The Effect of Refreshed Testimony on Eyewitness Memory and Cross-Examination Accuracy

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Declaration of Authorship

I, Francesca Leanne Ainsworth, hereby declare that this work was carried out in accordance with the Regulations of the University of London. I declare that this submission is my own work, and to the best of my knowledge does not represent the work of others, published or unpublished, except where duly acknowledged in the text. No part of this thesis has been submitted for a higher degree at another university or institution.

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Abstract

This thesis presents a series of studies investigating refreshed testimony, the process of refreshing a witness' memory with a copy of their original evidence. Study 1 explored the real world application of refreshed testimony by police officers in England. Data gathered through an online questionnaire revealed that refreshed testimony practices are inconsistent both within and between police forces. Examples of poor practice highlight the need for reform and the introduction of guidance is recommended. Three experimental studies investigated the potential for refreshed testimony to improve recall accuracy and cross-examination performance in both young and adult witnesses. Studies 2 (11-12 year old sample) and 3 (undergraduate sample) used video-recorded interviews to refresh memory and compare performance to non-refreshed controls. Counter to previous research, no effect of refreshed testimony was found in either study. Study 4 considered whether the medium of evidence used for refreshing (video interview, interview transcript, written statement) determines the effectiveness of refreshed testimony. No effect of refreshed testimony was found on memory in this study, regardless of the medium of evidence used. Across all three experimental studies, non-refreshed controls performed equally to refreshed participants in free recall and cross-examination. Although memory recall and cross-examination were not improved, no negative effects on memory were observed. Studies 2, 3 and 4 also examined the effect of question type on response accuracy in cross-examination interviews. All three reported that open questions produced more accurate responses than both closed and forced-choice questions, as predicted by best practice interviewing guidelines. Three main conclusions are drawn in this thesis. One, refreshed testimony practices in England are not standardised. Two, refreshed testimony has no measurable effect on recall accuracy and cross-examination performance under optimal recall conditions. Three, best practice interview questions produce the most accurate responses in a cross-examination context.

<div align="center">**Dissemination of Research**</div>

Papers

Ainsworth, F.L. & Memon, A. (2013) Refreshing Testimony in England and Wales – The Search for Best Practice. *Investigative Interviewing: Research and Practice*. Vol. 5(1), 1-11

Ainsworth, F. & Memon, A. (March 2013) Remember, Remember?, *The Journal Online,* First published 14-03-2013

Conference Papers

Ainsworth, F. (2011) Refreshed Testimony: What is it and should we be doing it? Short paper presented at the 4th Annual Conference of the International Investigative Interviewing Group (iIIRG). Dundee, Scotland. 1st June 2011

Ainsworth, F. & Memon, A. (2012) When, Where and How Often? A Summary of Refreshed Testimony Police Practices in England and Wales. Short paper presented at the 5th Annual Conference of the International Investigative Interviewing Group (iIIRG). Toronto, Canada. 24th May 2012

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Chapter 1: The Criminal Justice System, Eyewitness Memory and Refreshed Testimony

Chapter Overview:

This chapter introduces the reader to the value of eyewitness evidence within the criminal justice system. It highlights the challenges facing eyewitnesses in court, describing the stages of the criminal justice system in England and Wales. Delay and its negative effect on memory, for both an initial and repeated recall, is introduced and discussed. A theory of forgetting is presented, drawing on Fuzzy-FuTrace Theory and supporting evidence as the underlying theoretical framework of this thesis. The practice of refreshed testimony is introduced, and consideration is given to how this practice may provide a mechanism through which the recall of eyewitness evidence in court may be enhanced. The recall of both child and adult witnesses is discussed, developmental differences are highlighted and any implications of these for this thesis and the wider applied context are considered.

1.1. In Search of Justice – The Value of Eyewitness Evidence

In interpersonal crimes, such as sexual assault or domestic violence, eyewitness testimony may be the only evidence around which to build a case (Wells & Olson, 2003). In the absence of finding a video-recording of the crime, an eyewitness account can be one of the most valuable forms of evidence to direct a police investigation. Credible eyewitness evidence is powerful and persuasive in court, increasing the likelihood of a guilty verdict (Loftus, 1974). A study of mock jurors found that a minority (18%) would deliver a guilty verdict in cases based solely on circumstantial/physical evidence. However, if eyewitness evidence was included in a case, this percentage rose to the majority (72%). These findings have since been replicated (Hatvany & Strack, 1980; Sigler & Couch, 2002; Weinberg & Baron, 1982). Even the evidence of a discredited witness can be compelling compared to cases with no witness testimony (Whitley, 1987).

Given its influence, the cost of giving false eyewitness evidence, whether innocently or maliciously, is high for both the accused and for society. The imprisonment of an innocent individual allows the culprit to remain free in the community with the opportunity to commit further crimes. To date, the US

government has exonerated 321 individuals, post-conviction, after the emergence of exculpatory DNA evidence (The Innocence Project, 2014). In the majority of cases, individuals were originally convicted on the basis of eyewitness and circumstantial evidence alone. This figure only represents the known false convictions within the United States. Across criminal justice systems worldwide this error rate is likely to be considerably higher. It is clear from the number of successful exonerations in the US alone that eyewitness evidence, although valuable, is not without error.

A number of factors affect the accuracy of eyewitness memory both before and during a trial. External factors at the time of encoding, such as the length of time that the suspect was visible, the time of day and how far the witness was from the scene of the crime affect a witness' ability to remember the details of an event (Wells & Olson, 2003). Once a memory is formed, further factors can influence recall ability and accuracy such as delay, post-event information, the suggestibility of a witness, interviewing style and question types. These factors will be discussed within this and the following chapter of this thesis to identify for the reader some of the challenges to accurate eyewitness recall. Eyewitness memory is not accessed and presented in a vacuum but is part of a wider judicial process that can, at times, make maintaining accurate eyewitness testimony a challenge. As such, the reader will now be introduced to the process of the judicial system in the United Kingdom, specifically England and Wales.

Reporting a crime to the police marks the beginning of the criminal justice process. Following this, eyewitness and physical evidence is gathered, a suspect is identified and a case against the individual(s) is presented in court. This process can take several weeks, months or even over a year; the effect these delays have on memory will be discussed later in this chapter. In England and Wales, the Crown Court deals with the most serious of crimes and operates under an adversarial system. In such a system, the court acts as an independent and objective referee during the presentation of evidence from both the prosecution and the defence. A person is considered innocent until proven guilty and culpability must be proved beyond reasonable doubt.

When a case is brought to court, eyewitness evidence is presented as part of the evidence-in-chief. As per the European Convention on Human Rights, a defendant has the minimum right:

"to examine or have examined witnesses against him and to obtain the attendance and examination of witnesses on his behalf under the same conditions as witnesses against him" (Article 6 of the European Convention on Human Rights).

Therefore, all evidence is examined by the opposition once it is presented and can be re-examined. The cross-examination of evidence is an integral component of the adversarial system. As such, eyewitnesses must be available for questioning during criminal trials in England and Wales. This aspect of the criminal justice system is cognitively and emotionally demanding for witnesses of all ages (Plotnikoff & Woolfson, 2012). The nature of cross-examination and its impact on eyewitness accuracy is discussed in Chapter 2.

Finally, the justice process concludes with a verdict of innocence or guilt. An adversarial system uses an impartial individual (judge) and/or a group of individuals (12 person jury) to consider the facts of a case; the court is not involved in the investigation of the case itself. Once all the evidence has been presented and examined the jury deliberates. A jury is encouraged to reach a unanimous decision, however, in some cases a majority decision may be accepted (ten jurors to two being the minimum consensus required in England and Wales for a conviction).

Elsewhere in the United Kingdom, Scotland and Northern Ireland have their own legal systems (Scots Law and Northern Ireland Law). That being said, both countries also operate an adversarial system, within each country's legal framework. Although there are minor differences (e.g. a jury in Scotland is of made of 15 individuals rather than the 12 in England and Wales) the procedures are comparable in each of the four countries and therefore any conclusions drawn from this thesis are relevant across the United Kingdom.

The multi-staged nature of the justice system creates a potentially lengthy process. In an ideal world, the progression of a witness through each stage of the criminal justice system would be seamless. However, the reality is that any number of practical factors can delay this process: congestion in the court timetable, legal

challenges and the length of the investigation itself, to name but a few. As a result, the journey for a witness from reporting a crime to giving evidence in court is a lengthy one and this can have a negative impact on the witness' memory and ability to give their best evidence at trial.

1.2.   Delay in the Justice System

Within the justice system in England and Wales, two forms of delay must be considered. Firstly, there is the initial delay between witnessing a crime and the first recall attempt. Secondly, there is the delay between the first recall and any subsequent recall attempts i.e. the first interview(s) and giving evidence in court. This thesis is concerned primarily with the effects of the second form of delay, between multiple recall attempts, on memory recall and accuracy in eyewitnesses. That being said, the first type of delay is also relevant as the timing of the first police interview can influence the quality and quantity of subsequent recall attempts, as will be discussed.

It is well established in the memory literature that long delays between encoding and first recall (the retention interval) have a negative effect on memory quality: the longer the retention interval, the less accurate, complete and detailed a recall attempt will be (Hope, Gabbert, Fisher, & Jamieson, 2014). The deleterious effect of long retention intervals on memory before the first recall attempt has been observed in a variety of contexts including the recall of word lists (Ebbinghaus, 1913), suspect identification accuracy (Clifford, Havard, Memon, & Gabbert, 2012; Dysart & Lindsay, 2007; Wells, Memon, & Penrod, 2006), and in the recall of both forensically relevant and everyday autobiographical events (Flin, Boon, Knox, & Bull, 1992; Read & Connolly, 2007).

One way of protecting memory is to minimise retention intervals, interviewing witnesses as close in time to the event as possible. An early recall attempt can increase the strength of a memory and make it more likely to be recalled again, thus protecting details from being lost over long periods of delay (Bjork, 1988; Hope, Gabbert, & Fisher, 2011; Shaw, Bjork, & Handal, 1995). However, a number of factors may delay the scheduling of the initial police interview. For example, if there are a large number of witnesses, a victim/witness requires medical attention, or if someone is coming forward to report historical crimes, long delays cannot be

avoided. The benefits of an early recall attempt are demonstrated by a newly developed interview protocol which can be used when an investigative interview cannot be arranged immediately (Gabbert, Hope, & Fisher, 2009; Hope et al., 2011; Hope et al., 2014). This protocol, the Self-Administered Interview[©] (SAI[©]), is a written document that guides witnesses through a range of techniques and instructions, based on the principles of the Cognitive Interview (Fisher & Geiselman, 1992; Memon, Meissner, & Fraser, 2010). Witnesses are encouraged to make a detailed record of their memory for the event in their own time. Individuals who complete the SAI[©] provide a greater volume of accurate information in a delayed interview compared to those who have not made an earlier recall attempt (Gabbert et al., 2009; Gabbert, Hope, Fisher, & Jamieson, 2008; Hope et al., 2011; Hope et al., 2014). This clearly demonstrates the benefits of preserving memory as soon as possible after an event.

Although early retrieval can preserve and strengthen memories, it does not fully protect against delay. Memory is still subject to the second form of delay: forgetting between recall attempts. Lengthy delays and multiple recall attempts are problematic in the criminal justice system. Having given evidence to the police during the investigation, the witness must also give evidence in court. This evidence will be scrutinised for errors and inconsistences and will be compared to the testimony that was originally given to the police. It is therefore in the interest of the witness, and the justice process as a whole, that eyewitness testimony is not only accurate, but consistently accurate. In court, not only is a witness expected to give the same response to a question as they did in their police interview, they are expected to give consistent responses to repeated questions in the evidence-in-chief and cross-examination interviews. Consistency continues to be considered a good indication of accuracy and a reliable means of judging the credibility of a witness' testimony in court (N. Brewer & Burke, 2002; Fisher, Brewer, & Mitchell, 2009; Oeberst, 2012; Orbach, Lamb, La Rooy, & Pipe, 2012; Pozzulo & Dempsey, 2009). Unfortunately, the reconstructive nature of memory makes consistent eyewitness evidence challenging to deliver in court.

When re-accessing a memory after a delay, it is not uncommon for this recall to differ in volume and content from the first, and any subsequent, recall attempts. Details reported in an earlier interview can be omitted (Madigan & O'Hara, 1992;

Payne, 1987; Roediger & Payne, 1982), and fewer details overall may be recalled in a subsequent interview compared to the first after long delays such as six months or one year (La Rooy, Pipe, & Murray, 2007; Pipe, Sutherland, Webster, Jones, & La Rooy, 2004). In England and Wales, the interval between the police interview and giving evidence in court can be even longer (Ministry of Justice 2012a, 2012b; Plotnikoff & Woolfson, 2004). As such, a degree of forgetting can be expected between an eyewitness giving their first statement/interview during the investigation and their memory for the event when they come to give evidence in court several months later. This is a concern often expressed by witnesses themselves who are worried that they may be unable to recall their evidence over such long delays (Plotnikoff & Woolfson, 2004). To identify why inconsistencies can be observed in eyewitness testimony, Fuzzy-Trace Theory and relevant empirical research, will now be discussed to consider how memories are formed, stored and subsequently accessed. This theory underpins the proposed memory intervention which is to be explored in this thesis as a potential means of improving the quality and consistency of eyewitness recall in court.

1.3.   Fuzzy-Trace Theory

Through cognitive processing, human memory enables the capture, storage and recall of information for future access. As our cognitive resources are not exhaustive (Marois & Ivanoff, 2005), it is reasonable to assume that memory processing has developed to be efficient, using as few resources as necessary. Fuzzy-Trace Theory outlines a cognitive framework which describes such a system (Brainerd, Kingma, & Howe, 1985; Brainerd & Reyna, 1990). It is used here to identify why the natural processing of human memory creates numerous challenges for eyewitness memory in particular.

There are a number of assumptions about memory that are accepted, in the literature and in this thesis, which underpin a Fuzzy-Trace Theory of memory. These include the assumption that human memory is reconstructive and does not record the world in its exactness, like a video recording (Roediger & DeStato, (in press); Schacter, 2003; Schacter, Norman, & Koutstaal, 1998). As such, attention towards a stimulus is necessary for encoding to take place, determining what memories will be formed (Awh, Vogel, & Oh, 2006). Similarly, it is assumed that the strength of

memory representations may vary, and that strength can increase or decrease over time (Baker-Ward & Ornstein, 2002). Memory strength also relies on how often the memory is retrieved or rehearsed and the length of delay between encoding, recall and repeated retrieval. These assumptions will be considered more broadly within the framework of Fuzzy-Trace Theory and are used to introduce theoretical support for the focus of this thesis: refreshed testimony.

It is the existence, strength and type of a memory trace that determines our ability to recall the information, detail or episode held within it. It is accepted in the literature that a memory trace (the cognitive representation of information or an event) can take one of two forms: a gist (fuzzy) memory trace or a verbatim trace. Gist memory provides enough information to give a general account of the encoded information/event without pinpointing specific details. Recalling that you went shopping in the morning and got the bus to the supermarket, for example, provides the gist of the experience from fuzzy trace processing. Verbatim memory, on the other hand, provides very specific details. In our example, verbatim memory would provide details such as the colour of the bus, the exact time it arrived, where you sat on the bus, the name of the supermarket and so on (Brainerd et al., 1985; Brainerd & Reyna, 1990, 2004; Reyna & Brainerd, 1991). To process every sensory input in its verbatim form would be incredibly resource intensive, considering the wealth of sensory information available in the environment at any one time. Fuzzy-Trace Theory, as the name implies, argues that human memory favours gist processing as it is less resource intensive than verbatim memory. It argues that fuzzy traces are easier to encode, can be preserved over longer delays and are more accessible for retrieval, requiring fewer resources, resulting in a more efficient processing system (Brainerd et al., 1985; Brainerd, Reyna, Howe, Kingma, & Guttentag, 1990). Evidence to support these claims is outlined here.

Firstly, Fuzzy-Trace Theory argues that gist representations are easier to form than verbatim and are therefore more suited to form the basis of human memory and information processing (Brainerd & Reyna, 1990). Evidence to support this claim can be seen in a bias towards gist processing observed in classic studies based on the Deese/Roediger-McDermott (DRM) paradigm (Bransford & Franks, 1971; Deese, 1959; Roediger & McDermott, 1995; Thorndyke, 1976). Participants presented with lists of semantically related words often recall words not included in the original list.

For example, 'dream' is typically recalled after encoding a word list which includes 'bed, sleep, pillow, duvet, night', demonstrating that the gist of the words (collectively referring to elements associated with being asleep) prompts the retrieval of the semantically relevant word 'dream', resulting in false recall (Deese, 1959; Roediger & McDermott, 1995). This phenomenon occurs even when participants are forewarned of the likelihood of making a false recall and are given the above example to illustrate the anticipated effect on their recall ability (Peters et al., 2008).

Similar evidence of a gist bias has also been observed in the recall of more complex stimuli. When instructed to encode and recall short sentences that together form the gist of a story, participants often recall new sentences containing multiple elements of the implied narrative (Bransford & Franks, 1971). The sentences are not presented for encoding as a narrative, the instructions are to remember the exact phrasing, suggesting that the bias towards gist processing can overrule direct instructions to memorise verbatim information. This bias can also be seen in a non-verbal context. Participant descriptions of studied images typically include key objects that might be associated with a scene but have been removed specifically from the image (e.g. a beach scene with an absent umbrella) (Miller & Gazzaniga, 1998).

The main evidence supporting a bias towards gist processing in Fuzzy-Trace Theory uses simple stimuli such as word lists and static images. More recent evidence, however, is based on recall of autobiographical memory, making this theory more relevant in the context of eyewitness testimony. It is important to remember that Fuzzy-Trace Theory does not argue that human memory functions without verbatim details, just that they are not the de facto representation on which memory operates. A police investigation would be unable to progress if a witness was only able to report that a person robbed a shop but was unable to recall further details such as the suspect's gender, age, height, weight, hair colour, and clothing; whether the individual was armed; when and where the robbery took place; what was taken; if the suspect spoke to anyone or said anything; and so on. As these details are often reported during interviews, or described to sketch artists, it is clear that verbatim details *can* be stored. However, a link can be made here to schema processing.

Schemas are representations of the gist of familiar actions, or autobiographical events, which speed up processing time in novel situations. Schema representations influence memory retrieval and can result in the false recall of details about an event which were not witnessed by the individual, but fit with the schema for that experience. For example, witnesses may report the presence of a gun during a bank robbery, where none was present, as this item is often strongly associated with this type of crime due to the portrayal of such events in the TV/Film industry (Greenberg, Westcott, & Bailey, 1998; Kleider, Pezdek, Goldinger, & Kirk, 2008; Tuckey & Brewer, 2003b). False reporting, as the studies above have observed, arguably occurs when witnesses are freely recalling an event. As predicted by the bias towards gist processing proposed by Fuzzy-Trace Theory, free recall occurs mainly at the gist level. Related associations to gist memories may also be accessed, schema memories for example, resulting in false recall or a more general account of an event. To retrieve verbatim memory, more specific retrieval strategies must be used to overcome this gist processing bias, hence the need for witness to be interviewed in more complex cases in addition to being asked to provide a written statement.

A second proposition used to support a Fuzzy-Trace Theory of memory is that it accounts for multiple types of forgetting. It also demonstrates how memory recall of the same event changes over time and between repeated recall attempts. Fuzzy-Trace Theory proposes two forms of forgetting: retrieval-based and storage-based. The encoding of a memory trace is, in itself, insufficient to ensure that it can be recalled. A memory trace must also be accessible. Forgetting occurs when a memory trace is no longer available or it is temporarily or permanently inaccessible as a result of memory trace decay. Delay between encoding and retrieval, and between multiple retrieval attempts, can result in the decay of a memory trace or retrieval cue, resulting in either form of forgetting (Brainerd et al., 1985; Brainerd et al., 1990; Ebbinghaus, 1913; Madigan & O'Hara, 1992; Payne, 1987; Roediger & Payne, 1982).

Retrieval-based forgetting occurs when a memory trace is intact but its associated retrieval cue(s) have been lost (Brainerd et al., 1985). A retrieval cue is a stimulus which has an association to the encoded memory trace. This cue is used as a means to access the memory trace and trigger the recall of information stored in

long-term memory. Environmental context is an example of a retrieval cue; recall is greater when contextual information between encoding and recall is the same, either recreated physically or through mental context reinstatement, for both word lists and autobiographical memory (Dando, Wilcock, & Milne, 2009; Godden & Baddeley, 1975; Krafka & Penrod, 1985; Memon & Bull, 1991; Priestley, Roberts, & Pipe, 1999; Smith, 1994). The vague nature of a gist memory trace allows it to be associated with multiple, and varied, retrieval cues. If one or more retrieval cue is lost for gist memory, an alternative is often available to enable successful recall of the encoded information. Verbatim memory traces are precise by definition and are therefore limited to the specific retrieval cues associated with them. If these retrieval cues are lost, a verbatim trace cannot be accessed by alternative associations, resulting in forgetting. Storage-based forgetting, on the other hand, occurs if a memory trace itself is weakened or no longer exists. Weaker memory traces are more difficult to recall, even if the original retrieval cue is intact, and will be impossible to recall if the trace is lost completely (Brainerd et al., 1985).

Delay is one factor known to reduce the strength and availability of memory traces and retrieval cues, thereby increasing the likelihood of forgetting before an initial recall (Clifford et al., 2012; Ebbinghaus, 1913; Flin et al., 1992; Read & Connolly, 2007), and between recall attempts (Madigan & O'Hara, 1992; Payne, 1987; Roediger & Payne, 1982). Although delay affects both gist and verbatim traces, it is proposed that verbatim memory decays more quickly, regardless of whether it has previously been strengthened through prior recall (Brainerd et al., 1990). This makes verbatim memory less likely than gist to be the basis of human memory as information would be too difficult to store over long periods and would be less likely to be available when required to complete day-to-day tasks.

The final argument in support of a Fuzzy-Trace Theory of memory to be discussed here is the malleability of fuzzy traces in comparison to verbatim (Brainerd & Reyna, 1990). In order to allow humans to react to changes in their surroundings, memory must be adaptable. The malleability of a memory trace refers to the extent to which an existing trace can be updated based on changes in the environment, new experiences and knowledge. It could be costly to make decisions without having access to the most up to date knowledge about a person, situation, or series of events (Loftus, 2005). For example, remembering that you have developed a new food

allergy would allow you to avoid certain foods in the future. Fuzzy-Trace Theory argues that a gist memory trace is more adaptable. The original trace can easily form new and updated associations to reflect new information. Conversely, the theory argues that a verbatim trace is a rigid structure. New information must either form a co-existing and competing memory trace, or the original memory trace must be overridden. The need to adapt to our ever changing environment supports the notion that human memory operates predominantly on the more malleable, fuzzy traces (Otgaar, Howe, Smeets, & Garner, 2014).

The malleability of memory is not always adaptive, however. During the delay between witnessing an event and giving evidence in court, witnesses may be exposed to post-event information through discussions with the police, other witnesses and media coverage of the event. These details may contradict the witness' own memory or provide new information not previously known to them, creating a false memory. There is evidence that these post-event details become incorporated by a witness into their memory and can be reported in their testimony at a later date (Allan, Midjord, Martin, & Gabbert, 2012; French, Garry, & Mori, 2008; Gabbert, Memon, & Allan, 2003; Lepore & Sesco, 1994; Loftus, 2005; Paterson, Kemp, & Ng, 2011; Poole & Lindsay, 2001; Poole & Lindsay, 2002; Principe & Ceci, 2002; Principe & Schindewolf, 2012; Ridley & Clifford, 2004; Shapiro & Purdy, 2005). When post-event information is encountered, it is not clear what happens to the original memory. The favoured explanation in the literature is that source monitoring errors occur resulting in confusion between the original memory trace and the more recent post-event information (Johnson, Hashtroudi, & Lindsay, 1993). Fuzzy-trace theory suggests that false memories for non-experienced events are most likely to rely on gist memory traces whereas true memories will incorporate both gist and verbatim details (Brainerd & Reyna, 2002). The effect of post-event information on memory is discussed further in Chapter 2. This chapter continues to consider how Fuzzy Tracy Theory provides the rationale for refreshed testimony as an appropriate means of improving recall accuracy after delays between retrieval attempts.

1.4.   Refreshed Testimony: A Memory Intervention

The adaptive and flexible nature of human memory, as evidenced by the above discussion of Fuzzy-Trace Theory, is problematic in the criminal justice system. The natural processes of memory make it more difficult for accurate eyewitness testimony to be gathered during an investigation, preserved over delays, and presented consistently in court. Refreshed testimony is proposed in this thesis as a means of countering these challenges, enhancing the quality of eyewitness testimony by improving memory recall, accuracy and consistency over a delay.

The strength of a memory trace, and the number of potential retrieval cues associated with that trace, influence the likelihood of that information being accessible and available for retrieval when required. After long delays, if a decayed memory trace and/or retrieval cue could be strengthened, it could be expected that memory recall and accuracy would improve. Information rehearsal is well established as being an effective method of improving memory trace strength and increasing recall (Henry & Gudjonsson, 2004; Hessen, 2011; Shiffrin & Atkinson, 1969). The act of retrieval itself has also been found to increase the success of future retrieval attempts for the recalled information (Anderson, Bjork, & Bjork, 1994; Bjork, 1988; Chan & LaPaglia, 2011; Danker & Anderson, 2010; Roediger & Butler, 2011; Roediger & Payne, 1982; Shaw et al., 1995). In England and Wales, refreshed testimony allows a witness to read their written statement, a transcript of their police interview or to view a video recording of their interview, before giving evidence in court (Criminal Justice Act, 2003, Section 139). There is a general lay assumption that refreshed testimony improves recall (Crown Prosecution Service, 2010), and anecdotal evidence indicates that witnesses feel more prepared to give their evidence after refreshing (Plotnikoff & Woolfson, 2004).

Through the process of reading or listening to one's own recollection of a witnessed event, active memory retrieval and rehearsal can be expected to take place. This process could therefore be argued to strengthen existing memory traces that have decayed over time. Anecdotal evidence from professionals who work with child witnesses suggests that children often correct details from their original testimony during refreshing. This indicates that witnesses do engage in active retrieval when reviewing their original statement or video-recorded interview and

that this is resulting in the recall of new information. By prompting witnesses to actively retrieve memory traces it is possible that refreshed testimony may create new associations and retrieval cues for their memory (Bjork, 1988; McDaniel, Kowitz, & Dunay, 1989). These new retrieval cues could then increase the likelihood of a successful recall attempt in court by making these memories more accessible for the witness than they were before refreshed testimony took place.

As verbatim details are the most valuable in the justice process, and are more susceptible to decay, it can be argued that refreshed testimony would be of most benefit to the improvement of verbatim recall. That is not to say that gist recall would not be expected to improve, but that gist memory decays more slowly over time and, therefore, the greatest benefit would be expected for verbatim details. While a theoretical argument can be made for the benefits of refreshed testimony, little empirical research has been conducted to identify what measurable effect this practice has, if any, on memory recall, accuracy and consistency. To date, only two studies are known to have investigated refreshed testimony experimentally and, although they did observe memory improvements after refreshing, there are a number of methodological issues which limit the relevance of these studies to the experience of real-world witnesses (Magner, Markham, & Barnett, 1996; Turtle & Yuille, 1994). A discussion of these studies, their methodology and findings is provided in Chapter 4.

Little is known about the real world practice of refreshed testimony. Eyewitnesses are legally entitled to refresh their memory, however this does not appear to be a standardised practice. It is known that some witnesses give evidence without refreshing due to scheduling issues in the justice system, or because they are simply not offered the opportunity (HMCPSI & HMIC, 2012; Plotnikoff & Woolfson, 2004). Furthermore, there is no known guidance for the practitioners responsible for delivering refreshed testimony and existing research has not examined the practice in any great detail (HMCPSI & HMIC, 2012; Plotnikoff & Woolfson, 2004, 2009). The first study of this thesis aims to bridge this gap in knowledge using questionnaire data from police officers directly involved in preparing witnesses to give evidence in court to further our understanding of real-world refreshed testimony practices (Study 1, Chapter 3).

With the limited research available in the literature regarding the potential benefits of refreshed testimony, it is the aim of this thesis to expand our understanding of refreshed testimony and to test the hypothesis that this practice can improve memory recall, accuracy and cross-examination (see Chapter 2) in child and adult witnesses in Studies 2, 3 and 4. Studies 3 and 4 of this thesis also consider whether both verbatim and gist forms of memory are improved by refreshed testimony, rather than looking solely at total memory recall. The studies also consider whether this practice improves the consistency of repeated recall attempts, preventing forgetting and affecting the recall of new information. It is worth noting that this thesis uses both child (Study 2) and adult (Studies 3 and 4) population samples. It is therefore necessary to consider any developmental differences between these two age groups which may affect their ability to encode, store and retrieve autobiographical memories and whether this may affect the results of this research.

With regard to refreshed testimony and the research in this thesis, there is nothing to suggest that the underlying principles of memory differ for children and adults. However, the knowledge and skills required for spontaneous retrieval of those memories develops with age (Baker-Ward & Ornstein, 2002). Autobiographical and episodic memory, for example, depend on the development of verbal recall and language skills, and are both closely related to social development (Fivush, 1993, 2011). Children learn conversation skills from their interactions with others and rely mainly on adults to guide conversations. This helps them to identify what details are important to retrieve and recall as part of a narrative for others (Lamb & Brown, 2006). Details that children consider important to notice, remember and report spontaneously therefore vary compared to those an adult might choose to report, or what is forensically relevant (King & Yuille, 1987). As a result, although children are no less accurate than adults, they report less information without guidance (Cassel & Bjorklund, 1995; Cassel, Roebers, & Bjorklund, 1996; Geddie, Fradin, & Beer, 2000; Hamond & Fivush, 1991; Jack, Simcock, & Hayne, 2012).

As knowledge increases with age, attention, encoding and retrieval of forensically relevant details improves (Saywitz, 2002). This is challenging for investigative interviewers. Due to the limited spontaneous recall of verbatim details,

it becomes necessary to probe a child's memory by repeating questions or by asking more specific questions. When direct questions are introduced into an interview, developmental differences between age groups become more evident. Children are frequently criticised as being more suggestible to misleading information and leading questioning styles (Bruck & Ceci, 1999; Ceci & Bruck, 1993, 1995a, 1995b; Ceci, Crossman, Scullin, Gilstrap, & Huffman, 2002; Ceci, Ross, & Toglia, 1987b; King & Yuille, 1987; Klemfuss & Ceci, 2012). However, it is the questioning styles of the interviewer that are often the cause of confusion and errors on the part of the child witness (Walker, 1993). If children are questioned in a non-leading manner, using age appropriate questions, they can be equally as accurate as adult witnesses (Ceci & Bruck, 1995a; Klemfuss & Ceci, 2012; Lamb & Brown, 2006; Spencer & Lamb, 2012; Walker, 1993).

We know that mnemonic techniques in the Cognitive Interview can be successfully used to enhance the recall of children (Holliday, 2003; Verkampt & Ginet, 2010), implying that younger children may encode and store memory traces as well as older children and adults, it is simply a matter of accessing those memories (D. A. Poole & White, 1991, 1993). It could therefore be argued that the potential for refreshed testimony to improve memory strength and the accessibility of memory is relevant for witnesses of all ages; though this may be more difficult to observe in the free recall of children. It may be that any benefits of refreshed testimony may be easier to identify in adult witnesses who are able to employ more complex retrieval tactics.

Despite the predicted benefits of refreshed testimony on free recall performance, a potential danger of this practice must be considered (applicable for witnesses of all ages). If both an original memory trace and associated retrieval cues have been lost to decay over time, refreshed testimony may replace these with the formation of new memory traces. This would create a memory, not for something the witness experienced, but for their previous testimony. There is an important distinction to be made here. The law requires that a witness is able to remember the event itself, not what they know themselves to have told the police. A case can therefore be appealed if a witness is no longer capable of remembering the event (*R* vs Malicki [EWCA] Crim 365). Witnesses must therefore be able to monitor the source of their memories to make this important distinction.

The potentially damaging effect of using refreshed testimony in an applied context is acknowledged. However, the main focus of this thesis is to determine whether refreshed testimony can improve free recall and cross-examination performance after a delay. If refreshing is not found to have any measurable effect on recall, the question of source-monitoring will be moot. Priority is therefore given in this thesis to the investigation of memory recall, accuracy and cross-examination performance, independent of the source of memory. An additional investigation of source-monitoring, in the context of refreshed testimony, was not conducted as part of this research due to time constraints but it is acknowledged as a valuable research question in its own right. It is hoped that future research is conducted to address this question.

The following chapter will now consider the potential benefits of refreshed testimony on cross-examination performance. Cross-examination is one of the most challenging experiences for eyewitnesses and the evidence from the literature indicates that this practice can be damaging to both the accuracy and credibility of a witness. The applied relevance of refreshed testimony would be greatly increased if it could be shown to improve both free recall accuracy and cross-examination performance. As part of the discussion of cross-examination practices and research, the suggestibility and source monitoring abilities of child and adult witnesses will also be considered.

Chapter 2: "Can You Remember? Are You Sure?" An Overview of Cross-examination Practices

Chapter Overview:

This chapter provides the reader with an overview of current cross-examination practice and research. The focus is on the question types typically used in cross-examination and the detrimental effect these have on eyewitness accuracy in comparison to best practice guidelines. The role of suggestibility in cross-examination is discussed with acknowledgement of the differences between child and adult witnesses as the two population groups in this thesis. Memory trace strength is discussed as an influencing factor in suggestibility and cross-examination performance. Following from this, refreshed testimony is presented as a potential means of improving cross-examination accuracy. The chapter concludes by outlining the experimental direction of this thesis.

2.1. Cross-Examination

"Against erroneous or mendacious testimony, the grand security is cross-examination: cross-examination, by which, if the individual facts are charged false, true ones (by their inconsistency with which, they are disproved) may be brought out against them."

(Bentham, 1897)

Eyewitness recall in court does not take place under the same circumstances as an investigative interview. After lengthy delays since giving their original statement, witnesses must repeat their evidence in court and be questioned during a cross-examination. As Bentham's statement highlights, the purpose of cross-examination is to check the accuracy and reliability of evidence to satisfy the court that the evidence is truthful and, as far as is possible, accurate. As discussed in Chapter 1, the cost of a false conviction is high and numerous exoneration cases demonstrate that eyewitness testimony is not infallible. Cross-examination is an integral part of an adversarial justice system and was deemed of significant importance to be included in Article 6 of the Human Rights Act 1998.

Cross-examination is considered by some to be the main safeguarding process in an adversarial system (Ellison, 1999). However, many academics and practitioners believe that the process is more frequently used as a means to attack a witness' credibility, limiting the impact of their evidence in court (Cossins, 2009; Henderson, 2012; Spencer & Lamb, 2012; Zajac, O'Neill, & Hayne, 2012). Cross-examination has been likened to being *"...every bit as robust as question-and-answer contests in the House of Commons*" (Slapper, 2007). The occasionally aggressive and accusatory nature of cross-examination was brought to the attention of the media in a recent sexual abuse case in the UK in 2013. In this specific case, one victim was subjected to 12 days of cross-examination during the trial and was repeatedly shouted at by multiple defence lawyers. Other victims were accused of lying about their evidence (Norfolk, 2013). It is clear from the literature that this aggressive and accusatory style of questioning is not an isolated incident (Plotnikoff & Woolfson, 2004, 2012; Walker, 1993).

Current cross-examination practices are promoted by existing legal training and guidance. Law schools place an emphasis on the use of persuasive questioning techniques to control the presentation of evidence in the lawyers' favour (Clark, Dekle Sr., & Bailey, 2010; Wellman, 1903; 1997). The effects of these practices on a witness' accuracy in court are likely to be an afterthought, or not considered at all, as the lawyer is trained to employ any means necessary to get a witness to give the desired response. As witnesses of almost any age can give evidence in court if they are deemed to be competent, young and vulnerable individuals are open to this challenging style of interviewing.

A witness is deemed competent if they are able to both comprehend questions put to them and provide cohesive responses. Both these abilities are required to enable a meaningful cross-examination to take place. As such, competency hinges on the language and questions used to challenge a witness in court. If the language and grammar used is inappropriate for the witness' age or cognitive development, the assessment of competency may be incorrect. Inaccurate assessments can prevent the testimony of a competent witness from being used as evidence when competency could have been adequately demonstrated with appropriate questioning. An example of this can be seen in the appeal case of R. v. Barker [EWCA] Crim 4. In this case,

the competency of a child (Child X) was challenged because of the responses they gave during cross-examination.

Child X was 3 years old when the alleged abuse took place and over 4 years old when called to court to give evidence. The following extract is part of her cross-examination by the defence and offers insight into why X may have struggled to respond cohesively during questioning to demonstrate competency:

> "*So you don't fibs and Curly Kate asked you—not in the tape—whether Stephen had ever touched you and you said he didn't. Stephen never touched you with his willy did he? Did he, X?*"

(R. v. Barker [EWCA] Crim 4)

In R v Barker, the lawyer used grammatically complex, multi-part questions throughout the cross-examination, such as the example above, which can be difficult even for an adult to understand. Despite the obvious complexity of the question, no objections were raised by the opposition or the judge. When X was unable to answer this and other questions, the issue of competency was raised. However, in the same cross-examination, X demonstrated herself to be a competent witness when questioned appropriately, providing comprehensive responses when short and simply phrased questions were used. This demonstrates the negative influence that question types can have on witness comprehension and recall accuracy in cross-examination.

The example of poor questioning in the R. v. Barker case is not an isolated incident (Brennan, 1995; Brennan & Brennan, 1988; Lamb & Fauchier, 2001; Walker, 1993; Zajac, Gross, & Hayne, 2003). In some of the earliest work on cross-examination interviewing styles, Anne Walker consulted on an American court appeal case in Chicago (Walker, 1993). In this case, the competency of a 5 year old eyewitness was challenged. Walker was asked to assess the child's language abilities to determine whether she met the legal requirements for competency. The criteria used to determine competency in the jurisdiction of Chicago are the same criteria used in England and Wales: the ability to understand questions put to the witness and the ability to provide comprehensible responses. Walker argued that age-inappropriate words and expressions, complex syntactic constructions and

ambiguous questions had all been used to question the witness, concluding that the witness was legally competent but was questioned poorly.

A linguistic analysis of multiple cross-examination transcripts, drew similar conclusions to that of the single case study examined by Walker (Brennan, 1995). Brennan (1995) remarked that the studied sample of cross-examinations transcripts revealed a form of questioning which had specific characteristics, describing it a 'strange language'. Cross-examination was characterised as including features such as the juxtaposition of topics; rapid changes in the direction of questioning; questions lacking grammatical or semantic sense; the use of tagging or negative tagging at the end of a statement to encourage witnesses to give short 'yes/no' responses; perseveration to create a rhythm to the evidence, limiting the witness' response options and other complex tactics (see Brennan (1995) for full analysis). Brennan concluded that any and all of these questioning tactics have the effect of confusing a witness, potentially jeopardising their ability to demonstrate competency.

