Forcing you to experience wonder: Unconsciously biasing people's choice through strategic physical positioning

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Abstract

Magicians have developed powerful tools to covertly force a spectator to choose a specific card. We investigate the physical location force, in which four cards (from left to right: 1-2-3-4) are placed face-down on the table in a line, after which participants are asked to push out one card. The force is thought to rely on a behavioural bias in that people are more likely to choose the third card from their left. Participants felt that their choice was extremely free, yet 60% selected the 3rd card. There was no significant difference in estimates and feelings of freedom between those who chose the target card (i.e. 3rd card) and those who selected a different card, and they underestimated the actual proportion of people who selected the target card. These results illustrate that participants' behaviour was heavily biased towards choosing the third card, but were oblivious to this bias.

Introduction

We fully embrace the feeling of being in charge of our thoughts and actions, and yet much of our behaviour is unconsciously driven by external factors. The compelling sense of free will we experience when we make a decision may indeed be an illusion itself (Wegner, 2003), an idea that gains support from a wide range of empirical studies. For example, back in 1853 Michael Faraday (1853) investigated the spiritualist practice of table turning, and discovered that people are often unaware of the true cause of their motor actions. More recently, research highlights that we frequently make decisions without fully understanding the reasons for this choice (Nisbett & Wilson, 1977), a phenomenon known as choice blindness (Johansson, Hall, Sikstrom, & Olsson, 2005). Understanding this illusory sense of free will is central to human cognition, and much of the research relies on examining subtle techniques that unconsciously influence people's behaviours.

Magicians have developed powerful cognitive tricks to misdirect their audience's conscious experience of the world and themselves (Kuhn, 2019). Forcing is a principle central to magic, and allows magicians to covertly influence a spectator's choice or outcome (Kuhn, Amlani, & Rensink, 2008). For example, in a "pick a card trick" the spectators might feel like they have selected a random card, when in reality the magician forced the card. In recent years there has been much interest in examining these deceptive techniques (Kuhn et al., 2008; Macknik et al., 2008; Rensink & Kuhn, 2015; Thomas, Didierjean, Maquestiaux, & Gygax, 2015), and several studies have focused on the principle of forcing. Forcing refers to conjuring techniques by which magicians covertly influence a spectator's choice or its outcome. Most of these techniques rely on the fact that options are presented in a way that makes one of them easier to choose (physically or mentally). For example, Shalom et al., (2013) examined the classic force, a technique in which participants are asked to manually select a forced card that was physically restricted. Olson et al., (2015) conducted several experiments in which participants were asked to mentally select a card from a visual stream of different cards where the force card was more visible than all other cards. Although different techniques are used, both take advantage of the fact that spectators tend to adopt a path of least resistance and take the most accessible option. In both studies, the forcing techniques were extremely effective at manipulating participants' choices. Most importantly, participants erroneously felt they had a free choice. Forcing offers a remarkably effective way of influencing a person's choice and understanding the cognitive mechanisms that underpin some of these forcing principles can provide new insights into this illusory sense of free will.

In the current paper we investigate a very simple force – the placement force. The placement force relies on placing the force card (or object) in a convenient location and asking people to physically select an item by touching it, or pushing it towards the performer (Banachek, 2002). To do so, the magician deals four cards onto the table, and it is expected that right-handed spectators will pick the third card from their left. In theory, people would be more likely to select objects that are easily reached, and be unaware of this behavioural bias. Back in 1894, Alfred Binet

noted that conjurors often exploit behavioural biases like this to covertly manipulate the spectator's choice. He suggested that "there is a sort of laziness that is exploited without the person being aware of it " (Binet, 1894, p. 348) (See also, Triplett, 1900). In other words, when asked to select an item, people will simply reach for the most convenient item.

