Supporting older eyewitnesses' episodic memory: The Self-Administered Interview and Sketch Reinstatement of Context

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Abstract

Environmental support at retrieval improves episodic performance, yet there exists very few empirically evaluated techniques for supporting older witnesses/victims' remembering (> 65years). We investigated two techniques for use in a criminal justice context - the Self-Administered Interview and Sketch Reinstatement of Context. Older adults (N =134) witnessed an unexpected live event, following which half immediately completed a Self-Administered Interview and half did not (Time 1). All were interviewed 48 hours later (Time 2) using one of three face-to-face interview techniques: Sketch Reinstatement of Context, Mental Reinstatement of Context, or no support Control. Those who completed a Self-Administered Interview at Time 1 recalled more correct information at Time 2 irrespective of interview condition and confabulated less. Likewise, participants interviewed using the Sketch Reinstatement of Context technique recalled more correct information and confabulated less, whether they had completed a Self-Administered Interview, or not. However, the Self-Administered Interview + Sketch Reinstatement of Context was the most effective combination, indicating an interaction between stabilizing a memory trace quickly and how sketching appears to scaffold memory retrieval during face-to-face interviews.

Introduction

Healthy aging is accompanied by a decline in episodic memory, the ability to remember personal experiences in a different temporal and spatial context to that of encoding (Tulving, 1984). Reductions in episodic memory are pronounced in free- and cued-recall (see Craik & Jennings, 1992; Craik & McDowd, 1987). Yet, older adults are asked to retrieve episodic information using free- and cued-recall tasks when they come into contact with the Criminal Justice System (CJS) as witnesses and/or victims[1] (e.g., College of Policing, 2019; Milne & Bull, 1999), which introduces task demands that do not arise during everyday remembering. A dearth of empirically tested environmental support techniques for assisting this population to recall an experienced event means they may not always provide 'best evidence'[2]. This fuels perceptions (e.g., police; jurors; prosecutors) that older adults are less credible and reliable than younger witnesses (see Kwong, Sheree, Hoffman, & Wood 2001; Wright & Holliday, 2005), and serves to limit access to justice (e.g., Brogden & Nijhar, 2000; Görgen, 2006; Moriarty, 2005; Lister & Wall, 2006).

Preserving Post-Experience Memory

The dynamic nature of post-event memory maturation can affect memory performance. During the post acquisition period new traces are prone to interference (see Dudai, 2004). Delay also reduces the completeness of witness accounts (e.g., Rubin &

[1]From hereon we use the term witness to include both onlookers and victims of crime.

[2] The term 'best evidence' is based on the common law rule of evidence, *'the best [evidence] that the nature of the case will allow',* and is used by the UK Ministry of Justice with reference to assisting vulnerable witnesses and victims to access justice by giving tailored support to help them give their best evidence.

Wenzel, 1996; Tuckey & Brewer, 2003) and limits the retrieval of fine-grained details (Goldsmith, Koriat, & Pansky, 2005; Reyna & Kiernan, 1994) which typically decay more rapidly than gist level information (Goldsmith et al., 2005; Koriat, Levy-Sadot, Edry, & de Marcas, 2003). Accordingly, eliciting a first episodic account expeditiously may reduce the immediate task demands for older adults and early retrieval may stabilize the memory trace thereby reducing decay (Anderson, 1983; Ayers & Reder, 1998). In the first few minutes to hours after encoding the development of experience-dependent internal representations are susceptible to interference. With practice (e.g., rehearsal, repeated retrieval) they become resistant to interference. Therefore, an initial retrieval may enhance performance at a later date (e.g., Richardson-Klavehn & Bjork, 1988; Roediger & Karpicke, 2006a, 2006b).

Pragmatically, other than for the most serious of criminal events, early retrieval opportunities rarely exist. To overcome this, the Self-Administered Interview (SAI; Gabbert, Hope, & Fisher, 2009; Hope, Gabbert, & Fisher, 2011) was developed for the immediate harvesting of episodic information. The SAI takes the form of a standardized protocol of instructions and questions that enable witnesses to provide their own statement, without the need for an officer to conduct an interview. It can therefore be used to elicit comprehensive initial statements from witnesses, quickly and efficiently. Laboratory studies have indicated the efficacy of the SAI in conditions of intentional encoding for younger adults (Gabbert et al., 2009; Hope et al., 2011; Matsuo & Miura, 2016) and older adults (Gawrylowicz, et al., 2014). Given the reported benefits, a key aim of the current study was to explore the efficacy of the SAI for older adults who experienced a live, unexpected event, and were unaware that they would be asked to

recount the event until afterwards.

Retrieval Support

The Cognitive Interview technique (CI; Fisher & Geisleman, 1992) is the prevalent empirically informed method for retrieving information from witnesses. The CI comprises several mnemonic components and retrieval support strategies (see Memon, Meissner, & Fraser, 2010) including the Mental Reinstatement of Context technique (MRC). MRC draws upon 'encoding-specificity' (Tulving & Thomson, 1973) and encourages witnesses to mentally recreate the psychological and physical environment that existed at the time of encoding to facilitate the feature overlap between the event and the retrieval environment.

The beneficial effect of MRC is well established. Componential research reveals MRC is one of the most effective individual components of the CI for both children and adults < 65 years (e.g. Gwyer & Clifford, 1998; Dando, Wilcock, & Milne, 2009; Dando, Wilcock, Milne, & Henry, 2009; Dando, Wilcock, Behnkle, & Milne, 2011; Fisher et al., 1984; Memon & Bruce, 1985). However, less is known about the utility of the MRC technique with older adults (but see Dando, 2013; McKenna, 2012), and the beneficial effects of MRC do vary (e.g., Emmett, Clifford, & Gwyer, 2003), with some studies reporting strong positive effects, others reporting weak effects.

The suitability of the CI (which includes MRC) for older adults is empirically supported (e.g., Dornburg & McDaniel, 2006; Holliday et al., 2011; Wright & Holliday, 2007a; 2007b). However, the literature is relatively sparse, and cognitive theories of aging indicate MRC may be less effective for older adults. The demands associated with the instructions may outstrip the cognitive resources available to many older adults who

typically exhibit reduced processing capacity (Craik & Byrd, 1982; Hashtroudi, Johnson, & Chrosnaik, 1990; Park & Hedden, 2001; Salthouse, 1996) and deficits in working memory/executive control (Castell, Farb, & Craik, 2007). Difficulties associating or linking single units of information (Navah-Benjamin, 2000; Navah-Benjamin, Hussain, Guez, & Bar-On, 2003; Naveh-Benjamin, Guez, & Sulman, 2004), and reductions in attention capacity (see Craik, 2002; Craik & Jennings, 1992) are also well documented in older adults.

The Task Support Hypothesis (e.g., Bowler, Mathews, & Gardiner, 1997) contends that performance might be improved when retrieval support is uncomplicated, and where sufficient time is allowed to process cognitive tasks (e.g., Calcombe & Kramer, 2003; Ballesteros et al., 2009). Sketch-Reinstatement of Context (Sketch-RC) was developed as an alternative to the Mental Reinstatement of Context (MRC) technique for supporting witnesses to mentally recreate the psychological and physical environment that existed at the time of encoding. Sketch-RC naturally allows age related adjustments in line with the Task Support Hypothesis. There are a few simple instructions, and witnesses can dictate the pace of recall, ensuring sufficient time to think about and understand the instructions, thereby reducing the situational demands. In conditions of intentional encoding, the Sketch-RC has been found to be an effective replacement for MRC with adult mock witnesses (Dando et al., 2009a; 2009b; 2011), typically developing children (Gental, Powlee, & Sharman, 2014), and children with Autism (Mattison, Dando, & Ormerod, 2014: 2016). One small pilot study has also reported benefits for older adults in conditions of unintentional encoding (Dando, 2013), and

another has also reported benefits in conditions of intentional encoding (McKenna, 2012).

