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Protecting and enhancing eyewitness memory:

The impact of an initial recall attempt on performance in an investigative interview

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Abstract

Evidence-gathering begins at the scene of an incident. Available witnesses may be asked to provide an account of what happened, either in response to an open request for information or, in some regions, by completing a Self-Administered Interview (SAI©). In both cases, an investigative interview may be conducted at some later date. This study sought to determine the impact of an initial retrieval attempt on a subsequent interview. After exposure to a mock crime, participants completed an SAI© or a Free Recall or did not engage in an initial retrieval (Control). One week later, participants were interviewed with a Cognitive Interview. SAI© participants reported more correct information and maintained higher accuracy than FR and Control participants. Consistency analyses revealed that the SAI© was effective because it preserved more of the originally recalled items (Time 1) than did an initial FR, and not because it yielded new recollections at Time 2.

Protecting and enhancing eyewitness memory:

The impact of an initial recall attempt on subsequent interview performance

Eliciting detailed and accurate memory reports from eyewitnesses is critical in many different contexts, including the investigation of crime, occupational accidents or security incidents. Investigators face a particular challenge when a serious incident occurs for which there are numerous eyewitnesses. Any of these witnesses may hold potentially vital event information that will provide both critical leads for the investigation or crucial evidence in a subsequent trial or disciplinary proceeding. Although investigators will attempt to prioritise witnesses at the scene, limited resources often restrict opportunities to interview the witnesses for several days or even weeks after the incident (particularly if the witnesses are not directly implicated). During this period, witnesses' memories are vulnerable to decay and the influence of post-event information, both of which may compromise recall completeness and accuracy (Ayers & Reder, 1998; Loftus, Miller & Burns, 1978; McCloskey & Zaragoza, 1985).

Delay systematically decreases the amount of information that can be recalled (Ebbinghaus, 1885; Rubin & Wenzel, 1996; see also Tuckey & Brewer, 2003) and items of information in memory typically become less accessible with increased time (Anderson, 1983; Ayers & Reder, 1998). Important details may be forgotten quickly and the completeness of eyewitness evidence *decreases* as the delay between witnessing an incident and recall *increases* (see Penrod, Loftus & Winkler, 1982; Wixted & Ebbesen, 1991, 1997). Delaying recall also selectively reduces access to detailed information (e.g. Begg & Wickelgren, 1974; Reyna & Kiernan, 1994) because more fine-grained or detailed information decays more rapidly than coarse or gist-level information (Fisher; 1996; Goldsmith, Koriat, & Pansky, 2005; Koriat, Levy-

Sadot, Edry & de Marcas, 2003). Finally, delay increases the opportunity that witnesses will be exposed to other, non-episodic information (e.g., co-witness information, misleading questions) that may distort their memories (Gabbert, Hope, Fisher, & Jamieson, 2012; Zaragoza & Lane, 1994).

How might the deleterious impact of delay on recall quality and quantity be minimized? As retrieving an item from memory increases the likelihood that it will be recalled again subsequently (Bjork, 1988; Shaw, Bjork & Handal, 1995; Wilkinson & Koestler, 1984), one solution is to provide witnesses with a opportunity to recall what they saw prior to formal interviews (see Brock, Fisher & Cutler, 1999; Ebbesen & Rienick, 1998; McCauley & Fisher, 1995). Recent research has capitalized on this phenomenon by developing a reporting tool designed to elicit a detailed account and, thereby, minimise the impact of delay on witness memory (Gabbert, Hope, & Fisher, 2009; see also Hope, Gabbert & Fisher, 2011). This Self-Administered Interview (SAI©) draws on cognitive techniques, such as mental reinstatement of context, to facilitate an early recall of the witnessed incident and enables witnesses to record their own account immediately after the critical event. Completing an early detailed recall using the SAI© elicits more accurate details of an incident from a witness than simply asking for a free recall account (Study 1; Gabbert et al., 2009). Furthermore, completing an SAI© soon after witnessing an event improved recollection on a free recall task conducted one week later (Study 2; Gabbert et al., 2009).

These results are promising. However, the initial proof of concept tests of the SAI© did not address a number of important contextual factors pertaining to the wider investigative interviewing domain. At the scene of an incident, witnesses are usually asked for a brief informal account of what happened and a formal investigative interview may be conducted at

some later date. The information provided in the course of the follow-up interview typically constitutes the witness's formal statement. In assessing the applicability of Gabbert et al. (2009) to the experience of witnesses, two key limitations were identified which motivated the current study. First, in Gabbert et al. (2009), participants either provided an initial account using the SAI© or did not provide any initial account. It is possible that engaging in *any* other form of initial recall attempt (e.g. an informal free recall) might have produced a similar advantage as the SAI© on a subsequent recall task. Second, the memorial benefits observed in Gabbert et al. (2009) may be attributable to the quality of the initial recall. In contrast to a standard free recall request, the SAI© elicits an early recall using a specific set of instructions, questions and probes designed to provide retrieval support and facilitate detailed, accurate accounts. Research suggests that it is not simply the act of engaging in retrieval at an early stage that preserves episodic memory, but the act of engaging in *high quality* initial recall that enhances delayed recall (see Hashtroudi, Johnson, Vnek & Ferguson, 1994; Marsh, Tversky & Hutson, 2005; Suengas & Johnson, 1988). Thus, one aim of the current study was to determine the impact of initial account format, either SAI© or a standard free recall (FR), on performance in a subsequent investigative interview.