Empirical research from other domains also suggests that physical positioning of an item influences the chance of it being selected. For example, when people are asked to select arbitrary symbols, or toilet paper rolls from a stall, there is a general bias towards choosing items located in the middle position rather than the those located at the edges (Bar-Hillel, 2015; Chae & Hoegg, 2013). Bar-Hillel (2015) suggests that this middle item preference derives from a reachability effect: the items in the middle are mostly easier to physically or mentally reach (see also Bar-Hillel, Peer & Acquisti, 2014). It is worth noting that there is some controversy surrounding the explanation of this middle preference. For examaple, Rodway and colleagrues (2016) have suggested that the centre-stage effect may be independent of phyical reachability. However, when the items' valence plays no role and the options are all identical, reachability seems to be what guides participants' choices. In other words, with other things being equal, such as the identical back of 4 cards, people tend to favour objects that are located in situations that are more easily reached (Christenfeld, 1995; Dayton & Bar-Hillel, 2011; Shaw, Bergen, Brown, & Gallagher, 2000).

Magic relies on exploiting counter-intuitive errors and biases in cognition, and a force is only effective if people are unaware of this bias (Kuhn, 2019). Research on Choice Blindness illustrates that people typically fail to correctly explain why they chose a particular item and instead confabulate elaborate, yet impossible, justifications for their decisions (Hall, Johansson, Tarning, Sikstrom, & Deutgen, 2010; Johansson et al., 2005). Likewise, Nisbett and Wilson's (1977) classic stocking experiment revealed systematic preference biases for identical garments, and yet the participants failed to realise the true nature of this bias (i.e. physical positioning). In principle, it appears plausible that the spectators are oblivious of the positioning bias, but very little is known about the extent to which people are aware of the bias.

The current experiment empirically investigated the placement force and our objectives were three-fold. Our first aim was to establish the extent to which people choose an item (i.e. card) that is placed in an easily reachable position. To do so, the experimenter placed four cards on the table horizontally and asked the participant to select a card by pushing it toward him. This is a typical psychological force (Banachek, 2002), and an online survey conducted questioning 91 magicians suggested that 57% of the participants should pick the force card. We therefore predicted that participants who use their right hand to make the selection would select the card that was immediately in front of the hand making the selection (i.e. third card from their left). Since the force relies on the ease by which the item can be reached, it should be ineffective if participants use their left hand.

Our second aim was to investigate the extent to which people are consciously aware of the systematic placement bias. To do so, we used a range of measures. After selecting the card, each participant was asked to indicate how free they felt about the selection. If the force is effective, we would expect identical ratings for participants who chose the force card compared to those who selected another card. There are a number of forcing principles in which people genuinely have a free choice, but don't have any control over the outcome of this choice. A force is therefore only effective if people fail to notice that the outcome is predetermined. Participants were therefore asked to also estimate the number of people (out of 100) who would choose the same card as they did. Given the frequent use of the placement force, we would expect participants to underestimate the number of other people who would choose the force card, and there to be no difference between participants who chose the force card and those who selected a different one. Finally, we explicitly asked participants whether there was any way in which the experimenter could possibly predict their choice. We predicted that people are oblivious to the force, and therefore should not report the location bias. More specifically, we predicted that participants who chose the force card will be just as likely to suggest reasons that imply the physical positioning of the card as the other participants.

Our third aim was to investigate the role people's experiences of the choice have on the wonder that such magic tricks can elicit. Magic allows us to experience the impossible and it elicits a wide range of emotions (Bagienski & Kuhn, 2019). However, at the core of the experience lies a cognitive conflict between the things we believe to be possible and the things we experience (Kuhn, 2019; Lamont, 2017; Leddington, 2016a, 2016b; Rensink & Kuhn, 2015). If the participant chose the force card the experimenter magically revealed that he predicted this choice. We admit that this effect is not the most impressive piece of magic, but we expected it to elicit some wonder. Participants were therefore asked to rate the amount of wonder they experienced when the prediction matched their choice. If magic relies on creating a conflict between people's experience (i.e. the matching prediction) and their beliefs about what is possible (i.e. the extent to which others would behave in identical ways) we would predict a negative correlation between wonder and the population estimates of how many other people will choose this card. We were agnostic as to whether their sense of freedom over the choice would have any impact on the wonder that the illusion would elicit.

Method

Participants

Sixty participants (24 female, 36 male) between 18 and 25 years old (M = 20.4, SD = 1.41) were recruited in Tsinghua University. Tsinghua Psychology Department provided ethical approval for the experiment. The sample size was calculated based on a pilot study not reported here.

