

Running head: INDUSTRIAL INCIDENT INVESTIGATIONS

Social Cognitive Factors in Workplace Accident Investigations:

The Role of the Eyewitness

A Thesis Submitted in Partial Fulfillment of the Requirements for the

Degree of Master of Science in Applied Psychology

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Social Cognitive Factors in Workplace Accident Investigations:

The Role of the Eyewitness

Carla L. MacLean

Submitted May 1, 2004

Abstract

Workplace accidents compromise the health and well-being of employees as well as impact the financial resources of companies. The workplace accident investigation plays an important role in preventing future accidents by determining direct and contributing causes, implementing corrective action to those causes, and raising safety awareness. Little is known regarding how such investigations are conducted, but the implicit assumption is that witnesses to a workplace accident are *neutral and accurate*. This thesis is the first to investigate eyewitness memory for industrial accidents. Specifically, I examined the effectiveness of interview style on eyewitness recall for a workplace accident. Witness reports were made on either the Standard investigation form employed by industry (Mongomery, 1996) or a psychologically-based investigation form derived from the Cognitive Interview (Fisher & Geiselman, 1992). Results indicate that, as hypothesised, significantly more accurate information was derived from participants completing the Cognitive Interview investigation form compared to those completing the Standard investigation form. The confidence and accuracy correlation for witnesses in both conditions was positive; however, those witnesses completing the Standard investigation form had significantly higher confidence in the accuracy of their results. Additionally, witnesses participated in three realistic post-event situations (filler task, think, discussion). Witnesses who were asked to think about the workplace accident that they saw were found to have a significantly stronger confidence rating than those in the filler task condition. Thus, these results suggest that the CI may be a useful tool in workplace accident investigations.

## Social Cognitive Factors in Workplace Accident Investigations:

### The Role of the Eyewitness

Every working day 3 Canadian workers die from an occupational injury or disease, and more than 3,000 are injured (Human Resource Development Canada, 2000). For every minute worked, approximately \$77,500 in compensation payments is charged to the Canadian economy and paid to workers for accident injuries. Furthermore, the number of work days lost due to occupational injury is equivalent to the number of days worked for 62,150 full-time jobs in one year (Human Resource Development Canada, 2000).

The staggering magnitude of these numbers on individual health, as well as organizational profitability, displays a trend that is present in all of North America. The figures retrieved from the U.S. Census in 1995 demonstrate that in one year there were 6,210 fatal work injuries and approximately 3.6 million disabling injuries in the U.S. (Barling, Kelloway & Zacharatos, 2002). The impact of these injuries resulted in 225 million production days lost for that year alone. Almost 455 million work days will be lost in the future because of the debilitating, long term consequences of workplace incidents (Barling et al., 2002).

Although there has been a constant watch on health and safety, not much of a shift has transpired since the 1995 report. As of 2001, the US Census reported that 5,900 Americans died as a result of going to work (excluding victims of the Sept. 11<sup>th</sup> terrorist attack) and 5.2 million reported occupational illness and injuries. In addition, youth are being highly impacted, as the injury rate of teenage workers in the United States is cited

as being twice as high as that of adult workers. Every year about 200,000 adolescents are injured on the job as they are far more likely to be untrained (Schlosser, 2002).

The issue of being adversely impacted on the job seems to compound when we consider Schlosser's (2002) statements on injury rates, "There is strong evidence that these numbers, compiled by the Bureau of Labour Statistics, understate the number of meatpacking injuries that occur. Thousands of additional injuries and illnesses most likely go unrecorded" (p. 172). Under-reporting workplace accidents is not a new phenomenon and is reported across a number of industries. Barach and Small (2000) estimated that 50-96% of accidents were under-reported in the British healthcare field, and Beaumont (1980) states that 15 -20% of accidents are under-reported in the manufacturing industry in Britain (as cited in Pimble & O'Toole, 1982).

From these numbers it is clear that occupational health and safety is a highly relevant issue for individual health as well as organizational profitability, as an unhealthy or absent workforce may hamper organizational advancement.