The subjective nature of the witness experience (Schacter, Norman, & Koutstaal, 1998) indicates the 'one size fits all' MRC technique may result in incompatible retrieval cues generated by others, which can impair episodic retrieval performance. For older witnesses, the negative effects of incompatible retrieval cues are compounded because (Hasher, Tonev, Lustig, & Zacks, 2001; Yarmey & Yarmey, 1997) they can degrade their ability to make meaningful connections between the to-be-remembered elements (Navah-Benjamin, 2000; Navah-Benjamin et al., 2003). Therefore, an additional benefit may arise from self-generated retrieval cues through sketching rather than relying on cues provided by the interviewer (see Dando, 2013; Kontogianni, Hope, Taylor, Vrij & Gabbert, 2018; Wheeler & Gabbert, 2017). Indeed, age differences are reduced in tasks that provide *efficient* cues at retrieval (e.g., Ceci & Tabor, 1981; Sauzeon et al., 2000; Angel, 2010), here cues associated with the encoded event.

The current research investigates the efficacy of the SAI and the Sketch-RC for older adult witnesses (> 65 years) in conditions of unintentional encoding to mirror the experiences of genuine eyewitnesses who typically are not expecting to experience an event. The contemporary theoretical and applied literature supports the following hypotheses. First, because during the post-acquisition period new memories are prone to interference (see Dudai, 2004), and delay reduces the completeness of eyewitness accounts, an early retrieval using a SAI (within 30 minutes) will improve recall during a later face-to-face interview (conducted following a 48-hour delay). Second, a face-to-face Sketch-RC interview 48 hours post event will improve memorial performance versus a no

support control and an MRC interview because it supports the provision of compatible retrieval cues, and directs limited processing resources to goal relevant stimuli. Third, a SAI immediately post event, followed by a face-to-face Sketch-RC interview (48 hours post event) will be the most effective because the positive effects are likely accumulative.

Method

Design

A 2 (Time 1 Condition; SAI; No SAI) X 3 (Time 2 Retrieval: Mental Reinstatement of Context Interview; Sketch Reinstatement of Context Interview; Control interview) between subjects design was employed. To date, no comparative immediate retrieval technique for use in forensic settings exists, so immediately post the to-be-remembered event participants were randomly allocated to either the SAI immediate retrieval condition, or a no immediate retrieval control. Two days later, all participants were randomly allocated to one of three post event interview conditions (MRC; Sketch-RC; Control). The dependent variable was Time 2 memorial performance measured by (i) the amount of correct, erroneous and confabulated items of information recalled as a function of interview condition, globally and as a function of interview phase and (ii) percentage accuracy (calculated by dividing the proportion of correct information items by the proportion of total number of information items recalled) globally and as a function of phase,

Materials

Global cognitive status of older adults was determined using the Mini Mental States Examination (Folstein et al., 1975) and the Geriatric Depression Scale (Sheikh & Yesavage, 1986). The Mini Mental States Examination (MMSE) screens for cognitive

impairment without obscuring the effects of age on recall, and was administered individually. This is a short test (10 mins in duration) comprising 20 questions assessing orientation, attention, language abilities, immediate and short-term recall, as well as the ability to follow simple verbal commands (Crum, Anthony, Bassett, & Folstein, 1993). No participant scored below 26 on this measure, indicating the absence of abnormal cognitive impairment. The Geriatric Depression Scale Short Form (GDS -15) is a 15-item questionnaire designed to screen for depressive symptoms in older adults. No participant scored over 5 on this measure, indicating the absence of abnormal depressive symptoms.

Self-Administered Interview (SAI). We used the paper-based booklet version of the SAI comprising sections containing information and instructions designed to facilitate both recall and reporting of memories for a witnessed event. (see Gabbert, et al., 2009). For the purposes of this research, the Self-Administered Interview was slightly modified for our older adult participant group. The font size was increased to 16pt, the format of the booklet was altered to ensure that participants experienced only one instruction per page, and the spacing (formatting) between the components of each individual retrieval instruction was increased.

Interviews

All of the Time 2 interviews conducted for this research were similarly structured, comprising the following phases: (i) greet and explain, (ii) rapport, (iii) free recall, (iv) questioning, and (v) closure. They comprised the same number of retrieval attempts in the same order, and only differed in the Free Recall phase during which the experimental manipulation took place. Five experienced interviewers conducted all of the interviews, with each interviewer conducting between 20 and 26 interviews across all of the Time 2

conditions. Each interviewer followed the condition appropriate protocols (verbatim). Irrespective, of interview condition, all protocols were based on the PEACE investigative interview model. In brief, the interview procedures were as follows (detailed interview protocols are available from the first author):

All interviews commenced with the *greet and explain* phase, during which the interviewer greeted the participant, introduced herself, and explained what the interview would entail. In addition, each participant was given an opportunity to ask any questions, and permission was again sought for the interview to be audio recorded. The interviewer then moved seamlessly into the *rapport* phase, during which the interviewer interacted meaningfully with the participant, contributing as an interested party, using open-ended invitations to exchange information and to demonstrate an understanding of the situation from the participant's point of view (e.g., Collins, Lincoln & Frank, 2002; Vallano & Compo, 2011).

Sketch Reinstatement of Context Interview. The *free recall* phase of interviews in this condition commenced with each participant being provided with paper and pencils, and then being asked to draw the to-be-remembered event in as much detail as possible, and to describe each item/event as they were drawing (see Dando et al., 2009; Dando, 2013; Mattison et al., 2014). Participants were instructed to draw absolutely anything they wished, on the condition that it reminded them of the event. Participants were given unlimited time to draw, following which the interviewer verbalised four retrieval instructions: (i) please explain what you remember about the event you saw a few days ago, (ii) I only want you to tell me what you *actually* remember, please don't guess, (iii) if you can't remember just say so, and (iv) tell me absolutely everything you

can, even if you can only remember partial details, or apparently insignificant information (from hereon referred to as the Retrieval Instructions).

Mental Reinstatement of Context Interview. The *free recall* phase of interviews in this condition commenced with interviewer giving instructions aimed at aiding the interviewee to mentally reinstate both the physical and psychological context that existed at the time of encoding in line with the procedure currently taught to police interviewers. The instructions were delivered slowly and deliberately, and in between each instruction the interviewer paused for five seconds to allow enough time for the participant to picture/image, and reinstate the context as instructed. Following this, participants were given the Retrieval Instructions.

Control (no support) Interview. The *free recall* phase of interviews in this condition commenced with interviewer giving the Retrieval Instructions. Irrespective of condition, participants were given unlimited time to explain what they remembered, during which time they were uninterrupted by the interviewer. Throughout, the interviewer displayed supportive and active listening behaviour, while making brief bullet notes about the main topics remembered, and the order of those topics as they were verbalised by the interviewee (for use in the questioning phase).

The *questioning* phase of each interview followed the *free recall* phase. All participants were again given the four Retrieval Instructions prior to the commencement of this phase, during which the interviewer questioned each participant in a manner compatible with the way in which he/she had recalled the event during the free recall phase. To do this, the interviewer used the notes she made during that free recall phase, asking one question about each of the topics recalled. Thereafter, the interviewer

completed the *closure* phase, during which the participant was thanked for his/her participation, and offered an opportunity to ask questions.

Participants

A total of 134 older adults from the general population took part in the research[3], 51 males and 83 females with a mean age of 71.50 years (*SD* 5.51 years) ranging from 65 to 88 years. All lived independently in the community, and were recruited directly via four community organizations that allowed the research team access to mailing lists to invite members to a series of community presentations entitled 'Introducing Psychology'.

Procedure

A 'live' mock witness event was used, which was repeated on seven occasions, between the hours of 2pm and 4pm on Thursday and Friday afternoons over a 30-month period. Eight actor pairs were recruited for the research (4 males and 4 females). Actors were matched across pairs for age, clothing and general appearance etc., and used a pre-learned script, which in brief was as follows; a pair, comprised a male and a female actor, entered the seminar room (large rooms with seating for an audience of approximately 75, and with overhead projection facilities and a podium at the front), and approached and interrupted the speaker, who at the time was presenting to an invited audience of between 14 and 26 attendees. A conversation ensued concerning whether or not they (the actors) should in fact be attending this lecture. During the verbal exchange between the speaker and the actors concerning room bookings and possible solutions to the problem, the female actor used her cell phone to call a friend, while the male actor consulted his diary.