Case studies and examples in the literature suggest that this style of interviewing appears to be the norm during cross-examination and that it is far removed from the recommended best practice for interviewing. Best practice guidance is used to advise practitioners on how to question witnesses appropriately to get the best quality of evidence during an interview. In England and Wales, the Achieving Best Evidence Guidance (2011) encourages interviewers to ask open questions wherever possible as these types of question produce the best quality of eyewitness recall above all other question types (Fisher & Geiselman, 1992; Memon, Meissner, & Fraser, 2010). The guidance also highlights the dangers of using leading or suggestive questions during an interview and recommends a limited use of closed and forced-choice questions.

Although they do not constitute a legally enforceable code of conduct, practitioners are encouraged to closely follow best practice guidelines during investigative interviews. However, many lawyers do not themselves follow the recommended questioning style during cross-examination. Deviation from the guidance during an investigation may result in a witness' evidence being called into question when the case comes to court. The appeal case for *R v Malicki* [2009] is an example of this. In this case, an appeal was upheld, and the conviction overturned,

as it was argued that the specific phrasing of an allegation had been introduced by the interviewing officer through a leading question, as follows.

"Q. .... And did you tell mummy that John had nipped you somewhere?

A. He didn't nick me.
Q. Lick, did you say, did he lick? What did you say to mummy, lick or nip?
A. Lick.
Q. Lick. Did he lick you?
A. (Nods head)"

(R. v. Malicki [2009] EWCA Crim 365)

In R. v. Malicki, the suggestive questioning used during the original interview, which went against best practice guidance, contributed to the success of the appeal. Despite the legal system taking a strong stance on questioning styles during an investigation, best practice guidelines are not typically applied in court. This, in spite of the growing literature documenting the negative effect this style of questioning has on cross-examination performance.

2.1.1. Accuracy and Credibility

Cross-examination, in both real-world and experimental studies, evidences the difficulty witnesses have, not only in understanding what they have been asked, but also with the errors and inconsistencies that are introduced into evidence as a result of this style of interviewing. Consistency is considered by many as a good indicator of credibility (Berman & Cutler, 1996; N. Brewer & Burke, 2002; Oeberst, 2012; Pozzulo & Dempsey, 2009). Inconsistencies can appear in eyewitness recall in a number of ways: a witness recalls a new piece of information that they did not report in a previous interview; a witness does not recall a detail they reported in an earlier interview; or a witness gives contradictory responses to the same question, changing a detail from one they previously reported. In the latter case, for example, a witness may recall that a suspect was wearing a blue item of clothing in one interview and report the item of clothing as red during cross-examination. By the very definition of a contradiction, one or both responses must be incorrect and so the witness appears to be inconsistent and inaccurate and is likely to be considered unreliable.

The likelihood of a witness contradicting himself during an interview increases when certain question types are used compared to others (Lamb & Fauchier, 2001). In a case study of investigative interview transcripts, witnesses who contradicted at least one substantive detail during their interview did so in response to focused questions only, such as forced-choice or leading questions. The use of open questions, the benefits of which are clear when repeatedly questioning a witness (Memon & Vartoukian, 1996), did not result in contradictory responses in the examined transcripts. Although this study focussed solely on investigative interviews, these transcripts contained a mixture of question types, including those known to feature in cross-examinations (Brennan, 1995; Davies & Seymour, 1998; Walker, 1993). These findings have since been replicated in case studies of cross-examination transcripts and through experimental research. A sample of examination-in-chief and cross-examination transcripts (see Chapter 1 for different stages of the justice process) revealed differences in the consistency of answers given to different question types in each interview (Zajac et al., 2003). Evidence-in-chief interviews predominantly featured best practice question types such as open and non-leading questions. Whereas cross-examination transcripts contained more complex, grammatically confusing, credibility-challenging, leading and closed questions. Furthermore, the cross-examination transcripts contained a greater number of contradictions in comparison to the evidence-in-chief interviews.

There are a number of possible reasons as to why witnesses give contradictory evidence during questioning. Both Lamb & Fauchier (2001) and Zajac et al. (2003) concluded that contradictions in cross-examinations were a result of the questioning style as the total number increases when interviewers do not follow best practice guidance. In both studies, contradictions were made only when witnesses were asked a specific question (i.e. closed or forced choice). However, the presence of contradictions are not necessarily an indication of reduced accuracy. The observed contradictions could be the result of self-monitoring, resulting in a conscious change to correct an earlier mistake. As discussed in Chapter 1, it is well established in the literature that new, accurate details can be recalled after a delay (Goodman & Quas, 2008; Hershkowitz & Terner, 2007; La Rooy, Lamb, & Pipe, 2008; Memon & Vartoukian, 1996; Orbach et al., 2012; Turtle & Yuille, 1994). This makes it plausible that the presence of contradictions in interviews are evidence of

self-correction. This possibility cannot be ruled out in case studies which lack an objective account of the witnessed event to corroborate a witness' evidence. It is therefore not possible to determine whether contradictions are increasing or decreasing accuracy in these studies. Experimental studies, on the other hand, enable this distinction to be made. By controlling the witnessed event, researchers can create an objective recording to allow contradictions to be categorised as corrections or errors.

The evidence in the literature suggests that contradictions are, on the whole, new errors and not self-corrections. Numerous studies have concluded that the questions typically used during cross-examination reduce the accuracy of both child and adult witnesses (Kebbell & Giles, 2000; Perry et al., 1995; Valentine & Maras, 2011; Wheatcroft, Wagstaff, & Kebbell, 2004; Zajac & Hayne, 2003, 2006). This finding has been observed across a number of population samples using multiple experimental designs. For example, two experimental studies used scripted cross-examinations to challenge the recall of young and older children on their memory for a real-world experience (visit to a police station). After an eight month delay from the initial interview, 85% of younger, and 70% of older children, changed at least one of their responses to challenging question types during a cross-examination. These changes were just as likely to be errors as they were self-corrections (Zajac & Hayne, 2003, 2006). Comparatively, a more recent study cross-examined adults on their memory for a simulated crime video after a four month delay. This study used an unscripted cross-examination with a trainee barrister, finding similar results to Zajac and Hayne. 73% of adults changed at least one of their responses during cross-examination, becoming less accurate by making new errors (Valentine & Maras, 2011). Although these three studies employed different methods, they found similar results across the age groups indicating that witnesses of all ages are susceptible to the negative effects of cross-examination.

Poor questioning in cross-examination not only affects measured accuracy but can also affect the perceived accuracy of a witness. Mock-jurors rated individuals as being less accurate after listening to audio recordings of witnesses questioned with complex question types (Wheatcroft et al., 2004). However, negative feedback was also given to the complex questions condition, regardless of the accuracy of the original response. Mock-jurors therefore heard the interviewer

tell the witness that their responses were incorrect, potentially biasing the rating and reducing perceived accuracy. However, a more recent study found that mock-jurors rated perceived accuracy lower in video-recorded interviews when more complex questions were asked despite no negative feedback being given. In this study, perceived accuracy was rated as significantly higher when questions followed best practice guidelines. This would suggest that the questioning style, not the negative feedback, was responsible for the low ratings of accuracy in the previous study (Kebbell, Evans, & Johnson, 2010).

It is clear from the literature that current cross-examination practices negatively affect the quality, accuracy and impact of eyewitness evidence. Given the influence that eyewitness testimony can have on juror decision making (see Chapter 1), it is of applied relevance to consider means of increasing cross-examination accuracy in addition to free recall accuracy. This chapter will continue to explore factors, in addition to questioning styles, which impact upon cross-examination accuracy and consider whether any of these may be manipulated to improve performance. These factors include the suggestibility of a witness, source monitoring and memory trace strength.

2.1.2. Suggestibility: Conformity and Memory Trace Strength

Chapter 1 highlighted the malleability of memory and the challenge this poses for eyewitness accuracy. During cross-examination, lawyers may purposefully introduce post-event information and suggest details to a witness through leading questioning. They may pose alternative scenarios to those described by the witness, or may discuss details about the event that the witness did not see, or did not take place, placing pressure on a witness to accept the alternative version of events. The aim of this is to get the witness to contradict their own testimony, by changing their responses, so that they appear less credible (Clark et al., 2010; Slapper, 2007; Wellman, 1903; 1997). The effect of post-event information on memory and response accuracy is therefore relevant to our consideration of cross-examination performance. The extent to which an individual is influenced by post-event information and certain questioning styles is referred to as suggestibility and can occur under a range of conditions (Ridley, 2013).

It is important to distinguish between the different forms of suggestibility when considering eyewitness memory. A witness' evidence can be affected in more ways than one. The acceptance of misleading or inaccurate post-event information can be *immediate*, resulting from a leading question, and/or *delayed,* resulting in incorrect recall as a result of an earlier exposure to misinformation (Eisen, Winograd, & Qin, 2002; Ridley & Gudjonsson, 2013). Immediate suggestibility has been associated more with individuals who are agreeable and intelligent whereas delayed suggestibility is greatest in individuals with poorer recall skills (Eisen et al., 2002). Eisen et al. concluded from this that immediate suggestibility could be attributed to social factors and pressures during questioning and that delayed suggestibility was a result of an inability to distinguish between the observed event and the false information, essentially a source monitoring error (Eisen et al., 2002; Ridley & Gudjonsson, 2013).

In immediate suggestibility, the emphasis is based on social compliance: an individual makes a behavioural change to respond to social pressures, regardless of whether or not the response corresponds with their memory of the event (Gabbert & Hope, 2013; Gudjonsson, 1984, 1986, 2013; Gudjonsson & Clark, 1986). This form of suggestibility is more typically referred to as *interrogative suggestibility* (Gudjonsson, 1984, 1986, 2013; Gudjonsson & Clark, 1986), and is likely to influence cross-examination performance due to the challenging and aggressive nature that this style of interviewing can take (Norfolk, 2013). In response to cues in an interviewer's question, tone or body language, witnesses who are susceptible to interrogative suggestibility try to give the answer they think the person wants to hear (Gabbert & Hope, 2013). This is demonstrated in its most extreme form in some American police interrogative interviews where false confessions can often be made if extreme questioning tactics are used (Davis & Leo, 2013). Although cross-examination interviews are unlikely to go to the extremes of a police interrogation, practitioners do employ persuasive tactics during cross-examination which can result in immediate changes to a witness testimony (Zajac et al., 2003; Zajac & Hayne, 2006).

Social pressure can be as subtle as repeating a question. Chapter 1 highlighted the importance of witness consistency both within and between recall attempts. Repeating a question can cause a witness to change their testimony, the

inference being that the interviewer didn't like the first response, or knew the first response to be incorrect (Cassel et al., 1996; Ceci & Bruck, 1995a; Krähenbühl & Blades, 2006b; La Rooy & Lamb, 2011; Memon & Vartoukian, 1996; O'Neill & Zajac, 2013; D. A. Poole & White, 1991). This is arguably a demonstration of interrogative suggestibility as it is possible that the witness is capable of accessing and recalling an accurate memory, but provides an alternative answer in response to perceived social cues. This highlights the importance of establishing ground rules before any interview (e.g. explaining to the witness the importance of being complete, saying "I don't know", correcting the interviewer, and not guessing), in addition to using best practice interviewing techniques.

This thesis will look at the effect of multiple question types on memory recall, in a cross-examination context, including mildly interrogative style questions (see experimental chapters for detail). It is anticipated that evidence of reduced accuracy will be found as a result of these challenging questioning styles. However, this research will also consider the effect of delayed suggestibility as a result of a witness not having access to, or being unable to distinguish between, an original memory and false memories formed after exposure to post-event information through misleading questioning. Delayed suggestibility is more commonly referred to as the 'misinformation effect', first identified in the early work of Elizabeth Loftus and colleagues (Loftus, Miller, & Burns, 1978). The misinformation effect typically involves the introduction of false details after a witnessed event which are later reported in place of the correct response. For example, in Loftus' study, participants were questioned whether another car had passed a 'yield sign' in a slide sequence they had viewed, when in fact it had been a 'stop sign'. When questioned later, the majority of misled participants failed to correctly identify the sign, recalling that it was a yield sign as had been suggested earlier during questioning.

As discussed in Chapter 1, there is continuing debate as to whether misinformation effects occur because the original memory trace has been overwritten and replaced or because the post-event information has impaired access to an intact memory trace. The predominant explanation is that misinformation is a result of source monitoring errors due to confusion between the original memory trace and the more recent post-event information (Johnson et al., 1993). Regardless of the cognitive processes behind the effect, from an applied perspective, the behavioural

outcome is the same. However, if the misinformation effect is a result of source monitoring failures, or impaired access to the original memory, there may be an opportunity to reduce susceptibility to this effect by increasing memory trace strength through refreshed testimony.

Chapter 1 considered the effect of memory trace strength on recall ability and the malleability of memory. Witnesses with stronger memories are typically found to be less suggestible to false information than those with weaker memories (Ceci, Toglia, & Ross, 1988; Henry & Gudjonsson, 2004; Holliday, Douglas, & Hayes, 1999; Holliday, Reyna, & Hayes, 2002; Loftus, 2005; Marche, 1999; Pezdek & Roe, 1995), and better able to identify the source of their memories (Crawley, Newcombe, & Bingman, 2010; Pezdek & Roe, 1995; Thierry & Spence, 2002; Thierry, Spence, & Memon, 2001). Increasing memory trace strength could therefore reduce suggestibility, increasing cross-examination accuracy. For example, in Pezdek & Roe (1995), memory trace strength was manipulated by controlling the number of times four and ten year old children were permitted to view a slide sequence (the to-be-remembered event) before being exposed to misinformation. When children of both age groups viewed the slide sequence twice, rather than once, they were less likely to be misled about key details in the images.

Similar results have been observed using a video-recorded simulated crime as the to-be-remembered event (Henry & Gudjonsson, 2004). In Henry and Gudjonsson (2004), memory trace strength was observed to have an impact on suggestibility when children were asked specific, closed questions, after being exposed to misleading information, requiring access to verbatim memory. Children with stronger memories of a video (who received two viewings) were less susceptible to misinformation than those who had only viewed the video once, consistent with Fuzzy-Trace Theory and earlier misinformation research. It can therefore be argued that fostering conditions to enhance memory trace strength may improve a witness' resistance against suggestive and misleading questioning during cross-examination. This thesis proposes that this can be achieved through refreshed testimony.

2.2. Refreshed Testimony and Cross-examination

Recognising that a major cultural shift will be required to change the approach lawyers take to cross-examination, this thesis proposes an intervention which may reduce witness suggestibility to current cross-examination styles of interviewing. Cross-examination accuracy relies on a witness' ability to access verbatim details in response to specific questions. As discussed in Chapter 1, access to verbatim memory is more difficult for witnesses if there has been a long delay between the original event and the initial recall. However, it is also increasingly difficult to access these specific details when there have been long delays between recall attempts (i.e. between the investigation and giving evidence in court and being cross-examined).

Chapter 1 proposed that access to verbatim and gist memory traces after long delays between recall attempts could be improved by increasing memory trace strength through refreshed testimony (allowing a witness to review their original written statement, video-recorded interview or interview transcript before giving evidence). Based on a Fuzzy-Trace Theory of memory, it was argued that refreshed testimony could provide a means of rehearsing previously recalled details. This is predicted to improve the strength of existing memory traces and retrieval cues thereby enhancing accessibility and improving recall (Brainerd et al., 1985; Brainerd & Reyna, 2004; Brainerd et al., 1990). Extending this theoretical argument to cross-examination permits the hypothesis that refreshed testimony may benefit cross-examination performance in addition to free recall ability.

This chapter has focussed on the challenging nature of cross-examination. It has highlighted the likelihood of a witness being questioned in a confrontational and often misleading manner, making them susceptible to interrogative suggestibility and the misinformation effect. Evidence indicating that stronger memory traces can protect against misinformation has been discussed. In light of the proposed benefits to memory trace strength from refreshed testimony, it is reasonable to assume that cross-examination performance can also benefit. If witnesses are presented with false information during questioning, having stronger verbatim memory for the original event may improve source monitoring. This could make it easier for witnesses to distinguish between the original memory trace and post-event information, allowing them to reject the false information and correctly recall the

event. Refreshed testimony may therefore make witnesses less suggestible to the interrogative style questioning of cross-examination and less likely to provide contradictory evidence during questioning through increased memory trace strength. This thesis will therefore consider whether refreshed testimony can improve both free recall and cross-examination accuracy through a series of experimental studies.

Before concluding this chapter with the outline of this thesis, it is again necessary to consider any developmental differences between the two population samples used in this thesis and how this may affect the results of this research (as in Chapter 1). In terms of cross-examination performance, the majority of studies that make a direct comparison between pre-school children, older children and/or adults, consistently identified the youngest age group as being more suggestible to misinformation. In a review of several experimental studies, younger children were consistently found to change more of their responses and were more strongly influenced by post-information and suggestive questioning than older children and/or adults (Ceci & Bruck, 1993). In more recent comparisons, younger children were found to change more of their answers during interrogative questioning than older children. This being said, both children (Zajac & Hayne, 2003, 2006), and adults (Valentine & Maras, 2011), are known to make changes to their testimony.

Memory trace strength has been discussed as a means of improving suggestibility using evidence from both child and adult studies (Ceci, Ross, & Toglia, 1987a; Ceci et al., 1988; Henry & Gudjonsson, 2004; Holliday et al., 1999; Holliday et al., 2002; Marche, 1999; Pezdek & Roe, 1995). As discussed in Chapter 1, evidence in the literature indicates that there are limited differences in the underlying cognitive processes of memory between adults and children, although there may be behavioural differences in free recall, suggestibility and cross-examination accuracy. These differences occur because the knowledge and skills to retrieve and identify the source of memories are not fully developed in younger witnesses. It can therefore be expected that the proposed benefits of refreshed testimony on cross-examination performance, through increased memory trace strength, are relevant to all age groups. However, evidence of these benefits may be easier to detect in an adult sample who have the necessary skills to take advantage of increases in memory trace strength (e.g. source monitoring skills and complex retrieval strategies).

Age differences in source monitoring are clearly relevant here. Source monitoring skills develop with age. These skills allow a witness to determine if the memory they have retrieved is the information that was requested (i.e. are they recalling their memory for the event (requested) or memory for something they heard about after the event). This comes back to the potential dangers of refreshed testimony, outlined in Chapter 1, where the source of the memory must be the event itself, not memory for the content of a witness statement or video interview. Children are less adept at considering and identifying the source of their memories during recall, however, if source monitoring training is provided, suggestibility can be successfully reduced in children (Ceci, Fitneva, & Williams, 2010; Lane, Roussel, Villa, & Morita, 2007; Lindsay, Johnson, & Kwon, 1991; Thierry et al., 2001). Again, as discussed in Chapter 1, if refreshing is not found to have any measurable effect on recall, the question of source-monitoring ability in witnesses of different ages will be moot and measures of source-monitoring were not taken in this thesis due to time restraints. However, it is acknowledged that, should refreshing be found to improve recall and cross-examination, further research including source-monitoring measures will be necessary.

2.3. Thesis Outline

Chapters 1 and 2 have outlined memory theory and relevant experimental research regarding memory processing and cross-examination performance. This has raised research questions in relation to refreshed testimony and its proposed ability to measurably improve recall accuracy and cross-examination performance after delays between retrieval attempts. It has been argued that enhanced recall and cross-examination accuracy can be achieved by increasing memory trace strength and accessibility, increasing access to decayed memory traces and retrieval cues after a delay. This thesis presents three experimental studies to address this question which compare the accuracy and quality of free recall and cross-examination performance in refreshed and non-refreshed controls. Differences in recall ability, suggestibility and cross-examination performance have already been discussed in these two chapters and this thesis uses both child (Study 2) and adult (Studies 3 and 4) population samples to investigate refreshed testimony.

It is recognised that repeated interviews and retrieval attempts can result in changes to the content of memory over time, and the negative implications this has in an applied context. New information can be recalled and previously recalled details can be omitted or forgotten between recall attempts. Studies 3 and 4 consider whether refreshed testimony interacts with naturally occurring changes to memory recall and accuracy (reminiscence, forgetting and hypermnesia) in repeated recall attempts in adults. Study 4 also extends the research to consider whether the medium of evidence used for refreshing (written statements, interview transcripts or video-recorded interviews) influences the potential ability of this practice to improve memory.

Prior to the experimental studies, a questionnaire study (Study 1) is presented. The research described in Chapter 3 provides the first detailed assessment of real-world practices based on the experiences of serving police officers with a responsibility for preparing witnesses to give evidence in court. It evidences a need for increased research into the area of refreshed testimony, providing further justification for the experimental direction of this thesis.

Chapter 3: Identifying the Gaps - Refreshed Testimony in Practice

Chapter Overview:

This chapter presents the first study of this thesis. It identifies current gaps in knowledge regarding the real-world application of refreshed testimony. Literature is discussed which focuses on a range of factors which may influence the effectiveness of refreshed testimony including when, where and how often refreshing takes place; the format of evidence used; witness instructions; and whether a witness is supervised during refreshing. A questionnaire was designed for this study and completed by 217 police officers in England, over a one month period, providing the first detailed overview of refreshed testimony practices, at the time of writing. The results reveal that refreshed testimony practices are inconsistent across the sample in this study. The implications of these findings are discussed. The chapter concludes with the recommendation that further research is conducted into the variables associated with refreshed testimony. It is suggested that both witnesses and practitioners would benefit from the introduction of best practice guidance to standardise the process of refreshing memory as part of the witness preparation process.

3.1. Current Research

As discussed in Chapter 1, refreshed testimony permits a witness to review either their original written statement, interview transcript or audio/video-recorded interview before giving evidence and being cross-examined in court (Criminal Justice Act 2003, Section 139). The practical arrangements required to facilitate this process are the responsibility of the police, in cooperation with the prosecution (Crown Prosecution Service, 2013). Currently, little is known about the kinds of arrangements that are made by police and the prosecution in order for refreshed testimony to take place. There is evidence that some witnesses are not offered the opportunity to refresh their memory and are occasionally denied the chance to do so when it has been requested (HMCPSI & HMIC, 2012; Plotnikoff & Woolfson, 2004). This may suggest that some practitioners are unaware of refreshed testimony as a practice, or may be unaware of the potential benefits this practice can offer to witnesses. To our knowledge, there is currently no training offered to police officers involved in the preparation of refreshed testimony. The only known guidance on this

subject is very brief and does not focus on some of the practical considerations that need to be made when arranging for refreshed testimony (Achieving Best Evidence, 2007; 2011). These will be discussed in this chapter.

Given the limited guidance available to practitioners it is reasonable to expect there to be differences in the way witnesses experience refreshed testimony across England and Wales. This chapter explores the practical elements of refreshed testimony, identifying where differences in practices may be likely to occur. There is discussion around how these various factors may influence the effectiveness of refreshed testimony and ultimately the quality of evidence given in court. The factors to be considered include: the timing, location, and frequency of refreshed testimony, the format of evidence used for refreshing and the supervisory arrangements used when this practice is delivered.

3.1.1. Refreshed Testimony in Practice

Timing

The timing of refreshed testimony is influenced by practical factors such as the availability of both the witness and police officer before the scheduled date of the trial. Best practice recommends that young and vulnerable witnesses should not review their testimony on the day of the trial itself. This is to avoid fatiguing the witness before they are required to review their evidence in court as part of the evidence-in-chief before cross-examination (Achieving Best Evidence Guidelines, 2007; 2011). Reviewing evidence multiple times on the same day may affect the attention and concentration of a witness during cross-examination, affecting their ability to comprehend and respond to questioning. Depending upon the content and the length of an interview, it may also be emotionally distressing for witnesses to review their testimony more than once in a single day. Although the guidance states that refreshing should occur in advance of the trial, recommendations are not made for the most appropriate time for refreshed testimony to take place. It is currently unknown how far in advance witnesses are being refreshed, and what effect the timing of refreshing has on their memory recall and accuracy.

Refreshing a witness too far in advance or too close to giving evidence in court may negatively affect their recall ability. Refreshed testimony is proposed to

strengthen memory for details discussed in the police interview by rehearsing previously recalled details (see Chapter 1). However, during cross-examination, witnesses may be questioned on peripheral details about the witnessed event that the police did not ask about. In the context of retrieval-induced forgetting, non-rehearsed details may become temporarily inaccessible during cross-examination (Anderson et al., 1994; MacLeod, 2002; Shaw et al., 1995). Refreshing on the day of the trial itself may therefore have wider implications for memory access beyond the welfare of the witness. However, refreshing a witness too far in advance leaves the witness exposed to the deleterious effects of delay on memory between retrieval attempts (La Rooy et al., 2007; Pipe et al., 2004).

Location

The location at which refreshed testimony is delivered may be determined by the availability of individuals and resources. For example, witnesses who gave a video-recorded interview require access to a private room and audio-visual equipment in order for refreshed testimony to take place. If the witness' evidence is a written statement or an interview transcript then location options can be more flexible as these forms of evidence do not require specialist equipment to be reviewed. As with the timing of refreshed testimony, the choice of location may affect a witness' memory and recall ability by limiting or increasing access to specific memory traces due to context based retrieval cues.

As discussed in Chapter 1, the availability of retrieval cues influences the success of a recall attempt with gist details having a greater range of retrieval cues than verbatim traces. When the environment changes between encoding and recall, this may negatively impact on memory retrieval. Reinstatement of contextual cues, on the other hand, can facilitate recall (Aslan, Samenieh, Staudigl, & Bäuml, 2010; Godden & Baddeley, 1975; Smith, Glenberg, & Bjork, 1978). Mental reinstatement of context can also be used to aid memory recall when physical environmental cues change between encoding and recall. Specific retrieval instructions to reinstate context are used as part of the Cognitive Interview. These have been shown to increase the number of correct details a witness can recall (Dando et al., 2009; Fisher & Geiselman, 1992; Memon et al., 2010).

To date, no known research has investigated the effect of location and contextual cues on memory recall in relation to refreshed testimony. Refreshed testimony is proposed to offer the opportunity to rehearse memory for an original event. Active retrieval of specific memory traces is also expected as part of this process (see Chapter 1). During active recall, new retrieval cues can be formed associated with the current context, in this case refreshed testimony (Bjork, 1988; McDaniel et al., 1989; Schacter et al., 1998). New retrieval cues associated with the experience of refreshing testimony can therefore provide additional routes to gist and verbatim memory traces during a subsequent recall attempt. If new and existing contextual cues are available during recall and cross-examination, memory accessibility may be enhanced. As can be seen from the following examples, this makes the choice of location important.

Police station: Refreshing the witness in the same location as their original police interview can strengthen contextual retrieval cues associated with the original interview. Although recall during refreshed testimony may benefit from these congruent contextual cues, the retrieval cues in court will be different to that of the police station. As the cues from the original interview may have been reinforced by refreshing, this may make recall in a different context, namely in a courtroom, more challenging. However, both police stations and courtrooms are formal locations and part of the criminal justice system and therefore it can be expected that the two locations are not unlike in the associations they evoke during recall.

Witness' Home: Providing refreshed testimony in a witness' own home may be less intimidating for the individual, making them less anxious during refreshing. One caveat to this would be if the individual is a victim or witness of domestic or familial sexual abuse where allegations may have occurred in the home. In such cases, refreshing in the home would be inappropriate as it may cause the witness additional stress and trauma. From a memory theory perspective, a family home environment will be void of any contextual cues associated with the original interview location. This may make it more difficult for the witness to access their memory of the interview and the original event during refreshing. Both the contextual retrieval cues formed during the refreshed testimony process (i.e. the home environment), and those formed during the original interview location (police station), will differ to those available to the witness in court. This could potentially

make it more difficult for witnesses to access verbatim and gist details when questioned in court in the absence of relevant context-related retrieval cues.

Court: Refreshing testimony at court may be the most appropriate location choice in terms of the provision of contextual retrieval cues. If a witness is refreshed in court, any newly formed retrieval cues will also be available when the witness is giving evidence and being cross-examined. Although these cues will differ to those of the original interview location (police station) there may be enough similarities between the two locations to activate context-dependent retrieval cues to enhance recall during refreshed testimony itself (as per the police station example).

Frequency

The frequency of refreshed testimony must also be considered. Repeated exposure and rehearsal of information are well documented methods of increasing retention and recall in word learning tasks (Ebbinghaus, 1913; Hessen, 2011; Hintzman, 1970; Roediger & Butler, 2011; Roediger & Payne, 1982) and in eyewitness memory (Ceci et al., 1988; Henry & Gudjonsson, 2004; Holliday et al., 1999; Magner et al., 1996; Marche, 1999; Pezdek & Roe, 1995; Turtle & Yuille, 1994). Fuzzy-Trace Theory and wider evidence from the literature argues that increased repetition and rehearsal results in a stronger memory trace and therefore a higher likelihood of retention and subsequent recall (Brainerd & Reyna, 1990; Brainerd et al., 1990; Gardiner, Gawlik, & Richardson-Klavehn, 1994; Hessen, 2011; Hintzman, 1970; Odinot & Wolters, 2006; Ozubko & Fugelsang, 2011; Reyna & Brainerd, 1995; Tuckey & Brewer, 2003a). The focus of this thesis is to determine whether refreshed testimony provides the opportunity to increase memory trace strength for eyewitness evidence through repetition and rehearsal. It is therefore relevant to consider whether it is sufficient to provide refreshed testimony once to improve memory, or whether repeated opportunities are more beneficial for witnesses.

A witness can be refreshed once, review their testimony multiple times in one session (mass repetition) or review their testimony several times over a number of hours or days (spaced repetition). As with other aspects of refreshed testimony, there are practical considerations which are likely to influence the number of times refreshed testimony can take place. For example, a written statement can be read

more than once in a single session whereas witnesses with video-recorded interviews require more time to review their evidence. If an interview is several hours long, it is neither practical nor reasonable to expect a witness to watch the video multiple times in one session. Spaced repetition would be more appropriate in this situation, but this is time consuming. Current research into refreshed testimony has only examined whether the opportunity to refresh memory once increases recall accuracy (Magner et al., 1996; Turtle & Yuille, 1994). It is not currently known how often practitioners allow their witnesses to refresh their memory, or how this may affect their recall. Given the time constraints in the criminal justice system, as evidenced by the lengthy delays between prosecution and trial (Ministry of Justice, 2012a), it can be expected that refreshed testimony, if it does take place, is likely to be provided only once.

Medium of Evidence

The medium of evidence used for refreshing a witness' memory may impact on the effectiveness of refreshed testimony. The original format of evidence (e.g. video-recorded interview, audio-recorded interview, written statement) is likely to determine the medium used for refreshing. However, it is possible in some cases to change the format of evidence if this is more suitable to the witness' needs and capabilities. Audio and video-recorded interviews, for example, can be transcribed into text and a written statement can be read aloud to a witness or audio recorded. For visually impaired witnesses, it is also possible to convert their statement/interview transcript into braille to permit refreshing. Current studies have not investigated the effect of different evidence mediums on the success of refreshed testimony. Research from other domains, such as education and advertising, however, suggest that some mediums are more successful at transferring information for subsequent retention and recall than others (Furnham, De Siena, & Gunter, 2002; Furnham & Gunter, 1989; Furnham, Gunter, & Green, 1990; Gunter, Furnham, & Griffiths, 2000; Walma van der Molen & van der Voort, 1997, 1998, 2000).

Information presented in an audio-visual format has been associated with superior recall accuracy compared to the use of a printed medium for information transfer (Furnham & Gunter, 1989; Furnham et al., 1990). Some researchers report the opposite, however, with printed materials resulting in better recall (Furnham et al., 2002; Gunter et al., 2000; Walma van der Molen & van der Voort, 1997, 1998,

2000). The effect of presentation medium on recall is explored experimentally in this thesis (Study 4) and a more detailed discussion of this relevant literature can be found in Chapter 6.

Witness Supervision

The final factor in refreshed testimony to be considered in this study is concerned with whether others are present when a witness reviews their testimony. Anecdotal evidence from practitioners makes it unclear as to whether witnesses are supervised, and if they are, by whom. Young and vulnerable witnesses require supervision to ensure that they attend to the information in their testimony but also to ensure and safeguard their welfare. The UK government makes it clear that safeguarding children and vulnerable individuals is everyone's responsibility to ensure they are protected from neglect or abuse to their safety and wellbeing (HM Government, 2013). The provision of refreshed testimony is no exception to this. However, if a family member or friend accompanies a witness, they may discuss the evidence, potentially changing the witness' memory for the event (Allan et al., 2012; French et al., 2008; Gabbert et al., 2003). Some witnesses may also feel pressured to memorise their testimony if an authority figure is present during refreshing.

As a separate but related issue, it is possible that witnesses may recall new details during refreshed testimony, or identify previous errors in their evidence (see Chapter 1 for literature on the recall of new information in a repeated retrieval attempt). If a witness is unsupervised during refreshing, or there is no record made of the process, either by video-recording the witness or by a practitioner produced report, there is no way to document any additional details and/or corrections if they emerge. Currently, there is no requirement for a record to be made when refreshed testimony takes place. There may be issues here around the potential completeness of a witness' evidence. If forensically relevant information emerges during refreshed testimony that was not reported during the initial investigation, there is currently no known mechanism in place to record that information.

3.1.2. Summary and Hypothesis

The above outlines a number of factors which can change the way a witness experiences refreshed testimony. These factors may also influence the effectiveness of refreshed testimony and subsequent recall ability, with potential implications for witness welfare. This study, the first in this thesis, investigates real-world refreshed testimony practices from the perspective of police officers. On the basis of previous research (HMCPSI & HMIC, 2012; Plotnikoff & Woolfson, 2004), and the currently limited availability of guidance, it was predicted that this study would find evidence of differing refreshed testimony practices in a sample of police officers in England and Wales.

3.2. Methods

A questionnaire was developed, peer reviewed and transferred into an online format, hosted by SurveyGizmo. All police forces in England and Wales were invited to take part in the study via online customer contact forms. Each police force was sent a web-link to the questionnaire and asked to circulate it only to officers who are actively involved in witness preparation. Practitioner members of the International Investigative Interviewing Research Group (iIIRG) were also contacted and asked to distribute the questionnaire to colleagues. The questionnaire was available to participants for 31 days between July and August 2011. An information sheet was displayed prior to the start of the questionnaire and informed consent was obtained electronically. At the end of the data collection period, the questionnaire was taken offline and all responses were collated and transferred into SPSS to allow descriptive and non-parametric data analyses to be performed. Thematic analysis (Braun & Clarke, 2006) was used to identify patterns and themes in the open response comments provided by participants at the end of the survey. This analysis was undertaken by two independent researchers (see Section 3.3.8 of this chapter for a more detailed description of this process).

3.2.1. Design and Questionnaire

The questionnaire was developed specifically for use in this study. Comments and suggestions on drafts were taken from multiple individuals with experience of the criminal justice process, or who work with witnesses to prepare them for court. The questionnaire was focussed on experience of police officers in

arranging and providing refreshed testimony in relation to the factors highlighted in the introduction of this chapter. The final questionnaire consisted of sixteen questions using either of two response types: category choice or written responses (see Appendix A for full questionnaire).

3.2.2. Participants

The sample consisted of 217 police officers from England[1]. No Welsh police officers chose to take part in this study. A breakdown of respondents into regional locations and occupations is displayed in Table 3.1. Some groups and regions were represented by a small number of respondents and were therefore collated to form the following: Major Crime Teams (Major Crime Unit, Domestic Violence Teams and the Child Abuse Investigation Unit); Detectives; Investigative Officers (all respondents who stated that they are involved in the investigation of a case); and Other (Traffic Officers, Chief Inspectors, CID and Neighbourhood Patrol). Regions were defined as South/South East (Surrey, Devon & Cornwall and Cambridgeshire) and North/North East (Northumbria and West Yorkshire). The distribution of participants between the two defined regional areas was skewed with 34 participants from the South/South East compared to 154 from the North/North East. As such, the survey results were not broken down to regional level for individual questions.

Despite analyses not being conducted at regional level, the distribution of respondents amongst occupations and locations is provided for the reader to give context as to the makeup of this sample.

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[1] Researcher was not in control of the number of police officers invited to take part in this research therefore it is not possible to determine a response rate for this study.

Table 3.1 Distribution of Participants in the Study 1 Sample by Occupation and Location

	Major Crime Teams	Detectives	Investigative Officers	Other[a]	Totals
South/South East	8	20	4	2	34
North/North East	4	49	76	25	154
Totals	12	69	80	27	188

Note: Totals reflect responses; some participants did not report location and occupation details.
[a.] Traffic Officer, Chief Inspector, CID, Neighbourhood Patrol

3.3. Results

It was hypothesised that the questionnaire would find evidence that refreshed testimony practices differ in England and Wales based on a sample of police officers. This was supported by the data. The data collected in this study violated the assumptions of parametric tests. Descriptive results are provided for the survey results, and where appropriate, non-parametric analyses are presented. The preferred method of analysis for the 'response option' data would be Chi-square. This would enable the frequency of response choices of each groups to be compared to determine whether there were differences between the options chosen by certain occupations in the sample. A Chi-squared analysis could not be completed in this case because response frequencies to some options were fewer than five for most of the questions, violating the assumptions of Chi-square. As some of the question response options were provided on a Likert-scale type of response, where the gradients between each response increased incrementally and equally (e.g. percentage of witnesses refreshed: 0-25%, 26-50%, 51-75%, 76-100%), Kruskall-Wallis tests were conducted where appropriate.

All tables in this chapter present the percentage of respondents who selected each option unless otherwise stated.

3.3.1. Prevalence of Refreshed Testimony

Question: On average, what percentage of your witnesses are refreshed?

The majority of respondents, regardless of location or occupation, reported that they refresh most (76-100%) of their witnesses (see Table 3.2 for response percentages). Fewer practitioners in 'Other' occupations (see Table notes) refresh the majority of their witnesses. Major Crime Team officers were most likely to report refreshing their witnesses in this sample. These findings reflect the existing research that most, but not all, witnesses are refreshed before giving evidence (HMCPSI & HMIC, 2012; Plotnikoff & Woolfson, 2004). However, there were no significant differences between the four groups on the likelihood of whether a witness would be refreshed or not, $H(3) = 1.25$, $p = 741$.

Table 3.2 Percentage of Respondents Reporting What Proportion of their Witnesses are Refreshed

	0-25% Witnesses	26-50% Witnesses	51-75% Witnesses	76-100% Witnesses
Major Crime Teams	13.6	.	.	86.4
Investigative Officers	8.3	4.7	6.0	81.0
Detectives	5.3	5.3	3.9	85.5
Others[a]	5.7	8.6	8.6	77.1
Total	7.4	5.1	5.1	82.5

Note: '.' Denotes zero responses in category
[a] Traffic Officer, Chief Inspector, CID, Neighbourhood Patrol

3.3.2. Delay

Question: How far in advance of the court appearance are witnesses typically refreshed?