Procedure

The experimenter sat at a table in the laboratory, with a consent form on the table. On the back of the consent form it stated that: “You will choose the seven of diamonds.” (the forced card was seven of diamonds). Participants were asked to sit opposite the experimenter and read and sign the consent form, without knowing the text on the back of the form.

The experimenter then placed four cards face down on the table from left to right (from participants perspective 1-2-3-4). The experimenter asked the participant to choose one card by saying “Here are four cards. Please choose one of them and push it forward.” The participant’s choice and the hand with which it was chosen were recorded.

The experimenter then verbally asked three questions about their choice and noted the answers. Firstly, they were asked to indicate how free they felt about their choice (scale 1 – 10, whereby 1 represents not free at all and 10 represents very free). Next, they were asked how the experimenter could possibly predict their choice. Specifically, they were asked “if I predicted that you would choose this card, how do you think I could have achieved this?” Finally, they were asked how many people they thought would have chosen the same card (out of 100). The experimenter then revealed the identify of all of the other cards, including the force card.

For participants who chose the forced card, the experimenter magically revealed the prediction by asking the participant to turn over the consent form. The experimenter then asked participants to use a 10-point scale to rate the amount of wonder they experienced when the prediction matched their choice

At the end of the experiment participants completed the Edinburgh Handedness Inventory (revised) (Williams, 2017) to measure their Laterality Quotient (LQ).

We report all measures, conditions, and data exclusions.

