I will focus particularly on the convenience of smart mobile devices for social media and social interaction. Smartphones have extended data capabilities in communication functions. What this data means is that all online activity can be carried out on the smartphone. A mobile application takes the form of an icon that users can use to access various software or online content installed on the smartphone. According to Howard and Davis, smart mobile applications (apps) are operation shortcuts in the use of smartphones (see section 2.2.1). Lathia *et al* describe some of the changes that smartphones represent for users who are familiar with computers. Smartphones today place more digital memory and processing capabilities in individuals' pockets than computers of decades past placed on people's desktops (see section 2.2.1).

Second, the convenience of a user-centered smartphone enhances the accessibility of social media. In addition, social media is a collective of users' personal media and serves as a place for social exchanges and information exchange. The factors that allowed social media to take on this role are various: they are online spaces with a person's real name, an extension of an offline person; they function like other media in that they show images and write articles; they function to provide information based on users' interests. SNSs are based on personal information, although sometimes people use online pseudonyms. The information provided according to the users' interest can be fake information.

Lastly, the convenience of smart mobile devices and the powerful media capabilities of SNSs stimulate users' desires. Social interaction is a common feature of communication and social media. Social media can respond to various user needs. They are social spaces where many people express their interest in each other. This space allows real-time confirmation of people's immediate reactions.

As mentioned several times, users have a desire for information. SNSs are places to share information about socialisation. An individual's social networking account is based on the user's age, location, educational background, occupation, and interest groups. It also connects users with their acquaintances who are also using the social network, thus forming a big social network with the user at the center. For example, the interviewee in his 30s responded that his Facebook friends are his reference group, therefore social events on Facebook connect his online and offline lives (see section 4.5.4). Because there are many acquaintances or people pools in the SNS, users use this platform to create groups or invite them to events. The interviewee in his 40s responded that her friend helps her boyfriend to organize a social event via Facebook every Friday in Melbourne (see section 4.5.4).

This is a change in the way information is exchanged, requiring users to access SNSs in order to acquire information easily and quickly, regardless of their interest in the SNS otherwise. The interviewee in his 30s pointed out that organising a social event on Facebook or checking others' events is one of his main reasons for accessing Facebook. A SNS is a place of social information exchange.

7.2.4. What are the symptoms of digital anxiety?

I conclude that the symptoms of digital anxiety are high usage, addictive reaction, digital preference, social anxiety, addiction to social networking sites, and physical symptoms.

Smart mobile users who demonstrate *high usage* admit the following behaviours: checking their smartphone for no clear reason, using their smartphone when they should not (such as in class), feeling an urge to use their smartphone straight after putting it away, carrying their smartphone even when going to the toilet, and being encouraged to use their smartphone due to smartphone notifications. The first four

behaviours are quite clear and reasonable. The last one was explored in an in-depth discussion in the literature review (see section 2.2.2). Notifications were explored as one of the biggest factors contributing to addition to smart mobile devices. Smart mobile users find it hard to ignore the notifications about emails, subscribed information, social networking sites, and other mobile applications. In the questionnaire, one participant wrote that notifications pushed him to check his smartphone. A few participants mentioned that they feel anxious when they see notifications such as a number on a mobile app icon. They feel the need to check the notification immediately after seeing it.

Smart mobile users who show *addictive reaction* have the following behaviours: losing focus at work due to their smartphone, keeping their smartphone in mind even when they are not using it, and feeling stressed when their smartphone is not connected to the Internet. These addictive reactions have increased significantly since people have had access to full Internet data signal and Wi Fi signal in so many places. I found it interesting that I could not remember what I used to do while was waiting for transportation before had had my smartphone. I had a strong desire to be connected to the Internet. Searching for information and scanning others' activities became my way of killing time. The information I read is not of particular importance. I might forget many of the things I have read after a few hours, as I discussed in section 2.2.2.

Digital preference manifests as the following behaviours: being happy to pay for smartphone applications, preferring to surf the web on a smartphone rather than on a laptop, and reading the news mostly on a smartphone. These questions focus on how smart mobile users have an ability to control smart mobile functions. One interviewee who is in his 20s preferred digital reading because he was practiced at reading on his Kindle. He used the practical features on his Kindle application such as searching for highlighted content, using the online dictionary, and saving memos. He also preferred to check the number of sentences other people had highlighted; this is because this number represents a useful reference in the book.

This is important. In order to understand the differences in digital preference from one generation to the next, we must study digital addiction. The reason is that each generation uses the digital devices and media that they are used to. Even if different

generations use the same device, their user experiences are likely to be different. The highest age group of the average of Smart Mobile Addiction Test scores was the 35 to 44 year olds (see section 6.1.5). The interesting thing was that both the 18 to 24 year old group and the 35 to 44 year old group scored highest for *high usage*. This meant that those in the young age group think they have less addictive reaction, social anxiety, social networking site addiction, and physical symptoms resulting from smart mobile addiction. Another important point is that the interviewees in their 30s and 40s complained more about stress resulting from interactions on social networking sites than those in their 20s. This is a different result from what was suggested by the literature review. I doubt that researchers including myself really understand young people who were born with smart mobile devices. There is a possibility that researchers including myself focus only on traditional ways of forming relationships or defining addiction. The younger generation was born with the use of social networking sites; online social places were not a new concept for them. Smart mobile devices and social networking sites have been available since when they were teenagers or children. I worried about this during my research. This is because I participated in the development of an arts education mobile application for children during my master's degree, but it was aimed only at younger children who were practiced at using smart mobile devices and social media, and so I was not really concerned with teenagers and those in their 20s. There can be a gap between young smart mobile users and researchers in terms of what they consider to be smart mobile addiction; also, young smart mobile users have a different view of what constitutes a close social relation. What adults consider to be a shallow social relationship might not be for young smart mobile users.

Smart mobile users who have *social anxiety* have a high preference for developing friendships and relationships mostly through smartphone communication rather than through face-to-face to communication, talking to friends and family via their smartphones rather than talking face-to-face, and considering that being unable to use their smartphone is as painful as losing a friend. My interviewees and the respondents mostly answered that they prefer to talk on the phone with close friends and family members, but prefer to talk with friends by sending a text or using a social networking site chat function. The participants in my main drawing experiment thought that making a call or meeting to face is important for forming a good relationship with

someone if the person is important to them. However, smart mobile devices provide technological advantages, allowing people to connect wherever they are and at any time. Social networking sites allow for the formation of large groups of acquaintances. I did not find any participants who responded that they preferred to talk to their friends and family via a smartphone rather than talking face-to-face, but most of the participants responded that text-based communication occupies over 60% of their smart mobile communication, and the others said that text is a dominant form of communication for them. It is possible that smart mobile users are not aware of the changes they are making to their social relations, as I felt less need to meet someone offline (see section 4.5.2).

In line with Sherry Turkle's argument about us being "alone and together", I think it is important to discuss how the view of social interactions has changed from the use of the mobile phone to the use of smart mobile devices. It is important to establish how people's positions have changed in their social structures through changes to their personal devices (see section 2.2.). The importance of relationships online and offline can be paralleled by the blurred boundary between online and offline life. This has accelerated since smart mobile users have adopted the advantages of smart technology.

Smart mobile users who are *addicted to social networking sites* exhibit the following behaviours: frequently checking information on a smartphone, checking SNSs (social networking sites) such as Twitter or Facebook right after they wake up, and checking their smartphone so as not to miss updates on Twitter or Facebook. These social networking sites also have accelerated changes to the value of relationships or a friendships both online and offline. As I discussed in section 2.2.3., social networking sites are egocentric networks. Being stressed by watching other users' lifestyles was a common issue from my interviewees (see section 4.5.4). This made them compare the quality of their own life with those of their online friends. Moreover, they were conscious of how others think of them. They thought their life would be valued by how they appear on social networking sites, and they felt jealous when they saw others' attractive-looking lives. For these reasons, social networking sites have a totally different meaning from web sites. Social networking sites mean, literally, sites where we can socialise. Therefore, there are visible social groups and invisible social

groups. My interviewee told of a hurtful experience of social rejection (see section 4.5.5.). Social networking site users constantly check their smartphones so as not to miss updates on Twitter or Facebook. This is because users do not want to become distant from others. I doubt that social networking sites satisfy users' desire to create a meaningful social life. My perception is that users' lives on social networking sites are exaggerated, and that users worry about the other people around them.

Smart mobile users who feel *physical symptoms* exhibit the following behaviours: they experience blurred vision due to excessive smartphone use, feel pain in their wrists and/or in the back of their neck whilst using their smartphone, and feel tired and lack adequate sleep due to excessive smartphone use. There is much research and many news articles indicating that the excessive use of smart mobile devices damages users' health. I explored whether smart mobile addiction could damage users' mental health, but was not able to research how addiction hurts users' physical health. This issue is only barely touched upon in my research project, and belongs more to the subject of medical science. However, I surmise that awareness of side effects of smart mobile addiction will constitute meaningful further research into digital wellbeing. There are digital detox programmes such as travelling camps. This is a meaningful course of action, but I am proposing a sustainable programme throughout smart mobile use, rather than a single event.

7.2.5. *How does digital drawing/digital doodling affect digital anxiety?*

I hypothesized that drawing positively affects digital anxiety. Broadly, the participants who were identified as having digital anxiety showed more engagement with the drawing tasks, but there were exceptions (see 6.3.3.). What was interesting was that there was a large difference in the engagement between individual participants of different genders; women participated much more actively in the drawing experiment than men. Therefore, a few female participants who were paired with a male partner were unsatisfied with their drawing conversations because of the lack of response they received from their partners. However, there was an exception, which was Case Nine.

7.2.5.1. Emotions

Participants have described how drawing helped them to share their feelings in the following way: one pair had a good laugh over the emoticons, which helped them

bond better as they both shared in the joke, and one participant imagined her partner might look like her emoticons, which helped her to build up a closer relationship with that person. This was the pair in which both participants were identified as having digital anxiety. One of them said that the emoticons in the on-screen emoticon keyboard were used much more frequently due to their speed and convenience. Drawing is a slow form of communicating that demands time and effort in order to convey ideas and thoughts, rather than a form of convenience. As I argued in chapter two, drawing is an indirect way of expressing one's thoughts. A few participants did not use certain emoticons such as those expressing 'anger'. This is because an emoticon expresses a particular emotion, which the participants did not feel. Many of the participants used their emoticons not only with their partners but also with other people they were communicating with online, because it was an effective means of expressing their feelings.

7.2.5.2. *Memory and Mind*

Drawing was helpful to both the drawer and the viewer. Drawings were imprinted on the drawer's memory by allowing them to recall a previously hazy memory, solidifying that memory, and allowing them to delineate it with lines and colours. The scene in the participant's memory comprised a sequence making up a story they wanted to describe; therefore, the drawer was obliged to follow the track of his memory. The drawers experienced certain emotions while drawing; these became another story in their memories. The drawers shared their drawings of their memories with their partners; this became yet another memory, as they shared their emotions, for example laughing about a particular drawing. Drawing was also imprinted on the viewers' memories; thus, a number of participants remembered what their partners did or ate, as well as how they were feeling while they were conversing through drawing. Having those stories strengthened their memories. A few participants used terms such as 'reinforce' or 'push' to describe this process. The use of colour was important in helping certain images to be imprinted on users' memories. The participant who used black made less of an impression both on himself and on his partner. It was interesting that he remembered what his partner ate but did not remember what he himself had eaten. I found that emotion is strongly related to memory throughout my research. The participants found that drawings that were made while experiencing positive feelings such as happiness or a state of relaxation helped them to remember. Lastly,

many participants had difficulty conducting an ideational drawing, which I called ‘conceptual visualisation’ in my drawing experiment. They thought that visualising things they had partially or totally forgotten was a challenge. There were three tasks regarding conceptual visualization in the drawing experiment. These were: drawing a song, illustrating a person who the participant had temporarily forgotten, and depicting an English word that the participant cannot remember. Drawing a song was comparatively easy because this was similar to the expression of a mood. However, participants made image connections between their memory of the song and their drawing, and this new image became what they recalled when they thought of the song. Two participants found it useful to draw English words that they found it hard to remember. For some participants, English was not their native language, and others were bilingual. A number of participants found that they could more easily remember a word after drawing it.

Drawing inspires smart mobile users by retaining pictorial images in the memory. One participant felt close to his partner through the experiment, and admired some of his partner’s sketches and ideas. This participant wanted to meet his partner because her drawings still lingered in his mind. The participants copied their partner’s drawing styles, and sent them to their partners. This action shows how much they liked their partners’ drawings. Other participants helped one another develop their drawings collaboratively by making references to colour, texture, etc.

7.2.5.3. *Unexpected Collaboration*

One pair drew on photos they had taken in order to convey more with a single image, with one participant imitating their partner’s style of creation. These cases are a form of drawing collaboration. I did not intend this when I designed the drawing experiment, but had some expectation that there would be some form of interactions such as drawing collaboration. These cases come close to asynchronous arts collaboration.

7.2.5.4. *Support and Encouragement*

A bond of sympathy developed between the participants through drawing. There were many cases in which the participants drew images or created drawing emoticons in order to comfort each other, to encourage their partner, to share something they liked

about their day. I gave them the daily task of ‘drawing an interesting moment’; this was expanded to allow sympathy for a partner’s life story. The participants sent drawings of flowers or grassland as greetings, drawings representing ‘good luck’ for a partner with an essay deadline, drawings telling the other to relax, etc. It was interesting that smart mobile users made an effort to use their creativity for their partner’s benefit. There were a number of drawings saying good luck; for example, one participant drew a four-leaf clover, a rainbow, and a thumbs-up.

The participants were encouraged to find a state of wellbeing through drawing their lifestyles and depicting their emotions. Many of the participants became aware of their eating behaviour. In these cases, the participants thought drawing made them aware of what they were usually having as meals. The drawings made it seem real. Some of them realised that they should change their problematic eating habits. Participants thought that they should do more activity to improve their health as they became aware of a certain routine in their daily lives. I did expect that drawing would affect smart mobile users’ physical health, but many participants discovered through drawing what they needed for a better lifestyle. Some participants mentioned that they were able to relax by seeing their drawings of previous moments when they had been relaxed, such as depictions of them doing yoga. They recalled the relaxing moment, and the memory helped them feel better. One participant drew his version of paradise, and set it as his mobile screen background in order to relax. I found this participant interesting. She designed a number of characters. The first character was a human figure, who introduced places where she had watched a movie or showed what she had eaten. Later in the experiment, she reflected on the animals and colours she liked, and so created a new character, which was a blue bear. The blue bear was depicted as flipping a frying pan to cook a sausage, crying and eating popcorn while watching a movie, saying ‘have a good weekend’, and getting angry, showing his claws. This was an impressive case in which the participant developed my drawing assignments in her own way.

7.2.6. *How can my research help improve smart mobile users’ wellbeing?*

Some users explored their unhealthy lifestyles in their digital drawings. Some of them noted that they need to improve their wellbeing and some of them took action to improve their lifestyle. Through my digital drawing experiment, I identified three

aspects of participants' unhealthy lives. These are unhealthy eating habits, repetition and routine, and poor memories. Some participants realised that they were eating the same food every day or that they were eating unhealthy food. Others found that their daily routine was monotonous. Some of them made changes, finding new activities. Changes to their repetitive daily lives gave them new energy. Some participants drew these changes, and after a while, seeing the drawings helped them to feel positive. A few participants found that digital drawing helped them recall how much they had liked to draw in the past. Since then, they have occasionally started to draw again. Interestingly, they have begun to use analogue tools such as paper and pencil, not digital tools.

7.3. Key Contributions to New Knowledge

The key contributions are: new concepts of digital anxiety, effective communications for helping alleviate digital anxiety, and effective digital drawing content to alleviate digital anxiety.

7.3.1. *New Concepts of Digital Anxiety*

Cox and Onuf used the term 'digital anxiety' in 2003 (see section 2.1). Clarifying and developing the term has been one of my research aims. In my research, digital anxiety is a generic term to denote the appearance of different kinds of problems resulting from the use of smart mobile devices. I investigated digital anxiety from various angles. I established a theoretical framework, and used different methods such as self-exploration, in-depth interviews, surveys, and open-ended questionnaires. Sherry Turkle and Nicholas Carr were the main theorists underpinning my research. Turkle posited that an over-reliance on digital communication could result in feelings of real-world isolation and loneliness, emotional disconnection, anxiety and mental exhaustion (Turkle, 2013). I found during my self-exploration that I strongly wanted to use my smartphone, especially when I had a spare 5 or 10 minutes, for example while waiting for transportation. I tried to cast my mind back to the past in order to remember what I used to do while waiting for public transportation before owning a smartphone, but I cannot clearly remember. My interviewees, like me, reported that seeking social interaction and information were their main motivations for accessing smart mobile devices. Social networking sites became an important social space, and blurred the boundary between users' online and offline lives. Thus, the interviewees

mentioned that they felt worried about being judged by other online users. Therefore, as Turkle said, people display the best aspects of their lifestyles on social networking sites (Turkle, 2013). The interviewees complained about feeling uncomfortable when they observed others' lifestyles. This made them have unhealthy thoughts, comparing their own lives with the best aspects of others'.

My data suggests that smart mobile users were experiencing and exhibiting problematic behaviour as a result of excessive usage of their smart mobile devices. These problematic emotions include loneliness, emotional disconnection, social anxiety, oversensitivity, etc. Problematic behaviours include constantly checking their smartphone, using their smartphone when they should not (for example, in class or in a meeting), checking social networking sites immediately after waking up, etc. These problematic emotions and behaviours were identified using the Smart Mobile Addiction Test (SMAT). This test is a modified version of the Smartphone Addiction Scale (Kwon, 2013). The SMAT results were surveyed, their validity proved through factor analysis. The problematic emotions and behaviours were divided into high usage, addictive reaction, digital preference, social anxiety, addiction to social networking sites, and physical symptoms. High usage includes smart mobile addiction, social network addiction, and information addiction. In previous chapters, I used the term 'text addiction' to describe information addiction. When I studied the scholarly literature related to text addiction, I understood that users were addicted to reading digitally and typing. I assumed that this was one of the reasons why smart mobile users preferred text-based communication to spoken communication. Since then, I have looked more closely at possible reasons for text addiction.

I found that smart mobile users were addicted to gathering information rather than being addicted to text itself. They had a strong desire to acquire knowledge and to scan new information. This was one of their main motivations for accessing their smart mobile devices. Secondly, smart mobile users prefer communicating using text, rather than other forms of communication. This preference stems from the advantages of communicating via text, such as its convenience, rapidity, and it being free of charge. Thus, in the literature review, interviews, and open-ended questionnaires, I found a high preference for text-based communication instead of other types of communication via smart mobile devices. This, however, varied with age. In my

literature review, I made reference to the younger generations, Generation Net (Tapscott, 2008) and the App Generation (Howard and Davis, 2013), and explained that they, more than other generations, note their exhaustion and lack of time; they are always online, and their time is highly leveraged through multitasking.

7.3.2. Findings: Effective Communication for Alleviating Digital Anxiety

7.3.2.1. Asynchronous Communication

The development of digital devices has enabled users to share and collaborate (Godwin-Jones, 2005). The multiple channels of digital media amplify the places where users are able to share and collaborate (Hayles, 2012). Social media allows users to have their own public voice (Loader and Mercea, 2012). I researched asynchronous and synchronous communication in my pilot studies 2 and 3, in order to understand the way users interact socially and collaborate. Social media are online social platforms that consist of both synchronous and asynchronous communication. As I wrote in section 4.3.1., synchronous communication involves sharing a view of an online space, in the sense of ‘what you see is what I see’ (Li and Hopper, 1998). A great number of people use social media, suggesting the success of this kind of synchronous communication. There is a higher possibility that other users will look at the same online content and they take actions based on that content, such as writing a comment on it, even if they had not planned to see that content at the same time. Synchronous communication looks dynamic, and as I suggested in section 2.2.3., it quickly shapes a social structure. Thus, I expected synchronous arts collaboration might create some interesting synergy until I studied the topic of digital arts content created through collaboration (see section 4.3).

In Pilot Study 2, I found that many popular collaborative arts projects were based on an asynchronous system. This was not what I had expected, so I ran workshops of synchronous drawing collaborations. I found that precise guidelines are necessary in drawing collaborations, such as having a goal for the drawing project. Synchronous drawing collaboration did not work as I had expected. I thought that people would draw on one another’s pictures, developing them. However, each participant avoided the areas where other people were drawing. Each person kept to his or her own area of paper. I expected that they would discuss how to approach the drawing collaboration,

choosing a topic, for example. There was some encouragement about other people's drawings. For example, the postgraduate group shared some anecdotes about their holidays. However, I did not find that they collaborated in any significant way. On the other hand, I found examples of asynchronous collaborative arts projects, such as Virtual Choir and the Jonny Cash Project, which are like arts versions of Wikipedia. I was interested in researching collaborative projects because users' contributions – their ideas, and the time they spend collaborating, are advantages online. They might create a powerful synergy on smart mobile devices. However, my research focuses more on the value of communication in digital drawing instead of digital arts projects. I decided on Drawingtalk for Kakao (see section 4.3.1.) as a tool for conducting my digital drawing experiment.

I will divide the reasons why asynchronous arts collaboration created a powerful synergy into two. More details can be seen in section 4.3. Firstly, an asynchronous system requires gathering arts pieces from the participants, and a project leader or a designed digital system reorganizes the collected art pieces. For example, Virtual Choir was recreated by Eric Whitacre after he received short films from participants around the world. The Jonny Cash Project, on the other hand, was managed by a web system after participants sent their drawings to a website. The process of reorganization or recreation is omitted from synchronous arts collaboration. Secondly, asynchronous collaboration involves a time gap. Participants have enough time to think of how they would like to contribute. Their creations are contributed one by one; and are redesigned as part of the collaboration. A synchronous system is spontaneous, and allows little opportunity for participants to be concerned about their contributions. But I think there is still some potential here that I have not discovered yet. Synchronous collaboration might provide opportunities for brilliant ideas to spontaneously emerge if people are thinking together and being creative in real time. I am interested in developing a digital programme that enables real time media arts collaboration in the future. My master's thesis was about arts collaboration in real time between two smart mobile users, although I focused on the process of designing a mobile application called 'Bo Pollock'. In future research, I will explore how to support the spontaneous production of ideas through real-time art projects.

7.3.2.2. *Digital Drawing as a communication tool*

It was a long process, involving multiple failures, to come to the conclusion that digital drawing can be a type of smart mobile communication. However, it is clear from my data that digital drawing is a supportive, rather than a primary, mobile communication tool. I reviewed the scholarly literature regarding the excessive use of text-based communication (see section 2.2.2.). This suggested that the predominant type of mobile communication is text-based. My interviewees used social networking sites, mobile chat applications, and texts to communicate with one another. Some participants in my digital drawing experiment claimed that they had difficulty communicating through drawing because they felt that it was easier to send text. I found that drawing had a positive impact on users, enhancing their memory, strengthening their relationships, inspiring optimism and aspects of digital wellbeing. Nevertheless, using digital drawing as a communication tool is a different matter. First, we must consider the definition of communication. Communication is [1] the imparting or exchanging of information by speaking, writing, or using some other medium or [2] a means of sending or receiving information, such as telephone lines or computers (Dictionaries and Waite, 2012). Digital drawing was a useful medium of exchanging information or ideas by sending and receiving drawings through the mobile application. It was difficult for the participants to accurately express what they wanted to convey through drawing, so many comments and conversations using text naturally followed. I therefore emphasised that digital drawing is used as a supportive communication tool. In traditional analogue drawing, rather than digital drawing, participants may express themselves in different ways. Users with poor digital drawing skills are less free to express themselves than they are in traditional drawing. Moreover, the size of the smartphone screen is an important limitation, making it difficult to express one's thoughts in pictures. But there are many other benefits to using smartphones as tools for digital drawing (see section 2.3.7.).

I designed my digital drawing experiment after much trial and error. At the early stages of thinking about the digital drawing experiment, I focused on the core elements of communication, which include the language of drawing. I reviewed the

literature regarding pictorial language, but this was removed after the direction of my research became clear. Many ancient languages inhabit a position somewhere between pictures and letters. At different periods, several cultures in Mesoamerican and Andean South America wrote with hieroglyphics, pictorial images, and abstract signs, combining elements of all three to different degrees (Boone and Mignolo, 1994). The Maya script, along with Sumerian and Chinese, is a morphemic or morphosyllabic system, and therefore classified as “real writing” by Hill and DeFrancis (cited in Boone and Mignolo, 1994). I wanted to design an online sharing platform similar to Wikipedia, where people can create, share, and edit pictographs. I tested this project with my participants, asking them to create a pictorial language through digital drawing. iPads were used to create them. During the creation of pictograms, I felt the need for certain language rules in the creation of these pictographs, and realised that some aspect of the experiment was not working. During the testing period, I felt that this project was biased towards linguistics, and was not researching the relationship between digital drawing or drawing language and digital anxiety. The reason I wanted to establish a Wikipedia-style pictorial sharing platform was because it would allow sharing and collaboration, which are advantages of digital communication on smartphones and social networking sites. Since then, I have been studying aspects and consequences of digital anxiety, and how drawing or drawing training can help alleviate it. So, I designed a digital drawing experiment. This can be broken down into: aims of the experiment, a selection of digital drawing tools, a design of digital drawing tasks, themes of the study, and my method of pairing participants. Thus, drawing became a supportive communication tool in my digital drawing experiment.

7.3.3. Effective Digital Drawing Content for Relieving Digital Anxiety

There are differences between drawing and digital drawing as methods of communication. Drawing on a digital screen may be easier or more difficult than drawing on paper, depending on the user. This depends on users’ technical skills. My research focused on digital communication as well as drawing, so technical factors such as the communication type used by the smart mobile devices, such as asynchronous or synchronous communication, was also important. My research into how digital anxiety negatively affects users’ memories is limited to short term

memory. Thus, the drawing tasks given to the participants of the digital drawing experiment were a type of iterative training that could enhance short term memory. They included, for example, ‘Doodle the food you had today’ and ‘Doodle an interesting moment from today’. As a result, when two individuals identified as having digital anxiety were paired in the experiment, they had much more productive and emotionally involved communication than other pairs. When the person with the highest degree of digital anxiety and the person with the lowest degree of digital anxiety were paired, they ended up modifying the given drawing task. This only happened with them. It is important to note that only one man had digital anxiety among the participants. I have not included a discussion of the way digital anxiety affects different genders in this project, because in order to achieve reliable results it will be necessary to replicate the experiment with a larger sample size. As a result, his partner, a female participant, was more actively engaged in the drawing assignments than he was, and provided an interesting discussion of ‘*aporia*’ in her assessment of the conceptual visualization task. The pairs of participants who did not suffer from digital anxiety showed active participation in the experiment. These are Case 10 and Case 14. The participants in Case 10 felt the need to explain their drawings with a lot of text, because they worried that their meaning might otherwise be misinterpreted. I will emphasise again at this point that drawing is a *supportive* communication tool. In Case 14, it can be seen that drawing is helpful to develop the creativity of participants when it is used as a daily conversation tool. The task of drawing one’s own appearance had especially creative results. In the pilot study, I focused on drawing based on synchronous communication. The reason is that I was aware of the potential creative synergy when people collaborate in real time. However, asynchronous collaboration has been more effective in facilitating impactful creations.

I conclude that asynchronous collaboration is suitable if I can find a connection between asynchronous and synchronous communication in my digital anxiety study. One of the factors that cause digital anxiety is rapid information acquisition and consumption. This can cause smart mobile addiction as well. Real-time synchronous communication is the fastest way to share information. At the beginning of my research, I noted that various technical aspects of smartphones were advantages, such as their real-time communication capabilities and the fact that they operate like mini

computers. I assumed that these advantages would be useful for relieving digital anxiety if can be harnessed for creative purposes. I found that some aspects of this thinking were mistaken. Problems relating to digital anxiety include memory loss, emotional anxiety, and social anxiety. In order to solve these problems, it is necessary to constantly train oneself, for example making enough time each day for drawing practice. It is difficult to expect an instant, non-persistent activity such as synchronous collaboration to have a positive effect on digital anxiety. Therefore, the digital drawing tasks provided to the participants were based on an asynchronous system and were divided into five themes.

These five themes were emotion, social relations, day memory, spatial memory, and conceptual visualisation.

The theme that was evaluated most positively from my digital drawing experiment was memory. Many participants were able to remember the food they had eaten a few days or weeks ago as a result of the drawing exercises. In addition, several participants also remembered the food that their experiment partner had eaten. Participants could remember through recalling the process of drawing, remembering their drawings, or thinking about fun moments when they had talked through drawing. One participant did not remember the food he had eaten, but he did remember what his partner ate. I have concluded that this is because he drew all his drawings in only black, but his partner used various colours, making his drawings more memorable. One participant described the process by which drawing was inscribed in their memory; they said that drawing was helpful to firm up their memories by compelling them to recall an event, solidify an image in their mind, and think about how that could be represented in drawing. Many participants talked about 'selecting the image' to draw a 'moment'. This thought process has a positive impact on memory. Participants did a self-evaluation before sending their drawings to their experiment partners. This provided time to think about whether or not their partner would understand what their drawing was intended to represent. Again, this reveals that asynchronous communication is a better way of alleviating digital anxiety.

I found that the emotions they experienced during the experiment affected participants' memories. This became clear from the words they used in their self-evaluations: 'laugh', 'joy', 'funny', for example, in their answers to questions about 'memory'. I can conclude that emotions are accompanied by memories of those emotions.

The theme of 'social relationships' included the tasks of introducing oneself, drawing a self-portrait, and designing emoticons. The participants did not know each other; they had to introduce themselves with drawings in order to find out more about each other once they had been paired up. In order to introduce themselves, participants drew aspects of their identities, such as their name, age, and nationality. Interestingly, in this process, inferences, questions, and answers were made based on the drawings. In most cases, nationality was expressed through a national flag. In the case of dual-nationality participants, a number of flags were drawn and a percentage was added to each flag.

In response to being asked to draw their portrait, there were three major reactions. The first was that participants answered that this was a good opportunity to imagine and observe their own appearance. The second was that this was a difficult new challenge. A very small number of participants also responded that they did not want to draw themselves. However, these participants also expressed certain aspects of their appearance, such as their dark brown curly hair. Participants differed in their style of drawing, but some of their drawings of their daily activities included their own image. For example, I was able to figure out their physical appearance through drawings of them jogging, ordering a meal at a restaurant, or moving things around.

The emoticon design task was one of the participants' favorites, and helped to build rapport between experiment partners. Although many participants acknowledged that drawing emoticons was a useful way of expressing their emotions, some preferred to use emoticons already installed on their mobiles. The reason was that these are convenient and made it possible to respond quickly to texts. Fast response and fast consumption were identified as factors leading to digital anxiety. I have inferred that sending emoticons designed by users is more positive than sending emoticons already

installed on smartphones. Some participants said they used the drawing emoticons not only with their partner but also other friends. However, it is not clear that this is a better way of forming friendships than using emoticons installed on smartphones. I used the open-ended questionnaire to gather the participants' thoughts about this digital drawing experiment. It is helpful to analyse what they said about their experiences. However, if I were to replicate this in future research, I would like to observe participants using scientific tools. I do not have a clear idea of what precisely this would comprise, but EEG would be one option.

The theme of 'conceptual visualisation' is especially relevant for bilingual participants whose native language is not English. This drawing task did not need to be carried out every day during the experiment. It was designed to help participants' remember words they had temporarily forgotten. Even in someone's native language, sometimes it is possible to forget a word. I am Korean. Korean is my native language, and sometimes I cannot find the words I want to say in English. Unfortunately, none of the participants whose native language is English discussed this drawing task. However, as I have mentioned, some participants who were not native speakers of English drew a faint image when there was a word they suddenly could not remember, and found that, through this task, eventually they remembered them. Some participants found that there were certain English words they repeatedly forgot because English was not their first language. However, they did not forget the images, which became associated with the words, once they had drawn them. It was an important part of my experiment to encourage participants to draw vague thoughts and dimly remembered images.

7.4. Possible Limitations

I found several limitations of this experiment in the process of analysing my research data and writing this thesis. Section 7.4.5 explores this, because I think it is interesting and should be included in my research.

7.4.1. *Setting Range for Digital Anxiety*

I have studied the concept of smartphone addiction, why users are addicted to smartphones, addicted behaviours, and the consequences of being addicted to

smartphones. However, the scope of this study is limited to everyday life. I did not include specific reasons for addiction or areas of frequent addiction. For example, the smartphone game market currently occupies a large segment of the mobile application market. I understand that games can be a big part of smartphone addiction. But my research goal was to sort out the patterns of everyday life for users who are addicted to smartphones, and to understand the changes in people's online and offline lives as a result of social networking sites. In addition, I studied how people relate to devices and media and how they communicate. I studied whether there was a change in people's emotions due to the use of addictive devices and media. I established that users do not always recognize feelings of discomfort and addictive behaviours as symptoms of digital anxiety.

7.4.2. *Limitations of New Concepts of Digital Anxiety*

Digital Anxiety is the most important keyword throughout my thesis. There were some limitations to my study that I discovered while investigating new concepts of digital anxiety. In the survey, I found a nearly significant difference between the age groups that reported high usage. The 35 to 44 year old group reported the highest usage. The person who got the highest score was a male in his thirties, a banker who had been through higher education. I did not write this in my quantitative analysis because it was not relevant to the factor analysis. However, I now think that there might be correlations among age, education background, information addiction, smartphone addiction, and addiction to social networking sites. Social networking sites have become a popular channel through which users can receive fast updated news. For example, my interviewee in his 30s highlighted that he often accesses his social networking sites to check newly updated information, as well as for social interaction. For eight months, from February to October 2016, I managed a number of education programmes at a museum. This gave me a chance to observe how older people use their smartphones and for what reasons. This is not a method that I used for my current PhD research but it encouraged me to think about future research. The correlation between age and educational background is also important when doing statistical analysis on smartphone use or smartphone addiction. The museum education programme that I designed was an elderly cultural education programme, which was conducted with two groups. The first group comprised elderly people with

low education. The elderly in the second group were highly educated because they were retired teachers. Both groups were involved in cultural activities through the creation of associations. Therefore, they were very active communicators. However, the methods of communication and data sharing differed between the two groups. The second group used smartphones more often and shared most of their data with smartphones. They wanted to get training materials in digital format before the class. On the other hand, the first group preferred to listen to instead of read the class materials, despite being able to read and write well. Despite their similar age, the two groups had many differences in the way they used smart devices. Therefore, I would suggest that using two variables, age and educational background, will be useful in finding patterns of digital anxiety. Unfortunately, I am lacking statistical data for various educational backgrounds. I will therefore leave this to a future research project.