From the sample it is clear that most witnesses are being refreshed on the day of the trial itself (92.1%). Investigative Officers, Detectives, and 'Other' occupations reported that they most frequently refresh witnesses on the day of the trial (see Table 3.3 for response percentages). For these witnesses, the delay between refreshing and giving evidence may be only a few hours. Officers from Major Crime Teams, however, were more varied in their responses. Over half reported that they refresh witnesses on the day of the trial; around a third, 1-2 days before. A small percentage

of respondents reported that they refresh their witnesses up to a week in advance of the trial. A one week delay is often included in eyewitness research to encourage forgetting (Gabbert et al., 2009; Gabbert, Hope, Fisher, & Jamieson, 2012; Krähenbühl & Blades, 2006a; Paterson et al., 2011). Including the same delay in refreshed testimony may therefore be detrimental to improving recall.

Table 3.3 Percentage of Respondents who Refresh Witnesses at Each Time Point

	On the Day	1-2 Days Before	2-3 Days Before	1 Week Before
Major Crime Teams	57.1	28.6	4.7	9.5
Investigative Officers	98.8	.	1.2	.
Detectives	90.8	5.3	2.6	1.3
Others[a]	100.0	.	.	.
Total	92.1	4.7	1.9	1.4

Note: '.' Denotes zero responses in category
   [a] *Traffic Officer, Chief Inspector, CID, Neighbourhood Patrol*

3.3.3. Format of Refreshing

Question: What format of evidence is most typically used during refreshed testimony?

The majority of respondents indicated that they most typically refresh their witnesses with a written statement (82.6%) or a combination of evidence formats (14.4%). Major Crime Teams reported that they most often used video-recorded interviews for refreshed testimony (see Table 3.4 for response percentages). This group is the most likely to deal with cases involving young and vulnerable witnesses, who will typically have a video-recorded interview (see Chapter 1). Traffic Officers and Neighbourhood Patrol Officers, on the other hand, typically deal with minor crimes where a full interview may not take place. This is reflected in the absence of 'Other' respondents reporting the use of both video and transcript testimony formats.

Table 3.4 Percentage of Respondents Using Different Formats of Evidence for
Refreshed Testimony

	Video	Transcript of Interview	Written	Combination
Major Crime Teams	22.7	.	40.9	36.4
Investigative Officers	1.2	.	92.9	6.0
Detectives	2.6	3.9	75.0	18.4
Others[a]	.	.	88.2	11.8
Total	3.7	1.4	82.6	14.4

Note: '.' Denotes zero responses in category
[a] *Traffic Officer, Chief Inspector, CID, Neighbourhood Patrol*

3.3.4. Single or Repeated Refreshing

Question: How many times is a witness permitted to refresh their memory?

Due to the phrasing of this question, it was not possible to establish whether reports of multiple opportunities for refreshing referred to several reviews taking place on one occasion (mass repetition) or on separate occasions (spaced repetition). Despite this limitation, the data offers some insight into current practice. Respondents who selected the 'other' response option provided additional details to elaborate. However, these respondents used this opportunity to make their own commentary, the contents of which were not related to the question so shall not be discussed further.

The majority of respondents reported that witnesses are given unlimited opportunities to review their testimony, regardless of the occupation of the police officer (see Table 3.5 for response percentages). Approximately one third reported that a witness has only one opportunity to refresh their memory.

Table 3.5 Percentage of Respondents Who Permit Witnesses Single or Multiple Opportunities for Refreshed Testimony

	Once	Twice	Unlimited	Other
Major Crime Teams	45.5	4.5	45.5	4.5
Investigative Officers	32.1	.	61.9	6.0
Detectives	39.5	2.6	52.6	5.3
Others[a]	22.9	.	74.3	2.9
Total	34.6	1.4	59.0	5.1

Note: '.' Denotes zero responses in category
   [a] *Traffic Officer, Chief Inspector, CID, Neighbourhood Patrol*

3.3.5. Supervision of Refreshing

Question: Is the witness ever video-recorded during refreshed testimony?

The majority of respondents (96.3%), regardless of occupation, indicated that they do not make a video-recording of witnesses during refreshed testimony. Only 3.7%, across the whole sample, responded that they video-recorded the process of refreshed testimony. Officers in Major Crime Teams were the most likely to record refreshing (13.6% of all Major Crime Team respondents), but overall this practice appears to be rare. It is possible that video-recording is more commonly used by Major Crime Team officers in this sample due to safeguarding requirements of young and vulnerable witnesses as discussed previously.

Question: Who (if anyone) is present during refreshed testimony?

This was an open response question and respondents could therefore identify multiple individuals. The data provides an overview of the variety of individuals that have been present during refreshed testimony on at least one occasion, based on this sample. A range of individuals were indicated, these included: Police Officer (115), Lawyer (27), Registered Intermediary (8), Witness Services (64), Friends/Family (37), Other Witnesses (52) (number of respondents given in parenthesis):. Twenty-three respondents indicated that witnesses were typically refreshed on their own.

As can be seen from these figures, police officers were reported most frequently as being present for refreshed testimony. This is not unexpected as police officers are identified as the primary practitioner group responsible for delivering refreshed testimony. Other groups such as Lawyers, Registered Intermediaries and Witness Service personnel could be expected as they are involved in supporting the witness through the justice system. Other witnesses, whether from the same or different cases, were also reported as having been present during refreshed testimony. This can occur if refreshing takes place in the witness waiting room, for example. If witnesses in the same case are being refreshed together, they may overhear additional or contradictory evidence from a co-witness, leading them to question or alter their own testimony. This is considered potentially poor practice.

3.3.6. Witness Instructions

Question: What do you tell the witness before they review their testimony? (i.e. what do you say the purpose is?)

Respondents provided short open responses to describe the instructions they give witness before refreshed testimony. These comments were coded by two independent researchers using thematic analysis (using the same methods as described in 3.3.8. of this chapter). Inter-rater reliability analysis identified a significant level of consistency between the two coders, Kappa = .85, $p < .001$. The coded responses indicated that practitioners give witnesses a variety of explanations for refreshed testimony. Some practitioners give witnesses no explanation, instead giving advice or other comments relating to the court experience (see Figure 3.1 for response totals).

The majority of respondents indicated that they inform witnesses that the purpose of refreshed testimony is to remind them of the original event, or to refresh their memory in general, without specifying whether this is memory for the event or the original interview. Respondents also reported that they instruct witnesses to refresh their memory for the original interview, with some explaining that refreshed testimony was designed to benefit both types of memory (event and interview). Where advice/other comments were reported, these typically included talking the witness through the process of giving evidence, without referring specifically to refreshed testimony. This suggests that some witnesses are not given an explanation,

or no clear explanation, as to why they are reviewing their original statement or interview and what benefit this might be to their ability to remember their evidence. It is also possible that police officers are unintentionally compromising a witness' evidence. As discussed in Chapter 1, legally, a witness must be able to recall the alleged event itself, not what they know themselves to have told the police when interviewed during the investigation. Informing witnesses that they are to remind themselves of their original interview, as the results of this survey suggest that some officers are doing, may therefore give the witness the wrong impression on what information they should recall in court.

Figure 3.1 Total Number of Respondents Using Different Refreshed Testimony Instructions
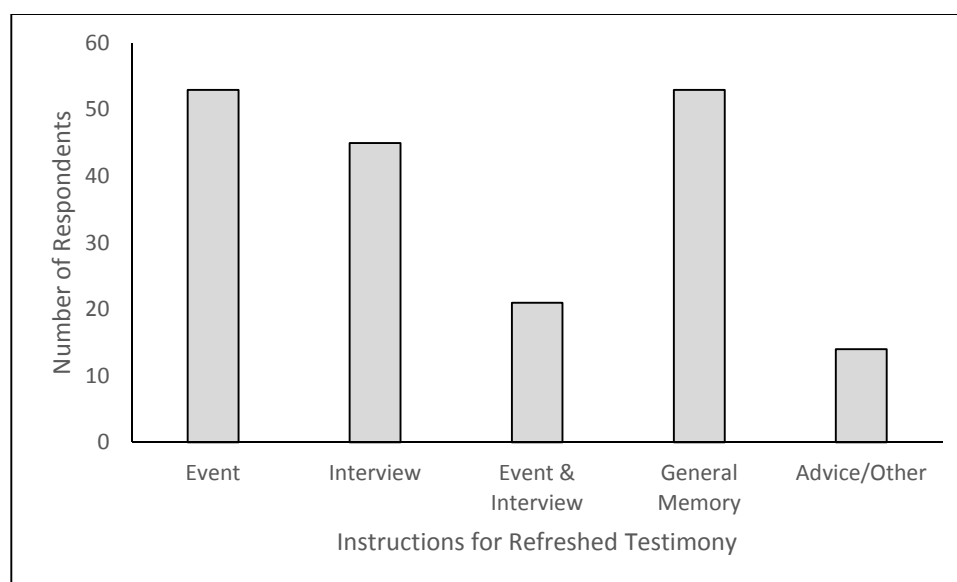
3.3.7. Location of Refreshing

Respondents were asked three separate questions to identify how often witnesses are typically refreshed in each of three locations: at the witness' home, in court or at a police station.

The responses in this sample suggest a preference amongst practitioners for refreshing at court but that this is not the only location used (see Figure 3.2 for percentage distributions). A small proportion of practitioners indicated that they used police stations or the witness' own home as a routine location for refreshing. It is likely that the courtroom is given preference due to its convenience. However, without conducting the necessary research it is not possible to assess whether this is

the most appropriate location in terms of recall accuracy (see introduction for discussion on the potential effect of location choice on recall).

No significant differences were found between the police occupation groups for the likelihood of refreshing a witness at court, $H(3) = 5.2$, $p = .156$, or in the witness' own home, $H(3) = 6.84$, $p = .077$. However, differences in the likelihood of refreshing a witness at a police station bordered on significance for occupation, $H(3) = 8.05$, $p = .045$. Mann-Whitney U tests were used to follow up this finding. A Bonferroni correction was applied and so effects are reported at a .0125 level of significance. The only significant effect observed between the groups was a higher likelihood that Major Crime Teams would refresh participants at a police station in comparison to Investigative Officers, $U = 648$. As the Major Crime Team category includes officers working on domestic and child abuse cases, it is more likely that they will interact with young and vulnerable witnesses. They would therefore require access to audio-visual equipment, available at a police station, in order to refresh video-recorded interviews, which may account for this finding.

Figure 3.2 Percentage of Respondents Indicating the Frequency that Specific Locations are used for Refreshed Testimony
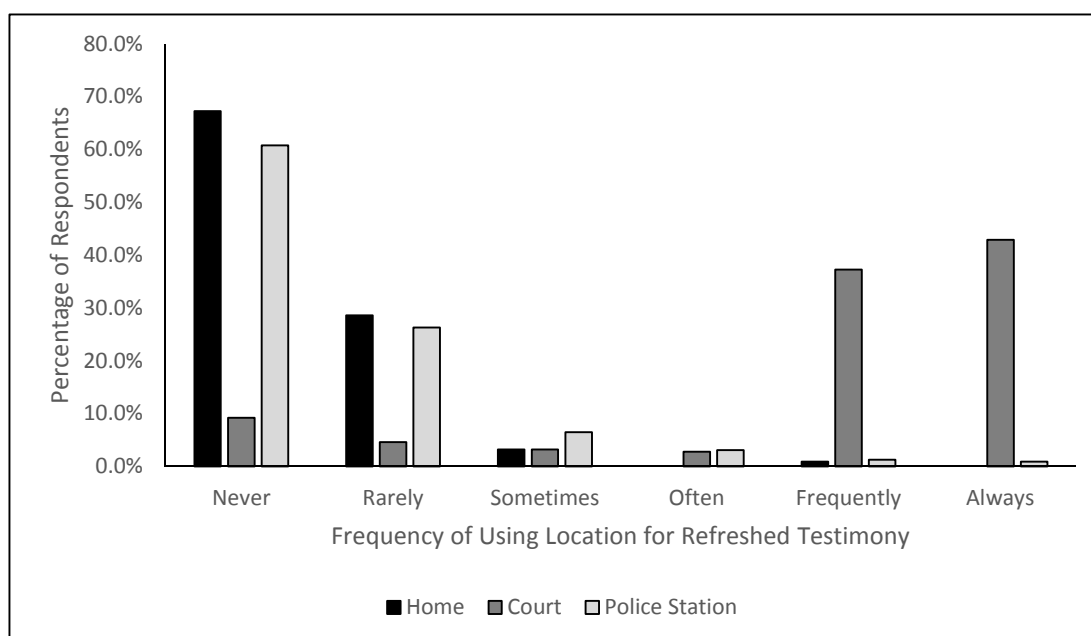
3.3.8. Practitioner Comments

Analysis

One hundred and forty-eight respondents provided additional comments at the end of the survey. Thematic analysis was used to identify patterns and themes within the comments (Braun & Clarke, 2006). This analysis was completed by two independent researchers. Both researchers first familiarised themselves with the data through multiple readings of all 148 comments, independently assigning temporary codes to specific comments. The two researchers then met to discuss their initial codes and to identify and agree common themes amongst the codes.

For example, the following two comments were given initial codes as 'delay in court/rushed preparation' for the former, and 'giving time for witness preparation' for the latter. Multiple comments with similar references to the timing of preparation or delay throughout the dataset led to the formation of a theme relating to the timing of refreshed testimony being agreed by both researchers.

Witnesses have very little time to prepare for giving evidence at court, they are often left waiting for hours sometimes days only for the defendant to plead guilty on the day of the trial.

Participant 87, Detective.

It may be useful for criminal justice units [who generally handle admin/file matters on behalf of the officer in the case] to send out a copy of their statement to witnesses a week or two before the trial date with some written guidance.

Participant 88, Other.

Multiple themes were agreed by the two researchers using the same process. These themes included Timing, Location, Training, Concerns, Perceived Benefits and Unrelated. After agreeing the themes the researchers recoded the dataset independently, categorising comments into each of the themes. As participants often made more than one point in each comment, two themes were permitted per comment. In the following quote, for example, the participant makes reference to both the timing of refreshed testimony but also the effect that this has on witnesses. As such, this comment was coded by both researchers into the theme of Timing and the theme of Perceived Benefits.

Witnesses are always happy that they get to read their statements again but it would be much better if they get to read them a couple of days before and then on the date of court. This facility is not in place at this time.

Participant 86, Investigative Officer.

Once the data was recoded into the agreed themes, the codes were quantified to provide an indication of how well represented each theme was within the dataset. The distribution of comments to each theme can be seen in Figure 3.3. Inter-rater reliability analysis found a significantly high level of consistency between the two coders for Theme 1, Kappa = .90, $p < .001$, and Theme 2, Kappa = 1.00, $p < .001$.

As can be seen in Figure 3.3, comments unrelated to refreshed testimony (other) formed the majority of the overall data. These comments will not be discussed further as they did not offer any insight into practitioner experiences of refreshed testimony.

Figure 3 3 Percentage of Respondent Comments by Theme
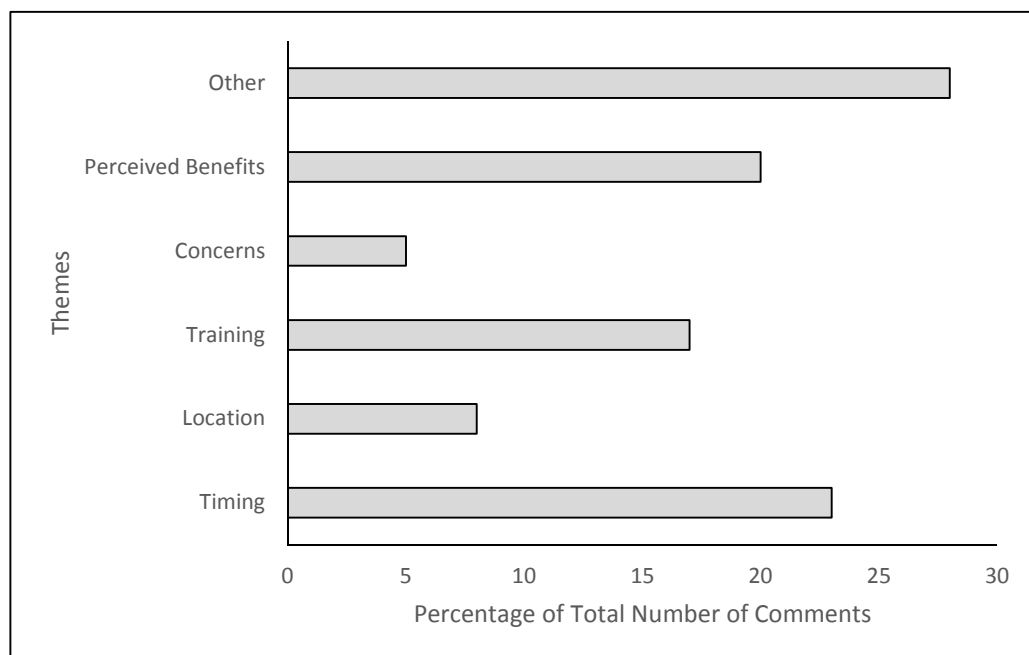
Themes in the Practitioner Comments

One of the identified themes focussed on the issue of training in refreshed testimony. A number of comments highlighted that refreshed testimony did not form part of the officers' training on witness preparation and that guidance on this process is limited. As one respondent reported:

"Current procedures are left to the discretion of the officer in charge of the case and there is very little guidance. Official policy or guidance would be beneficial to both police and witnesses. I cannot recall receiving training around this subject"

Participant 203, Investigative Officer.

Although the majority of comments expressed that training in refreshed testimony would be beneficial, three of the twenty-five comments in this theme stated no training was required. Concerns were also identified in the comments that some respondents felt that refreshed testimony could be misconstrued as witness coaching and subsequently used by the defence to discredit eyewitness testimony in court (as can be seen from the quote below). This suggests that training and/or guidance is necessary to ensure that this process is properly understood by those with the responsibility for delivering it.

"Benefits of the witness only refreshing their testimony at court, in a controlled environment, is that there can be no suggestion that the witness has 'rehearsed' their evidence or has been 'coached' in what to say."

Participant 80, Detective.

Location and the timing of refreshed testimony were also highlighted by respondents. It emerged in the comments that the choice of location, and timing of refreshed testimony, are likely to be determined by the format of the witness' evidence (e.g. in court if it is a written statement or at a police station if it is a video-recorded interview). This affirms the assumptions made in the introduction to this chapter that the choice of location would primarily be based on logistics.

"A written statement is normally given to the witness by prosecution council and they will inform the witness that the statement is to remind them. I have only once provided a child victim of an allegation of rape to watch her video prior to trial. This took place at a police station with her mother present. The victim did not want to watch the video at home however she was given the opportunity to do this.

Participant 12, Detective.

"Depending on the form of interview the person made dictates the way they can refresh their evidence. If it is a written statement they will see it at court prior to giving evidence. A video would be shown the day before or at the best time for the witness."

Participant 66, Detective.

Many respondents expressed dissatisfaction with the current procedures of refreshing. As one individual commented, *"...there has to be something better in place, than the witness being handed his/her statement 10 minutes before trial, as happens now."* (Participant 209, Investigative Officer). However, potential benefits to witness welfare were highlighted as a common theme in the commentary. Respondents made frequent reference to the increased confidence which can occur when a witness is permitted to view their statement before court. This would suggest that refreshed testimony may have benefits for both memory recall and the wellbeing of eyewitnesses.

"...I often find witnesses are nervous about appearing at court and one of their major concerns is not remembering what they originally said. It is a regular occurrence that giving the witness the opportunity to read their statement settles their nerves prior to entering the court room."

Participant 82, Detective

3.4. Discussion

The data in this study are novel and significant. Although previous research has touched on refreshed testimony as part of a broader remit (HMCPSI & HMIC, 2012; Plotnikoff & Woolfson, 2004), Study 1 is the first of its kind to look at refreshed testimony practices in detail. As hypothesised, the data from this sample shows that the delivery of refreshed testimony is not formally standardised and, based on the practitioners' responses, there appears to be limited guidance and training available. Inconsistencies have been identified across all the factors in refreshed testimony including: when, where and how often refreshing takes place; the format of evidence used; witness instructions; and whether a witness is supervised during refreshing. As discussed in the introduction to this chapter, some of these practices may have a detrimental impact on the recall ability of an eyewitness in court. These findings therefore highlight a pressing need to further explore refreshed testimony in the literature, both experimentally and through

qualitative research, to advance our understanding of this practice and its potential benefits and dangers to witness welfare and recall ability.

Nominal differences in the responses of different police occupations were identified within the sample in this study. These mainly included differences between respondents who identified themselves as working in one of the Major Crime Teams compared with 'other' occupations (e.g. Traffic Officer, Neighbourhood Patrol). These findings suggest that refreshed testimony is delivered differently, depending on the type and severity of a case or the type of witness. Low-level crimes, such as traffic offences, may be seen in court relatively quickly and require limited evidence from eyewitnesses. Officers dealing with these cases indicated that they were less likely to refresh a witness, more likely to use written statements, and would typically refresh a witness on the day of a court appearance. On the other hand, Major Crime Team units are likely to handle complex cases involving young and vulnerable witnesses, requiring a video-recorded interview and more in-depth witness preparation. These respondents were more likely to indicate that they refresh the majority of their witnesses, do so further in advance of the trial, and use video-recorded interviews as well as written statements for refreshing. That being said, these differences, on the whole, were mainly observational. Where statistical analyses have been performed, the majority of the perceived differences were not found to be significant.

This study has highlighted issues beyond the practicalities of administering refreshed testimony. Some respondents in the sample voiced concerns based on an apparent perception of refreshed testimony within the criminal justice system. Currently, there appears to be a danger that refreshed testimony is being misconstrued as a form of witness coaching by a few individuals who are unfamiliar with the true nature of the practice. The coaching of witnesses through their testimony is not permitted in England and Wales, unlike in the United States. The Bar's Code of Conduct (paragraph 705) makes it clear that "a barrister must not... ...rehearse practise or coach a witness in relation to his/her evidence". Doing so can cast serious doubts on the evidence of an eyewitness who is thought to have been coached, making their testimony inadmissible. This misconception may prevent some police officers from offering witnesses the opportunity to refresh if there are fears that doing so may compromise the reliability and validity of their evidence.

Overall, the findings of this study suggest that there is a benefit, for both witnesses and practitioners, in raising awareness in the criminal justice system of refreshed testimony as a legitimate practice. Supplementing this with the introduction of official guidance and training on refreshing would encourage practitioners to take a consistent approach to the delivery of refreshed testimony to witnesses. It is acknowledged that any guidance would need to be flexible to adapt to the needs of witnesses, and practitioners, which will differ per individual case and may change for the same witnesses as a trial progresses. The production of such guidance will be considered in greater detail later in this discussion.

3.4.1. Methodological Issues

Study 1 makes a valuable contribution to the literature, however, there are a number of methodological issues to consider which limit the analyses and interpretation of the results. If this questionnaire study were to be replicated in the future, it is recommended that the population sample be expanded and made more representative. The questionnaire itself could be improved with additional questions to provide a more rounded understanding of the population sample's experiences and their need for training and guidance. These opportunities were missed in the present study, as discussed below.

Population Sample

All police forces in England and Wales were invited to take part in this study. Participation in the survey was by self-selection and therefore it is not a truly random sample. This is evidenced by clusters of respondents from the same regions and the fact that only five police forces are represented in the sample (see methods for sample details). Furthermore, Study 1 had a sample size of 217. Compared to the total number of officers at the time of the study, 134,101 officers at the end of March 2012 (Amardeep, 2012), this may be considered an insufficient sample size to be representative of the total police force covering England and Wales. The Home Office Report (2012) on officer numbers does not state what proportion of officers from the overall total are directly involved with preparing witnesses for court, and would therefore have experience of refreshed testimony. Without knowing this proportion it is difficult to make an accurate assessment as to how representative the sample is.

The questionnaire was distributed electronically and therefore the researcher had no control over who was invited to take part in the study. Although the information sheet made it clear that the questionnaire was aimed only at officers with direct involvement in preparing witnesses to give evidence in court, it is acknowledged that some respondents may have limited or no experience of refreshed testimony (one respondent indicated in the additional commentary that he had been unaware of the practice until he had taken part in the survey). However, the majority of respondents appear to have had some level of experience with refreshing as only a minority reported that they refreshed between 0 and 25% of their witnesses.

The current study sampled one profession from the criminal justice system. As the findings of this questionnaire demonstrate, a number of other occupations can also be involved in the delivery of refreshed testimony to witnesses. Groups such as the Crown Prosecution Service and Victim and Witness Services were not targeted in this survey as the Achieving Best Evidence Guidelines (2011) identified that it is the responsibility of the officer in charge of the case to arrange refreshed testimony. However, future research into this topic would benefit from widening the sample to additional occupations. This would provide a more comprehensive overview of practitioner experiences of refreshed testimony from multiple perspectives.

Although there are difficulties in assessing how representative the sample is of the police force population as a whole, it is argued that a sufficient sample was gathered in this study compared to previous research. Earlier research has gathered data of witness and practitioner experiences within the criminal justice system using much smaller samples and have only looked at refreshed testimony from the witness' perspective (HMCPSI & HMIC, 2012; Plotnikoff & Woolfson, 2004). As the first of its kind to provide a comprehensive assessment of real world refreshed testimony practices, the sample size in Study 1 is considered adequate for this initial investigation. It is recommended that the sample population be expanded if future research in this topic is undertaken.

Questionnaire Design

This study used an original questionnaire which was designed specifically for this thesis. Comments and suggestions on the phrasing and content of the questionnaire were sought from peers with knowledge of the criminal justice system

and experience of refreshed testimony (see Methods section). It was the aim of the researcher to limit the number of questions to as few as possible to ensure that the questionnaire was not excessively time consuming to complete for practitioners, given the demands on their time.

Despite repeatedly reviewing the questionnaire prior to distribution, there remains room for improvement in the design for certain questions in particular. As mentioned in the results section of this chapter, there are limitations to the conclusions which can be drawn from the question relating to the number of times a practitioner allows a witness to review his/her evidence (see Q.7, Appendix A). This question, and its response options, cannot differentiate between single, spaced or mass repetition as the phrasing of the question was not specific. A second question to clarify the distinction between the differing ways in which refreshed testimony can be provided repeatedly (i.e. massed or spaced repetition) would have enabled a more meaningful analysis of this data.

Similarly, additional questions in the survey to enrich our understanding about the sample population and their level of experience with refreshed testimony would have been beneficial. For example, a measure of how often respondents are involved in preparing witnesses for court, whether this is a routine part of their job or something they are infrequently responsible for, could have been included. This would have provided an indication of whether an individual's responses were based on limited or extensive experience of delivering refreshed testimony. Furthermore, a specific question on training and guidance for the delivery of refreshed testimony would have been valuable. Information on training and guidance reported in this chapter was gathered from the 'additional comments' section of the questionnaire and therefore the majority of respondents in this sample did not reference training or guidance needs. Inclusion of these additional questions in future research would provide evidence of whether there is an appetite for further work around refreshed testimony best practice from a practitioner perspective.

3.4.2. Future Directions

The results from Study 1 have evidenced that refreshed testimony practices in England are not standardised amongst the police force as a whole, based on this sample. It has also evidenced that differences in practice occur within occupation

groups. As discussed in this chapter's introduction, there are a number of implications associated with the varying practices that have been documented in this questionnaire. Some of these may be potentially harmful to a witness' recall ability in court. However, further research is required before this can be stated with any certainty. It is clear from elsewhere in the literature that the use of empirical evidence in the criminal justice system, to identify best practice and produce guidance, has led to improvements in processes and the quality and reliability of eyewitness evidence. Both interview and identification parade procedures are examples where the development of guidelines based on empirical evidence have identified best practice, reduced bias and improved eyewitness evidence (Criminal Justice System, 2011; Gronlund, Carlson, Dailey, & Goodsell, 2009; Horry, Memon, Milne, Wright, & Dalton, 2013; Lindsay, Lea, & Fulford, 1991; Searcy, Bartlett, & Memon, 2000; Valentine, Darling, & Memon, 2007; Valentine & Heaton, 1999; Wilcock, Bull, & Vrij, 2005). The findings of Study 1 suggest that delivery of refreshed testimony could also benefit from focussed research in a similar way.

It would be the recommendation from this research that the Crown Prosecution Service in collaboration with the Ministry of Justice, and supported by ongoing empirical research, should look to introduce best practice guidelines for the delivery of refreshed testimony. Doing so would support a range of practitioners including Police Officers, Witness Service staff, and Registered Intermediaries. The introduction of guidance could also be used to raise awareness that refreshed testimony is a legitimate practice and not a form of witness coaching, dispelling some of the views expressed in Study 1. That being said, before best practice guidelines can be developed a gap in the refreshed testimony literature needs to be filled. This chapter has outlined a number of practical and theoretical factors that may influence the effectiveness of refreshed testimony, few, if any, of which have been investigated in this context to date.

First, it is appropriate to investigate whether refreshed testimony measurably improves eyewitness accuracy overall, before turning attention towards additional variables, such as when and where refreshed testimony takes place. If refreshed testimony does not improve the quality of eyewitness recall and accuracy there is little benefit in pursuing the development of guidance, from a memory perspective at least. Currently, there is limited evidence in the literature. Existing studies do

suggest that refreshing memory before a delayed repeated retrieval attempt will improve recall accuracy (Magner et al., 1996; Turtle & Yuille, 1994). This would suggest that some witnesses are at a disadvantage in court if they are not offered the opportunity to refresh their memory before giving evidence. However, the methodologies of these two studies (Magner et al., 1996; Turtle & Yuille, 1994) are not directly comparable to the real world experience of witnesses and therefore further research into refreshed testimony is required (see Chapter 4). The remainder of this thesis investigates the potential for refreshed testimony to improve recall through a series of experimental studies on child and adult witnesses, presented in Chapters 4, 5 and 6.

Chapter 4: Refreshed Testimony, Recall Accuracy and Cross-Examination Performance in Children

Chapter Overview:

This chapter presents the first experimental study of this thesis. It investigates the potential effect of refreshed testimony using a video-recorded interview on memory recall, accuracy and cross-examination performance. Based on memory theory and existing evidence, it was hypothesised that memory recall and accuracy would increase after refreshed testimony. 11-12 year old children viewed a live event and gave an interview based on best evidence practices shortly afterwards. This was followed by a scripted cross-examination two weeks later. Half the children watched a video-recording of their original interview before cross-examination; the other half completed a filler task. Refreshed testimony was not found to have any effect on recall accuracy and cross-examination performance in this study. Both refreshed and control participants recalled the event equally and were just as likely to change their responses during cross-examination. In line with the literature, open questions were identified as producing more accurate responses during the cross-examination in comparison to closed and forced-choice questions. The influence of stimulus familiarity, context reinstatement and the absence of an unbiased measure of repeated recall in this study are discussed.

4.1. Introduction

Chapter 1 highlighted the challenges facing eyewitnesses as a result of lengthy delays between giving their initial statement and coming to court to give evidence. Based on a Fuzzy-Trace Theory of memory, it was argued that refreshed testimony could mitigate the deleterious effect of delay between recall attempts. By increasing memory trace strength and the availability of retrieval cues, memory recall and accuracy for both verbatim and fuzzy trace details of a witnessed event are predicted to improve (see Chapter 1 for detail). Chapter 2 continued this discussion and considered whether the benefits of refreshed testimony would extend to cross-examination performance. In discussions of interrogative suggestibility and the misinformation effect, it was considered whether improved memory trace strength would allow witnesses to resist suggestive questioning and perform source

monitoring to differentiate between the witnessed event and post-event information more accurately (see Chapter 2 for detail). To date, only two empirical studies have investigated the effect of refreshing on recall. Both of these found evidence of improved recall after refreshed testimony in comparison with non-refreshed groups (Magner et al., 1996; Turtle & Yuille, 1994). Study 2 of this thesis is the first in a series of experiments which aims to extend the existing refreshed testimony research to investigate whether measurable benefits to both memory recall and cross-examination performance can be observed after refreshing. Study 2 aims to replicate the current literature using an experimental design that comes closer to the real-world experience of witnesses than was used in this earlier research. An overview of the methodology and results of existing refreshed testimony research is therefore relevant at this point.

In the first of the two existing studies (Turtle and Yuille, 1994), participants were shown a brief (4.5 min) video recording of a simulated armed robbery as the to-be-remembered event. The effect of repeated interviews on recall, as well as refreshed testimony, was investigated in this study. The number of recall attempts, and the timings thereof, were manipulated in addition to the main experimental condition (refreshed testimony). Turtle and Yuille used a six group design as follows: two groups (one refreshed, one non-refreshed) made a recall attempt immediately after the witnessed event, and made repeated recall attempts at one-week intervals for three weeks (four recall attempts in total); two groups (one refreshed, one non-refreshed) made a recall attempt immediately after the witnessed event, and one repeated recall attempt after three weeks (two recall attempts in total); one group made a single delayed recall attempt after three weeks; the final group made a single immediate recall attempt.

Before the first recall attempt, participants in the Turtle and Yuille study were provided with written instructions which suggested mnemonic techniques to improve recall, based on the four main components of the cognitive interview (context reinstatement, report everything, recall the event in different orders, change perspective to consider what someone else may have seen (Fisher & Geiselman, 1992; Memon et al., 2010). The researchers argued that their methods were forensically relevant as they were investigating memory and that the cognitive interview is a well-documented technique for improving recall. However, this

opinion can be challenged based on the way that participants recorded their memory of the to-be-remembered event. There was no participation in a verbal interview in this study, nor in the Magner et al. (1996) study. Turtle and Yuille required participants to complete sheets of paper, which provided space for 16 details to be recorded (participants also answered 10 questions on forensically relevant details from the video and attempted to identify the two suspects). Recording recall in this way does not accurately represent the experience of real-world witnesses who would be encouraged to make a free recall of the event before being asked more specific questions by an interviewer (Achieving Best Evidence Guidance, 2011). Nor does it closely replicate the experience of completing a witness statement where a full and complete narrative is encouraged, as would be in a verbal free recall.

Both groups that made weekly recall attempts in the Turtle and Yuille study, whether or not they reviewed their previous statement beforehand, showed a limited decline in the total number of details recalled between the first and final recall attempt. This is consistent with a Fuzzy-Trace Theory of memory and the repeated interview literature (see Chapter 1). The act of accessing a memory trace, in itself, strengthens that trace, making the successful retrieval of that information in a future recall attempt more probable (Anderson et al., 1994; Chan & LaPaglia, 2011; Danker & Anderson, 2010; Roediger & Butler, 2011; Roediger & Payne, 1982). The refreshed group which recalled the witnessed event on a weekly basis therefore did not benefit from refreshed testimony as a way to preserve and strengthen their memory as there was no significant difference between the recall of the refreshed and non-refreshed groups. Comparatively, the two groups who made only two recall attempts (an immediate recall and a repeated attempt after a three week delay) did evidence benefits of refreshed testimony. Unlike those making weekly recall attempts, these two groups showed signs of memory decay between the initial recall and the final recall three weeks later. As a result of the delay, there were significant differences in the recall of refreshed and non-refreshed groups in this condition. The refreshed group recalled a greater number of accurate details in the final recall attempt, demonstrating greater accessibility to their memory, compared to the non-refreshed group.

Although the Turtle and Yuille study was focussed on the effect of repeated recall on reminiscence (the recall of new information in a repeated interview) and

hypermnesia (an increase in the net recall across repeated interviews), their data provides the first empirical evidence that refreshed testimony can improve recall in a repeated interview after a delay. The second study focussed specifically on the question of refreshed testimony and therefore their findings are perhaps more relevant here (Magner et al., 1996). This study also used a brief (2 min) simulated crime video (depicting a bank robbery) and all participants made an immediate recall attempt and a repeated recall attempt after a two-week delay. The number of repeated recall attempts and the length of delay were kept consistent for all participants. However, Magner et al. chose to manipulate the content of the materials used for refreshed testimony. They examined whether refreshing memory with one's own account of an event would have a different effect compared to refreshing with an account produced by someone else. Participants were refreshed either with their own written statement or a statement prepared by the experimenters. Two versions of the experimenter statement were prepared: one accurate, one inaccurate. The control group was not refreshed. In a real-world context, a witness would never experience refreshed testimony with the evidence of another witness. Nevertheless, it is possible that a witness may be exposed to post-event information through co-witnesses and the media (as evidenced in Study 1 of this thesis, see Chapter 3). The additional manipulation included by Magner et al. allows it to be considered whether media summaries of events can act as a form of refreshed testimony for witnesses. If so, are misinformation effects be observed as a result?

The methods used to measure recall in the Magner et al. study are arguably more reflective of a real world experience of giving a written statement than those in Turtle and Yuille. Participants were asked to write as detailed an account of the witnessed event as possible, similar to the requirements when providing a police written statement. The same method of recall was used for the repeated recall attempt after a two-week delay. Still, a face-to-face interview did not take place and participants were not required to respond verbally to questioning at any point. Thus the methods used by Magner et al. are more forensically relevant than those used in Turtle and Yuille but fall short of replicating the real-world experiences of eyewitnesses giving evidence and being cross-examined in court.

The findings of the Magner et al. study mirror those of Turtle and Yuille. Non-refreshed controls were the least accurate in their second recall attempt than any

of the other refreshed groups (own, experimenter accurate, experimenter inaccurate). Not surprisingly, misinformation effects occurred in the group who read an inaccurate account of the witnessed event fabricated by the experimenter. This suggests that post-event information encountered in the media coverage of a crime can become part of a witness testimony in the same way as traditional misinformation research has demonstrated (Davis & Loftus, 2007; Gabbert et al., 2012; Loftus et al., 1978; Principe & Schindewolf, 2012). A more focussed analysis of the recall of non-refreshed controls and participants refreshed with their own statement (in Magner et al.) revealed that refreshed witnesses recalled a greater number of details and were more consistent in their recall between the first and second attempt: if they reported a detail in the first statement, they were more likely to report that same detail in the second attempt. This fits with a Fuzzy-Trace Theory of memory, as discussed in Chapter 1, as the opportunity to refresh can be argued to have strengthened the memory trace for previously reported details, making them more accessible in the second recall attempt. Non-refreshed participants on the other hand did not have the opportunity to strengthen memory traces after the delay between the first and second recall attempt and therefore omitted a greater proportion of previously recalled details than the refreshed group.