Second, determining the impact of an initial recall request on subsequent interview performance constitutes an important applied question. Gabbert et al. (2009) used a FR task at Time 2. This contrasts with the experience of witnesses who are interviewed about what they have seen as, unlike best practice interviews, standard FR instructions offer little retrieval support. Perhaps receiving retrieval support at *any* time during the sequence of interviews (either Time 1 or Time 2) would be sufficient to ensure good recall, in terms of quantity and quality of information, at Time 2. In this case, the SAI© effect would be eliminated if the Time 2

interview provided more retrieval support that a mere free recall instruction. Thus, with the aim of facilitating a more discriminating test of the hypothesis that the SAI© enhances performance on a subsequent interview and determining generalizability of the SAI© effect to wider interview contexts, all witnesses in the current study were given a Cognitive Interview (CI) at Time 2. The CI is an interviewing protocol firmly rooted on empirical principles of social dynamics, memory retrieval and cognition, and communication (Fisher & Geiselman, 1992; for reviews, see Fisher, 2010; Memon, Meissner, & Fraser, 2010) and elicits more information from eyewitnesses than a standard investigative interview, without decreasing accuracy (e.g., Fisher et al., 1987; Fisher, Geiselman & Amador, 1989; Mello & Fisher, 1996). Adopting the CI as the second interview affords all witnesses the opportunity to provide a detailed recall account and should facilitate performance - irrespective of the nature of their initial recall attempt. Furthermore, if an efficient interview technique at Time 2 elicits the same amount of information for those in the Control condition (no initial interview) as the total output for those who also provide an initial account, then there may be no practical advantage of providing an initial account and/or no concern over the quality of the initial recall attempt.

In the context of investigative interviewing where multiple accounts have been elicited from witnesses, concerns are often expressed with respect to the 'consistency' of such accounts. Such concerns are perhaps unsurprising as, particularly in legal circles, there seems to be an underlying assumption that consistency is indicative of accuracy while inconsistency is associated with inaccuracy (Oeberst, 2012). Indeed, exploiting inconsistencies often forms an important part of an active defense strategy to discredit witnesses (e.g. Bailey & Rothblatt, 1985, Ellison, 2001). Thus, a further aim of the study was to examine how information recalled in an initial account relates to the content of a subsequent recall attempt. Examining consistency in the

current study is valuable for several reasons. First, consistent items (i.e. items reported at both Time 1 and Time 2) reflect how many Time 1 items are preserved at Time 2. If, as argued by Gabbert et al. (2009), completing an SAI© preserves memory over a delay, completing an SAI© (as opposed to a Free Recall test) should promote more consistent recall in a delayed test. Information reported in the delayed test that the participant did not recall previously is also of interest (*reminiscence;* Erdelyi & Becker, 1974). Although often viewed with suspicion in forensic contexts, reminiscence is regularly observed in accounts of witness memory (e.g. Bornstein, Liebal, & Scarbury, 1998; Scrivner & Safer, 1988; see Erdelyi, 1996 for a review). Gilbert and Fisher (2006) found that 98% of mock witnesses produced reminiscent details at high accuracy rates (.87) in a delayed recall attempt. Similarly, in a study of children's eyewitness memory, La Rooy, Pipe & Murray, (2005) also found high accuracy rates (.92) for reminiscent details. Given that a delayed interview will likely generate new information beyond that supplied in an initial account, exploring the extent to which this reminiscence varies as a function of the nature of the initial account is interesting for both theoretical and applied reasons.

Broadly, the literature suggests that a detailed initial recall (such as the SAI©) may either promote or suppress reminiscence. With respect to the former, an immediate high quality recall may support and facilitate episodic memory. According to network models of memory, a retrieval attempt should increase the activation levels of these items and the associations between them. This retrieval may well also facilitate the success of additional cues and probes in a subsequent recall attempt through the cuing of additional details across the episodic trace. Furthermore, research suggests that increased recall across multiple tests is due to the effect of the earlier tests (Roediger & Payne, 1982, 1983; Roediger, Payne, Gillespie, & Lean 1982). Thus, individuals who had completed the SAI© may recall additional items of information at the

delayed recall due to their higher quality initial recall and, as a consequence, outperform both Free Recall and control participants.