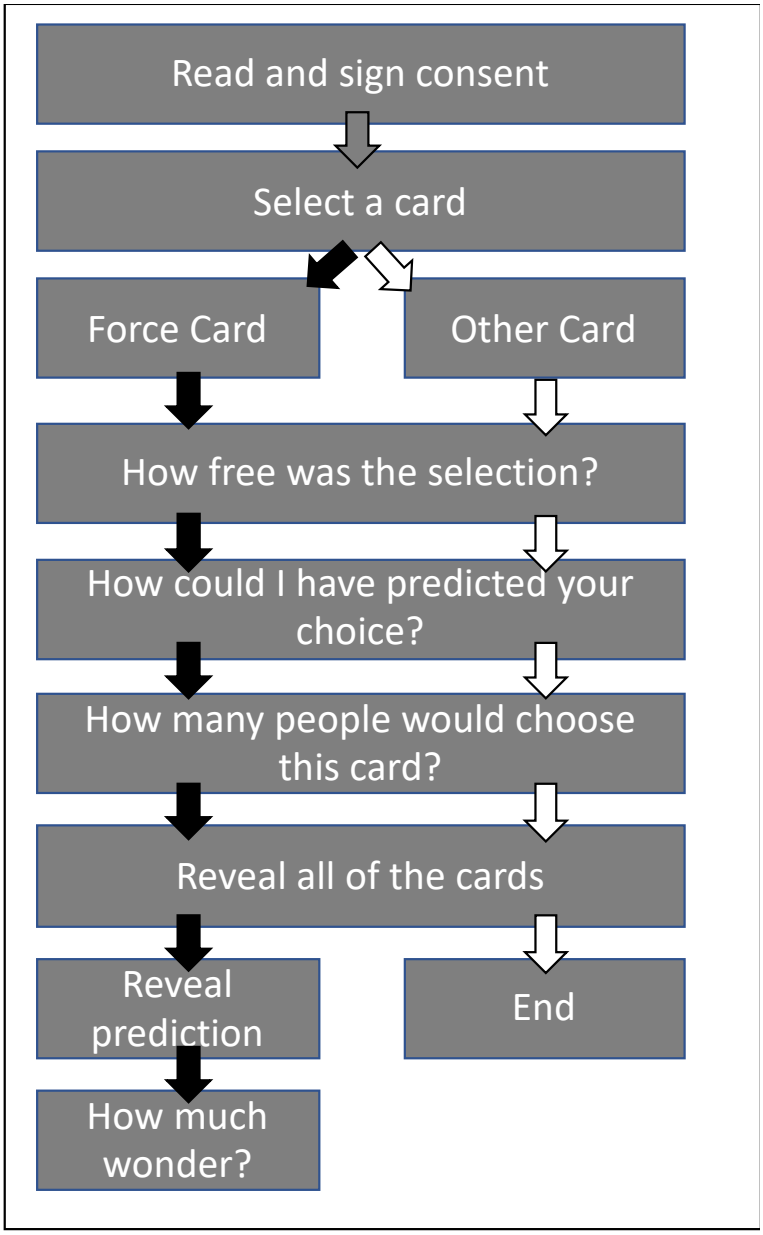

Figure 1. Flow diagram illustrating the procedure

Results

The position force relies on people touching the card that is most convenient, meaning the card that is immediately in front of the hand that is reaching for the card. In the current set-up, the force card was always in the 3rd position, implying it will only work for people who use the right hand to select the card. Only 20% of the participants made the selection with their left hand. The LQ data revealed no significant difference (Mann-Whitney U = 245, p = .20) between participants who used their right hand to push the card (M= 97.2, SD = 8.73) compared to participants who used their left hand for the selection (M = 84.9, SD = 36) (100 indicates right handed, -100 indicates left handed, and 0 implied ambidextrous).

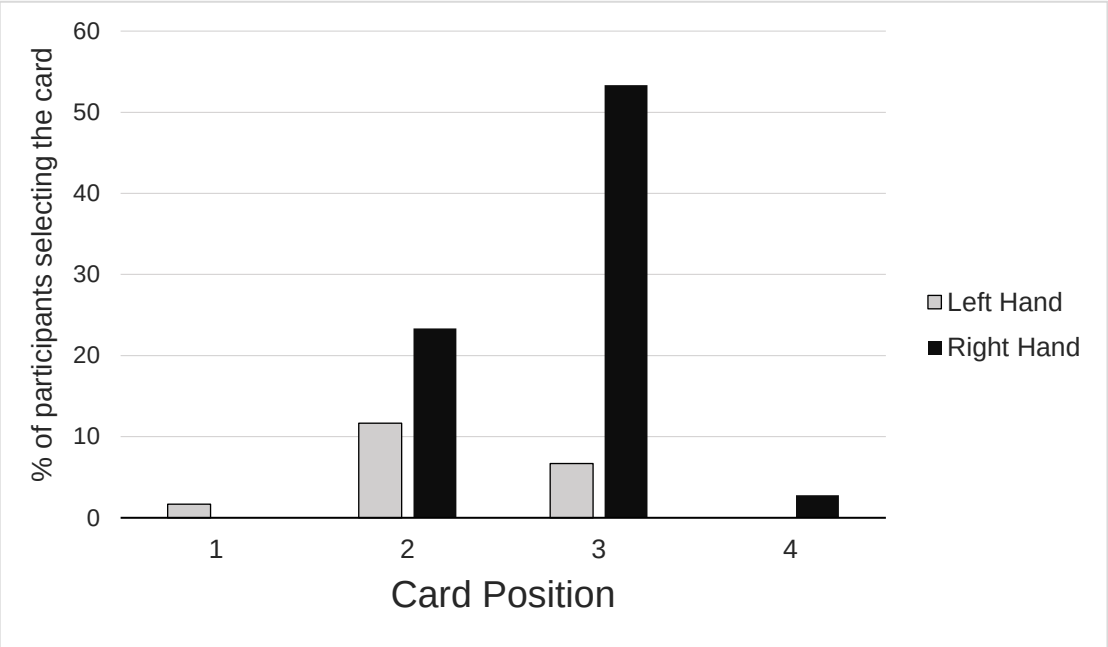

Figure 2. Percentage of individuals who chose playing cards in the 4 different positions as a function of the hand they used to make the selection.

Figure 2 shows the percentage of individuals who chose playing cards in the 4 different positions as a function of the hand they used to make the selection. It is clear from figure 2 that there are systematic biases in which cards are chosen and these biases varied as a function of which of the hands were being used. Sixty-six percent of the participants who chose the card with their right hand chose the force card, which is significantly more than would be expected based on chance (i.e, 25%) (X2(1,96) = 16.8, p <.001). Those who made their selection with their right hand were significantly more likely to choose the force card than those who selected it with their left hand (X^2(1, 60) =4.33, p = 0.04).