Evidence of potentially negative effects of refreshing were also observed in the Magner et al. study. As discussed in Chapter 3, the timing of refreshed testimony may impact on the ability of a witness to recall non-rehearsed details of an event i.e. details not originally reported during their initial interview, due to retrieval induced forgetting (Anderson et al., 1994; Ciranni & Shimamura, 1999; MacLeod, 2002; Shaw et al., 1995; Storm, Bjork, & Bjork, 2007). Magner et al. observed that refreshed participants recalled fewer new details in the second recall attempt than those who were not refreshed. Reviewing their earlier statement may have prevented refreshed participants from accessing new details due to the increased memory trace strength of previously recalled details, resulting in retrieval-induced forgetting. Forensically, if witnesses are prevented from accessing memory for details not discussed in their police interviews, for which a memory trace exists, this could impact on their ability to respond to cross-examination questioning in court.

Despite the potential benefits to eyewitness memory, suggested by the above research and memory theory, the existing studies are limited in their applied

relevance. As highlighted, the effect of refreshing memory on verbal recall ability has not been assessed in the existing studies. Furthermore, although both studies included a series of specific questions after the recall of the event, these questions were non-leading, were responded to in writing and did not replicate the complex and challenging nature of cross-examination. As such, neither study can inform on the potential effects of refreshed testimony on cross-examination, a fundamental element of the criminal justice process. It is therefore the aim of this thesis to investigate refreshed testimony using a more forensically relevant experimental design, as will be described.

4.1.1. Summary and Hypotheses

Chapters 1 and 2 established the theoretical rationale for Study 2. The negative effects of delay on memory trace strength, between an initial and repeated recall attempt, identified an opportunity to improve recall after a delay. Based on a Fuzzy-Trace Theory of memory, and the experimental evidence reviewed in this chapter, it is proposed that refreshed testimony can mitigate the effects of decay by improving memory trace strength, and strengthening retrieval cues, to enhance memory recall, accuracy and cross-examination performance. It is therefore predicted that non-refreshed participants will have lower recall accuracy and poorer cross-examination performance compared to those provided with refreshed testimony in the current study. As such, the following hypotheses were tested in Study 2.

1. Refreshed testimony will improve memory recall and accuracy compared to the control group.

2. Refreshed testimony will improve cross-examination accuracy compared to the control group.

The opportunity to include both complex and best practice question types in the cross-examination element of study allowed the effect of these different question types on accuracy to be explored. The extensive interviewing literature, as discussed in Chapter 2, clearly identifies that open questions produce a greater volume and accuracy of information from eyewitnesses. It was therefore expected that:

3. Open questions will produce more accurate responses than closed and forced-choice questions.

4.2.   Methodology

Studies into eyewitness memory typically use a variation of the same experimental design. There is a witnessed event, a recall attempt, and a period of delay before a repeated recall attempt. Experimental manipulations can take place at one or several of these stages depending on the particular research question. Within this experimental design there are a number of factors to consider: the sample population, type of to-be-remembered event, the length of delay to be used, how recall will be measured etc. The rationale behind the experimental design for Study 2 is based on these considerations.

4.2.1.   Sample Population

Previous research investigated the effect of refreshing memory on recall in adults only (Magner et al., 1996; Turtle & Yuille, 1994). Both Chapters 1 and 2 discussed the potential differences in the episodic recall of young children and adults. Although young children can be just as accurate as adults when questioned appropriately, they have not yet developed sophisticated retrieval mechanisms. As a result, children spontaneously recall fewer details than adults but are no less accurate (Ceci & Bruck, 1995a; Klemfuss & Ceci, 2012; Lamb & Brown, 2006; Spencer & Lamb, 2012; Walker, 1993). Children also forget more information over delays between recall attempts (Flin et al., 1992). If children are forgetting more information over delays than adults, and are likely to recall fewer details to start with, refreshed testimony may potentially be of greater value to child witnesses than to adults, although any such benefits may be more difficult to detect. Cross-examination has been shown to be particularly challenging for young and vulnerable witnesses and they are therefore in need of greater assistance in their performance in court (Plotnikoff & Woolfson, 2004, 2009, 2012). As such this group was selected as the target population for the current study.

The Youth Justice and Criminal Evidence Act 1999 (YJCEA 1999) defines young witnesses as any individual under the age of 18. Access to very young children could not be arranged with a local school therefore a secondary school was approached in Surrey, UK. Previous research has successfully used a scripted cross-examination with a 9-10 year old sample, which falls roughly at the median age of the target population (under 18s). Therefore the youngest year group from the

secondary school (Year 7) was selected as the sample population, comprised of children aged between 11 and 12 years.

4.2.2. To-Be-Remembered Event

Eyewitness studies can present to-be-remembered information in a number of ways, some of which are more forensically relevant than others. A still image slide (Loftus & Palmer, 1974), or series of slides (MacLeod, 2002; McCloskey & Zaragoza, 1985; Porter, Yuille, & Bent, 1995), has been used in some studies to depict a crime or crime scene. This form of to-be-remembered information benefits from being easy to construct and control, but lacks ecological validity as it contain a limited range of stimuli. Still image slides are less cognitively demanding to process than real time events where both audio and moving visual stimuli are processed simultaneously. Studies have replicated the more advanced cognitive load by using video-recorded crime simulations (Perry et al., 1995; Scrivner & Safer, 1988; Sharman & Powell, 2012; Turtle & Yuille, 1994) and live-events with neutral or negative content (O'Neill & Zajac, 2013; Valentine, Davis, Memon, & Roberts, 2012; Zajac & Hayne, 2003, 2006), as a witnessed event.

Video-recorded crime simulations can present more emotional content, similar to witnessing a real crime event. Simulated crimes typically depict a non-violent theft (Sharman & Powell, 2012) or neutral event (Thierry et al., 2001). However, violent crimes have also been used (Scrivner & Safer, 1988; Turtle & Yuille, 1994; Vredeveldt, Hitch, & Baddeley, 2011). Video-recorded events provide an objective record against which the accuracy of recall can be verified. Despite these advantages, participants are aware that the observed event is fictional and are therefore unlikely to experience the full range of cognitive and emotional responses evoked by a real crime event. This may affect their memory and recall compared to real-world witnesses. Live-events more realistically simulate the real-world experience of eyewitnesses. Examples of live events used in previous studies have included visits to a police station (Zajac & Hayne, 2003, 2006), and staged confrontations between actors (Valentine et al., 2012).

To simulate a real-world experience most accurately, a neutral live event is the preferred means of delivering the to-be-remembered information. A live event was selected for Study 2 on this basis and due to its successful use in previous cross-

examination research using a similar age group (Zajac & Hayne, 2003, 2006). Study 2 used a police safety assembly as the chosen event. Acknowledging the benefits of having an objective account of the witnessed event in experimental research, the assembly was video-recorded to allow recall to be coded for accuracy.

4.2.3. Delay

As discussed in Chapter 1, delay in an eyewitness context includes both the delay between the original event and the witness' first interview and between the first interview and any subsequent repeated interviews. This study included both types of delay to accurately reflect the eyewitness experience where a police statement/interview may not occur immediately after a witnessed event. The delay between viewing the to-be-remembered event and making the first recall attempt was therefore two or three days depending upon the testing schedule and the availability of the children.

Delays between the investigative interview and giving evidence in court are typically several months to over a year in England and Wales (Ministry of Justice 2012). Delays of this length have been used in previous cross-examination research (Zajac & Hayne, 2003, 2006), however, due to the time and resource constraints on doctoral research it was not possible to include similar delays in this study. Previous research has observed sufficient levels of forgetting after delays of one week (Gabbert et al., 2009; Gabbert et al., 2012; Krähenbühl & Blades, 2006a; Paterson et al., 2011), and delays as brief as one or two days (Bjorklund et al., 2000; Bornstein & Zickafoose, 1999; Karageorge & Zajac, 2011). Based on previous refreshed testimony research, a two-week delay was included between the first and second recall attempts (Magner et al., 1996). Based on the literature, this delay is considered more than sufficient to induce forgetting to prevent ceiling effects.

4.2.4. Refreshed Testimony and Recall Measure

In earlier refreshed testimony research, written statements have been used to both refresh memory and measure recall accuracy (Magner et al., 1996; Turtle & Yuille, 1994). Although many witnesses will provide a written statement as evidence, young and vulnerable witnesses in England and Wales typically have a video-recorded interview (YCJEA 1999). The effectiveness of video-recorded interviews as a means of refreshing memory has not been investigated to date. As

the sample population in this study is child witnesses, it is most appropriate to investigate the effectiveness of video-recorded interviews as a means of refreshing memory to increase the applied relevance of the results. Furthermore, witnesses are verbally questioned in court during cross-examination. It is therefore relevant to pursue the investigation of refreshed testimony with methodology more closely aligned to the real-world experience of witnesses. This study required participants to make verbal recall attempts both before and after the delay.

4.2.5. Cross-examination

Cross-examination style interviewing (as reviewed in Chapter 2) has been simulated in previous research using scripted interviews (Zajac & Hayne, 2003, 2006) and trainee barristers (Valentine & Maras, 2011). Although the use of trainee barristers increases the likeness to the real-world experience of a witness, it is not possible to keep the type of questions or the volume of questions used for each participant consistent with this method. A scripted cross-examination was therefore used in the current study to standardise questioning and increase experimental control. The script was modelled on the style of typical cross-examination interviews (Brennan, 1995; Brennan & Brennan, 1988; Lamb & Fauchier, 2001; Walker, 1993; Zajac et al., 2003) and experimental research (Zajac & Hayne, 2003, 2006).

The cross-examination script in Study 2 utilised multiple question types, including open, closed, forced-choice and 'shift' questions, to allow a comparison to be made between the best practice and cross-examination style questions. Shift questions purposefully challenged the accuracy of a previous response, aiming to get the individual to change his/her evidence during questioning. The shift questions used in Study 2 were modelled on those used in Zajac and Hayne (2003; 2006), an example of a shift question is provided in the methods section of this chapter.

4.3. Methods

4.3.1. Participants

Ethical approval was granted for this study by Royal Holloway, University of London's Psychology Ethics Committee. Participants were recruited from a secondary school in Surrey, UK, by permission of the Head Teacher. Parental consent was obtained and each child gave verbal consent to take part at the start of both sessions. One child withdrew consent at the start of Session 1. They were debriefed and removed from the study.

In total, 39 participants took part. One participant was removed from the sample as the video-recording of their second session ceased due to insufficient storage space on the recording equipment. The final sample totalled 38 children (18 male, 20 female), aged between 11 and 12 years old (average age = 12 years 2 months). Participants were randomly allocated to each condition: nineteen participants (9 male, 10 female) in the refreshed group and nineteen in the control group (9 male, 10 female).

4.3.2. Interviewers

The interviews and cross-examinations were conducted by two researchers. Researcher A conducted all the Session 1 interviews and Researcher B conducted all the cross-examinations. Researcher A received Cognitive Interview training from Professor Amina Memon as part of the Royal Holloway Eyewitness Lab Group in 2011. Researcher B had limited interviewing experience, however the cross-examinations were scripted and the researcher received training in the interview protocol in advance of the study. Prior to the start of the study, both researchers conducted practice interviews on two peers to familiarise themselves with the interview script and protocol. After the first five participants had been interviewed by each researcher, the video-recordings were reviewed and both researchers were found to be consistent in complying with the interview protocol.

4.3.3. Design

A three-part, between-groups experimental design was used in this study with two groups: refreshed and non-refreshed control group.

4.3.4. Procedure

All participants viewed a live event, had a face-to-face interview after two to three days and returned for a verbal cross-examination after two weeks. For ease of reference, an outline of the procedure is provided in Table 4.1, with more detail on each stage of the procedure described below.

Table 4.1 Method of Study 2

Live Police Assembly
2-3 Day Delay
Session 1
Face-to-face interview
14-16 Days Delay
Session 2
Refreshed with video-recorded interview or watched neutral video (control group only)
Cross-examination

4.3.4.1.   Live Police Assembly

The live event was a police assembly in the school's theatre in front of approximately 300 Year 7 children. Two Police Community Officers (PCOs) from the Surrey Police Force (in full uniform) introduced themselves at the start of the assembly. They showed the children a video on the dangers of cyberbullying and followed this with a discussion around the potential consequences of cyberbullying. The PCOs asked some questions, which children raised their hands to answer. There was no other interaction between the PCOs and the children. At the end of the assembly, two teachers made general announcements. The assembly lasted 17 minutes and 41 seconds and was video-recorded from the back of the room. Neither of the researchers from Sessions 1 and 2 were visible during the event.

4.3.4.2.   Session 1 – Verbal Interview

Session 1 took place two to three days after the police assembly. The interview was guided by Achieving Best Evidence Guidelines (2011). The ABE guidelines emphasise the importance of rapport building; encourage an initial, uninterrupted free recall attempt; advocate the use of open, non-leading questions and the limited use of closed and forced-choice questions; and advises against the use of misleading questions. These principles were followed in the Session 1 interview.

Researcher A collected each child from reception and took them to a designated room in the school. A brief period of rapport building took place. Once the child appeared comfortable they were asked if they were willing to take part in the study. With permission, the video-camera was switched on and the interview began. The child was invited to tell the researcher everything that they could remember about the assembly using the following instruction:

"I heard that something different happened in your school assembly a few days ago, when someone came to your school. I wasn't able to be there so could you tell me what happened? Please tell me what happened from the very start of the assembly, through to the end."

If the child indicated that they could not remember the assembly they were prompted. If the child failed to provide an account of the event after two prompts, the interview was terminated. Once the child provided a free recall account of the event, the interview continued with open questions, encouraging the child to report everything that they could remember, (e.g. *"Tell me what happened in the video. Tell me what the policemen looked like"*).

When recall came to a natural end the interviewer continued with specific non-leading questions referring to details provided by the child earlier in the interview. For example, if the participant reported that the boy in the video had introduced himself they were asked: *"What did the boy in the video say his name was?"*. No question was asked about a topic unless it had been mentioned by the child first (see Appendix B for full interview script).

At the end of the interview the child was thanked and asked not to talk about the interview with others. This instruction was an attempt to avoid memory conformity from peer discussions and any active retrieval of the event and their

interview during the delay which may have increased memory trace strength (as discussed in Chapter 1). The child was then escorted back to reception.

4.3.4.3.   Session 2 - Cross-examination

Session 2 took place 14-16 days after Session 1. Researcher B collected each child from reception and took them to the designated room in the school. A brief period of rapport building was then conducted. Children were randomly allocated to the refreshed or control conditions and asked if they could remember the assembly and talking to Researcher A. They were told that Researcher B wanted to ask them some more questions about what they had seen. If the child indicated that they could not remember the original interview, they were prompted (see Appendix C for full script). If the child was unable to recall the interview after two prompts the session was terminated and the child was debriefed and returned to the classroom.

Once the child acknowledged that he/she could remember the police assembly and Session 1 were shown the video appropriate to the randomly assigned condition. The control group watched a cartoon before being questioned (*One Man Band* selected from *The Pixar Short Films Collection*). The refreshed group was told that they were going to watch a video to help them remember what happened (recording of the child's interview from Session 1). They were instructed to watch and listen carefully and were told that the interview would begin after the video finished. With the child's permission, the video-recorder was turned on and the cartoon/refreshing video was displayed on a laptop. The audio was played over headphones to ensure participants were able to hear the content over any background noise. The researcher remained silent throughout the viewing. If the child became distracted the interviewer directed attention back to the video. At the end of the video the laptop screen was switched off and the cross-examination began.

The cross-examination script (see Appendix C) contained six open questions (e.g. *what were the policemen wearing*?), eight closed (e.g. *what day was the assembly on*?), seven forced-choice (e.g. *did the policemen have their jackets on or off*?) and seven shift questions.

The shift questions were modelled on those used in Zajac & Hayne (2003; 2006) and consisted of four parts. For example:

Open question: *"How many policemen where there?"*
(Correct answer – two).

Challenge: *"Are you sure there weren't three policemen?"*

Distracter: *"How many teachers were there?"*

Suggestion: "*You could have mistaken a policeman for a teacher, so you think there were only two when there were three, is that what happened?"*

After the last question in the script had been asked and answered, the video-recorder was switched off and this concluded Session 2. Children were thanked for their help and fully debriefed. They were asked not to discuss the interview with others to avoid alerting other participants to the purpose of the study. Children were then escorted back to reception.

4.3.4.4. Transcribing and Coding

Video-recordings of Sessions 1 and 2 were transcribed verbatim and coded for correct and incorrect details according to a coding sheet developed from the video-recording of the police assembly. An example of the coding system can be seen below:

The child is asked to describe what the police officer was wearing. The child's response to this question could be coded in multiple ways:

1. Child reports that the police officer is wearing a black jacket: this would be coded as two accurate details;

2. Child reports that the police officer is wearing a green jacket: this would be recorded as one accurate detail (the jacket) and one error (the colour);

3. Child reports that they officer was wearing a jacket with no colour description: this would be coded as one accurate detail and one omitted detail;

4. Finally, child does not mention a jacket: this would be recorded as two omitted details.

The dependent variables measured in Study 2 can be seen in Table 4.2. Recall accuracy was measured in addition to the number of correct and error details reported. This measure takes into account what proportion of details from the overall recall were correct. Frequent errors in testimony can negatively affect witness credibility in court, regardless of whether the rest of the testimony is accurate (Pozzulo & Dempsey, 2009; Tenney, MacCoun, Spellman, & Hastie, 2007) therefore this measure is of applied relevance.

Table 4.2 List of Dependent Variables Measured in Study 2.

Amount of Recall	Number of correct details reported. Number of errors reported.
Recall Accuracy	Proportion of correct details as a function of the total number of details.
Cross-examination Performance	Number of answers changed to shift questions. Proportion of answers changed to shift questions.

4.4. Results

Before continuing to the results of this study, the reader should be aware that the experimental design limited the analyses of the data in this study. As Fuzzy-Trace Theory was used to form the rationale and hypotheses for this study, analysis of recall, broken into different information types (i.e. gist, verbatim, person, place, object, action), would have been valuable in addition to the overall recall. This would allow consideration as to whether refreshed testimony improves recall for all types of memory or specific memory types only. It is of particular applied relevance if recall for verbatim details could be shown to be enhanced after refreshing, as specific information is the most useful and valuable within the criminal justice system. Enhancing gist recall alone would be of limited benefit to eyewitness recall as this information, by its nature, is more likely to be accessible to witnesses between recall attempts, even after a delay (see Chapter 1 for discussion and evidence of Fuzzy-Trace Theory).

The chosen methods of this study were designed to simulate the real-world experience of witnesses more accurately, in comparison to those used in the existing

refreshed testimony studies (Magner et al., 1996; Turtle & Yuille, 1994). Study 2 followed similar methodology to Zajac and Hayne (2003; 2006) which simulated the typical procedure for young and vulnerable witnesses. The use of a video-recorded interview in place of evidence-in-chief interviews for young and vulnerable witnesses means that witnesses are only cross-examined in court and are not first interviewed like adult witnesses. Therefore in the current study, the Session 2 interview proceeded directly to cross-examination without a verbal interview beforehand. Without a repeated recall, there was no measure of memory that was directly comparable to the first recall attempt. The cross-examination transcript was comprised mostly of direct questions, with witnesses prompted to focus on the retrieval of verbatim details. The direct questions may have acted as retrieval cues for verbatim details, interfering with the assessment of refreshed testimony on memory. Similarly, the recall of person, place, action and object details were biased by the process of cross-examination. It is therefore not possible to determine what volume of specific details would have been recalled spontaneously in a repeated free recall. Consequently, the decision was taken not to code for different types and qualities of memory (person, place, action, object, gist and verbatim) in Study 2 due to the limited value of any findings in light of the experimental bias in the retrieval of memory.

It is acknowledged that this decision limits the scope of the analysis in Study 2. The reader should note that this is addressed and corrected for in Studies 3 and 4 of this thesis to allow a more informative assessment of memory in these two studies (see Chapters 5 and 6). Using improved methodology, Studies 3 and 4 allow a more detailed analysis of memory recall to explore the potential effect of refreshed testimony on gist and verbatim memories, as well as for person, place action and object, details. These studies also examine the consistency of memory between recall attempts, looking at the recall of new details (reminiscence) and the omission of previously recalled details (forgetting), which was not possible in the current study.

4.4.1. Verbal Interview – Session One

The length of the Session 1 interview was dependent on the responsiveness of each participant. On average, interviews lasted 6 min 14 sec (*SD* 1.77) for refreshed

group participants and 6 min 6 sec (*SD* 2.77) for the control group. A between groups *t* test found no significant difference in the interview lengths, $t(36) = -.378$, $p = .71$. Although these are short interviews, recall accuracy was high.

As both conditions contained the same number of male and female participants (9 males, 10 females in each group), a gender analysis was conducted in an addition to the experimental manipulation. As can be seen from Table 4.3, two-way ANOVAs confirmed that there was no effect of condition on recall for the refreshed and the control groups in the Session 1 interview. Both recalled equal numbers of correct details, made similar numbers of errors and had the same levels of recall accuracy. Similarly, there was no effect of gender on recall and no interaction, all *p* values greater than .05.

Table 4.3 Mean Number of Correct Details, Errors, and Recall Accuracy in Session 1 Free Recall. Standard Deviations are given in parenthesis.

	Correct	Error	Recall Accuracy
Refreshed	29.00 (11.59)	5.53 (2.95)	.83 (.77)
- Male	28.00 (12.36)	4.63 (3.02)	.85 (.09)
- Female	30.80 (11.58)	6.00 (2.94)	.83 (.06)
Control	30.85 (14.11)	4.05 (2.95)	.84 (.21)
- Male	31.00 (13.85)	4.44 (2.75)	.77 (.29)
- Female	29.30 (11.95)	3.20 (2.82)	.91 (.07)

After the police assembly it was brought to our attention that some children (52% of the sample – 13 in the refreshed group, 7 in the control group) had seen the cyber bullying video in a primary school assembly the previous year. Between groups *t* tests assessed whether this additional viewing had enhanced recall for the event. (see Table 4.4 for means). Although the means for participants who had previously seen the video are higher than those seeing the video for the first time in this study, for correct details and errors, these differences were not significant, $F(1, 37) = 1.868$, $p = .18$, $F(1, 37) = 1.72$, $p = .20$. There was also no significant

difference between the recall accuracy of the two groups, $F(1, 37) = .252$, $p = .62$. As the recall of the two groups did not significantly differ, this variable was omitted from further analyses.

Table 4.4 Mean Number of Correct Details, Errors, and Recall Accuracy in the Session 1 Free Recall for Had vs. Had Not Previously Seen the Video. Standard Deviation is given in parenthesis.

	Correct	Error	Recall Accuracy
Seen Previously	32.20 (11.46)	5.25 (2.86)	.85 (.08)
First Viewing	26.61 (13.74)	4.00 (3.01)	.82 (.22)

4.4.2. Cross-examination Interview – Session Two

Session 2 took place 14 to 16 days after Session 1. The average interview length was 14 min and 50 sec (*SD* 4.15) for the refreshed group and 11 min and 45 sec (*SD* 2.30) for the control group. Between groups *t* tests confirmed that the refreshed group had significantly longer interviews than the control group, $t(36) = 2.826$, $p = .008$, $d = 0.93$. The refreshed group watched their video-recorded interviews prior to cross-examination, which varied in duration, whereas the control group watched a fixed duration cartoon which was shorter (4 min) than the average length of the Session 1 interviews (an average of approx. 6 min). Thus the experimental manipulation accounts for the length of the cross-examinations in the respective conditions. As the cross-examination was scripted, longer interviews were not considered an indication of more extensive questioning.

As a free recall style interview was not repeated in the second session, it was necessary to consider recall accuracy in terms of performance across all cross-examination questions. It was predicted that refreshed testimony would improve memory recall and accuracy compared to the control group. This hypothesis was not supported by the data based on the responses to all questions in the cross-examination in Session 2. Although the mean number of correct details was higher in the refreshed group (see Table 4.5 for means), between groups *t* tests revealed that this was not a significant difference. There were no significant differences in the number of errors and recall accuracy of the two groups, all *p* values > .05.

Table 4.5 Mean Number of Correct Details, Errors, and Recall Accuracy for All Questions in Session 2 Cross-examination. Standard Deviation is given in parenthesis.

	Correct	Error	Recall Accuracy
Refreshed	31.47 (11.46)	5.11 (2.64)	.85 (.06)
Control	29.68 (11.06)	4.00 (1.88)	.86 (.07)

4.4.2.1.   Shift Questions

In Session 2, participants were asked seven shift questions designed to challenge accuracy, aiming for the individual to change their response (see methods section). It was predicted that the refreshed group would change fewer answers to shift questions than the control group. This hypothesis was not supported by the data. Between groups *t* tests compared the total number and proportion of answers changed between the groups (see Table 4.6 for means). As some participants did not give responses to all shift questions, the proportion of responses changed was also analysed. There were no significant differences between the number, $t(36) = -.735$, *p* = .47, or the proportion, $t(36) = -.711$, *p* = .48, of responses changed in response to shift questions.

Table 4.6 Total Number and Proportion of Answers Changed to Shift Questions in Session 2. Standard Deviation is given in parenthesis.

	Number of Answers Changed	Proportion of Answers Changed
Refreshed	1.84 (1.50)	.27 (.04)
Control	2.26 (1.99)	.33 (.06)

4.4.2.2.   Open, Closed and Forced-Choice Questions

The cross-examination used multiple question types to examine the effect of best practice and complex questioning styles on memory recall and accuracy. It was predicted that open questions would produce more accurate responses than both closed and forced-choice questions. This was explored using mixed ANOVAs with a

between groups factor of condition (refreshed, control) and a within groups factor of question type (open, closed, forced-choice).

There was a significant main effect of question type on the number of correct details reported, $F(2, 72) = 130.095$, $p < 0.001$, $\eta_p^2 = .783$. Planned comparisons were conducted with within groups t tests to identify whether open questions differed significantly to other question types. Based on a Bonferroni corrected p value of .025, a significantly higher number of correct details were reported to open questions than to both closed, $t(37) = 12.182$, $p < .001$, $d = 2.73$, and forced-choice questions, $t(37) = 10.893$, $p < .001$, $d = 2.46$. There was no interaction between condition and question type, $F(2, 72) = .286$, $p = .752$, no effect of question type on the total number of errors, $F(2, 72) = .589$, $p = .558$, and no significant interaction between question type and condition for errors, $F(2, 72) = 3.066$, $p = .053$.

A main effect of question type on recall accuracy was observed, $F(2, 72) = 44.038$, $p < .001$, $\eta_p^2 = .550$. Planned comparisons were conducted with between groups t tests. Based on a Bonferroni corrected p value of .025, responses to open questions were significantly more accurate than both closed, $t(37) = 10.876$, $p < .001$, $d = 2.46$, and forced-choice questions, $t(37) = 7.806$, $p < .001$, $d = 1.83$. There was no interaction between condition and question type for recall accuracy, $F(2, 72) = .392$, $p = .68$.

Table 4.7 Mean Number of Correct Details, Errors, and Recall Accuracy to Question Types in the Cross-Examination by Condition. Standard Deviation is given in parenthesis.

	Refreshed Group	Control Group
Closed		
Correct	2.37 (.83)	2.47 (.77)
Errors	1.89 (.88)	1.58 (.69)
Recall Accuracy	.57 (.10)	.61 (.17)
Forced-choice		
Correct	4.42 (1.02)	4.37 (1.46)
Errors	2.00 (.88)	2.16 (1.53)
Recall Accuracy	.69 (.13)	.67 (.22)
Open		
Correct	23.63 (11.11)	21.84 (9.99)
Errors	2.58 (2.46)	.86 (.17)
Recall Accuracy	.91 (.08)	.95 (.04)

4.5.   Discussion

This study investigated whether refreshed testimony with a video-recorded interview can improve recall accuracy and cross-examination performance after a two week delay in 11 to 12 year old witnesses. The main findings will now be discussed in light of any methodological issues.

4.5.1. Main Findings

This study did not find any positive effect of refreshed testimony on memory recall and accuracy after a two week delay between the initial interview and the cross-examination. As such, this data failed to replicate previous findings which found that memory recall and accuracy were improved as a result of refreshed testimony (Magner et al., 1996; Turtle & Yuille, 1994). In the previous studies, however, it was possible for the researchers to compare the initial and repeated recall attempts directly. This allowed them to demonstrate that refreshed testimony resulted in more consistent memory recall, in that details previously recalled were more likely to be recalled again, compared to the non-refreshed controls (Magner et al., 1996). Study 2 did not include a directly comparable repeated recall and

therefore this measure of memory could not be used across the two types of interview.

As highlighted prior to the results section of this chapter, the scripted cross-examination interview in Session 2 biased participants' recall through the use of leading and direct questions. These questions focussed recall on specific aspects of the to-be-remembered event and included a limited number of open questions. This structured form of questioning is thought to have provided additional retrieval cues to participants resulting in enhanced recall for verbatim details that may not have otherwise been reported. Taking this bias into account, memory recall in Session 2 was measured using the total number of correct details and overall recall accuracy to all questions. Breaking down the recall by quality of memory (gist or verbatim) or type of information (person, place action and object) recalled was desirable but such analysis would be of limited value given the questioning style, thus the depth of the analysis in Study 2 was limited.

Refreshed testimony did not increase the volume of details, or overall accuracy in recall. Iimportantly, no negative effects were observed. Both the refreshed and the control groups recalled equal numbers of correct details, made a similar number of errors, and overall measures of recall accuracy were comparable. This observation has applied relevance as refreshed testimony is currently delivered to a majority of witnesses, as identified in Chapter 3. This finding offers reassurance that refreshed testimony is not detrimental to cross-examination performance, even if it has not been shown to improve it. However, refreshed testimony may have had an influence on recall and accuracy for specific types of memory that could not be detected due to the limited analysis of the data.

Errors and inconsistencies in evidence negatively affect witness credibility (Berman & Cutler, 1996; Brewer & Burke, 2002; Oeberst, 2012; Pozzulo & Dempsey, 2009). Changes made to testimony in court can therefore have real implications as to the weight afforded to that evidence. As such, this study explored whether improvements to memory strength from refreshed testimony, particularly for verbatim details, could increase accuracy to cross-examination style questions, predicting that it could. However, this hypothesis was not supported by the data. Refreshed testimony had no impact on the number of responses changed during

cross-examination. On average, participants changed approximately 30% of their responses to shift questions and the percentage of answers changed did not differ between the two conditions. Although this is a relatively low percentage, it is evidence that witnesses do change their testimony in response to challenging question types, supporting the findings of earlier research (Zajac & Hayne, 2003, 2006). Study 2 was unable to identify why participants changed some, and not all, answers to shift questions and why refreshed testimony did not enhance performance in comparison with the control group.

There are a number of potential explanations why refreshed testimony does not appear to have a positive impact on recall accuracy and cross-examination performance in Study 2. Firstly, it is possible that the theoretical argument on which the hypothesis is formed, based on a Fuzzy-Trace Theory of memory, is incorrect. It is possible that decayed verbatim memory traces and retrieval cues cannot be strengthened or replaced between recall attempts through rehearsal. This is not considered the most plausible explanation due to the extensive literature which demonstrates benefits of repeated interviewing, memory rehearsal and early retrieval on memory preservation and for enhancing recall (Brainerd et al., 1990; Chan & Langley, 2011; Gardiner et al., 1994; Hessen, 2011; La Rooy et al., 2008; La Rooy, Pipe, & Murray, 2005; Odinot, Memon, & La Rooy, 2013; Orbach et al., 2012; Payne, 1987; Roediger & Butler, 2011; Turtle & Yuille, 1994). As outlined in Chapter 1, the evidence in support of Fuzzy-Trace Theory is compelling and there is a logical progression from this theory to the predicted benefits of refreshed testimony proposed in this thesis.

A more probable explanation is that refreshed testimony, as a practice, may not be an effective means of rehearsal and retrieval and therefore does not influence memory trace strength. This possibility cannot be confidently supported or rejected by the data in the current study due to the shallow analysis of memory recall and accuracy, as discussed. A more detailed comparison of memory, both before and after refreshing is required to make this assessment. Studies 3 and 4 of this thesis provide this analysis, continuing to investigate the potential effects of refreshed testimony on memory recall and cross-examination performance with an improved experimental design.

Finally, a third explanation is considered for the observed null effect of refreshed testimony on cross-examination performance specifically. As Chapter 2 highlighted, cross-examination exposes witnesses to both interrogative and delayed suggestibility to misinformation through complex questioning styles and aggressive interviewing tactics (Gudjonsson, 2013; Ridley & Gudjonsson, 2013). Suggestibility implicates both social factors and interviewing style in cross-examination performance. After exposure to misinformation, witnesses either acquiesce to interviewers' suggestions, but reject the information internally; reject the interviewers' suggestions verbally, and rely on their own recall; or incorporate the misinformation into their own memory and report it as part of their evidence. It is therefore possible that refreshed testimony, whether it increases memory trace strength or not, cannot be effective in improving cross-examination performance in all contexts. Cross-examination performance is influenced by both cognitive and social cues, in addition to the strength and accessibility of memory. Increasing memory trace strength, therefore, may not improve accuracy to complex questioning styles. The common denominator in suggestibility, misinformation effects and cross-examination performance is the style of questioning. It may be that refreshed testimony is not the most effective intervention to improve cross-examination evidence in court and that the focus needs to shift to look at interviewing practices in court (Ceci & Bruck, 1995a; Plotnikoff & Woolfson, 2012).

Best practice questions have been found to be effective in a cross-examination context in this study. Based on eyewitness literature (Fisher & Geiselman, 1992; Lamb & Fauchier, 2001; Lamb, Hershkowitz, Orbach, & Esplin, 2008; Memon & Bull, 1991; Memon et al., 2010) and interviewing guidelines (Achieving Best Evidence Guidelines, 2011), predictions that open questions would produce more accurate responses than closed and forced-choice questions were supported by findings in the current study. Open ended questions were associated with significantly more correct details, and recall accuracy was also higher for these questions, compared to closed and forced-choice questions in both conditions. Performance on all questions by both groups was comparable across all question types in the cross-examination. However, as previously discussed, refreshed testimony was not accurately assessed in this research and it is therefore possible that

differences in response accuracy to multiple question types may be observed after refreshed testimony under different experimental conditions.

4.5.2. Methodological Issues

A number of methodological factors identified in this research have interfered with the analyses of the data in Study 2, some of which have been discussed. There are additional factors which may have enhanced the recall of both groups, resulting in ceiling effects, making it difficult to observe any potential influence of refreshed testimony in the data. These are stimulus familiarity and context reinstatement.

Stimulus Familiarity

A school assembly was selected as the live event for this study on the assumption that it would be a novel experience for participants. However, within the testing period, the children had a second assembly on road safety, also delivered by police officers. Although this second assembly was taken by different police officers to those involved in this study, it emerged after testing that this type of event takes place more frequently than anticipated. Children were familiar with the format of the event and knew to pay close attention to the content of these assemblies as they contain important information. Furthermore, fifty-two per cent of the sample had seen the cyberbullying video (the to-be-remembered event) in a previous assembly. Although recall of those who had previously seen the video did not differ significantly from those seeing it for the first time in this study, it is clear that police visits are a matter of routine rather than a novel occurrence. It is therefore likely that the children have formed script/schema memories for these experiences which may have aided their recall in this study (Brewer & Nakamura, 1984; Greenberg et al., 1998; Tuckey & Brewer, 2003a) (see Chapter 1).

Memory for the event is likely to have been further enhanced due to the children's familiarity with the two Community Police Officers who delivered the assembly. It transpired that these individuals work with all the schools in the local area, hosting a monthly drop-in session at the school from which the sample population was selected. The children, therefore, had multiple opportunities to interact with the police officers, both before and after the to-be-remembered event. This may have enhanced recall for details about the police officers' appearance.

However, it is not unusual for children to give testimony about people who are known to them so there is not an issue here of ecological validity, simply that children were familiar with the event.

Context Reinstatement

It is likely that context reinstatement effects, as discussed in previous chapters, were present in this study. The reinstatement of context is one technique advocated in the cognitive interview to improve eyewitness recall (Dando et al., 2009; Fisher & Geiselman, 1992; Memon et al., 2010). Recall of information is improved when the physical and/or mental cues at the time of encoding and retrieval are identical, or closely matched (Godden & Baddeley, 1975). Attempts were made to minimise context reinstatement in the current study by ensuring that the two interviews were conducted by different researchers. Despite this, constraints on room availability at the school meant that both interview sessions were conducted in the same room. This may have enhanced participants' recall for both the original event and their testimony from Session 1. Under these optimal recall conditions, it may not have been possible to observe the proposed effects of refreshing on recall.

4.6. Summary

The data in Study 2 does not support the hypothesis that refreshed testimony improves recall accuracy and cross-examination performance. However, optimal recall conditions make interpretation of the results difficult, particularly in the absence of a repeated free recall after the experimental manipulation. Participants were also familiar with the to-be-remembered event which may have enhanced their recall. Despite the difficulties in analysing the data in detail, the results of this study raise the possibility that refreshed testimony is not an effective means of enhancing memory trace strength and cross-examination accuracy. Study 3 therefore continues the investigation of refreshed testimony using a modified design to allow a more detailed analysis of memory recall in both refreshed and non-refreshed individuals.

Chapter 5: Refreshed Testimony Revisited - A Revised Design, Methods and Materials

Chapter Overview

This chapter addresses the theoretical and methodological issues raised in Study 2. It presents an improved experimental design for Study 3 to continue the investigation into the potential effects of refreshed testimony on recall accuracy and cross-examination performance. The revised design allowed for a more detailed assessment of memory recall than was possible in Study 2. First year undergraduate students viewed a video-recording of a simulated crime and made an initial recall attempt. After a one week delay, half were refreshed with a video-recorded interview. Performance in a repeated recall and cross-examination was compared to a non-refreshed control group. Refreshed testimony was not found to have an effect on recall accuracy and cross-examination performance in this study. Best practice interviewing techniques were found to increase recall accuracy in comparison to cross-examination style questions. The results and conclusions of this study are discussed.

5.1. Study 3 Methodology

Chapter 4 identified a number of methodological issues which limited the analysis of memory recall and accuracy in Study 2. These included stimulus familiarity, context reinstatement and the interference of cross-examination in assessing memory trace strength after refreshing. As Study 2 did not include a repeated interview prior to cross-examination, it was not possible to analyse recall for different categories of information (i.e. person, place, action, object) or for different types of memory (gist or verbatim) due to the bias created by the direct style of questioning in the cross-examination (see Chapter 4 for detail). Study 3, presented in the current chapter, aimed to address these methodological issues using a revised experimental design.

The theoretical rationale for refreshed testimony and the hypotheses in Study 3 do not differ to that of the previous study (see Chapter 4). This introduction therefore focuses on the specific revisions made to the experimental design in the present study and the justification for these changes (summarised in Table 5.1 and discussed in more detail below).