Alternatively, the SAI© may simply preserve memory for the items initially reported such that the subsequent interview is little more than a re-statement of the initial account with little or no signs of reminiscence. Plausibly, the repeated retrieval of the same information may even reduce access to information not recalled in the initial recall attempt (Anderson, Bjork, & Bjork, 1994; Levy & Anderson, 2002). Shaw, Bjork and Handal (1995) reported retrieval induced forgetting using an eyewitness paradigm where participants were asked to encode details of a scene and then report what they could recall about particular target items on three occasions such that some items became 'practised' (in that they were reported on multiple occasions) whereas others did not. Recall of unpracticed items in the practised category was poorer than recall of unpracticed items in the unpracticed category, suggesting that items in the practiced category had been suppressed. MacLeod (2002) reported similar effects relating to the description of a suspect where subsets of descriptive information had been subject to repeated questioning. Although the current study was not designed to test the phenomenon of retrieval inhibition, items reported in the SAI© and the Free Recall condition may be reported again at Time 2 but at the cost of reducing access to earlier unreported information. Here, control participants might well out-perform both SAI© and Free Recall participants in the delayed interview which would suggest that an early recall attempt, irrespective of quality, inhibits access to unreported information. In light of current investigatory practices, this is an important empirical question.

In sum, the current study focused on the effect of an initial recall attempt on performance in a delayed interview. Firstly, we sought to determine whether varying the nature of the initial

recall task affected subsequent performance in a Cognitive Interview. Extending previous research, we predicted that completing an SAI© would enhance performance on a subsequent interview on the grounds that performance at interview is likely to be facilitated by a detailed earlier recall. We explored two competing hypotheses that might account for the predicted SAI© advantage. Firstly, the SAI© advantage in a delayed test may occur because completing an SAI© at T1 generates a more detailed memory representation containing more items at Time 1 than a Free Recall and as such strengthens the accessibility of items reported at Time 1 for a subsequent interview. If this explanation accounts for the SAI© advantage then SAI© participants should provide more consistent accounts than Free Recall participants across recall tasks. Alternatively, if SAI© participants produce more reminiscent items than Free Recall participants (i.e. less consistent accounts) it would suggest that completing an SAI© works to facilitate access to previously unrecalled items in a subsequent interview.

Method

Design

After witnessing a videotaped staged crime, participants were allocated randomly to one of three conditions (SAI©, Free Recall or Control) in a between-subjects design. All participants watched a stimulus event and participants in the immediate recall conditions either completed an SAI© or provided a free recall account of what they had witnessed. Control participants did not complete an immediate recall task. All participants returned after a delay of one week and were given a CI.

Participants

Sixty members of the general public were recruited via advertisements in the local community (44 female; approximate age-range 20-45 years). All participants had a minimum of secondary level education and participated in exchange for a small honorarium.

Materials

Stimulus event. The stimulus event depicted an attempted car theft (lasting 2 min 40 s). The event involved three main target individuals who appeared to be attempted to break into a number of cars in a parking lot (see Gabbert et al., 2009, for previous use of this stimulus event). The film was shown to participants individually on a high-quality 20-inch screen.

Self-administered interview. The self-administered interview tool used in the current study was the original tool reported by Gabbert et al. (2009). The SAI© takes the form of a written booklet and comprises five sections containing information and instructions designed to facilitate both recall and reporting of memories for a witnessed event. Briefly, Section 1 provided witnesses with background information regarding the SAI©, Section 2 contained information and instructions pertaining to the Context Reinstatement and Report Everything components of the CI. Instructions requested witnesses to provide the most complete and accurate account possible but to avoid guessing. Section 3 focused on gaining detailed person descriptor information by asking witnesses to provide as much detail as possible about the perpetrators' appearance (e.g., hair, complexion, build, distinguishing features, etc.). Section 4 asked witnesses to generate a sketch of the scene to preserve important spatial information. Section 5 contained questions relating to the event that witnesses might not previously have thought to mention, for example, details of the viewing conditions at the scene of the event (e.g., time of day, lighting, whether their view was clear or obstructed, weather conditions, etc.). Witnesses were also asked to describe any other persons who were present and who may have seen what

happened even if they were not directly involved (e.g., other witnesses). Throughout the booklet, participants were instructed to provide the most complete and accurate account possible while avoiding guesswork.

Free recall form. Participants in the FR condition were supplied with blank paper in the form of a response booklet and were also instructed to provide the most complete and accurate account possible without guessing at details they could not remember.

Procedure

Participants were not informed in advance about what the nature of their tasks during the experiment would be. On arrival at the laboratory, all participants completed consent forms and viewed the stimulus event. Immediately after viewing the event, participants were randomly allocated to one of three experimental conditions. To ensure all participants had equivalent interactions with one of two experimenters in Session 1, participants in the SAI© and FR conditions completed the respective response booklets, which contained full written instructions for each task, independently in silence. They did not engage further with the experimenter during this task and no time limit was imposed for completion. Participants in the Control condition did not engage in any retrieval attempt in Session 1. Prior to leaving, all participants made arrangements to attend Session 2, which was conducted after a delay of one week. No information was given to any of the participants regarding what would be required of them in Session 2.

In Session 2, participants were interviewed individually by one of two interviewers (who were blind to Session 1 condition) using the CI technique (Fisher & Geiselman, 1992). Training in the CI involved participation in six hours of lectures and six hours of exercises and feedback, in addition to 10 practice eyewitness interviews. All components of the enhanced cognitive

interview technique were used apart from the Change Order and Change Perspective instructions. Interviews were recorded using a digital recorder and then transcribed in full.