In conducting my interviews, I neglected to focus on the issue of economics. The open-ended questionnaires were conducted long after the interviews. In the questionnaire, a few participants mentioned that the use of mobile chat applications allows them to save money; therefore, they prefer using the app instead of sending text messages. In the literature review, I discuss how the artist Newsom highlighted the financial benefits of using smart mobile devices for art creation (see section 2.3.7). My interviewee in their 20s preferred using a Kindle to read instead of hard copy books. It is useful to point out that Kindle allows access to hundreds of thousands of books free of charge if the user joins Kindle unlimited, and also that users usually pay less for a Kindle book compared to a paper book. These financial benefits might be one reason for digital preference, which is a category of digital anxiety. These are some of the limitations of my study. I intend to explore some of them in the future.

7.4.3. *Lack of Statistical Sample*

In section 6.1.7, which details SMAT participants' scores, I found a nearly significant difference between the ages with 'high usage'. The usage among the 18 to 44 year old group does not show a large difference. However, the 35 to 44 year old group was the highest group, and then the 18 to 24 year old group followed with a slight difference. The 25 to 34 year old group showed lower scores than the other two groups. Also, I

found that different ethnic groups achieved different results in the Smart Mobile Addiction Test. The Asian groups, especially 'Chinese' and 'Any other Asian background', show the highest scores. 'White-English, Welsh, Scottish, Northern, Irish, British' and 'Black-African' participants follow after the Asian groups. I demonstrated the validity of my data through conducting statistical analysis and validity analysis, but there is a possibility that my analysis would have been strengthened if I had collected more samples for both the ages and the ethnic groups. Regarding the ethnic groups; it would be useful if I had more samples of 'Black-African' ethnicity.

Asian groups, both 'Chinese' and 'Any other background', showed the highest scores. The participant who ranked highest in the SMAT was an Asian male in his 30s who was a banker. I reviewed the literature on phablets from 2012. A high number of Asians preferred using phablets, but they were of limited appeal in Europe because Europeans prefer a smaller smartphone. I presume there is the possibility of a correlation between preference of smart mobile size, smart mobile addiction, and information addiction. It would have been useful if I had added a question asking participants' preference of smart mobile size to the Smart Mobile Addiction Test; then I might have found some correlation among ethnic groups, smart mobile size preference, smart mobile addiction, and information addiction.

7.4.4. Limitations of Digital Drawing Content for Relieving Digital Anxiety

In my experiment, memory is very important. I separated the keyword 'spatial memory' from 'memory', but the experiment did not proceed as I had intended. My intention with the 'spatial memory' task was for participants to draw a memory of a route, direction, or place. I gave participants the task of drawing where they had been that day, but they misunderstood it. As a result, few participants drew a route or direction, and most drew only a place. Thus, this task produced results that were often not very different from the task of drawing a particular 'moment' from their day. I had hoped to find a link between spatial intelligence and memory. I learned that this task had not worked in the way I had expected in the process of analysing the data after the experiment.

7.4.5. *Raising New Possibilities*

The term ‘digital anxiety’ is a key term in my research. I have used it as a generic term to denote the appearance of different kinds of problems resulting from the use of smart mobile devices. I infer that people in the age group who have used smart mobile devices since they were children – using them, for example, to watch animations – possibly think differently about digital preference and social relations. For example, there is a possibility that they think talking with friends online is equally as important as talking with friends offline. There is a possibility is that the term ‘shallow’ that I borrowed from Turkle and Carr does not apply to that age group. It would have been useful if I had also conducted research on groups of middle school students and high school students.

7.5. Future Research Plans

7.5.1. *Smart Technology and Digital Anxiety*

The main keyword of my thesis is ‘smart mobile device’, which is the communication device used by a high percentage of the world’s population. This device plays an important role in the present and future fourth industry. For example, automotive IT systems now work with smartphones to enhance user convenience. Furthermore, the iPhone integrates Siri, an artificial intelligence system, into the smartphone, so that it can work as the user’s secretary. It is constantly being invested in and developed. With the recent development of the Internet of Things, home systems such as refrigerators, humidifiers, washing machines, and air conditioners are linked with smart mobile devices. In this way, users are exposed to a wide range of environments where digital anxiety can occur in the future. Artificial intelligence is not a subject covered in my thesis. However, artificial intelligence is nevertheless related to users’ heavy reliance on smart mobile devices. Users should consider the side effects of science, technology, devices, and media as they evolve. Digital anxiety will be relevant not only to smart mobile devices but also to advanced technologies. Users should moderate their use of evolving technology according to its side effects. As I have suggested in this thesis, that balance can be maintained in a continuous manner through daily practice. Although a method such as a digital detox camp, mentioned previously, may have a positive effect, I would instead recommend a more consistent, continuous method that becomes part of everyday life. Therefore, I focused my

experiment on drawing, the communication between two people, and daily tasks. There is a common link between the healing art class explored in my pilot study and the digital drawing experiment in my main study. Creative drawing and conversation formed the basic framework of both class and experiment. As Pilot Study 4 found, users seek relationships with others and want to acquire ongoing information. Therefore, if users of other advanced technologies or devices are experiencing digital anxiety, I hope to find solutions that allow for constant interaction with people. Interaction between people is partly due to the desire for a relationship and partly due to the desire for new information.

Lastly, I hope that users will find the balance between the convenience and adverse effects of the device, just as participants in my experiment found a degree of well-being through digital drawing.

7.5.2. Digital Drawing, Hand Gestures, Communication

It is unclear how this section will link to my current research. I do not want to limit my study of digital drawing to drawing itself, because I think it is also related to hand gestures. There are reasons why I experimented with drawing on smartphones, and there are reasons why I have focused on communication. As the function of the mobile phone evolves, there has been a change in the way users' communicate. At first, telephone communication was the primary communication method. As the mobility of devices has evolved, shorter, more frequent text messages have become the primary means of communication, in place of telephone calls. With the advent of smart mobile devices and social networking sites, it is possible to communicate with others around the world not only via text messages but also in real time. Currently, smartphone users' main communication is text-based. However, this is also likely to change. For example, the evolution of Siri allows users to activate the device with their voice instead touching the screen with a finger. The Apple Watch, for example, is a wearable device that requires a hand gesture to work, whereas Microsoft's HoloLens is a wearable device with a virtual screen that recognizes the user's hand gestures.



Figure 43 HoloLens user moves her design work in virtual space by hand

As seen in the image, when a designer opens design software on a virtual screen, she can handle a motorcycle, viewing it from 360 degrees. What I consider important here is that HoloLens recognizes the movement of the user's hand in virtual space. This will be more convenient to users than drawing on a smartphone screen. I therefore predict some changes to the way users' communicate with wearable devices. I researched the relationship between digital anxiety, smart mobile addiction, social networking addiction, information addiction, and text-based communication. My future research will focus on wearable devices, hand gestures, communication, and their side effects. This thesis will be a useful reference point for me.

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Appendix 1: Visual Guideline

7 Steps of The "Drawing Talk Experiment"



Step1: Signing Consent



Step2: Smartphone Addiction Test
It may take less than 10 mins



Step3: Finding your partner
Your partner will be chosen on the basis of your result of the smartphone addiction test.



Step4: Psychological Test 1
First online psychological test needs to be completed to measure the level of your digital anxiety. It may take less than 10 mins

Step5: Drawing Talk with your partner



Examples of your tasks are:

- [1] Design your name in drawings
- [2] Design emoticons of the following words: hi, good morning, and good night
- [3] Design emoticons of the following emotions: funny, sad, happy, angry, sick, and tired
- [4] Design numbers in drawings
- [5] Doodle your portrait
- [6] Doodle where you have been today
- [7] Doodle the food you had today
- [8] Doodle your interesting moment today
- [9] Draw an abstract image of a word you cannot remember suddenly
- [10] Draw an abstract image of something you cannot remember suddenly
- [11] Design an abstract image of your favourite song / a piece of music



Step6: Psychological Test 2
Second online psychological test needs to be completed again to check how you have (or have not) changed through the experiment. It may take less than 10 mins



Step7: Interview
The interview will be take place to understand your thoughts on this experiment.

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Appendix 2: Consent

Goldsmiths
UNIVERSITY OF LONDON

Welcome and thank you for responding to the smartphone addiction test

My name is Bo Ram Lee and I am a PhD candidate in design at Goldsmiths, University of London. I am trying to design a therapeutic communication tool to help a smartphone user who is suffering with digital anxiety.

I would like to ask you to participate in my research if you are a smartphone user. Before you decide whether to participate it is important that you understand what the research involves and what you will be asked to do. Please take time to read this information, and do not hesitate to contact me if you have any question or need further clarification.

Participating in this research is voluntary. This test aims to explore a smartphone user's behaviour and thoughts, and to determine how it relates to smartphone addiction.

The test would require approximately 5minutes of your time. You will first be asked to provide some demographic data, and then be asked to do the test. There are no risks involved in taking part in this survey, and all data obtained for the purposes of this research will be kept confidential. You are very welcome to contact me if there is any question about this test or my research.

Bo Ram Lee
PhD candidate
Department of Design
Goldsmiths, University of London

[The “drawing talk experiment” on smartphone]

PARTICIPANT INFORMATION STATEMENT

(1) What is this study about?

You are invited to take part in a research study about exploring how drawings work in mobile communication. This study aims to understand how your behavior, emotion, and cognition regarding smartphone use may (or may not) change by running the experiment tasks.

You have been invited to participate, because you have shown interest in this study. This Statement specifies the details of the research, and will therefore help you decide if you want to take part in the experiment. Please read this sheet carefully and do not hesitate to ask any further questions.

Participation in this research study is voluntary.

By giving consent to take part in this study, you are acknowledging that you:

- ✓ Understand what you have read.
- ✓ Agree to take part in the research study as outlined below.
- ✓ Agree to the use of your personal information as described.

You will be given a copy of this Participant Information Statement to keep.

(2) Who runs the study?

The study is carried out by:

- Bo Ram Lee, PhD candidate, Department of Design, Goldsmiths.

Bo Ram Lee is conducting this study as partial fulfillment of the requirements for the degree of PhD at Goldsmiths, University of London. This will take place under the supervision of Kay Stables, Professor of Design Education, and Mike Waller, Senior Lecturer in Design.

(3) What does this study involve?

You will be required to participate in an (drawing) experiment, which entails a smartphone addiction test, two psychological tests, and an interview.

- ✓ *You will use your smartphone for the experiment, and download two mobile applications. One is a mobile chat application called 'KakaoTalk'. The other is a drawing application called 'Drawingtalk for Kakao'.*
- ✓ *The estimated period of the experiment is four weeks, but it may take longer because of the Easter break.*
- ✓ *Location does not matter; you can participate in this experiment regardless of where you are.*
- ✓ *You will be asked to complete the smartphone addiction test in order to find your experiment partner.*
- ✓ *You will be asked to complete two psychological tests to measure your digital anxiety level.*
- ✓ *You will be asked to do an interview after the experiment. This can be done either face-to-face or online. Face-to-face interviews will be recorded.*
- ✓ *You will be asked to provide a few examples of your drawing talk, for the reference of the research.*
- ✓ *Your contact details (KakaoTalk ID) will be given to your experiment partner.*

(4) How long will the study take?

You may need to spend a few hours per week over around four weeks. You may communicate with your experiment partner through KakaoTalk, which means that you do not have to come to a specific place for this study. You can complete both the psychological tests and interview online or offline. That is completely your choice.

(5) Is it possible to withdraw from the study once I have started?

Participation in this study is completely voluntary. Your decision to participate will not affect your current or future relationship with the researcher or anyone at Goldsmiths, University of London.

You are free to withdraw from the experiment if you decide to take part in the study and then change your mind later; however, I kindly ask you to make the final decision before 20th March 2015.

You are not obliged to answer all the interview questions should you feel uncomfortable. All interviews will be recorded; however, notes can be taken instead if you feel uncomfortable with the recordings.

(6) Is there any risk or cost involved in the study?

Aside from your spare time, the researcher does not expect that there will be any risk or cost involved in the study.

(7) Is there any benefit for participants?

Upon the end of experiment, two participants will be selected in a random draw to receive £50 amazon vouchers.

(8) What will happen to information collected during the study?

- ✓ *Information about participants will be recorded, collected and used in the study. They include the transcripts and/or recording of the interview, the test result, and a few examples of your drawing talks.*
- ✓ *Your data will be used for analysis, which will be part of future publications including the PhD thesis, journal articles, and conference presentations. However, your individual identity will not be revealed in any of the publications.*
- ✓ *Your personal information will be kept confidential, but your contact detail (KakaoTalk ID) will be shared with your experiment partner.*
- ✓ *All data will be stored in the researcher's own laptop. Only the researcher will have access to your data.*
- ✓ *Your data will be archived and retained for up to 10 years for further academic research purposes.*

By providing consent, you agree to the aforementioned points. Your personal information and all data collected will only be used for the purposes outlined in this Participant Information Statement.

(9) Can I tell other people about the study?

Yes, you are free to tell other people about the study.

(10) What if I would like further information about the study?

Bo Ram Lee will be available to discuss further with you and answer any question you may have. Please feel free to reach *Bo Ram Lee* at: (e-mail) or (mobile).

(11) Will I be told about the results of the study?

You have the right to receive information about the findings of the study. You can also notify the researcher in advance that you hope to receive information about the study once it is complete.

If you have read the statement and agree to give consent, please type your name below in lieu of signature:

Name:

Date:



Boram Lee

8 October 2014 · 3

Welcome and thank you for responding to the smartphone addiction test

My name is Bo Ram Lee and I am a PhD candidate in design at Goldsmiths, University of London. I am trying to design a therapeutic communication tool to help a smartphone user who is suffering with digital anxiety.

I would like to ask you to participate in my research if you are a smartphone user. Before you decide whether to participate it is important that you understand what the research involves and what you will be asked to do. Please take time to read this information, and do not hesitate to contact me if you have any question or need further clarification.

Participating in this research is voluntary. This test aims to explore a smartphone user's behaviour and thoughts, and to determine how it relates to smartphone addictions.

The test would require approximately 5minutes of your time. You will first be asked to provide some demographic data, and then be asked to do the test. There are no risks involved in taking part in this survey, and all data obtained for the purposes of this research will be kept confidential. You are very welcome to contact me if there is any question about this test or my research.

Bo Ram Lee
PhD candidate
Department of Design
Goldsmiths, University of London



Smartphone Addiction Test

Survey Participation



Boram Lee

17 March · London

Last Call for Participation!! Please Help!

[I am looking for participants to do a joyful experiment for my PhD research]

My name is Bo Ram Lee and I am a PhD candidate in design at Goldsmiths, University of London. I am designing a joyful experiment and hope you could participate in it, if you are interested. What I would like to ask you for this experiment is to doodle a few things and your daily life on a mobile drawing application, and share them with your experiment partner via a chat application. You would not need any drawing skills at all; but only need to enjoy doodling and have fun with your experiment partner!

I also would like to ask you to complete the smartphone addiction test. Your experiment partner for the experiment will be decided based on the result of the smartphone addiction test. Your potential partner can either be male or female, and an undergraduate student or a postgraduate student.

Please let me know should you are interested as your participation is significant for my research. In case you agree to participate in this experiment, I will send you a more detailed instruction and find your partner for the experiment. Thanks you for reading, and I hope to hear back from you by Thursday (20th March 2015)!

Best wishes,

Bo Ram Lee, PhD candidate
Department of Design
Goldsmiths, University of London



Please do not hesitate to message me, email me, or add me to your Facebook smile emoticon

Appendix 3: Smart Mobile Addiction Test

This is the original version of the **Smartphone Addiction Scale** (Kwon et al., 2013) which includes 48 questions.

- [1] Missing planned works due to smartphone usage
- [2] Having a hard time concentrating in class, while doing assignments, or while working due to smartphone use
- [3] Experiencing lightheadedness or blurred vision due to excessive smartphone use
- [4] Feeling pain in the wrists or at the back of the neck while using a smartphone
- [5] Feeling tired and lacking adequate sleep due to excessive smartphone use
- [6] Being incapable of doing anything without a smartphone as all schedules and personal stuff are saved in the smartphone
- [7] Neglecting matters other than smartphone use even when there are many other things to be done
- [8] Conflicting with family members due to smartphone use
- [9] Experiencing auditory hallucinations of smartphone sound while not using a smartphone
- [10] Feeling calm or cozy while using a smartphone
- [11] Feeling pleasant or excited while using a smartphone
- [12] Feeling confident while using a smartphone
- [13] Being able to get rid of stress with smartphone use
- [14] There is nothing other than smartphone use that is fun to do in my life.
- [15] Having used a smartphone just to feel good
- [16] My life would be empty without my smartphone.
- [17] Feeling most liberal while using a smartphone
- [18] Smartphone use is the most fun thing to do.
- [19] Won't be able to stand not having a smartphone
- [20] Feeling impatient and fretful when I am not holding my smartphone
- [21] Having my smartphone in my mind even when I'm not using it
- [22] I will never give up using my smartphone even when my daily life is already greatly affected by it.
- [23] Getting irritated when bothered while using my smartphone
- [24] Bringing my smartphone to the toilet even when I am in a hurry to get there

- [25] Feeling depressed, anxious, or oversensitive when I am not able to use my smartphone
- [26] Being stressed out when I am not in a hot zone (Wi-Fi area)
- [27] Always preparing my charging pack to make sure that my smartphone charged all the time
- [28] Feeling bored while doing other stuff without my smartphone
- [29] Feeling more relieved with my smartphone by my bedside when going to bed
- [30] Feeling great meeting more people via smartphone use
- [31] Feeling that my relationships with my smartphone buddies are more intimate than my relationships with my real-life friends
- [32] Not being able to use my smartphone would be as painful as losing a friend
- [33] Feeling that my smartphone buddies understand me better than my real-life friends
- [34] Constantly checking my smartphone so as not to miss conversations between other people on Twitter or Facebook
- [35] Checking SNS (Social Networking Service) sites like Twitter or Facebook right after waking up
- [36] Preferring to talk with my smartphone buddies to hanging out with my real-life friends or with the other members of my family
- [37] Not minding spending money on paid smartphone applications
- [38] Trying to hide what I have been up to in relation to my smartphone
- [39] Not being able to keep appointments due to excessive smartphone use
- [40] Having used my smartphone when I am not supposed to (in class, during a meeting, etc.)
- [41] Preferring searching from my smartphone to asking other people
- [42] My fully charged battery does not last for one whole day
- [43] Using my smartphone longer than I had intended
- [44] Feeling the urge to use my smartphone again right after I stopped using it
- [45] Having tired time and again to shorten my smartphone use time but failing all the time
- [46] Always thinking that I should shorten my smartphone use time
- [47] The people around me tell that I use my smartphone too much
- [48] Preferring Web surfing on my smartphone to doing so on computers

I modified the Smartphone Addiction Scale (SAS) as below

THE SMART MOBILE ADDICTION TEST

For the 40 statements listed below, please rate them on a scale of 1-6:

1	2	3	4	5	6
Never / Almost Never	Seldom / Rarely	Sometimes	Often	Usually / Most of the time	Always / Almost Always

1. I lose focus in class / at work due to smartphone use
2. I experience blurred vision due to excessive smartphone use
3. I feel pain in my wrists and / or in the back of my neck whilst using my smartphone
4. I feel tired and lack adequate sleep due to excessive smartphone use
5. I am incapable of doing anything without my smartphone, as all schedules and personal items are saved on it
6. I procrastinate and / or neglect tasks at hand due to my smartphone
7. I hallucinate smartphone sounds (or feel vibration) when I am not using it
8. I feel calm and comfortable whilst using my smartphone
9. I keep my smartphone in mind even when I am not using it
10. I feel stressed when my smartphone is not connected to the Internet
11. I feel pleasant / excited whilst using my smartphone
12. I carry a battery charger so my smartphone battery never goes out
13. I get irritated when someone bothers me whilst using my smartphone
14. I feel comfortable when I have smartphone by my side when going to bed
15. I constantly check my smartphone so as not to miss updates on Twitter or Facebook
16. I prefer reading digital copies on my smartphone over hard copies
17. My life would be empty without my smartphone
18. I feel great meeting people through my smartphone
19. I frequently check information on my smartphone
20. I feel impatient and fretful when I am not holding my smartphone
21. I check SNS (Social Networking Sites) like Twitter or Facebook right after I wake up
22. I read and write on my smartphone for as many hours as I do on a laptop / computer
23. I prefer talking to my friends / family via smartphone rather than talking face-to-face
24. I carry my smartphone even when going to the bathroom
25. I have tried to shorten the time I spend with my smartphone
26. I feel depressed, anxious, or oversensitive when I am not able to use my smartphone

27. I think I tend to develop friendships and relationships mostly through smartphone communication rather than through face-to-face communication
28. I read news mostly on my smartphone
29. I do not mind paying for smartphone applications
30. I would consider being unable to use my smartphone to be as painful as losing a friend
31. I tend to hide what I do with my smartphone from others
32. I use my smartphone when I should not (e.g. in class, during a meeting, etc.)
33. I prefer finding a solution (e.g. googling) by using my smartphone rather than by asking people
34. I tend to use my smartphone longer than I first intended
35. I feel some urge to use my smartphone again straight after I put it away
36. I often use my smartphone to communicate with friends on SNSs
37. I have been told I use my smartphone too much
38. I prefer surfing the web on my smartphone rather than on a laptop / computer
39. I regularly check my smartphone for no clear reason
40. I am encouraged to use my smartphone due to the smartphone notifications and alerts

Appendix 4: A Sample of the State-Trait Anxiety Inventory for Adults (5 sample items from the instrument are permitted to be reproduced for inclusion in the thesis)

For use by Bo Ram Lee only. Received from Mind Garden, Inc. on March 4, 2015

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**State-Trait Anxiety Inventory
for Adults™
Instrument and Scoring Key**

Developed by Charles D. Spielberger

in collaboration with R.L. Gorsuch, R. Lushene, P.R. Vagg, and G.A. Jacobs

Published by Mind Garden, Inc.

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www.mindgarden.com

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SELF-EVALUATION QUESTIONNAIRE STAI Form Y-1

Please provide the following information:

Name _____ Date _____ S _____

Age _____ Gender (Circle) M F T _____

DIRECTIONS:

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel *right now*, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

VERY MUCH SO
MODERATELY SO
SOMEWHAT
NOT AT ALL

- 1. I feel calm 1 2 3 4
- 2. I feel secure 1 2 3 4
- 3. I am tense 1 2 3 4
- 4. I feel strained 1 2 3 4
- 5. I feel at ease 1 2 3 4

Appendix 5: Data of Statistics

Factor Analysis

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.899
Bartlett's Test of Sphericity	Approx. Chi-Square	3752.051
	df	780
	Sig.	.000

Rotated Component Matrix^aRotated Component Matrix, table, 2 levels of column headers and 1 levels of row headers, table with 11 columns and 45 rows

	Component									
	1	2	3	4	5	6	7	8	9	10
Q39	.739									
Q21	.696									
Q34	.671									
Q35	.654									
Q15	.651									
Q32	.635									
Q37	.553									
Q40	.518									
Q17	.499									
Q33	.465									

Q14										
Q29		.687								
Q18		.667								
Q28		.566								
Q38		.558								
Q24		.536								
Q16		.503								
Q22		.477								
Q27			.744							
Q23			.733							
Q30			.638							
Q20			.546							
Q8				.764						
Q11				.678						
Q6	.460			.492						
Q1	.473			.480						
Q9				.423						
Q12					.709					
Q13					.572					
Q26	.412				.420					
Q5						.717				
Q19	.427					.495				
Q10						.473				
Q2							.779			
Q3							.609			
Q4							.505	.431		
Q7								.717		
Q31										
Q25									.715	
Q36										.840

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.^a
 a. Rotation converged in 17 iterations.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.894
Bartlett's Test of Sphericity	Approx. Chi-Square	3518.391
	df	703
	Sig.	.000

Rotated Component Matrix^a Rotated Component Matrix, table, 2 levels of column headers and 1 levels of row headers, table with 10 columns and 43 rows

	Component								
	1	2	3	4	5	6	7	8	9
Q39	.737								

Q34	.723								
Q35	.670								
Q21	.659								
Q32	.651								
Q15	.588								
Q40	.538								
Q37	.525				.456				
Q33	.504	.432							
Q1	.467		.458						
Q29		.659							
Q28		.657							
Q38		.629							
Q16		.560							
Q18		.555							
Q24		.472							
Q22		.461							
Q5		.409							
Q8			.759						
Q11			.648						
Q6	.476		.562						
Q9			.551						
Q10			.509						
Q19	.409		.416						
Q27				.783					
Q23				.756					
Q30				.533			.478		
Q20				.491					
Q12					.666				
Q13					.585				
Q26					.490				
Q25					.419				
Q2						.727			
Q3						.726			
Q4						.576			
Q17	.438						.556		
Q7								.628	
Q36									.807

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.^a

a. Rotation converged in 19 iterations.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.894
Bartlett's Test of Sphericity	Approx. Chi-Square	3313.961
	df	595
	Sig.	.000

Rotated Component Matrix^aRotated Component Matrix, table, 2 levels of column headers and 1 levels of row headers, table with 9 columns and 40 rows

	Component							
	1	2	3	4	5	6	7	8
Q39	.726							
Q34	.706							
Q32	.680							
Q35	.676							
Q21	.620							
Q15	.546							
Q40	.544							
Q37	.542							
Q6	.489			.486				
Q1	.482			.479				
Q33	.460							
Q26	.419						.415	
Q29		.689						
Q18		.641						
Q24		.573						
Q38		.563						
Q28		.555						
Q22		.428						
Q27			.800					
Q23			.769					
Q30			.533					.447
Q20			.480					
Q8				.809				
Q11				.693				
Q9				.466				
Q5					.630			
Q19					.629			
Q10					.425			
Q3						.778		
Q4						.644		
Q2						.625		.415
Q12							.697	
Q13							.668	
Q16		.448						.542
Q17	.495							.504

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.^a

a. Rotation converged in 16 iterations.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.898
Bartlett's Test of Sphericity	Approx. Chi-Square	2894.216
	df	465
	Sig.	.000

Rotated Component Matrix^a Rotated Component Matrix, table, 2 levels of column headers and 1 levels of row headers, table with 8 columns and 36 rows

	Component						
	1	2	3	4	5	6	7
Q39	.729						
Q32	.686						
Q34	.674						
Q21	.663						
Q35	.657						
Q15	.619						.421
Q37	.583						
Q40	.544						
Q26	.474						
Q33	.426				.420		
Q29		.697					
Q18		.672					
Q38		.578					
Q24		.552					
Q28		.551			.405		
Q22		.459					
Q27			.800				
Q23			.778				
Q30			.572				
Q20			.510				
Q8				.801			
Q11				.645			
Q6	.480			.557			
Q9				.501			
Q1	.472			.500			
Q5					.699		
Q19					.582		
Q10					.473		
Q3						.757	
Q4						.677	
Q2						.583	.542

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.^a

a. Rotation converged in 13 iterations.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.892
Bartlett's Test of Sphericity	Approx. Chi-Square	2609.954
	df	406
	Sig.	.000

Rotated Component Matrix^a Rotated Component Matrix, table, 2 levels of column headers and 1 levels of row headers, table with 7 columns and 34 rows

	Component					
	1	2	3	4	5	6
Q32	.730					
Q39	.701					
Q34	.679					
Q35	.651					
Q40	.565					
Q37	.544					
Q24	.467	.438				
Q26	.441					
Q33	.419					
Q29		.744				
Q28		.647				
Q38		.622				
Q22		.512				
Q5						
Q8			.799			
Q11			.636			
Q6	.453		.597			
Q9			.516			
Q1	.479		.515			
Q23				.820		
Q27				.817		
Q30				.563		
Q15	.457				.654	
Q21	.524				.596	
Q19					.569	
Q10			.409		.412	
Q3						.732
Q2						.712
Q4						.630

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.^a

a. Rotation converged in 10 iterations.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.892
Bartlett's Test of Sphericity	Approx. Chi-Square	2532.268
	df	378
	Sig.	.000

Rotated Component Matrix^aRotated Component Matrix, table, 2 levels of column headers and 1 levels of row headers, table with 7 columns and 33 rows

	Component					
	1	2	3	4	5	6
Q32	.721					
Q34	.673					
Q39	.672					
Q35	.639					
Q40	.566					
Q37	.492					
Q24	.471	.430				
Q33						
Q26						
Q29		.740				
Q28		.654				
Q38		.624				
Q22		.524				
Q8			.801			
Q11			.652			
Q6	.485		.595			
Q9			.524			
Q1	.480		.508			
Q10			.428			
Q27				.820		
Q23				.819		
Q30				.572		
Q15					.698	
Q21	.468				.638	
Q19					.535	
Q2						.725
Q3						.724
Q4						.620

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.^a

a. Rotation converged in 8 iterations.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.888
Bartlett's Test of Sphericity	Approx. Chi-Square	2264.748
	df	325
	Sig.	.000

Rotated Component Matrix^aRotated Component Matrix, table, 2 levels of column headers and 1 levels of row headers, table with 7 columns and 31 rows

	Component					
	1	2	3	4	5	6
Q32	.727					
Q39	.685					
Q34	.670					
Q35	.652					
Q40	.566					
Q37	.499					
Q24	.478		.451			
Q8		.795				
Q11		.662				
Q6	.490	.605				
Q9		.503				
Q1	.487	.499				
Q10		.435				
Q29			.743			
Q28			.646			
Q38			.629			
Q22			.519			
Q23				.822		
Q27				.815		
Q30				.578		
Q15	.412				.699	
Q21	.485				.629	
Q19					.527	
Q2						.729
Q3						.728
Q4						.622

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.^a
 a. Rotation converged in 8 iterations.