Table 5.1 Comparison of the Experimental Design and Procedure Changes between Studies 2 and 3

	Study 2	Study 3
Sample Population	11-12 Year Olds	First Year Psychology Undergraduates
Session 1	Live School Assembly • Unscripted Interview	Simulated Crime Video • Free Recall
Delay	Two Weeks	One Week
Session 2	• Experimental Manipulation • Scripted Cross-examination	• Experimental Manipulation • Free Recall • Scripted Cross-examination

5.1.1. Sample Population

The sample population changed between Studies 2 and 3 of this thesis. This change was a result of the practicalities of conducting experimental research and not for theoretical reasons. The target population in Study 2 was young and vulnerable witnesses, leading to a sample population aged between 11 and 12 years old from a secondary school in Surrey. For logistical reasons, it was not possible to use the same population group in Studies 3 and 4 of this thesis. A first year undergraduate sample was therefore used in the present study. Being a much larger target population, this allowed the sample size to be increased in comparison to Study 2 (56 compared to 38).

The two introductory chapters to this thesis (Chapters 1 and 2) recognised the potential differences in recall ability, accuracy and suggestibility between young and adult witnesses. It was concluded that the recall ability of children can be as accurate as adults, when questioned appropriately. However, it was also noted that children are typically less spontaneous during free recall, requiring more direct questioning than adults to get a complete recall of a witnessed event. With respect to cross-examination performance, adult witnesses are susceptible to changing their testimony and making errors in response to challenging questioning and misinformation effects,

although to a lesser extent than children. Despite these differences, the change of age groups used between the two studies should not influence the interpretation of the findings in the current study. Changes in free recall and cross-examination performance are proportionate across developmental stages. It could therefore be expected that any potential effects of refreshed testimony would also be proportionate across all age groups.

It is recognised that first year undergraduate students would mostly be exempt by age from the special arrangements offered to young and vulnerable witnesses under the Youth Justice and Criminal Evidence Act 1999 (YJCEA 1999). These special provisions are for witnesses under the age of 18 and include the use of a video-recorded interview in place of evidence-in-chief. This provision makes it almost certain that young witnesses are refreshed with video-recorded interviews, providing the rationale for the use of this medium for refreshing in Study 2. However, adults may also give a video-recorded or audio-recorded interview depending upon the severity of the crime (Sauerland, Krix, van Kan, Glunz, & Sak, 2014). It would not be used in place of evidence-in-chief in court, but would be available for use as part of refreshed testimony. Thus the use of video-recorded interviews as a means of refreshing memory in Study 3 remains appropriate.

It is acknowledged that adult witnesses may be refreshed with other forms of evidence besides video-recorded interviews (see Chapter 3). This may impact on the effectiveness of refreshed testimony. This is investigated in Study 4 of this thesis when recall and cross-examination performance is compared after refreshing memory with written statements, interview transcripts and video-recorded interviews (see Chapter 6).

5.1.2. Delay

The length of delay in experimental research is often directed by the practical aspects of data collection i.e. the availability of time and resources. In the present study, due to the limited availability of testing facilities and a restricted testing schedule, the delay between viewing the to-be-remembered event and the first interview was 30 minutes. During this delay, filler tasks were completed to distract participants and to prevent them from rehearsing their memory prior to the initial recall attempt. The delay between the first and second interview was one week.

Despite the interval being shorter than that used in Study 2, it is considered an appropriate length of delay to induce forgetting. As discussed in Chapter 4, previous research has observed sufficient levels of forgetting between a first and second recall attempt after a one week delay (Gabbert et al., 2009; Gabbert et al., 2012; Krähenbühl & Blades, 2006b), and over delays as brief as one-two days (Bjorklund et al., 2000).

5.1.3. To-Be-Remembered Event & Context Reinstatement

A pre-recorded crime simulation was selected as the most appropriate and practical method of presenting the to-be-remembered event to an undergraduate participant group. It was considered impractical to use a live event, as was used in Study 2, as it would be highly resource intensive to present a live event for individual participants. A pre-recorded crime simulation ensured that all participants were exposed to the same information and ensuring a reasonable degree of experimental control. The video used in Study 2, depicted a theft from a local convenience store. It included a suspect, a witness and a bystander who has limited awareness of the crime. The short video (1 min 58 sec) simulated the experience of an eyewitness who may have limited exposure to a suspect. The video was professionally produced for the Department of Psychology at Royal Holloway, University of London and had not previously been used in any other context.

As previously discussed in Chapter 4, returning to the original location or context of encoding increases the accuracy of recall, due to the additional retrieval cues available (Godden & Baddeley, 1975; Krafka & Penrod, 1985). Study 2 conducted both interviews in the same room which may have created optimal recall conditions, making refreshed testimony less effective or masking any potential benefits of refreshing. To minimise the influence of context reinstatement on recall in Study 3, both interviews were conducted by different researchers and took place in different rooms within the Department of Psychology at Royal Holloway, University of London. As identified in the findings from the questionnaire study in Chapter 3, this more accurately replicates the experience of real world eyewitnesses who are interviewed in multiple locations.

5.1.4. Free Recall and Cross-Examination

Study 2 included a verbal interview which adhered to Achieving Best Evidence (2011) guidelines. Participants were asked to freely recall the witnessed event and their response was followed up with open and non-leading questions. Although this accurately reflected a real-world police interview, experimental control was reduced as all witnesses were not asked the same number or type of questions. To increase experimental control, the current study adopted a scripted free recall procedure. This consisted of free recall instructions and two open questions for all witnesses. The same script was used for the second free recall attempt in Session 2 prior to a scripted cross-examination. The script followed ABE guidance (uninterrupted free recall, use of open questions) but did not constitute an ABE interview.

A repeated free recall was included in the design of Study 3 to allow a more detailed assessment of memory than had been possible in Study 2. This allowed memory, both before and after the experimental manipulation, to be compared directly. As the hypothesised benefits of refreshed testimony are based on a Fuzzy-Trace Theory of memory, it is therefore particularly relevant to consider whether recall consists mainly of gist or verbatim details, and what specific types of verbatim details are reported (i.e. person, place action and object). Similarly, it is common for witnesses to recall new details (reminiscence) in a repeated interview due to the reconstructive nature of memory. When the recall of new information exceeds forgetting this results in an increase in overall recall, referred to as hypermnesia (see Chapter 1). The revised design in Study 3 allowed for the potential effect of refreshed testimony these naturally occurring memory processes., and on different types of memory, to be properly investigated without the interference of the cross-examination questioning (as was the case in Study 2).

5.1.5. Aims and Hypotheses

Study 3 tests the same hypotheses as Study 2 of this thesis. Existing research and memory theory predict that refreshed testimony can improve recall accuracy and cross-examination performance (see Chapter 1). Therefore, the hypotheses for the current study are as follows:

1. Refreshed testimony will improve memory recall and accuracy compared to the control group.

2. Refreshed testimony will improve the quality of memory compared to the control group: increasing consistency between repeated recalls, reducing forgetting and increasing the number of new details reported in the second interview.

3. Refreshed testimony will improve cross-examination accuracy compared to the control group.

4. Open questions will produce more accurate responses than closed, forced-choice and misleading questions.

5.2. Methods

Ethical approval was granted for this study by Royal Holloway University of London's Department of Psychology Ethics Committee.

5.2.1. Participants

Participants were recruited from the student and staff population of Royal Holloway, University of London. Participants received course credit or £10 for taking part. Written consent was obtained prior to the start of the experiment. The sample totalled 56 participants (46 females, 10 males) aged between 18 and 27 years old ($M = 19$ (SD 1.68)). Participants were randomly allocated to each condition: twenty-nine (25 females, 4 males, $M = 19.04$ years (SD 1.629)) in the refreshed group; twenty-seven (21 females, 6 males, $M = 18.97$ (SD 1.763)) in the control group.

5.2.2. Interviewers

Session 1 and Session 2 interviews were conducted by two researchers. Researcher A conducted all the Session 1 interviews and Researcher B conducted all

the Session 2 interviews. Both researchers received Cognitive Interview training from Professor Amina Memon as part of the Royal Holloway Eyewitness Lab Group in 2011. Prior to the start of the study, both researchers conducted practice interviews on two peers to familiarise themselves with the interview script and protocol. After the first five participants had been interviewed by each researcher, the video-recordings were reviewed and both researchers were found to be consistent in complying with the interview protocol.

5.2.3. Design

A mixed design was used with the between subjects factor of condition (refreshed, control), and a within-subject factor of repeated recall (session one, session two). The two interview sessions, were separated by a one-week delay. The study and test sessions were conducted in different rooms. The dependent measures are summarised in Table 5.3.

5.2.4. Procedure

For ease of reference, the procedure of the current study is displayed in Table 5.2 with a written description following.

Table 5.2 Method of Study 3

Session 1
Video-recorded Crime Simulation
30 min Filler Task
Free Recall

One Week Delay
Session 2
Refreshed with Video-recorded Interview
or
Watched Neutral Video (control group only)
Free Recall
Cross-examination

5.2.4.1.   Session 1

All participants viewed a simulated crime video before completing a 30 minute filler task. Participants viewed this video on a computer screen with headphones to allow the audio stimuli to be heard over background noise; the interviewer was sat at the opposite side of the room, facing away from the screen while the video played.

All participants had a structured free recall interview with Researcher A. This included an instruction to report everything that they could remember about the event, without leaving any details out. Following this free recall period, two open questions were used to prompt the participant to recall further details about the people and the location shown in the video (see Appendix D). Participants were given as much time as they needed to complete their recall.

5.2.4.2.   Session 2

Session 2 took place after a one week delay. The session was taken by Researcher B in a different location to that of Session 1. Participants were randomly assigned to either the refreshed or control condition and appropriate instructions were given (see Appendix E for full interview script). The control group watched a neutral video (*One Man Band*), selected from *The Pixar Short Films Collection,* and the refreshed group watched their video-recorded interview from Session 1.

Session 2 included a structured free recall (following the same instructions and open questions as Session 1) and a scripted cross-examination. The cross-examinations included four misleading, four forced-choice, four closed, four open and four shift questions (see Appendix E). Shift questions are multi-part questions that specifically challenge a witness on the veracity of their evidence. These questions are modelled on those used in previous research, and were also used in Study 2 of this thesis (Zajac et al., 2003; Zajac & Hayne, 2003). At the end of the study participants were debriefed and thanked for their time.

5.2.4.3.   Transcribing and Coding

Video-recordings of the two interview sessions were transcribed verbatim and coded for correct details, errors and omitted details. The dependent variables measured in the current study are outlined in Table 5.3. Recall accuracy was

measured in addition to the number of correct and error details reported. This measure takes into account what proportion of details from the overall recall were correct. Frequent errors in testimony can negatively affect witness credibility in court, regardless of whether the rest of the testimony is accurate (Pozzulo & Dempsey, 2009; Tenney et al., 2007) and therefore this measure is of applied relevance.

One of the limitations of Study 2 was that the experimental design did not allow for an in-depth analysis of different qualities of memory and information types to be conducted (see Chapter 4). The revised design of the present study did allow for such analysis. The two free recall attempts were both coded for the type of information recalled (person, place, action and object) and for the specificity of the information (whether it was gist or verbatim), using a coding system developed for the video used in this study (see Appendix F for coding system used). The example below illustrates the type of information that was coded as gist versus verbatim.

Object - Verbatim

- Shopping list says: Heinz beans
- Sundried tomatoes
- Heinz soup
- Ketchup
- Milk
- Shopper picks up bread
- Shopper picks up milk
- Milk is semi-skimmed

Object - Gist

- There are items on the shopping list
- Shopper puts items into basket

Table 5.3 List of the Dependent Variables Measured in Study 3

Amount of Recall	Number of correct details reported.
	Number of errors reported.
Recall Accuracy	Proportion of correct details as a function of the total number of details.
Cross-examination Performance	Number of answers changed to shift questions.
	Proportion of answers changed to shift questions.
Consistency	Number and proportion of details reported in both Sessions 1 and 2 free recalls.
Forgetting	Number and proportion of details reported in Session 1 free recall and omitted from Session 2 free recall.
New	Number and proportion of details omitted in Session 1 free recall and reported in Session 2 free recall.
Hypermnesia	The total number of unique details gained in free recall in Session 2 minus the total number of details forgotten from free recall in Session 1.

5.3.   Results

5.3.1. Session One: Free Recall

The length of the Session 1 interview was dependent on the responsiveness of each individual participant. The average interview length was 4 min 31 sec (*SD* 1.31) for the refreshed group, and 4 min 45 sec (*SD* 1.87) for the control group. A between groups *t*-test found no significant difference in the interview lengths of the two groups, $t(54) = -.568$, $p = .57$. This was expected as the free recall questioning was standardised across all participants. Although these were short interviews, recall accuracy was high. A multifactor analysis of gender and condition was not performed in the current study due to the skewed gender representation in the sample

(see Section 5.2.1. of this chapter for gender breakdown). Therefore this factor will not be discussed further.

The refreshed and the control group recalled an equal number of correct details in the session one free recall interview (refreshed M = 35.59, control M = 34.03). Both groups made a similar number of errors (refreshed M = 2.11, control M = 2.55) and had equal levels of recall accuracy (refreshed M = .94, control M = .93). This was confirmed with between groups t-tests which found no significant differences between the groups on any of the measures: total number of correct details, $t(54$ = .660, p = .512); total number of errors, $t(54)$ = -.820, p = .416; overall recall accuracy, $t(54)$ = .783, p = .437. See Table 5.4 for mean totals and standard deviations.

Although the error rate across the whole sample was low, any mistakes in eyewitness evidence can be damaging to credibility. Mistakes can be made by reporting false memories for events that did not happen or by reporting real details about an event inaccurately. Analysis was therefore conducted to compare the groups on the types of errors made in the Session 1 free recall. Errors were coded as either inaccuracies (the participant made a mistake about something they did see in the video) or confabulations (the participant reported something they had not seen in the video). A mixed ANOVA, with a between subjects factor of condition and a within subjects factor of error type, confirmed a significant effect of error type, $F(1, 54)$ = 82.001, p < .001, η^2 = .60. A greater number of errors were 'inaccuracies' (M = 2.38, SD 1.94) rather than confabulations (M = .05, SD .30) in both groups. There was no interaction between the experimental condition and the type of error, $F(1, 54)$ = .874, p = .354, indicating no difference between the groups in the volume or type of errors made prior to the experimental manipulation.

Recall was analysed for the type of details that were reported (e.g. person, place, object, action). Participants in both groups recalled a greater number of correct person (refreshed M = 13.81, control M = 13.69) and action (refreshed M = 10.96, control M = 11.62) details compared to location (refreshed M = 6.19, control M = 5.52) and object (refreshed M = 4.44, control M = 3.69) details. The two groups did not differ in the total number of each type of information they recalled. Between groups t-tests confirmed no difference in the total number of person, $t(54)$ = .125, p =.901, place, $t(54)$ = 1.002, p = .321, action, $t(54)$ = -.693, p = .491, and object, (54)

= 1.184, $p = .242$, details recalled by each group, indicating no effect of refreshed testimony. See Table 5.4 for all mean totals and standard deviations.

Recall was also analysed to determine whether reported details were gist or verbatim in quality. A mixed ANOVA, with the experimental condition as the between groups factor and the type of memory as the within groups factor, revealed that both groups recalled significantly higher total numbers of verbatim details (refreshed 30.21, control 30.89) compared to gist (refreshed 5.48, control 5.69), $F(1,54) = 554.192$, $p < .001$, $\eta^2 = .911$. There was no interaction between experimental condition and the type of detail recalled, $F(1, 54) = .173$, $p = .676$. As there was no effect of condition on the total recall of gist and verbatim details, the data was collapsed to form one group. Within groups t tests confirmed that verbatim recall was higher than gist recall for all four information types: person, $t(55) = 27.12$, $p < .001$, place, $t(55) = 14.34$, $p < .001$, action, $t(55) = 10.93$, $p < .001$, and object, $t(55) = 9.28$, $p < .001$. Mean totals and standard deviations can be seen in Table 5.5.

5.3.2. Session Two: Free Recall

The average length of the second free recall was 4 min 54 sec (*SD* 1.21) for the refreshed group and 5 min15 sec (*SD* 2.58) for the control group. A between-groups t test compared the average interview lengths and found no significant difference, $t(54) = -1.048$, $p = .30$. Again, the interviews were short but overall accuracy was high.

It was hypothesised that refreshed testimony would improve memory recall and accuracy. This hypothesis was not supported by the data in this study. Both groups recalled similar numbers of correct details, although the control group recalled slightly fewer correct details (*M* = 32.38) compared to the refreshed group (*M* = 34.37). As in the Session 1 interview, the two groups made an equal number of errors (refreshed *M* = 2.78, control *M* = 2.93) and were equally as accurate overall (refreshed *M* = .93, control *M* = .92). This was confirmed with between groups *t*-tests which found no significant differences on any of the measures: total number of correct details, $t(54) = .660$, $p = .512$), total number of errors, $t(54) = -.820$, $p = .416$) and overall recall accuracy , $t(54) = .783$, $p = .437$). See Table 5.4 for mean totals and standard deviations.

As per Session 1, although the error rate across the whole sample was low, any mistakes in eyewitness evidence can be damaging to credibility. The groups were compared for the types of errors made in the Session 2 free recall (inaccuracies or confabulations). A mixed ANOVA, with a between subjects factor of condition and a within subjects factor of error type, confirmed a significant effect of error type, $F(1, 54) = 87.118$, $p < .001$, $\eta^2 = .62$. There was no significant interaction between condition and type of errors in the Session 2 free recall, $F(1, 54) = .004$, $p = .950$, indicating no effect of refreshed testimony on the volume or type of error.

Mixed ANOVAs were conducted with a between participants factor of experimental condition (refreshed, control) and a within groups factor of recall attempt (Session 1, Session 2). A significant effect of delay was observed for the total number of correct details, $F(1, 54) = 4.109$, $p = .048$, $\eta^2 = .071$, and overall recall accuracy, $F(1, 54) = 4.138$, $p = .047$, $\eta^2 = .071$. Across the whole sample, the total number of correct details recalled was lower in Session 2 compared to Session 1 (Session 1: $M = 34.79$ (SD 8.78); Session 2: $M = 33.34$ (SD 8.36)), as was the overall recall accuracy (Session 1: $M = .94$ (SD .05); Session 2: $M = .92$ (SD .06)). There were no interactions between condition and delay on the total number of accurate details, $F(1, 54) = .093$, $p = .762$, nor overall recall accuracy, $F(1, 54) = .046$, $p = .830$, suggesting that refreshed testimony did not improve the accuracy of a repeated recall after a one week delay. The total number of errors made did not differ significantly between the first and second recall, $F(1, 54) = 3.192$, $p = .080$. See Table 5.4 for mean totals and standard deviations.

Recall in Session 2 was also analysed for the type of information that was reported (e.g. person, place, object, action) and followed the same pattern observed in Session 1. A greater number of person (refreshed $M = 13.89$, control $M = 13.55$) and action (refreshed $M = 10.41$, control $M = 10.24$) details were recalled by both groups compared with place (refreshed $M = 6.63$, control $M = 5.59$) and object (refreshed $M = 3.59$, control $M = 3.24$) details. The two groups did not differ in the total number of each type of information they recalled. Between groups t-tests confirmed no difference in the total number of person, $t(54) = .296$, $p = .769$, place, $t(54) = 1.794$, $p = .078$, action, $t(54) = .181$, $p = .857$, and object, $t(54) = .531$, $p = .577$, details recalled by each group. See Table 5.5 for mean totals and standard deviations.

Recall was also analysed to determine whether reported details were gist or verbatim in quality. A mixed ANOVA, with the experimental condition as the between groups factor and the type of memory as the within groups factor, reflected the results of Session 1. A significantly higher number of verbatim details were recalled by both groups (refreshed 28.59, control 30.37) compared to gist details (refreshed 5.62, control 5.41), $F(1, 54) = 554.192$, $p < .001$, $\eta^2 = .991$. There was no significant interaction between the experimental condition and the type of detail recalled, $F(1, 54) = .176$, $p = .676$. As no difference in the total number of gist and verbatim details recalled by each group had been observed, the data was collapsed into one group. Recall of verbatim details was found to be higher than gist details for all four information types using within groups t tests: person, $t(55) = 23.36$, $p < .001$, object, $t(55) = 7.52$, $p < .001$, action, $t(55) = 13.54$, $p < .001$, and place, $t(55) = 12.61$, $p < .001$. Mean totals and standard deviations can be seen in Table 5.5.

Table 5.4 Mean Number of Correct Details, Errors and Recall Accuracy in Sessions 1 and 2 Free Recall. Standard Deviation is given in parenthesis.

	Session 1		Session 2	
Refreshed				
Correct	35.59	(8.21)	34.37	(6.72)
Person	13.81	(3.33)	13.89	(3.78)
Place	6.19	(2.72)	6.63	(2.20)
Action	10.96	(3.28)	10.41	(2.81)
Object	4.44	(2.46)	3.59	(2.15)
Error	2.11	(1.70)	2.78	(2.72)
Recall Accuracy	.94	(.04)	.93	(.07)
Control				
Correct	34.03	(9.37)	32.38	(9.66)
Person	13.69	(4.12)	13.55	(4.67)
Place	5.52	(2.62)	5.59	(2.15)
Action	11.62	(3.78)	10.24	(3.92)
Object	3.69	(2.32)	3.24	(2.50)
Error	2.55	(2.26)	2.93	(2.14)
Recall Accuracy	.93	(.06)	.92	(.05)

Table 5.5 Mean Totals of Gist and Verbatim Details Recalled by Information Type, Experimental Condition and Interview Session. Standard Deviation is given in parenthesis.

		Session 1	Session 2
Refreshed			
Gist			
	Person	.28 (.53)	.31 (.66)
	Place	1.00 (.00)	1.00 (.00)
	Action	3.41 (1.27)	3.45 (1.33)
	Object	1.02 (.59)	.90 (.62)
Verbatim			
	Person	13.21 (3.87)	12.90 (4.39)
	Place	4.07 (2.22)	4.28 (1.94)
	Action	9.34 (3.35)	8.17 (3.41)
	Object	3.59 (2.21)	3.24 (2.42)
Control			
Gist			
	Person	.15 (.53)	.22 (.64)
	Place	1.00 (.00)	1.00 (.00)
	Action	3.30 (.95)	3.22 (1.12)
	Object	1.04 (.59)	.96 (.65)
Verbatim			
	Person	13.22 (3.17)	13.30 (3.38)
	Place	4.44 (2.26)	4.28 (1.94)
	Action	8.96 (2.81)	8.48 (2.44)
	Object	4.26 (2.28)	3.59 (2.12)

5.3.3. Session Two: The Effect of Repetition on Memory

The inclusion of a second free recall attempt in Session 2 allowed a more detailed assessment of the impact, if any, of refreshed testimony on the content of memory in a repeated recall. This included memory consistency, forgetting and the recall of previously unreported (new) details. It was predicted that refreshed testimony would increase consistency between the free recalls in Sessions 1 and 2. This was measured by the number of details (accurate and error) reported in the Session 1 free recall that were also reported in the Session 2 free recall (consistent); the number of new details (accurate and error) omitted from the Session 1 free recall but reported in the Session 2 free recall, and finally, the number of forgotten details (accurate and error) that were reported in the Session 1 free recall but were omitted from the Session 2 free recall.   This hypothesis, however, was not supported by the data as outlined below.

5.3.3.1.   New Details: Reminiscence

Due to the reconstructive nature of memory (see Chapter 1), the recall of new details (reminiscence) in a repeated interview occurs naturally. Reminiscence was observed in 55 of the 56 participants in this study. However, as can be seen in Table 5.6, the number of new details recalled in the Session 2 free recall did not differ between the two groups. Between groups t-tests confirmed no significant difference in the number of new correct details, $t(54) = .626$, $p = .534$, new errors, $t(54) = .053$, $p = .958$, and overall proportion of new details in recall, $t(54) = .189$, $p = .850$.

The type and quality of new correct details was compared between the groups for the type of information and quality of recall using between groups t-tests. These revealed no significant difference between the total number of new, and correct, verbatim, $t(54) = .817$, $p = .418$, and gist, $t(54) = -1.144$, $p = .258$, details. The two groups recalled similar totals of new person, $t(54) = -.157$, $p = .876$, place, $t(54) = .254$, $p = .800$, action, $t(54) = .156$, $p = .876$, and object, $t(54) = -.056$, $p = .958$, details in the Session 2 free recall. This indicates that refreshed testimony did not affect reminiscence of correct details, nor the quality and type of detail reminisced after a one week delay between retrieval attempts.

5.3.3.2. Memory Consistency, Forgetting and Hypermnesia

As can be seen from Table 5.6, the refreshed group recalled more details consistently ($M = 29.56$) than the control group ($M = 27.63$). However, between groups t-tests found no significant difference between the number of correct consistent details, $t(54) = .859$, $p = .394$, consistent errors, $t(54) = -.162$, $p = .872$, and the proportion of details reported consistently, $t(54) = .113$, $p = .911$, in Sessions 1 and 2. Nor were there differences between the types of memory consistently reported between the groups. Both verbatim, $t(54) = .804$, $p = .425$, and gist details, $t(54) = -1.144$, $p = .258$, were recalled equally by the two groups. Furthermore, no differences were detected between the two groups for the types of information (person, place, action, object) recalled consistently, all p values greater than .05. Refreshed testimony did not increase consistency across any of the measures of memory as had been predicted. Looking at this another way, consistency of recall was not compromised by refreshing memory.

As can be seen from Table 5.6, forgetting occurred equally between the two groups. Both the refreshed and the control groups forgot similar numbers of details between the first and second free recall attempt. Between groups t-tests indicated no significant difference between the total number of correct details, $t(54) = -.234$, $p = .816$, and errors, $t(54) = -.957$, $p = .343$, reported in Session 1 and omitted from Session 2 between the two groups. Equal numbers of gist, $t(54) = -.572$, $p = .570$, and verbatim, $t(54) = -.633$, $p = .529$, details were omitted in the second recall after being reported in Session 1. Similarly, there were no differences in forgetting for specific types of information (person, place, action, and object), all p values greater than .05, indicating that refreshed testimony did not prevent forgetting for any of the measure, going against the stated hypothesis.

Further support that refreshed testimony did not affect memory was the observation of hypermnesia in 41% of participants, distributed evenly across the sample. Hypermnesia is observed when the total number of details gained in a repeated interview exceeds the number of details forgotten (see Chapter 1). Between groups t-tests revealed no significant difference in the presence of hypermnesia between the two groups, $t(54) = .487$, $p = .628$.

Table 5.6 Mean Totals and Proportions of Correct and Error Details Reminisced, Forgotten and Reported Consistently by Condition. Standard Deviation is given in parenthesis.

	Refreshed		Control	
Consistent				
Correct	29.56	(7.06)	27.63	(9.52)
Errors	1.48	(1.72)	1.55	(1.53)
Proportion Consistent	.82	(.10)	.83	(.09)
Forgotten				
Correct	6.00	(4.73)	6.28	(4.08)
Errors	.67	(.78)	.93	(1.25)
Proportion Forgotten	.19	(.12)	.23	(.15)
New				
Correct	4.96	(2.59)	4.55	(2.32)
Errors	1.37	(2.17)	1.34	(1.34)
Proportion New	.18	(.11)	.17	(.08)

5.3.4. Session Two: Cross-Examination

The cross-examination in Session 2 included several question types. Participants were asked four shift questions, modelled on those used in previous research (Zajac & Hayne, 2003, 2006). The cross-examination also included four open, closed, forced-choice, and misleading questions.

5.3.4.1. Shift Questions

It was hypothesised that refreshed testimony would improve memory and recall accuracy and therefore refreshed participants would change fewer of their responses to shift questions than the control group. As can be seen in Table 5.7, both groups performed equally in response to shift questions. Between groups *t*-tests revealed that refreshed testimony did not affect cross-examination performance. No significant difference was observed between the two groups regarding the proportion of shift questions to which a participant changed a response, $t(54) = -.322$, $p = .749$, and the proportion of questions to which they conceded they may have made an error, $t(54) = -.079$, $p = .937$.

Across both groups, within groups *t*-test revealed that participants changed their answer to a shift question, or conceded the possibility of making an error, more often than they confirmed their original response, $t(55) = -3.451$, $p = .001$, $d = .93$. Conceding the possibility of an error can be as damaging to the credibility of a witness as making a contradiction. The data suggests that all participants gave credibility damaging responses, with no effect of refreshed testimony.

Table 5.7 Proportion of Answers Changed or Conceded to Error by Condition. Standard Deviation is given in parenthesis.

	Changed	Maybe	Combined
Refreshed	.13 (.22)	.22 (.21)	.35 (.28)
Control	.15 (.24)	.23 (.29)	.38 (.31)

5.3.4.2.   Open, Closed, Forced-Choice, and Misleading Questions

It was predicted that open questions would produce more accurate responses than both closed and forced-choice questions, regardless of condition.   This hypothesis was supported by the results of this study. As can be seen in Table 5.8, a greater number of correct details were reported in response to open questions compared to both closed and forced-choice questions in the two groups. Similarly, overall response accuracy was highest for open questions in both groups, suggesting that refreshed testimony did not affect recall to individual question types. Misleading questions were omitted from the analysis due to unexpected high accuracy rates for this question type ($M = 3.39$ out of 4), indicating that these were not good exemplars of the category they represented.

Mixed ANOVAs revealed a significant main effect of question type, with differences in the total number of correct details, $F(2, 54) = 92.86$, $p < .001$, $\eta_p^2 =$ .632, and recall accuracy, $F(2, 54) = 58.901$, $p < .001$, $\eta_p^2 = .522$. Planned comparisons were conducted using within groups *t* tests to compare the recall to open questions to that of both closed and forced-choice questions. Based on a Bonferroni correction of $p < .025$, significantly greater numbers of correct responses were given to open questions in comparison to both closed, $t(55) = 11.132$, $p < .001$, $d = 2.07$, and forced-choice questions, $t(55) = 9.00$, $p < .001$, $d = 1.72$. Recall accuracy was also highest for open questions compared to both closed, $t(55) =$

11.352, $p < .001$, $d = 2.21$, and forced-choice, $t(55) = 6.577$, $p < .001$, $d = 1.34$, questions. There was no main effect of question type on the total number of errors reported, $F(2, 54) = .413$, $p = .663$, and no interaction between question type and experimental group for any of the measures, all p values greater than .05.

Table 5.8 Mean Numbers of Correct Details, Errors and Recall Accuracy by Condition and Question Type During Cross-examination. Standard Deviation is given in parenthesis.

	Refreshed Group		Control Group	
Open				
Correct	5.74	(2.71)	5.83	(2.88)
Errors	1.00	(1.47)	.83	(.97)
Recall Accuracy	.84	(.24)	.86	(.16)
Closed				
Correct	1.59	(.84)	1.55	(.69)
Errors	.56	(.64)	.97	(.87)
Recall Accuracy	.41	(.24)	.38	(.17)
Forced-choice				
Correct	2.26	(.94)	2.21	(.90)
Errors	.78	(.70)	.79	(.86)
Recall Accuracy	.56	(.24)	.55	(.23)

5.4. Discussion

The current study investigated the potential effect of refreshed testimony on recall accuracy and cross-examination performance using a revised experimental design. The changes in the design aimed to address the methodological issues identified in Study 2 which prevented an in-depth analysis of memory recall (see Chapter 4). Based on previous research findings and memory theory, it was predicted that refreshing testimony would improve memory quality, recall accuracy and cross-examination performance, compared to a non-refreshed control group. It was also predicted that open questions would produce more accurate responses during cross-examination in comparison to other question types.

5.4.1. Refreshed Testimony and Free Recall

The predicted improvement in recall accuracy was not observed in the current study. As can be seen in Table 5.4, the overall recall of the two groups was almost identical: both the refreshed and control groups recalled similar numbers of accurate details, made the same number of errors and had the same levels of recall accuracy in the second free recall. It was suggested in the discussion of Study 2, that potential effects on refreshed testimony may not have been observed in the data because a more in-depth analysis of recall, to include the quality (gist, verbatim) and type of memory (person, place, action and object), had not been possible. The data in the present study does not suggest this was the case.

The criminal justice system relies strongly on specific details in evidence, therefore verbatim recall is valuable from a forensic perspective. Evidencing that refreshed testimony improved gist recall would be less beneficial. Based on Fuzzy-Trace Theory, verbatim details are thought to be more negatively affected by delays between recall attempts, being more prone to decay than gist memory (see Chapter 1). It was therefore expected that verbatim recall would benefit the most from refreshed testimony as gist memories would be more readily accessible without assistance. The results in the present study, however, did not find any difference in the total number of verbatim or gist details recalled by the refreshed group compared to the non-refreshed control group.

Furthermore, the type of verbatim detail has forensic relevance. Being able to identify the suspect, their actions, and describe the location of a crime, including any relevant objects, is crucial for an investigation. In the current study, a greater number of details were reported for person and action details than object and location details by both groups. This is consistent with previous research (Dando, Wilcock, Behnkle, & Milne, 2010; Hope et al., 2014; Memon, Wark, Holley, Bull, & Koehnken, 1997; A. M. Wright & Holliday, 2007; Yuille & Cutshall, 1986). The data in the present study compared memory at a more detailed level and did not reveal any effects of refreshed testimony across the different types of information recalled. This would suggest that refreshing had no observable effect on memory of any type and quality under the current conditions.

A direct comparison between the two repeated recall attempts (Session 1 and Session 2) enabled a more detailed analysis of the potential benefits of refreshed testimony on forgetting, reminiscence and consistency of recall across multiple retrieval attempts. Eyewitness recall can change in a number of ways between retrieval attempts. Witnesses may report a detail in one interview and omit the same detail in a second interview; change the description of a detail between interviews (e.g. first reporting a blue item of clothing and then saying the colour was red), or they may recall new information in a repeated interview that was not previously mentioned. These forms of inconsistency naturally occur due to the reconstructive nature of memory (refer to Chapter 1 for literature). However, they can have negative consequences. Consistency is crucial in eyewitness testimony as it is considered a good indicator of credibility by jurors and practitioners (Berman & Cutler, 1996; Brewer & Burke, 2002; Oeberst, 2012; Pozzulo & Dempsey, 2009). Inconsistency can therefore be problematic in the context of eyewitness evidence.

Evidence of consistent recall, reminiscence and forgetting were all observed in Study 3. The hypothesis that refreshed testimony would increase the amount of new information recalled, limit forgetting and increase consistency in comparison to the control group, was not supported by the data. Reminiscence was observed in almost the entire sample, with 55 of the 56 participants recalling new information in the second interview. Refreshed testimony was not found to affect the volume of new information recalled in the second free recall. Similarly, both groups were equal in the amount of information that was consistently reported in both Sessions 1 and 2, again, showing no effect of refreshing (see Table 5.5 for means). Forgetting did take place between the two repeated free recall attempts with all participants recalling fewer details overall in the second free recall. However, both groups forgot the same number of details, and less than half (41%) of the sample demonstrated hypermnesia (the recall of more new information in a repeated interview than the number of details forgotten). These additional measures add weight to the conclusion that refreshed testimony does not measurably improve or preserve memory between recall attempts over a short delay (one week in this case), as was predicted.

These findings may indicate a genuine null effect of refreshed testimony on memory. However, there are other factors to consider. The free recall interviews

were relatively short in both Sessions 1 and 2, however recall accuracy in both groups was high. Participants experienced only a 30 minute delay (with filler tasks) between watching the simulated crime video and making their first recall attempt. Although this method (presenting the to-be-remembered event and making the first recall attempt in the same session after a brief delay) is widely used within the literature, it is possible that participants' memory for the video was too readily accessible under these conditions. Recalling the event to a high degree of accuracy in the first session may have reinforced and strengthened the traces for those details, preserving these traces against the deleterious effect of delay in the short term (Chan & Langley, 2011; Gabbert et al., 2009; Hope et al., 2014; Roediger & Butler, 2011). It is therefore possible that refreshed testimony was not required to enable access to verbatim details after the short delay between the first and second recall attempt (one week). The data in this study, therefore, cannot inform whether refreshed testimony is beneficial over longer delays between retrieval attempts, when a greater degree of decay and forgetting would be expected.

It is possible that the null effect observed in the current study is linked to the use of video-recorded interviews as the means for refreshing memory. Existing evidence of the benefits of refreshing, which informed the direction of this thesis and the hypotheses of the current study, used written forms of evidence to refresh memory (Magner et al., 1996; Turtle & Yuille, 1994). The use of video-recorded interviews for refreshing in Studies 2 and 3 arguably made refreshed testimony a more cognitively demanding task compared to previous research. Video-recorded interviews require the witness to process auditory and visual stimuli simultaneously. This must be done quickly as the information is presented continuously in real time. Written materials, on the other hand, present a single, static stimulus. During refreshing, the reader would be able to process written evidence at their own pace. This would allow them to allocate a greater volume of cognitive resources and devote additional time to process information to a greater level of detail, thus enhancing storage and subsequent recall (Craik & Lockhart, 1972). The greater cognitive demands of refreshing with a video-recorded interview may therefore make this an unsuitable method of refreshing memory. This possibility is considered in Study 4 of this thesis.

5.4.2. Refreshed Testimony and Cross-examination

As an integral part of the criminal justice process, cross-examination was also investigated in Study 3. The results were found to replicate those not only of Study 2, but of previous cross-examination research (Zajac & Hayne, 2003, 2006). In Study 3, refreshed testimony had no observable effect on cross-examination performance over the short delay. The majority of participants changed at least one response to the shift style questions (see Methods section of this chapter), despite recall accuracy in the free recall being high for both groups. Refreshed and control participants were equally as likely to change their answers to shift questions and to concede that a previous answer may have been incorrect. Although refreshed participants were no better at resisting this style of questioning, their performance was not below that of the control group. This suggests that refreshed testimony did not compromise consistency during cross-examination after a short delay. As with free recall, it is valuable in an applied context that the results of this study demonstrate no negative effect of refreshing on cross-examination performance under the current conditions.

There are a number of potential explanations for the observed pattern of results. Firstly, as considered in relation to free recall performance, refreshed testimony may be ineffective at increasing memory trace strength and trace accessibility. If this is the case, the refreshed group would have no advantage over controls when attempting to access verbatim details in response to direct questions in the cross-examination. However, it cannot be determined from the data in this study whether refreshed testimony is ineffective at improving recall in general or if optimal recall conditions in this study made refreshing unnecessary.

Repeated retrieval attempts in this study may have negated any necessity for refreshed testimony under the present conditions. The early retrieval in Session 1 (after a 30 minute delay) and the repeated retrieval in Session 2 (after a one week delay) may have increased memory trace strength, preserving memory through the act of retrieval (Chan & Langley, 2011; Gabbert et al., 2009; Hope et al., 2014; Roediger & Butler, 2011). This would account for the observed null effect. However, as with the free recall measures in this study, the data cannot inform whether refreshing would have improved memory trace strength, and therefore cross-examination performance, over longer delays. Similarly, the observed null

effect of refreshed testimony may be due to other factors, not explored in this study (see Chapter 6).