[3] Some data from 45 participants has previously been reported (see Dando, 2013). Did this group differ in any way from the current group? - No

Both the actors left the room, apologising for the confusion. The interruption lasted for about one minute.

Each presentation was identical and lasted approximately 45 minutes. Partway through each presentation (after 20 minutes had elapsed), the aforementioned event took place, after which the speaker continued presenting for a further 20 minutes. Once the presentation was complete, the researcher entered the seminar room, explained that what had occurred was part of a research project and recruited participants (providing them with information sheets, answering questions, and obtaining signed consent forms).

Sixty-seven participants were randomly allocated to each of the Time 1 conditions (SAI; No SAI). Those in the SAI condition immediately completed a SAI (individually) and then left after having made an appointment for the researcher to conduct a face-to-face interview 48 hours later. Participants in the No SAI condition left immediately after having arranged for a researcher to conduct a face-to-face interview 48hrs later. All participants were then randomly allocated to one of the time 2 face-to-face interview conditions (MRC; Sketch-RC; Control) and interviewed accordingly 48hrs later.

Coding and Scoring

Each of the live events was discretely digitally audio- and video-recorded. These recordings were used to ensure parity across each of the events, and to construct a scoring and coding template (cf. Dando et al., 2009a, 2011). A comprehensive list of events in the film was compiled, totalling 97 details. Each of the interviews was scored for the number of correct, erroneous (e.g., reporting that the man's bag was black, when in fact it was brown), and confabulated information items (reporting a detail or event that was not present or did not happen) verbalised from the commencement of the *free recall* phase

until the end of the *questioning* phase. The position within the interview that the information was verbalised was noted (free recall or questioning), and information items were only scored once (on first mention).

Fifty interviews were selected at random and coded independently by a research assistant who was naive to the aims of the experiment and hypotheses. Pearson's correlations were calculated for the three performance measures. Results indicated good inter-relater reliability for all three measures: total correct, $r(50) = .816$, $p = .007$; total errors, $r(50) = .889$, $p = .003$; total confabulations, $r(50) = .922$, $p = .001$

Results

Manipulation Checks

No significant differences emerged across the experimental conditions for age, GDS scores, and MMSE, all $Fs < 1.748$, all ps $> .128$. (see Table 1 for the manipulation means and standard deviations).

Table 1.

Means and standard deviations (in parenthesis) across experimental conditions for age, MMSE scores, and GDS scores, N = 134.

	Condition					
	Sketch-RC	MRC	Control	SAI + Sketch-RC	SAI + MRC	SAI + Control
Age	72.39 (6.18)	71.27 (5.73)	73.86 (7.07)	70.86 (3.97)	69.78 (4.00)	70.86 (5.11)
MMSE	29.70 (3.39)	29.09 (1.29)	29.01 (1.07)	29.00 (.976)	29.04 (.976)	28.68 (1.211)
GDS	2.26 (1.76)	2.36 (1.46)	2.27 (1.24)	3.00 (1.77)	2.30 (1.89)	3.36 (1.81)

Analysis Approach

A 2 (Time 1: SAI; No SAI) X 3 (Time 2: Mental Reinstatement of Context Interview; Sketch Reinstatement of Context Interview; Control interview) ANOVA with interviewer as a random effect investigated global memory performance as function of, correct items recalled, inaccurate items recalled, confabulations, and percentage accuracy. Interviews comprised two distinct phases. The analysis of global episodic performance alone provides little information about the impact of our manipulations or pre interview interventions (here the SAI) on the 'parts' of the interview, and whether they contribute to global performance in a positive and meaningful manner. Thus, in order to fully understand the impact of our experimental manipulations and the locus of any effects we also analysed performance as a function of interview phase. All significant interactions were investigated via planned comparisons (applying Bonferroni's correction) with reference to our hypotheses whereby the SAI conditions (SAI + Control; SAI + MRC; SAI + Sketch-RC) were compared to the control (no SAI) conditions, and the SAI + Sketch-RC was compared to all other conditions.

Overall Memory Performance

Correct recall. Analysis revealed significant Time 1, F (1, 4.253) = 17.075, p = .013, η_p^2 = .80, and Time 2, F (2, 12.427) = 45.111, p < .001, η_p^2 = .87, main effects, (see Table 2 for main effect means, SDs and CIs) and a significant Time 1 X Time 2 interaction, F (2, 9.932) = 7.627, p < .010, η_p^2 = .61, for the amount of correct information recalled at Time 2 (see Table 3 for interactions means, SDs and CIs). The random effect of Time 2 interviewer was non-significant, F = .825, p = .592.

Table 2. *Main effects for global memory performance across conditions (means, SDs, Confidence Intervals for % accuracy, correct, errors and confabulations.)*

	SAI	No SAI	Sketch-RC	MRC	Control
			Mean (SD) 95% CI		
Correct	41.23 (12.43) 39.12; 43.33	34.55 (8.17) 32.42; 36.69	46.29 (10.98) 43.54; 49.04	36.47 (8.27) 33.97; 38.97	30.00 (6.87) 27.42; 32.59
Errors	2.87 (1.83) 2.46; 3.29	3.47 (1.48) 3.05; 3.89	2.96 (1.23) 2.43; 3.51	3.43 (1.64) 2.94; 3.93	3.19 (1.65) 2.68; 3.70
Confabulations	.44 (1.03) .21; .72	2.15 (1.33) 1.90; 2.48	.51 (.87) .14; 88	2.14 (1.90) 1.80; 2.48	1.53 (1.35) 1.18; 1.88
% Accuracy	91.79 (4.58) 90.78; 92.80	85.71 (5.39) 84.76; 86.80	92.67 (3.66) 93.14; 96.68	87.16 (6.58) 85.81; 88.40	86.53 (5.39) 85.28; 87.78

Irrespective of Time 2 interview condition, participants who completed a SAI at Time 1 recalled significantly more correct information at Time 2 than those who did not. Irrespective of Time 1 condition, participants in the Sketch-RC condition recalled more correct information than those in both the MRC and Control, $p < .001$. Participants in the MRC recalled more correct information than those in the Control, $p < .001$ (see Table 2 for main effects).

Participants in the SAI + Sketch-RC, SAI + Control and SAI + MRC all recalled more correct information than those in the no SAI conditions, $p < .001$. Participants in the SAI + Sketch-RC condition recalled more correct items than those in the SAI + MRC and SAI + Control, $p < .001$. Participants in the SAI + MRC condition recalled more correct information than those in the SAI + Control, $p < .001$ (see Table 3 for interaction effects).

Errors. The Time 1 main effect for the number of errors was significant, F (1, 5.191) = 9.916, p = .024, η_p^2 = .66 (see Table 2). Participants who completed a SAI at Time 1 made fewer errors at Time 2 than those who did not complete a SAI. The Time 2 main effect and Time 1 X Time 2 interaction were non-significant, all Fs < 1.237, all ps > .330 (see Table 3). The random effect of Time 2 interviewer for number of errors was also non-significant, F = .383, p = .865.