Coding

The SAI© and Free Recall data reported at Time 1 and the information provided in the course of the Time 2 interview were initially coded for accuracy. As in Gabbert et al. (2009), recall was coded using a scoring template which classifies each piece of information in the stimulus video as a Person (P), Action (A), Object (O) or Setting (S) detail. For example, a video sequence showing 'a man pushing a green and red bike across the car park' was coded as: 'man (1 –P; one person detail) pushed (1-A; one action detail) green and red (2-O; two object details) bike (1-O; one object detail) across a car park (1-S; one setting detail). An item was deemed correct if it was present in the video and described correctly, and deemed incorrect if it was present in the video but described incorrectly or if it was not present in the video at all. Subjective responses (such as "he was ugly") were not coded. Finally, each item of information provided by the witnesses was counted only once when tallying total accuracy scores. To assess inter-coder reliability, 10 randomly selected Time 1 recall accounts and Time 2 interviews were coded by two independent scorers. Across category and accuracy of items, inter-coder reliability exceeded 80% ($K = 0.89$, $p < 0.001$).

Consistency coding. A secondary coding was conducted to characterize the nature of the information reported within the interview at Time 2 in relation to the information reported in the initial SAI© or Free Recall account at Time 1. Items of information within the interview were categorized in one of four different ways: consistent (same item reported both at Time 1 and Time 2); contradictory (i.e. a modification; an item reported at Time 2 that directly contradicts an item reported at Time 1); reminiscent (i.e. an addition; item reported at Time 2 that was not

present in the initial Time 1 account) and forgotten[1] (i.e. an omission; item reported at Time 1 that was not reported at Time 2).

Results

All statistical tests were performed with a preset alpha of .05. Where homoscedasticity was an assumption of a statistical test, Levene's (1960) test for equality of variance was assessed and corrected values reported if necessary. Effect sizes are reported as Cohen's (1988) *d* and *f*. Accuracy rates were calculated by dividing the total correct items by total responses to obtain the proportion of accurate responses.

Recall at Time 1

Participants who completed the SAI© provided significantly more correct details than participants in the Free Recall conditions, $t(26) = 6.75$, $p < .001$, $d = 2.65$. Participants in the SAI© condition also reported more incorrect details, $t(38) = 3.82$, $p < .001$, $d = 1.20$. However, there was no significant difference in the overall accuracy rate between accounts provided in either condition, $t(38) = -1.16$, $p = .25$, $d = -.38$.

[Table 1 about here]

Recall at Time 2

There was a significant effect of experimental condition on the total number of accurate details reported during a CI after a week's delay, $F(2, 57) = 6.06$, $p = .004$, $f = .46$. Participants who had

[1] We acknowledge that while the term 'forgotten' implies a memory lapse, there may well be other mechanisms underlying failure to report an item at Time 2 (e.g. a shift in reporting criterion, inhibition etc.). On reflection, we decided to retain the term 'forgotten' for ease of understanding as other terms (e.g. non-reported, missing etc.) do not convey that the item was reported at Time 1 or suggest the item was remembered but not reported.

completed the SAI© a week prior recalled significantly more correct details than participants who simply provided a free recall after witnessing the event and control participants who did not document their recall after witnessing the event. Planned comparisons revealed that the amount of correct details provided by the Free Recall and Control group did not differ from each other ($t(57) = 0.87$, $p = .39$, $d = .23$) but the SAI© group provided significantly more correct details than the Free Recall group ($t(57) = -3.35$, $p < .001$, $d = .89$) and the Control group ($t(57) = -2.49$, $p = .02$, $d = .66$). There was no difference between conditions with respect to the number of incorrect details reported, $F(2, 57) = 0.94$, $p = .39$, $f = .18$. There was a significant difference in accuracy rates between conditions, $F(2, 57) = 3.31$, $p = .04$, $f = .34$. Planned comparisons revealed no difference in accuracy between Free Recall and Control participants ($t(57) = 0.13$, $p = .89$, $d = .03$). However, participants in the SAI© condition demonstrated a higher accuracy rate than Control participants ($t(57) = -2.29$, $p = .03$, $d = .61$) and Free Recall participants ($t(57) = -2.16$, $p = .03$, $d = .57$).

Participants in the SAI© condition reported significantly more correct details than Free Recall and Control participants regarding people they observed in the original event, $F(2,57) = 5.67$, $p < .01$, $f = .44$. Planned comparisons revealed that the number of correct person details provided by the Free Recall and Control group did not differ from each other ($t(57) = 0.69$, $p = .49$, $d = .18$) but the SAI© group provided significantly more correct details than the Free Recall group ($t(57) = -3.20$, $p < .01$, $d = .85$) and the Control group ($t(57) = -2.51$, $p = .02$, $d = .66$).