Memorial factors are not the only variables which influence cross-examination performance, as discussed in Chapters 2 and 4. Based on the evidence in both Studies 2 and 3 of this thesis, it is arguable that question types, interviewing style and the suggestibility of a witness have a greater effect on cross-examination performance than memory trace strength. Despite displaying high levels of recall accuracy in the free recall, almost all participants made changes to their testimony in response to challenging shift questions. Furthermore, the more complex question types, such as open and forced-choice questions, resulted in less accurate responses. Open questions were once again shown to produce the most accurate responses, in line with best evidence guidance and the eyewitness literature (Achieving Best Evidence Guidelines 2007; 2011). Similarly, a growing evidence base in the literature indicates that cross-examination style interviewing reduces accuracy compared to simpler question types (Davies & Seymour, 1998; Kebbell, Deprez, & Wagstaff, 2003; Valentine & Maras, 2011; Zajac & Hayne, 2003, 2006).

However, before it can be concluded that memory trace strength has a limited influence on cross-examination performance, it is necessary to consider whether refreshing with other forms of evidence can improve memory trace strength, thereby enhancing both recall and cross-examination performance. If refreshing memory with other forms of evidence (written statement or interview transcript) results in improved free recall but no equivalent improvements in cross-examination accuracy, this would suggest that question type and interviewing style have a greater impact on cross-examination performance than memory trace strength. This possibility is explored further in Chapter 6 and the general discussion chapter of this thesis.

5.4.3. Methodological Issues

The present study was designed to address the methodological issues identified in Study 2: context reinstatement, stimulus familiarity and the absence of a repeated measure of recall to allow an in-depth analysis of recall in Session 2. Two of these issues were appropriately mitigated in the present study. Participants had no previous experience of the to-be-remembered event, removing the influence of stimulus familiarity from the data. The revised experimental design allowed for

recall to be coded for a more detailed analysis of memory, including the types of memory and information recalled (gist, verbatim, person, place, action, object), as well as the consistency of recall between the two sessions.

The adjustments made to limit context reinstatement in this study, however, may not have been fully effective. It was acknowledged in Chapter 4 that information about the environment at the time of encoding (the incidental environment) is automatically processed and associated with a memory trace. This is true whether the memory is for a word list, a conversation or details about a crime event (Smith et al., 1978; Smith & Vela, 2001). These contextual details can act as retrieval cues for the encoded information. The more cues available, whether these are physically or mentally reinstated, the greater the likelihood of successfully recalling the information (Dando et al., 2009; Fisher & Geiselman, 1992; Memon et al., 2010). Although the two sessions in this study were conducted in different locations and by two different researchers, participants may still have benefited from retrieval cues based on shared features of the two locations. Both interview rooms were within the Department of Psychology at Royal Holloway, University of London and therefore the context and décor of the rooms were similar. These similarities may have enhanced participants' accessibility to memories for the witnessed event, contributing to the high levels of accuracy observed in this sample. This may have affected our ability to detect any benefits of refreshing on memory recall and cross-examination performance in this study.

As highlighted throughout this discussion, optimal recall conditions may have affected the results of this study. The initial recall attempt took place after a 30 minute delay (including filler tasks) and the second recall attempt took place after only one-week. It is possible that refreshed testimony was not required to enable successful recall because a limited amount of forgetting had occurred during the delay, both before the first recall and between subsequent recall attempts. As such, the current findings cannot inform on the potential effects of refreshed testimony on memory recall and accuracy under sub-optimal conditions, such as longer delays. Despite this limitation, it is valuable to continue investigating refreshed testimony using the same delay to further explore additional factors which may account for the null effect. Firstly, benefits from refreshing have been observed using the same lengths of delay as were used in this study using different methods (Magner et al.,

1996; Turtle & Yuille, 1994). Secondly, keeping the length of the delay consistent (one week) will allow a controlled manipulation of other factors while making the results directly comparable to those of the current study.

5.4.4. Summary

Contrary to what earlier studies would lead us to expect, Studies 2 and 3 of this thesis have not found evidence of improved recall after refreshed testimony using a video-recorded interview over a short delay. Earlier research, which has found benefits of refreshed testimony, used written statements to refresh memory (Magner et al., 1996; Turtle & Yuille, 1994), whereas the current studies in this thesis have used a video-recorded interview. Chapter 6 considers literature which explores the effect of medium, such as written and audio-visual materials, on the transfer of knowledge. Based on this literature, Study 4 of this thesis examines whether the medium of evidence used for refreshing influences the effectiveness of refreshed testimony. It compares the recall accuracy and cross-examination performance of individuals refreshed with a video recorded interview, an interview transcript and a written statement, to a non-refreshed control group.

Chapter 6: Does Medium Matter? Refreshing Memory with Audio-Visual and Written Forms of Evidence.

Chapter Overview:

This chapter presents Study 4, the final study of this thesis. This study continues the investigation into the potential effects of refreshed testimony on recall accuracy and cross-examination performance. The impact of the medium of evidence on refreshed testimony is considered. Based on previous findings in this thesis and the literature presented in this chapter, it is hypothesised that written forms of evidence are more effective at refreshing memory than video-recorded interviews. Using the same methodology as Study 3, first year undergraduate students refreshed their memory for a simulated crime video with either a written statement, video-recorded interview or an interview transcript. There was a non-refreshed control group. All participants made an initial free recall after a 30 minute filler task in the first session, returning after a one-week delay for a repeated free recall and cross-examination. Refreshed testimony was not found to have any effect on recall accuracy and cross-examination performance, regardless of the medium of evidence used. Best practice interviewing techniques were found to increase response accuracy in comparison to cross-examination style questions. The results and conclusions of this study are discussed.

6.1. Introduction

In the criminal justice system, eyewitnesses may provide evidence in a variety of formats. They may provide a written form of evidence such as a written statement or complete a Self-Administered Interview© (Gabbert et al., 2009; Gabbert et al., 2012). Alternatively, witnesses may have a face to face interview with the police which can be audio or video recorded. The format of a witness' evidence can also be changed after the fact. Audio and video interviews can be transcribed and an audio recording can be made of written statements or a Self-Administered Interview©. The format of any evidence is likely to depend upon the severity of the crime and/or the type of witness. More serious crimes are more likely to require a full police interview, as will young and vulnerable witnesses, whereas minor traffic incidents can be captured with a witness statement (Sauerland et al., 2014).

Evidence from Study 1 of this thesis suggests that some forms of evidence are used more frequently than others in an applied context. The majority of police officers in the Study 1 sample reported that they refresh their witnesses using a written statement, that young and vulnerable witnesses are refreshed with a video-recorded interview, and that some witnesses are refreshed with a written interview transcript (see Chapter 3). It is clear, therefore, that a number of options are available to practitioners and witnesses, when it comes to giving evidence, and that the majority of these options are currently in use in a real-world context. It is therefore of applied relevance to consider whether some forms of evidence are more effective than others at delivering the proposed benefits of refreshed testimony.

Refreshing with a written statement has previously been shown to improve recall accuracy (Magner et al., 1996; Turtle & Yuille, 1994). Thus far, this thesis has found no evidence that refreshed testimony with a video-recorded interview has any effect on recall accuracy and cross-examination performance (see Chapters 4 and 5 for details). The discrepancy between the findings of this thesis and earlier research could be explained by the use of different mediums of evidence for refreshing. The medium of presentation has been shown to influence the quantity and accuracy of recall across a range of areas such as education, marketing and journalism (Corston & Colman, 1997; Furnham et al., 2002; Furnham & Gunter, 1989; Furnham et al., 1990; Gunter et al., 2000; Walma van der Molen & van der Voort, 1997, 1998, 2000). Evidence from these other domains, and the dual-coding hypothesis, will be discussed in this chapter to provide a theoretical rationale as to why video-recorded interviews may not be an effective means of refreshing memory. To date, there is no known research assessing knowledge transfer in the context of eyewitness memory where individuals recall their own output (i.e. the content of their own written statement or police interview) rather than an externally generated stimulus (e.g. news report or textbook) This thesis therefore presents the first experimental research in this area.

6.1.1. Information Processing

For information to enter into memory it must first be perceived and processed to form a memory trace. Effective processing can only be achieved if there are sufficient cognitive resources to cope with the volume of incoming information.

Human cognition is not an infinite resource and must therefore operate within its limits (Marois & Ivanoff, 2005). When capacity is exceeded, incoming stimuli cannot be perceived and/or stored and this information is therefore lost before it can enter into memory (Baddeley, 2003; Baddeley & Hitch, 1974). The range of cognitive resources required for the successful processing, encoding and storage of information differs according the type of stimulus. Therefore, the medium of presentation may limit the volume of information that can be successfully recalled at a later date (Sweller, van Merrienboer, & Paas, 1998).

When providing information as text, the speed of presentation is controlled by the reader, written information typically presents only one form of stimulus (written text), or may include additional static images. When reading, an individual can pause at any point to allow themselves enough time to fully process the information before continuing on to the next section. Similarly, a reader may re-visit some, or all, of the text to repeat and rehearse the information. This would increase the likelihood of successful encoding and retrieval as a result of deeper processing (Craik & Lockhart, 1972). By comparison, the speed of presentation for audio-visual materials is usually not in the control of the individual. This type of stimulus also contains more dynamic information, with both audio and visual information presented as continuous input. This requires the availability of sufficient cognitive resources to hold subsequent information while earlier content is processed (Baddeley, 2003; Baddeley & Hitch, 1974). If more information is presented than can be either processed or temporarily stored in short-term memory, some of the input will be lost and a memory trace will not be formed. If a viewer/listener is not given the ability to pause audio-visual presentations, there is a danger that working memory capacity will be exceeded if there are insufficient resources to process and hold information simultaneously (Baddeley, 2003; Baddeley & Hitch, 1974)

We know from the literature that adults have been found to recall a greater number of details after reading information, compared to listening (Furnham & Gunter, 1989), or viewing (Furnham et al., 1990), the same information. However, the superior recall of printed materials observed in some studies has not been replicated in all contexts in adults, nor in children. For young children, recall has been shown to be highest when information is presented in an audio-visual format (Furnham et al., 2002; Gunter et al., 2000). Audio-visual material may be a more

engaging way to transfer information and knowledge to children because their language and reading abilities are less advanced. However, the superiority of recall for audio-visual presentation has been found to occur independent of reading ability (Walma van der Molen & van der Voort, 1997, 1998, 2000).

Information processing theory offers an explanation for the differing findings between the above adult and child studies. According to the dual-coding hypothesis, audio-visual materials have an advantage over print for the transfer of information under certain conditions, conditions which were present in the child studies highlighted above (Paivio, 1969, 1978). When audio-visual materials are processed and encoded, two memory traces are formed: one for the audio and one for the visual element. If both these inputs contain the same information, the details will be stored twice, increasing the likelihood of successful retrieval in the future. A hypothetical example helps to illustrate this. A weather reporter tells viewers that there is a forecast of rain for the week. At the same time, a weather symbol representing rain is displayed on a map. The viewer may forget the verbal content of the forecast (i.e. the audio memory trace is lost). However, remembering that it is going to rain is still possible if the visual memory trace is intact. Audio-visual presentations can therefore compensate for a degree of forgetting when the two inputs are identical. In studies which have reported superior recall of audio-visual materials over print, this has been the case (Furnham et al., 2002; Gunter et al., 2000; Walma van der Molen & van der Voort, 1997, 1998, 2000).

The benefits of dual-encoding only apply if both components of a stimulus present the same information. If separate details are presented by the audio and visual inputs, recall of printed stimuli is superior (Furnham et al., 2002; Gunter et al., 2000). A second hypothetical example illustrates this. A reporter gives a verbal update on a news event accompanied by a visual image or recording. The visual element provides additional details about the event that were not part of the reporter's speech. If the viewer forgets what the reporter said (i.e. the audio memory trace is lost), the information cannot be retrieved through the visual memory trace, resulting in a retrieval failure. Existing evidence of superior recall using audio-visual materials in both children (Gunter et al., 2000), and adults (Furnham et al., 2002), has only been observed when the accompanying images presented the same information as the audio element. This has implications in the context of

refreshed testimony, for the use of a video-recorded interview as opposed to written statements/transcripts, as discussed below.

6.1.2. Mediums of Evidence and Refreshed Testimony

Studies 2 and 3 of this thesis found no effect of refreshed testimony on memory recall and accuracy using video-recorded interviews (see Chapters 4 and 5). The dual-coding hypothesis, outlined above, offers a potential explanation for this finding. A video-recorded interview contains the dialogue between the interviewer and the witness accompanied by an image of the interview room, the interviewer and the witness themselves. With the exception of some hand gestures, the visual element of a video-recorded interview provides extraneous information. From the perspective of dual-coding processing, this suggests that a printed form of evidence may be more effective as a means of refreshing memory than a video-recorded interview.

Video-recorded interviews, as audio-visual materials, are also more cognitively demanding for witnesses to process than written statements, as previously discussed. This increases the likelihood that cognitive capacity will be exceeded when refreshing with a video interview. Witnesses may not get the full benefit of refreshed testimony with video interviews if there is insufficient capacity to process and strengthen memory for all the details covered in the interview. Furthermore, the researcher noted that participants in Study 2 of this thesis (11 – 12 year olds) made frequent references to their appearance and clothing during refreshing, suggesting that the visual content of a video-recorded interview can be distracting for witnesses. Focusing on extraneous details in a video interview may limit a witness' ability to pay attention to the content of their testimony, placing additional pressure on the already limited cognitive resources available. Again, this may prevent crucial details from being processed and rehearsed effectively. Refreshing with a printed form of evidence (such as written statement or interview transcript) allows a witness to process the content of their original evidence in their own time and in greater depth, if they choose to do so. It is therefore possible that the proposed benefits of refreshed testimony to recall accuracy and cross-examination may be observed using written forms of evidence. Study 4 explores this possibility.

6.1.3. Aims and Hypotheses

Based on memory theory and previous refreshed testimony studies, it was hypothesised that refreshing memory would improve recall accuracy and cross-examination performance in comparison to non-refreshed controls (see Chapters 1 and 2). This was not observed in the earlier studies of this thesis (see Chapters 4 and 5). The medium that was used to refresh memory in these studies (video interview) was identified as a potential factor to explain why no observable benefit of refreshed testimony was observed in the earlier studies of this thesis (Studies 2 and 3).

Based on knowledge transfer research and a dual-coding hypothesis of processing, as discussed in this chapter, it is argued that the medium of evidence used for refreshing memory is integral to the success of refreshed testimony. It is proposed that refreshing memory with written forms of evidence (written statement or interview transcript) may be more effective at improving memory compared to refreshing with video-recorded interviews. This was investigated in the current study to test the following hypotheses:

1. Refreshed testimony with printed forms of evidence will improve recall accuracy.

2. Refreshed testimony with printed forms of evidence will improve the quality of memory, increasing consistency between repeated recalls, reducing forgetting and increasing the number of new details reported in the second interview.

3. Refreshed testimony with printed evidence will improve cross-examination performance.

4. Open questions will produce more accurate responses than closed, forced-choice and misleading questions regardless of the medium of refreshing.

6.2. Methods

Ethical approval was granted for this study by the Psychology Department's Ethics Committee of Royal Holloway, University of London. Study 4 used the same methods and materials as Study 3.

6.2.1. Participants

Participants were recruited from the student and staff population of Royal Holloway, University of London. Participants received course credit or £10 for

taking part in this research. Written consent was obtained from all participants prior to the start of the experiment.

The sample totalled 109 participants. Due to participant drop-outs, weather disruption and interviewer illness, 14 participants failed to complete the study. The final sample total was 94 (82 females, 12 males), aged between 17 and 45 years old (average age = 19.5 years, *SD* 4.27). Participants were randomly allocated to each condition: twenty-eight (22 female, 6 male; average age = 20.7 years, *SD* 6.42) in the control group, twenty-one (18 female, 3 male; average age = 19, *SD* 1.92) in the video group, twenty-three (20 female, 3 male; average age = 19.8, *SD* 4.31) in the transcript group, twenty-two (all female; average age = 18.7, *SD* .97) in the written statement group.

6.2.2. Interviewers

The interviews and cross-examinations were conducted by several researchers. Researcher A (main researcher) conducted all the Session 1 interviews. Researcher A received Cognitive Interview training from Professor Amina Memon as part of the Royal Holloway Eyewitness Lab Group in 2011. A team of eight researchers conducted the Session 2 interviews. The team of researchers all received a full day of training on the interviewing protocol from the main researcher. Prior to the start of the study, all researchers conducted practice interviews on two peers to familiarise themselves with the interview script and protocol. After the first three participants had been interviewed by each researcher, the video-recordings were reviewed and all researchers were found to be consistent in complying with the interview protocol.

6.2.3. Materials

The pre-recorded crime simulation video and interview scripts from Study 3 were used (see Appendices D & E). A written statement replaced the verbal interview in Session 1 for the written statement condition only (see Appendix G).

6.2.4. Design

A mixed design was used with a between groups factor of refreshing (video, written statement, transcript, control) and a within groups factor of repeated recall

(session one, session two).   The experiment took part across two sessions with a one-week delay.

6.2.5. Procedure

For ease of reference, the procedure of the current study is displayed in Table 6.1 with a written description following.

Table 6.1 Method of Study 4

Session 1
Video-recorded crime simulation
30 min filler task
Free Recall
or
Written Statement (written statement group only)
One Week Delay
Session 2
Refreshed with video-recorded interview/transcript/written statement
or
Watched neutral video (control group only)
Free Recall
Cross-examination

6.2.5.1. Session 1

All participants viewed a simulated crime video before completing a 30 minute filler task. The video-interview, transcript and control conditions had a structured free recall interview (see Appendix D). Participants in the written statement condition were provided with a blank police statement and given verbal instructions to make a written free recall of the event (see Appendix G). Participants were given as much time as they needed for recall/to complete their statements.

6.2.5.2. Session 2

Session 2 took place after a one week delay, the length of time used in Study 3 and previous research (Gabbert et al., 2009; Gabbert et al., 2012; Krähenbühl & Blades, 2006a; Paterson et al., 2011). The session was taken by a different researcher, in a different location to that of Session 1. Participants were refreshed according to their condition following the interview script.

- Control Group: watched a neutral video (*One Man Band*) selected from *The Pixar Short Films Collection*

- Video Group: watched their video-recorded interview from Session 1.

- Transcript Group: read a verbatim, typed transcription of their interview from Session 1

- Written Statement Group: read the written statement they provided in Session 1

Participants in the written statement and transcript groups were given a maximum of ten minutes to refresh their memory to ensure that the testing schedule was adhered to. It is acknowledged that real-world participants may be given unlimited time to review their testimony, however, scheduling changes may result in refreshed testimony taking place under time pressures. As such, it was not considered detrimental to restrict the refreshing time period in this study. Witnesses in the written statement and interview transcript groups did not have to use the full allocated time if they felt that they had refreshed themselves sufficiently.

Session 2 contained a structured free recall and a scripted cross-examination which included four misleading, four forced-choice, four closed, four open and four shift questions (see Appendix E). Shift questions are multi-part questions that specifically challenge a witness on the veracity of their evidence. These questions are modelled on those used in previous research (Zajac & Hayne, 2003, 2006), and were used earlier in this thesis (see Chapters 4 and 5). The inclusion of multiple question types allowed the effect of cross-examination and best practice questions on accuracy to be compared. This also allowed any potential effects of refreshed testimony on responses to different question types to be explored. At the end of the study participants were debriefed and thanked for their time.

6.2.5.3. Coding and Transcribing

Video-recorded interviews and written statements for both sessions were transcribed and coded for correct, incorrect and omitted details. The dependent variables measured in this study are listed in Table 6.2. Recall accuracy was measured in addition to the number of correct and error details reported. This measure calculates what proportion of details from the overall recall were correct. Frequent errors in testimony can negatively affect witness credibility in court, regardless of whether the rest of the testimony is accurate (Pozzulo & Dempsey, 2009; Tenney et al., 2007), therefore this measure is of applied relevance.

This study used the same coding system that was developed for Study 3 (as the testing materials were the same). This system allowed recall to be coded for the recall of gist or verbatim details, as well as person, place, object and action (see Appendix F for the coding system used). The example below illustrates the type of information that was coded as gist versus verbatim.

Object - Verbatim	**Object - Gist**
- Shopping list says: Heinz beans - Sundried tomatoes - Heinz soup - Ketchup - Milk - Shopper picks up bread - Shopper picks up milk - Milk is semi-skimmed	- There are items on the shopping list - Shopper puts items into basket

Table 6.2 List of Dependent Variables Measured in Study 4

Amount of Recall	Number of correct details reported.
	Number of errors reported.
Recall Accuracy	Proportion of correct details as a function of total number of details.
Cross-examination Performance	Number of answers changed to shift questions.
	Proportion of answers changed to shift questions.
Consistency	Number and proportion of details reported in both Sessions 1 and 2 free recalls.
Forgetting	Number and proportion of details reported in Session 1 free recall and omitted from Session 2 free recall.
New	Number and proportion of details omitted in Session 1 free recall and reported in Session 2 free recall (reminiscence).
Hypermnesia	The total number of unique details gained in free recall in Session 2 minus the total number of details forgotten from free recall in Session 1.

6.3. Results

6.3.1. Session One: Free Recall

The length of the Session 1 interview was dependent on the responsiveness of each participant. Participants in the written statement condition took an average of 10 min 50 sec (*SD* 5.59) to provide their statement. The average free recall interview length was 4 min 48 sec (*SD* 2.06) for the control group, 5 min 33 sec (*SD* 2.95) for the video group and 4 min 17 sec (*SD* 1.39) for the transcript group. There was no significant difference between the Session 1 interview lengths of the three groups, confirmed with a one-way ANOVA, $F(2, 70) = 1.591$, $p = .22$. A multifactor analysis of gender and condition was not performed in the current study due to the

skewed gender representation in the sample (see Section 5.2.1. of this chapter for gender breakdown). Therefore this factor will not be discussed further.

The four groups recalled an equal number of correct details in the Session 1 free recall (control, $M = 36.14$; video, $M = 38.43$; written statement, $M = 35.91$; transcript, $M = 36.35$), and made a similar number of errors (control $M = 2.90$; video, $M = 3.4$; written statement, $M = 1.73$, transcript, $M = 2.96$). See Table 6.3 for standard deviations. This was confirmed with one-way ANOVAs which found no significant differences between the groups prior to the experimental manipulation for correct details, $F(3, 93) = .312$, $p = .82$, and recall accuracy, $F(3, 93) = 1.806$, $p = .15$. There was a significant difference in the number of errors made between the groups, $F(3, 93) = 2.877$, $p = .04$. As this difference occurred prior to the experimental manipulation, post-hoc tests were conducted to identify where the differences in errors lie in the data. Tukey HSD comparisons revealed that the video group made a significantly greater number of errors compared to the written statement group. As can be seen from the means above, this equates to an average difference of only two errors between the two groups. This was the only significant pairwise comparison observed in the data.

Although the error rate across the whole sample was low, any mistakes in an eyewitness evidence can be damaging to credibility. Mistakes can be made by reporting false memories for events that did not happen or by reporting real details about an event inaccurately. As such, incorrect recall was coded into inaccurate details (reporting a detail from the video incorrectly) and confabulations (reporting a detail that was not observed in the video). A mixed ANOVA, with the experimental condition as the between groups factor and the type of information as the within groups factor, revealed a significant within groups difference for the type of incorrect detail reported in the Session 1 free recall, $F(1,90) = 117.47$, $p < .001$, $\eta^2 = .566$. Participants across the whole sample were more likely to report incorrect details ($M = 2.49$, SD 1.93) than confabulations ($M = .26$, $SD = .60$). There was no significant interaction between the type of error recalled and group prior to the experimental condition.

The groups were compared with one-way ANOVAs on their recall for different information types (person, place, action, object) to check whether

differences in recall ability were present prior to the manipulation. Some differences were identified using Bonferroni corrected between-groups t tests. These indicated that the participants randomly allocated to the written statement group recalled fewer person details than both the control, $t(50) = -3.492$, $p = .001$, $d = .99$, and the video, $t(50) = -2.995$, $p = .005$, $d = .94$, groups. The written statement group also recalled a greater number of action details, $t(50) = 3.517$, $p = .001$, $d = .096$, than the control group. There were no other statistically significant details between any of the groups, all p values greater than .0125 (see Figure 6.1 on p.142).

Recall was also analysed to determine whether reported details were gist or verbatim in quality. A mixed ANOVA, with the experimental condition as the between groups factor and the type of information as the within groups factor, revealed that all groups recalled significantly more verbatim details compared to gist, $F(1, 89) = 296.32$, $p < .001$, $\eta^2 = .769$. This replicates the findings of Study 3 of this thesis. There was no interaction between experimental condition and the quality of memory recall (gist/verbatim), $F(4, 89) = .780$, $p = .54$.

6.3.2. Session Two: Free Recall

The mean interview length for the free recall in Session 2 was 4 min 30 sec (SD 1.66) for the control group, 4 min 8 sec (SD 2.78) for the video group, 4 min 9 sec (SD 1.71) for the transcript group, and 4 min 1 sec (SD 1.48) for the written statement group. A one-way ANOVA found no significant difference in the length of the Session 2 free recall between the groups, $F(3, 93) = 1.00$, $p = .40$. Although these were short interviews, recall accuracy was high.

The Session 2 interviews were conducted by a team of interviewers (eight in total). One-way ANOVAs compared the recall accuracy and total numbers of correct details and errors in the free recall, with interviewer as a factor. No significant differences were found on any of the measures: correct details, $F(6, 93) = 1.458$, p = .20, errors, $F(6, 93) = .363$, p = .90, and recall accuracy, $F(6, 93) = .785$, p = .58, therefore this variable was omitted from subsequent analyses.

It was hypothesised that refreshed testimony with a printed form of evidence (written statement or interview transcript) would increase accuracy in the free recall compared to video-interview refreshing and a control condition. As can be seen in

Table 6.3, this was not supported by the data. Participants refreshed with a video-recorded interview, interview transcript and written statement recalled a similar number of details on average. Although the non-refreshed control group recalled slightly fewer correct details than the experimental conditions, one-way ANOVAs revealed no significant differences in the number of correct details, $F(3, 93) = 1.054$, $p = .373$, and errors, $F(3, 93) = .130$, $p = .94$, between the groups. There was also no difference in recall accuracy, $F(3, 93) = .045$, $p = .99$. This suggests that refreshed testimony did not affect recall compared to the control group, regardless of the medium of evidence used.

Despite the low error rate in the Session 2 free recall, errors were analysed for inaccurate details (reporting a detail from the video incorrectly) and confabulations (reporting a detail that was not observed in the video). A mixed ANOVA, with the experimental condition as the between groups factor and the type of information as the within groups factor, revealed a significant difference between the type of incorrect detail reported in the Session 2 free recall, $F(1, 90) = 140.927$, $p < .001$, η^2 = .610. Participants across the whole sample were more likely to provide inaccurate details ($M = 3.03$, SD 2.18) than make confabulations ($M = .27$, $SD = .79$). There was no significant interaction between the type of error recalled and group prior to the experimental condition in Session 2, all p values greater than .05.

Mixed ANOVAs explored the effect of a one-week delay on a repeated free recall across the groups. The number of correct details, errors and overall recall accuracy were compared between the first and second free recall (within groups), with a between groups comparison of experimental group. A significant main effect of interview session was found for the number of correct details, $F(1, 90) = 26.348$, p < .001, $\eta p^2 = .226$, and the number of errors, $F(1, 90) = 11.200$, p =.001, $\eta p^2 = .111$, as well as recall accuracy, $F(1, 90) = 19.974$, p < .001, $\eta p^2 = .182$. There was no significant interaction between the interview session and experimental group for any of the measures, all p values greater than .05. This suggests that the effect of the one week delay on recall was not mitigated by refreshed testimony. With no interaction between the variables, the groups were collapsed into one sample to allow the significant within-groups effect to be explored with repeated measures t tests. The average total recall of correct details in Session 1 was higher than in Session 2, $t(93)$ = 5.365, p < 0.01, $d = 0.32$, the average number of errors made was lower in Session

1 than in Session 2, $t(93) = -3.271$, $p = .002$, $d = -0.29$, and recall accuracy was higher in Session 1 than Session 2, $t(93) = 4.470$, $p < .001$, $d = 0.40$. From this, it can be concluded that the one-week delay had a negative impact on recall ability as intended.

The effect of experimental condition on recall for different information types was investigated. A one-way ANOVA revealed significant differences between the four groups in the number of action details recalled by the four groups, $F(3, 93) = 3.612$, $p = .016$. There were no other significant differences in recall for the other types of information: person, $F(3, 93) = 2.048$, $p = .11$, place, $F(3, 93) = .326$, $p = .81$, or object, $F(3, 93) = 1.713$, $p = .170$. Planned comparisons were conducted using between groups t tests. It was hypothesised that written forms of evidence would improve recall in comparison to non-refreshed and video-refreshed groups. As such, comparisons were made between transcript and video/control groups, and written statement with video/control groups. Based on a Bonferroni correction of .0125, there was a significant difference between the recall of action details between the written statement and the control group, $t(50) = 3.667$, $p = .001$, $d = 1.02$, 95% CI [2.52, 4.36]. The written statement group recalled a greater number of action details than the control group, however, it must be noted that this difference was also observed prior to the experimental manipulation so it is not thought to be an effect of refreshing on memory (see Figure 6.1 on p.142). No other comparisons were significant, all p values greater than .0125.

Recall was also analysed to determine whether reported details were gist or verbatim in quality. A mixed ANOVA, with the experimental condition as the between groups factor and the type of information as the within groups factor, revealed that all groups recalled significantly more verbatim details compared to gist, $F(1, 89) = 187.576$, $p < .001$, $\eta^2 = .678$, replicating the findings in Session 1. There was no interaction between experimental condition and the quality of memory recalled, $F(4, 89) = .470$, $p = .76$.

Table 6.3 Mean Number of Correct Details, Errors and Recall Accuracy in Sessions 1 and 2 Free Recall by Condition. Standard Deviation is given in parenthesis.

	Session 1	Session 2
Video Interview		
Correct	38.43 (10.35)	35.95 (10.76)
Error	3.24 (2.14)	3.33 (1.85)
Recall Accuracy	.92 (.05)	.91 (.04)
Interview Transcript		
Correct	36.35 (8.23)	35.52 (9.04)
Error	2.96 (2.14)	3.57 (3.20)
Recall Accuracy	.93 (.04)	.91 (.06)
Written Statement		
Correct	35.91 (9.75)	35.50 (9.65)
Error	1.73 (1.42)	3.18 (2.24)
Recall Accuracy	.93 (.05)	.91 (.07)
Control		
Correct	36.14 (9.18)	31.90 (8.00)
Error	2.90 (2.09)	3.28 (2.17)
Recall Accuracy	.93 (.05)	.91 (.06)

Figure 6.1. Mean Number of Correct Details Recalled by Type of Information and Condition During Free Recall in Sessions 1 and 2 (including error bars).
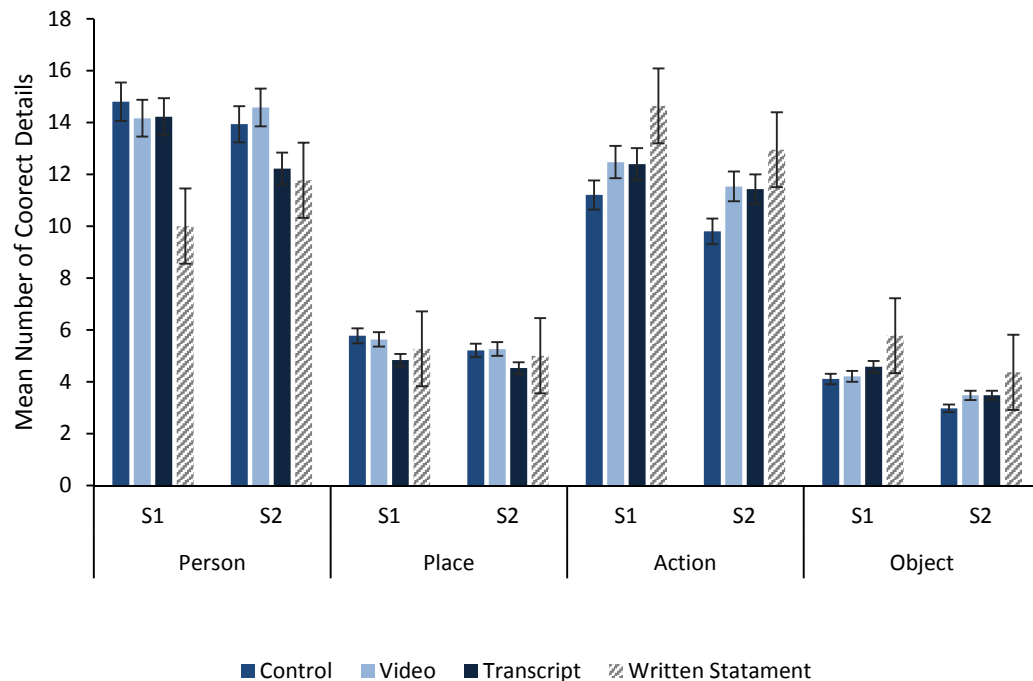
6.3.3. Session Two: The Effect of Repetition on Memory

Free recall across the two sessions was examined for measures of memory consistency, forgetting and the recall of new details. It was predicted that refreshed testimony with printed forms of evidence (written statement or interview transcript) would improve memory quality. This would be evidenced by an increased number of details reported in the free recalls of both Sessions 1 and 2 (consistency), a reduction in the number of details reported in Session 1 free recall but omitted in Session 2 (forgetting), and an increase in the number of details reported in Session 2, that were not reported in Session 1 (new details), compared to the video group and non-refreshed controls. This hypothesis was not supported by the data as reported below.

6.3.3.1. New Details: Reminiscence

It is a natural occurrence of memory for witnesses to recall new details (reminiscence) in a second interview, even after a delay (see Chapter 1). Reminiscence was observed across the majority of the sample with 89 of the 94 participants recalling new details during the free recall in Session 2. As can be seen in Table 6.4, the transcript group recalled fewer new accurate details ($M = 2.70$)

compared to the video interview (M = 4.14), written statement (M = 5.27), and control (M =4.301) groups.

This difference was explored with one-way ANOVAs comparing the average total of new correct and error details and the proportion of new details reported in the Session 2 free recall. A significant effect of condition was found for the number of new correct details reported, $F(3, 93) = 4.101$, $p = .009$, and the proportion of overall recall that consisted of new details, $F(3, 93) = 4.169$, $p =.008$. It was hypothesised that written forms of evidence would improve the consistency of recall compared to non-refreshed and video groups. Planned comparisons, with between-groups t tests, revealed no significant differences between the transcript and video/control groups, nor between the written statement and video/control groups. Therefore the data does not support this hypothesis.

Reminiscence for particular types of information was compared between the groups using one-way ANOVAs (see Table 6.5 for means). There was a significant difference between the groups for the number of new person details they reported in the second free recall, $F(3, 93) = 5.106$, $p = .003$. Planned comparisons were conducted using between groups t tests to compare the transcript and video/control groups, and written statement with video/control groups. Based on a Bonferroni correction of .0125, the transcript group recalled significantly fewer new person details in the second free recall attempt than both the control, $t(51) = -2.682$, $p = .01$, $d = .76$, 95% CI [1.02, 2.40], and the video group, $t(40) = -2.732$, $p = .009$, $d = .081$, 95% CI [.60, 2.28], although these effect sizes are small (Cohen, 1988). There were no significant differences in the total recall of new accurate details between the written statement group and video or control groups.

Reminiscence for gist and verbatim details was also compared across the conditions with one-way ANOVAs (see Table 6.5 for means). A significant effect of group on reminiscence for both gist, $F(3, 93) = 6.515$, $p < .001$, and verbatim recall, $F(3, 93) = 3.478$, $p = .019$, was observed. Planned comparisons were conducted as per above. Based on a Bonferroni correction of .0125, the written statement group recalled a greater number of gist details in the second free recall compared to both the control, $t(50) = 3.215$, $p = .002$, $d = .88$, 95% CI [.035, 1.21], and the video group, $t(39) = 3.757$, $p = .001$, $d = 1.19$, 95% CI [.59, 1.47]. Again, these effect sizes

are small (Cohen, 1988). There were no significant differences on verbatim reminiscence between the written statement group and the video/control groups, nor between the transcript group and the video/control groups for gist and verbatim reminiscence, all p values greater than .0125.

6.3.3.2. Memory Consistency

It was predicted that refreshed testimony with printed evidence (written statement or interview transcript) would increase the consistency of free recall in Session 1 and 2 (the number of details recalled in both interviews) compared to the video-interview refreshed group and the control group. As can be seen in Table 6.4, the control group reported fewer details consistently ($M = 26.45$) compared to the video interview ($M = 31.55$), transcript ($M = 29.65$) and written statement ($M = 29$) groups. This was explored with one-way ANOVAs, comparing the conditions on the total number of correct details and errors reported in both Session 1 and Session 2, and also what proportion of details were consistent from the total number of details recalled.

There was no significant difference between the total number of correct details, $F(3, 93) = 1.310$, $p = .29$, and errors, $F(3, 93) = 1.241$, $p = .30$, reported consistently in both free recalls. There was a significant difference in the proportion of consistent details from the total number of details recalled in Session 2, $F(3, 93) = 3.556$, $p = .017$. Planned comparisons were made between transcript and video/control groups, and written statement with video/control groups. Based on a Bonferroni correction of .0125, there were no significant differences between the proportions of overall free recall which comprised of details recalled consistently in both interviews in any of the pairwise comparisons, all p values greater than .0125.

Consistency for particular types of information was compared across the conditions using one-way ANOVAs (see Table 6.5 for means). A significant effect of condition was observed for both person, $F(3, 93) = 3.221$, $p = .026$, and action, $F(3, 93) = 3.452$, $p = .020$, details. There was no effect of condition on the consistency of recall for place and object details. Planned comparisons were made as per above. Based on a Bonferroni correction of .0125, significant differences were observed between the written statement and the control group. The written statement groups recalled fewer person details consistently, $t(50) = -2.597$, $p = .012$, $d = .073$,

95% CI [2.14, 4.12], and recalled a greater number of action details consistently, $t(50) = 3.188$, $p = .002$, $d = .87$, 95% CI [2.18, 4.00], in comparison to the control group, however these effect sizes are small (Cohen, 1988). No other pairwise comparisons were significant, all p values greater than .0125.

Consistency for gist and verbatim details was also compared using one-way ANOVAs. This analysis did not reveal any significant effect of condition on the consistency of recall for either gist, $F(3, 93) = .222$, $p = .88$, or verbatim details, $F(3, 93) = 2.051$, $p = .112$.