Reliability Analysis

Case Processing Summary Case Processing Summary, table, 1 levels of column headers and 2 levels of row headers, table with 4 columns and 6 rows

		N	%
Cases	Valid	210	100.0
	Excluded ^a	0	.0
	Total	210	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics Reliability Statistics, table, 1 levels of column headers and 0 levels of row headers, table with 3 columns and 3 rows

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.826	.827	6

Inter-Item Correlation Matrix Inter-Item Correlation Matrix, table, 1 levels of column headers and 1 levels of row headers, table with 7 columns and 8 rows

	Subscale1	Subscale2	Subscale3	Subscale4	Subscale5	Subscale6
Subscale1	1.000	.616	.526	.445	.659	.405
Subscale2	.616	1.000	.439	.453	.622	.409
Subscale3	.526	.439	1.000	.345	.455	.321
Subscale4	.445	.453	.345	1.000	.351	.293
Subscale5	.659	.622	.455	.351	1.000	.301
Subscale6	.405	.409	.321	.293	.301	1.000

Item-Total Statistics Item-Total Statistics, table, 1 levels of column headers and 1 levels of row headers, table with 6 columns and 8 rows

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Subscale1	11.9603	12.954	.748	.569	.764
Subscale2	12.0101	13.738	.705	.514	.776
Subscale3	12.2831	14.106	.559	.323	.806
Subscale4	13.2776	16.127	.492	.263	.819
Subscale5	11.3331	12.047	.662	.517	.788
Subscale6	12.9680	16.074	.444	.220	.826

One Way ANOVA

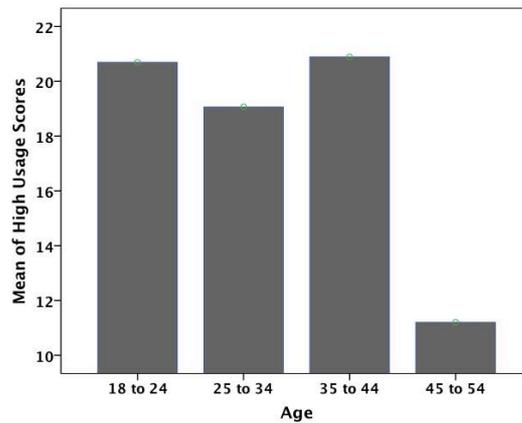
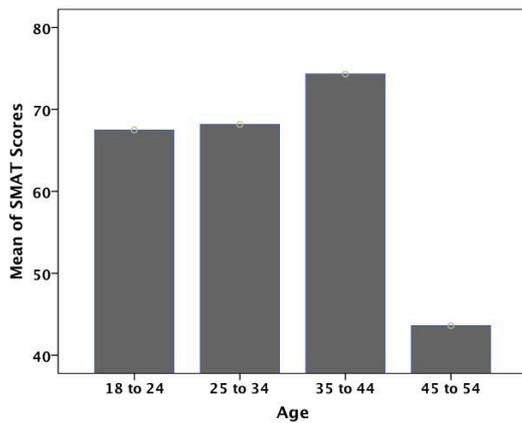
Descriptives

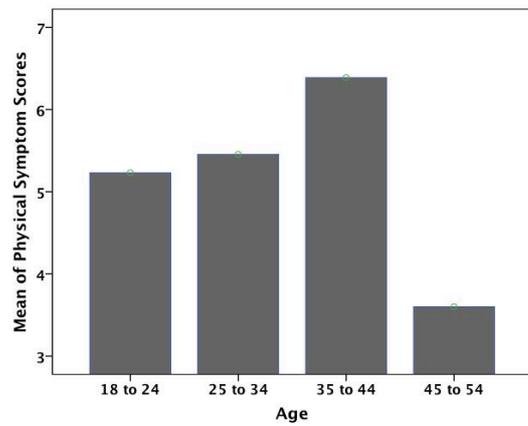
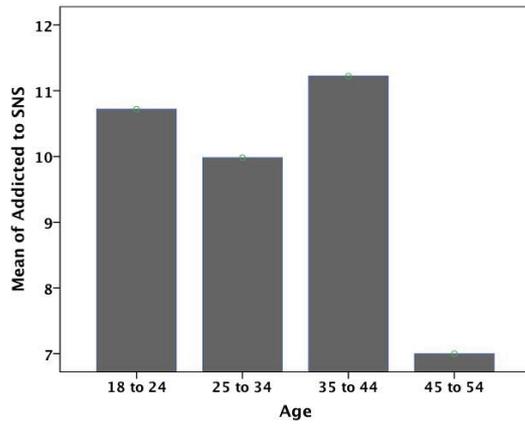
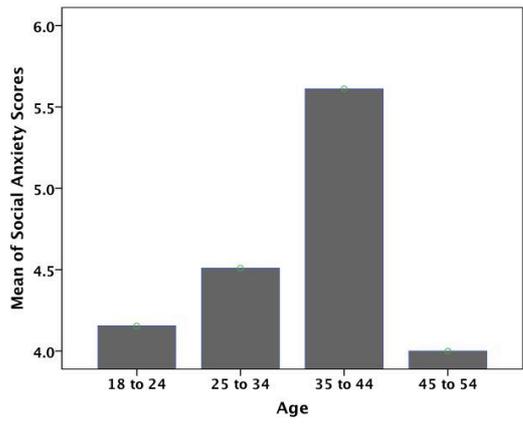
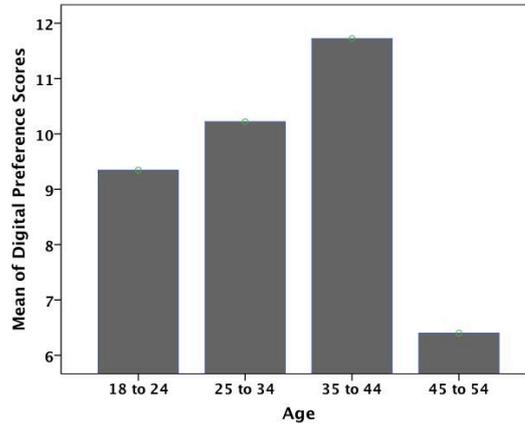
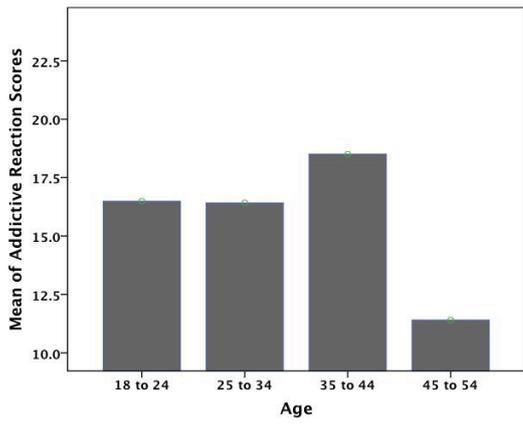
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Total Score	18 to 24	77	67.49	16.106	1.835	63.84	71.15	31	101
	25 to 34	104	68.17	17.586	1.724	64.75	71.59	26	111
	35 to 44	18	74.33	17.836	4.204	65.46	83.20	49	107
	45 to 54	5	43.60	17.813	7.966	21.48	65.72	28	71
	55 to 64	1	75.00	.	.	.	.	75	75
	Total	205	67.89	17.435	1.218	65.49	70.29	26	111
THIGHUSAGESCORE	18 to 24	78	20.69	7.022	.795	19.11	22.28	0	36
	25 to 34	108	19.06	7.676	.739	17.60	20.53	0	40
	35 to 44	18	20.89	6.201	1.462	17.80	23.97	9	31
	45 to 54	5	11.20	4.438	1.985	5.69	16.71	6	17
	55 to 64	1	20.00	.	.	.	.	20	20
	Total	210	19.64	7.366	.508	18.64	20.64	0	40
ADDICTIVE REACTION	18 to 24	78	16.49	5.086	.576	15.34	17.63	0	28
	25 to 34	108	16.42	6.148	.592	15.24	17.59	0	31
	35 to 44	18	18.50	5.884	1.387	15.57	21.43	10	32
	45 to 54	5	11.40	6.189	2.768	3.72	19.08	7	22
	55 to 64	1	24.00	.	.	.	.	24	24
	Total	210	16.54	5.802	.400	15.75	17.33	0	32
TDIGITALPREFERENCE	18 to 24	78	9.35	4.193	.475	8.40	10.29	0	23
	25 to 34	108	10.22	4.318	.415	9.40	11.05	0	22
	35 to 44	18	11.72	3.816	.900	9.82	13.62	4	20
	45 to 54	5	6.40	3.578	1.600	1.96	10.84	4	12
	55 to 64	1	10.00	.	.	.	.	10	10
	Total	210	9.93	4.266	.294	9.35	10.51	0	23
TSOCIALANXIETY	18 to 24	78	4.15	2.000	.227	3.70	4.60	0	10
	25 to 34	108	4.51	2.366	.228	4.06	4.96	0	15
	35 to 44	18	5.61	2.893	.682	4.17	7.05	3	13
	45 to 54	5	4.00	1.732	.775	1.85	6.15	3	7
	55 to 64	1	6.00	.	.	.	.	6	6
	Total	210	4.47	2.290	.158	4.16	4.78	0	15

TADDICTEDTOSNS	18 to 24	78	10.72	3.452	.391	9.94	11.50	0	18
	25 to 34	108	9.98	4.187	.403	9.18	10.78	0	18
	35 to 44	18	11.22	3.904	.920	9.28	13.16	5	18
	45 to 54	5	7.00	3.082	1.378	3.17	10.83	3	10
	55 to 64	1	12.00	.	.	.	.	12	12
	Total	210	10.30	3.906	.270	9.77	10.83	0	18
TPHYSICALSYMPTOM	18 to 24	78	5.23	2.203	.249	4.73	5.73	0	12
	25 to 34	108	5.45	2.610	.251	4.96	5.95	0	13
	35 to 44	18	6.39	2.953	.696	4.92	7.86	3	12
	45 to 54	5	3.60	1.342	.600	1.93	5.27	3	6
	55 to 64	1	3.00	.	.	.	.	3	3
	Total	210	5.40	2.494	.172	5.06	5.73	0	13

ANOVA

				Sum of Squares	df	Mean Square	F	Sig.
Total Score	Between Groups	(Combined)		3768.308	4	942.077	3.235	.013
		Linear Term	Unweighted	21.446	1	21.446	.074	.786
			Weighted	49.398	1	49.398	.170	.681
			Deviation	3718.909	3	1239.636	4.257	.006
	Within Groups			58245.331	200	291.227		
	Total			62013.639	204			
THIGHUSAGESCORE	Between Groups	(Combined)		506.475	4	126.619	2.396	.052
		Linear Term	Unweighted	20.080	1	20.080	.380	.538
			Weighted	178.089	1	178.089	3.370	.068
			Deviation	328.386	3	109.462	2.071	.105
	Within Groups			10833.739	205	52.848		
	Total			11340.214	209			
ADDICTIVE REACTION	Between Groups	(Combined)		258.758	4	64.690	1.957	.102
		Linear Term	Unweighted	23.513	1	23.513	.711	.400
			Weighted	.925	1	.925	.028	.867
			Deviation	257.833	3	85.944	2.600	.053
	Within Groups			6777.437	205	33.061		
	Total			7036.195	209			
TDIGITALPREFERENCE	Between Groups	(Combined)		155.935	4	38.984	2.191	.071
		Linear Term	Unweighted	1.484	1	1.484	.083	.773
			Weighted	16.051	1	16.051	.902	.343
			Deviation	139.884	3	46.628	2.621	.052
	Within Groups			3647.132	205	17.791		
	Total			3803.067	209			
TSOCIALANXIETY	Between Groups	(Combined)		34.844	4	8.711	1.682	.155
		Linear Term	Unweighted	2.378	1	2.378	.459	.499
			Weighted	17.636	1	17.636	3.406	.066
			Deviation	17.208	3	5.736	1.108	.347
	Within Groups			1061.422	205	5.178		
	Total			1096.267	209			
TADDICTEDTOSNS	Between Groups	(Combined)		97.231	4	24.308	1.612	.172
		Linear Term	Unweighted	.041	1	.041	.003	.959
			Weighted	16.834	1	16.834	1.117	.292
			Deviation	80.397	3	26.799	1.777	.153
	Within Groups			3090.869	205	15.077		
	Total			3188.100	209			
TPHYSICALSYMPTOM	Between Groups	(Combined)		42.103	4	10.526	1.715	.148
		Linear Term	Unweighted	9.361	1	9.361	1.525	.218
			Weighted	.272	1	.272	.044	.834
			Deviation	41.831	3	13.944	2.272	.081
	Within Groups			1258.092	205	6.137		
	Total			1300.195	209			





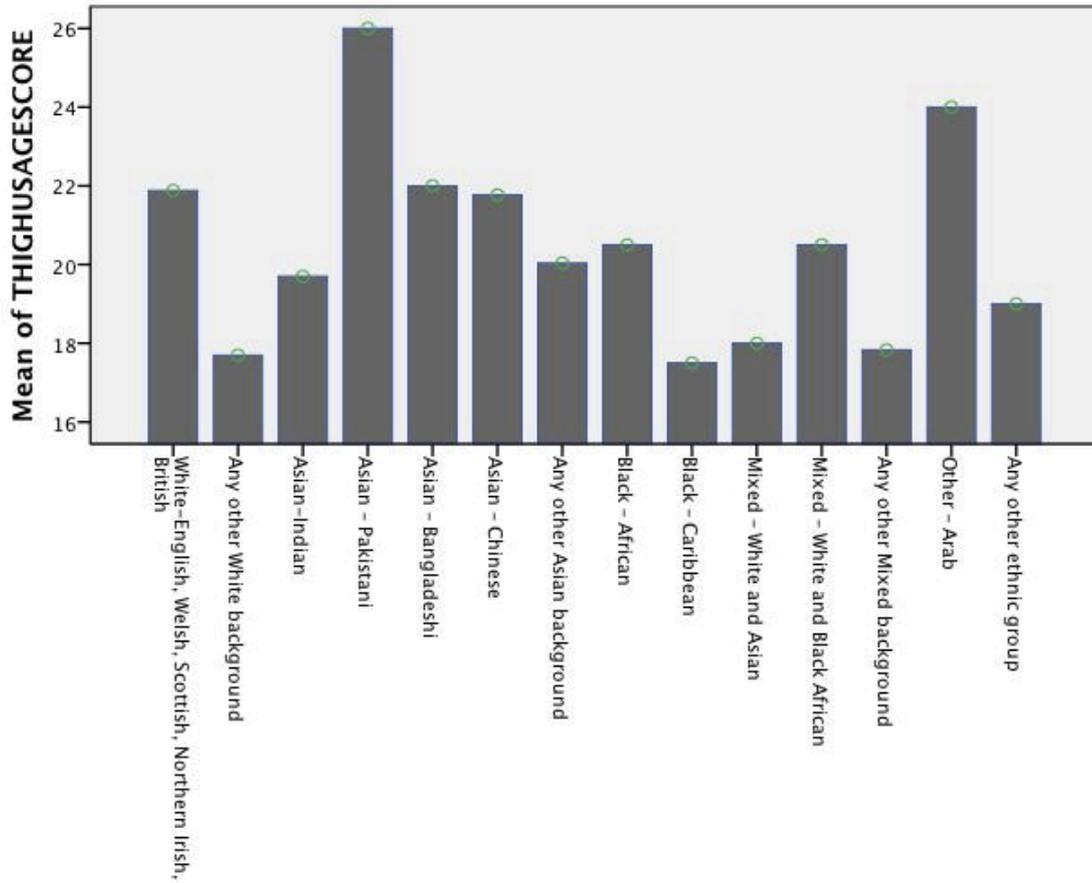
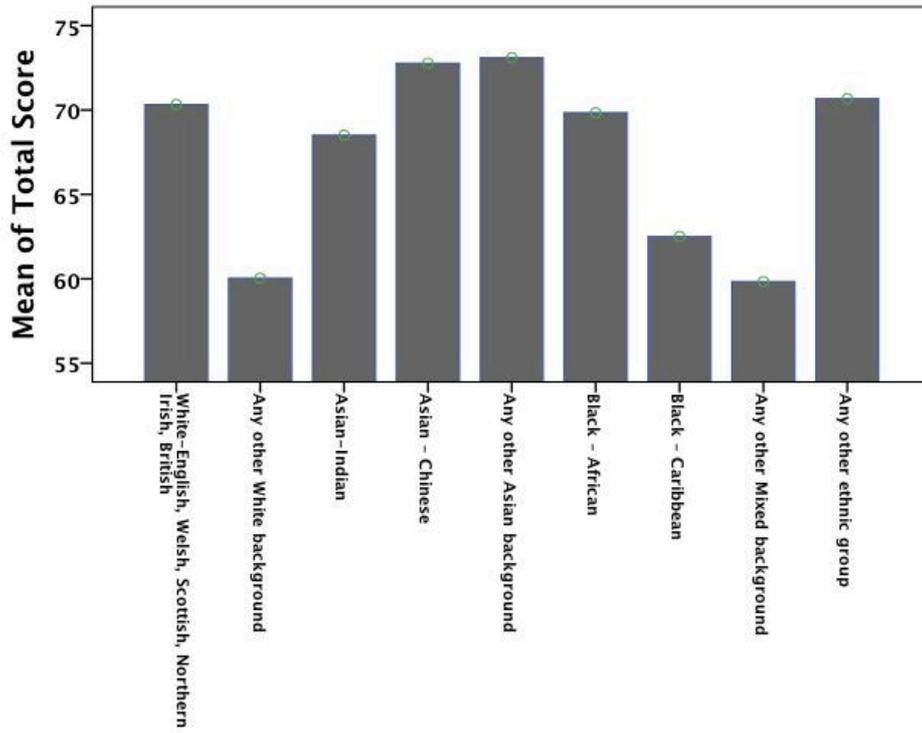
Descriptives

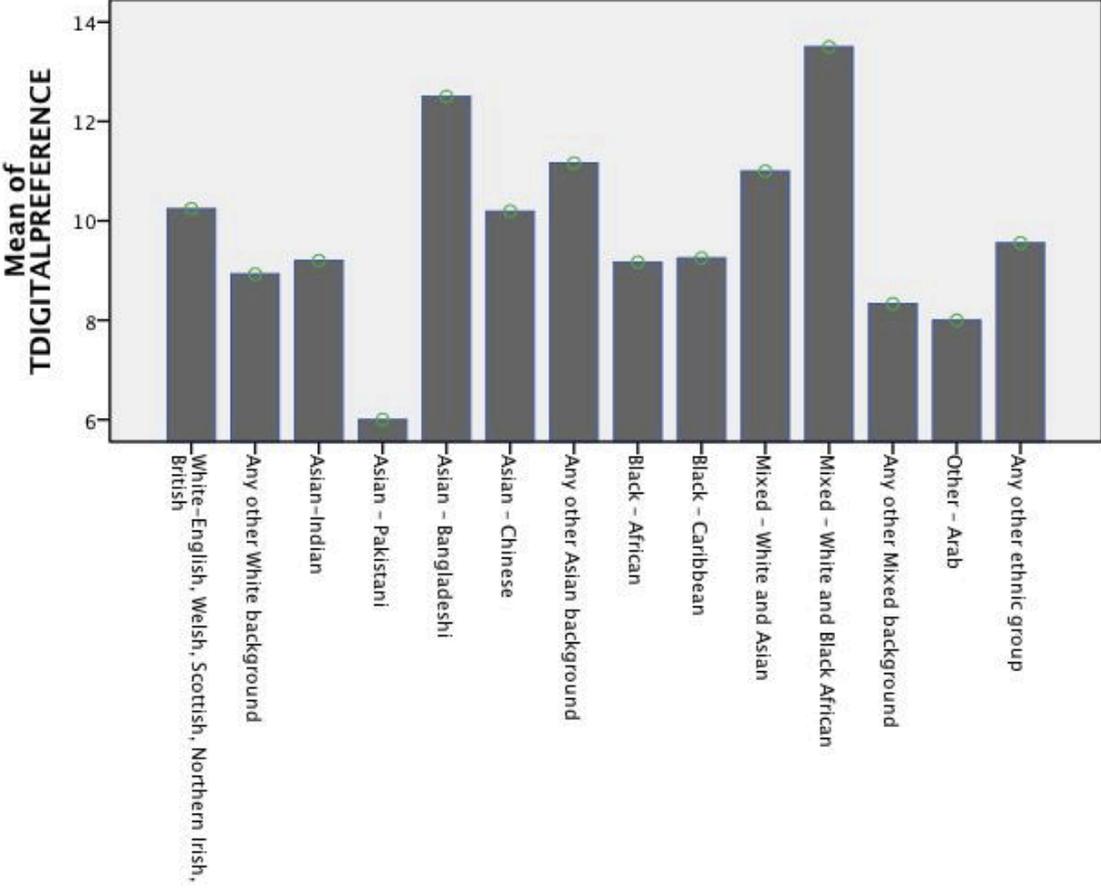
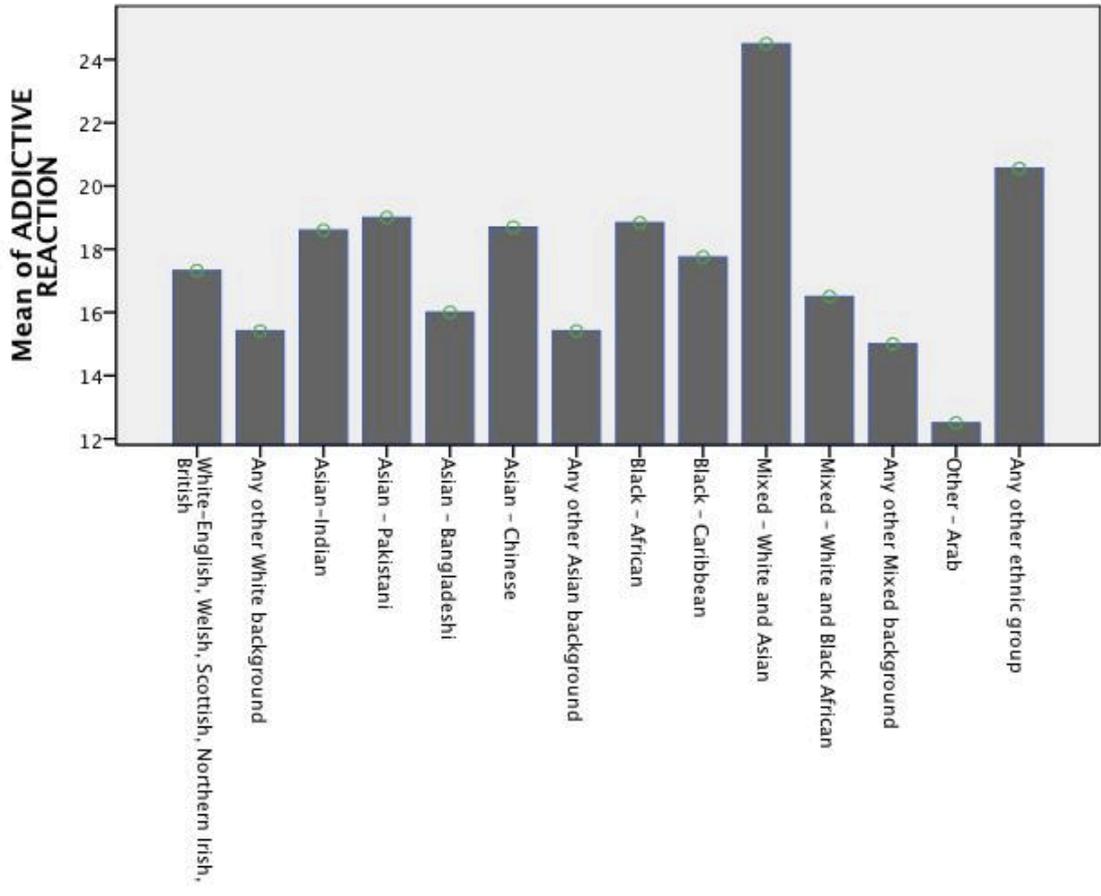
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum		
					Lower Bound	Upper Bound				
Total Score	White-English, Welsh, Scottish, Northern Irish, British	25	70.32	16.780	3.356	63.39	77.25	39	107	
	Any other White background	56	60.04	15.474	2.068	55.89	64.18	31	103	
	Asian-Indian	10	68.50	18.745	5.928	55.09	81.91	42	95	
	Asian - Pakistani	1	71.00	.	.	.	.	71	71
	Asian - Bangladeshi	2	72.00	29.698	21.000	-194.83	338.83	51	93	
	Asian - Chinese	26	72.77	14.776	2.898	66.80	78.74	46	108	
	Any other Asian background	52	73.10	14.272	1.979	69.12	77.07	42	109	
	Black - African	6	69.83	30.459	12.435	37.87	101.80	38	111	
	Black - Caribbean	4	62.50	26.715	13.357	19.99	105.01	28	93	
	Mixed - White and Asian	2	74.00	9.899	7.000	-14.94	162.94	67	81	
	Mixed - White and Black African	2	70.00	4.243	3.000	31.88	108.12	67	73	
	Any other Mixed background	6	59.83	22.445	9.183	36.28	83.39	28	88	
	Other - Arab	2	61.50	30.406	21.500	-211.68	334.68	40	83	
	Any other ethnic group	9	70.67	22.489	7.496	53.38	87.95	26	98	
	Total	203	67.92	17.327	1.216	65.52	70.32	26	111	
	THIGHUSAGESCORE	White-English, Welsh, Scottish, Northern Irish, British	25	21.88	5.960	1.192	19.42	24.34	9	31
		Any other White background	56	17.70	5.821	.778	16.14	19.26	0	35
		Asian-Indian	10	19.70	7.761	2.454	14.15	25.25	10	35
		Asian - Pakistani	1	26.00	26	26
		Asian - Bangladeshi	2	22.00	14.142	10.000	-105.06	149.06	12	32
Asian - Chinese		26	21.77	6.225	1.221	19.26	24.28	10	34	
Any other Asian background		56	20.04	8.403	1.123	17.79	22.29	0	39	
Black - African		6	20.50	10.858	4.433	9.11	31.89	10	40	
Black - Caribbean		4	17.50	8.963	4.481	3.24	31.76	6	26	
Mixed - White and Asian		2	18.00	.000	.000	18.00	18.00	18	18	
Mixed - White and Black African		2	20.50	.707	.500	14.15	26.85	20	21	
Any other Mixed background		6	17.83	6.145	2.509	11.38	24.28	8	26	
Other - Arab		2	24.00	12.728	9.000	-90.36	138.36	15	33	
Any other ethnic group		9	19.00	9.695	3.232	11.55	26.45	3	31	
ADDICTIVE REACTION		Total	207	19.75	7.257	.504	18.76	20.75	0	40
		White-English, Welsh, Scottish, Northern Irish, British	25	17.32	4.888	.978	15.30	19.34	7	28
		Any other White background	56	15.41	4.763	.636	14.14	16.69	7	29
		Asian-Indian	10	18.60	4.526	1.431	15.36	21.84	14	26
		Asian - Pakistani	1	19.00	19	19
		Asian - Bangladeshi	2	16.00	9.899	7.000	-72.94	104.94	9	23
	Asian - Chinese	26	18.69	4.297	.843	16.96	20.43	12	31	
	Any other Asian background	56	15.41	5.892	.787	13.83	16.99	0	28	
	Black - African	6	18.83	11.017	4.498	7.27	30.39	8	32	
	Black - Caribbean	4	17.75	7.274	3.637	6.17	29.33	7	23	
	Mixed - White and Asian	2	24.50	3.536	2.500	-7.27	56.27	22	27	
	Mixed - White and Black African	2	16.50	.707	.500	10.15	22.85	16	17	
	Any other Mixed background	6	15.00	8.025	3.276	6.58	23.42	7	27	
	Other - Arab	2	12.50	6.364	4.500	-44.68	69.68	8	17	
	Any other ethnic group	9	20.56	6.579	2.193	15.50	25.61	6	27	
	Total	207	16.66	5.679	.395	15.88	17.44	0	32	
	TDIGITALPREFERENCE	White-English, Welsh, Scottish, Northern Irish, British	25	10.24	4.465	.893	8.40	12.08	4	20
		Any other White background	56	8.93	4.173	.558	7.81	10.05	0	22
		Asian-Indian	10	9.20	4.264	1.348	6.15	12.25	4	17
		Asian - Pakistani	1	6.00	6	6
Asian - Bangladeshi		2	12.50	2.121	1.500	-6.56	31.56	11	14	
Asian - Chinese		26	10.19	3.073	.603	8.95	11.43	6	17	
Any other Asian background		56	11.16	4.872	.651	9.86	12.47	0	23	
Black - African		6	9.17	3.371	1.376	5.63	12.70	4	14	
Black - Caribbean		4	9.25	4.787	2.394	1.63	16.87	4	15	
Mixed - White and Asian		2	11.00	1.414	1.000	-1.71	23.71	10	12	
Mixed - White and Black African		2	13.50	.707	.500	7.15	19.85	13	14	
Any other Mixed background		6	8.33	3.615	1.476	4.54	12.13	4	12	
Other - Arab		2	8.00	4.243	3.000	-30.12	46.12	5	11	
Any other ethnic group		9	9.56	3.245	1.082	7.06	12.05	4	15	
Total		207	9.96	4.225	.294	9.38	10.54	0	23	

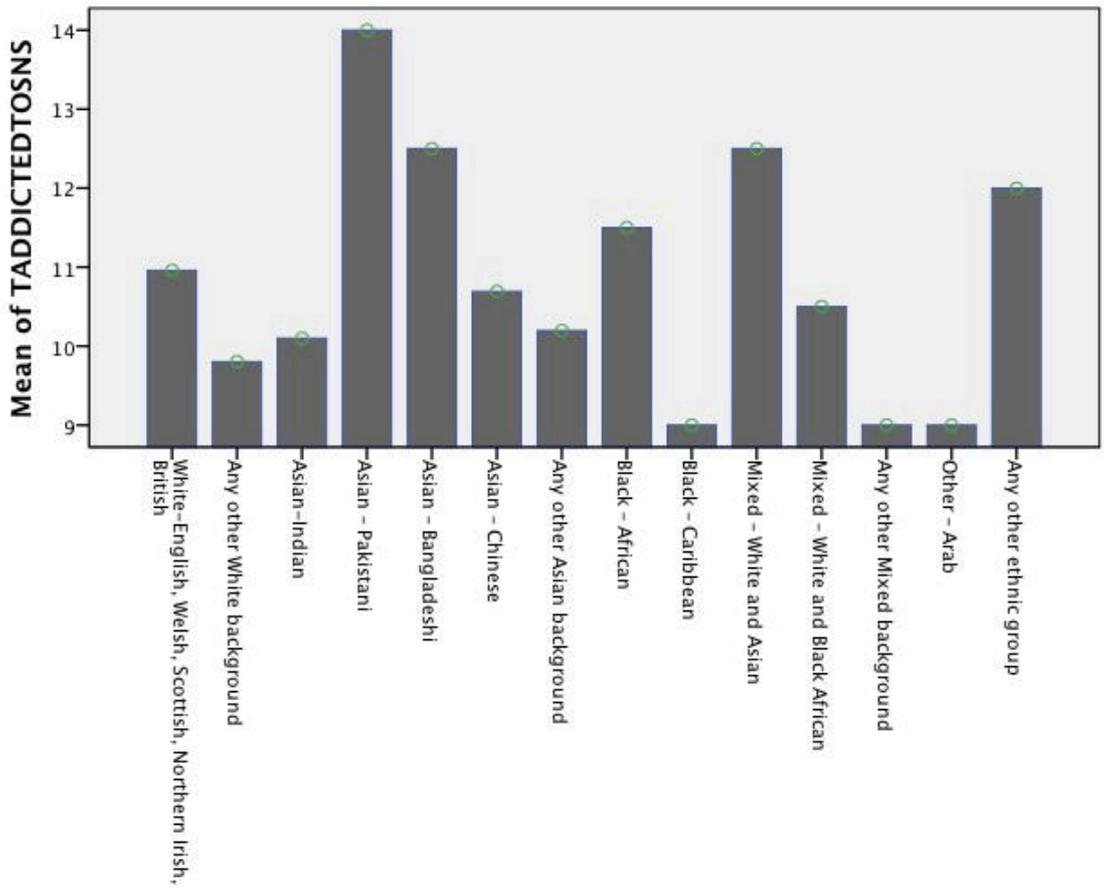
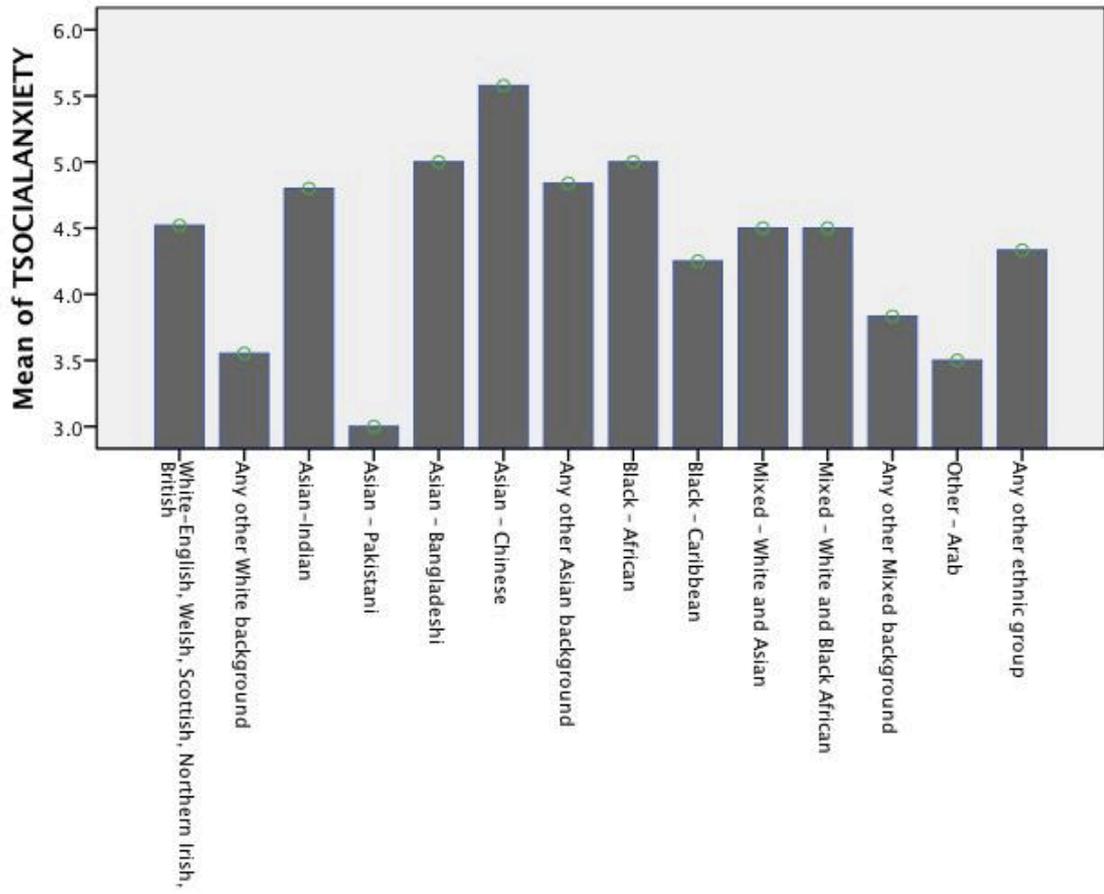
TSOCIALANXIETY	White-English, Welsh, Scottish, Northern Irish, British	25	4.52	2.312	.462	3.57	5.47	3	13	
	Any other White background	56	3.55	1.413	.189	3.18	3.93	0	9	
	Asian-Indian	10	4.80	1.989	.629	3.38	6.22	3	8	
	Asian - Pakistani	1	3.00	.	.	.	.	3	3
	Asian - Bangladeshi	2	5.00	2.828	2.000	-20.41	30.41	3	7	
	Asian - Chinese	26	5.58	3.088	.606	4.33	6.82	3	15	
	Any other Asian background	56	4.84	2.485	.332	4.17	5.50	0	13	
	Black - African	6	5.00	2.280	.931	2.61	7.39	3	8	
	Black - Caribbean	4	4.25	1.893	.946	1.24	7.26	3	7	
	Mixed - White and Asian	2	4.50	.707	.500	-1.85	10.85	4	5	
	Mixed - White and Black African	2	4.50	2.121	1.500	-14.56	23.56	3	6	
	Any other Mixed background	6	3.83	.753	.307	3.04	4.62	3	5	
	Other - Arab	2	3.50	.707	.500	-2.85	9.85	3	4	
	Any other ethnic group	9	4.33	2.000	.667	2.80	5.87	2	8	
	Total	207	4.46	2.240	.156	4.15	4.77	0	15	
	TADDICTEDTOSNS	White-English, Welsh, Scottish, Northern Irish, British	25	10.96	2.993	.599	9.72	12.20	5	18
		Any other White background	56	9.80	3.640	.486	8.83	10.78	3	18
Asian-Indian		10	10.10	4.040	1.278	7.21	12.99	5	17	
Asian - Pakistani		1	14.00	.	.	.	.	14	14
Asian - Bangladeshi		2	12.50	2.121	1.500	-6.56	31.56	11	14	
Asian - Chinese		26	10.69	3.771	.740	9.17	12.22	4	18	
Any other Asian background		56	10.20	4.359	.582	9.03	11.36	0	18	
Black - African		6	11.50	4.593	1.875	6.68	16.32	6	18	
Black - Caribbean		4	9.00	4.320	2.160	2.13	15.87	5	15	
Mixed - White and Asian		2	12.50	4.950	3.500	-31.97	56.97	9	16	
Mixed - White and Black African		2	10.50	.707	.500	4.15	16.85	10	11	
Any other Mixed background		6	9.00	3.950	1.612	4.86	13.14	3	15	
Other - Arab		2	9.00	5.657	4.000	-41.82	59.82	5	13	
Any other ethnic group		9	12.00	4.183	1.394	8.78	15.22	3	17	
Total		207	10.35	3.847	.267	9.83	10.88	0	18	
TPHYSICALSYMPTOM		White-English, Welsh, Scottish, Northern Irish, British	25	5.40	1.936	.387	4.60	6.20	3	8
		Any other White background	56	4.64	1.911	.255	4.13	5.15	3	11
	Asian-Indian	10	6.10	2.846	.900	4.06	8.14	3	11	
	Asian - Pakistani	1	3.00	.	.	.	.	3	3
	Asian - Bangladeshi	2	4.00	2.828	2.000	-21.41	29.41	2	6	
	Asian - Chinese	26	5.85	2.092	.410	5.00	6.69	3	11	
	Any other Asian background	56	6.23	3.110	.416	5.40	7.07	0	13	
	Black - African	6	4.83	2.714	1.108	1.98	7.68	3	10	
	Black - Caribbean	4	4.75	2.872	1.436	.18	9.32	3	9	
	Mixed - White and Asian	2	3.50	.707	.500	-2.85	9.85	3	4	
	Mixed - White and Black African	2	4.50	.707	.500	-1.85	10.85	4	5	
	Any other Mixed background	6	5.83	2.317	.946	3.40	8.26	3	8	
	Other - Arab	2	4.50	2.121	1.500	-14.56	23.56	3	6	
	Any other ethnic group	9	5.22	2.489	.830	3.31	7.14	3	10	
	Total	207	5.43	2.476	.172	5.09	5.76	0	13	