Table 3. *Interaction effects across conditions for global memory performance means, SDs and Confidence Intervals (% accuracy, correct, errors and confabulations).*

	SAI + Control	SAI + Sketch-RC	SAI + MRC	No SAI + Control	No SAI + Sketch RC	No SAI + MRC
	Mean (SD) 95% CI					
Correct	31.78 (7.79) 28.11; 35.46	52.76 (9.77) 49.16; 56.38	39.15 (7.97) 35.49; 42.80	28.52 (5.99) 24.90; 32.13	40.90 (7.74) 36.86; 44.94	34.24 (7.72) 30.82; 37.66
Errors	3.14 (1.83) 2.32; 3.95	2.55 (1.22) 2.00; 3.09	3.99 (1.62) 2.30; 3.70	3.23 (1.48) 2.57; 3.88	3.22 (1.17) 2.71; 3.72	3.86 (1.58) 3.16; 4.57
Confabulations	.73 (1.03) .27; 1.18	.18 (.50) -.04; .40	.48 (.73) .16; .79	2.05 (1.33) 1.46; 2.63	.87 (1.01) .43; 1.31	3.55 (1.40) 2.92; 4.17
% Accuracy	88.32 (4.61) 86.27; 90.36	94.91 (2.37) 93.86; 95.96	92.13 (3.91) 90.44; 93.82	84.73 (5.61) 82.24; 87.22	90.43 (3.35) 88.98; 91.89	82.18 (4.65) 80.12; 84.24

Confabulations. Significant Time 1, F (1, 4.785) = 85.940, p < .001, η_p^2 = .95, and Time 2, F (2, 11.665) = 15.928, p < .001, η_p^2 = .73, main effects, and a significant Time 1 X Time 2 interaction, F (2, 10.724) = 15.876, p = .001, η_p^2 = .75, emerged for the number of confabulations (see Table 2). The random effect of Time 2 interviewer for was non-significant, F = .477, p = .806. Participants who completed a SAI at Time 1 confabulated less at Time 2 than those who did not complete a SAI. Participants

interviewed using the Sketch-RC confabulated less than those in both the control and MRC interview conditions, $p < .001$. There was no difference for the number of confabulations between the Control and MRC, $p = .060$. Participants in the SAI + Sketch-RC, SAI + Control and SAI + MRC all confabulated significantly less than those in the no SAI conditions, $p < .001$. Participants in the SAI + Sketch-RC confabulated less than those in the SAI + Control and SAI + MRC, $p = .002$. No significant difference emerged between the SAI + Control and SAI + MRC conditions $p = .358$.

Accuracy. Significant Time 1, F (1, 128) = 68.244, $p < .00$, $\eta_p^2 = .35$, and Time 2, F (2, 128) = 28.942, $p < .001$, $\eta_p^2 = .31$, main effects, and a significant Time 1 X Time 2 interaction, F (2, 128) = 7.449, $p = .001$, $\eta_p^2 = .10$, emerged for percentage accuracy (see Table 2 for main effects and Table 3 for interactions). Participants who completed a SAI at Time 1 were significantly more accurate at Time 2 than those who did not complete a SAI. Participants interviewed using the Sketch-RC were more accurate than those in both the control and MRC interview conditions, $p < .001$. There was no difference between the Control and MRC, $p = .124$.

Participants in the SAI + Sketch-RC and SAI + MRC were more accurate than those in the no SAI conditions, $p < .001$, with no significant difference between the former two conditions, $p = .088$. Participants in the SAI + Sketch-RC and SAI + MRC were more accurate than those in the SAI + Control, $p = .001$.

Interview Phase Performance

Time 2 interviews comprised two distinct recall attempts, namely a *free recall* (which included the MRC manipulation according to condition: No MRC; Sketch-RC;

MRC) and *questioning*. Here we analysed correct recall as a function of phase, accuracy and collapsed errors and confabulations, referring to this measure as inaccurate recall.

Free recall correct. Significant Time 1, F (1, 128) = 28.033, $p < .001$, $\eta_p^2 = .18$, and Time 2, F (2, 128) = 67.726, $p < .001$, $\eta_p^2 = .51$, main effects (see Table 4) and a significant Time 1 X Time 2 interaction, F (2, 128) = 6.668, $p = .002$, $\eta_p^2 = .09$ emerged (see Table 5 for interaction means and CIs). Participants who completed a SAI at Time 1 recalled more correct information than those who did not (. Participants in the Sketch-RC condition recalled more correct information than those in both the MRC and Control conditions, $p <.001$, and participants in the MRC condition recalled more correct information than those in the Control, $p = 002$. Participants in SAI + Sketch-RC, SAI + Control and SAI + MRC conditions all recalled more correct information than those in the no SAI conditions, $p <.001$. Participants in both the SAI + Sketch-RC and SAI + MRC recalled more correct information than those in the SAI + Control, $p < .001$. Participants in the SAI + Sketch-RC recalled more correct information that those in the SAI + MRC, $p < .001$.

Free recall inaccurate. Significant Time 1, F (1, 128) = 34.354, $p < .001$, $\eta_p^2 = .21$, and Time 2, F (2, 128) = 12.072, $p < .001$, $\eta_p^2 = .13$, main effects emerged for inaccurate recall (see Table 4 for main effects). The Time 1 X Time 2 interaction was non-significant (applying Bonferroni's correction), $F = 3.552$, $p = .032$ (see Table 5 for interactions). Participants who had completed a SAI at Time 1 made fewer errors than those who did not. Participants in the Sketch-RC condition made fewer errors than those in both the MRC and Control, $p < .001$. Participants in the Control condition made fewer errors in the than those in the MRC condition, $p < .001$.

Table 4. *Free recall and Questioning phase correct and inaccurate main effect means and % accuracy, SD and 95% CI (N = 134)*

	SAI	No SAI	Sketch-RC	MRC	Control
			Mean (SD) 95% CI		
Correct Free Recall	29.37 (8.60) 28.11; 30.68	24.63 (6.52) 23.28; 25.83	33.76 (6.97) 32.30; 35.42	26.20 (5.87) 24.59; 27.71	20.91 (5.00) 19.33; 22.48
Inaccurate Free Recall	1.15 (.87) .91; 1.38	2.12 (1.22) 1.89.28; 2.63	1.61 (1.08) .86; 1.43	2.13 (1.35) 1.86; 2.44	1.16 (.79) 1.32; 1.90
Free Recall % Accuracy	92 (15.83) 88.76; 95.41	88 (12.17) 85.24; 91.90	93 (13.53) 89.03; 97.14	88 (14.61) 84.35; 92.46	89 (14.26) 85.39; 93.60
Correct Questioning	11.58 (5.76) 10.46; 12.73	9.83 (4.18) 8.65; 11.00	12.13 (6.22) 10.74; 13.56	11.00 (4.47) 9.57; 12.44	8.97 (3.87) 7.53; 10.42
Inaccurate Questiong	2.21 (1.23) 1.90; 2.52	3.47 (1.54) 3.13; 3.75	2.21(1.28) 1.84; 2.59	3.29 (1.86) 2.91; 3.67	2.98 (1.26) 2.59; 3.36
Questioning % Accuracy	79 (13.24) 75.90; 82.17	65 (13.13) 62.57; 68.75	77 (12.53) 73.23; 81.00	71 (16.86) 67.25; 74.87	69 (14.75) 65.13; 72.84

Free recall percentage accuracy. The Time 1 and Time 2 main effects for percentage accuracy in the free recall phases of interviews were non-significant, all *Fs* < 2.189, all *ps* >.141. However, there was a significant Time 1 X Time two interaction, F (2, 128) = 4.182, p = .017, η_p^2 = .06. Participants in the SAI + MRC and SAI + Sketch conditions were more accurate in the free recall, than those in the SAI + Control, p = .002, with no difference between the former two conditions. Participants in SAI + MRC condition recalled more correct information than those in the Control (no SAI) + MRC condition, p =.001. No other significant interactions emerged.

Questioning correct. There was a significant Time 2 main effect for the amount of correct information recalled in the questioning phase, F (2, 128) = 4.823, p = .010, η_p^2

= .70 (see Table 4). Both the Time 1 main effect and the Time 1 X Time 2 interaction were non-significant (applying Bonferroni's correction), F (1, 128) = 4.341, p = .039, and, F (2, 128) = 2.330, p = .101, respectively (see Table 5 for interactions). Participants in the Sketch-RC and MRC conditions recalled more correct information than those in the Control, $p < .001$, with no significant difference between the Sketch-RC and MRC conditions, p = .353.