#### *Overview of the Present Study*

The following study assessed the role of the eyewitness in the non-forensic setting of an industrial accident investigation. The exploratory nature of this study is evident, as no research to date has addressed the function of an eyewitness in a workplace context. This study incorporated the critical elements presented in the literature regarding memory, questioning and the confidence/accuracy (CA) relationship through utilizing two different questioning techniques and three varied post-event conditions. Participants were asked to partake in one of the following post-event conditions after witnessing an industrial incident: to discuss the event with fellow witnesses (discussion), think about

the event (think), or do an alternative task which prevents cognitive replay of the witnessed incident (filler task). These three conditions were incorporated to establish that how a witness accesses his/her memory post accident can impact memory reconstruction. Upon completion of one of these three conditions the witness was asked to complete one of the two accident investigation forms. In the investigation form condition, participants were asked to recall the details of the workplace accident on either a version of the Standard investigation form utilized by industry or the Cognitive Interview (CI) investigation form created for this study. These two types of forms were employed to demonstrate that how one asks questions can affect the amount and substance of accurate information as well as the CA relationship. The literature on industrial accident investigations and eyewitness testimony will be discussed prior to presenting the five proposed goals of the study.

### *Investigations*

In an attempt to reduce injuries, fatalities and costs in the workplace, safety and human resource professionals have increasingly turned to safety programming (Kelloway, Stinson & MacLean, 2004). Programs such as behaviour based safety training, engineering and administrative interventions were reviewed by Goldenhar and Shuttle (1994) who concluded that each form of intervention has the potential to increase workplace health and safety. A critical element of an organization's health and safety program is the accident investigation which takes place after an incident has occurred (Montgomery, 1996). Kelloway et al. (2004) state that although accident investigations are understood to be a beneficial element of health and safety programming, research in industrial investigations has been mostly overlooked in the literature to date.

Identifying causes and recommending corrective actions to prevent similar events from transpiring in the future is the fundamental purpose of the accident investigation (Vincoli, 1994). Additional benefits of the investigation process have been cited as fulfilling legal requirements for the organization, determining compliance with applicable safety regulations (Canadian Centre for Occupational Health and Safety (CCOHS), 1998), determining costs accrued, and promoting safety awareness among employees (Laing, 1992).

Considering the relevance of the safety investigation it is, therefore, surprising to note that little training and expertise is possessed by the individuals performing the inspecting (Kelloway et al. 2004) The person most frequently allocated the responsibility of investigating an industrial accident is the manager or the line supervisor. Guidance and instruction as to proper investigation techniques are rarely communicated, and the investigators seldom understand the true purpose of the investigation, which is future prevention (Vincoli, 1994). Furthermore, the health and safety literature offers elementary suggestions on interviewing techniques (Ferry, 1998; Montgomery & Kelloway, 2002) and templates for standardized “incident report forms”, but the literature provides few concrete tools and guidelines for how to conduct these investigations.

There are many components of a well-executed industrial incident investigation such as photographically documenting the environment, assessing machinery, and record and schedule checks (Montgomery, 1996). Because almost every system, activity, operation, task, or function has a human element, the evidence obtained from a witness is of vital importance to the incident investigation (Vincoli, 1994). Although the workplace accident investigation literature recognizes the fragility of witness memory, it still makes

the fundamental assumption that eyewitnesses to an incident are accurate, neutral recording devices who are attending to all elements in the precipitating circumstances (Kelloway et al. 2004). Moreover, it assumes that asking the appropriate questions will extract the correct answer from the accident witness. The literature on eyewitness memory in forensic contexts challenges this assumption by clearly displaying that human memory is highly malleable and suggests that how one asks the questions greatly impacts the information obtained (e.g. Cutler & Penrod, 1995; Koriat, Goldsmith, & Pansky, 2000; Fisher & Geiselman, 1992). This thesis will highlight some of the relevant features of the eyewitness literature and demonstrate their applicability to industrial accident investigations.

### *Eyewitness Memory*

When recalling a memory most people consider their accounts to be an accurate depiction of what has transpired. In the last few decades, the scientific research on memory accuracy has revealed that people's memories are often inaccurate (Haber & Haber, 2000). Much like physical evidence, the memory trace can be contaminated, lost, destroyed or otherwise made to produce results that can lead to an inaccurate reconstruction of the event in question (Wells & Loftus, 2003). Most police officers understand little of the social-cognitive factors that impact memory or the processes involved with it (Wells & Loftus, 2003). Accident investigators are likely similarly ignorant of these psychological processes due to their lack of specific training in investigation techniques (Laing, 1982). There are many elements that may impact the resulting testimony of an eyewitness, two of which that hold paramount importance are

the questioning procedure used and the post-event situation the witnesses finds themselves in.