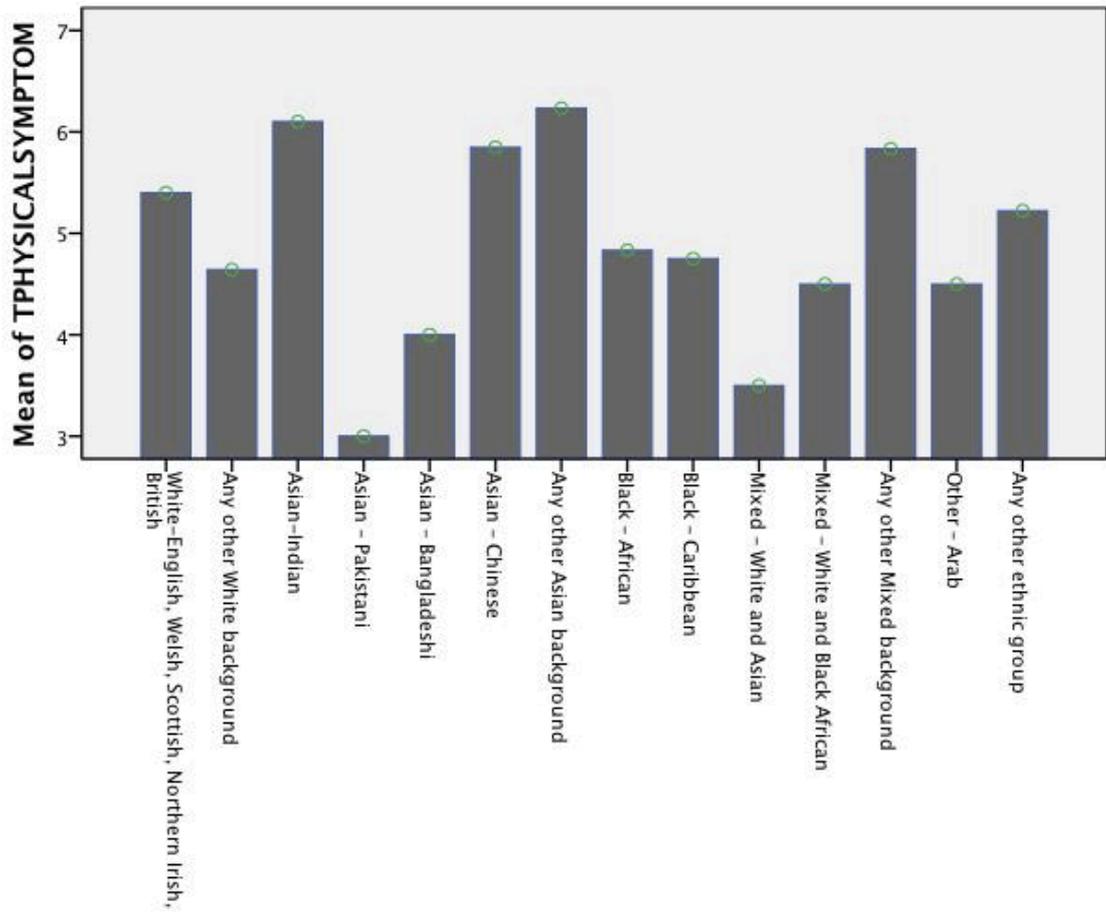
ANOVA

				Sum of Squares	df	Mean Square	F	Sig.
Total Score	Between Groups	(Combined)		6440.569	13	495.428	1.727	.058
		Linear Term	Weighted	502.611	1	502.611	1.753	.187
			Deviation	5937.958	12	494.830	1.725	.064
	Within Groups			54204.170	189	286.795		
	Total			60644.739	202			
THIGHUSAGESCORE	Between Groups	(Combined)		603.478	13	46.421	.875	.581
		Linear Term	Weighted	.119	1	.119	.002	.962
			Deviation	603.359	12	50.280	.947	.501
	Within Groups			10244.957	193	53.083		
	Total			10848.435	206			
ADDICTIVE REACTION	Between Groups	(Combined)		680.856	13	52.374	1.695	.064
		Linear Term	Weighted	31.526	1	31.526	1.021	.314
			Deviation	649.330	12	54.111	1.752	.059
	Within Groups			5961.791	193	30.890		
	Total			6642.647	206			
TDIGITALPREFERENCE	Between Groups	(Combined)		236.086	13	18.160	1.018	.435
		Linear Term	Weighted	6.841	1	6.841	.384	.536
			Deviation	229.244	12	19.104	1.071	.386
	Within Groups			3441.605	193	17.832		
	Total			3677.691	206			
TSOCIALANXIETY	Between Groups	(Combined)		96.739	13	7.441	1.533	.108
		Linear Term	Weighted	6.101	1	6.101	1.257	.264
			Deviation	90.638	12	7.553	1.556	.107
	Within Groups			936.662	193	4.853		
	Total			1033.401	206			
TADDICTEDTOSNS	Between Groups	(Combined)		117.179	13	9.014	.593	.858
		Linear Term	Weighted	1.867	1	1.867	.123	.726
			Deviation	115.312	12	9.609	.633	.813
	Within Groups			2932.077	193	15.192		
	Total			3049.256	206			
TPHYSICALSYMPTOM	Between Groups	(Combined)		105.993	13	8.153	1.361	.182
		Linear Term	Weighted	6.107	1	6.107	1.019	.314
			Deviation	99.886	12	8.324	1.389	.174
	Within Groups			1156.596	193	5.993		
	Total			1262.589	206			









Appendix 6: Research Ethics Approval Form

DEPARTMENT OF DESIGN
Research and Enterprise Committee
RESEARCH ETHICS APPROVAL FORM (Staff and students)

This form should be completed for any research project that involves human participants or if the research involves animals or if it may involve environmental harm. The principal investigator or, where the principal investigator is a student, the supervisor, is responsible for exercising appropriate professional overview of the research.

You should:

- first, read and understand the Goldsmiths Code of Practice on Research Ethics: <http://www.gold.ac.uk/media/research-ethics.pdf>
- then complete and submit this form
- then, wait for approval before contacting any potential participants in any research.

Section One Applicant Details

1.1 Name of researcher	Bo Ram Lee
1.2 Status (undergraduate student, postgraduate student, staff)	PhD student
1.3 Email address	
1.4 Contact address	
1.5 Contact phone number	

Section Two For students only

2.1 Programme	MPhil/PhD in Design
2.2 Course	3 rd Year/ PhD in Design
2.3 Your supervisor or course leader's name	Mike Waller, Kay Stables
2.4 Your email address (if different from above)	
2.5 Your contact address (if different from above)	

Section Three Project Details

3.1 Project title: The "drawing talk experiment" on smartphone
3.2 <i>Brief</i> outline of the project, including its purpose: This study aims to understand how your behaviour, emotion, and cognition regarding the smartphone use may (or may not) change by running the experiment tasks.
3.3 <i>Brief</i> description of methods of data collection: There are five different types of data collections as follows: [1] data of the smartphone addiction test, [2] data of state trait anxiety inventory for adults, [3] a structured interview of asking about digital dementia, [4] the captured images of drawing-doodling communication, and [5] interviews of asking about the experiment.
3.4 Where will the data collection be undertaken? The data collection will be used for analysis, which will be part of future publication including PhD thesis, journal article and conference presentation.

Section Eight Other matters

	Insert ✓	Y	N
8.1 Are there any conflicts of interest regarding the investigation and dissemination of the research (e.g. with regard to compromising independence or objectivity due to financial gain)?		*	✓
8.2 Is the research likely to have any negative impact on the academic status or reputation of the College?		*	✓
8.3 Is data to be collected from an institutional location (such as a school, prison, hospital)? <i>If so, attach evidence of agreement obtained from the relevant authority (e.g. Head Teacher, Local Education Authority, Home Office)?</i>			✓
8.4 If you have ticked a box marked * please give the question number/s and fuller information here:			

Section Nine Attachments, signatures and submission

Wherever possible, applications will be dealt with within two weeks of receipt. Delays will occur if the application has not been carefully completed. The decision regarding your application for ethical approval will be communicated to you and your supervisor (if applicable) directly.

You should now complete the following checklist, supply any necessary signatures and submit the full application/documentation to the Department Research and Enterprise Committee Chair/Department Ethics Office via the Design Office.

9.1 Attachment checklist:

Have you attached copies of all supporting materials? Please indicate which and insert ✓ in the appropriate column

Document	Not applicable	Attached
Recruitment document/s		✓
Informed consent		✓
Other information for participants		✓
Consent agreements for young, vulnerable or 'in custody' persons	✓	
Criminal Records Bureau clearance	✓	
Institutional location agreement	✓	
Other (please specify)...	✓	

9.2 To be completed by student applicants...

Please note that your Supervisor and the Department Research and Enterprise Committee Chair/Department Ethics Officer should be notified of any adverse or unforeseen circumstances arising out of this study. If there are significant changes to the research design regarding research ethics, please notify the Committee immediately.

Signature of Applicant



Date 30 Mar 2015

9.3 To be completed by Principal Supervisor...

Please note that the Department Research Ethics Committee Chair/Department Ethics Officer should be notified of any adverse or unforeseen circumstances arising out of this study or of any emerging ethical concerns that the Supervisor may have about the research once it has commenced.

	Insert ✓	Y	N
Has the student read and understood the Goldsmiths Code of Practice on Research Ethics?		✓	
Has there been appropriate discussion of the ethical implications of the research with you as Supervisor?		✓	
Are the ethical implications of the proposed research adequately described in this application?		✓	
Please add any other comments you wish to make here:			

Kay Stabk

Signature of Principal Supervisor

Date 2nd July 2015

10 Statement of Ethical Approval

This project has been considered using agreed Departmental procedures and is now approved. This approval is valid for a maximum period of 3 year/s.

Signed

S. Keirl

Date 14/7/2015

Print Name Steve Keirl

Department Research Ethics Committee Chair/Department Ethics Officer

Design: R&E Ethics 2013v4

Appendix 7: The Script of the Instructor Interview

Researcher: Thank you for accepting the interview request. You are a professional instructor of healing art. What are the conditions essential for relieving people's anxiety and stress in your class?

Instructor: I have found that meditation is really important because it brings people to the present, in the moment, and helps them relax in the class. Relaxation is important in every healing art, so I like to combine meditation and art. Other conditions are feeling safe and supported. And this space has no judgment.

Researcher: People shared their opinions of others' drawings.

Instructor: I think sharing is really important on several levels. One thing is connections between people. That interaction... sharing is important and is related to being connected to each other. And I feel that supports encouragement from another people as well. And also I think by sharing that expression of the feelings in their hearts is very important. And also when people share they can see things in another person's art they might not have noticed themselves. So it's helpful to have insights also from other people.

Researcher: My research is to make an electronic version of healing art that helps to relieve users' stress. What would you suggest I use in developing that content?

Instructor: Would it be for personal use?

Researcher: Yes, it's for a smartphone.

Instructor: It's difficult to know without more idea of how it will work. One thing is that people now don't have time and don't know how. It just plays. I think now everything is very productive. And we have all those goals and targets. And you know sometimes people feel and think they are wasting time when they don't get the outcomes. I guess the mobile application would be something where there was less pressure to produce an outcome, where you could just play and relax in the moment.

Researcher: So it's a kind of doodle. Doodling something?

Instructor: Yes right. And give some encouragement when they finish it. Saying how wonderful it is.

Researcher: Yes encouragement is an important point I guess. In your class, I listened to peaceful music while doing meditation. Is that important for meditation?

Instructor: That kind of music helps relaxation. I think relaxation is important in the creative process. Because when we relax, our brain changes. So one-way very active state and one-way alpha brain wave. Relaxation helps more alpha rhythm brain wave and then theta brain wave coming in after. That is one way more creative and more expressive to more be healing that comes in that space. So I think meditation music is very important.

Researcher: But it is hard to transfer the conditions of meditation to a mobile phone. Do you think.

Instructor: Unless if you have a recorded meditation. People could use earphones.

Researcher: So that will enable people to follow the instructions. Does drawing help people to heal? Does it work well without meditation?

Instructor: Absolutely. Because drawing itself is a form of meditation.

Researcher: Oh is that a form of meditation?

Instructor: Yes. There are a thousand different forms of meditation. One of aspects of meditation is being present in the moment. Just actively creating something. Whether it is creating a sculpture or you know painting something on the mobile phone. It brings your focus on the present moment. Even just active drawing is a form of meditation. I believe any form of expression and creativity is healing in itself as well.

Researcher: Could you give me an example of how people changed throughout your classes?

Instructor: Yes. I see all the time my people come in really stressed and heavy, but they feel happy after the class and they send me emails after the class that they have shifted and are living better. So they are completely changed.

Researcher: OK. I'm also interested in a good aspect of collaborative drawing. Have you tried that in your class before?

Instructor: We did once. With the mandala series of crown chakra. You know when we used the mandalas in the class.

Researcher: Yes. We expressed our anger through the mandalas.

Instructor: Yes. I did it with a big sheet of mandala which I folded into eight. I get people into express something in each section. It was folded and past from one person to the next. By the end of the class, it was a collaborative work of mandala. That was a really beautiful work of connections.

Researcher: Oh was it? Then which one do you think would be more effective for healing? Individual drawing or collaborative drawing?

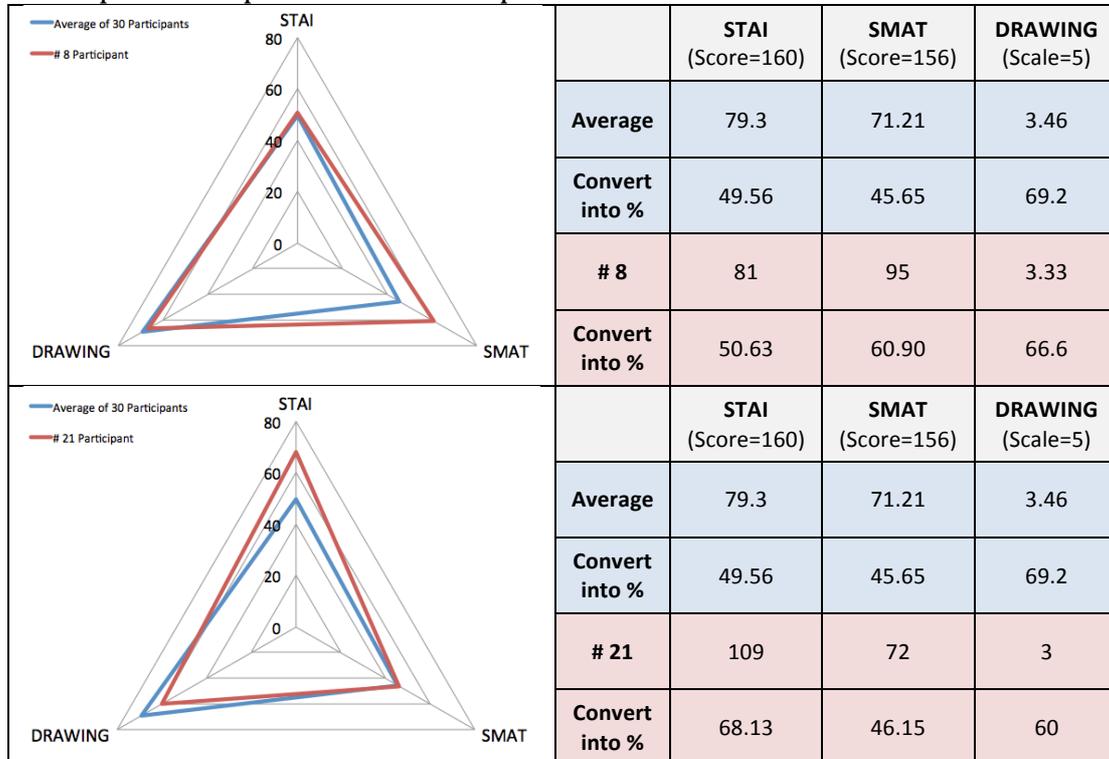
Instructor: I think both work in different ways. I think some people work better when they are alone. Other people work more effectively in groups I think.

Researcher: Right some people don't like group activities. So it depends on the person. Thank you for the interview.

Appendix 8: Qualitative Analysis of Sixteen Cases

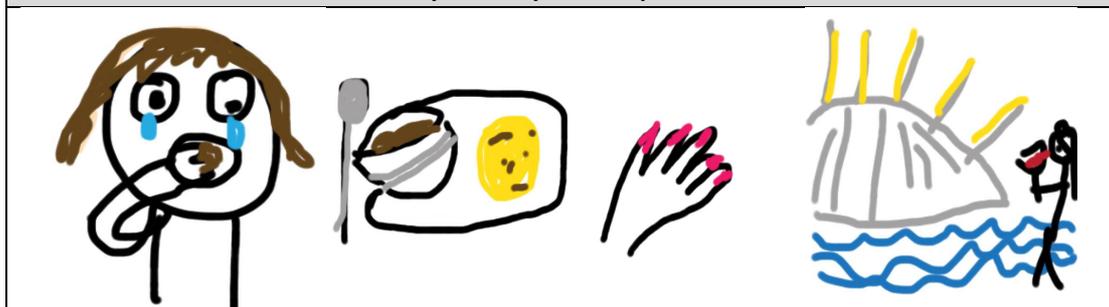
Case One

Participant #8 is paired with Participant #21



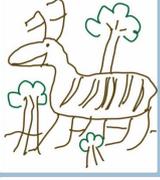
Participant #8 is a 29-year-old female. She belongs to the high SMAT group. Her partner Participant #21 is a 26-year-old female. She also belongs to the high SMAT group. Both of them have the highest possible score for physical symptoms. Participant #21 got a high STAI score of 109, which is well over 100. I began the drawing analysis with this pair because both have been identified as smart mobile users who have digital anxiety. Participant #21 is less confident of her drawing ability, as seen in the graph. She remarked several times in the questionnaire that she is not good at drawing. I could identify this lack of confidence in her drawing ability in the conversations between this pair.

Day Memory – Participant #8

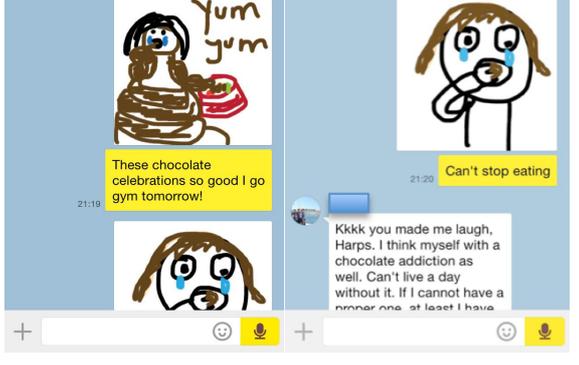


Description	Annotation
<p>Participant #7 described the effect drawing had on her memory as follows:</p> <p>'The images definitely help me remember the food I ate as well as what food my partner had. I remember events based on faces and images – I recall dumplings and soup and laughing over drawings of Indian food and the drawings about crying about putting on too much weight but still eating chocolate whilst crying about weight!</p> <p>'Drawing helped me to remember, as in order to draw a memory I had to think of the event and solidify the memory in my head. So rather than just remembering the event, I remembered it through the memory of drawing it.'</p>	<p>Drawing images of food helped inscribe it in her memory. It is interesting that she remembers not only what she ate but also what her partner ate. Their drawings contain a story, as she said. She was laughing about her drawings of Indian food and about her drawings of her awareness of diet. These became a form of memory.</p> <p>The first drawing above is the image in which she tried to express a desire to stop eating chocolate in order to lose weight, and her inability to do so.</p> <p>Drawing an interesting event made her remember her thoughts of the event rather than the event itself. This is because a drawing is a representation of a drawer's memory. The drawer's eyes capture information, and then the information is recreated depending the drawer's viewpoint and thinking. Participant #7 explained this in terms of 'thinking of the event' and 'solidifying the memory'.</p>

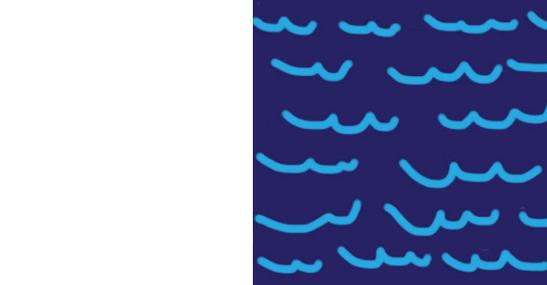
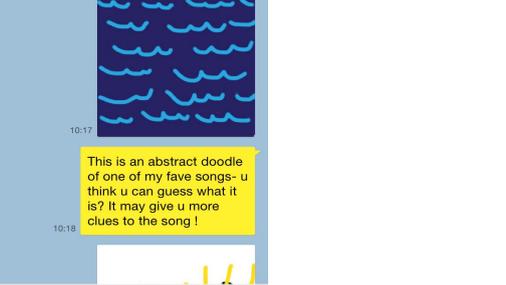
Day Memory – Participant #21	
	
Description	Annotation
<p>Participant #21 describes the way drawing affects her memory as follows:</p> <p>'I could obviously recall the food that I had eaten through the experiment because of the drawings. I put more effort into thinking and remembering to draw.</p> <p>Drawing was very helpful. I would forget meaningless everyday happenings and life events. But drawing made me practice recalling what I had done that day to draw and send it to my partner. It was fun and meaningful so it stayed in my memory.'</p>	<p>Participant #21 clearly recalled what she had eaten, as a result of her drawings. She explains that she remembered her food because thinking about it is a step toward drawing.</p> <p>Her phrase, 'meaningless everyday happenings', is interesting. Drawing inspired her to find more meaning in her ordinary daily life. The drawing task was fun and meaningful and made her recall how her day had passed. I think that sharing her drawings with her partner encouraged her to draw more.</p>
Discussion	

 <p>Today I had a soft tofu jjigae as dinner. I don't know how to explain jjigae in English, but anyway it is Korean food and something like stew hehe</p> <p>22:37</p>	<p>Participant #21 explains the food she drew after sending it to Participant #8. Participant #21 thought that her partner may not understand what she had drawn.</p>	 <p>WBS</p> <p>After two weeks of family trip, I finally went back to my office. Can you see what I do? I am a PhD student in business management, and I am at</p> <p>17:41</p>	<p>This image is one scene from Participant #21's day. I found that Participant #21 liked to make Participant #8 guess what she had drawn.</p>
<p>Haha I thought you hurt your hand... hehe</p> <p>19:40</p>  <p>HEATHROW Terminal 2</p> <p>ADIEU</p> <p>I am on my way back home from heathrow airport. My</p>	<p>In the beginning, Participant #21 used text in her images to help her partner interpret what she had drawn. However, this changed later on, when she stopped including text in her drawings.</p>	<p>hehe. If you haven't tried pilates, i really really recommend it to you!</p>  <p>23:00</p>	<p>Participant #21 drew a flower she found on her evening walk. She wanted to show her partner how much she loved that flower.</p> <p>This action is like a little greeting.</p>
 <p>Had brunch at toms kitchen</p> <p>15:35</p>  <p>Went to hairdresser!</p> <p>15:37</p>  <p>Now going for a massage!!</p> <p>The last drawing was terrible as I'm running late!</p> <p>15:50</p> <p>Friday, 1 May 2015</p>	<p>Participant #8 recorded what she had done that day in chronological order. She had a drink at the pub, had brunch, went to the hairdresser, and said, "now going for a massage". She apologised that her final drawing was terrible because she was in a rush. Her partner then immediately drew what she had done.</p>		
 <p>And there was a WBS PHD party tonight. (It doesnt sound interesting I know kk)</p> <p>22:39</p>	<p>This image explains how to play beer pong. The arrows indicate the direction.</p>	<p>Oh i didn't know about that benefit! I will definitely try it later 😊</p>  <p>Guess what I saw yesterday (it is over 12am)</p> <p>00:42</p>	<p>This is another image that Participant #21 asks her partner to guess.</p>

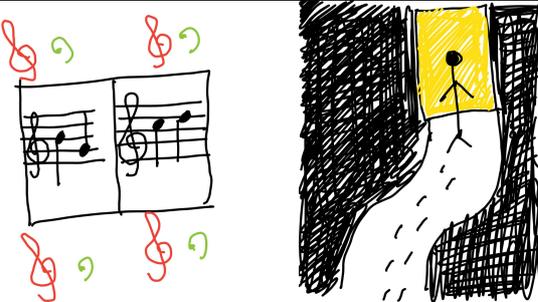
	<p>This image is an example of what Participant #8 called 'meaningless everyday happenings'. She said that drawing drawing made a mundane day memorable.</p>		<p>This image explains what Participant #8 thinks of the taste of her food. Participant #8 not only drew the image of the food, but also drew her reaction to the taste.</p>
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	<p>These two images show the conversation which Participant #8 said she could remember, in which she discussed eating chocolate.</p> <p>The drawings demonstrate that chocolate was make her gaining weight but she continues to eat it while crying.</p>
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Conceptual Visualisation – Participant #8

	
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Description	Annotation
<p>Participant #8 describes her conceptual visualisation as follows:</p> <p>‘By dwelling on the emotional side of the word I couldn’t remember it helped me link emotion and be able to remember the word easily.</p> <p>I have a talent of remembering song lyrics very well as the tune plays in my head first and then the lyrics slot into the music. Drawing the image of the song – I was singing the song in my head with lyrics the entire time I was drawing so it made the lyrics more solid in my memory.’</p> <p>She also describes how she could solidify the unclear image to draw through conducting the drawing tasks as follows:</p> <p>‘Drawing does help as I identify the main features – in this case my own features for the self portrait such as hair and skin colour.</p>	<p>She had difficulty drawing unclear images. I gave her the task of drawing a word she could not remember or a person she had forgotten.</p> <p>She has a talent for remembering song lyrics. She sang a song in order to draw and it made the lyrics of the song solidify in her memory.</p> <p>Drawing was helpful to identify the main features. She used the example of how she illustrated her self-portrait. She used her hair colour and skin colour to make herself recognisable.</p> <p>Her memory was strengthened by looking deeper into her memory to create an image of a word she was unsure of. She examined her emotions surrounding that word in order to illustrate it.</p>

<p>Highlighting these features would solidify a person's existence in my memory with the word I forgot. Drawing it helped me look deeper in my memory to figure out the word based on emotions I had related to the forgotten word and eventually I remembered the forgotten word.'</p>	
<p>Conceptual Visualisation – Participant #21</p>	
	
<p>Description</p>	<p>Annotation</p>
<p>Participant #21 describes her experience of conceptual visualisation as follows:</p> <p>'Still I cannot match someone's face and his/her name. There was no experience I could remember better.</p> <p>It happens very often to me. At least, doodling was helpful in that it had a visual impact on memory so I would not forget the word which is doodled.</p> <p>I liked the songs that I doodled.'</p>	<p>She did not find that drawing helped her recall a forgotten person. She has difficulty matching people's faces and names.</p> <p>However, with regard to remembering a word, she often had trouble remembering English words because it is not her native language. The interesting point is that she found doodling helped prevent her from forgetting the word again.</p>

Design Number – Participant #8	
Description	Annotation
<p>As previously explained, the task involving designing a number was completed by only a few participants. Participant #8 responded that ‘this drawing task has not helped me to remember the numbers.’ However, she suggests that she would be better able to remember numbers if they were in picture form.</p> <p>She also discussed a feature of modern mobile devices:</p> <p>‘I memorised numbers when I was younger and you’d see the person’s phone number when sliding on the mobile. The new operating systems on phones now mean you never see the numbers, only people’s names.’</p>	<p>As Participant #8 mentions, smart mobile users do not have many chances to see someone’s mobile number, only the name of the person. This is a quite important point that the researcher should consider more.</p>
Spatial Memory – Participant #21	
Description	Annotation
<p>Participant #21 describes spatial memory as follows: ‘I had difficulty reading a paper map. I am not usually good at finding directions, and am especially very bad at reading paper maps. This task helped me to capture specific places I had been to.’</p>	<p>Participant #21 also is a person with poor spatial awareness. She simply describes how the drawing assignment helped her to remember specific places she had been.</p>
Emotion and Social Relationship – Participant #8	
Description	Annotation
<p>Participant #8 describes her response to the emoticon design task as follows: ‘we had a good laugh over the emoticons and it helped us bond</p>	<p>Participant #8 explains how she and her partner interacted by drawing emoticons. They had fun creating their drawing emoticons. The emoticon</p>

better as we both shared in the joke. However, having an on-screen emoticon keyboard, the emoticons were used much more frequently due to their speed and convenience.'	helped them to develop a social relationship by sharing jokes. However, the on-screen emoticon keyboard was used more often because of its speed and convenience.
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Emotion and Social Relationship – Participant #21	
	
Description	Annotation
Participant #21 describes how she responded to the emoticon design talk as follows: 'we liked sending emoticons to each other. I have never seen my partner but I could imagine she might look like her emoticons (expression of anger, sad, and other facial expression). That helped me to build a closer relationship with my partner. I could guess her character through looking at her emoticon drawings.'	Participant #21 describes how her partner's emoticons helped her to imagine what she looked like, which made her feel closer to her.

Table 30 data analysis of the case one

Case One is a pair who both identified as having digital anxiety. (See section 6.2.3.) Both were females and they scored highly for physical symptoms. Participant #21 got a high STAI score of 109 (scores are 'high' when over 100). This pair is of particular importance in my research because they are the only case in which both were identified as having digital anxiety.

This pair was very actively engaged and participated in the drawing experiment. In my view, this is not irrelevant to their suffering from digital anxiety. Having digital anxiety encompasses high usage, high addictive reactions, high digital preference, high social anxiety, being highly addicted to social networking sites, and having physical symptoms. Overall, this pair was mostly positive about the tasks in my

drawing experiment. These tasks were focused on ‘daily memory’, ‘spatial memory’, ‘emotion’, ‘social relationships’, and ‘conceptual visualisation’.

Regarding the topic of ‘daily memory’ Participant #8 explained that she could recall her drawing of Indian food because she was laughing over her drawing. As with Participant #8’s experience, philosophers and scientists have puzzled for centuries over how the brain and mind are related; thus a new field, called cognitive neuroscience, explores a more comprehensive synthesis of the mind and brain (Posner and Raichle, 1994). I mention this because I found a pattern connecting memory and emotion not only in the responses of this pair but also in the responses of other pairs. Participant #8 also mentioned a specific drawing that strongly embedded in her memory. This was the image of eating the chocolate, which linked to her worries about gaining weight, and which lasted a long time in her memory. Here are the images of her eating chocolate:



Figure 20 The Images of Eating the Chocolate

In her drawing, she is eating the chocolate even though she is crying because she is worried about getting fat. Her drawing helped firm certain images in her memory, as she was compelled to recall the event, solidify it into the image, and examine the drawing. She explained that the memory does not represent the actual event, because it was recreated by her drawing.

Participant #21 made the interesting point that drawing made her daily life more special; moreover, drawing her ‘daily memory’ was a useful practice in helping her to recall images of what she had done that day. Participant #21 also mentioned the connection between emotion and memory, describing how the drawings remained in her memory because the tasks were fun and meaningful.

Regarding the topic of ‘spatial memory’ both participants mentioned that they had poor spatial awareness. However, Participant #8 thought that drawing was helpful in improving her spatial memory, as it solidified her view of a scene. Participant #21 described how drawing helped her to capture images of the places where she had been.

Regarding the topic of ‘social relationships’ Participant #8 said that drawing emoticons was helpful in developing their relationship, as it allowed them to share jokes. However, she preferred to use the existing emoticon keyboard because that was speedy and convenient. On the other hand, Participant #21 described how drawing emoticons was helpful to imagine how her partner was behaving while they were chatting. Participant #21 could imagine how her partner might feel about the drawing emoticon, which gave her the feeling of being closer to her partner.

Here is the example of the development of their social relationship.

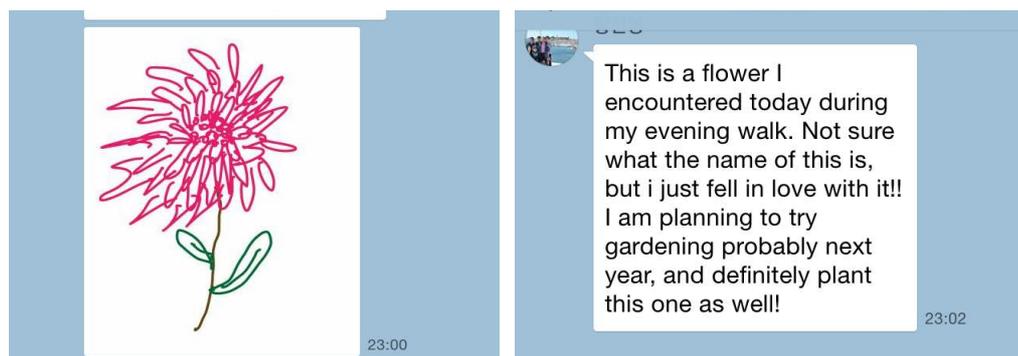


Figure 21 The example image of the drawing emoticon

Participant #21 drew this flower to convey how much she liked it, and wanted to share her positive feeling with Participant #8. This action is like a little greeting. Participant #24 used the word ‘greeting’ with regard to the topic of ‘social relationships’ (see Case Fourteen).

On the topic of ‘conceptual visualization’, Participant #8 found that this task was helpful in reminding them of a general mood, but not exact images. Drawing an image of a song was helpful to solidify the visual concept in the participant’s memory. Participant #8 was aware that drawing made her to look deeper into her memory. Drawing formatted her fluid thinking which embodied her emotions. Participant #21 found that conceptual visualization was helpful to keep the image in her memory.

English is not Participant #21’s native language, and she had difficulty with a few words, which were repeatedly forgotten. Thus, she drew a word that was frequently forgotten. As a result, the drawing inscribed the word in her memory; therefore, she did not forget that word after drawing it.