Questioning inaccurate. Analysis revealed significant Time 1, F (1, 128) = 31.201, $p < .001$, $\eta_p^2 = .20$, and Time 2, F (2, 128) = 8.399, $p < .001$, $\eta_p^2 = .12$, main effects (see Table 4). The Time 1 X Time 2 interaction was non-significant, F= 3.107, p = .046 (see Table 5). Participants who had completed a SAI at Time 1 made fewer errors than those who did not complete a SAI. Participants in the Sketch-RC condition made fewer errors than those in both the MRC and Control conditions, p = .006, with no significant difference between the latter two conditions, p = .160.

Table 5. *Interview phase memory performance means, SDs and Confidence Intervals (correct, and inaccuracies) and % accuracy for interaction effects across conditions, N = 134.*

	SAI + Control	SAI + Sketch-RC	SAI + MRC	No SAI + Control	No SAI + Sketch RC	No SAI + MRC
	Mean (SD)					
Free Recall Correct	21.45 (4.76) 19.23; 23.68	38.45 (5.51) 36.22; 40.68	28.26 (4.99) 26.81; 30.44	20.36 (5.28) 18.13; 22.59	29.26 (5.01) 27.81; 31.44	24.04 (5.29) 21.82; 26.27
Free Recall Inaccurate	1.32 (.89) .91; 1.73	.77 (.68) .36; 1.18	1.35 (.93) .95; 1.78	1.91 (1.19) 1.50; 2.31	1.52 (.73) 1.12; 1.92	2.95 (1.25) 2.54; 3.36
Free Recall % Accuracy	89 (19.60) 83.38; 94.98	93 (19.25) 86.29; 97.89	95 (9.10) 89.32; 99.89	89 (5.45) 84.01; 95.62	94 (3.23) 88.41; 99.76	81 (18.49) 76.01; 87.62
Question Correct	8.81 (3.49) 6.77; 10.87	14.18 (6.31) 12.13; 16.23	11.74 (5.22) 9;74 13.74	9.14 (3.11) 7.09; 11.18	10.09 (5.57) 8.08; 12.09	10.27 (3.49) 8.22; 12.32
Question Inaccurate	2.59 (1.14) 2.05; 3.13	1.91 (1.11) 1.37; 2.45	2.13 (1.39) 1.60; 2.66	3.36 (1.29) 2.82; 3.90	2.52 (1.12) 1.99; 3.01	4.45 (1.56) 3.91; 4.99
Question %Accuracy	73 (13.84) 68.10; 79.13	83 (8.91) 77.61; 88.39	80 (15.00) 75.11; 85.89	71 (12.91) 65.72; 76.27	64 (12.11) 58.97; 69.75	61 (13.06) 56.25; 67.02

Questioning percentage accuracy. There were significant Time 1 and Time 2 main effects for percentage accuracy in the questioning phases of interviews, F (1, 126) = 36.138, $p < .001$, $\eta_p^2 = .22$, and, F (2, 126) = 4.685, $p = .010$, $\eta_p^2 = .07$, respectively. Participants who completed a SAI at Time 1 were more accurate when questioned than those who did not, and participants in the Sketch-RC condition at Time 2 were more accurate than those in both the Control and MRC condition, $p = .001$, with no significant difference between the Control and MRC conditions, $p = .259$. The Time 1 X Time two interaction was non-significant, $F = 1.639$, $p = .198$.

Discussion

We examined two environmental support tools for assisting older adults' eyewitness performance, investigating whether the SAI might work to stabilize post experience memory, and how older witnesses might be best supported to recall event information in a subsequent face-to-face interview. In mimicking real life where eyewitnesses typically learn without intentional study and are required to consciously retrieve learned

information following a delay, we used a live event and refrained from conducting face-to-face interviews for forty-eight hours, thus bridging the gap between performance in artificial laboratory tasks and real world behaviour (e.g., Neisser, 1985; Roediger, Neisser, & Winograd, 1990). Incidental encoding of this nature does not allow rehearsal, and so offers a more robust test of environmental support techniques for use in eyewitness settings. Currently there is no comparable quick first retrieval method suitable for Criminal Justice purposes, and so we did not contrive an additional Time 1 retrieval condition, rather we mirrored likely practice in the real world.

Our first hypothesis, that a SAI administered soon after experiencing an event would improve later episodic performance in a face-to-face interview, was supported. Following a SAI, participants recalled approximately 17% more correct information in later face-to-face interviews (irrespective of interview condition), without an increase in errors or confabulated recall. The locus of the SAI superiority effect was the Free Recall phase, where participants recalled almost 20% more correct information items with approaching 40% fewer inaccuracies. No significant SAI effect emerged for correct recall in the questioning phase, but there was a significant reduction in intrusions. Participants were more accurate in their free recall when a SAI was followed by an interview at Time 2 that included some retrieval support (MRC and Sketch-RC), and the questioning phases of all conditions when a SAI was completed at Time 1. Similar SAI superiority effect results have been reported with younger adults (e.g., Gabbert et al., 2009; see Hope et al., 2011 for a review) and older adults in conditions of intentional encoding (Gawrylowicz, et al., 2014). Our results serve to further support the utility of the SAI for quickly collecting and preserving episodic information.

Repeated remembering tends to increase the amount of correct information recalled subsequently due to practice and memory trace strengthening (Knutsson, Attwood & Johansson, 2011; Roediger & Karpickle, 2006). Our results are consistent with the 'testing' effect (McDaniel, Roediger, & McDermott, 2007; Roediger & Karpicke, 2006), and with predictions emanating from the theoretical literature concerning episodic retrieval delay, whereby longer retrieval delays are associated with increased hippocampal activity, whereas shorter delays are less effortful, typically resulting in more accurate retrieval decisions (Huijbers et al., 2010; McNaughton et al., 1995). Here, improved correct output without a concomitant increase in the reporting of errors indicates more accurate retrieval decisions.

Our second hypothesis was that a Sketch-RC interview would improve performance in a delayed interview (irrespective of whether participants had completed a SAI, or not). Our findings support this prediction whereby over the course of the interview Sketch-RC elicited approaching 35% and over 20% more correct information than the Control and MRC interviews, respectively. Moreover, this improved performance was accompanied by a significant reduction in confabulations and no increase in errors. Where the SAI is absent, episodic information cannot be immediately harvested. Self-generated retrieval cues activated through sketching has been found to reduce confabulations versus MRC and no support control *per se* (e.g., Dando et al., 2011; Dando, 2013; Mattison et al., 2015; 2018) and our results mirror these previous findings. Here, self-generated retrieval through sketching cues may have also helped to limit the negative impact of interference in the post-acquisition period thus reducing

confabulations, although research specifically designed to investigate this possibility is required.

MRC interviews were more effective than the Control, which is not unexpected since the Control interviews provided no retrieval support. Hence, improved performance without an increase in errors or confabulations is predicted by the support hypothesis (Bowler et al., 1997; Calcombe & Kramer, 2003), and our results concur with previous research in this area (e.g., Holliday et al., 2011; Wright & Holliday, 2007a; 2007b).

Sketch-RC significantly improved recall of correct information in both the Free Recall and Questioning phases with reduced intrusions, and participants were significantly more accurate in the questioning phase than those in all other conditions. A similar pattern of results emerged for MRC interviews, where participants outperformed those in the no support Control, but to a lesser extent. We found MRC to be less effective for older adults, but clearly some support was better than none. It has long been argued that information within memory is organised hierarchically, and that specific episodic information is organised at a lower level than many other memories (Conway, 2005). Sketch-RC may have stimulated a more rigorous search through the memory hierarchy in terms of encouraging more effortful generative retrieval attempts, rather that 'allowing' less-effortful direct retrieval, which involves the spontaneous activation of episodic information. Imaging is known to improve episodic first response performance (see Anderson, Dewhurst, & Nash, 2012), and both the MRC and Sketch-RC encourage imaging. In the case of the former, participants are instructed to mentally image the encoding context, and imaging is implicit in the latter technique because participants are

instructed to draw (which necessarily includes imaging e.g., Calabrese & Marucci, 2006; Cohen & Bennett, 1997; Kontogianni et al., 2018).