6.3.3.3. Forgetting and Hypermnesia

It was predicted that refreshed testimony with written forms of evidence would protect against forgetting over a one week delay. The earlier analysis of delay on recall in Section 6.3.2., looked at total recall only, regardless of whether the same information or new information was being omitted from recall. The following looks at forgetting between recall attempts for individual details (whether a specific detail originally reported in Session 1 was omitted from Session 2). As can be seen in Table 6.4, the refreshed groups forgot fewer accurate details, previously reported in Session 1 free recall, compared to the control group. This was explored with one-way ANOVAs. There was no significant effect of condition on forgetting, $F(3, 91) = 1.108$, $p = .35$. Forgetting for particular types of information was compared across the conditions. One-way ANOVAs revealed no significant difference between any of the groups on the number of person, place, action, and object details reported in the first free recall but omitted from the second. Nor were there significant differences in the number of gist and verbatim details forgotten between recall attempts by the groups, all p values greater than .05 (see Table 6.5 for means).

Hypermnesia (when the total number of details gained in a repeated interview exceeds the number of details forgotten) was observed in 25% of the sample in this study. A one-way ANOVA revealed no significant differences in hypermnesia effects between the conditions, $F(3, 93) = 1.044$, p = .37. This finding indicates that hypermnesia can be observed in eyewitness recall but that it is not influenced by the presence or absence of refreshed testimony, nor the format of evidence used for refreshing over a one-week delay.

Table 6.4 Mean Totals and Proportions of Consistent, Forgotten and New Correct Details and Error by Condition. Standard Deviation is given in parenthesis.

	Video		Interview Transcript		Written Statement		Control	
Consistent								
Correct	31.55	(10.11)	29.65	(8.71)	29.00	(9.46)	26.45	(8.49)
Errors	2.30	(1.49)	1.96	(1.94)	1.36	(1.14)	1.93	(1.69)
Proportion Consistent	.85	(.10)	.88	(.10)	.79	(.09)	.80	(.13)
Forgotten								
Correct	6.55	(3.66)	6.43	(3.45)	7.00	(4.27)	8.45	(5.38)
Errors	1.35	(1.42)	.96	(.77)	.36	(.58)	.97	(1.23)
Proportion Forgotten	.19	(.10)	.19	(.11)	.20	(.13)	.23	(.13)
New								
Correct	4.30	(3.54)	2.70	(2.31)	5.27	(1.75)	4.41	(2.37)
Errors	1.35	(1.22)	1.52	(1.68)	1.82	(1.71)	1.38	(1.61)
Proportion New	.14	(.08)	.11	(.09)	.20	(.09)	.17	(.09)

Table 6.5 Mean Totals of Consistent, Forgotten and New Correct Details by Type and Condition. Standard Deviation is given in parenthesis.

		Video		Interview Transcript		Written Statement		Control	
Consistent:	Person	12.00	(4.22)	11.78	3.62)	8.77	(3.83)	11.90	(4.60)
	Action	10.21	(3.69)	10.30	(3.80)	11.32	(4.11)	8.23	(2.87)
	Place	4.68	(2.87)	4.13	(3.07)	3.82	(2.46)	4.60	(2.74)
	Object	3.26	(2.16)	3.39	(2.25)	3.95	(3.02)	2.80	(1.38)
	Gist	4.53	(1.22)	4.96	(1.40)	3.90	(1.12)	4.53	(1.74)
	Verbatim	26.74	(8.45)	25.57	(7.86)	25.23	(8.42)	24.90	(7.03)
Forgotten :	Person	1.84	(1.21)	2.43	(2.09)	1.55	(1.34)	2.97	(2.46)
	Action	2.16	(1.95)	2.09	(1.91)	3.36	(3.59)	2.67	(2.25)
	Place	1.00	(1.12)	.70	(.93)	1.23	(1.80)	1.17	(1.32)
	Object	.95	(1.08)	1.13	(1.58)	2.05	(2.08)	1.50	(1.41)
	Gist	.84	(.69)	.57	(.79)	.50	(.74)	.83	(.15)
	Verbatim	4.89	(3.51)	5.52	(2.87)	7.00	(5.03)	7.27	(4.62)
New:	Person	2.26	(2.13)	.87	(1.10)	2.73	(1.70)	1.93	(1.64)
	Action	1.42	(1.90)	1.13	(1.25)	.91	(.87)	1.30	(1.37)
	Place	.63	(.90)	.39	(.78)	.82	(.96)	.60	(.81)
	Object	.21	(.54)	.09	(.29)	.36	(.49)	.43	(.68)
	Gist	.42	(.69)	.61	(.84)	1.45	(1.10)	.67	(.76)
	Verbatim	3.52	(3.44)	2.26	(1.66)	4.50	(2.39)	3.73	(1.99)

6.3.4. Session Two: Cross-Examination

The cross-examination in Session 2 included several question types. Participants were asked four shift questions, modelled on those used in previous research (Zajac & Hayne, 2003, 2006). The cross-examination also included four open, four closed, four misleading and four forced-choice questions to replicate the experience of real world eyewitnesses.

6.3.4.1. Shift Questions

It was hypothesised that printed forms of evidence would increase memory strength resulting in the written statement and transcript groups changing fewer of their answers to shift questions in comparison to the video and control group (see Chapter 2 for related literature). This was not supported by the data in the current study. As can be seen in Table 6.6, participants in all groups changed few of their responses. Participants were more likely to concede the possibility of being incorrect (a "maybe" response). When response changes and "maybe" responses were combined, the control group had the highest resistance to the shift questions, making fewer changes and giving fewer "maybe" responses, compared to the three refreshed groups. This was explored with one-way ANOVAs comparing the proportion of answers changed to shift questions and the proportion of responses in which the participant conceded the possibility that their response was incorrect (maybe responses).

There was no significant effect of condition on the proportion of answers changed to shift questions, $F(3, 93) = .621$, $p = .61$, the proportion of maybe responses, $F(3, 93) = .935$, $p = .43$, or the combined measure of changed and maybe responses, $F(3, 93) = .348$, $p = .79$.

Table 6.6 Proportion of Answers Changed or Conceding to Error in Response to Shift Questions in the Session 2 Cross-examination by Condition. Standard Deviation is given in parenthesis.

	Changed	Maybe	Combined
Video	.14 (.16)	.18 (.23)	.32 (.29)
Interview Transcript	.11 (.13)	.24 (.21)	.35 (.24)
Written Statement	.16 (.17)	.15 (.15)	.31 (.24)
Control	.11 (.20)	.18 (.18)	.26 (.05)

6.3.4.2. Open, Closed, Forced-choice and Misleading Questions

It was predicted that open questions would produce more accurate responses than both closed and forced-choice questions, regardless of condition. As can be seen in Table 6.7, a higher number of correct details were reported in response to open questions. Similarly, fewer errors were made in response to open questions. Recall accuracy was highest for open questions followed by forced-choice and closed questions. This pattern of results was shown consistently across all experimental groups, suggesting that refreshed testimony did not affect response accuracy to different question types. This was confirmed with mixed ANOVAs which compared the total number of correct details, errors and recall accuracy with question type (open, closed, forced-choice) as the within groups factor and experimental condition (video, transcript, written statement, control) as the between groups factor. Misleading questions were omitted from the analysis due to unexpected high accuracy rates for this question type ($M = 3.37$ out of 4), indicating that these questions were not good exemplars of the category they represented.

The predicted benefits of open questions were observed in the data. A significant main effect of question type was observed for the total number of correct details, $F(2,180) = 196.952$, $p <.001$, $\eta_p^2 = .686$, the number of errors, $F(2,180) = 21.105$, $p < .001$, $\eta_p^2 = .190$, and recall accuracy, $F(2,180) = 262.342$, $p < .001$, $\eta_p^2 = .745$. There was no interaction between question type and experimental group for any of the measures, all p values greater than .05. As such, the experimental conditions were collapsed into one sample and the significant effects of question type were explored with planned comparisons using repeated measures t tests. Significant differences were observed across all comparisons. Based on a Bonferroni correction of .025, open questions produced significantly greater numbers of accurate details in comparison to both closed, $t(93) = 15.746$, $p <.001$, $d = 2.26$, and forced-choice questions, $t(93) = 13.995$, $p < .001$, $d = 1.88$. Open questions produced fewer errors in recall compared to both closed, $t(93) = -6.104$, $p < .001$, $d = 0.85$, and forced-choice questions, $t(93) = -6.008$, $p < .001$, $d = .88$, although these are both small effect sizes (Cohen, 1988). Finally, open questions resulted in higher overall recall accuracy in comparison to both closed, $t(93) = 31.337$, $p < .001$, $d = 4.78$, and forced-choice questions, $t(93) = 16.393$, $p < .001$, $d = 2.36$. These findings replicate those of both Studies 2 and 3 of this thesis and the wider literature.

Table 6.7 Mean Numbers of Correct Details, Errors and Recall Accuracy by Cross-examination Question Type and Condition. Standard Deviation is given in parenthesis.

	Video		Transcript		Written Statement		Control	
Open								
Correct	6.10	(2.95)	6.17	(2.87)	6.14	(2.46)	5.72	(2.69)
Errors	.05	(.22)	.22	(.67)	.14	(.47)	.10	(.31)
Recall Accuracy	.99	(.03)	.97	(.09)	.92	(.06)	.99	(.04)
Closed								
Correct	1.65	(.59)	1.57	(.79)	1.64	(.79)	1.45	(.51)
Errors	.65	(.67)	.57	(.66)	.50	(.51)	.66	(.72)
Recall Accuracy	.41	(.15)	.39	(.19)	.41	(.19)	.36	(.13)
Forced-choice								
Correct	2.10	(1.02)	2.26	(1.29)	2.05	(1.09)	2.21	(.82)
Errors	.80	(1.01)	.57	(.66)	.73	(.83)	.86	(.95)
Recall Accuracy	.53	(.26)	.57	(.32)	.51	(.27)	.55	(.20)

6.4. Discussion

Study 4 continued the investigation into refreshed testimony in this thesis. It has considered whether the format of evidence used for refreshed testimony influences the effectiveness of this practice in improving memory recall and accuracy. Based on previous research findings (Furnham et al., 2002; Gunter et al., 2000; Magner et al., 1996; Turtle & Yuille, 1994), and a dual-coding theory of information processing (Paivio, 1969, 1978), the current study hypothesised that refreshing memory with printed forms of evidence (a written statement or interview transcript) would increase recall accuracy compared to refreshing with a video interview or a non-refreshed control group. It was also predicted that witnesses refreshed with a written statement or interview transcript would have enhanced cross-examination performance by reducing the number of answers they changed in response to challenging question types. Finally, it was predicted that open questions would produce the most accurate responses during cross-examination for all four experimental groups. This discussion considers the results of this study and any methodological issues which may affect the interpretation and wider relevance of these findings.

6.4.1. Refreshed Testimony and Recall Accuracy

In line with the previous findings in this thesis, Study 4 found no effect of refreshed testimony on eyewitness recall accuracy, regardless of the format of evidence used. As can be seen in Table 6.3, the mean number of correctly recalled details and errors were almost identical across the three refreshed conditions, with accuracy rates of 91% for all three refreshed groups, as well as the control group. Similarly, the type and quality of recall did not differ between the conditions. All groups recalled similar numbers of person, place and object details and there was no difference in the recall of gist or verbatim details between the groups overall. A slight variation was observed in the number of action details recalled by two of the conditions in the second free recall.

The written statement group recalled significantly more action details than the control group in the second free recall attempt (see Figure 6.1 on p.142). However, although these findings are in line with the hypotheses, it is not thought that they occurred due to the experimental manipulation. Firstly, the difference in recall of action details between these two groups was present in the Session 1 recall, prior to the experimental manipulation. Secondly, the written statement group did not differ significantly from any of the other conditions, besides the control group (a post-hoc *t*

test confirmed that there was no difference from the transcript group). However, the written statement group recalled the highest number of action details of all the groups, in both the Session 1 and 2 free recall attempts. It must be considered whether the process of writing a statement, rather than giving a verbal interview, focussed the participants' minds more towards documenting the events and actions they saw in the video, rather than the finer detail of the people, objects and place. If this were the case, the first recall attempt would have strengthened memory for action details specifically, more so than other detail types (Gabbert et al., 2009; Hope et al., 2014; Pansky, 2012; Tizzard-Drover & Peterson, 2004). This explanation would account for the higher recall of action details in both recall attempts by the written statement group.

Despite the minor differences between the recall of some of the groups for certain types of information, overall recall was very similar across all conditions. Although this does not suggest any benefit of refreshed testimony, it does show that this practice did not negatively affect memory and recall ability under the optimal conditions in this study (the effect of these recall conditions on the findings of this study will be discussed shortly). As highlighted in previous chapters, it is of applied relevance to show that refreshed testimony does not compromise recall ability in any way.

This study was also able to explore the consistency of memory between repeated recall attempts (Sessions 1 and 2) and whether this was influenced by refreshed testimony. It is natural for witnesses to be questioned more than once throughout a criminal investigation. However, the reconstructive nature of memory means that a person's recall can change between repeated recall attempts, although these changes to recall do not necessarily affect accuracy (see Chapter 1 for literature and discussions). Omitting previously reported details, and recalling new details are all ways in which a witness may appear inconsistent in their testimony (Fisher, Vrij, & Leins, 2013). This is problematic in the courtroom as consistency is considered to be an indicator of credibility by jurors and practitioners (Berman & Cutler, 1996; Brewer & Burke, 2002; Oeberst, 2012; Pozzulo & Dempsey, 2009), whereas inconsistency is considered an indicator of wilful deception (Fisher et al., 2013; Strömwall & Granhag, 2003). It was therefore important for this study to consider whether efforts to improve memory recall after a delay affected consistency in order to avoid the veracity and credibility of a witness being challenged in court after refreshing.

The pattern of results for measures of consistency, forgetting and reminiscence in this study replicated the findings of Study 3. No overall difference was observed between the conditions for the number of new details recalled in Session 2, the number of details recalled consistently in both interviews and the number of details which were forgotten between the two recall attempts. However, within these measures some minor significant effects were observed. These included the number of new correct details reported in Session 2, specifically the number of new person details, and the overall proportion of new details reported. Despite the appearance of these differences in the data, the findings are not considered to be evidence in support of the hypotheses of this study. Planned comparisons were used to investigate significant effects of condition on consistency, reminiscence and forgetting. The majority of these comparisons did not yield significant differences in favour of the hypothesis.

Where significant pairwise comparisons were observed, these differences had notably low effect sizes (Cohen, 1988), and could therefore be sample specific differences. For example, the significant difference between the number of errors forgotten by the written statement group, compared to the video group, had an effect size of $d = .91$. The difference in the mean total number of forgotten errors between these two groups equated to less than one error detail. Given the small effect size and the limited size of the groups in this study (ranging from 21 to 28 – see Methods section), caution must be exercised before interpreting any significant pairwise comparisons in this data as support for the hypotheses. Replication of these results is required before they can be said to represent genuine effects rather than variations in the recall of randomly allocated population samples.

Overall, the predicted benefits to memory from refreshing with written forms of evidence were not observed in this study. Particularly, gist and verbatim recall remained unaffected by refreshing, regardless of medium. Although it remains relevant that refreshed testimony did not negatively affect natural recall processes and overall accuracy, it must be considered why the benefits to memory observed in previous research, were not replicated in this study (Magner et al., 1996; Turtle & Yuille, 1994). As noted earlier, recall in this study occurred under optimal conditions and therefore it is not possible to determine whether refreshed testimony would offer any improvement to memory recall and accuracy under more challenging conditions outside the confines of laboratory research. Although evidence of forgetting between recall attempts was observed in the study, it is possible that memory decay was insufficient to detect any

benefits of refreshed testimony in comparison to non-refreshed controls. Alternatively, refreshed testimony may not be an effective means of improving recall, in spite of the rationale and hypotheses presented throughout this thesis. This will be considered in more detail in the general discussion of this thesis (Chapter 7).

6.4.2. Refreshed Testimony and Cross-examination Performance

Replicating the findings of Studies 2 and 3 of this thesis, refreshed testimony was not found to have any effect on cross-examination performance, regardless of the medium of evidence used. No differences were observed between any of the groups for the proportion of answers changed in response to shift questions and the number of times a participant conceded the possibility of making an error. Although participants were no better able to resist this challenging style of questioning after refreshing, reviewing their original interview before cross-examination did not make any group more likely to change their responses. As previously discussed, consistent testimony is considered an indication of accuracy in court and it is therefore important to note that refreshed testimony, under optimal conditions, did not negatively affect the consistency of responses to challenging question types.

As discussed in previous chapters of this thesis, the null effect of refreshing on cross-examination performance may be accounted for in a number of ways. Refreshed testimony may be ineffective at improving recall accuracy and consequently offers no benefits during cross-examination. Taking note of the literature, however, it is more likely that interviewing style and question type, with the added factor of suggestibility, have a bigger influence on cross-examination performance and accuracy than memory trace strength. Cross-examination is a challenging experience for witnesses of any age. Extensive research has demonstrated that difficult and complex question types adversely affect accuracy at both the investigative and evidentiary stages of the criminal justice process (see Chapter 2 for literature and discussion). The results of the current study have once again confirmed the finding that open questions produce the most accurate responses compared to closed and forced-choice questions. This not only replicates the findings of previous studies in this thesis (Studies 2 and 3), but also those of the existing literature and recommendations of interviewing best practice. This robust finding further strengthens the argument that questioning styles are more influential than memory trace strength by repeatedly demonstrating the negative impact of questioning style on memory recall and accuracy in multiple contexts (see Chapters 1 and 2 for

literature). However, as with the evaluation of free recall, the potential benefits of refreshed testimony on cross-examination performance over longer delays cannot be ruled out by the data in this study. The discussion chapter (Chapter 7) will therefore consider in more detail the effect of question type, and any interaction with memory trace strength, on cross-examination performance.

6.4.3. Methodological Issues

As with all experimental research, methodological issues affect the interpretation and generalisation of these findings. The current study followed the same methods as Study 3, using the same procedures and materials. Consequently, the same methodological issues identified in Chapter 5 are relevant here. The main issue is that recall of the witnessed event took place under optimal recall conditions: participants viewed a short, simulated crime event and gave a free recall after a brief (30 minute) filler task. There was a delay of one week before participants repeated the free recall attempt and were cross-examined. Recall was significantly lower in the second free recall, compared with the first. However, it is clear from the high levels of recall accuracy, in all four conditions, that participants were able to access their memory for the video with relative ease. Access to memory for the to-be-remembered event may have also been aided by context reinstatement. Although interviewed in different rooms for each session, both locations were in the same building within the Psychology Department at Royal Holloway, University of London. Participants waited in the same foyer and took the same route for both interview rooms in Sessions 1 and 2. Similarities in procedure, and the general décor of the testing rooms, may have provided relevant retrieval cues to aid recall in Session 2 (Aslan et al. 2010; Godden & Badddeley, 1975; Smith et al. 1978; Wong & Read, 2011; Priestley et al. 1999).

The findings of this study are limited therefore in ecological validity as in a real-world context much longer timescales would be involved and context reinstatement would be minimal or non-existent. Chapter 7 considers these limitations in more detail and how these can be addressed in future studies to provide a more comprehensive understanding of refreshed testimony.

6.4.4. Summary

Study 4 has replicated and extended the earlier findings of this thesis. Refreshed testimony with a video-recorded interview has been shown to have no effect on recall accuracy and cross-examination performance compared to non-refreshed witnesses

recalling under optimal conditions. Furthermore, no effect of refreshing has been observed with other formats of evidence (written statement, and interview transcript). Cross-examination performance has once again been shown to be unaffected by refreshed testimony. This leads to the conclusion that, under optimal retrieval conditions, interviewing style and question type may be better indicators of cross-examination accuracy than memory trace strength. Study 4 has replicated the findings of earlier studies in this thesis (Studies 2 and 3), and in the literature, to demonstrate the benefits of using open questions over other question types to increase accuracy during cross-examination.

The following chapter provides the reader with an overview of the main findings of this thesis, assessing its contribution and applied relevance to the wider eyewitness literature. The impact of any methodological limitations of this thesis are discussed and recommendations are made for future avenues of research.

Chapter 7: General Discussion

Chapter Overview:

This thesis has explored the practice of refreshed testimony and the potential benefits for the quality and accuracy of eyewitness recall and cross-examination performance. The first detailed assessment of current refreshed testimony practices in England and Wales has been presented alongside a series of experimental studies. This chapter is the culmination of this research, bringing together the results to present the main findings of this thesis. It considers the applied and theoretical relevance of this research, in light of potential limitations. It proposes alternative methods of refreshing memory in an eyewitness context and argues for reform of cross-examination practices. This chapter concludes that a number of gaps in current knowledge of refreshed testimony remain along with recommendations for continued research in this area to improve the quality of eyewitness evidence in court.

7.1. Thesis Overview

Chapter 1 reviewed relevant memory theory literature. A Fuzzy-Trace Theory of memory and information processing was used as the theoretical rationale to propose a positive effect of refreshed testimony on recall accuracy (through increased memory trace strength after refreshing). Chapter 2 reviewed relevant cross-examination and suggestibility literature to evidence the negative impact that cross-examination style interviewing has on eyewitness accuracy and credibility. Again, it was proposed that refreshed testimony could be used to improve cross-examination performance. This literature review identified gaps in our knowledge of refreshed testimony from both a real-world and experimental context. These included the absence of a detailed assessment of current real-world refreshed testimony practices and a limited number of experimental studies into the benefits of refreshed testimony. Existing studies, identified as part of the literature review, were assessed as having inadequately simulated the experience of real world eyewitnesses in their methods (Magner et al., 1996; Turtle & Yuille, 1994). Furthermore, a lack of experimental research into the potential effect of refreshed testimony on cross-examination accuracy was also recognised, with the first known study being published only recently (Jack & Zajac, 2014). In addition, it was identified that the

effect of refreshed testimony on response accuracy to best practice interview questions has not been explored to date. Thus the studies presented in this thesis began to address these gaps in knowledge. Chapter 3 presented a questionnaire study, the first of its kind to provide a detailed assessment of refreshed testimony practices by police officers in England. Chapters 4 to 6 outlined three separate experimental studies which investigated the potential effect of refreshed testimony on memory recall and cross-examination accuracy. The main findings of this research are summarised below.

7.2. Main Findings

Three main conclusions can be drawn from the research presented in this thesis. First, the questionnaire results from Study 1 suggest that different procedures are being used by police officers across England and Wales for the delivery of refreshed testimony, based on those sampled in this research. Second, the experimental results from Studies 2, 3 and 4 suggest that refreshing memory for a staged event does not have any clear effect on eyewitness recall and cross-examination performance under optimal recall conditions. And third, the experimental results from Studies 2, 3 and 4 indicate that best practice interviewing techniques can be successfully applied to cross-examination interviews. This style of interviewing increases recall accuracy in comparison to more complicated questioning tactics. Evidence for these conclusions, gathered throughout this thesis, will now be summarised followed by a discussion of any theoretical and applied implications of this research.

Prior to the research in this thesis, the delivery of refreshed testimony in real-world contexts had not been investigated in any depth. Existing reports offered limited insight into the practice itself, instead focussing on whether the opportunity for refreshing is offered to witnesses as a standard practice (HMCPSI & HMIC, 2012; Plotnikoff & Woolfson, 2004). Study 1 replicated the findings of these earlier reports, confirming that refreshed testimony is offered to some, but not all, witnesses. It went further, providing new insights into the delivery of refreshed testimony. It identified numerous examples of inconsistency in the practices of police officers in the sample. These differences include the timing, location, and frequency of refreshed testimony; the use of different protocols for whether the witness is

supervised during refreshing and inconsistent instructions being given to witnesses prior to refreshed testimony. Study 1 also highlighted that knowledge of refreshed testimony, as a practice, varies among police officers in England and Wales. Some police officers, prior to taking part in the study, had been unaware that refreshed testimony is permitted as part of the witness preparation process. Others expressed a belief that refreshed testimony equated to witness coaching, a practice of guiding witnesses through their testimony which is not permitted in the UK.

The findings of Study 1 highlighted the possibility that some witnesses are at a disadvantage when giving evidence in court because of the inconsistent methods currently being used to refresh memory (i.e. longer or shorter delays between refreshing and court date) or because they are not given the opportunity to refresh their memory at all. Refreshed testimony is proposed as a means of improving recall accuracy and cross-examination performance. This could suggest that non-refreshed witnesses find it more challenging to recall their memory after a long delay between the police interview and the court date. This possibility guided the experimental direction of this thesis to investigate, through a series of experimental studies, whether a measurable advantage exists between refreshed and non-refreshed eyewitnesses.

Study 2 was the first of these experiments. It investigated the effect of refreshed testimony on the recall accuracy and cross-examination performance of a sample of 11-12 year olds, with a two week delay between an initial recall attempt and cross-examination. Video-recorded interviews are most commonly used to refresh young and vulnerable witnesses in England and Wales, under the Youth Justice and Criminal Evidence Act 1999. Video-recorded interviews were therefore used in this study to refresh memory whereas previous research had used written statements (Magner et al., 1996; Turtle & Yuille, 1994). Study 2 found no effect, positive or negative, of refreshed testimony on recall accuracy and cross-examination performance. Memory recall and accuracy were equal across the two conditions and both groups made a similar number of changes to their evidence during cross-examination. However, the findings of Study 2 could not be confidently interpreted as a genuine null effect of refreshing. Participant familiarity with the live-event, context reinstatement and issues with the experimental design (a lack of repeated free recall) affected the analysis of memory recall in this study (see Chapter 4).

Studies 3 and 4 used a revised experimental design to allow a more detailed assessment of memory and recall accuracy than had been possible in Study 2. By including a repeated free recall attempt in Session 2, prior to cross-examination, recall could be coded for information type (person, place, action and object) and also for the type of memory (gist and verbatim) in both studies. The repeated recall attempt also allowed an investigation into the consistency of recall between retrieval attempts, and any effects of delay. Both Studies 2 and 3 were able to compare recall across the experimental conditions for recall consistency (details reported in both interviews), forgetting (details reported in Session 1 but omitted from Session 2) and reminiscence (details omitted from Session 1 but reported in Session 2).

Study 3 compared the recall of two groups (a video-refreshed and non-refreshed control group) and Study 4 extended this investigation to consider whether video-recorded interviews are the most effective format of evidence to use for refreshed testimony (in comparison to printed forms of evidence i.e. written statement or interview transcript). Both used a first year undergraduate sample. Neither study found evidence of any effect of refreshed testimony on recall accuracy and cross-examination performance (see Chapters 5 and 6). Looking at the type of information recalled (i.e. person, place, action, object, gist and verbatim), participants in both studies recalled a greater number of person and action details, in comparison to object and location details, in line with earlier research (Dando et al., 2010; Hope et al., 2014; Memon et al., 1997; Wright & Holliday, 2007; Yuille & Cutshall, 1986). However, the groups did not differ overall, in either study, on their recall of these different information types. Gist and verbatim recall was equal between the refreshed and control conditions in both studies. Hence there was no apparent advantage of refreshing memory on the recall of verbatim details as was predicted.

No significant group differences were observed in either study for measures of reminiscence (the recall of new details in a repeated interview), forgetting (the recall of details in Session 1 that were omitted from recall in Session 2), or consistency (recall of details in both Sessions 1 and 2). This more in-depth analysis of memory, provided by both Studies 3 and 4, strengthens the overall conclusion of this thesis that refreshed testimony does not affect recall in an observable way under optimal recall conditions. This appears to be the case regardless of the medium of

evidence used for refreshing. Furthermore, refreshed testimony was not found to have any impact on cross-examination performance in either study, replicating the earlier results of this thesis. Participants in both studies were just as likely to change their responses when challenged and no differences in accuracy were observed between any of the groups when responding to best practice and cross-examination style question types.

It is notable that no negative effects of refreshing on memory were observed in all three experimental studies. Participants became no less accurate, nor did they change a greater proportion of their answers to cross-examination style questions. Importantly, refreshed testimony did not affect participants' ability to respond accurately to best practice interview questions. In all three studies, the use of open questions during cross-examination resulted in more detailed and accurate responses in comparison with the use of closed and forced-choice questions, as predicted. The implications of these findings will now be discussed.

7.3. Applied and Theoretical Implications

7.3.1. Refreshed Testimony in Practice

The conclusions drawn from Study 1 of this thesis have applied relevance for the evidentiary stages of the criminal justice system. This research has demonstrated that levels of knowledge and understanding of refreshed testimony vary between police officers in England. Based on this sample, it can be assumed that limited guidance and training is available to practitioners on how to best deliver refreshed testimony, resulting in the inconsistent practices that were observed in this research. In the absence of evidence-based best practice guidance, it is difficult to say whether observed inconsistencies in the delivery of refreshed testimony constitute poor practice, however, these findings raise a number of theoretical questions regarding the delivery of refreshed testimony and the potential effects on memory.

Based on other areas of eyewitness literature (reviewed in Chapter 3), it can be inferred that some of the practices reported in Study 1 have the potential to negatively affect a witness' ability to recall their evidence in court accurately. While it is important to consider the potential differences in recall ability between refreshed and non-refreshed witnesses, a range of other factors were also identified in Study 1

which may affect recall. One example is the varying lengths of delay between refreshed testimony and giving evidence in court. In identifying that some witnesses are refreshed on the day of the trial and others can be refreshed over a week in advance, the potential effects of these varying delays should not be underestimated. Theoretically, refreshing too close to the trial may risk retrieval-induced forgetting; however, if a witness is refreshed too far in advance, their recall may be subject to the negative effects of decay on memory (see Chapter 3 for literature). Similarly, the results of Study 1 highlighted that the location at which a witness is refreshed has the potential to enhance or limit the effects of refreshed testimony, ultimately depending on the availability of relevant contextual cues in the courtroom. Furthermore, the location choice may compromise the credibility and accuracy of an eyewitness' testimony. Notable examples from the practitioner comments include reports that refreshed testimony can take place in the presence of co-witnesses, and a suggestion that witnesses should be sent a copy of their evidence to their home address to review in advance of the trial. Both are potentially damaging practices.

Refreshing in the presence of other witnesses, and sending a copy of evidence to a witness' home, increases the danger of a witness collaborating with others by discussing their evidence with family members, friends or co-witnesses. These discussions increase the likelihood of memory conformity, whereby individuals recall details which they did not personally observe, compromising the quality and accuracy of their evidence (Allan et al., 2012; Principe & Ceci, 2002; Principe & Schindewolf, 2012; Wright, Memon, Skagerberg, & Gabbert, 2009). Although witnesses should be instructed not to discuss their testimony with others, according to UK Police and Criminal Evidence (PACE) guidelines, this is likely to be difficult to enforce. Fifty-eight per cent of real-world witnesses, in a UK police sample, admitted to having discussed crime details with other witnesses prior to an identification parade (Skagerberg & Wright, 2008). The above examples demonstrate the potentially negative impact that current refreshed testimony practices can have on the quality of evidence in the justice system (see Chapter 3 for full questionnaire results and additional refreshed testimony practices which may negatively impact recall ability).

The findings of Study 1 cannot inform on the extent to which various practices occur outside this sample without further research. However, it is unlikely

that the findings are entirely sample specific as respondents were from multiple police forces and police occupations across England. From an applied perspective, this suggests that there may be widespread benefits from the development and introduction of best practice guidance and training for police officers. By standardising refreshed testimony across England and Wales, the potentially damaging practices, as identified in this research, may be reduced or prevented entirely. The benefits of standardisation are evident from other areas of the criminal justice system which have already undergone reform. Evidence-based best practice guidance has improved procedures and increased the quality and accuracy of eyewitness evidence in the context of both investigative interviewing (Achieving Best Evidence 2007; 2011) and identification parade procedures (Horry et al., 2013). These are two key examples where empirical research informed the development of guidance to the continued benefit of eyewitnesses and the wider criminal justice system. The null effect of refreshing on recall accuracy and cross-examination performance observed in this thesis does not negate the issues surrounding the inconsistent delivery of refreshed testimony. There are many factors that remain unexplored such as the timing, location and manner in which testimony is refreshed as well as the benefits of refreshing memory under less than optimal conditions (e.g. following long delays). Pursuit of research in these areas will better inform our understanding of refreshed testimony and will further the development of best practice guidance for use in this area of the justice system.

7.3.2. Recall Accuracy

The overall aim of this thesis was to identify whether refreshed testimony is effective at improving recall accuracy, motivated by the need to mitigate the lengthy delays between a witness' initial recall attempt and their giving evidence in court (Ministry of Justice, 2012a). Refreshed testimony is a resource intensive process, particularly if the witness has given a video-recorded interview. Both the witness and a police officer must be available, in addition to a suitable location and equipment, for the duration of the refreshed testimony process. Eyewitness interviews can take place over several hours, and across multiple interviews, therefore refreshing memory can be time consuming, adding further delays to an already lengthy justice process. Given the resource intensive nature of refreshed

testimony, it is of applied relevance to determine whether this process confers any benefit to an eyewitness and the quality of their evidence.

The research presented here did not find evidence of the proposed benefits of refreshed testimony on memory recall and accuracy under the current experimental conditions. Given these findings, it is difficult to justify the continuation of refreshed testimony; however we would argue that proposing the dismissal of refreshed testimony would be premature. There are a number of other factors to consider. Firstly, refreshed testimony may offer benefits to witnesses that were not assessed in this research. Comments made by practitioners in Study 1 suggest that refreshed testimony can often boost the confidence of a nervous witness. In this study, police officers commented that witnesses often express gratitude when given the opportunity to review their original statement or interview and report feeling more confident in their recall ability after doing so. Confidence in the accuracy of our own memories decreases over time (Clifford et al., 2012). Young witnesses, in particular, are often nervous about giving evidence after lengthy delays and are concerned about being cross-examined (Quas et al., 2005). If a witness appears anxious during their testimony, or feels that they are unable to recall the event in question clearly, they may be perceived as lacking confidence by a judge or jury (Brewer & Burke, 2002; Kebbell et al., 2010; Tenney, Spellman, & MacCoun, 2008; Wheatcroft et al., 2004; Wheatcroft, Wheatcroft, & Manarin, 2015). Therefore, although refreshed testimony may not measurably improve recall accuracy, based on the results of this thesis, it may beneficial to witness welfare and the perceived credibility of a witness in court.

The second argument in favour of retaining refreshed testimony is that it may improve memory and recall accuracy over longer delays than those used in this research. The practical constraints of doctoral research prevented the use of realistic lengths of delay (e.g. seven or eight months). Although the length of delay used in this thesis can be justified (see methods sections in Chapters 4 to 6), it is probable that delays of one to two weeks were insufficient in these studies to observe the hypothesised benefits of refreshed testimony. The dismissal of refreshed testimony on the basis of this thesis alone, therefore, cannot be justified. A recently published study supports this conclusion, finding that refreshed testimony improved recall accuracy to best practice style questions after a delay of eight months between retrieval attempts (Jack & Zajac, 2014). This new research did not assess memory

with a free recall, however, but proceeded directly into cross-examination after the delay. The benefits of refreshing were observed only for questions that were asked in the initial interview and repeated in the cross-examination. Nevertheless, improvements to memory recall and accuracy were observed in comparison to non-refreshed controls. Continued investigation into refreshed testimony, using more forensically relevant timescales, is now required to determine whether the benefits of refreshing observed under the limited conditions studied by Jack & Zajac, can be evidenced in other contexts and can be seen in responses to open-ended questions that have not been rehearsed.

More broadly, the findings of this thesis arguably have theoretical relevance, contributing further evidence of the reconstructive nature of memory and support a Fuzzy-Trace Theory of memory (Brainerd et al., 1985; Brainerd & Reyna, 2004; Brainerd et al., 1990). Fuzzy-Trace Theory provided the theoretical rationale for the use of refreshed testimony to improve memory recall (see Chapter 1). This theory accounts for the loss of information from memory as a result of retrieval failures due to either decay of the original memory trace, the retrieval cue, or both the memory trace and retrieval cue. Fuzzy-Trace Theory predicts reminiscence of previously unreported information, in a repeated recall, when formerly inaccessible memory traces are activated by new retrieval cues. The majority of participants in both Studies 3 and 4 displayed reminiscence for both gist and verbatim details, recalling new accurate information in the second free recall attempt. Both studies also demonstrated evidence of forgetting, when specific details from the first recall attempt were omitted in the second attempt, supporting the predictions of Fuzzy-Trace Theory and evidence of reminiscence in the wider literature (Brainerd et al., 1990; Gilbert & Fisher, 2006; Payne, 1987; Peterson, 2011; Turtle & Yuille, 1994). Furthermore, this research has demonstrated that refreshed testimony does not interfere with the natural memory processes. Refreshed participants were no more or less likely to recall new accurate details in their repeated free recall attempts and they were as consistent as non-refreshed controls and in not displaying increased levels of forgetting.

Currently, refreshed testimony is the only method used in an applied context with the aim of improving eyewitness memory and recall accuracy. Given the results of this research, it is possible that refreshed testimony is not the most effective

method of achieving the aims of refreshing in its current format (increased memory trace strength and increasing memory accessibility over a delay between recall attempts). As such, it is valuable to consider other methods of improving recall accuracy after long delays between retrieval attempts, particular any that are suitable for use in the criminal justice system. Refreshed testimony is not a completely passive process. A witness reviews their own statement, or watches their interview, and the incoming information provides retrieval cues to trigger the recognition and active recall of memory. Two possible alternatives are presented here which could assist witnesses to engage more fully in active recall, thereby more effectively improving memory recall than current refreshed testimony arrangements.

Firstly, evidence in the literature outlines the benefits of retrieval practice on memory (La Rooy et al., 2008; La Rooy et al., 2007; Roediger & Butler, 2011; Roediger & Payne, 1982; Shaw et al., 1995). In line with Fuzzy-Trace Theory, repeated access and rehearsal of memory increases memory trace strength and accessibility (Brainerd et al., 1985; Brainerd et al., 1990). The benefits of active retrieval were in fact part of the rationale for the use of refreshed testimony to improve recall. Thus, repeating a best practice interview in advance of giving evidence in court would engage the witness in active recall and may be a more effective means of improving memory trace strength and accessibility (Chan & Langley, 2011; Danker & Anderson, 2010; Ozubko & Fugelsang, 2011; Roediger & Butler, 2011). It may be particularly useful if the repeated interview takes place in the same context as the first, further aiding recall through context reinstatement (Aslan et al. 2010; Krafka & Penrod, 1985; La Rooy et al., 2007; Memon & Bull, 1991; Wong & Read, 2011). This may offer an advantage over traditional refreshed testimony methods by prompting witnesses to fully engage in active recall, rather than being reliant upon the retrieval cues provided by refreshed testimony. However, while it is theoretically possible to improve recall after a delay between retrieval attempts by repeating the original interview, it is acknowledged that this is perhaps an unfeasible proposal from a practical perspective. This method is likely to be as resource intensive as refreshed testimony, if not more so. Repeating interviews with all witnesses in the criminal justice system would therefore place further pressure on an already overstretched system.