For the ‘settings’ category of information, there was also a significant difference in the number of correct details provided, $F(2, 57) = 7.66$, $p < .001$, $f = .51$. The SAI© group performed significantly better than both the Free Recall group ($t(57) = -3.76$, $p < .01$, $d = .99$) and the Control group ($t(57) = -2.80$, $p < .01$, $d = .74$) which did not differ significantly from

each other ($t(57) = .96$, $p = .34$, $d = .25$). For the 'actions' category of information, there was a difference between groups, $F(2, 57) = 4.19$, $p = .02$, $f = .37$. SAI© participants reported significantly more accurate details relating to this category than Free Recall participants ($t(57) = -2.76$, $p < .01$, $d = .73$) and Control participants ($t(57) = -2.15$, $p < .04$, $d = .57$). Free Recall and Control groups did not differ from each other, ($t(57) = .60$, $p = .32$, $d = .16$). For the 'objects' category there were no significant differences between conditions in terms of number of accurate details reported $F(2, 57) = 2.71$, $p = .08$, $f = .31$). Accuracy rates for person, action and object details did not differ among conditions (see Table 1).

Comparing Recall at Time 1 & Time 2

To confirm the pattern of results between repeated recall attempts between conditions, analyses of variance with time of test (Time 1 or Time 2) as the within-subjects factor and nature of initial recall (SAI© vs. Free Recall) as the between group factor were conducted on the number of total correct and incorrect responses and accuracy rate data. There was a main effect of time of test such that participants provided significantly more details about the witnessed incident at Time 2 than at Time 1, $F(1, 38) = 82.26$, $p < .001$, $f = 1.47$. There was also a main effect of between group condition, $F(1, 38) = 32.23$, $p < .001$, $f = .92$. There was no interaction between time of test and condition, $F(1, 38) = 0.55$, $p = .47$, $f = .12$. For incorrect details, there was also a main effect of time of test with more errors produced at Time 2, $F(1, 38) = 27.97$, $p < .001$, $f = .86$. There was also a significant interaction between time of test and condition, $F(1, 38) = 6.99$, $p = .01$, $f = .42$.

There was no main effect of time of test ($F(1, 38) = 1.98$, $p = .17$, $f = .23$) or condition ($F(1, 38) = 0.38$, $p = .54$, $f < 1$) on accuracy rates. However, there was a significant interaction between time of test and condition, $F(1, 38) = 7.38$, $p < .01$, $f = .44$, such that while the accuracy

rate for participants in the SAI© condition remained relatively stable between Time 1 and Time 2 (.93 vs .94), the accuracy rate in the Free Recall condition dropped between Time 1 and Time 2 (.95 vs .92).

Consistency Analyses

In Time 2 accounts, participants could supply only three types of information in relation to Time 1 accounts: consistent, reminiscent and contradictory information.

[Table 2 about here]

Consistent items. Any item a participant reported at both Time 1 and Time 2 was identified as a 'consistent' item. Overall, SAI© participants reported significantly more items at Time 2 that were consistent with items reported at Time 1 than participants in the Free Recall condition, $t(24) = 7.33$, $p < .001$, $d = 2.32$ (see Table 2). In order to compare consistent items between SAI© and FR conditions in a more informative manner, we calculated the proportion of consistent information as a function of all possible information reported at Time 2 (i.e. consistent, reminiscent and contradictory). Consistent information represented a significantly higher proportion of reported information at Time 2 for participants in the SAI© condition than in the Free Recall condition, $t(38) = 5.12$, $p < .001$, $d = 1.58$. There was no significant difference between conditions in the accuracy rate for consistent information, $t(38) = 0.70$, $p = .49$, $d = -0.38$.

To determine the extent to which either the SAI© or FR account at Time 1 preserves information over a delay, we calculated the proportion of correct Time 1 items consistently reported at Time 2. A significantly greater proportion of correct Time 1 information was reported consistently at Time 2 by participants in the SAI© condition (SAI© $M = 0.98$, Free

Recall $M = .85$; $t(38) = 2.22$, $p = .03$) suggesting that an initial SAI© preserves information across delay to a greater extent than an initial Free Recall.

Reminiscent Items. Any new item reported at Time 2 that had not been reported at Time 1 was identified as a 'reminiscent' item and again scored as either correct or incorrect. All participants in both the SAI© and FR conditions provided reminiscent details in their Time 2 account), with SAI© participants reporting significantly fewer reminiscent items than Free Recall participants, $t(26) = 2.03$, $p = .05$, $d = .64$. Reminiscent items represented a significantly smaller proportion of the total information reported by participants who had completed an earlier SAI© than the Free Recall group, $t(38) = 5.08$, $p < .001$, $d = 1.69$. There was no difference between conditions in terms of the accuracy rate of reminiscent information, $t(38) = 1.50$, $p = .14$, $d = .54$.

Contradictory Items. Any item reported at Time 2 that directly contradicted an item reported at Time 1 (e.g. the participant reports a red hat at Time 2 but a blue hat at Time 1) was identified as a 'contradictory' item and scored as either correct or incorrect. The number of contradictory items reported was small and there was no difference between experimental conditions, $t(38) = 1.28$, $p = .21$. Overall there was no difference between conditions in the proportion of recall at Time 2 that could be classified as contradictory items, $t(38) = .05$, $p = .96$.