Case Two

Participant #12 is paired with Participant #22

		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 12	53	42	3.33
	Convert into %	33.13	26.92	66.6
		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 22	80	107	3.67
	Convert into %	50	68.59	73.4
<p>Participant #12 is a 20-year-old male. He not only belongs to the low SMAT group, but he is also the participant who got the lowest SMAT score. He ranked the lowest for high usage, social anxiety, and addiction to SNS. Moreover, he got the lowest STAI score.</p> <p>Participant #22 is a 36-year-old female. She not only belongs to the high SMAT group, but also she is the participant who got the highest SMAT score. She ranked the highest for high usage, digital preference, and addiction to SNS.</p>				

Day Memory – Participant #12



Auto save



Description	Annotation
<p>Participant #12 described how drawing may affect her memory: 'we talked about favourite food but not daily food. I got too busy with all of the deadlines.</p> <p>Usually the moments I drew from my day were fairly stressful, memorable or beautiful moments that I would naturally remember. Things that I wanted to share with someone else.'</p>	<p>Participant #12 and Participant #22 began to explore who are they by sharing their favourite foods, but not the food they ate on a daily basis.</p> <p>Participant #12 drew interesting moments from his day, moments he found stressful, memorable, or beautiful. He explains that he would naturally remember these moments, which is his reason for selecting them.</p> <p>I have observed that his drawings look like comic book illustrations. The second image indicates that he was on the computer when a file he was working on disappeared unexpectedly. The third image indicates that he realised the file had auto-saved so he did not lose his work after all.</p> <p>As Participant #12 explained, he draw moments that aroused strong emotions in him. I find that emotion and memory must be discussed together.</p>

Day Memory – Participant #22	
	
Description	Annotation
<p>Participant #22 described how drawing may affect her memory in the following way: 'the drawing assignments may have helped me to remember what I had. I don't normally remember what I ate for dinner.</p> <p>It narrowed my day down to one moment which wasn't as inclusive as the whole day.'</p>	<p>She simply responded that this task may have helped her to remember what she had eaten.</p> <p>I would like to focus on the word 'narrowed'. I think this word is similar to the term 'selection', used in this experiment. However, the participant may also be concerned about the importance of expressing her entire day.</p>
Conceptual Visualisation – Participant #12	
Description	Annotation
<p>Participant #12 described the conceptual visualisation task as follows:</p> <p>'I think it's impossible to draw an image of something you've forgotten because if you have forgotten something then you can't recall it to draw it. If something that you've drawn sparks a memory then I guess it's an incidental abstraction of that memory though...hmm yeah I guess you could. Anyhow I drew an old memory if that's close enough. Of when my headteacher from my secondary school/6th form called me up and we presented my drawing to everyone. I forgot the lighting. I can recall everything else about that evening apart from the light. Odd.'</p>	<p>Participant #12 has a negative view of conceptual visualisation, suggesting that it is an impossible task. He thinks that something forgotten cannot be recalled and therefore cannot be drawn.</p> <p>However, he changed his mind while writing his answer, suggesting that it may be possible after all.</p> <p>He recalled a memory from his youth: a scene in which he was presenting his drawing to classmates. He remembered that he could not draw the lighting. That experience has stayed in his memory and the lighting which should be in the drawing but wasn't has become the visual metaphor element. Therefore, he could associate it with the day when he was presenting his drawing to people.</p>
Spatial Memory – Participant #12	
Description	Annotation
<p>Participant #12 described how drawing may affect her spatial memory in the following way: 'I excel in orienteering and my day to day life revolves around understanding space in 3D. So it hasn't helped me now but I remember when I went on school trips years ago and doodled in my seat. For this task now it didn't help me remember a place or route but when I was young it helped me remember a lot.'</p>	<p>The task, which was to draw where he had been, did not help this participant to retain memories of certain places. However, he remembered drawing when he was young. He also described a similar experience in his response to the 'conceptual visualisation' task. This is an interesting point that needs to be reviewed with the literature about how drawing affects short term and long term memory differently.</p>
Emotion and Social Relationship – Participant #12	

Description	Annotation
<p>Participant #12 described his response to the drawing emoticon task in the following way: 'I didn't really design emoticons, I instead drew an emotion or a comic with a story that had an emotion attached to it. So in this case I built a social relationship by talking about my situation and commenting on my doodle partner's situation.'</p> <p>Participant #22 simply responded to this task as follows: 'it seemed like we had a good relationship.'</p>	<p>As previously mentioned, Participant #12 drew in a comic book style rather than designing emoticons of facial expressions or physical characters. He thinks his comic-book drawings express his emotions, and that talking about their daily lives or commenting on their drawings helped to develop a relationship between the participants. It seems that he is saying that drawing stories help the participants to explore who they are; drawing contains emotion itself.</p> <p>Participant #22 simply said that he and his partner had a good relationship.</p>

Table 31 data analysis of case two

Case Two is Participant #12 and Participant #22. Participant #12 is male. He got the lowest score on the SMAT. Participant #22 is female. Her results on the SMAT and STAI indicated that she might have digital anxiety (see section 6.2.3.). She also got the highest score (see section 6.2.1.) on three subscales. These are 'high usage', 'digital preference', and 'addiction to Social Networking Sites'. Through reviewing their drawings and conversations, I observed that this pair was not as highly engaged with the drawing experiment as Case One. It would be difficult to say that Case One was more engaged because they were identified as having digital anxiety. However, it is useful to know what the differences are between the two cases.

Regarding the 'daily memory' task, they did not conduct the drawing assignment I gave them. They shared their favourite foods, not the food they ate each day. Participant #12 explained that he drew interesting moments from each day. These moments were chosen based on his emotions, identified as events that were stressful, memorable, or beautiful. I am convinced that emotion and memory has a deeper relation than I originally thought. Participant #12 had a particular style of drawings that resembled comic book illustrations, which contain a story. He explained that he is

interested in speaking artistically. What he means by that is that he likes to use online images or web video links to support what he is talking about. His partner, on the other hand, responded that drawing the food she had ate was helpful in remembering it. However, she complained that drawing an interesting moment from her day narrowed her day down to one moment.

Regarding the ‘social relationships’ task, Participant #12 responded that he drew in the style of comic books, as seen below.



Figure 22 Participant #12's Drawings like Comics

Regarding the topic of ‘social relationships’, Participant #12 wrote the following: ‘I didn’t really design emoticons, I instead drew an emotion or a comic with a story that had an emotion attached to it. So in this case I built a social relationship by talking about my situation and commenting on my doodle partner’s situation.’

He explains that drawings themselves contain emotions. Also, he mentioned that sharing his situation and commenting on the drawings was helpful in building a social relationship. Here, again, I found the importance of ‘commenting’, which was touched on in the exploratory phase of this research. Participant #22 simply said that they had a good relationship.

Case Three

Participant #9 is paired with Participant #16

		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)	
		Average	79.3	71.21	3.46

	Convert into %	49.56	45.65	69.2
	# 9	59	91	3.67
	Convert into %	36.88	58.33	73.4
		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 16	93	67	3.67
	Convert into %	58.13	42.95	73.4

Participant #9 is a 40-year-old male. He belongs to the high SMAT group. His partner #16 is a 32-year-old female. She also belongs to the high SMAT group. Participant #16 was identified as having digital anxiety through the quantitative analysis.

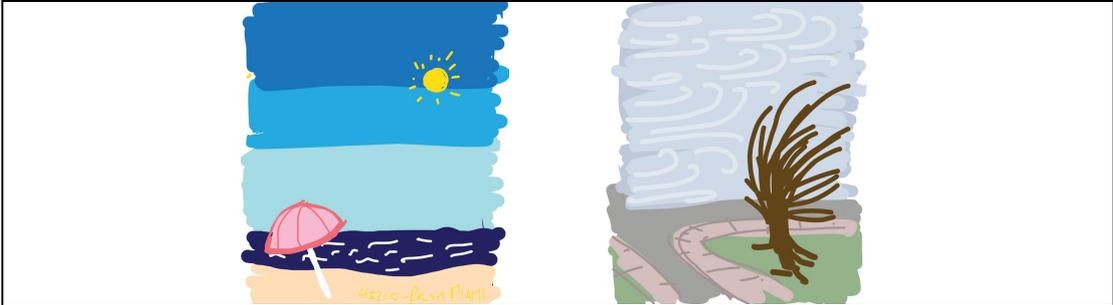
Day Memory – Participant #9

Description	Annotation
Participant #9 drew something that looks interesting.	Participant #9 put a lot of effort into his drawings, but did not give me enough information to understand how he conducted the drawing experiment.

Day Memory – Participant #16	
	
Description	Annotation
<p>Participant #16 described how drawing affected her memory in the following way: 'as I usually do not remember or keep record of what I ate, doodling forced me to think about this. Doodling also forced me to take time to eat and not eat while I work.</p> <p>Doodling did help me to remember what we talked about, especially the food. I eat the same thing a lot so it was quite difficult to repeat this again. Also, there tends to be a set routine for my day. When I realize the doodle would be the same, I wanted to try to find something new to do.</p> <p>The drawing task was very helpful. Many of my days are very stressful so I try to do something to relieve the stress. This task helped me to remember that moment of representing the stress, a walk in nature, a glass of wine, even enjoying a run in the rain. So while the task helped to recall that moment in the day it also helped me to focus on the positive moment of the day rather than all of the negative moments. This can be a very therapeutic task that could be done daily to help manage negative emotions, I think.'</p>	<p>Participant #16 used the word 'force' twice, a word which was also mentioned by Participant #4. She used the word 'force' to describe two things: first, drawing forced her to think about what she ate so she could doodle it later, second, drawing forced her to change her eating habits.</p> <p>She mentioned that doodling helped her to remember what they talked about, especially the food. Again, the doodling helped her focus on the pattern of her days. She realised that she has a set routine to her days; therefore, this gave her a chance to find something new to do.</p> <p>Drawing also has positively affected her emotions, helping her relieve stress. In order to get rid of her stress, she drew calming activities such as a walk in nature, a glass of wine, and enjoying a run in the rain. Through drawing those scenes, she could recall them and revisit positive feelings. She concluded that doodling her daily activities could be a very therapeutic tool that could be done daily to help managing her negative emotions.</p>
Conceptual Visualisation – Participant #16	
	
Description	Annotation
<p>Participant #16 described her response to the conceptual visualisation task as follows: 'well, it depends on the song. My favorite song is a little old, from 1983. It has also been my favorite since the early 1990s but there are so many</p>	<p>Drawing her favourite song helped her to think about the meaning of the lyrics in order to create a visual representation of the song. There were not many participants who think that presenting their favorite songs as drawings</p>

<p>lyrics that I do not remember them as well as more recent songs that I may not like as much. The task did not necessarily help me to remember the song as it is ingrained in my memory but it did make me think about the meaning of the lyrics in order to create a visual representation of the song.</p> <p>I did not have an English word I could not remember but I did have feelings or experiences I could not explain in words. I decided to make doodles to try and communicate this and that is why here are two doodles: worry and reading. I used this exercise to work through my thoughts.'</p>	<p>helped them to remember the lyrics. The participants generally focussed on the theme of the song, not the meaning of the lyrics.</p> <p>She also tried to draw two words, worry and reading. In the second image, she drew a portrait of her face. She is closing her eyes in her drawing. In the third image, she drew a pile of books. She has PhD upgrade viva ahead; thus, she was under pressure to write the literature review. She wanted to express her feelings of worry and stress deriving from heavy reading.</p>
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Spatial Memory – Participant #16



Description	Annotation
<p>Participant #16 described how drawing affected her spatial memory as follows: 'I do not have trouble reading a map usually. I doodled a view of where I had been or an element of where I had been. This tasks helped me to know and reflect where my partner had been and how he viewed places. This was a great way to communicate where I was also.'</p>	<p>Participant #16 mentioned two points in her description of this theme. One is that she explored an element of where she had been and how she viewed the place. And also she could see how her partner viewed the places he had visited.</p> <p>It is interesting that she normally writes simple text under or around her drawings to help her partner interpret what she drew. This, however, is not the case for this task.</p>

Design Number – Participant #16	
Description	Annotation
Participant #16 responded as follows: ‘the doodles I made of numbers were of my favorite numbers, which are rarely in the phone numbers of my family. I do not try to memorize numbers anymore and did not make the connection to do so with the doodles. Perhaps in the future I would really like to use doodles to help me remember certain information.’	She tried to doodle numbers which are not seen often in her everyday life, such as her phone number or the phone numbers of her family. However, as most participants agreed, doodling numbers did not positively affect her memory.
Mobile Handwriting – Participant #16	
Description	Annotation
Participant #16 described her experience of the digital handwriting task as follows: ‘the experiment encouraged me to start pencil drawing again, perhaps once a week. This occurred in that many of the places I doodled were of the outdoors. I first learned to draw in pencil by drawing nature. Doodling reminded me of this and how relaxing it is to draw nature so I would like to draw at least once a week.’	It is interesting that digital handwriting or doodling made her to return to pencil drawing. This is because she first learned to draw in pencil. This doodling assignment reminded her of how the pencil drawing could help her to relax. Thus, now, she would like to draw at least once a week.
Emotion and Social Relationship – Participant #16	
	
Description	Annotation
Participant #16 described what feelings she had when drawing her emoticon: ‘this was a very welcoming and ice breaking experience. The first introductory emoticons were very quick and simple, which made it easy to start talking with my partner as if we had known each other before. Also, making the emoticons was interesting because it made me think about the emotions and their visual representation. I did not have to use all of the emoticons because I did not want to portray some of the emotions, for example anger.’	This participant described this task as ‘a very welcoming’ and ‘ice breaking experience’. The participant thinks that the use of emoticons not only allows them to convey their feelings, but also to reflect on them. Therefore, Participant #16 did not want to draw an emoticon to represent ‘anger’.

Table 32 Data Analysis of Case Three

Case Three comprises Participant #9 and Participant #16. Participant #9 is male and he belongs to the high SMAT group. Participant #16 is female. The results of the SMAT and STAI indicate that she might have digital anxiety (see section 6.2.3.). I

received limited data from Participant #9; nevertheless, I found that this pair actively participated in the drawing experiment by reviewing their drawings and conversations, which I received from Participant #16.

On the topic of ‘daily memory’, Participant #16 used the word ‘force’ twice to explain how drawing changed her in a positive way. Firstly, drawing forced her to recall aspects of her day. Secondly, drawing forced her to change her eating behavior. She stopped eating meals at the same time as working, while she was conducting the drawing experiment. For Participant #16, drawing remained a visual metaphor, allowing her to recall what she had talked about, especially the food. She also explored her life pattern through drawing her daily life. She identified a certain routine in her lifestyle, and therefore tried to do new activities. She also remarked that drawing was helpful in getting rid of stress. Seeing drawings of the stress-relieving activities she had done reminded her of those moments; therefore, seeing the drawings refreshed her, and gave her a positive mindset. She concluded that doodling her daily life could be a very therapeutic activity.

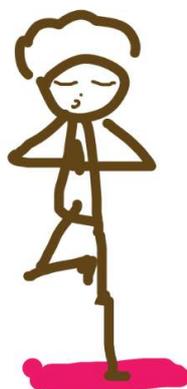


Figure 23 Yoga drawing

This image is an example of Participant #16’s drawing. She drew herself doing yoga, which is a new activity she took on after identifying a certain routine in her daily life. Seeing this drawing was helpful to remind her of the atmosphere of the moment.

On the topic of ‘spatial memory’, Participant #16 saw how drawing was useful to remember not only where she had been but also where her partner was. She made the following comments: ‘I doodled a view of where I had been or an element of where I

had been. This task helped me to know and reflect where my partner had been and how he viewed places. This was a great way to communicate where I was also.'

On the topic of 'Social Relationships', Participant #16 mentioned that drawing emoticons was a 'very welcoming' or 'ice breaking experience'. She thought drawing emoticons not only conveyed feelings but also reflected how they acted on those feelings. Therefore, she avoided drawing the emoticon that represented 'anger'.

Case Four

Participant #3 is paired with Participant #28

<p>Average of 30 Participants # 3 Participant</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 3	72	53	4
	Convert into %	45	33.97	80
<p>Average of 30 Participants # 28 Participant</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 28	79	80	3.67
	Convert into %	49.38	51.28	73.4
<p>Participant #3 is a 24-year-old male. He belongs to the low SMAT group. His partner Participant #28 is a 22-year-old female. She also belongs to the low SMAT group. Participant #3 got the lowest scores for social anxiety and addiction to SNS. On the other hand, Participant #28 got the highest scores for physical symptom. Also, Participant #28 is one of the participants (in total 9 participants) who have digital anxiety as identified by the quantitative analysis.</p> <p>As seen in the graphs, Participant #3 got lower than average STAI and SMAT results; however, he has higher confidence in his drawing ability. Participant #28 shows a slightly higher SMAT result and also has a little more confidence when drawing.</p>				

Day Memory – Participant #3

Description	Annotation
<p>Participant #3 describes his experience of this task as follows: 'I remember them fairly vividly because I had recorded them.</p> <p>The one where I drew my paradise when I was very stressed. After sending it I went and edited my sketch using adobe photoshop and put it as my cell phone's background. I remember it often now.'</p>	<p>As seen in the images, this participant put effort into the drawing tasks and he had high confidence in his drawing ability. He described his experience of recall. He drew his paradise when he was very stressed. After sending it to his partner, he edited the image using adobe photoshop and put it as his smart mobile background so he could see it often.</p>



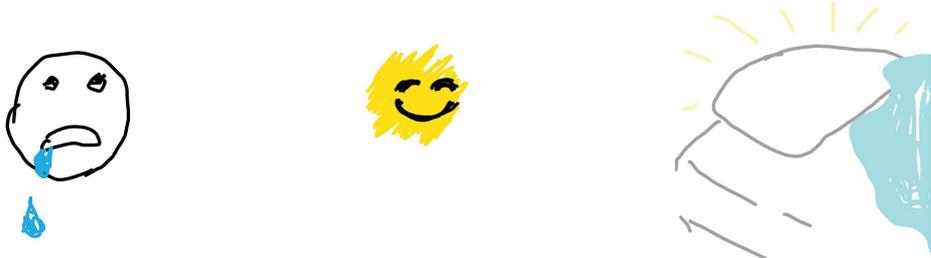
Day Memory – Participant #28	
	
Description	Annotation
<p>Participant #28 describes her response to this task as follows: ‘when I doodle the food I had that day I had to recall it to draw it so it helped to remind me what I’d eaten and sometimes made me realise I should eat better or healthier food.</p> <p>Once I doodled about moments and people I met at that time, it helped me to recall the day and remind of the moments. Those specific moments are still very clear in my mind.</p> <p>Drawing helped me to recall the place, atmosphere and events. Even now as I see the drawings again, I remember those moments very clearly. Also some situations before and after that moment as well. Those doodles have the effect of photos of that moment, but it’s stronger than a photo because I have to recall the moment in great detail otherwise I can’t draw properly.</p> <p>Recording my daily life helped me to remember the moments clearly and it lasts quite a long time so I still remember those moments quite precisely. And also if it was happy moment, it helps to remind me of that feeling again so I’ve seen my last drawings often because some of them make me happy again.’</p>	<p>As seen in the images, characteristics of Participant #28’s drawing include vivid colours, fine drawing lines, and detailed points.</p> <p>She found that drawing her food reminded her whether she was eating healthily or not. I found this to be an interesting point in this drawing assignment. Not only Participant #28, but many participants mentioned that they became aware that they were having unhealthy food by being required to draw their food everyday.</p> <p>Drawing her daily activities helped her to remember a moment clearly and for quite a long time. I think that people who spent longer describing the object or visualising the event were more likely to remember what they drew. They associate the drawing with their memory of the past experience.</p> <p>Participant #28 uses the words ‘clear’ or ‘clearly remember’ several times. Unlike Participant #2, Participant #28 explains that she can recall not only the place, atmosphere and events, but also the cause and effects of that moment.</p> <p>Participant #2 had talked about how a single drawing cannot contain all aspects of her day, but Participant #28 described the association of visual metaphors between the drawing and her memory. Because drawing is a visual expression with line compositions, colours, and space play, as she mentions, doodling has a stronger effect than a photo.</p> <p>And also, Participant #28 mentioned that her drawing reminds her of the feeling of happiness by recording a happy moment. She sees her emotion through her drawings.</p>

Table 33 data analysis of case four

Participant #3 put his focus on the dialogic function of drawing while conducting this drawing experiment. He was the person who scored the lowest on social anxiety and

addiction to SNS. This means that he is the person who most prefers getting to know someone online. He had high confidence in his drawing ability, and expanded my drawing experiment with further steps to create a better-looking image. He edited his drawing using Photoshop and put it as the background image of his smart mobile device. These actions strongly inscribed his paradise image in his mind.

Participant #28 had many ideas and approaches to drawing that I addressed in the literature review. Her mention of ‘seeing through drawing’ was interesting. She grew happy when she saw the drawings she had made when she was happy.

Emotion and Social Relationship – Participant #3	
	
Description	Annotation
Participant #3 describes his feelings toward Participant #28 after completing the experiment: ‘I actually feel fairly close to my partner through the experiment and would like to meet her at somepoint. Perhaps part of it is begin forced to talk throughout the day without it naturally occurring. I admired some of her sketches and ideas.’	This participant focuses on being forced to communicate regularly on a daily basis. At the end of the experiment, he not only feels fairly close to his partner but also wants to meet Participant #28. He has strongly positive images of his partner. This is because her drawings inscribed certain images of her in his mind.

Emotion and Social Relationship – Participant #28	
Description	Annotation
<p>She describes her feelings about Participant #3 after completing the experiment: ‘we’ve used the emoticons to respond to our partner’s words or drawings. And they imply a lot of emotions and words through the face, I think they helped to communicate better than conversations with only texts.’</p>	<p>It is interesting to note that she uses the word ‘we’. The word ‘we’ expresses the sympathy between Participants #28 and #3. Participant #28 thinks their creation of emoticons implies many emotions and meanings. Also, the emoticon designs such as the third image above (the cloud crying with tears) are evidence that they shared a rich feelings during their conversations.</p>



This image is the conversation between Participant #3 and Participant #28. Participant #28 is telling her about how tired she is due to her heavy workload. Her emoticon expresses well how tired she felt. Participant #3’s emoticon follows up to show his sympathetic gesture with her.

Figure 24 Conversation between Participant #3 and Participant #28

Their drawings indicate shared sympathy. These emoticons work as what Participant #28 called ‘seeing through drawing’. Sharing emotions is one of the reasons why Participant #3 wants to meet her partner.



Here is another image that indicates how they strengthened their social relationship. Participant #3 is throwing himself on the ground. The heavy burden of ‘work’ is pressing on his back. Participant #29 then sent a drawing of a cup of coffee, a caffeine drink called Red Bull, and a piece of chocolate cake. These caffeine and sweets are intended to give him energy. Her written text follows with the words “cheer up”.

Figure 25 Conversation between Participant #3 and Participant #28

These conversations through drawings are positive, and contribute to creative thinking and interpretation.

Participant #29's drawings communicate indirectly what she wants to say. The coffee, the Red Bull, and chocolate cake are things that people have when they feel tired.



Participant #3 and Participant #28 support each other to develop their drawings. Participant #3 explains that he remade one image, which he had sent to her the previous day, using Photoshop. He put an image of cloud under the mountain. Participant #28 praised his work, and also suggested another type of cloud texture that she likes.

Figure 26 Conversation between Participant #3 and Participant #28

Participant #3 and Participant #28 is the ideal pair I was hoping for. They not only conducted the drawing assignments, but also expanded actively their drawing subjects.

Overall, case four comprises Participant #3 and Participant #28. Participant #3 is male and he belongs to the low SMAT group (see section 6.2.1.). He also got the lowest scores on two subscales. These are 'social anxiety' and 'addicted to social networking sites'. On the other hand, Participant #28 is a female and the results of the SMAT and STAI indicate that she might have digital anxiety (see section 6.2.3.). She is ranked at the top of the subscale for 'physical symptoms'.

On the topic of 'Daily Memory', Participant #3 drew his 'paradise' of stress relief. After drawing this paradise, he edited the drawing with the editing software programme Photoshop. Then, he set it as the background for the main screen of his smartphone. Participant #28 mentioned two points on this topic. The first point was the awareness of whether she was eating healthy food or not. The second point was that drawing helped her to remember moments of her day clearly; moreover, the drawing lasted a long time. This pair actively participated in the drawing experiment, and put a lot effort into their drawings. In her questionnaire, Participant #28 used the

words 'clear' or 'clearly remember' several times when she answered on this topic. She found that drawing was helpful to recall a place, an atmosphere, events, and the causes and effects of certain moments. Moreover, she mentioned that drawings created stronger memories in comparison with photos. I consider this may relate to Derrida's statement that "drawing attempts to make tangible something slippery and irresolute through a performative act; as sign, symbol and signifier, as conceptual diagrams as well as medium, process and technique" (Garner, 2012). Moreover, drawing not only had a positive effect on memory, but also reminded participants of happy moments. Both of them were reminded of their happy moments when they saw their drawings.

On the topic of 'Social Relationships', this pair felt fairly close to each other. Participant #3 responded that he has strongly positive images of his partner; furthermore, he wanted to meet his partner. Participant #28 used the term 'we', not 'I'. They built a good social relationship by sharing sympathetic gestures. Here is the image of an example.

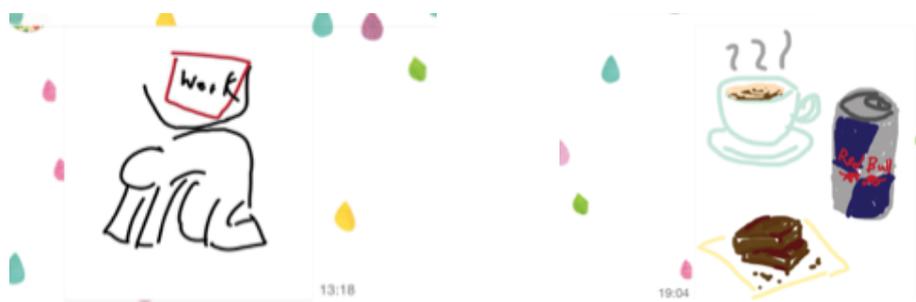


Figure 27 Image of Drawing Conversation

Participant #3 drew himself kneeling down under the pressure of heavy work. Participant #28 drew some sweets and caffeine to convey the gesture of giving energy to Participant #3.

This pair put effort into developing their drawings, as seen in the above images. Participant #3 drew a cloud under a mountain. In response, Participant #28 complimented the texture of the cloud.



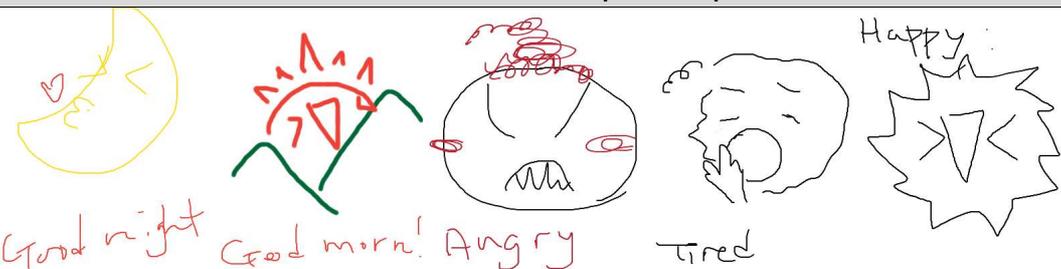
Figure 28 Image of Sharing Ideas for Drawing

The most interesting point is that Participant #3 remarked that he admired her drawings; moreover, he wants to meet her in person. This is because they actively engaged in the drawing experiment. Participant #3 is not usually a person who has social anxiety or who seeks social life over Social Networking Sites.

Case Five

#7 Participant is paired with #14 Participant

<p>— Average of 30 Participants — # 7 Participant</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 7	79	81	3.67
	Convert into %	49.38	51.92	60
<p>— Average of 30 Participants — # 14 Participant</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 14	60	60	3.33
	Convert into %	37.5	38.46	66.6
<p>Participant #7 is a 24-year-old female. She belongs to the high SMAT group. Her partner Participant #14 is a 27-year-old female. She belongs to the low SMAT group. Participant #7 is one of the participants (in total, 9 participants) who have digital anxiety as identified in the quantitative analysis.</p>				

Day Memory – Participant #7	
	
Description	Annotation
<p>Participant #7 describes how drawing affected her memory as follows: ‘the drawing task obviously helped me to remember what I ate, even though the meal was not special. I usually drew the most impressive moments in my day. Some doodles became memories in my head while I was drawing. Drawing a moment was quite an effective way to memorise.’</p>	<p>I find it interesting that she used the word ‘memorise’ instead of ‘remember’, ‘recall’, or ‘memory’. I find that the most of her drawings include text; thus, I looked up how she had described her drawing ability. She described her drawing ability as lower than the average. This may be the reason why she includes simple text under or next to her drawings.</p>
Day Memory – Participant #14	
	
Description	Annotation
<p>Participant #14 describes how drawing affects her memory as follows: ‘doodling helped me to remember the food menu I or my partner had better. I can still remember some of them.’</p>	<p>Participant #4 had mentioned that he cannot remember his drawings of the food but can remember what his partner had because of the vivid colours. Participant #14 mentions the interesting point that doodling helped her to remember not only the food she had but also what her partner had.</p>
Emotion and Social Relationship – Participant #14	
	
Description	Annotation
<p>Participant #14 describes what feelings he has about the emoticons task: ‘I think emoticons</p>	<p>Participant #14 makes two points. One is that her emoticon designs show her feelings better.</p>

showed my feelings better, so I think I felt that we build some kind of connection although we are not that close to each other.'	The other is that they helped them to build some kind of connection even though they are not that close to one another.
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Design Number – Participant #14	
	<p>Annotation</p> <p>Participant #14 says that she is not sure whether designing the number was helpful to remember it or not. However, not many participants did this task. Her designs of the number look interesting.</p>

Table 34 Data Analysis of Case Five

Case Five comprises Participant #7 and Participant #14. Both of them are female. Participant #7 is identified as having digital anxiety (see section 6.2.3.). Participant #14 belongs to the low SMAT group. This pair conducted the drawing experiment even though Participant #14 was away traveling during the period of the experiment. Because of Participant #14’s holiday schedule, this pair did not participate in the drawing experiment as actively as other participants.

However, I reviewed their data. Participant #7 wrote that she drew the most impressive moments of her days. And her drawings became memories. Drawing the moment was quite an effective way to remember. Participant #14 mentioned that drawing was helpful in reminding her not only of the food she had eaten but also to remember what her partner ate. Their drawings look fun and vivid.



Figure 29 Example images of food drawings

On the topic of ‘Social Relationships’, Participant #14 thought that they built up a good social relationship by drawing emoticons even though they were not that close.

Case Six

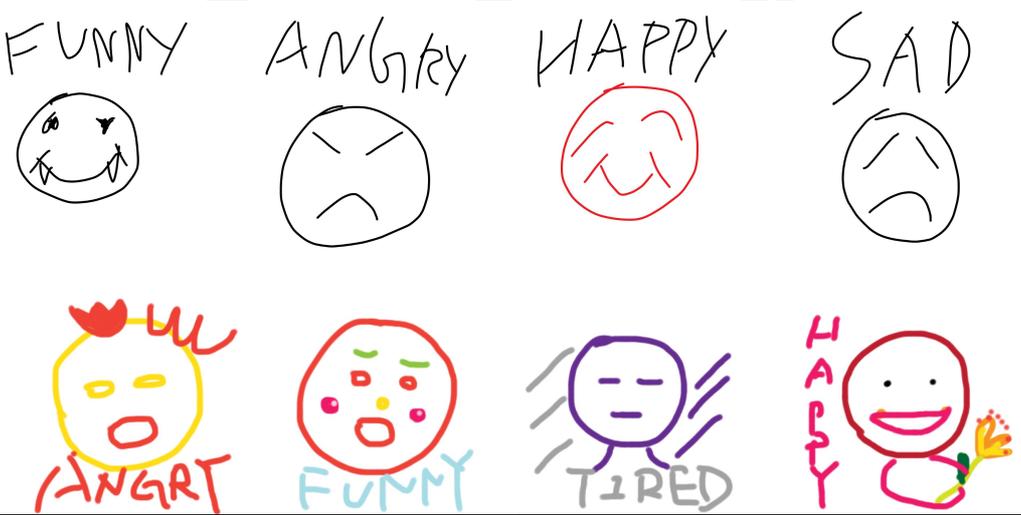
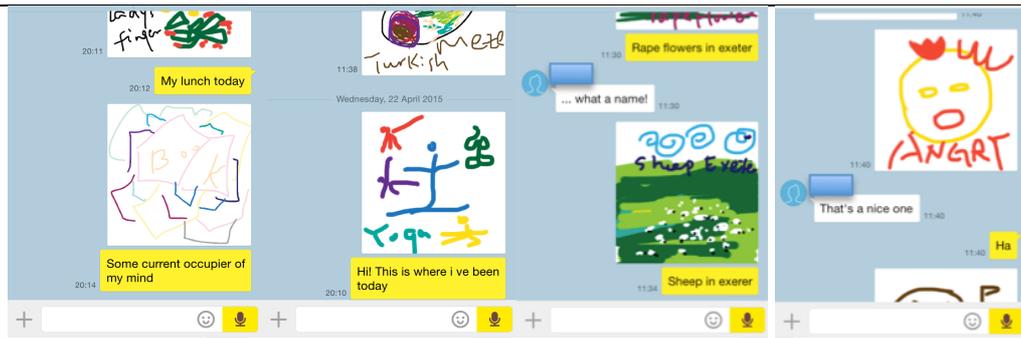
Participant #11 is paired with Participant #19

<p>Average of 30 Participants # 11 Participant</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 11	53	57	3.33
	Convert into %	33.13	36.54	66.6
<p>Average of 30 Participants # 19 Participant</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 19	75	93	2.67
	Convert into %	46.88	59.62	53.4
<p>Participant #11 is a 24-year-old female. She belongs to the low SMAT group. Her partner #19 is a 33-year-old male. He got the highest scores for addictive reaction, social anxiety, and addiction to SNS, and also has digital anxiety as identified in the quantitative analysis. Participant #11 got the lowest STAI score.</p>				

Day Memory – Participant #11	
Description	Annotation
<p>Participant #11 described how drawing affected her memory as follows: ‘the task of doodling the food is interesting and did prompt me to pay more attention to what I have eaten in a day.</p> <p>This is an interesting task. It is important to have a memory of the moment in order to visualise the moment on paper, so surely it would help with the recalling of moments.’</p>	<p>Not only Participant #11, but also other participants mentioned that drawing encouraged them to look back or focus on their lifestyle or life patterns.</p> <p>One interesting thing about her drawings is that they are accompanied by simple text.</p>
Day Memory – Participant #19	
Description	Annotation
<p>Participant #19 described how drawing affected his memory as follows: ‘I had to try and think of what moment it was first, then realise it’s not that easily expressed in pictures (second), then the most practical way to draw it (third), then whilst doing I take into account whether or not it would be correctly interpreted (fourth), then would hedge by providing a text expression (fifth).’</p>	<p>Participant #19 did not provide enough images of his drawings; therefore, it is hard to establish what his drawings were like. However, he explains his thought process regarding how the drawing assignments affected his memory.</p> <p>First, he imagined the moment he would like to draw. Second, he had difficulty visualising it as a drawing. Third, he decided to visualise it in a quick drawing. Fourth, he asked himself whether the drawing would correctly convey his thinking. Fifth, he explained what he wanted to draw using text.</p> <p>Participant #19’s drawings look very simple and speedy.</p>

Conceptual Visualisation – Participant #11	
Description	Annotation
<p>Participant #11 described her response to the conceptual visualisation task as follows: ‘yes, I have sometimes forgotten about some people I met offline. The task is interesting in itself, it questions your awareness of forgetting and remembering. If I do forget, how can I draw the things I forgot? If I could draw the thing, I did not forget it. It is an aporia, isn’t it? I guess the key thing I learnt through this exercise is that I do find the word or the word or the ‘something’ I forgot can be very temporal and it can just apply to a previous occasion where I want to recall something or a word and fail to recall it. Later, I would recall it so that word or something would become the object of forgetting. If I still fail to recall that object or subject, I would not be able to call it a thing that I forgot because that thing is unknown to me.</p> <p>This assignment is more like an artificial space for reflection rather than helping with memory.</p> <p>Sometimes, it depends on what kind of song it is. I drew a piece of music that does not contain lyrics so it might just help me to recall the theme and the aroma surrounding the music rather than the lyrics.’</p>	<p>Participant #11 begins her talks with the following useful question: if I forget something, how can I draw the things I have forgotten? If I could draw it, it would mean I had not forgotten it. This is an aporia.</p> <p>She thinks that the thing she had forgotten, even after she tried to visualise it, retained some kind of association for a certain time.</p> <p>Drawing a piece of music helped her to recall the theme and the mood of the music.</p>
Spatial Memory – Participant #11	
	
Description	Annotation
<p>Participant #11 described how drawing affected her spatial memory as follows: ‘I drew a portrait of a place or to capture the physical landscape really so it does not show any route in a larger context. I guess it does not really affect my sense of the physical map. I think I am good at reading a paper map most of the time for professional reasons – anthropological fieldwork requires a good sense of orientation.’</p>	<p>Participant #11 explains that the assignment in which she was asked to draw where she had been was helpful in capturing the physical landscape, but not in tracking her route there.</p> <p>I think that the participants had different approaches to conducting this drawing assignment. Some participants drew what they had seen. Some people recorded how they got there, as Participant #4 did in her drawing.</p>
Emotion and Social Relationship – Participant #11 and Participant #19	

Description	Annotation
<p>Participant #19 described her response to the emoticon task: 'it did tell me more about my partner. She put a lot of effort into designing her emoticons, including colours, and how they looked, etc. I was focusing more on effectiveness and speed. I'd have liked to get to know her more but am embarrassed I didn't complete all the tasks, and that our objectives were mismatched.'</p>	<p>Participant #11 did not respond to this task. However, I do not think that she forgot to answer it. She may think that the pair did not manage to develop a social relationship. Participant #11 completed all the drawing tasks with ardor and also responded to every question with considerable thought; this task was the exception.</p> <p>I discovered why she missed this task out by looking through their conversations and reviewing her partner's words. He mentioned that he did not complete all the tasks. I did not receive his drawing data except for the second row above. He also said that Participant #11 put a lot of effort into her drawings.</p> <p>As seen in their conversations, Participant #11 sent many of her drawings to Participant #19 but did not receive feedback from him. It looks as though she is talking to herself.</p> <p>However, the drawings in the second row were designed by Participant #11; the drawing images in the third row are designed by Participant #19.</p> <p>In this description, Participant #19 put more focus on effectiveness and speed in his</p>



	<p>drawings, while his partner spent a lot of time designing her emoticons, including their colours and how they looked, etc.</p> <p>It seems that Participant #19 was not able to engage with this experiment, unlike Participant #11.</p> <p>I think this is because he has below-average confidence. In comparison, Participant #11 said that she likes drawing, and that she enjoyed carrying out the drawing assignments when I had a little chat with her to collect her data from this experiment.</p>
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Table 35 data analysis of case six

Case Six comprises Participant #11 and Participant #19. Participant #11 is female. She belongs to the low SMAT group, and also got the lowest STAI score (see section 6.2.). On the other hand, Participant #19 is the only male who has digital anxiety, out of 30 participants. He also got the highest scores on three subscales. These are ‘addictive reaction’, ‘social anxiety’, and ‘addicted to Social Networking Sites’ (see section 6.2.).