The second alternative method for refreshing memory arguably offers the same benefits as a repeated witness interview with the advantage of requiring fewer resources. The Self-Administered Interview© (SAI©), as introduced in Chapter 1, is an interviewing toolkit which guides witnesses through memory retrieval to provide a rigorous and detailed recall. It has been shown to slow the effects of delay, preserving a greater number of details for recall at a future date. Although previous SAI© research has focussed on preventing decay over the delay between the event and an initial recall attempt, it should be considered whether this tool could counter the decay of memory between recall attempts. By undertaking detailed memory retrieval, a greater number of details are preserved over time, reducing forgetting (Gabbert et al., 2008). There is also evidence that completion of a SAI© increases the consistency of memory recall: participants who completed a SAI© after a witnessed event, rather than a free recall, reported more information when interviewed after a one week delay. Not only are more items reported accurately using the SAI©, but the details were more likely to be recalled again in the second interview (Gawrylowicz, Memon, & Scoboria, 2013; Hope et al., 2014). The SAI© has also been used effectively with vulnerable witness groups including older adults (Clarke, Dando, Gabbert, & Hope, 2011) and young children (af Hjelmsäter, Strömwall, & Granhag, 2011), demonstrating its applicability to a wide range of population groups. Therefore this method could offer an advantage over traditional refreshed testimony practices by engaging the witness in more active retrieval processes to improve recall for existing memories.

Both a repeated interview and the SAI© place an emphasis on the retrieval of verbatim details. However, both these methods can only strengthen memory for details that are already accessible to the witness. Fuzzy-Trace Theory proposes that verbatim memories are more difficult to form, store and access, particularly after long delays (see Chapter 1). It is therefore unlikely that these methods would increase access to details which have already been lost between retrieval attempts, which are most likely to be verbatim details, those that are the most relevant in criminal cases. There is also a danger that access to unrehearsed details, during a repeated interview or SAI©, would be impaired due to retrieval-induced forgetting (Anderson et al., 1994; MacLeod, 2002; Phenix & Price, 2012; Shaw et al., 1995;

Storm et al., 2007), although this is also a criticism of traditional refreshed testimony methods.

There is currently no known research which has compared different methods of refreshing on eyewitness memory recall and accuracy. Although Study 4 compared the effect of different mediums of evidence on refreshed testimony, the process was the same across all conditions (all witnesses refreshed their memory with a copy of their own previous recall attempt, whether it was a video-recorded interview, written statement or interview transcript). This thesis did not examine different methods of refreshing memory, such as those proposed above. Continued research into different methods of refreshing is therefore necessary to determine the most appropriate means of improving recall accuracy after lengthy delays between retrieval attempts. Such research can identify whether the alternatives to traditional refreshed testimony methods, proposed here, can be effective and practically applied to improve memory recall in a real-world context.

7.3.3. Cross-examination

A further aim of this thesis was to identify whether refreshed testimony could be used to improve cross-examination accuracy. Cross-examination tactics in the UK adversarial system are purposefully challenging (see Chapter 2 for details). Witnesses are more likely to report contradictory details when asked challenging questions, making their evidence inconsistent and typically less accurate. The findings of this thesis have therefore replicated observations in the literature that cross-examination reduces accuracy. Refreshed testimony was repeatedly found to have no effect on cross-examination accuracy in all three experimental studies. Once again given the optimal testing conditions used in the studies here, we cannot rule out potential benefits to cross-examination performance after refreshed testimony over longer delays. However, this thesis has also considered the possibility that memory trace strength has a limited influence in cross-examination compared with other factors.

Based on the evidence in this thesis, it is proposed that accuracy is influenced less by memory trace strength and more by the choice of question types, interviewing style and witness suggestibility. Throughout all three experimental studies, best practice question types consistently produced the most accurate responses. Cross-

examination style questions, on the other hand, reduced accuracy of both child and adult participants. Arguably, participants had sufficient access to verbatim memory in all three studies, as indicated by the highly accurate recall in the Session 2 free recalls, making them capable of accessing verbatim memory during cross-examination. If memory trace strength is the strongest determining factor in cross-examination accuracy, participants should have responded more accurately to detail-oriented questions. The fact that the majority of participants changed their responses when asked challenging questions suggests that memory trace strength alone is insufficient for accurate cross-examination performance.

A recently published study, discussed earlier in this chapter, assessed the potential effect of refreshed testimony on cross-examination accuracy over long delays (eight months), and reaches the same conclusion (Jack & Zajac, 2014). In Jack and Zajac's (2014) research, refreshed testimony (with an audio recorded interview) was provided to half a sample of children, eight months after they had viewed a brief simulated crime video and made a free recall. During the cross-examination, participants were found to change their answers to cross-examination style questions, similar to those used in this thesis and earlier research (Zajac & Hayne, 2003, 2006). Despite the longer delay used to increase forgetting (eight months compared to the one or two weeks delay used in Studies 2 to 4), the results of Jack and Zajac (2013) are consistent with those of this thesis. Increasing memory trace strength through refreshing did not increase accuracy in response to cross-examination style challenges between refreshed and non-refreshed groups who changed the same number of answers to shift questions. However, unlike Studies 2, 3 and 4 of this thesis, evidence of improved memory over a long delay was observed when best practice interviewing techniques were used. Any advantage from refreshed testimony on recall appears to have been overridden when participants were faced with complex and challenging questioning styles. Together with the findings of this thesis, these results suggest that the manner in which a witness is interviewed has the biggest impact on cross-examination performance.

With this in mind, it is clear that the process of cross-examination is in need of reform to protect the quality and accuracy of eyewitness evidence in the justice system. The merits of following best practice guidance have been repeatedly demonstrated in this thesis. However, these guidelines are not currently followed in

court in most adversarial systems. Based on the evidence in the literature on the negative effect of challenging questioning styles (see Chapter 2), there is a growing campaign amongst academics and practitioners to move towards the use of best practice interview techniques during cross-examination (Henderson, 2012; Pigot, 1989; Plotnikoff & Woolfson, 2012; Spencer & Lamb, 2012). Such a move would benefit young and vulnerable witnesses in particular. Although the accuracy of adults and older children is impaired by cross-examination (Valentine & Maras, 2010; Zajac & Hayne, 2006), the accuracy of young and vulnerable witnesses is most negatively affected (Davies & Seymour, 1998; Jack & Zajac, 2014; Kebbell et al., 2003; Kebbell et al., 2010; Kebbell, Hatton, Johnson, & O'Kelly, 2001; Kebbell & Johnson, 2000; O'Neill & Zajac, 2013; Perry et al., 1995; Walker, 1993; Zajac & Hayne, 2003; Zajac, Jury, & O'Neill, 2009; Zajac et al., 2012).

Reforms in cross examination practices has been achieved in other jurisdictions. Western Australia is a positive example where a concerted effort has been made towards improving the experience of young and vulnerable witnesses in criminal proceedings. Interviewers in Western Australia are expected to adhere to "Guidelines for Cross-Examination of Children and Persons Suffering a Mental Disability", introduced in 2010 (Jackson, 2012). These guidelines advocate the use of best practice interviewing techniques, including the use of open and non-challenging question types. In the UK, the Advocates Training Council (ATC) is working towards a similar goal. The Advocates Gateway (www.theadvocatesgateway.org), launched in 2013, provides toolkits and guidance on how to interview young and vulnerable witnesses appropriately, to avoid the negative effects of cross-examination. Current toolkits are based on empirical evidence and the experience of Registered Intermediaries, who observe first-hand the problems that inappropriate questioning can cause for vulnerable witness groups.

In addition to changing the style of cross-examination, further steps can be taken to protect the most vulnerable of witnesses throughout the adversarial process. Pre-recording a witness' evidence in advance of a trial, including the cross-examination and re-examination of that evidence, allows a witness' testimony to be fully captured during the investigative stages of a case. This removes any requirement for the witness to attend court and prevents lengthy delays interfering with their recall, thereby improving the quality and accuracy of evidence. From a

welfare perspective, pre-recording evidence also allows the witness, or victim, and his/her family to move on from their experience and begin to overcome any emotional trauma they have experienced without the additional stress of a potential court appearance (Cossins, 2012; Spencer & Lamb, 2012).

Pre-recording of evidence has been achieved in Western Australia. However, in the UK, the same progress has not been made towards introducing this change in the adversarial process. The Youth Justice and Criminal Evidence Act 1999 (YJCEA 1999), on the recommendation of the Pigot Report (1989) makes allowances in the law to make giving evidence in court easier for young and vulnerable witnesses (see Chapter 2). This includes a provision in Section 28 of the YJCEA 1999 which allows for the pre-recording of cross-examination interviews. There is increasing demand for this provision to be enacted. Fifteen years after this law was passed, this provision is now being introduced for young and vulnerable witnesses in three pilot areas in England (Leeds, Liverpool and Kingston-upon-Thames) a positive step towards reform (Casciani, 2013). As it has taken so long for Section 28 to be introduced in a pilot scheme, it is likely to be much longer before pre-recording practices become standard for all young and vulnerable witnesses in England and Wales. Furthermore, pre-recording cross-examination is insufficient on its own to counter the negative effect of this style of interviewing on eyewitness testimony. The nature of questioning must also be changed, as the example from Western Australia demonstrates (Spencer & Lamb, 2012). Therefore the negative effects of cross-examination documented in this thesis and in the literature will remain an issue for witnesses of all ages.

Reforming the style of cross-examination interviewing techniques could provide benefits which extend beyond improved recall accuracy to the welfare of victims and eyewitnesses. The emotional distress that cross-examination can cause a witness of any age, particularly the young and vulnerable, is clearly evidenced in recent cases. As discussed in Chapter 1, the trial of seven men accused of abusing and selling several young women for sex is one such example which received extensive media attention due to the way in which the victims were questioned at trial (Norfolk, 2013). Victims in this particular case were cross-examined for several days by multiple lawyers, repeatedly shouted at by the defence and accused of lying. Many of the victims were reported as being visibly distressed throughout.

Historically, cross-examination has been portrayed as a battle of wits and words. It will therefore be necessary to change the culture around cross-examination as part of any reform to ensure that future lawyers and barristers are trained to question witnesses more appropriately (Slapper, 2007; Wellman, 1903; 1997). This will help to ensure best evidence can be heard, not the evidence a lawyer wants to be heard.

7.4. Limitations

As with all experimental research, there are limitations which prevent studies from adequately replicating the real-world experiences they intend to simulate. Specific methodological limitations have been raised in the corresponding chapter for each study of this thesis and are therefore only briefly summarised here. These limitations have included stimulus familiarity, context reinstatement and brief delays between repeated retrieval attempts. Despite these limitations, the methodology of this thesis allowed the researcher experimental control. This is of particular importance when a topic is in the early stages of investigation in the literature, helping to filter out confounding factors which interfere with the results. This cannot be achieved using real-world witnesses and is therefore an appropriate, and frequently used, method of research in this context.

Further limitations to this research include the omission of measures of individual differences such as memory ability, intelligence, and suggestibility, with the exception of age. It is acknowledged that these factors influence memory recall and cross-examination accuracy, however measures of these factors were not taken in this study for a number of reasons. Firstly, due to scheduling restrictions there was insufficient time available to complete measures of individual differences with participants. Although Studies 3 and 4 included a 30 minute delay between viewing the video and making a recall attempt, the decision was taken to use unrelated filler tasks (e.g. word search). It was felt that the inclusion of any assessments before completing a recall attempt, such as memory or suggestibility questionnaires, might have biased the behaviour of participants if they felt they had identified the purpose of the study. Furthermore, individual differences cannot be catered for in the criminal justice system. It was considered appropriate to examine the effect of refreshed testimony on recall accuracy independent of individual differences. This is

consistent with previous refreshed testimony research (Magner et al., 1996; Turtle & Yuille, 1994).

7.5. Future Research

It is clear from the literature (see Chapters 1 and 2), and the research in this thesis, that the effect of refreshed testimony on recall accuracy and cross-examination performance is not fully understood, and not currently well evidenced. In light of the continuing challenges faced by witnesses in the criminal justice system (lengthy delays, complex questioning tactics, and the slow progression of reform to the adversarial process), it is recommended that research into refreshed testimony, and alternative methods of improving memory recall, is continued. Based on the current findings, three areas of research are proposed which could improve the quality of eyewitness evidence in the criminal justice system and help protect the welfare of eyewitnesses.

Firstly, it is essential that the parameters within which refreshed testimony is effective are identified to ensure that it is a useful tool for eyewitnesses. The priority would be to replicate existing findings that refreshed testimony can be beneficial to memory recall and accuracy over longer delays (Jack & Zajac, 2014). This requires memory to be assessed using a repeated free recall, rather than through comparisons of responses to questions put in an initial interview and repeated in a delayed cross-examination, as per Jack & Zajac's study. Furthermore, this thesis has identified a range of factors, in addition to delay, which could influence the effectiveness of refreshed testimony. To encourage the standardisation of refreshed testimony, research into these various elements, combined with existing memory literature, is encouraged in order to facilitate the development of best practice guidance for refreshed testimony. To extend the relevance of any future research, it is recommended that future investigations include alternative methods of refreshing testimony, such as those that have been identified in this chapter, to provide a more thorough assessment of memory refreshing,.

Secondly, if refreshed testimony is found to provide benefits for recall over longer delays, as in more recent research (Jack & Zajac, 2014), it is recommended that any improvements to recall accuracy are explored in the context of source-monitoring research. An important distinction must be made as to whether refreshed

testimony improves access to existing, but decayed, memory traces, thereby increasing access to memory for the original event, or whether new memories are formed to replace those that have been lost completely, creating memory for the original interview. This is of particular applied relevance given the potential legal implications. If a witness can no longer recall the specific details of an allegation, but is only able to recall the content of his/her original testimony, the evidence may be inadmissible. A real-world example of this can be seen in the appeal case, *R* vs Malicki [EWCA] Crim 365, first discussed in Chapter 2. The evidence of *L,* who was four years and eight months at the time of an alleged sexual assault, was deemed inadmissible as it could not be clear during cross-examination whether *L* was recalling the event itself or whether she was recalling her video-recorded interview (*L* had viewed her video interview twice in advance of appearing in court). In a separate case against the same defendant, the evidence of *S* had been questioned when she freely admitted that she was recalling the content of her video interview during cross-examination, and could not recall the alleged event itself. It is therefore recommended that any evidence of improved recall after refreshing needs to be further explored through source-monitoring research. This would allow an assessment as to whether refreshed testimony compromises eyewitness evidence, as was the case in *R* vs Malicki [EWCA] Crim 365.

Finally, it is recommended that future research continues to build on the evidence presented in this thesis and the wider literature concerning the use of best practice interviewing techniques in cross-examination. Pilot testing of guidelines based on those used in Western Australia (Jackson, 2012) in an experimental context would allow an assessment of whether cross-examination accuracy can be improved whilst maintaining lawyers' ability to determine the accuracy and credibility of a witness' evidence. Future research in this area must also consider the impact of any changes to typical cross-examination practices on juror decision making and the perceived accuracy and credibility of witnesses.

7.6. Conclusion

This thesis has made both an applied and a theoretical contribution to the area of eyewitness memory and refreshed testimony. It aimed to provide an overview of refreshed testimony practices and to determine whether recall accuracy and cross-

examination could be improved by allowing an original interview or written statement to be reviewed beforehand.   This thesis has begun to bridge a gap in knowledge regarding the application of refreshed testimony in a real-world context, drawing on the experience of current police officers in England. It has identified potential gaps in training and guidance and highlighted areas of practice which may be negatively affecting the ability of eyewitnesses to give their best evidence. These findings have led to the conclusion that best practice guidance for the delivery of refreshed testimony would be beneficial to both practitioners and witnesses.

Although no evidence of any benefits of refreshed testimony on recall accuracy and cross-examination performance were observed under the current conditions, this thesis concludes that the practice has no detrimental impact on natural memory processes. The research presented here adds weight to the conclusion that interviewing techniques are more influential on cross-examination performance than memory strength. The findings of this research are therefore in line with, and in support of, the growing campaign for reform of cross-examination practices. A move towards the full implementation of pre-recorded interviews and the introduction of cross-examination best practice guidance is strongly encouraged to protect the quality of evidence and the welfare of all witnesses in the criminal justice system.

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Appendix A - Study 1 Questionnaire

First Page: Consent Form

My name is Francesca Ainsworth and I am a PhD student in Psychology at Royal Holloway, University of London. As part of my research degree I am carrying out a study which is looking at the experiences of police officers and intermediaries in England and Wales. My project is supervised by Prof. Amina Memon. If you would like to discuss any aspect of the research with Prof. Memon you can contact her by email on Amina.Memon@rhul.ac.uk. If you wish to contact me, please contact me by email on Francesca.Ainsworth.2010@live.rhul.ac.uk.

Witnesses in England and Wales are permitted to refresh their testimony by watching the video-tape, or reading the transcript, of their original police interview before they give evidence in court. It is valuable to know how this process occurs in day-to-day practice. Whilst we know it is permitted, previous research would suggest that it is not something that is always made available to witnesses and anecdotal evidence indicates that the actual process itself varies across police forces and between individuals. In order to assess this I have developed a short questionnaire.

If you agree to take part in this research you will be asked to answer a number of questions about your experiences of working with witnesses. No personal or case information will be requested. All responses are anonymous and confidential. Only myself and my supervisor will have access to your responses. You are free to leave out any questions that you do not wish to answer. You may withdraw from the study at any time.

 The questionnaire will take approximately five to ten minutes to complete.

Second Page: Briefing

Throughout this questionnaire the phrase "refreshed testimony" will be used. This refers to any situation where the witness is provided with an opportunity to watch a video-tape of their police interview and/or permitted to read a transcript of their police interview / written statement. Please keep this definition in mind throughout the questionnaire.

Third Page - Questions

1. Are you an intermediary or a police officer?

2. What is your main occupation?...

3. Which area(s) of England or Wales do you work in most often? Please specify local Police Force if applicable..

4. On average, what percentage of the witnesses that you work with will have, their testimony refreshed before trial?

   a. 0%

   b. 1-25%

   c. 26-50%

   d. 51-75%

   e. 76-100%

5. What is the most frequently used format for refreshing a witness' testimony?

   a. Video-tape of interview

   b. Transcript of interview

   c. Written statement

   d. A combination of the above

6. How long before a trial does refreshed testimony take place?

   a. Happens on the day

   b. 1-2 days before

   c. 3-4 days before

   d. 1 week before

   e. More than 1 week before

7. How often would a witness have their testimony refreshed?

   a. Once

   b. Twice

   c. As many times as they wish to review the transcript/video of their interview

   d. Other (please specify)

8. How often does refreshed testimony take place at the witness' home?
   a. Never

   b. Rarely (1-25% of the time)

    c. Sometimes (26-50% of the time)

    d. Often (51-75% of the time)

    e. Frequently (76-99% if the time)

    f. Always

9. What percentage of the time does refreshed testimony take place at the Police station?

10. What percentage of the time does refreshed testimony take place at your own place of work?

11. What percentage of the time does refreshed testimony take place at the courtroom?

12. Does refreshed testimony take place in any other location? Please specify.

13. Please state what you tell the witness before they review their testimony (e.g. What do you say the purpose is)?

……………………………………………………………………………………..

14. Who (if anyone) is present with the witness during refreshed testimony?

Please list all individuals (not specific names): ....

15. Is the witness ever video-recorded during refreshed testimony?

a. Yes please state circumstances

b. No

17. Please add any further comments you have about this subject, such as how current procedures and practice can be improved, what training needs you have, and how witnesses react when their testimony is refreshed. Please do not refer to any cases or individuals by name

....

Appendix B - Study 2 Session 1 Interview Script

Examples of rapport building questions – asked en route from classroom to interview room

- Hello! My name is ... you must be ... is that right? What do you like to be called?
- How old are you?
- What classes do you have this afternoon?
- Which is your favourite subject?

Investigative Questioning

I heard that something different happened in your school assembly a few days ago when someone came to your school. I wasn't able to be there so could you tell me what happened?

If no response is given:

Someone told me that something happened in the theatre?

If no response is given:

Did someone visit the school at the start of the week?

If no response interview terminated.

If a response is given:

Please tell me what happened from the very start of the assembly, through to the end.

Can you tell me about the people who gave the assembly?

What did the policemen look like and how were they dressed? Please tell me every little thing.

Now, could you tell me what the policemen did during the assembly?

Can you tell me what happened in the video from start to finish?

Can you tell me what the policemen talked about during the assembly?

Once child has indicated that they can't think of anything else:

I'm going to ask you a few more questions now. You might have told me some of this before but if you have, please tell me again. I just want to make sure I really understand what you saw because I couldn't be there.

What did the boy in the video say his name was?

What colour was his hair?

Who was bullying the boy?

What did the bullies look like?

What did the text message he received say?

Do you remember what type of phone the boy had?

What did the instant message he received say?

Can you remember what the website was called?

Did the video display a message at any point?

What did the message say?

Did the policemen ask any questions?

What did the policemen tell you about Facebook?

Concluding the interview

Thank you for answering my questions today.

Appendix C - Study 2 Cross-examination Script

Examples of rapport building questions – asked en route from classroom to interview room

- Hello! My name is ... you must be ... is that right? What do you like to be called?
- How old are you?
- What classes do you have this afternoon?
- Which is your favourite subject?

<u>Instructions for refreshed group:</u>

A couple of weeks ago you had an assembly and someone called Francesca asked you some questions about it. Do you remember that?

If child indicates that they do not remember the following prompt is given:

I heard that you had an assembly and the police came and then a few days after that Francesca asked you some questions about what happened in the assembly.

If child still indicates that they don't remember the event the interview session is terminated and they are returned to the classroom. If they indicate that they do remember the interview continues:

I'm going to ask you some more questions about the assembly and your chat with Francesca. I'm going to show you a video to help you remember what happened. I'd like you to watch the video and listen carefully and then I'll ask you some more questions.

<div align="center">

Interview or Cartoon Video plays

</div>

Now I'm going to ask you some questions. Some of them may be a little difficult, just try your best to answer. Please only tell me what you saw and heard in the assembly, OK?

<u>Instructions for control group:</u>

A couple of weeks ago you had an assembly and someone called Francesca asked you some questions about it. Do you remember that?

If child indicates that they do not remember the following prompt is given:

I heard that you had an assembly and the police came and then a few days after that you Francesca asked you some questions about what happened in the assembly.

If child still indicates that they don't remember the event the interview session is terminated and they are returned to the classroom. If they indicate that they do remember the interview continues:

I'm going to ask you some more questions about the assembly and your chat with Francesca. Before we do that we're going to watch a cartoon. After we've watched the cartoon I'll ask you some more questions.

Interview or Cartoon Video plays

Now I'm going to ask you some questions. Some of them may be a little difficult, just try your best to answer. Please only tell me what you saw and heard in the assembly, OK?

Cross-examination Questions for Both Groups

1. Please tell me what happened in the assembly?

2. What day was the assembly on?

3. Who gave the assembly?

So a teacher didn't give the assembly?

Who usually gives an assembly?

So it could have been a teacher that gave the assembly and you just made a mistake?

4. Was the assembly in the morning or the afternoon?

5. Where was the assembly?

6. Have you seen the policemen before?

7. How many policemen were there?

So there weren't three policemen?

How many teachers were there?

So you could you have mistaken a policeman for one of the teachers and so you think there were only two when there were three?

8. Did the policemen have lots of hair or not a lot of hair?

9. What were the policemen wearing?

10. What colour was the policemen's uniform?

11. Did the policemen have walkie talkies?

Could it be possible that they didn't have walkie talkies?

Do you have a walkie talkie at home?

So did you see a walkie talkie or do you think that you did because you know that's what a policeman usually has?

12. Were the policemen tall or short?

13. What were the policemen called?

14. Did the policemen tell you their names in the assembly?

15. Did the policemen have guns with them?

Could they have had guns?

Are policemen allowed to have a gun?

So they could have had a gun and you just don't remember seeing it?

16. Did the policemen have their jackets on or off?

17. What happened in the video?

18. Had you seen the video before?

19. Who was being bullied in the video?

So it wasn't a girl who was being bullied?

Were there any girls in the video?

So it could have been a girl who was being bullied and you're confused as to what happened?

20. Did the person who was being bullied have long or short hair?

21. What did the bullies look like?

22. What was the person called in the video that was telling the story about getting bullied?

23. What colour was the hair of the person who was being bullied?

Could it have been blonde?

Do most people you know have brown hair?

Maybe you've got a bit mixed up, maybe the person really had blonde hair and you're confusing them with one of your friends, is that what happened?

24. At the end of the video was the person who was bullied happy or sad?

25. What did the bullies do?

26. Did the bullies make a website?

27. What did the policemen tell you after the video?

So they didn't talk about under-age drinking?

What's the legal drinking age?

It sounds like something a policeman would talk about, did they talk about it and you just can't remember?

28. Did the policemen talk about Facebook or MySpace?

29. What was the most important thing the policemen told you?

Appendix D - Studies 3 & 4 Free Recall Script

Pre-video instructions

I'm going to show you a short video in a moment. I would like you to watch and listen carefully as I will be asking you some questions about it afterwards. Before I start the video, do you have any questions?

Video is played – interviewer sits/stands with back to screen

Participant is given filler tasks to complete for 30 minutes

Rapport Building Task (example)

Before I ask you some questions about the crime you just witnessed we're going to do a short exercise. This is to get you used to talking to me and used to answering questions. I'd like you to think back your first lecture at Royal Holloway, can you remember that was?

I'd like you to think about the experience of your first lecture at Royal Holloway, when and where it was, who you were with, what you were wearing, how you felt and what you saw and heard. In your own time, please describe to me your first lecture at Royal Holloway in as much detail as possible. When you've finished telling me about this experience I'll ask you some more questions.

Turn camera on

Today you witnessed a crime take place. Please assume I am a police officer and this is interview is part of an ongoing investigation into the crime.

Please tell me what happened in the video from start to finish. Please keep in mind that I don't know what happened so please report everything, don't leave out any detail that you can remember, no matter how unimportant you think it may be. Please report everything. Please start in your own time.

Once free recall draws to a natural end, ask participant the following questions

You mentioned some people who were in the video, can you please describe what they each looked like and what they were wearing?

Can you please describe to me the location of the crime, what could you see and hear?

Appendix E - Studies 3 & 4 Cross-examination Script

Brief period of rapport building (neutral topics). Tell participant you are turning the camera on.

Control Instructions

A couple of weeks ago you witnessed a robbery and were interviewed by Francesca. Do you remember that?

Today I'm going to ask you some more questions about the robbery that you saw. Before we start I'm going to show you a short video. Please watch and listen carefully and once the video has finished I will ask you some more questions.

Refreshed Instructions

A couple of weeks ago you witnessed a robbery and were interviewed by Francesca. Do you remember that?

Today I'm going to ask you some more questions about the robbery that you saw. I'm going to show you the video tape of your first interview to help you remember what you said during the interview. Please watch and listen carefully, once the video has finished I will ask you some more questions.

Once video is complete read the following (instructions are the same for both groups from this point).

Two weeks ago you watched a video and witnessed a crime. Please treat this as if it was a real case and you have been called to court to give your evidence. First you will be asked what happened and then, you will be asked some more specific questions.

Please tell me what happened in the video from start to finish. Keep in mind that I don't know what happened so please report everything, don't leave out any detail that you can remember, no matter how unimportant you think it may be. Please report everything

Please start in your own time.

Once free recall is complete, ask following questions.

You mentioned some people who were in the video, can you please describe what they each looked like and what they were wearing?

Can you please describe to me the location of the crime, what could you see and hear?

Once recall has drawn to a conclusion then the cross-examination begins.

Now assume that you are have given your evidence in court and you are being cross-examined by the defence. Some of them may be a little challenging. Please do your best to answer them.

1. Am I right in saying that the robbery took place at night?
2. Did you see the shopkeeper talking on their landline telephone?
3. What colour was the shopkeeper's jumper?
   - So it wasn't red?
   - What colour is your t-shirt/top?
   - Maybe his jumper was red and you saw someone wearing a blue jumper today and that's why you think it was blue. Could that have happened?

4. What did the shopkeeper look like?
5. What colour was the sign with the shop's name and logo on it?
   - Could it have been white?

   - What are the colours on the sign for a Morrison's supermarket?

   - Is it possible that you are getting mixed up with a different shop and actually the shop's sign was white?

6. What items were on the counter of the shop?
7. Was the shopkeeper standing in front of alcohol or cigarettes?
8. What was the first item that the customer put into their shopping basket?
   - Didn't she pick up the milk first?

   - When did you last buy milk?

> ➤ Could she have picked up the milk first and you're just getting mixed up about what happened?

9. Was the customer wearing a brown or a black jacket?

10. Did you see the packet of crisps in the customers shopping basket?

11. What colour was the milk bottle lid that the customer bought?

12. What was written on the customer's shopping list?

13. Was the shopkeeper wearing a watch?

14. What colour was the suspect's hair?

> ➤ Could it have been blonde?

> ➤ How many people have you seen today with brown hair?

> ➤ I think maybe you've got confused, maybe the customer had brown hair but the suspect had blonde. That's what happened, isn't it?

15. What was the suspect wearing?

16. I would be correct in saying that the suspect stole boxes of baby food, wouldn't I?

17. What brand of lager was behind the suspect when they were shoplifting?

18. Did the suspect drop two or three items from their bag when they fell over?

19. Did the suspect walk calmly out of the shop?

20. Was there a blue or a black Jeep outside the shop when the suspect left?

END of questions – thank participant

Appendix F - Studies 3 & 4 Coding Sheets

Shopkeeper	Session 1 Accurate	Session 2 Accurate	Session 1 Error	Session 2 Error	Session 1 Omitted	Session 2 Omitted
Male						
Talking on the phone						
- Mobile phone						
Asian/indian						
Wearing glasses						
- black						
Wearing a fleece						
- Blue						
- Red stripe						
- White stripe						
Medium-large build						
Behind the counter						
Dark/Black hair						
Stood in front of cigarettes						

Shopper	Session1 Accurate	Session 2 Accurate	Session 1 Error	Session 2 Error	Session 1 Omitted	Session 2 Omitted
Female						
30-40 year old						
Blonde hair						
- Long						
- Straight						
Ring on thumb						
Carrying bag						
- Black						
- Shoulder						
Carrying a basket						
Coat						
- Black						
Jeans						
- Dark						
Boots						
- Grey						

Shopping list						
- Heinz beans						
- Sun-dried tomatoes						
- Heinz soup						
- Ketchup						
- Milk						

Suspect	Session1 Accurate	Session 2 Accurate	Session 1 Error	Session 2 Error	Session 1 Omitted	Session 2 Omitted
Female						
20-30 years old						
Brown Hair						
- Long						
- Wavy						
Carrying a bag						
- Black						
- Shoulder						
- Pineapple logo						
Jeans						
- light						
Hoody						
-blue						
-dark blue						
Trainers/shoes						
- black						

Objects	Session1 Accurate	Session 2 Accurate	Session 1 Error	Session 2 Error	Session 1 Omitted	Session 2 Omitted
Bread						
- kingsmill						
Milk						
- 1 pint						
- Semi-skimmed						
- Green lid						
Baby food						
- cow and gate						
- jar						
Packet						

- pasta					
- pasta n sauce					

Actions	Session1 Accurate	Session 2 Accurate	Session 1 Error	Session 2 Error	Session 1 Omitted	Session 2 Omitted
Suspect walks into shop						
Shopper puts bread in basket						
Shopper looks up as suspect walks past						
Suspect checks shopkeeper						
Shopkeeper is not paying attention						
Shopper puts can in basket						
Crosses items off list						
- Crosses beans						
- Crosses soup						
Shopper walks to refrigerated section						
Shopper picks up milk						
Puts milk in basket						
Shopper hears noise						
Shopper moves packet aside						
Shopper looks through shelves						

Suspect acting suspiciously					
Shopper bends down					
Shopper looks through lower shelf					
Suspect puts items in bag					
Suspect arranges items on shelf					
Suspect lays one jar on its side					
Suspect trips					
Suspects drops items					
- Drops two jars					
Suspect puts items back in bag					
Shopper and suspect bump into each other					
Suspect says sorry					
Suspect hurries out of shop					
Shopper goes to the aisle where the suspect was					
Shopper sees that baby food has been stolen					
Shopper looks at shopkeeper					
Shopkeeper finishes phone call					

Shopkeeper looks at phone					
Shopper looks back at shelves					

Location	Session1 Accurate	Session 2 Accurate	Session 1 Error	Session 2 Error	Session 1 Omitted	Session 2 Omitted
Convenience shop						
- Premiere						
- Yellow						
- Purple						
- White writing						
Car park outside						
Jeep						
- Black						
Car						
- Red						
- Pulls in						
Counter						
- Yellow						
Freezer section						
Mirror						
One aisle separating witness and suspect						
Second jeep						
- Black						
Sound of glass						
Nobody else in shop						

Any Additional Information Reported

Totals

	Session 1			**Session 2**	
Number of accurate details			Number of accurate details		
Number of errors			Number of errors		
Number of omissions			Number of omissions		
Number of additional details			Number of additional details		

Details reported in both Session 1 and Session 2 - Consistent

Accurate Details	
Errors	
Omissions	
Additional details	

Details reported in Session 1 and not in Session 2 - Forgotten

Accurate Details	
Errors	
Omissions	
Additional details	

Details reported in Session 2 and not reported in Session 1 - New

Accurate Details	
Errors	
Omissions	
Additional details	

	Session 1	Session 2
Number of accurate person details		
Number of accurate place details		
Number of accurate action details		
Number of accurate object details		
Number of inaccurate details		
Number of confabulations		

	Details reported in Session 2 and not reported in Session 1	Details reported in both Session 1 and Session 2	Details reported in Session 1 and not in Session 2
Number of accurate person details			
Number of accurate place details			
Number of accurate action details			
Number of accurate object details			

Person Verbatim

	Session 1 – accurate	Session 2 - accurate
Shopkeeper is male		
Shopkeeper is Asian/Indian		
Shopkeeper is wearing glasses		
Glasses are black		
Shopkeeper is wearing a fleece		
The fleece is blue		
The fleece has stripes		
The stripes are red and white		
Shopkeeper is medium/large build		
Shopkeeper has dark/black hair		
Shopper is female		
Shopper is 30-40 years old		
Shopper has blonde hair		
Shopper has long hair		
Shopper has straight hair		
Shopper has a ring on her thumb		
Shopper is carrying a bag		
The bag is black		
Shopper is carrying a basket		
Shopper is wearing a coat		
The coat is black		
Shopper is wearing jeans		
The jeans are dark		
The shopper is wearing boots		
The boots are grey		
The suspect is female		
Suspect has brown hair		
Suspect has long hair		
Suspect has wavy hair		
Suspect is carrying a bag		
The bag is black		
The bag is a shoulder bag		
The bag has a pineapple logo		
Shopper is wearing jeans		

The jeans are light		
The shopper is wearing a hoody		
The hoody is dark blue		
The shopper is wearing trainers		
The trainers are black		

Person – gist

There is no one else in the shop		
There is a man in the shop		
There are two ladies in the shop		
The shopkeeper isn't paying attention		
The shopper is wearing dark clothes		
The suspect is wearing casual clothes		

Object – verbatim

Mobile phone		
Shopper has a list		
List says: Heinz beans		
Sundried tomatoes		
Heinz soup		
Ketchup		
Milk		
Kingsmill bread		
Shopper gets milk		
Shopper gets 1 pint of milk		
Shopper gets semi-skimmed milk		
The milk has a green lid		
Suspect takes baby food		
Baby food is Cow & Gate		
Baby food is in a jar		
Shopper moves a packet of pasta		
It is Pasta n Sauce		

Object – gist

Phone		
There are various items on the shopping list		
Shopper puts various items into her basket		
Shopper moves a packet		
Suspect takes some products		

Location – verbatim

Shop is a Premiere		
Shop has a yellow sign		
Shop has purple sign		
Shop sign has white writing		
The shop has a car parked		
There is a jeep parked outside		
The jeep is black		
A car pulls in		
The car is red		
The shop has a counter		
The counter is yellow		
The shopkeeper is behind the counter		
The shopkeeper is in front of cigarettes		
The shop has a freezer section		
The shop has a mirror		
The shop has an aisle separating the suspect and the shopper		
There is a second jeep outside the shop		
The jeep is black		
There is nobody else in the shop		

Location – gist

There is a convenience shop		
There are cars parked outside		
The shop is quiet		
Till		
The shop is full of groceries		

Action – verbatim

The shopkeeper is talking on his phone		
The suspect walks into the shop		
The shopper puts bread in their basket		
The suspect looks at the shopkeeper		
The shopper puts a can in the basket		
Shopper crosses off beans		
Shopper crosses off soup		
Shopper walks to fridge section		
Shopper picks up milk		
Shopper puts milk in basket		
Shopper hears a noise		
Shopper moves packet aside		
Shopper looks through shelves		
Shopper bends down		
Shopper looks through lower shelf		
Suspect puts items in bag		
Suspect arranges items on shelves		
Suspect lays one jar on its side		
Suspect trips		
Suspect drops two items		
Suspect puts items back in bag		

Shopper and suspect bump into each other		
Suspect says sorry		
Suspect hurries out of shop		
Shopper goes to aisle where suspect was		
Shopper sees that baby food is missing		
Shopper looks at shopkeeper		
Shopkeeper finishes phone call		
Shopkeeper looks at phone		
Shopper looks back at shelves		

Action – gist

Lady goes into shop		
Lady is doing her shopping		
Lady walks up and down the aisles		
Shopkeeper is not paying attention		
Shopper crosses items off her list		
Shopper looks through the shelves		
Suspect is acting suspiciously		
Suspect falls over		
Suspect drops some things		
Suspect leaves the shop		
Shopper carries on with her shopping		
Shopkeeper gets off the phone		

Coding Sheet for Gist and Verbatim Details in Studies 3 and 4

	Session 1	Session 2
Person Verbatim		
Person Gist		
Object Verbatim		
Object Gist		
Location Verbatim		
Location Gist		
Action Verbatim		
Action Gist		

	New	Consistent	Forgotten
Person Verbatim			
Person Gist			
Object Verbatim			
Object Gist			
Location Verbatim			
Location Gist			
Action Verbatim			
Action Gist			

Appendix G - Study 4 Written Statement

| RESTRICTED (when complete) | MG11 |

WITNESS STATEMENT

Criminal Procedure Rules, r 27.2; Criminal Justice Act 1967, s. 9; Magistrates' Courts Act 1980, s.5B

URN

Statement of: ....

Age if under 18: .... (if over 18 insert 'over 18') Occupation: ....

This statement (consisting of   page(s) each signed by me) is true to the best of my knowledge and belief and I make it knowing that, if it is tendered in evidence. I shall be liable to prosecution if I have wilfully stated in it. anything which I know to be false, or do not believe to be true.

Signature: .... Date ....

Tick if witness evidence is visually recorded ☐ (supply witness details on rear)

Signature: .... Signature witnessed by: ....

| 2010-11 | RESTRICTED (when complete) |