Forgotten Items. Any item that had been reported at Time 1 but was not present in the subsequent Time 2 account was classified as a 'forgotten' item. For the SAI© participants, of the 126 items they recalled at Time 1, 15.25 were forgotten, whereas for the FR participants, of the 68 items they recalled at Time 1, 13.05 items were forgotten. There was no difference between conditions in the number of items forgotten, $t(38) = .72$, $p = .48$. Proportionally, participants in the SAI© condition failed to report an average of 12% of details reported at Time

1 whereas Free Recall participants failed to report an average of 19% of Time 1 details from their Time 2 account. Again, this difference was not significant, $t(22) = 1.64$, $p = .12$, $d = .54$.

With respect to detail accuracy, there was no difference between the groups in terms of the number of correct and incorrect details omitted from Time 2 accounts. Participants in the SAI© condition failed to report an average of 13.70 correct items whereas Free Recall participants failed to report an average of 12.20 correct items, $t(38) = .58$, $p = .60$. Similarly, there was no difference between the groups with respect to incorrect forgotten items (SAI© M = 1.55, Free Recall $M = .85$), $t(38) = 1.69$, $p = .10$.

Functional Value of Repeated Interview

To determine the 'functional' value of repeated memory testing in the current study, we calculated the total amount of correct information elicited across both retrieval attempts (i.e., Time 1 details plus reminiscent details at Time 2). This calculation has applied relevance as it reflects the total amount of accurate information available to an investigator by the end of two 'interviews' with the witness. SAI© participants provided more total correct details (M = 177.50, SD = 39.03) than FR participants (M =137.00, SD = 36.75), $t(38) = 3.38$, $p < .01$, $d = 1.05$. There was not a significant difference between SAI© ($M = 14.70$, SD = 6.00) and FR (M = 12.15, SD = 5.18) participants with respect to the total number of incorrect details reported across both 'interviews', $t(38) = 1.44$, $p = .16$, $d = .45$.

Discussion

This study examined the impact of an initial retrieval attempt on a delayed investigative interview. Specifically, the study manipulated the format of the initial retrieval attempt and compared the delayed interview performance of mock witnesses who provided a detailed initial

recall using a SAI© with those who had provided a standard FR account and those who had produced no initial account at all. In order to determine whether a beneficial effect of SAI© completion documented by Gabbert et al. (2009) persists when witnesses are provided with a high degree of retrieval support in a delayed interview, the nature of the interview was held constant and all mock witnesses were interviewed using the 'gold standard' investigative interview, the CI. Findings suggest that an initial retrieval attempt can have a positive impact on performance in a subsequent interview but, importantly, revealed that the nature of the initial recall is critical. Although participants in both the SAI© and FR conditions attempted retrieval at Time 1, only participants in the SAI© condition capitalized on this initial recall attempt in terms of enhanced performance in a subsequent interview after a one-week delay. Participants in the SAI© condition reported 28% more correct information than FR participants (and 21% more than control participants) in a CI at Time 2 while also maintaining a higher accuracy rate than both the FR and control conditions. By comparison, an initial free recall did not provide participants with any tangible benefit at Time 2.

As expected, the SAI© facilitated a higher quality initial recall with SAI© participants reporting 46% more correct information at Time 1 than FR participants with, critically, no significant difference in overall accuracy rates between SAI and FR accounts. As retrieving an item from memory increases the likelihood of recalling it subsequently, at least part of the SAI© advantage may be derived from generating a detailed memory representation soon after encoding (Bjork, 1988; Pansky & Nemets, 2012; Shaw, Bjork & Handal, 1995). The SAI© participants also reported significantly more total correct information (across Times 1 and 2) than the FR participants. These results are consistent with experimental findings suggesting that later recall is likely to be facilitated by a good quality earlier recall (e.g., Hashtroudi, Johnson, Vnek &

Ferguson, 1994; Marsh, Tversky & Hutson, 2005; Suengas & Johnson, 1988). The current findings also extend previous research on the SAI© effect confirming that the effect also generalizes to performance on a later CI. Thus, even when the delayed test takes the form of an interview that provides witnesses with enhanced retrieval support, generating an initial detailed account using an SAI© leads to producing even more information in that interview than when a less detailed account or no account has been provided initially.

Of course, given that the SAI© is based on the principles of the CI, there was necessarily some degree of overlap between the initial recall task and the subsequent interview for SAI© participants. Enhanced overall results for SAI© participants may suggest that SAI© participants were able to benefit from transfer appropriate processing as a result of this similarity between retrieval tasks (Morris, Bransford, & Franks, 1977). However, there are fundamental differences between a self-directed written retrieval attempt and the social, interpersonal exchange that takes place during the course of a CI (Fisher, 2010). Furthermore, it is worth noting that an SAI© advantage was observed in Gabbert et al. (2009) when the nature of the second interview was *not* compatible with the CI and therefore unlikely to trigger transfer appropriate processing.