### *Questioning Procedure*

The importance of appropriate questioning to maintain accuracy is illuminated in the literature concerning the influence of post-event information, the potential impact of event reiteration, and repeated questioning on eyewitnesses.

As a result of interviewer bias, conflicting co-witness information, or an additional information source, false post-event information may be presented to eyewitnesses and subsequently shape or alter their testimony (Haber & Haber, 2000). Post-event information that is accurate will enhance memory, whereas, inaccurate information will be incorporated to deteriorate recollection. This “misinformation effect” has profound implications in that questions or statements occurring after an event can alter eyewitness accounts (Loftus, Miller & Burns, 1978). When new information is presented to the witness during recall, witnesses tend to incorporate new information into existing testimony and are unaware of the acquisition. The new information becomes part of their official declaration of what they observed in the incident. Furthermore, witnesses are usually unaware that their report has changed as a result of the new information; therefore, they can no longer distinguish between what they have been told and what they originally observed (Haber & Haber, 2000).

Eyewitnesses to workplace accidents are often asked to provide numerous accounts of the event they saw. Witnesses of an incident may have to repeat their account many times to the various regulatory bodies involved in an industrial incident (Kelloway et al, 2004). The literature states that as a result, systematic changes may take place in the

memory trace of the individual as they may tailor their recollections to their audience (Haber & Haber, 2000). Furthermore, the repeated questioning of events that did not occur can lead to eyewitnesses believing that the questioned events took place. This result may be due to momentary imagination of the event each time the question is asked. As a result, repeated questioning can skew an eyewitness's recollections (Roediger & Gallo, 2002).

Rehearsal and repetition can help semantic memory for knowledge, language, and facts; however, the importance of facilitating accurate recall immediately after the incident is paramount as this is not the case with autobiographical memory for events (Haber & Haber, 2000). The more coherent the event to the witness the less alterations the witnesses memory undergoes. Conversely, events which are incoherent, unfamiliar, or contrary to the expectations of the witness undergo changes with each repetition, each modification serving to make the event more consistent to the witness (Haber & Haber, 2000). Thus, recollection that is incomplete or inaccurate can impair future memory (Brown & Packham, 1967). Hence, once the memory trace has become inaccessible through response bias (favouring postevent information in memory) or verbalization the effects on memory may be relatively resistant to the passage of time (McCloskey & Zaragoza, 1985; Schooler & Engstler-Schooler, 1990).

The susceptibility of a witness's memory to distort events seems to compound when we consider the differing psychological states that an eyewitness may experience as a result of the incident. Negative emotional events have been described as events that have the potential to elicit strong unpleasant feelings (emotional stress) for the viewer. These feelings may manifest from the viewing of unpleasant visual features (e.g. blood or



injuries; Christianson, 1992). Furthermore, by having a specific time of onset, lasting a relatively short time, and eliciting intensely negative reactions among participants and/or witnesses, occupational incidents have been considered catastrophic stressors (Pratt & Barling, 1988). The impact of a traumatic event on a witness's psyche can be the experience of repetitive, uncontrollable, and intrusive thoughts or memories of the event (Schooler & Baum, 1999). Divergent from the stress of natural disasters, the acute stress that can be involved in an industrial accident is associated with human-made elements, human error, or breakdown of human made systems (Baum, 1987). Evidence supports that witnesses of violent events are particularly susceptible to incorporating post-event information into their memory trace (Loftus & Doyle, 1997). An acutely stressful incident is presumed to produce a weaker memory trace; therefore, misinformation is less likely to be at odds with the witness's recollection of the incident (Loftus & Doyle, 1997). Although the literature does not conclude that memory for the emotional incident itself is impaired with an acutely stressful event, it does support that some peripheral information, for example, details preceding, succeeding and not directly related to the incident, seem to be impaired (Christianson, 1992).