Participant #11 conducted the drawing experiment more actively than Participant #19. I did not receive enough drawings from Participant #19 to observe how he conducted the drawing experiment. However, I could observe the general mood with which this pair conducted the drawing experiment by looking at the data from Participant #11.

Before discussing memory, I want to begin by analyzing the topic of ‘Social Relationships’. Participant #11 did not respond to this topic even though she answered discreetly to other topics. It seems likely, from observing their conversations, that she hardly established a relationship with Participant #19. Participant #11 completed all the drawing tasks with difficulty. Participant #19 also pointed out that she put a lot of effort into her drawings. On the other hand, he said that he put more focus on effectiveness and speed in his drawings. Here are the example images that explain how their drawing style was different.

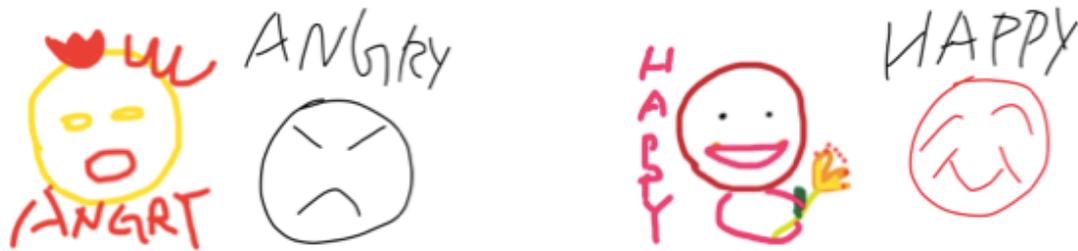


Figure 30 Different Styles of Drawing Emoticons

The first two images represent a feeling of anger. The left hand image is Participant #11's design of the emoticon. Her design looks more expressive and descriptive. As Participant #19 explained, the right hand image looks simple and as though it was done quickly. The second two images present a feeling of happiness. In the left hand image, the character holds a flower. The flower may represent a good feeling. In the right hand image, the character simply smiles, which put more focus on effectiveness and speed, as Participant #19 said.

Participant #11 sent many of her drawings to Participant #19. However, he did not send many back to her. Participant #19 did not engage with this experiment well, in comparison to Participant #11. In my view, this may be because of his drawing ability and interest in drawing. He is the participant who got the lowest score on drawing ability. Here are the example images. The drawings and yellow text boxes were sent by Participant #11. I could find only two responses from Participant #19, as seen in the images.

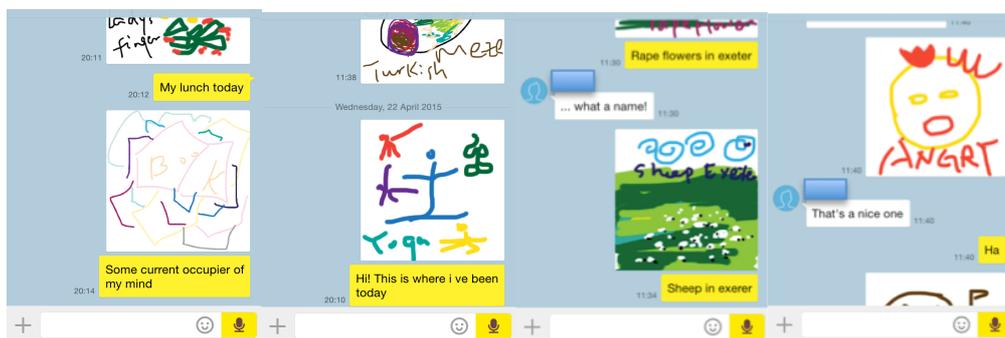


Figure 31 Images of the conversation between Participant #11 and Participant #19

On the topic of 'Daily Memory', Participant #11 mentioned that it allowed her to look back on her lifestyle. She described how it is important to remember a moment in order to visualize it on paper; therefore, this would help her to recall the moment. She

is another participant who included simple text in her drawings. Participant #19 explained how he could draw a memory from his day in the following way: [1] he imagined the moment in order to decide what to draw, [2] he simplified the image into a quick drawing, [3] he evaluated whether it conveyed the meaning or not, and [4] he explained what he had drawn after sending it to his partner.

On the topic of ‘Spatial Memory’, Participant #11 explained that the drawing assignment was helpful in capturing the physical landscape, not the route. I think this indicates a different approach to conducting this task. Some people drew what they viewed, but some others drew how they got to the place.

On the topic of ‘Conceptual Visualization’, Participant #11 had an interesting view of this task. She began with one question: “How can I?” She said that this is an aporia. She explored the question further: the key thing she learnt through this exercise is that drawing something which has been forgotten can be done if the thing has been only forgotten temporarily or if the fluid image can be associated with a previous occasion. However, if she still cannot visualize it for a certain period, then that image is just forgotten. The topic of ‘Conceptual Visualization’ was more like looking at an artificial space for reflection rather than helping with memory. Drawing a piece of music could recall the theme and the aroma surrounding the music.

Case Seven

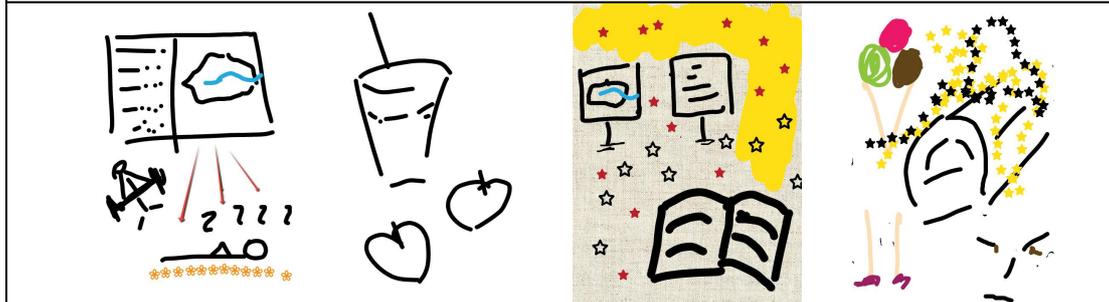
Participant #20 is paired with Participant #30

		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 20	120	58	3.67
	Convert into %	75	37.18	73.4
		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46

	Convert into %	49.56	45.65	69.2
	# 30	85	84	4
	Convert into %	53.13	53.85	80

Participant #20 is a 31-year-old female. She belongs to the low SMAT group. Participant #30 is a 22-year-old female. She not only belongs to the high SMAT group, but also she has been identified as having digital anxiety through the quantitative analysis. Participant #20 got a high STAI score of 120.

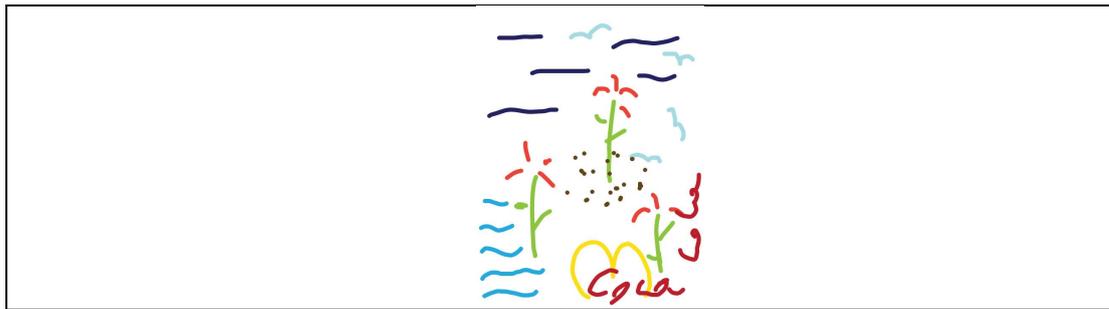
Day Memory – Participant #20



Description	Annotation
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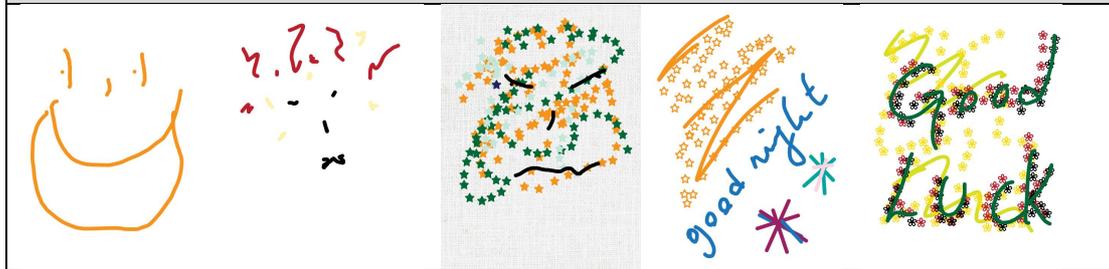
<p>Participant #20 described how drawing affected her memory: 'I found it difficult to draw many things, especially food. So I only drew food I ate a few times – the other issue was that the food I eat is the mostly the same. So did not see much point in sending the same images everyday.</p> <p>Again I do not draw well so I found it difficult to draw anything, including what I had done during the day. The other problem what that it was a difficult period for me as I had many deadlines. Therefore my days consisted mainly of studying so my daily doodles were similar. I had an uneventful and even boring few days during the task where I did the same things everyday.'</p>	<p>Participant #20 mentions how she had difficulty doing the drawings. Therefore, I looked up her answer to the question about her drawing ability; however, she answered that her drawing ability was above average. However, she had difficulty drawing, especially drawing food. She skipped this task often because she was eating the same as the previous day. And she also had a regular routine; moreover, she was under pressure, with many deadlines.</p> <p>Some participants used the drawing assignments to look back at their lifestyle, in order to make their life more special or to explore something new, like Participant #21.</p> <p>However, Participant #20 did not find that drawing made her days better. In the quantitative analysis, it was established that Participant #20 had high anxiety. She ranked second top in the STAI test. I thought drawing might be a therapeutic tool for her, but she may have negative feelings about her drawing skills and about the drawing tasks she had to complete during a busy period.</p>
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Spatial Memory – Participant #20



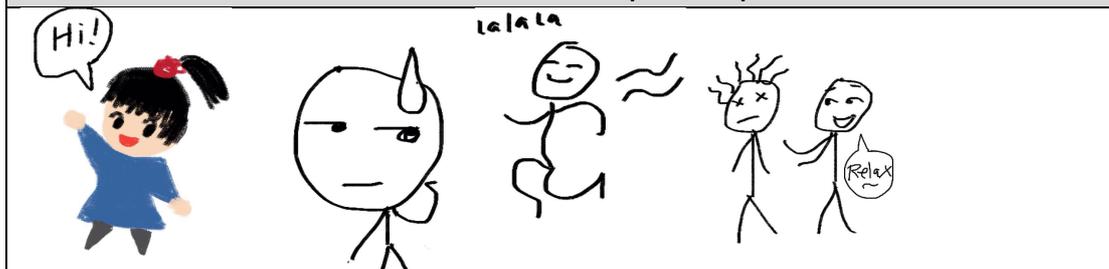
Description	Annotation
<p>Participant #20 described how drawing affected her spatial memory: 'I doodled places or activities. This was interesting but I prefer to exchange this information using words.</p> <p>I found that my doodling skills were mediocre so limiting.'</p>	<p>Again, here, Participant #20 appeals to her preference for exchanging information using words as a result of her limited drawing skills.</p> <p>She did not mention how the drawing affected her spatial memory.</p>

Emotion and Social Relationship – Participant #20



Description	Annotation
<p>Participant #20 described her response to the emoticon task as follows: 'I would use doodling tools to convey my emotions – in fact I also used them with other people during the task. I actually enjoyed doodling emotions or difficult moments as it proved to be a good way to express complicated feelings. I will definitely doodle emotions and feelings from now on. The task has changed how I communicate.'</p>	<p>Participant #20 did not identify any positive effects of drawing her food or daily activities.</p> <p>However, she prefers to use doodling tools to convey her emotions. She used her drawing emoticons with other people while conducting the drawing experiment. She used the term 'actually'. That may indicate a change in her mood. She had difficulty with her drawing skills, but enjoyed drawing her emotions by designing the emoticons.</p> <p>Drawing complicated emotions when she was facing difficult moments was helpful. Following this experiment, she plans to draw her emotions; furthermore, she thinks this task has changed the way she communicates.</p>

Emotion and Social Relationship – Participant #30



Description	Annotation
<p>Participant #30 described her response to the emoticon task: 'the emotion of restlessness is something both my partner and me feel these days, about our respective projects and papers. This created a kind of sympathy shared between us.'</p>	<p>Both Participant #20 and #30 had positive views of this task. They had a feeling of restlessness due to being under pressure.</p> <p>However, sharing their emotions and sympathy through sending those emoticons above helped make them feel better. For example, the fourth image is telling Participant #20 to 'relax'. In Participant #20's drawing, I found a 'good luck' image sent to Participant #30.</p>

Table 36 data analysis of case seven

Case Seven comprises Participant #20 and Participant #30. Both are female. Participant #20 belongs to the low SMAT group, but she got a high score (120) on the STAI, over 100. On the other hand, Participant #30 is identified as having digital anxiety from the results of his SMAT and STAI (see section 6.2).

Firstly, Participant #20 complained about difficulties in drawing even though she identified her drawing ability as above average before conducting the drawing experiment. She found difficulty especially in drawing her food. She also mentioned that she often skipped drawing food if she had had it before. She also complained that she had a regular routine in life. Like Participant #20, her partner, Participant #30 drew only new events or things that she had newly acquired. Participant #30 also had a routine in her days; she therefore skipped drawing things if they had been drawn before. Therefore, there are not many mentions of the topic of 'Daily Memory'.

However, on the topic of 'Social Relationships', Participant #20 preferred to use her doodles to convey an emotion. Therefore, she used the emoticon not only with her partner but also to other friends she was chatting with.

Participant #20 explained about the limitations of her drawing abilities, but enjoyed using the drawing emoticon to express her emotions. Moreover, she had one more positive view of the drawing experiment. Drawing helped her to sort out her

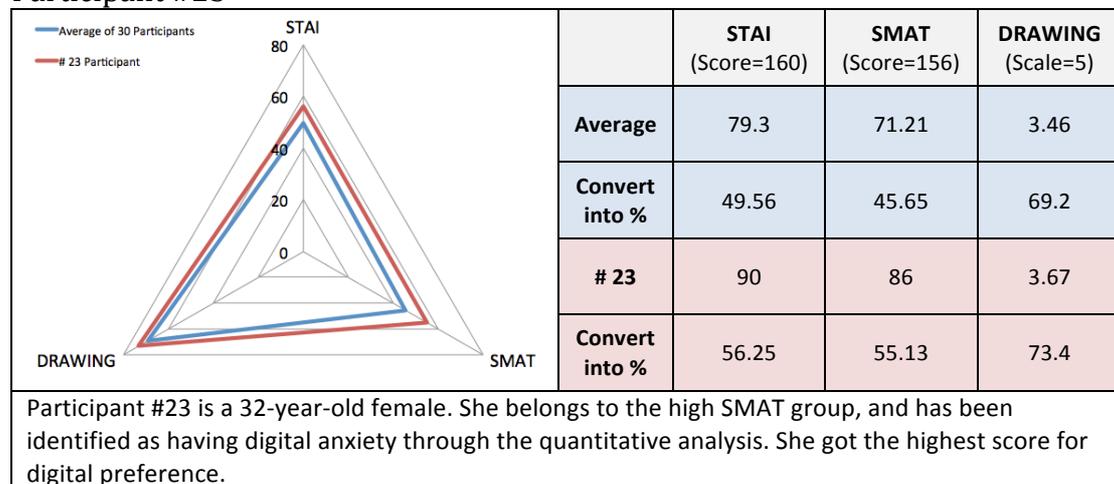
complicated feelings when she was facing a difficult moment. During the drawing experiment, she drew her emoticons in a way that changed the way she communicated over the digital screen. I could observe the reason for her positive feelings regarding ‘emotions’ in their conversation. Participant #20 and Participant #30 had a similar experience. Thus, sympathizing with, for example, a feeling of restlessness, helped them to recover their emotions in positive ways. They sent emoticons to say things like ‘good luck’ or ‘relax’, or to cheer each other up.



Figure 32 Images showing the forming of a social relationship via drawings

Case Eight

Participant #23



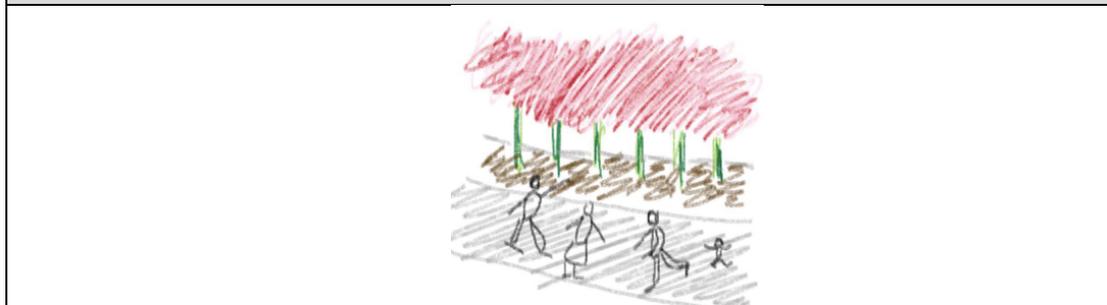
Day Memory – Participant #23		
Description	Annotation	
<p>Participant #23 described how a drawing affected her memory as follows: 'I tried to remember the exact image of the food I had and put some effort into detailing the image in my drawing tasks. Colouring the food was especially fun, since it involved directly transferring the coloring to my mind.'</p> <p>Imagining the moment of my daily life was quite interesting in this experiment, since drawing, instead of taking pictures, made the moment more special. It was like making my own personal drawing diary.'</p>	<p>To describe her drawings, Participant #23 used three key phrases. These are 'the exact image', 'detailing the image', and 'colouring the food'. The phrase 'the exact image' is interesting, because it suggests observational drawing. The term 'detailing' indicates the drawing of lines to solidify her images. She highlights that colouring the food was especially fun and directly inscribed the images in her mind. I find here the importance of using colours in drawings. Participant #4 described that he could remember what his partner had eaten because it was vividly coloured, but could not remember his own food, which was drawn using simple black lines.</p> <p>There is another important aspect of Participant #23's description. She thinks that drawing made moments more special in comparison to taking photos.</p> <p>Finally, she used the phrase 'personal diary'. Drawing expresses someone's personal feelings and thoughts through lines, colours, and structures. Participant #25 used the word 'personal' as well. I would conclude that drawing reflects the personal character of the drawer.</p>	
Hand Writing – Participant #23		
Description	Annotation	
<p>None of the participants thought about how digital hand writing may affect their user ability. However, Participant #23 said she thought about digital hand writing through the drawing experiment. She said: 'in most of the</p>	<p>Participant #23 uses two smart mobile devices. One is an iPad mini and the other one is a smartphone. It is important that she uses the word 'most'. In most of the drawing tasks, she used her iPad because it was easier to draw</p>	

<p>experiment, I used a bigger device such as an iPad mini for a better and much more accurate drawing. And I transferred the drawings to my cellphone, and then sent them to my partner. Now I can write quite well on iPad with my fingers. But I feel the necessity of a stylus pen for the device. Using my finger is still uncomfortable.'</p>	<p>more accurately than on the smartphone. She points out the importance of the size of the device when drawing. The bigger size is more comfortable, and also a stylus pen would be preferable when drawing on the digital screen. She still had difficulty drawing or writing with her finger. She spared no effort, as it was a complex procedure to draw something on her iPad, send it to her smartphone, and then send it to her partner. This is perhaps because she is the participant who ranked top for digital preference.</p>
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Conceptual Visualisation – Participant #23

Description	Annotation
<p>Participant #23 described her response to conceptual visualisation as follows: 'I tried to express the weather or experiences or places I have been by using my portrait and drawings. But still I think the text explanation is necessary for your partner to get the exact meaning.</p> <p>Drawing the image of a word that I cannot remember was fun, but that did not help me to recall the word really. Whenever I try to remember the word I recall the image not the word.'</p>	<p>Participant #23 points out the importance of adding text to her drawings to explain what she had drawn. Interpretations of drawings need to be discussed when reviewing the literature.</p> <p>She has two different points in comparison to other participants. One is that she used digital handwriting a lot in her drawing, and sometimes sent only digital handwritten text.</p> <p>The other point is that she is only the person who said conceptual visualisation was fun. The word 'interesting' was used by other participants', but none expressed an emotion like enjoyment.</p> <p>I also found while annotating her data that both the wording and the drawing are types of communication.</p> <p>I realise that she cannot express 'what she wanted to tell' through drawing. I think that can be an important point to discuss because that represents a different approach to text based communication and drawing communication.</p>

Spatial Memory – Participant #23



Description	Annotation
<p>Participant #23 described how drawings affected her spatial memory as follows: 'By imagining the place where I went, it helped me to possibly remember where I had been and</p>	<p>Participant #23 simply mentioned that drawing was a helpful way of remembering her daily activities. However, her response does not make reference to spatial memory.</p>

what I had done.'	
Emotion and Social Relationship – Participant #23	
	
Description	Annotation
Participant #23 described her response to the emoticon task as follows: 'designing was fun and has enriched my imagination and imaging skills but I am quite not sure whether it was helpful in conversation with my partner.'	<p>There are two aspects to her responses. One is that designing the drawing emoticons was helpful to enrich her imagination and develop her imaging skills. She enjoyed designing her emoticons.</p> <p>The other is that she does not have a positive view of its contribution to the social relationship with her partner.</p>

Table 37 data analysis of case eight

Case Eight is Participant #23. Participant #23 and her partner completed the process of the drawing experiment. However, her partner's data was not really useful; therefore, I removed his data from both the quantitative analysis and the qualitative analysis. Participant #23 has digital anxiety and she also got the highest score on the subscale 'digital preference' (see section 5.2.).

On the topic of 'Daily Memory', she explained, using three key phrases, that the task had a positive effect on her memory. These phrases are 'the exact image', 'detailing the image', and 'colouring the food'. The term 'exact image' describes an aspect of an observational drawing. The term 'detail' describes a process of solidifying her images. She highlighted that colouring the food was especially fun, and that it was directly printed in her mind. The importance of the use of colour often appears in the participants' data. Recording her daily activities as drawings made her days more special, as though she was writing a 'personal diary', and had more impact than taking a photo would have done.



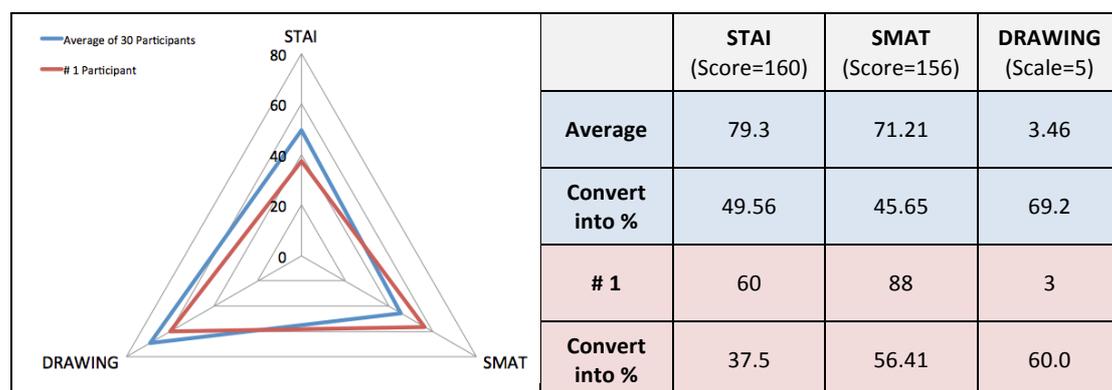
Figure 33 Example images of her drawings as a 'personal diary'

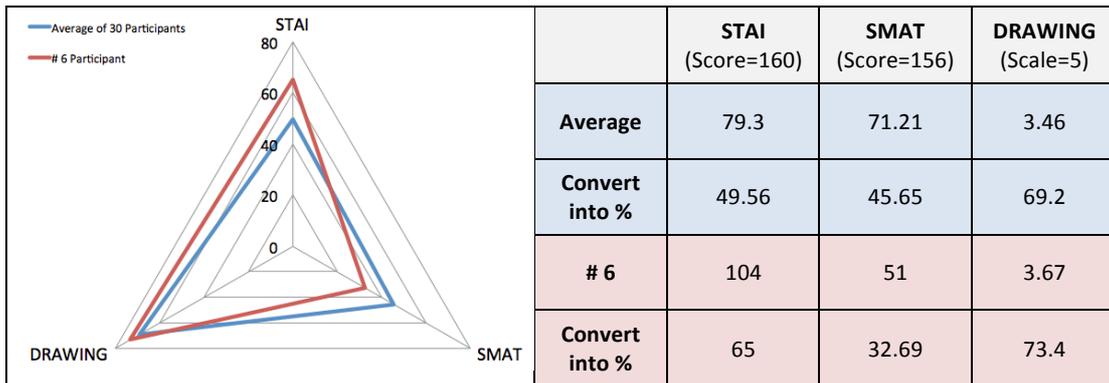
On the topic of 'Conceptual Visualization', she is the only one who answered that it was fun. I found some participants who said that it was interesting, but no others used the word 'fun'.

On the topic of 'Social Relationships', her responses consist of two main contexts. One is that the drawing emoticon was helpful to enrich her imagination and develop her imaging skills. The other one is that she did not find it very helpful in building a social relationship, even though she enjoyed designing the emoticons. From the images of their conversation, it is clear why she thought it was not. She did not receive feedback or any reactions to her drawings from her partner. In addition, I removed her partner's data because he submitted Participant #23's drawing as his own work. I discovered this from reading their conversation.

Case Nine

Participant #1 is paired with Participant #6





Participant #1 is a 24-year-old male. He belongs to the high SMAT group. His partner #6 is female and a 22-year-old. She belongs to the low SMAT group. Participant #6 got the lowest scores on three subscales. Those are 'addictive reaction', 'digital preference', and 'social anxiety'. But she got a high score (104) on STAI compared to other participants.

As seen in the graphs, Participant #1 has less confidence in his drawing ability compared to Participant #6, who has higher than average confidence.

Day Memory – Participant #1	
Description	Annotation
Participant #1 thinks that drawing the food he ate each day is a good way to describe it. He remarked that 'visualising the food using images is a good way to describe it. It's very easy to work out what food is using a simple drawing.'	The use of a simple drawing was helpful in communicating with his partner. He use simple lines, a few colours, letters of the alphabet, or a word to clarify what he wanted to represent. For example, in the first image, the letter 'T' represents the word 'tea'.

<p>He described the day he had drawn in the following way: 'the moment was easy to remember using the doodle. I rode into work for the first time and the simple image of me on my bike brought back the memories instantly. I just checked it now, two weeks after it was posed.'</p> <p>In his drawing, he did not use many colours, only obvious colours such as yellow for the sun and sky blue for the river.</p>	<p>He remarked that drawing a moment from his day made it easy to remember. He also said that he remembered the moment two weeks after the time he did the drawing. He could remember or imagine the scene of riding his bike to his workplace because the process of drawing works as a 'rehearsal'. The scene from his primary memory is brought to reconstruct the scene in a 'rehearsal', and this remains as a secondary memory.</p> <p>It is interesting that, in the second drawing, he wrote the word 'bike', to give exact information to his partner, even though he drew the bike well. I think this is because he had little confidence in his drawing ability.</p>
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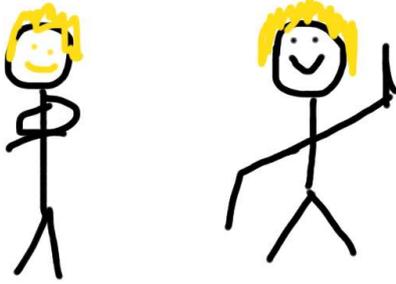
Day Memory – Participant #6	
	
Description	Annotation
<p>Participant #6 expressed the most negative views about the drawing assignments. In response to the question of how drawing helped her to remember aspects of her daily life, she wrote that: 'drawing the experience of buying books did not help me recall the moment, since I felt like actually holding and flipping through the books was a better way for me to remember.'</p> <p>She also said that remembering the food she had eaten was not an enjoyable experience. She said: 'I really did not enjoy doodling the food I ate that day. It made the food I ate feel more real when I had to tell someone about it, and drawing the food made me hyper aware of how I was not making healthy choices with my body.'</p>	<p>I will discuss her complaints more specifically with regard to other topics (conceptual visualisation, spatial memory, emotion, and social relationship). However, this participant does not like how her drawings turned out in general. She feels that she was unable to properly communicate her thoughts through drawing. Even though she gave herself a high score for drawing ability in comparison to other participants, not only was she not satisfied with her drawings, neither were her drawings useful to communicate with her partner.</p> <p>With this as her general mood with regard to drawing, she said that holding and flipping through the books helps her to remember the experience better than drawing the experience. This is to do with remembering touch. Touching is a different kind of stimulus that affects memory.</p> <p>She also talked about sending her drawings of food to her partner. She said that she disliked doing this because it made her hyper-aware of what unhealthy food she had eaten. Drawing made the image real, as did showing the image to her partner. She was ashamed at having unhealthy food that she had to present to her partner. It may have seemed like this was encroaching on her privacy.</p>

Participants #1 and #6 give precisely opposite opinions. Even though Participant #1 had less confidence in her drawing ability than Participant #6 before participating in the experiment, Participant #1 was satisfied with his drawing assignments. I consider this is the result of two different points. One is the key word 'child-like' mentioned by Participant #1. The second is their different approaches to the drawing assignments. Participant #6 thought drawing was hard or too much of a challenge to deliver the

information she wanted. However, Participant #1 enjoyed drawing simple child-like drawings.