Examining the relationship between the information provided at Time 1 with the information provided during the delayed interview is perhaps a more fruitful way to identify mechanisms underpinning the SAI© advantage. SAI© participants provided more consistent accounts than FR participants at Time 2. Specifically, in the delayed interview, participants who had initially completed an SAI© reported a greater proportion of items that they had originally reported at Time 1 than participants who had initially completed a free recall. Thus, not only did SAI© participants generate more items at Time 1 than did FR participants but these items were

more likely to be recalled at Time 2. In the delayed interview, SAI© participants reported, on average 95 per cent of the information they had reported initially whereas Free Recall participants reported 83 per cent of items included in their initial account. Therefore, although the proportional rates of forgetting were not significantly different (albeit in the predicted direction), the percentage of items retained by SAI© participants outweighs that retrained by Free Recall participants. Of course, items present at Time 1 but not at Time 2 in either condition may not necessarily have been forgotten – participants may simply have failed to report these items for other reasons. However, that SAI© participants reported a greater proportion of Time 1 items consistently at Time 2 suggests that a detailed retrieval practice makes those retrieved items more accessible for a subsequent test. Thus, this pattern of findings supports the notion that the SAI© advantage in a delayed test can be attributed to the preservation of items recalled initially. An obvious practical benefit of maintaining high levels of accurate and consistent between multiple accounts is that such consistency is valued in legal settings (Fisher, Brewer & Mitchell, 2009).

Why did a free recall attempt at Time 1 not provide a similar advantage? Participants in the FR condition generated significantly more reminiscent items than SAI© participants suggesting that they *were* able to access previously unreported information when interviewed. However, they did not generate a sufficient number of new items to overcome the deficit at Time 1. As such, FR participants did not demonstrate any benefit of having engaged in an initial recall attempt in comparison with participants who completed an SAI©. Note that the performance by participants in the SAI© condition differed from that of the FR participants in (at least) two important ways: (i) SAI© participants provided more correct items at Time 1 and Time 2 interviews and ii) SAI© participants reported a greater proportion of consistent items at Time 2,

suggesting that their Time 1 information is better preserved over a delay. Clearly, then, the nature or quality of the initial retrieval attempt is critical for subsequent recall performance.

One possible explanation for this pattern of results is that a more extensive retrieval attempt (such as that promoted by the SAI©) increases the activation levels of these items and associations between items. Associative network models of memory (e.g. Anderson, 1983) represent memory as a propositional network made up of nodes which represent concepts and share associative links. The quality of coding determines the initial strength of the associative link whereas retrieval strengthens these links across episodic memory. During retrieval, searching occurs according to link strength. Once strength declines below a certain threshold level, the information contained within the node can no longer be accessed. We speculate that the increased activation of episodic memory, facilitated by a high quality retrieval attempt in the form of the SAI©, supports the subsequent retrieval of items which might otherwise have become inaccessible. Thus, the main advantage of the SAI© appears to derive from its ability of elicit and preserve more Time 1 details shortly after a witnessed incident when memory traces are most likely to be accurate and plentiful.

Consistent with Oeberst (2012), all participants who were interviewed twice provided some reminiscent details at Time 2 (see also Gilbert & Fisher, 2006). However, SAI© participants produced proportionally fewer reminiscent items than FR participants. By reporting 46% more correct items than FR participants at Time 1, it may be that SAI© participants simply had fewer opportunities for the emergence of reminiscent items at Time 2 and effectively the rate of reminiscence was curbed by a more complete initial recall. Although the presence of a relatively small number of reminiscent items suggests SAI© participants were recalling what they had seen rather than what they had written previously, it seems that the SAI© effect can be

largely accounted for in terms of generating more items at Time 1 and preserving those items over delay rather than generating reminiscent items in a subsequent interview.

The reminiscence data are also interesting from an applied perspective where witness inconsistency is a thorny issue for the legal system. For judges, prosecutors and other legal experts, witness inconsistency appears to serve as an index of, or diagnostic cue to, witness inaccuracy on the grounds that inconsistency suggests a poorer recall of events (Fisher, Brewer, & Mitchell, 2009; Fisher & Cutler, 1995) or even a cue to deception (Granhag & Stromwall, 2001). Inconsistencies in testimony are frequently used to discredit witnesses on the stand during cross-examination (Glissan, 1991; Stuesser, 1993) and both mock jurors and police interviewers also tend to view inconsistencies negatively with respect to witness credibility (Potter & Brewer, 1999). Reminiscence, in particular, tends to be viewed with some suspicion in legal circles, as an increase in recall runs counter to the intuitive principle that memory decays over time. However, the psychological literature suggests that reminiscence is a common feature of repeated recall accounts (see Bornstein, Liebal, & Scarbury, 1998; Gilbert & Fisher, 2006; Scrivner & Safer, 1988). The findings of the current study indicate that reminiscent details can be highly accurate (reminiscent items for the SAI© condition had an accuracy rate of 91%) and commonplace (all participants in repeated test conditions made at least one reminiscent statement). However, when the inconsistency was a contradiction, the accuracy rate for the contradictory information was lower than for other forms of inconsistencies, particularly in the Free Recall condition. Again, this is compatible with previous literature (Brock, Fisher, & Cutler, 1999; Gilbert & Fisher, 2006). Such findings send a clear message to decision-makers within the legal system: Witness accounts that incorporate reminiscent items should not

immediately be discredited on the grounds of inconsistency and jurors should be better educated with respect to different types of inconsistency.