Thus, the importance of asking appropriate questions at the onset of the investigation procedure is paramount to prevent the damaging effects of post-event elements on eyewitness testimony. Fisher and Geiselman (1992) note that the eyewitness's task is difficult and the interviewer must overcome several eyewitness limitations to do their job successfully. In order to avoid these potential pitfalls with eyewitness testimony, care must be taken with each procedural step. Some of the current approaches used for questioning will now be discussed.

*The Interview*

The interviewing process undertaken by police investigators is considered standardized as its information demands tend to focus on the information required by the crime report (Fisher, Geiselman & Raymond, 1987). Memon and Higham (1999) warn that the term “standard interview” is somewhat of a misnomer as these interviews vary in content and do not follow a standard format. Similar to the police inquiry, industrial incident investigators utilize a standard incident report form for information acquisition. These incident report forms are variable in nature (Montgomery, 1996) and do not engage in any tailoring to individual recollection. Fisher and Geiselman (1992) proposed an alternative to the standard interview method that has been proven to elicit more accurate information from witnesses to an event. Termed the Cognitive Interview (CI), it uses a variety of mental techniques to aid the witness in extracting the most accurate and thorough descriptions of events as possible. Fisher and Geiselman (1992) propose that to obtain the maximum amount of information, the interview should be tailored to each eyewitness’s unique mental images.

The CI focuses on two elements of eyewitness testimony; memory and communication. To aid in the enhancement of eyewitness memory four mnemonic techniques are utilized, whereas for communication, enhancement is achieved through the use of additional cognitive strategies (Memon, Wark, Bull & Koehnken, 1997). Several experiments show that many events that cannot be recollected when the individual in need of remembering is given one retrieval cue can be recollected when a different retrieval cue is provided (Tulving, 1974). The mnemonics and cognitive strategies are the retrieval cues employed by the CI. The four mnemonic techniques used in the CI are:

mental reinstatement (thinking about the physical and personal context at the time of the accident), varied recall (remembering the event in a variety of temporal orders), varied perspective recall (remembering the event from a variety of perspectives, e.g. a co-worker) and report all information possible (Fisher & Geiselman, 1992). Mental reinstatement, varied recall and encouraging witnesses to report all recalled information are used in the CI investigation form. In addition, the cognitive strategies recommended by the CI that are used in the investigation form are non-leading, open-ended questions followed by probing as well as not interrupting the witness during recall (Fisher & Geiselman, 1992).

Cognitive reinstatement asks the witness to mentally “place” themselves back into the incident environment to attempt to retrieve more information (Fisher & Geiselman, 1992). This technique is used since people are more skilled at remembering events when their original thought patterns, emotional reactions, psychological state, and physical environment are the same or highly similar to those at the time of the incident (Fisher & Geiselman, 1992), therefore, the CI uses this technique to make it easier for the witness to extract pertinent information. Furthermore, the mnemonics of varied recall and report everything are utilized to encourage the witness to search their memory trace more thoroughly as the assumption is made that memory trace inaccessibility is a result of a limited search.

In addition to the mnemonics used in the CI investigation form, cognitive strategies were employed to enhance recall. Non-leading questions have been cited as a critical element when attempting to retrieve stored information (Wells, 1988). Memories are *reconstructed* during recall; therefore, the memory probe (the question) presented to

the witness may impact the recollection of the event (Tulving, 1983). The impact of asking “did the engineer turn her back on the machine?” or “at what point did the engineer turn her back to the machine?” is large as it may become part of the witness’s memory trace that the engineer turned her back when in fact she may not have. This may become more of an issue if we consider the possible power differentiation between the individual conducting the interview and the person being interviewed. In the context of the interview, the interviewer usually holds a higher status; thus, the witness may feel that the interviewer has access to privileged information containing details of the event that the witness does not. As a result, the eyewitness is likely to give more confirming responses and agree with the interviewer’s expectations (Smith & Ellsworth, 1987).

Open versus close ended questioning can greatly influence recall and is highly recommended in the CI (Fisher & Geiselman, 1992). The memory trace of the witness may contain a highly detailed account of the incident. The most effective way of accessing that memory trace is to allow free narration of the incident without interruption and to probe on specific issues once the witness has completed their report of the events. By asking primarily close ended questions the interviewer is doing most of the mental work which stands as counterproductive, as the eyewitness holds the relevant information (Fisher & Geiselman, 1992). Thus, the use of probing allows access into a witness’s mental image of the various parts of an event and permitting open response to questions as well as not interrupting witnesses when they are recalling information allows witnesses to dictate the pace of their response as well as structure their own recall. The use of these techniques enhance the quality and quantity of information retrieved from the eyewitness.