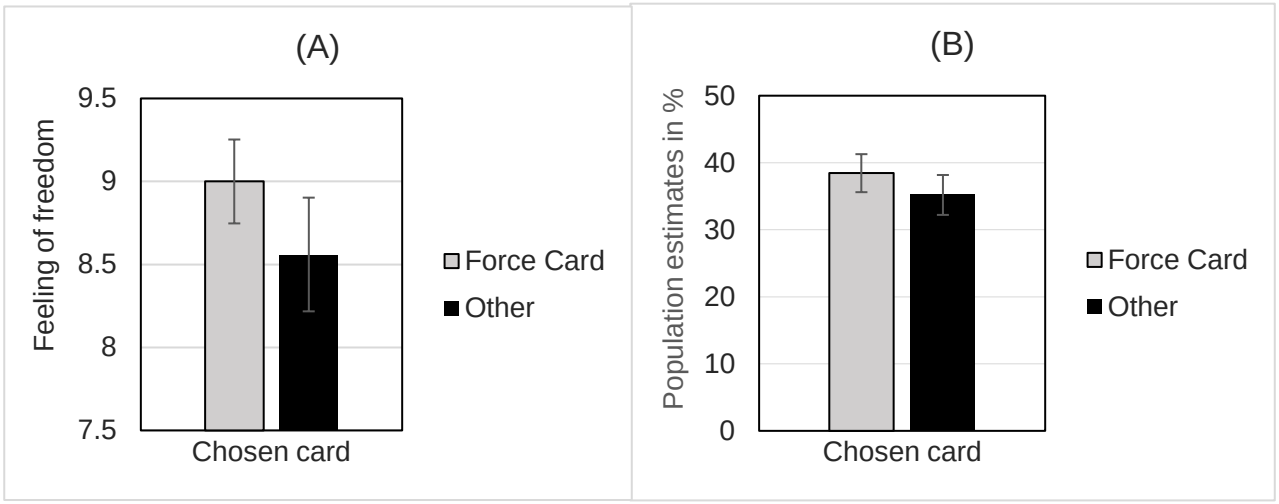

Figure 3. Participants' feeling of freedom for their choice according to the chosen card (A) and their estimations of the percentage of people who would have chosen the same card (B). Standard-error bars are displayed.

Next, we examined whether participants were conscious of the selection bias Figure 3a). For all subsequent analysis we only looked at the data from participants who selected the card with their right hand. The first analysis compared the sense of freedom rating given for the force card compared to all of the other cards.

There was no significant difference in freedom rating for participants who chose the force card (M = 9.00; SD = 1.43) and those who chose a different card (M = 8.56; SD = 1.36) U=202, p = 0.21. Also, these ratings were extremely high, suggesting that that participants felt free in their selection.

Figure 3b shows the estimates of how many other people participants thought may choose the same card. There was no significant difference between those who chose the force card (M = 38.4; SD = 16.0) compared to those who chose a different card (M = 35.2; SD = 11.9), U= 251.5, p = 0.93. Besides, participants who chose the force card significantly underestimated the actual percentage of people (66%) who would select the same card, $t(32) = 9.72$, $p<0.001$, $d = 1.72$.

Participants were asked how the experimenter could possibly predict their choice. Their verbal responses were transcribed and 3 independent raters read each of the statements and rated them according to whether the statement indicated that their choice was influenced by the physical positioning of the cards (1 = yes, 0 = no). There was a high inter rater consistency $\alpha = 0.818$. We calculated a mean rating for each participant. There was no significant difference between those who were successfully forced (M = 0.38, SD = 0.16) with those who chose a different card (M = 0.35, SD = 0.12), Mann-Whitney U (n = 32, p = .61) again suggesting participants were unaware of this bias.

Our final analysis focused on the sense of wonder that the correct prediction elicits (only right-handed participants who chose the force card). To do so, we ran a multiple regression model, with participants' freedom ratings and population estimates as predictor variables. The mean wonder rating was 5.53 (SD = 1.51, min = 2, max = 7). The model significantly predicted participants' wonder ratings ($F(2, 29)= 4.28$, $p= .024$) with an R^2 of .23. The population estimates significantly predicted the sense of wonder (Beta = - 0.05, $p = .007$). Participants' feeling of freedom was not a significant predictor of their sense of wonder about the magician's prediction (Beta = 0.067, $p = .61$). Moreover, there was no significant correlation between population estimates and feeling of freedom ratings ($r(32) = .1$, $p = .60$)).