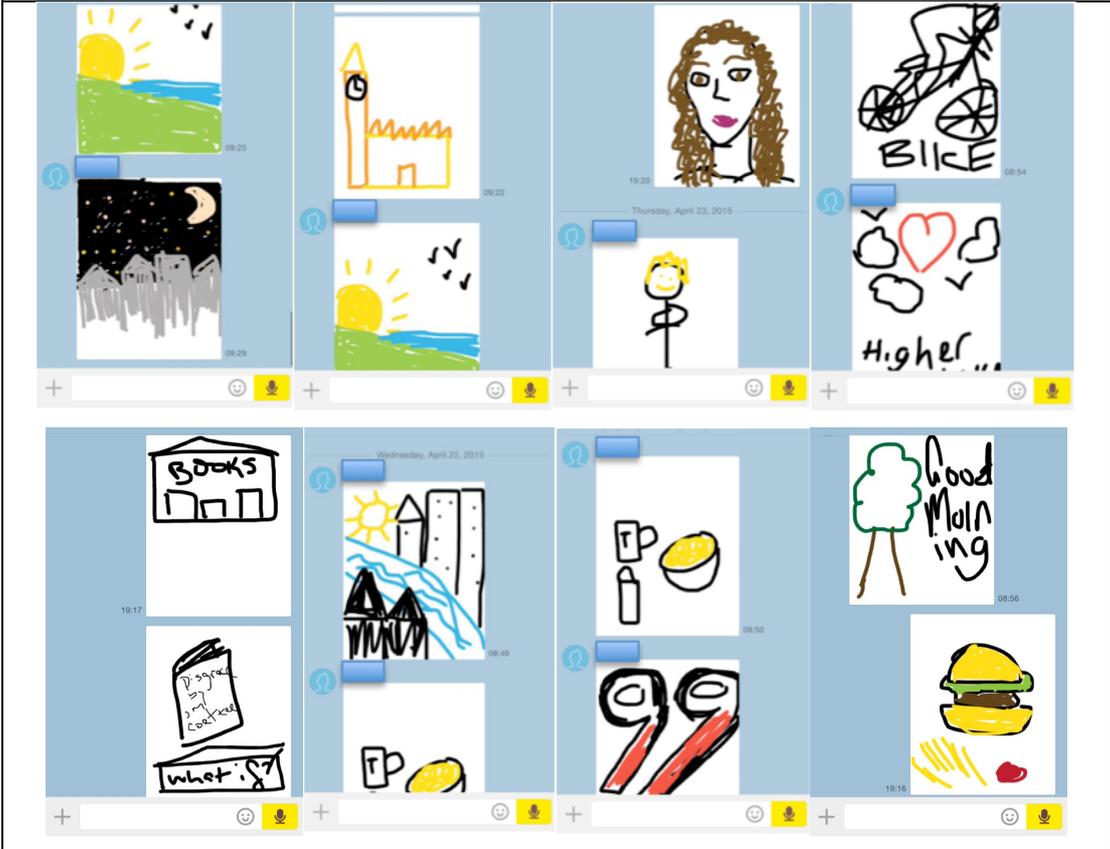
On the first image of Participant #6's drawings, we can see that she put less effort into presenting symbolic play. She decided to use more text in her drawings in order to deliver the information she wanted. This could be the reason why she thinks drawing really did not help her to remember the book or the book store. Making a drawing forces us to imagine and outline some points for visualisation.

Conceptual Visualisation – Participant #1	
 <p>Higher Love</p>	<p>The 'Conceptual Visualization' task was to draw something, someone, or some event that the participant could barely remember, or which they had forgotten. Alternatively they could draw an image of a song.</p>
Description	Annotation
<p>Participant #1 describes his experience as follows: 'I could draw very simple and childlike drawings very easily than can describe and explain a picture, a scene or an event. Drawing helped me to remember movies better. Drawing an image of a song helped me to remember its lyrics as I can associate and almost hear the song in my mind when I see the drawings.'</p>	<p>Drawing scenes from a movie helped him to remember it better. Not only Participant #1 but many other participants used the word 'associate'. Drawing the image of a song inscribed some kinds of images in his memory. Thus, he could almost hear the song in his mind. This drawing assignment was optional. Participant #6 did not do this task.</p>

Emotion and Social Relationship – Participant #1	
 <p>Good Morning</p>	
Description	Annotation
<p>Participant #1 said that 'designing emoticons were good and fun.' The first image is one that he used to say good night to Participant #6. The second image was used to say good morning. Through using the drawing emoticons, he felt that they were good fun and that he had a good</p>	<p>Participant #1's emoticon 'good night' presents the young moon hanging in the sky with glittering stars at night. The buildings are coloured in grey. He imagined midnight and drew the emoticon. In the image, I can see he had less time to draw the morning greeting.</p>

<p>mental image of his partner. 'I would not be able to recognize the person from the images, but it is fun to send doodles and pictures.'</p>	<p>Therefore, he drew a green tree that may represent something fresh in the morning. Like my interpretation, drawing is an indirect language that gives more opportunity to think whether it compares to the words 'good morning'.</p> <p>The third and fourth images are the participant's self-introduction. I will discuss this at the very end.</p>
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Emotion and Social Relationship – Participant #6



Description	Annotation
<p>Participant #6 did not mention the topics of 'emotion' or 'social relationship' with regard to the experiment. Her responses are negative in general.</p>	<p>These eight images were received from Participant #6. Even though Participant #6 sent me the captured images of their conversation, it can be observed that Participant #6 sent only 4 drawings, while Participant #1 sent 12 drawings to Participant #6.</p>

Table 38 data analysis of case nine

In case nine, neither of the participants was identified as having digital anxiety. This assessment is based on the quantitative analysis (see section 6.2.). Case Nine comprises Participant #1 and Participant #6. Participant #1 is male and he belongs to the high SMAT group. Participant #6 is female and she belongs to the low SMAT

group. I found that the SMAT score is likely to affect the result of the drawing experiment. This does not apply to every pair, but to a reasonable number of pairs, including the findings from the first 8 cases. However, again, Case Nine involves one participant who belongs to the high SMAT group and another who belongs to the low SMAT group.

Here, Participant #1 responded with a positive view of all drawing assignments. On the other hand, Participant #6 responded negatively to most of the drawing tasks.

On the topic of 'Daily Memory', Participant #1 mentioned that the memory of one of his drawings lasted until he answered the questionnaire. Participant #6 did not enjoy this topic, especially the food. The tasks were not helpful to retain images in her memory; moreover, she disliked the way her drawing turned out. She disliked sending the food she had eaten, because the drawings looked realistic. The awareness of having eaten unhealthy food was another reason for disliking the drawing assignment.

Participant #6 is the participant who shows the most negative view of the drawing experiment. I consider this is because she is the participant who got the lowest score for digital preference on SMAT, which was done before conducting the drawing experiment. After the drawing experiment, she answered that she prefers holding and flipping through books to remember her day, rather than drawing those images.

On the topic of 'Conceptual Visualization', Participant #1 responded that he could remember images from a movie he watched better. Also, drawing his favorite song was a useful assignment because the drawing of a song inscribed it as an image in his mind; therefore, he could almost hear the song in his mind.

On the topic of 'Social Relationships', they had opposite opinions. Participant #1 put more effort into designing the emoticon. He drew a crescent moon hanging in the dark grey sky with glittering stars at night, and the buildings in grey. He may have imagined midnight and reflected this in the drawing. Even though Participant #1 did not receive enough feedback about his drawing from Participant #6, he had a positive view of this topic. My perception is that the process of designing the emoticons not

only conveyed the creator's mind to the receiver, but also gave the creator a positive feeling.



Figure 34 Participant #1's emoticon designs

Case Ten

Participant #2 is paired with Participant #27

<p>— Average of 30 Participants — # 2 Participant</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 2	78	54	3
	Convert into %	48.75	34.62	60.0
<p>— Average of 30 Participants — # 27 Participant</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 27	71	87	3.67
	Convert into %	44.38	55.77	73.4
<p>Participant #2 is a 35-year-old female. She belongs to the low SMAT group. Her partner Participant #27 is a 27-year-old male. He belongs to the high SMAT group.</p> <p>This pair does not have any distinct characteristics identified by the quantitative analysis.</p>				

Day Memory – Participant #2			
			
Description	Annotation		
<p>Participant #2 describes her experiences and thoughts about the drawing experiment as follows:</p> <p>‘Whenever I had food, I often thought ‘how can I draw this food’ or ‘oh, I will draw this later on as I talk with my partner’. At first, I did my best to describe the food as realistically as possible but later my drawings were becoming abstract more and more only to deliver the fact I had eaten this or that (just indicating food rather than details).</p> <p>This is difficult to doodle because interesting events consists of a series of moments/stories/cause-and-effects. So I tried to choose only one specific moment among lots of images but I feel the picture does not represent the interesting moment.’</p>	<p>As she described, she focused or looked back at her daily routine even though it was not special. The drawing assignments gave her strong motivation to think about her everyday life.</p> <p>In the beginning, she did her best to describe the food as realistically as possible but later her drawings became more abstract and were intended only to deliver the bare facts. The word ‘realistic’ and the phrase ‘only delivering the facts’ are interesting because Participant #6 mentioned that she disliked drawing the food because it looked realistic. The food drawing assignment has aspects in common with observational drawing. Moreover, Participant #2 mentioned that she only tried to present certain things in her drawing that would deliver the facts. This is similar to what Participant #6 said. Participant #6 put more emphasis on delivering information rather than the aspects of creative-drawing-activities.</p> <p>Participant #2 explained how an event could be imagined. The interesting event consists of a series of moments/stories/cause-and-effects. So she had to sort out one specific moment among many images. Thus, the image could be an interesting moment.</p>		

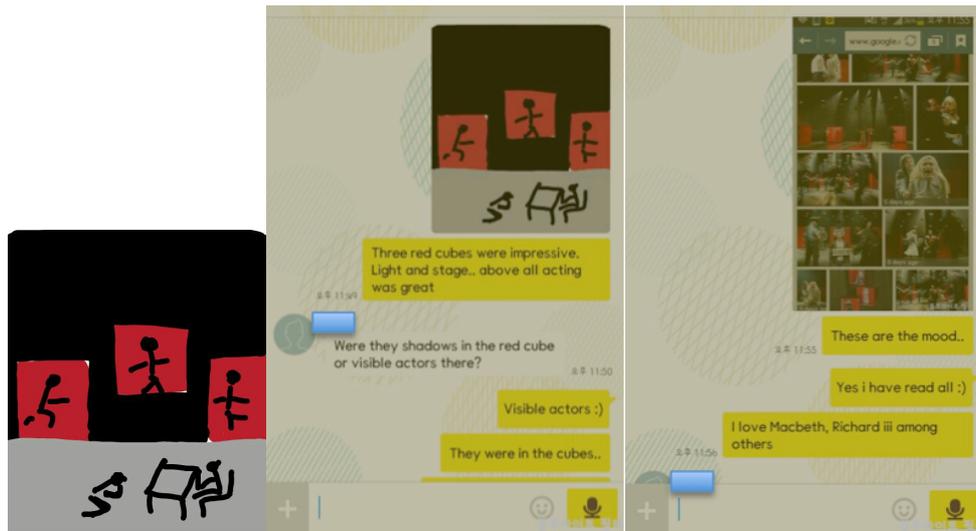


Figure 35 Moment consists cause and effect

The above images are her story of a performance. She had to select a specific moment from the performance that she had watched.

Her drawing does not represent the interesting moment because the interesting ‘moment’ was the process of watching the whole performance. That is what she meant when she talked about a series of moments / stories / cause-and-effects. Therefore, after she sent her drawing, she also sent the captured photos of the performance to give a better sense of the general mood and information about that performance.

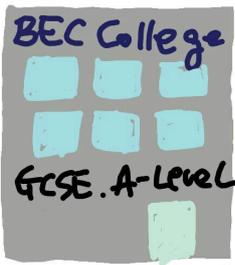
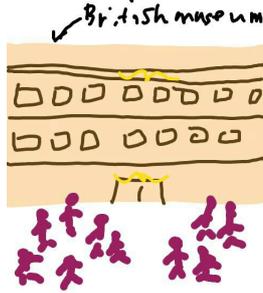
Day Memory – Participant #27	
Description	Annotation
<p>Participant #27 describes his experiment as follows:</p> <p>'It was good to recap and remember what I actually ate on that day and made me think sometimes wow I've eaten very unhealthily today or I ate very well today.</p> <p>It definitely jogged my memory on what I did on that day and was good to reflect on each day's events.'</p>	<p>Participant #27 was not the only one to mention unhealthy and healthy food; many other participants also discussed this issue. Participant #6 talked about disliking the food drawing task because drawing made her realise how unhealthy she had been. I think the drawing food assignment would be a useful activity to apply to smart mobile health apps. As seen in the image, one day this participant had junk food (KFC) and on another day he had sushi.</p> <p>Drawing an interesting moment from his day jogged his memory and was useful in allowing him to reflect what he had done each day.</p> <p>As seen in the images, one day he painted a wall and another day he drove a car with someone sitting next to him.</p>

Participant #2 and Participant #27 are one of the pairs who actively participated in the drawing experiment. Participant #2 discussed her indepth thinking on how a moment can be shaped. Participant #2 put more focus on delivering the facts and information in drawings. It seems that Participant #27 generally enjoyed the drawing experiment, like Participant #1.

Conceptual Visualisation – Participant #2



Description	Annotation
<p>This image explains the title and theme of a song to her partner. She describes her experience as follows: 'I think my drawing worked quite well to explain the abstract meaning, theme of the song.'</p>	<p>She thinks her drawing worked quite well to represent the idea behind the title and the theme of the song. This drawing became an event itself; she talked about this experience to me later on when we met to study together at Senate House Library. Participant #2 is known to me.</p> <p>The theme and the title of the song are the same, which is a new word popular among young people in South Korea.</p>

Spatial Memory – Participant #2	
	
	
Description	Annotation
<p>Participant #2 describes how she drew the places where she had been in the following way: 'I use the image in my head whenever I think of a certain place, which might be a kind of first impression, so when I draw the place my drawings (general structure, colour, and size and so on) are mostly similar, with only slight improvements in details. So the drawing makes me describe the place more clearly and made the first impression more certain and inscribed it in my mind.'</p>	<p>As she said, she imagines a scene or a place she had seen or observed. And she recreated it by giving it general structure, colour, and size. Thinking about how to draw the general structure, colour, and size is not only a process of creative thinking.</p> <p>She also said that drawing made her describe the place more clearly and made the first impression more firmly inscribed in her mind. I can explain why the place is more clearly inscribed in her mind as follows: [1] she thought about her day, [2] she selected a certain place or a specific scene from her memory of that day, [3] she imagined a way of structuring a drawing of what she was imagining, [4] she enacted that drawing structure using lines and colours, [5] she shared her drawing with her partner and explained the drawing, and [6] she received feedback about her drawing from her partner. Now that scene of watching tourists in front of the British Museum is inscribed in her memory.</p>

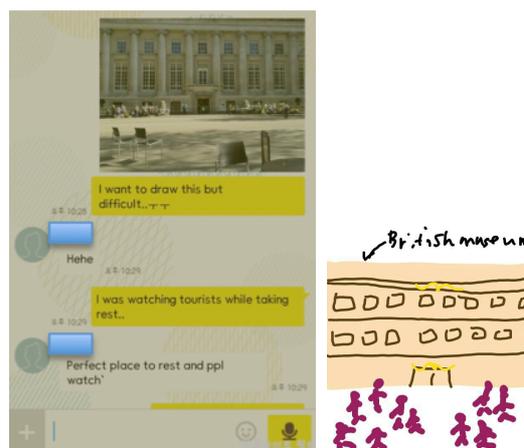


Figure 36 Participant #2 had difficulty drawing the British Museum

Participant #2 thinks that her drawing ability is below average; thus drawing assignments were a challenge for her. As seen in Participant #2 and her partner's conversation, she sent a photo of the British Museum to explain what she had wanted

to represent in her drawing. She wanted to draw the scene of watching tourists while taking a rest. Therefore, she drew the figures of people in front of the British Museum building. As with these two images, many participants mentioned that their conversations had increased because of their explanations of their drawings.

Emotion and Social Relationship – Participant #2	
	
Description	Annotation
<p>Participant #2 mentioned two different things with regard to forming a social relationship with her partner through conducting this drawing experiment.</p> <p>First, she mentioned this: 'I think as the relationship gets closer and more developed, drawings were not really important, but text messages were more dominant, but text messages were more dominant (for me) because my partner and me feel text is much easier than drawing, which was not actually comfortable. So the importance of drawing becomes weakened.'</p> <p>On the other hand, she also mentioned this. 'I designed a few emoticons, which seemed to be very useful because I have often used emoticons in text messages. My designs are quite close to the atmosphere / feelings of the emoticons that I have used previously. But here again, my designs focus on the message (angry / tired / happy) rather than on delivering the general atmosphere. So I only drew facial expressions by using eyes, mouth, and eyebrows.'</p>	<p>Participant #2 put her focus more on drawings as a communication tool instead of as a creative activity. She thinks the major aspects of communication are conveying facts regardless of the type of the communication. Thus, she thinks that text messages were more dominant because she and her partner felt that text is a much easier way to communicate than using drawings. Additionally, drawing could interrupt the conversation by causing misunderstandings.</p> <p>However, she thinks her emoticon designs are useful in forming a relationship. She created the emoticons on the basis of facial expressions by drawing eyes, a mouth, and eyebrows. She also mentioned using emoticons when she was talking to other friends.</p>

Emotion and Social Relationship – Participant #27	
	
Description	Annotation
Participant #27 mentioned this topic only briefly, as follows: 'it gave new fresh emojis to use between other friends rather than using the same stock ones given by the messenger service.'	In his drawings, Participant #27 also designed emoticons based on facial expressions. He also, mentioned that he used his new fresh emojis to communicate with other friends. Not only Participant #27, but other participants also spoke positively about designing the emoticons. They said that they felt more special in comparison with the emoticons provided by the messenger service.

Table 39 data analysis of case ten



Participant #2 discussed this image. After she sent her drawing emoticons, Participant #27 copied her emoticon style and sent it to her. She was fun and thought his gesture was cute. The brown coloured emoticon is Participant #27's drawing which is the copy of Participant #2's design. The multi-coloured emoticon is Participant #2's design, which is sent to her partner often.

Figure 37 An Example Image

Overall, Case Ten involves one participant from the high group and the other one from the low group (see section 6.2.). Participant #2 and Participant #27 are paired up. Participant #2 is female; she belongs to the low SMAT group. Participant #27 is male; he belongs to the high SMAT group. Again, here, Participant #2 had some negative views in comparison with Participant #27; however, these were not as strong as Participant #6's views. Participant #6 is the person who has the most negative view of the drawing experiment.

Firstly, Participant #2 revealed a negative view of the use of drawing as a means of communication. She put emphasis on the dialogic function when conducting the

drawing experiment. Therefore, she explained that text messages were more dominant (for her) because she feels text is much easier than drawing, which was not actually comfortable. Moreover, she worried about the possibility of miscommunication in drawing.

However, on the topic of 'Daily Memory', she was able to focus or look back at her daily routine that was casually communicated through doing the drawing experiment. She also mentioned that drawing her daily activities gave her a good motivation to think about everyday life. She pointed out that when drawing her food, she began with a realistic expression but then changed to more abstract shapes. Later on, she tried to convey only the fact of that information. The word 'realistic' appears again in her discussion of drawing her food. Her drawings became more abstract shapes, in order to convey only the fact of the food. This is because she saw drawing as having a dialogic function rather than being a creative activity.

She noted that drawing interesting moments does not manage to represent the actual interesting moment. This is because the interesting moment consists of a series of moments, or stories, or causes and effects. The scene she drew does not contain the series of moments, or stories, or causes and effects. Thus, she sent photos of the sequence of the performance, which was the interesting moment, to her partner after sending her drawing of one image captured from the performance.

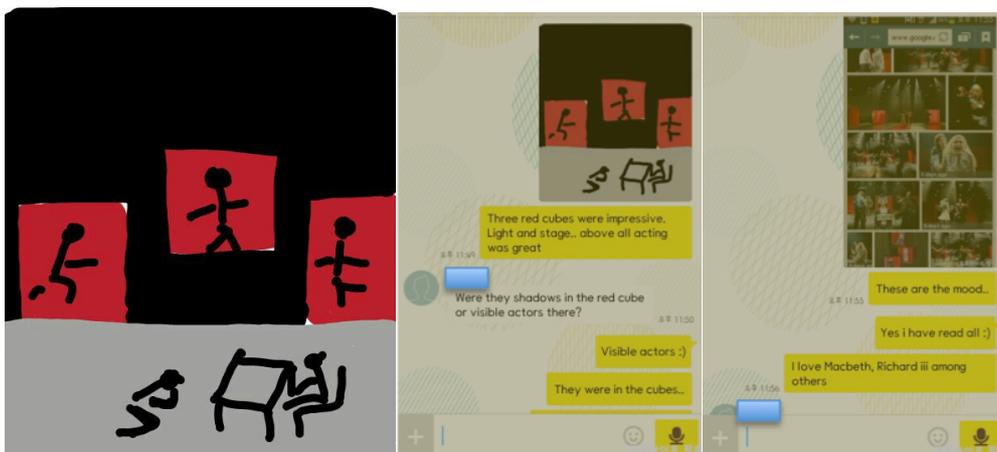


Figure 38 Drawing of the performance and images of their conversations

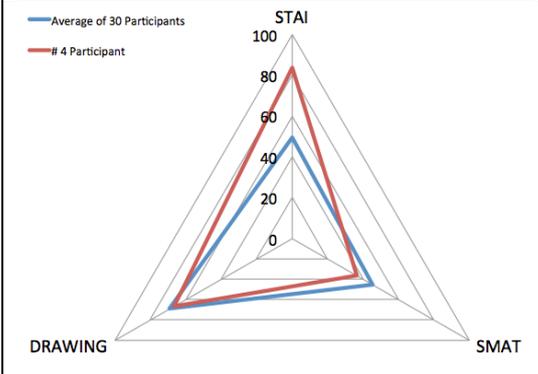
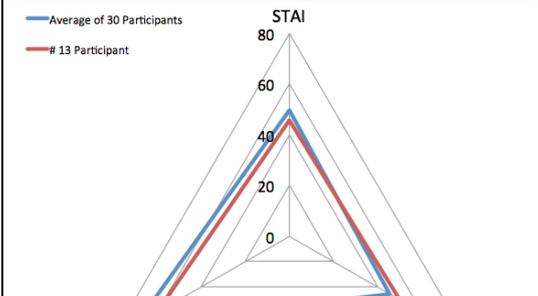
However, she mentioned the importance of selecting a specific scene, because this forced her to recall what it was like. On the other hand, Participant #27 answered that drawing an interesting moment jogged his memory, and that it was useful to reflect on what he had done each day. Again, Participant #27 mentioned his awareness of whether or not he had eaten healthy food. This is an aspect of finding the participant's wellbeing. Drawing a place helped Participant #2 to inscribe a first impression more firmly in her mind. Her drawings of places were similar to observational drawings, like her drawings of food.

On the topic of 'Conceptual Visualisation', she answered that her drawing explained a new coinage of hers, 'some'. That word represents both the theme and the title of the song. She wrote the simple phrase 'something between them' under her drawing. She explained her drawing successfully described the meaning of 'some'.

However, on the topic of 'Social Relationships', both of them found that the use of emoticons made them feel good. Thus, they used the emoticons not only with each other but also with other people. Participant #2 created an emoticon on the basis of facial expressions by using eyes, mouth, and eyebrows.

Case Eleven

Participant #4 is paired with Participant #13

 <p>A radar chart for Participant #4 comparing scores on three axes: STAI (top), SMAT (right), and DRAWING (left). The scale for STAI and SMAT ranges from 0 to 100, while DRAWING ranges from 0 to 5. A blue line represents the 'Average of 30 Participants' and a red line represents '# 4 Participant'. Participant #4 scores significantly higher than the average on all three axes.</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 4	134	57	3.33
 <p>A radar chart for Participant #13 comparing scores on three axes: STAI (top), SMAT (right), and DRAWING (left). The scale for STAI and SMAT ranges from 0 to 80, while DRAWING ranges from 0 to 5. A blue line represents the 'Average of 30 Participants' and a red line represents '# 13 Participant'. Participant #13 scores lower than the average on all three axes.</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 13	73	78	3

	Convert into %	45.63	50	60
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Participant # 4 is a 24-year-old male. He belongs to the low SMAT group. His partner Participant #13 is a 30-year-old female. She also belongs to the low SMAT group. As seen in the graphs, Participant #4 tips over a score of 100 on the STAI. This participant got the highest STAI of all the other participants. However, he got the lowest score for digital preference. Participant #13 does not have any outstanding points.

Day Memory – Participant #4



Description

Annotation

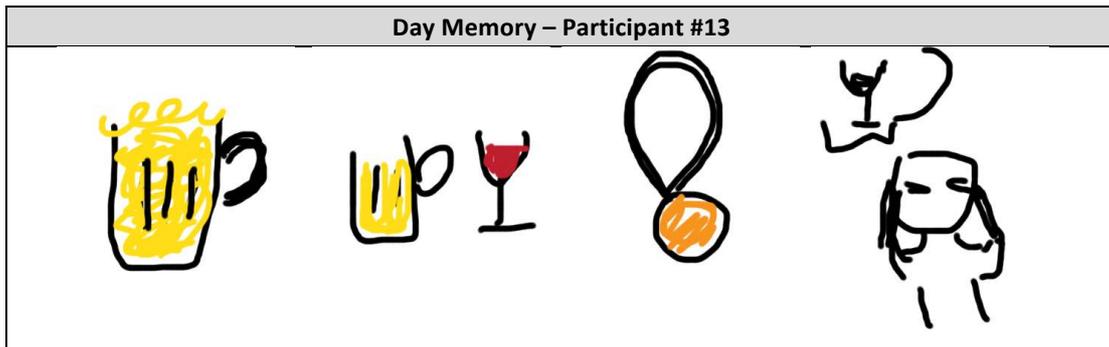
Participant #4 describes how drawing affected his memory as follows: ‘for the doodle task, it did not help me in recalling what I ate. However, I can still recall a few foods my partner ate because they were doodled colourfully. The process of doodling requires me to search through my mind to decide what was really interesting during that day. The responses of my partner to some moments I drew also reinforced my memory of it. For instance, I recalled especially that I had tapas with my friends because my partner mistook the tapas I drew as pizzas (sadly).’

As seen in the images, he used only simple black lines to draw. This can be observed in his other drawings. This may be the reason why he could remember what his partner ate, but could not remember his own drawings of his food. His partner, Participant #13, used colours in her drawings.

He mentioned exploring his mind to select the image of a really interesting moment from his day. Selecting a scene to draw is a common step for most participants, but Participant #2 pointed out that that selecting a scene does not represent the interesting moment because the moment consists of cause and effects. The moment is a narrative story which cannot be captured in one image.

Participant #4 used the interesting term ‘reinforced’. Drawing reinforced his memory; for example, he recalled the tapas he had eaten that day.

However, his partner misinterpreted his drawing as pizzas. The misinterpretation is a key issue that needs to be discussed because it could lead to a generally negative atmosphere. However, it can also possibly work in a positive way.



Description	Annotation
Participant #13 does not mention memory, but briefly mentions recalling the places she had been.	Not much information was given by Participant #13.

Discussions

	<p>The image (left) is Participant #4's drawings. The image (right) is Participant 13's drawings. As Participant #4 mentioned, his partner used more colours and details in her drawings. This could be the reason why Participant #4 can remember his partner's drawings but not his own drawings.</p>	
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Spatial Memory – Participant #4

	Description	Annotation
	<p>Participant #4 mentioned spatial memory as follows: 'drawing helped me to remember a route where I had been. That helped because I needed to recall the image of the place in order to draw it. In one case I was in fact abstractly sketching a map of my flight.'</p>	<p>The image (left) is his drawing of the map of his flight. He recorded where he travelled to, in order to send the image to his partner. As he mentioned, in order to draw the image, there was a process of recalling and tracking his travel journey. His mention of remembering the route is interesting because many other participants explain that they remembered the places but not the route.</p>

Emotion and Social Relationship – Participant #4 and Participant #13		
	<p style="text-align: center;">Description</p> <p>Participant #4 explained that his drawings and emoticons were the cause of dialogue because his drawings were poor, which resulted in extra conversation in order to clarify what he meant.</p>	
Annotation		
<p>The process of interpretation and descriptions of their drawings draws more attention to their thought processes. The image on the left indicates that Participant #13 would have free time after 6 o'clock. Participant #4 would work until 8 o'clock and may go home after 9 o'clock.</p> <p>The image on the right indicates that Participant #13 is annoyed because of having to work on Sunday. Her drawing is helpful in explaining how she is feeling now.</p> <p>Participant #4 also mentioned using facial expressions; this will be explained in an analysis of Participant #2.</p>		

Table 40 data analysis of case eleven

Case Eleven comprises Participant #4 and Participant #13. Participant #4 is male and Participant #13 is female. Participant #4 had a positive view of the drawing experiment even though he belongs to the low SMAT group (see section 6.2.). The interesting point was that Participant #4 got the lowest digital preference score and the highest STAI score. I received simple comments from Participant #13.

On the topic of 'Daily Memory', Participant #4 talked about the importance of the use of colors in drawing to improve recall. He described himself as having a goldfish memory. He could not remember what food he drew, but ironically remembered his partner's drawings. That was because of the vivid colors in her drawings. Participant #4 used the term 'reinforced'. He thought that the drawing assignment had reinforced his memory. Moreover, he mentioned that he looked into his mind to think about what the most interesting moment in his day was, then the moment became a scene like an image. I have learned that selecting the scene is a useful step for recall.



Figure 39 Examples of Participant #4's drawings - black lines



Figure 40 Examples of Participant #13's drawings - vivid colours

On the topic of ‘Social Relationships’, Participant #4 wrote that his emoticons did not really look like emoticons but standard person-like figures with different facial/physical expressions. He explained that the drawing emoticon opened up dialogue because his drawing was so poor, which resulted in extra conversation to clarify what he meant. On the other hand, Participant #13 simply answered “maybe not”. This suggests that drawing the emoticons may not have helped her to build a relationship with Participant #4. Moreover, Participant #4 only described the process of drawing the emoticons. He mentions that the use of the emoticons lengthened their conversations, in order to explain the drawings. This does not mean that the drawing was having a positive impact on their relationship.

Case Twelve

Participant #5 is paired with Participant #18

		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46

	Convert into %	49.56	45.65	69.2
	# 5	81	64	3.67
	Convert into %	50.63	41.03	73.4
		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 18	62	92	3.33
	Convert into %	38.75	58.97	66.6

Participant #5 is a 21-year-old female. She belongs to the low SMAT group. Her partner, Participant #18, is a 27-year-old female. She also belongs to the high SMAT group. Participant #5 got the lowest score for social anxiety. Participant #18 got the highest score for physical symptoms.

Day Memory – Participant #5	
Description	Annotation
<p>Participant #5 describes how drawing affected her memory as follows: ‘It was nice to express some of the inner images not through words but images. It was easier when I thought about it less and difficult when I tried purposely to think of an image describing something particular.</p> <p>I realised that often I don’t eat one main meal but make a meal of several little things, like a soup and a piece of bread, a bit of salad etc.</p> <p>It was really lovely seeing what stuck out to us and to remember that exact thing.’</p>	<p>She explains that thinking of an image in order to describe something particular is a challenge. That is the first step toward drawing an event. I think she found a good approach to the drawing process, exploring the inner image in her mind, not thinking about it too much, and transferring the image into drawings.</p> <p>Participant #5 is another person who focused on her eating behaviour through conducting the drawing assignment. She found that she normally eats several little things.</p> <p>She made another connection between emotion and memory. Participant #5 and Participant #18 both found the process of remembering something that stuck out to them and drawing it together enjoyable.</p>

Day Memory – Participant #18	
Description	Annotation
<p>Participant #18 describes how drawing affected her memory as follows: 'Because I had to draw what I ate I would always remember what meals I had had. I didn't draw them all but I'd drew the most memorable dish I had or one that would be interesting to draw. Having the image fresh in my head did help me remember the food so I wouldn't repeat drawings.</p> <p>When I drew the moment of the day it was almost done instantly after I realized that this was the exact moment I wanted to share. I had to be selective with the moments so knowing that I had to draw something interesting I would recall what I had done previously or what I had planned later so that I could draw it.'</p>	<p>Participant #18 and Participant #5 both conducted the drawing experiment with enthusiasm. Their drawings are so descriptive and creative, like children's drawings. Participant #18 drew only new items she had eaten. Her drawings of food inscribed it in her memory, therefore she did not repeat the drawings she had already made.</p> <p>She drew the moment she wanted to share as soon as it had happened. Here she uses the phrase 'selective with the moments'. This is something other participants have also mentioned.</p> <p>The drawing assignments, she found, were useful to recall or actively think of certain things that had happened during her day. She put a lot of effort into thinking what she had done, and tracing back to what she planned to draw.</p> <p>It can be observed that her drawings have a dialogic aspect; for example, the third image, of a smiling man giving a thumbs up to the food.</p>

Conceptual Visualisation – Participant #5	
Description	Annotation
<p>Participant #5 describes the conceptual visualisation task of drawing someone she had forgotten: ‘I really struggled to think of something I had forgotten, it seemed difficult to pick one thing out, and besides my memories tend to flow, not be still images.’</p>	<p>The conceptual visualisation task is to draw something or someone that the participant cannot remember well, or an image which is not clear. Participant #5 mentions that she really struggled to think of something. Here, she says that she had difficulty picking one thing out. The participants selected one image or overlapped several images. However, that did not work because thoughts are fluid, and do not easily become a single image.</p>
Conceptual Visualisation – Participant #18	
	
Description	Annotation
<p>Participant #18 describes the conceptual visualisation task as follows: ‘I forgot the word “flattery” one day. I visualized the word and then remembered it. That’s what led me to draw the word.</p> <p>I drew an emotion (angry) drawing in which I drew it singing to the song “O Fortuna from Carmina Burana”. There is no way my partner would have gotten the song as it’s a classical music piece and hardly anyone remembers the name of the piece, but the drawing reminded me of the song in the first place.’</p>	<p>Participant #18 has trouble remembering English words sometimes because she is bilingual. She had the experience of forgetting the word ‘flattery’. The first image she drew was to visualise the word ‘flattery’. She could remember the word by visualising that word.</p> <p>She also drew the atmosphere of the song “O Fortuna from Carmina” in her second image. The image does not visually express what the song is about so it is hard for Participant #5 to guess what the song is. However, drawing the image allowed Participant #18 to remember the piece of music.</p>
Design Number – Participant #18	
Description	Annotation
<p>There were very few opinions expressed about this drawing task. Participant #18 explains why it was hard to redesign a number: ‘although we did draw numbers, my partner and I hardly exchanged them because we focused more on drawing images that captured a place or activity. I didn’t experience any change in remembering numbers through the experiment because we didn’t really draw things that were measurable or quantifiable by numbers. We stuck to images that captured actions, people places, etc.’</p>	<p>Participant #5 did not mention this task. However Participant #18 explains that the task was hard because they did not often draw things that were measurable or quantifiable by numbers.</p>

Spatial Memory – Participant #18	
	
Description	Annotation
<p>Participant #18 describes the effect of drawing on her spatial memory as follows: ‘having to draw where I was did help me remember a lot of places that I had seen when it came to drawing the task. I was traveling during the experiment so I would remember places so that I could draw them for my partner.’</p>	<p>Participant #18 recorded where she had been while she was traveling; for example, the first image indicates that she visited the Eiffel Tower. She only mentions that her drawing helped her to remember a lot of places she had been.</p>
Emotion and Social Relationship – Participant #5	
	
Description	Annotation
<p>Participant #5 describes her response to the emoticon task as follows: ‘together we drew up a range of often quite abstract images communicating emotions. What was interesting was that each of us got it instantly regardless of how far off you might say they were.’</p>	<p>Participant #5 points out the benefit of drawing on smart mobile devices. Participant #5 and Participant #18 could share their emotions frequently by sending their digital drawings and emoticons, even though Participant #18 was away whilst conducting this drawing experiment. This indicates that one advantage of a drawing tool mobile application is its mobility, because it allows personalisation and has fewer limitations with respect to time and space. Smart mobile users can work easily with their device’s interface anywhere and anytime.</p> <p>Although they can share their expressions or emotions instantly through drawing, it requires more effort to share their feelings. The fifth image wishes ‘good luck’ to her partner. To compose a good luck image, Participant #5 drew a four leaf clover, a rainbow, and a thumbs up. Participant #18 could interpret the meaning of those images when they were delivered. It would be hard to quantify how their emotions had changed through communicating by digital drawings, but as David Hockney said in his interview (Gayford, 2010), smart mobile devices provide users with the opportunity to paint his morning quickly and send it to a friend right after he has finished. In fact, the participant in</p>

	this experiment took exactly that opportunity.
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Emotion and Social Relationship – Participant #18	
Description	Annotation
<p>Participant #18 describes how they shared their emotions through conducting the drawing experiment: ‘my partner and I exchanged a lot of emoticons which in which some emotions were obvious and some others weren’t. However, I would say that they were all really good and I would consider using them as I chat with other people.’</p>	<p>She strongly believes that using her emoticons is a good way of sharing emotions and building their relationship. Again, Participant #18 considered using her emoticons when chatting with other people.</p>

Table 41 Data Analysis of Case Twelve

Case Twelve comprises Participant #5 and Participant #18. One belongs to the low SMAT group and the other one belongs to the high SMAT group (see section 6.2.). Participant #5 got the lowest score for social anxiety. Participant #18 got the highest score for physical symptoms. This pair conducted the drawing experiment with enthusiasm. Their drawings are playful and child-like; for example, a smiling man gives a thumbs up to his food. There is a dialogic aspect to their drawings.