Insight into the processes underpinning the Sketch-RC is offered by considering the *nature* of episodic memory, and the *method* of recovering this type of information in an interview setting. Retrieving episodic information is a constructive process (Schacter, & Addis, 2007, Schacter Addis, & Buckter, 2008), which in an eyewitness setting (in the UK and elsewhere) is directed and supported by the interviewer. Load theory proposes that increases in cognitive load (such as working memory load) depletes resources available for attention control and associated tasks. It is known that cognitive load is evoked by the instructions accompanying a task. For instance, the 'split-attention' effect refers to the separate presentation of domain elements that demand simultaneous processing (de Jong, 2010), which is what the MRC technique demands. For older adults, who experience reduced processing efficiency and diminished working memory capacity (e.g., Hashtroudi, et al., 1990; Park & Hedden, 2001; Salthouse, 1996), being asked to engage in the split attention, resource heavy MRC task may lessen the resources available for searching, retrieving, and verbalising episodic information. Further research is necessary to investigate these possible explanations for the differences between the MRC and Sketch-RC conditions.

Incompatible retrieval cues are also known to lessen recall performance. Yet in an eyewitness setting, an interviewer has no option but to assist the rememberer to mentally reinstate the context by providing a set of programmatic cues, presented similarly to every interviewee (the interviewer not having been present at the event, and having little idea as to what might constitute an effective retrieval cue). The benefits of the Sketch-RC

may stem from the fact that participants are self-initiating, and as such are providing the most efficient cues to further remembering (see, Angel et al., 2010; Ceci & Tabor, 1981; Sauzeon et al., 2000; Wheeler & Gabbert, 2017). It is clear from this study, and the results of earlier work (Dando, 2013; Dando et al., 2009a; 2009b; 2011; Mattison et al., 2014) that the Sketch-RC offers an effective alternative to the MRC, and so is worth adding to toolbox of techniques available to cognitive interviewers.

Our results also supported our third hypothesis, that a SAI followed by a Sketch-RC interview would be the most effective combination for improving older adult's episodic performance. Overall, participants in this condition outperformed all others, recalling more correct information with far fewer confabulations, and accordingly were more accurate overall. The Sketch-RC technique was more effective when the memory trace is stronger (Knutsson, Attwood & Johansson, 2011; Roediger & Karpicke, 2006), an effect which appears to have arisen from having earlier completed an SAI, and which is apparent in both the free recall and questioning phases of the SAI + Sketch-RC condition. The SAI at Time 1 also improved the efficacy of the MRC (enhanced correct remembering in both free recall and questioning) and Control interviews, albeit not enough to equal or outperform the Sketch-RC interviews. The protective value of the SAI carried over, its positive effects persisting even when older adults were asked to perform a cognitively demanding, split-attention task, or had no retrieval support during a face-to-face interview, again indicating the impact of quickly consolidating post event memory.

This study is not without its limitations. Our adult sample all lived independently in the community, but we did not collect demographic information concerning levels of education and general health, all of which have the potential to affect memory

performance. We did not sub divide our sample into young-old and old-old groups (e.g., Wright. Alison, & Holiday. 2007). The live unexpected nature of the paradigm used in this research did not allow us to control for age in this manner. Future research should consider controlling for these variables, although it is important to note that in applied settings interviewers/investigators cannot do this. Likewise, a control (younger) comparison group may be of interest. However, this research was concerned with improving older adult's performance, *per se*, rather than relative to a younger control and the applied literature concerning impoverished episodic performance versus younger groups is well established (e.g., Bartlett & Memon, 2007; García-Bajos, Migueles, & Aizpurua, 2012; Mello & Fisher, 1996). We did not consider the type of information recalled, and/or whether the type of information recalled from time 1 to time 2 was stable. User groups should be surveyed about the practicability and perceived effectiveness of both the SAI and Sketch-RC support tools.

Our discussion offers much fuel for future research in this area. It is important that theoretical accounts are applied to eyewitness memory settings in an attempt to understand the nature of real world behaviour – including performance by specific demographic groups where the literature identifies important likely differences or changes (e.g. as a function of age). Most memory theory has its roots in laboratory word list experiments, thus, contextualising theory in an applied setting presents significant methodological challenges. However, the integration of theory is critical. To conclude, we found that, both individually and in combination, the SAI and Sketch-RC facilitated increased correct remembering in older adults and reduced intrusions, which illustrates appropriate support can assist older adults to access justice. Remembering necessitates

selecting goal relevant information in a competitive environment, where irrelevant and erroneous information may also be available. The SAI apparently appears to assist the consolidation of memory, and helps maintain goal directed remembering across time, and the Sketch-RC facilitates the retrieval of more correct goal relevant information during post event face-to-face interviews.

References

Anderson, J. R. (1983). A spreading activation theory of memory. *Journal of Verbal Learning and Verbal Behavior, 22,* 261-295.

Anderson, R. J., Dewhurst, S. A., & Nash, R. A. (2012). Shared cognitive processes underlying past and future thinking: The impact of imagery and concurrent task demands on event specificity. *Journal of Experimental Psychology, Learning, Memory, and Cognition, 38,* 356-365. doi: 10.1037/a0025451.

Ayers, M.S. & Reder, L.M. (1998). A theoretical review of the misinformation effect: predictions from an activation-based memory model. *Psychonomic Bulletin & Review, 5,* 1-21.

Angel, L., Fay, S., Bouazzaoui, B., Baudouin, A., & Isingrini, M. (2010). Protective role of educational level on episodic memory aging: An event-related potential study. *Brain and Cognition, 74,* 312-323. doi: 10.1016/j.bandc.210.08.012.

Association Of Chief Police Officers (2009). *National Investigative Interviewing Strategy.* Wybosten, National Policing Improvement Agency.

Bartlett, J. C., & Memon, A. (2007). *Eyewitness memory in young and older adults* (pp. 309-338). Mahwah, NJ: Lawrence Erlbaum.

Bowler, D. M., Matthews, N. J. & Gardiner, J. M. (1997). Asperger's syndrome and memory: similarity to autism but not amnesia. *Neuropsychologia, 35*, 65-70. doi: 10.1016/S0028-3932(96)00054-1

Brogden, M., & Nijhar, P. (2000). Crime, Abuse and the Elderly. London: Willan.

Ballesteros, S. Nilsson, L., Lemaire, P. (2009). Aging cognition and neuroscience: An introduction. *European Journal of Cognitive Psychology, 21,* 161-175. doi:

10.1080/0954144080259339.

Calabrese, L., & Marucci, F. S. (2006). The influence of expertise level on the visuo-patial ability: Differences between experts and novices in imagery and drawing abilities. C*ognitive Processing, 7,* 118-120. doi: 10.1007/s10339-006-0094-2

Castel, A. D., Farb, N. A. S., & Craik, F. I. M. (2007). Memory for general and specific value information in younger and older adults: Measuring the limits of strategic control. *Memory & Cognition 2007, 35*, 689-700. doi: 10.1037/a0014888.

Ceci, S. J., & Tabor, L. (1981). Flexibility and memory: Are the elderly really flexible? *Experimental Aging Research: An International Journal Devoted to the Scientific Study of the Aging Process, 7,* 147-158. doi:10.1080/03610738108259797.

Clifford, B.R., & Gwyer, P. (1999). The effects of the cognitive interview and other methods of context reinstatement on identification. *Psychology Crime and Law, 5*, 61–80. doi:10.1080/10683169908414994.

Cohen, D. J., & Bennett, S. (1997). Why can't most people draw what they see? *Journal of Experimental Psychology: Human Perception and Performance, 23,*609-621.