Discussion

Magicians have developed remarkably effective ways of covertly influencing people's decisions, and the current paper investigated one of these forcing techniques, the placement force. Sixty-six percent of our participants, who selected the card with their right hand, chose the card in the third position. Our results illustrate that people are much more likely to select a card that can be easily reached, and they appear to be oblivious towards this bias. The placement force only worked for participants who selected the card with their right hand. Indeed, those who used the left hand tended to prefer the card that was immediately in front of their hand. These results further demonstrate that the selection bias is not simply due to the physical location, but the ease by which people can reach the object, and thus dovetail ideas proposed by Bar-Hillel, Peer, and Acquisti (see also Bar-Hillel, 2015). Rather intriguingly, the data from our survey reveals that magicians have a fairly accurate insights into the effectiveness of their illusions.

Our second objective was to investigate people's conscious awareness of this bias. Our results demonstrate that participants felt their choice was extremely free (mean rating = 9, on a scale from 1 – 10) and there was no difference in their sense of freedom between the participants who chose the force card and those who chose a different card. In fact, participants who chose the force card gave numerically higher freedom ratings than those who selected a different card. These results dovetail previous studies that illustrate that people feel free when choosing a force item (Olson et al., 2015; Shalom et al., 2013). We also directly questioned the participants about the possibility of influencing their choice. Whilst some of the participants suggested it was possible to bias a choice by physically positioning a card in a specific location, most of them were blind regarding the impact of the card's positions. There was no difference in the types of explanations provided by participants who were successfully forced and those who chose a different card. These finding support previous results by Nisbett and Wilson (1977) who suggested that people fail to introspect about these types of biases. We also asked our participants to estimate the number of people who would choose the same card. Participants who chose the forced card clearly underestimated the extent to which their behaviour is influence by physical

positioning of the card. The force presented here provides a powerful example, of how our behaviours can be influenced by unconscious biases, here more specifically by the position of an item among others. Previous literature indeed showed that manipulating an object's physical location could influence people's choice in favour of this object – from food items (Kim, Hwang, Park, Lee, & Park, 2019) to highlighters (Shaw et al., 2000). Our results also clearly illustrate that people avoid selecting the cards at the extremities – in other words an edge aversion. Participants chose the most easily reachable card (on their right), while avoiding the fourth card from their left, at the right extremity. This dovetails previous research showing edge aversion when similar items are presented simultaneously (Bar-Hillel, 2015).

Magic allows us to experience the impossible, and it creates a conflict between the things we experience and the things we believe to be possible. Rather surprisingly, very little is known about the psychological factors that underpin this experience or wonder and astonishment that these illusions elicit (Kuhn, 2019; Leddington, 2016b, 2017). Many of our subjects were truly surprised by the magician's ability to predict their choice, and experienced modest levels of wonder (mean = 5.5, on a scale from 1 - 10). This sense of wonder was independent of how free people felt about their choice, but did relate to their beliefs about how many other people would chose the same card. In other words, the wonder was directly related to people's beliefs about how likely what they had seen is possible. With only 4 cards, the magician would be able to make a correct prediction in 25 % of the cases even without relying on the psychological factors underlying the place force. Most participants overestimated this probability (mean estimation= 36.8%), and yet they still experienced some sense of wonder for the prediction of their choice. It is important to note that the population estimates accounted for a relatively small proportion of the variance, which means that people's sense of wonder is driven by other psychological factors. In the context of a magic performance, participants may simply assume that the magician can predict the spectator's choice under all circumstances, and this erroneous belief may elicit a sense of wonder that is largely independent of the likelihood of the current event occurring by chance. Indeed, research in other areas shows that people often interpreted unlikely, yet statistically possible, events as magical or paranormal (see French and Stone, 2013). It is therefore possible that similar cognitive mechanisms are responsible for eliciting wonder in these types of magic tricks.

To conclude, we demonstrate that systematically placing a card in an easily reachable position is remarkably effective at ensuring that this card will be chosen. Moreover, most of our participants were oblivious to the way in which their choice had been influenced which supports the notion that much of our behaviour and decisions are driven by unconscious mental processes. The placement force represents one of many other psychological forces and understanding how and why these forces work, may provide important insights into our illusory sense of free will (Jones, 1994).

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