Participant #5 described the process of drawing as comprising the following steps: exploring the inner image in her mind, simplifying the image, and transferring the image into drawing. Through this process, the image in one’s memory is recreated as a drawing.

On the topic of ‘Daily Memory’, Participant #18 said she did not draw her food a second time if she had already drawn it before. She explained that her drawing was inscribed in her memory so she did not need to draw it again. She said that drawing her food was useful in helping her to remember it. Moreover, she mentioned that drawing was an enjoyable way of exploring something that she was having trouble remembering.

On the topic of ‘Conceptual Visualization’, Participant #5 found that she really struggled to pick one thing out. She tried to imagine a single image, but it was still unclear.



Participant #18 successfully visualized the forgotten word ‘flattery’. She drew a person saying ‘oh stop’. Participant #18 explained that drawing her favorite song became a visual metaphor that was helpful for recalling the place where she had listened to the music.

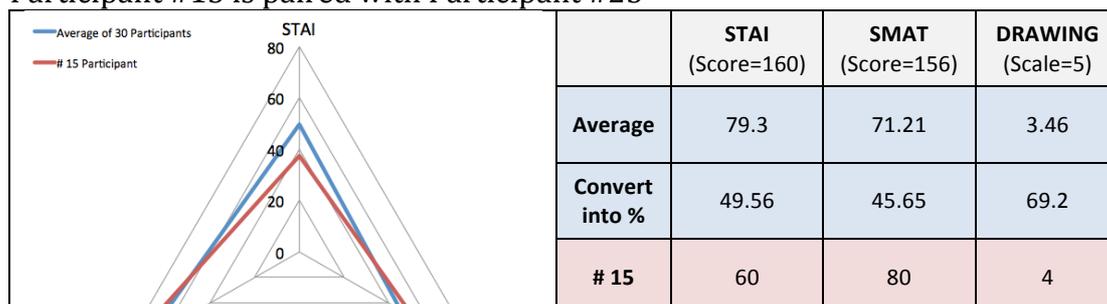
Figure 41 Participant #18's drawing of conceptual visualisation

On the topic of ‘Social Relationships’, Participant #5 said that it was interesting that they could convey their drawings instantly regardless of how far apart they were. I want to focus on the words ‘instantly’, ‘regardless’, and ‘how far’. Those words indicate that the benefits of the digital drawing tool are mobility, personalization and a decrease in limitations with respect to time and space. Smart mobile users can work easily with their device anywhere and anytime.

This pair put a lot of effort into designing the emoticons. Many other participants designed emoticons using facial expressions, using, for example, eyebrows, eyes, and a mouth. However, this pair drew more intricate designs such as symbolic images; for example, Participant #5 drew a four-leaf clover, a rainbow, and a thumbs up to represent ‘good luck’. Participant #18 is another person who used her emoticons with other people when she chatted to them.

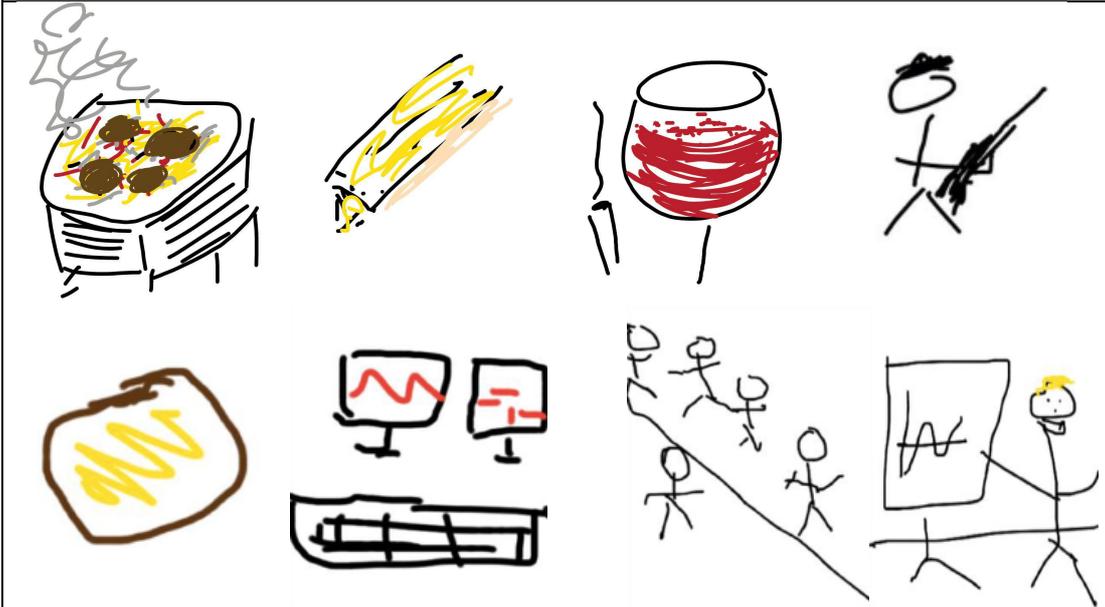
Case Thirteen

Participant #15 is paired with Participant #25



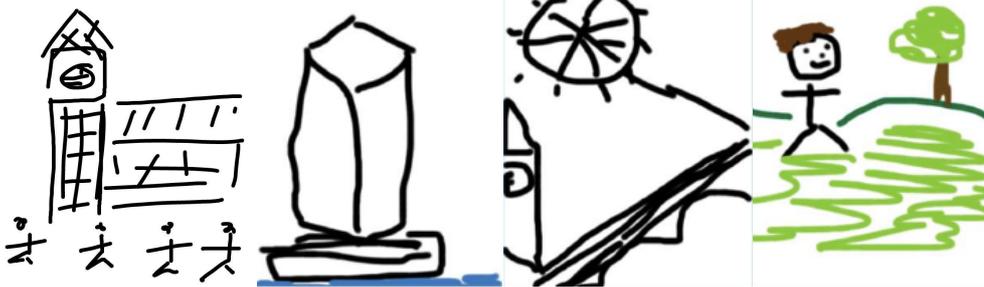
	Convert into %	37.5	51.28	80
		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 25	67	74	4
	Convert into %	41.88	47.44	80
Participant #15 is a 34-year-old female. She belongs to the high SMAT group. Participant #25 is a 19-year-old male. He also belongs to the high SMAT group. Participant #25 got the lowest score for social anxiety.				

Day Memory – Participant #15 and Participant #25



Description	Annotation
<p>Participant #15 described how drawing may have affected her memory as follows: 'I didn't really notice any difference, but I enjoyed drawing the food. It was fun.</p> <p>There is no difference, but I enjoyed drawing the moment.'</p> <p>Participant #25 described how drawing may have affected his memory as follows: 'I think this did help me recall what I had eaten that day as often forget if asked. Drawing pictures (or attempting to draw!) made me think more about this and also reminded me of what my partner had eaten which I wouldn't normally remember in text conversation.</p> <p>I drew a training conference I attended and I can remember the person standing in the room giving the lecture very clearly after drawing this.'</p>	<p>Participant #15 did not find that drawing affected her memory, even though she enjoyed doing the drawings.</p> <p>On the other hand, her partner, Participant #25 explains that the drawing positively affected his memory through allowing him to recall the food he had eaten, or what he had done. He is a person who often forgets his daily activities, but the drawing made him recall a training conference he had been to. He also described how drawing conversations helped him to remember in a way that would not have happened if the conversation had taken place using text. Drawing made him remember what his partner had eaten which he would not normally remember if they had discussed it using words.</p> <p>He described how he could remember one specific scene through his drawing. The scene is the day when he was listening someone's lecture at the training conference.</p>

Spatial Memory – Participant #15 and Participant #25



Description	Annotation
<p>Participant #15 described how drawing affected her spatial memory as follows: ‘No difference, I enjoyed drawing the places though. It was a challenge to try and communicate this through drawings.’</p> <p>Participant #25 described how drawing may have affected his spatial memory as follows: ‘I doodled where I had been today but we used text to work out exactly where this was (or give clues to help each other).’</p>	<p>Participant #15 did not perceive any change to her memory after completing the drawing experiment. She also mentioned that the use of drawing to talk with someone was a challenge.</p> <p>Participant #25 did not mention how the drawing affected his memory, but explained that they used text to prevent miscommunication. He used the term ‘clue’. I find that the participants try to avoid miscommunication. They try to deliver the exact information by giving ‘clues’.</p>

Emotion and Social Relationship – Participant #15 and Participant #25	
	
Description	Annotation
<p>Participant #15 describes her response to the emoticon task as follows: ‘we bonded most through drawing the moments from our days. That gave me more insight into who Participant #25 was and the kinds of things he was doing.’</p> <p>Participant #25 describes his response to the emoticon task as follows: ‘this did help build social relationship and we joked about how bad our drawing was.’</p>	<p>Participant #15 thinks that drawing their interesting moments was helpful to establish a good relationship with Participant #25. She used the term ‘insight’. Sharing an interesting moment from her day gave her more insight into who Participant #25 was and the kinds of things he was doing. I think drawing a moment contains the story of one’s life; therefore, many participants enjoyed this drawing assignment, which was helpful to get to know each other.</p> <p>Participant #15 responded, like Participant #12, that she built up the relationship with Participant #25 through drawing what their life was like. Participant #15 and #12 point out that the stories in drawings convey more interesting things to look at or interpret.</p> <p>Participant #25 mentioned that he and Participant #15 had fun joking about their drawing skills.</p>

Table 42 Data Analysis of Case Thirteen

Case Thirteen comprises Participant #15 and Participant #25. Both belong to the high SMAT group (See chapter 6.2). Participant #15 is female and she got the lowest score for social anxiety. Participant #25 is male.

On the topic of ‘Daily Memory’, Participant #15 did not find that drawing affected her memory even though she enjoyed it. On the other hand, Participant #25 explained that drawing positively affected his memory by allowing him to recall his food or his daily activities. He introduced himself as a person who often forgets daily activities. However, the drawing task made him practice remembering. He pointed out that he could remember the drawing conversation, which would not have been remembered if it had been text-based communication.

On the topic of ‘Social Relationships’, Participant #15 thought that drawing an interesting moment was helpful in forming a good relationship with Participant #25. This was the only topic for which she found the drawing experiment useful. She used the term ‘insight’. Sharing their interesting moments was helpful in giving her insights about Participant #25 and the kind of thing he was doing.

Case Fourteen

Participant #17 is paired with Participant #24

		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 17	66	61	3.33
	Convert into %	41.25	39.10	66.6
		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 24	81	54	3.33
	Convert into %	50.63	34.62	66.6
Participant #17 is a 30-year-old male. He belongs to the low SMAT group. Participant #24 is a 29-year-old female. She also belongs to the low SMAT group. Participant #24 got the lowest score for physical symptoms.				

Day Memory – Participant #17



Description

Participant #17 described how drawing may have affected his memory as follows: 'this was the most fun task of them all, I think. I believe it helped me to remember what I had eaten, because sometimes I would send the message at night and I would talk about what I had had for breakfast.

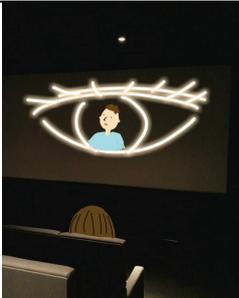
It was nice to remember the places I had been and things I had done. I felt as if I was re-living these situations, and that was nice.'

Annotation

Unlike Participant #6, Participant #17 mentioned that doodling the food he had eaten each day was the most enjoyable assignment. He thinks that the task of drawing his food made him practice his short term memory through recalling what he had eaten in the morning.

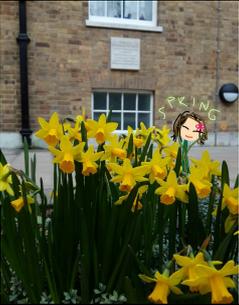
I find it interesting that he felt as though he was re-living his day through drawing where he had been or what he had done. This is because drawing is not only a way of recalling a memory, but also of reassembling a visual image in the mind.

I found instances where he had drawn something on a photo that he took with a view to doing the drawing task. His partner #24 also drew on photos as well.

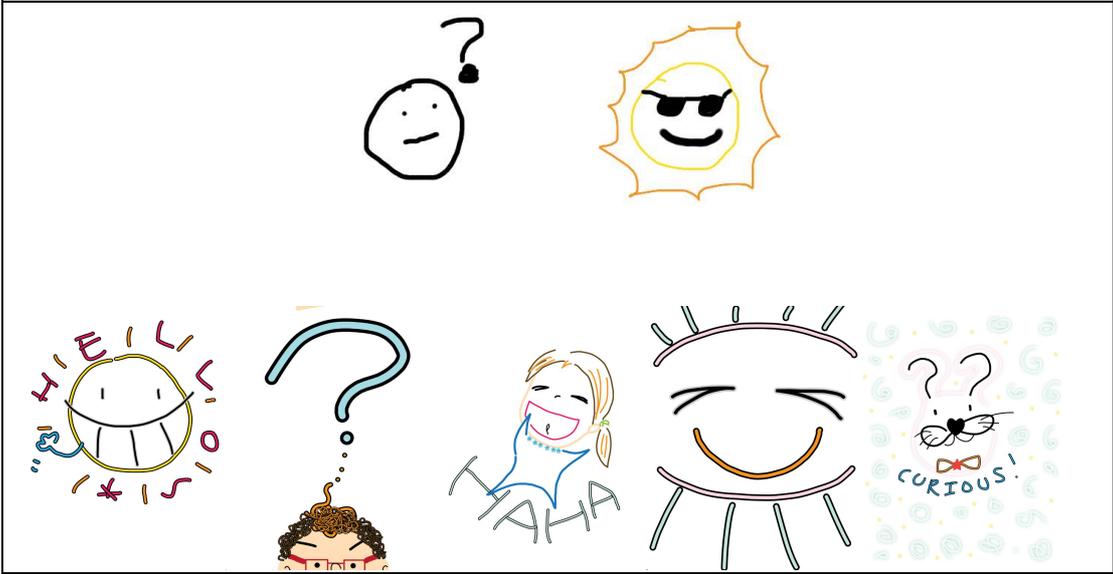
Day Memory – Participant #24	
	
Description	Annotation
<p>Participant #24 described how drawing affected her memory as follows: ‘positively, I often forget about things that I did as recently as yesterday because of my busy life and I don’t even bother to recollect. But while participating in the experiment, it helped me refresh myself recollection what I had done by drawing doodles.’</p> <p>‘Very positively. One thing I remember is a cat. I often bumped into a cat in my accommodation.. I tried to be friendly towards the cat but I was always totally ignored by him or her. When I drew a doodle based on the experience, I needed to search my memory for what the weather was like, and what colour eyes and fur the cat has.’</p>	<p>As I mentioned by Participant #17, this pair drew their emotions or symbolic images on the photos which were taken for the drawing experiment.</p> <p>Participant #24 is a person who often forgets daily occurrences, even as recently as the previous day. However, she found that her drawings were useful to recollect what she had done.</p> <p>She often points out that drawing made her pay more attention to what was around her; for example, she tells a story of a cat. She often meets a cat in her accommodation. She did not pay much attention to the physical appearance of the cat nor the weather conditions during their meeting until conducting the drawing experiment. However, this drawing task made her to look around her more.</p>
Conceptual Visualisation – Participant #24	
	
Description	Annotation
<p>Participant #24 described her experience as follows: ‘definitely, I often bumped into new people unexpectedly and found it hard to remember them and their names. While doing this experiment, I went to the cinema to watch a film. There I got to know a guy who is a big time film buff and had a chat with him for a short time. If I had not needed to draw doodles about my daily life, I would have forgotten what he looked like. But that day I got back home and doodled him to send it to my partner. Even though my drawing wasn’t good enough to describe his appearance clearly, I could recall</p>	<p>Participant #24 described how her drawing became a visual metaphor for remembering. She explored her memory through looking at her drawings. she is someone who goes to the cinema often. She sees many new faces there. One day, she met someone and drew that moment to send it to her partner after returning home. I find it interesting that she says, ‘even though my drawing wasn’t good enough to describe his appearance clearly , I could recall the encounter and his looks.’ Her drawing does not show his physical appearance clearly, but it becomes a tool for remembering;</p>

<p>the encounter and his looks.</p> <p>Definitely. I have many words that I often misspell. Strangely I make the same mistakes all the time. When I doodled, I misspelled one of those words again. But now I can associate my doodle with the word whenever I use that word. I will never forget or misspell it again!</p>	<p>thus she could recall the encounter and his looks.</p> <p>English is not her native language; thus, she often misspells English words. However, she found that drawing retained certain visual images; therefore, she did not misspell the word anymore after doodling the image of the word.</p>
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Spatial Memory – Participant #24

	
<p style="text-align: center;">Description</p>	<p style="text-align: center;">Annotation</p>
<p>Participant #24 described how drawing affected her spatial memory as follows: ‘when I doodled the places where I had been daily, I didn’t think about the route or way to get there, I tended to focus on the places. So I drew doodles about the places, not about how to get there.’</p>	<p>As seen in the images, she put more focus on sharing her emotions by drawing characters instead of drawing places or her route. Thus, she took photos of places she had been and drew her characters on those photos like comics.</p>

Emotion and Social Relationship – Participant #17 and Participant #24





Description	Annotation
<p>Participant #17 briefly described what feelings she had when drawing her emoticons: 'I think using emoticons helped to get more personal, as it was a way to show my feelings to a stranger.'</p> <p>Participant #24 described his response to the emoticon task as follows: 'we both are busy students so it wasn't easy for us to prolong our conversation and keep it steady. But we could exchange greetings everyday by using those emoticons we designed ourselves, to say good morning, good night, have a good weekend. As a consequence of that activity, I felt kind of happy to know there was someone I could say something sweet to on a daily basis.'</p>	<p>Participant #17 used the word 'personal' which was also used by a few other participants. I think the description of sharing 'personal' things or 'personal' emotions with someone sounds as though they were exchanging deep emotions.</p> <p>Participant #24 mentioned that exchanging greetings everyday by using emoticons made her happy. She also mentioned that it was sweet to talk in this way. As seen in the drawing images, she made progress in the designs of her emoticons. She used multiple drawing materials in the mobile drawing application, such as the neon drawing tool. She designed several types of emoticons such as images of her appearance, animal characters, and a series of characters. She designed the series of the blue bear. The blue bear says 'good weekend' and offers a gift, studies hard, watches a film, sings with a guitar and says 'have a good dinner', feels angry, and cooks a sausage. It is interesting that she designed her own character.</p>

Table 43 data analysis of case fourteen

Case Fourteen comprises Participant #17 and Participant #24. Both belong to the low SMAT group (see section 5.2.). Participant #24 got the lowest score for physical symptoms. This pair is interesting. They actively conducted the drawing experiment even though both are in the low SMAT group. What is distinctive about their drawing is that they drew an emoticon or a character onto photos.



Figure 42 Example images of how they drew on photos

On the topic of ‘Daily Memory’, Participant #17 mentioned that drawing his food was the most enjoyable assignment. He described how the assignment helped him to improve his short-term memory; for example, he recalled what he had eaten in the morning and drew that to send to his partner. He used the interesting term ‘re-living’. He felt that he was re-living through drawing what he had done or eaten during the day.

Participant #24 described herself as a person who often forgets her daily activities even though they might have happened only yesterday. However, she found that drawing her daily life was useful to recollect what she had done. She also said that drawing made her pay more attention to and remember more details of what she had seen or experienced; for example, she could remember the eye color of a cat that often appeared at her accommodation. She did not know this before conducting the drawing experiment. She could also remember the guy who she had briefly met at the cinema, as a result of drawing her daily activities. She explained that she could remember his physical appearance even though her drawing did not include details of his appearance. Her drawing becomes a visual metaphor to explore how he looked.

On the topic of ‘Social Relationships’, Participant #17 used the word ‘personal’ which has also appeared in other participants’ responses. My perception is that sharing ‘personal’ things or ‘personal’ emotions with someone sounds like they are exchanging something deeper.

Participant #24 mentioned that exchanging greetings everyday by using the emoticons made her happy. The use of the emoticons gave her a feeling of sweetness. I found that she made several versions of her emoticon designs. She used many different

materials to draw with, such as a neon drawing tool. She designed several types of emoticons, that reflected the way she looked or her character. She also made a series of images using a character: a blue bear saying ‘good weekend’ and giving a gift, studying hard, watching a film, singing and playing guitar, saying ‘enjoy your dinner’, feeling angry, and cooking a sausage.

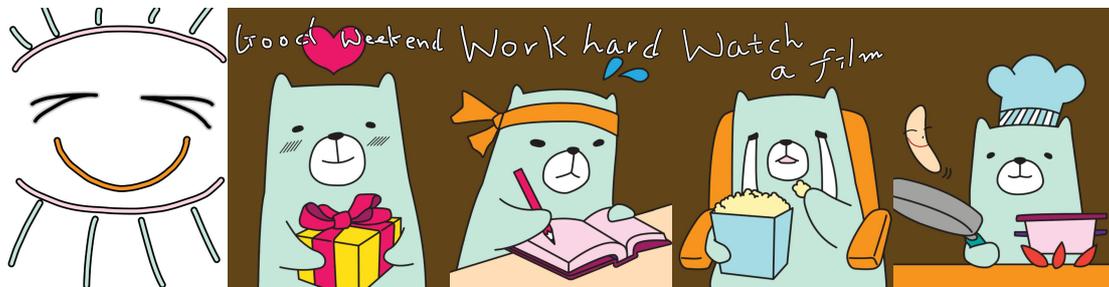


Figure 43 Examples of Participant #24's drawing emoticons

Case Fifteen

Participant #26 is paired with Participant #29

<p>— Average of 30 Participants — # 26 Participant</p> <p>STAI 80 60 40 20 0</p> <p>DRAWING SMAT</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 26	120	66	2.67
	Convert into %	75	42.31	53.4
<p>— Average of 30 Participants — # 29 Participant</p> <p>STAI 80 60 40 20 0</p> <p>DRAWING SMAT</p>		STAI (Score=160)	SMAT (Score=156)	DRAWING (Scale=5)
	Average	79.3	71.21	3.46
	Convert into %	49.56	45.65	69.2
	# 29	60	61	3.67
	Convert into %	37.5	39.10	73.4
<p>Participant #26 is a 24-year-old female. She belongs to the low SMAT group. Participant #29 is a 26-year-old female. She also belongs to the low SMAT group. Participant #26 got the lowest score for social anxiety, but she ranked second top in the STAI test. Her score was 120.</p>				

Day Memory – Participant #26	
Description	Annotation
<p>Participant #26 describes how drawing affected her memory as follows: 'it hasn't really helped although I do remember that I had salmon for my lunch one day and a salad for my lunch another day because I remember drawing pictures of them to send to my doodle partner.</p> <p>I remember I went for a run and wore a pink-shirt! I also remember I was on my laptop. I also remember being with the cat. These are all because I drew pictures.'</p>	<p>Participant #26 thinks that she remembers her drawings of her food which were sent to her partner. However, she does not think the task was helpful for her memory.</p> <p>She separates her experiences in her memory into observation and narrative story.</p> <p>She thinks she remembers certain stories because she drew them, such as the scene in which she was wearing a pink-shirt, or the scene of her laptop, or the cat next to her.</p> <p>It is interesting that some participants put more emphasis on memories which contain a linked chain of events rather than a simple image of an object.</p> <p>In her drawings, it can be observed that she is at the centre. The interesting point in this pair is that they reflect their physical appearances in their drawings. For example, Participant #26 drew her blond hair and freckles not only in the images above, but also in the images that she sent me. This can also be observed in her partner's drawings.</p>

Day Memory – Participant #29



Description	Annotation
<p>Participant #29 described how drawing affected her memory as follows: 'it made it easier to recall food I had eaten and did make me mindful over what makes me happy when eating. I think it has affected my eating habits by increasing the amount I eat however so for a time, I only recorded what I drank. This made me drink more fluids which I haven't been doing much in my lifetime and a good motivation to keep track of my fluid intake.</p> <p>It made me appreciate myself for picking up finer details of my life and how it affects the future self.'</p>	<p>Participant #29 points out that the drawing not only affected her memory, but also changed her lifestyle in a positive way.</p> <p>Firstly, she recalled the food she had eaten that day, in order to draw it. Secondly, the drawing activity helped her to explore what makes her happy when she is eating. That exploration resulted in increasing the amount of food she was eating and fluid she was drinking.</p> <p>She became aware that drinking more fluid would be good for her body, something she had not previously done.</p> <p>Drawing what she had eaten gave her a record of her food, and a strong motivation to increase her fluid intake.</p> <p>She could choose ways of living a healthy life as a result of the drawing assignments.</p>

Emotion and Social Relationship – Participant #26	
Description	Annotation
<p>Participant #26 described her response to the emoticon task: 'drawing has helped a little bit but not a huge amount. She seems to like Vietnamese food though and has cool round glasses.'</p>	<p>Participant #26 thinks that the use of her drawing emoticon designs helped her a little bit to develop a relationship with Participant #29.</p> <p>However, it can be observed that she remembered what her partner liked or had; for example, her partner liked Vietnamese food which is shown in the fifth image from Participant #29, on the topic of 'Daily Memory'. She also remembered that her partner drew herself wearing round glasses.</p> <p>However, the interesting thing about this pair is that they reflected their own appearance in their emoticon designs, something rarely seen in the other participants' designs. Other participants mostly drew only facial expressions like eyebrows, eyes, or a mouth, which did not reflect their physical appearance.</p>

Emotion and Social Relationship – Participant #29	
	
Description	Annotation
<p>Participant #29 describes her response to the emoticon design task as follows: 'I think I did this towards the end of the experiment, when I am more comfortable expressing myself. Maybe I am very closed to people I have just met and speak of things I've done more than things I have felt.'</p>	<p>Participant #29 explains that she designed her emoticons at a later stage of the drawing experiment when she felt more comfortable with Participant #26.</p> <p>I could observe that she drew an image to cheer up her partner (the first image above). Like her partner, she also suggested her own appearance in her emoticon; thus, her arms are up, she has a cheerful face, and she is wearing the t-shirt on which is written the word 'go' and her partner's name.</p> <p>She designed an emoticon saying 'good morning' to send it to her partner. In the image, she is waking up and smiling next to the sun.</p>

Table 44 Data analysis of case fifteen

Case Fifteen comprises Participant #26 and Participant #29. Both belong to the low SMAT group (see section 6.2). Participant #26 got the lowest score for social anxiety, but also ranked second highest in the STAI, along with Participant #20.

On the topic of 'Daily Memory', Participant #26 said that she does not think that drawing was helpful for her memory even though she remembered drawing what she had to eat, and sending them to her partner. However, she thought that drawing what she had done was helpful in improving her memory. I consider Participant #26 had more interest in drawing a scene in which something occurred, rather than simple images of objects.

The interesting point with regard to this pair is that they reflected their appearance in the most of their drawings, including the emoticons they designed, which is rarely seen in the other participants' emoticons. Other participants generally drew only facial expressions using the eyebrows, eyes, or a mouth.



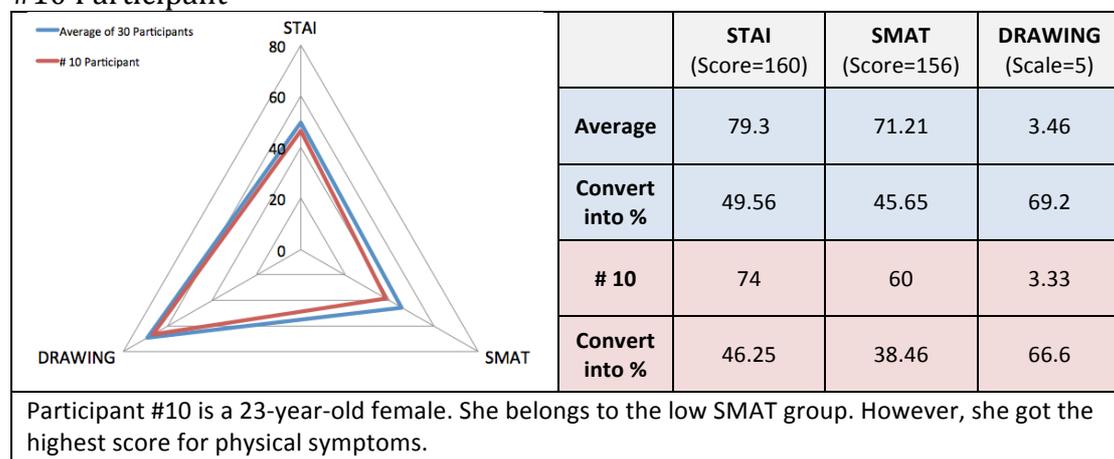
Figure 44 Examples of how they reflected their appearance in their drawings

However, on the topic of ‘Daily Memory’ again, Participant #29 pointed out that drawing not only improved her memory, but also changed her lifestyle in a positive way. This contrasts with her partner. She explained that there were three steps to change her lifestyle through drawing: she recalled the food she had eaten, explored what made her happy when she was eating, decreased the amount of food she was eating and increased the amount she was drinking. She became aware that drinking more fluids helps her to be healthy. Drawing became a way of motivating her to increase her fluid intake.

On the topic of ‘Social Relationships’, Participant #26 thought the use of emoticons helped her a little bit to develop a relationship with Participant #29. She mentioned that her partner seems to like Vietnamese food, and has cool round glasses. Moreover, Participant #29 mentioned this at the end of the experiment when she was more comfortable expressing herself. She explained that she generally conveyed what she had done rather than what she had felt.

Case Sixteen

#10 Participant



Day Memory – Participant #10	
	
Description	Annotation
<p>Participant #10 described how drawing affected her memory as follows: ‘food was the easiest thing to draw and therefore most of what we talked about. Drawing it out didn’t really change how well I remembered what I ate.</p> <p>By doodling an event it helped solidify it in my memory.’</p>	<p>Unlike Participant #20, Participant #10 thought that drawing the food was the easiest assignment given to them. Therefore, sharing what they had eaten was a frequent part of their conversation.</p> <p>Regardless, Participant #10 doesn’t think that drawing the food affected her memory.</p> <p>However, doodling an event helped solidify it in her memory. I think she means that the event consists of a story; thus, she could shape the story into drawings.</p>

Conceptual Visualization – Participant #10	
	
Description	Annotation
<p>Participant #10 described her response to the conceptual visualisation as follows: ‘I tried to doodle things like the seasons or other metaphors, but I don’t think my partner understood them. It didn’t really change how I recalled things.’</p>	<p>Participant #10 tried to visualise the four seasons and turn them into drawings. Not only did she find that drawing didn’t help her to recall things, but also she failed to communicate properly with her partner.</p>

Emotion and Social Relationship – Participant #10

Description	Annotation
<p>Participant #10 described her response to the emoticon design task as follows: 'we both had similar reactions to the same thing which built a commonality.'</p>	<p>Participant #10's partner completed the drawing experiment with her, but he did not send me his data. However, I could observe how they talked. The interesting thing about their conversation is that they only used images, no wording. Participant #10 explains that she felt she had something in common with her partner because they had similar reactions. Giving feedback and showing reactions to images is important to build up a relationship, as she said.</p>

Table 45 Data Analysis of Case Sixteen

Case Sixteen comprises Participant #10. Participant #10 is female and she belongs to the low SMAT group (see section 6.2.). Participant #10 and her partner completed the whole drawing experiment. However, her partner did not submit his drawings nor the digital anxiety questionnaire. In this case, therefore, I will only analyse Participant #10's data.

On the topic of 'Daily Memory', Participant #10 thought that drawing her food was the easiest assignment to conduct. Therefore, talking about what they ate was a frequent topic in their conversation. However, she thought that drawing her food did not have an effect on her memory. Doodling her daily activities was helpful to solidify her memory, though. It is clear to me that doodling a daily activity involves a sequence of stories. Thus, participants had to think of an event, how the event looks, and how to describe the event in images. These steps helped Participant #10 to solidify her memory.



Figure 45 Drawings of daily activities from Participant #10

On the topic of ‘Social Relationships’, Participant #10 answered as follows: ‘we both had similar reactions to the same thing which built a commonality’. Here are the images of the conversations between Participant #10 and her partner.



Figure 46 Drawing conversations between Participant #10 and her partner

In their conversations, I found one interesting point, which is that they used only their drawings, no words. Participant #10 mentioned ‘similar reactions’, and ‘commonality’. Here, again, I found that showing reactions and giving feedback are important in building a relationship.