One feature of the current study that makes it difficult to draw strong parallels with the repeated testing literature is the change in recall tasks from Test 1 to Test 2. Typically, in the repeated testing literature, the same test is used on multiple occasions (but not always; e.g. see McDaniel & Fisher, 1991). However, such changes reflect the likely experience of eyewitnesses. In fact, witnesses (and victims) in major crimes are often required to provide multiple accounts across different interview formats, including informal and formal interviews with several different interviewers. For similar reasons, a fully factorial design would have added little to understanding of witness performance as it is somewhat unlikely that a formal interview would ever precede a self-initiated account. However, it would be interesting to track eyewitness memory performance across multiple retrieval attempts where the nature of the recall task is held constant or varied. Designs of this nature would not only allow a closer examination of a number of interesting predictions relating to memory performance in more naturalistic repeated testing but also more closely replicate real world interviewing contexts. It would also be useful to manipulate the timing of the initial recall to determine what the optimum 'window' for eliciting an initial account from witnesses is in order to produce the effects shown here. Most SAI© studies to date have elicited recall within an hour or so of witnessing some target event. Future studies should test extended delays which may be realistic for certain types of crimes or incidents (where the scene is not suitable for SAI© completion, where witnesses are particularly upset or unable to stay at the scene etc.).

Notably, the accuracy rates in the current study were comparable and high across conditions (.92 - .95). We suspect that the high accuracy rates reported reflect that (a) witnesses

were discouraged from guessing, (b) no intentionally leading or suggestive questions were asked, and (c) information in both the SAI© and FR conditions was gathered via open-ended questions, which are known to elicit highly accurate responses. While memory errors may be a feature of eyewitness accounts, irrespective of how such accounts are collected, they are less likely to occur when investigators adhere to open-ended interview formats (Evans & Fisher 2011; Gilbert & Fisher, 2006; see also Fisher, Milne & Bull, 2011) . We recommend that all information-gathering procedures follow these principles when feasible.

To this end, evaluations of the use of the SAI© in the field by European police forces indicate that the SAI© works to identify additional key witness accounts and, in the opinion of investigators, elicits significantly more detailed accounts than would ordinarily have been obtained using other means at the scene. Of course, the SAI© is not without limitations – not least that unmotivated or non-compliant witnesses are unlikely to complete an SAI© while illiterate or witnesses lacking confidence in their literacy skills may struggle to provide a detailed written account (see Hope, Gabbert, & Fisher, 2011, for further discussion of practical limitations). However, the current results demonstrate that the SAI© has the capacity to be an effective and efficient investigative tool that not only protects witness memory, elicits detailed accounts with high accuracy rates and permits the timely prioritisation of witnesses, but also facilitates performance on a subsequent interview.

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Table 1. Mean number of correct and incorrect items (including accuracy rates) reported at Time 1 and Time 2 by condition.

Details		SAI©		Free Recall		Control	
		T1	T2	T1	T2	T1	T2
		M	M	M	M	M	M
Person	Accurate	74.15	92.65	39.95	69.95	-	73.25
	Inaccurate	5.70	7.35	2.95	7.10	-	6.70
	Acc. Rate	0.93	0.93	0.93	0.91	-	0.92
Action	Accurate	20.90	34.75	14.20	19.35	-	28.30
	Inaccurate	1.35	1.60	0.85	1.85	-	2.65
	Acc. Rate	0.94	0.96	0.94	0.91	-	0.91
Object	Accurate	17.00	24.85	10.65	19.35	-	21.50
	Inaccurate	1.15	1.35	0.55	0.85	-	1.55
	Acc. Rate	0.94	0.95	0.95	0.96	-	0.93
Setting	Accurate	14.40	24.70	3.05	17.50	-	17.10
	Inaccurate	1.35	1.55	0.00	1.45	-	1.65
	Acc. Rate	0.91	0.94	1.00	.91	-	0.90
Overall	Accurate	126.45	176.95	67.85	126.15	-	140.15
	Inaccurate	9.55	11.85	4.35	11.25	-	12.55
	Acc. Rate	0.93	0.94	0.95	0.92	-	0.92

Table 2. Mean number of items, accuracy rates and proportion of Time 2 recall comprising consistent, reminiscent and contradictory categories.

		SAI©	Free Recall
Consistent Items	No. Items	129.60	59.50
	Prop. of T2 Recall	0.68	0.47
	Acc. Rate	0.95	0.96
Reminiscent Items	No. Items	56.20	76.95
	Prop. of T2 Recall	0.30	0.52
	Acc. Rate	0.91	0.88
Contradictory Items	No. Items	3.0	2.1
	Prop. of T2 Recall	0.02	0.02
	Acc. Rate	0.80	0.46