Colcombe, S., & Kramer, A. F. (2003). Fitness effects on the cognitive function of older adults: A Meta-Analytic Study. *Psychological Science, 14,* 125-130. doi: 10.1111/1467-9280.t01-1-01430.

Collins, R., Lincoln, R., & Frank, M. G. (2002). The effect of rapport in forensic interviewing. *Psychiatry, psychology and law*, *9*(1), 69-78.

Conway, M. A. (2005). Memory and the self. *Journal of memory and Language, 53,* 594-628. doi: 10.1016.16/j.jml.2005.08.005.

Craik, F. I. M., & Byrd, M. (1982). Aging and cognitive deficits: The role of attentional resources. In F. I. M. Craik & S. E. Trehub (Eds.), *Aging and cognitive processes* (pp. 191-211). New York: Plenum.

Craik, F. I. M, & McDowd, J. M. (1987). Age related differences in recall and recognition. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 13*, 474-479. doi: 10.1037/0278-7393.13.3.474

Craik, F. I. M. (2002). Human memory and aging. In L. Bäckman & C. von Hofsten (Eds.), *Psychology at the turn of the millennium* (pp. 261-280). Hove, U.K.: Psychology Press.

Craik, F. I. M, & Jennings, J. M. (1992). Human Memory. In F. I. M. Craik & T. M. Salthouse (Eds.), *The Handbook of Aging and Cognition*. (pp. 51-110). Hillsdale N J: Earlbaum

Dando, C. J. (2013). Drawing to remember: External support of older adults' eyewitness performance. *Plos ONE 8: e69937*. doi: 10.1371/journal.pone.0069937

Dando, C. J., Taylor, P, J., & Ormerod, T. C. (2013). *Detecting deception: Can computers interview to detect persons of interest following an insider attack?* Paper presented at the American Psychology and Law Conference, 7-9th March, Portland, Oregon, USA.

Dando, C. J., Wilcock, R., Behnkle, C., & Milne, R. (2011). Modifying the cognitive interview: Countenancing forensic application by enhancing practicability. *Psychology, Crime, & Law, 17,* 491-511. doi: 10.1080/1068316090333421

Dando, C. J., Wilcock, R. & Milne, R. (2009a). The Cognitive Interview: The efficacy of

a modified mental reinstatement of context procedure for frontline police investigators. *Applied Cognitive Psychology, 23,* 138-147. doi: 10.1002/acp.1451.

Dando, C. J., Wilcock, R., Milne, R., & Henry, L. (2009b). An adapted Cognitive Interview procedure for frontline police investigators. *Applied Cognitive Psychology, 23,* 698-716. doi: 10.1002/acp.1501.

Dornburg, C. C., & McDaniel, M. A. (2006). The cognitive interview enhances long-term free recall of older adults. *Psychology & Aging, 21,* 196 –200. doi:10.1037/0882-7974.21.1.196.

Driscoll, I., Hamilton, D. A., Petropoulos, H., Yeo, R. A., Brook, W. M., Baumgartner, R. N., & Sutherland, R. J. (2011). The Aging Hippocampus: Cognitive, Biochemical and Structural Findings. *Cerebral Cortex, 13,* 1344-1351. doi 10.1093/cercor/bhg081.

Dudai, Y. (2004) The neurobiology of consolidations, or, how stable is the engram? *Ann.Rev. Psychol., 55*, 51-86.

Eichenbaum, H., Yonelinas, A. P., & Ranganath, C. (2007). The medial temporal lobe and recognition memory. *Annual Review of Neuroscience, 30,* 123-152. doi: 10.1146.annualrev.neuro.30.051606.094328.

Emmett, D., Clifford, B.R., & Gwyer, P. (2003). An investigation of the interaction between cognitive style and context reinstatement on the memory performance of eyewitnesses. *Personality and Individual Differences, 33*, 343–351.

Fisher, R. P., & Geiselman, R. E. (1992). *Memory-enhancing techniques for investigative interviewing: The cognitive interview.* Springfield, IL: Charles C. Thomas.

García-Bajos, E., Migueles, M., & Aizpurua, A. (2012). Bias of script-driven processing on eyewitness memory in young and older adults. *Applied Cognitive Psychology*, *26*, 737-745.

Geiselman, R.E., Fisher, R.P., Firstenberg, I., Hutton, L.A., Sullivan, S.J., Avetissian, I.V., & Prosk, A.L. (1984). Enhancement of eyewitness memory: An empirical evaluation of the Cognitive Interview. *Journal of Police Science and Administration, 12,* 74-80.

Gentle, M., Powell, M. B., & Sharman, S. J. (2014). Mental context reinstatement or drawing: Which better enhances children's recall of witnessed events and protects against suggestive questions?. *Australian Journal of Psychology*, *66*(3), 158-167.

Gabbert, F., Hope, L., & Fisher, R. (2009). Protecting eyewitness evidence: Examining the efficacy of a self-administered interview tool. *Law and Human Behavior, 33*, 298-307. doi: 10.1007/s10979-008-9146-8

Goldsmith, M., Koriat, A., & Pansky, A. (2005). Strategic regulation of grain size in memory reporting over time**.** *Journal of memory and Language, 52,* 505-525. doi: org/10.1016/j.jml.2005.01.010

Görgen, T. (2006). "As if I just didn't exist" - Elder abuse and neglect in nursing homes. In A. Wahidin & M. Cain (Eds.), *Ageing, crime and society* (pp. 71-89). Cullompton: Willan.

Hasher, L., Tonev, S. T., Lustig, C., & Zacks, R. T. (2001). Inhibitory control, environmental support, and self-initiated processing in aging. In M. Naveh-Benjamin, M. Moscovitch, & R. L. Roediger, III. (Eds.), *Perspectives on Human*

Memory and Cognitive Aging: Essays in Honour of Fergus Craik (pp. 286-297). East Sussex, UK: Psychology Press.

Hashtroudi, S., Johnson, M.J., & Chrosniak, L.D. (1990). Aging and qualitative characteristics of memories for perceived and imagined complex events. *Psychology and Aging, 5,* 119.126. doi: 0882-7974/90.

Hedden, T., & Park, D. (2001). Aging and interference in verbal working memory. *Psychology and Aging, 16,* 666-681. doi: 10.1037/0882-7974.16.4.666.

Holliday, R.E., Humphries, J.E., Milne, R., Memon, A., Houlder, L., Lyons, A., & Bull, R. (2011). Reducing misinformation effects in older adults with Cognitive Interview mnemonics. *Psychology and Aging.* doi: 10.1037/a0022031.

Hope, L., Gabbert, F., & Fisher, R. (2011). From laboratory to the street: Capturing witness memory using the Self-Administered Interview. *Legal and Criminological Psychology, 16,* 211-226. doi: 10.1111/j.2044-8333.2011.02015.

Huijbers, W., Pannartz, C. M. A., & Daselaar, S. M. (2010). *Neuropsychologica, 48,* 491-97. doi: 10.1016/j.neuropsychologica.2009.10.2006.

Koriat, A., Levy-Sadot, R., Edry, E., & de Marcas, S. (2003). What do we know about what we cannot remember? Accessing the semantic attributes of words that cannot be recalled. *Journal of Experimental Psychology, Learning, Memory & Cognition, 29,* 1095-1105. doi: 10.1037/0278-7393.29.6.1095.

Kwong. S., Sheree T., Hoffman, H. G., & Wood, T. L. (2001). Perceptions of an old female eyewitness: Is the older eyewitness believable*? Psychology and Aging, 16,* 346-350. doi: 10.1037/0882-7974.16.2.346.

Lister, S., & Wall, D. S. (2006) 'Deconstructing Distraction Burglary: an ageist offence',

In A. Wahidin & M. Cain (Eds.), *Ageing, crime and society* (pp. 71-89). Cullompton: Willan.

Maras, K., Mulcahy, S., Memon, A., Picariello, F., & Bowler, D. (in press). Evaluating the effectiveness of the Self-Administered Interview for witnesses with autistic spectrum disorder. *Applied Cognitive Psychology*.

Mattison, M., Dando, C. J., & Ormerod, T. C. (2014). Sketching to Remember: Episodic Free Recall Task Support for Child Witnesses and Victims with ASD. *Submitted for publication.*

McClelland, J. L., McNaughton, B. L., & O'Reilly, R. C. (1995). Why there are complementary learning systems in the hippocampus and neocortex: Insights from the successes and failures of connectionist models of learning and memory. *Psychological Review, 102,* 419-457. doi: 10.1037/0033-295X.102.3.419.

McMahon, M. (2000). The effect of the enhanced cognitive interview on recall and confidence in elderly adults. Psychiatry, Psychology and Law, 7, 9-32. doi: 10.1080/13218710009524968.

Manthorpe, J., Penhale, B., Pinkney, L., Perkins, N.,& Kingston, P. (2004). A systematic literature review in response to key Themes Identified in the report of the House of Commons Select Committee on elder abuse. London: Department of Health.

March, E. J., Tversky, B., & Hutson. (2005). How eyewitnesses talk about events: implications for memory. *Applied Cognitive Psychology, 19,* 531-544. doi: 10.1002/acp.1095.

Memon, A., & Bruce, V. (1985). Context effects in episodic studies of verbal and facial memory: A review. *Current Psychological Research and Reviews, 1985-1986,*

349-369.

Mello, E. W. & Fisher, R. P. (1996). Enhancing older adult eyewitness memory with the Cognitive Interview. *Applied Cognitive Psychology, 10,* 403-417.

Memon. A., Meissner, C. A., & Fraser, J. (2010). The cognitive interview: A meta-analysis and study space analysis of the past 25 years. *Psychology, Public Policy, & Law,16,* 3450-372. doi: 10.1037/a0020518

Moriarty, J. (2005). *Update for SCIE best practice guide on assessing the mental health needs of older people.* Social care workforce research unit, Kings College, London.

Neisser, U. (1985). The role of theory in the ecological study of memory. *Journal of Experimental Psychology*, *114*, 272-276. doi: 10.1037/0096-3445.114.2.272.

Milne, R., & Bull, R. (1999). *Investigative Interviewing. West Sussex:* Wiley

Ministry of Justice (2011). *Achieving best evidence in criminal proceedings*. London: Home Office.

Naveh-Benjamin, M. (2000). Adult age differences in memory performance: Tests of an associative deficit hypothesis. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 26*, 1170–1187.

Naveh-Benjamin, M., Hussain, Z., Guez, J., & Bar-On, M. (2003). Adult age differences in episodic memory: Further support for an associative-deficit hypothesis. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 29,* 826–837. doi: 10.1037/a0025194.

Naveh-Benjamin, M., Guez, J., & Sulman, S. (2004). Older adults' associative deficit in episodic memory: Assessing the role of decline in attentional resources.

Psychonomic Bulletin & Review 2004, 11, 1067-1073. doi:10.1037/a0022326

Nerenberg, L. (2000). Forgotten victims of financial crime and abuse: Facing the challenge. *Journal of Elder Abuse & Neglect, 12*, 49-73. doi: 10.1300/J084v12n02_0.

NPIA. (2009). *National investigative interviewing strategy.* London: ACPO.

Hedden, T., & Park, D. C. (2001). Aging and interference in verbal working memory. *Psychology and Aging, 16,* 666–681. doi: 10.1037/0882-7974.16.4.666

Roediger, H. L., Neisser, U., & Winograd,. E. (1990). "Remembering Reconsidered: Ecological and Traditional Approaches to the Study of Memory". *The American Journal of Psychology* 103, 403–409. doi:10.2307/1423218

Richardson-Klavehn, A., R A Bjork, R., A. (1988). Measures of Memory. *Annual Review of Psychology, 39,* 475-543. doi 10.1146/annurev.ps.39.020188.002355

Reyna, V. F., & Kiernan, B. (1994). Development of gist versus verbatim memory in sentence recognition: Effects of lexical familiarity, semantic content, encoding instructions, and retention interval. *Developmental Psychology, 30,* 178-191. doi: 10.1037/0012-1649.30.2.178

Roediger, H. L., & Karpicke, J. D. (2006a). Test-enhanced learning taking memory tests improves long-term retention. *Psychological Science, 17,* 249,255. doi: 10.1111/j.1467-9280.2006.01693.x.

Roediger, H. L. & Karpicke, J. D. (2006b). The power of testing memory: Basic research and implications for educational practice. *Perspectives on Psychological Science, 1,* 181-210. doi: 10.1111/j.1745-6916.2006.00012.x.

Rubin, D. C. & Wenzel, A. E. (1996). One hundred years of forgetting: A quantitative

description of retention. *Psychological Review, 103,* 734-760. doi: 10.1037/0033-295X.103.4.734.

Salthouse, T. A. (1996). The processing-speed theory of adult age differences in cognition. *Psychological Review, 103,* 403-428. doi: pa.org/psycinfo/1996-01780-001.

Schacter, D. L., & Addis, (2007). Constructive memory: Ghosts of past and future. *Nature, 445,* 27.

Schacter, D. L., Addis, & Buckter (2008). The Prospective Brain: Remembering the Past to Imagine the Future. *Nature Reviews Neuroscience, 8,* 657-661.

Schacter, D. L., Norman, K. A., & Koutstaal, W. (1998). The cognitive neuroscience of constructive memory. *Annual Review of Psychology, 49,* 289-318. doi: 10.1146/annurev.psych.49.1.289

Squire, L. R., Stark, C. E., & Clarke, R. E. (2004). The medial temporal lobe. *Annual Review of Neuroscience, 27,* 279-306. doi: 10.1146/annurev.neuro.27.070203. .

Tuckey, M. R, & Brewer, N. (2003).The influence of schemas, stimulus ambiguity, and interview schedule on eyewitness memory over time. *Journal of Experimental Psychology: Applied, 9,* 101-118. doi: 10.1037/1076-898X.9.2.101

Tulving, E., & Thomson, D.M. (1973). Encoding specificity and retrieval processes in episodic memory. *Psychological Review, 80,* 352-373.

Tulving, E. (1984). Precis of elements of episodic memory. *The behavioral and Brain Sciences, 7,* 223-268.

Tversky, B., & Marsh, E. (2000). Biased retellings of events yield biased memories. *Cognitive Psychology, 40,* 1-38. doi: 10.1006/cogp.1999.0720.

Vallano, J. P., & Compo, N. S. (2011). A comfortable witness is a good witness: Rapport-building and susceptibility to misinformation in an investigative mock-crime interview. *Applied Cognitive Psychology*, *25*, 960-970.

Wheeler, R. L. & Gabbert, F. (2017). Using Self-Generated Cues to Facilitate Recall: A Narrative Review. *Frontiers in Psychology, section Theoretical and Philosophical Psychology. 8:1830*. doi: 10.3389/fpsyg.2017.01830

Wright, A. M., & Holliday, R. E. (2007). Enhancing the recall of young, young–old and old–old adults with cognitive interviews. *Applied cognitive psychology*, *21*(1), 19-43.

Wright, A. M., & Holliday, R. E. (2007a). Enhancing the recall of young, young-old and old-old adults with the cognitive interview and a modified version of the cognitive interview. *Applied Cognitive Psychology, 21,* 19 – 43. doi:10.1002/acp.1260.

Wright, A. M., & Holliday, R. E. (2007b). Interviewing cognitively impaired older adults: How useful is a cognitive interview? *Memory, 15,* 17–33. doi:10.1080/09658210601047351

Wright, A. M., & Holliday, R. E. (2005). Police perceptions of older eyewitnesses. *Legal & Criminological Psychology, 10*, 211–223. doi: 10.1348/135532505X37001

Yarmey, A.D., & Yarmey, M.J. (1997). Eyewitness recall and duration estimates in field settings. *Journal of Applied Social Psychology, 27*, 330-344. doi: 10.1111/j.1559-1816.1997.tb00635.x