Research has shown that the CI elicits 25% to 100% more correct statements than the Standard or Structured interview (Fisher, Brennan & McCauley, 2002). This increase in accuracy can come at a cost, however, as some studies have demonstrated that the CI not only pulls out more accurate information but inaccurate information as well (e.g. Mantwill, Kohnken, & Aschermann, 1995; McCauley & Fisher, 1995; Mello & Fisher, 1996; Memon, Wark, Bull, & Kohnken, 1997). Although more inaccurate information can be drawn from the witness the research finds that the CI elicits additional facts at the same accuracy rate as the Standard or Structured interview (Fisher, Brennan & McCauley, 2002). Although the majority of research assessing the enhancing techniques in the CI is found in the criminal literature, support has been established in other fields. Studies have assessed the effectiveness of the CI in food intake recall (Armstrong, MacDonald, Booth, I., Platts, Knibb & Booth, D., 2000; & Fisher & Quigley, 1992), long term memory of physical activities (Fischer, Falkner, Trevisan, & McCauley, 2000), and child and adult recall of motor vehicle accidents (Brock, Fisher & Cutler, 1999; Chapman & Perry, 1995). Although no literature has addressed the use of the CI in the context of an industrial incident investigation, its utility in other applications suggests that it might be a valuable tool for workplace accident investigations.

As a result of organizations using a Standard incident report form and not employing the memory enhancing methods of the CI, I predict that using the CI should enhance eyewitness memory for industrial incidents. I hypothesize that a greater number of accurate statements about the accident should be accessed through the implementation of the paper-based CI investigation form than through the Standard incident investigation form method.

*Hypothesis 1*

**A greater number of accurate statements will be acquired from eyewitnesses as a result of using the Cognitive Interview investigation form than the number acquired through the Standard incident investigation form.**

*Confidence/ Accuracy Relationship*

Obtaining accurate information from a witness is highly relevant in an industrial accident investigation, however, how does the investigators know if the information they are receiving from the witness is accurate? People tend to believe that the confidence a witness has in his/her testimony reliably demonstrates his/her level of accuracy (Haber and Haber, 2000). Ferry (1998) states that investigations are executed by individuals with little if any investigative training or background, thus, it is fair to conclude that the investigators could be susceptible to the same misconceptions as those held by the general public (e.g. witnesses have a positive, predictive CA relationship which does not decline over time; Haber & Haber, 2000). These misconceptions could be translated into detrimental results if the investigator falsely believes that the witness with the strongest confidence has the highest accuracy level. This does not pose a problem if witnesses are accurate, however, if inaccurate it could lead to erroneous omission of accurate yet conflicting testimony or details in the report (Kelloway et al. 2004). Additionally, the nature of the investigation may be further impacted as witness-to-witness discussion between a highly confident and unconfident witness could lead to distortion of the unconfident witness's memory recall (Kelloway et al. 2004). Thus, it is important for the investigators to know the elements that impact the CA relationship and how they relate to what they are exploring.

How correct are witnesses in estimating the accuracy of their testimony? Does their confidence support their level of accuracy? Haber and Haber (2000) conducted a review of survey studies that assessed individual's attitudes towards ten *false* statements about memory. Most of the incorrect assertions about witness recall focused on the perceived accuracy that individuals had after witnessing an event. The results found that most people agreed or strongly agreed with the incorrect statements about eyewitness memory. This overview proves to be a good benchmark as to public opinion on perceived accuracy of eyewitness testimony. The relationship between witness confidence and the objective accuracy of his/her statement is an issue that has generated much controversy over the years within the field of eyewitness identification. Much literature has explored a witnesses memory for the perpetrator of a crime and has found that public opinion holds that there is a positive CA relationship (Read, Lindsay, & Nicholls, 1998); however, numerous line-up identification studies show that the CA relationship is weak at best (e.g. Deffenbacher, 1980; Smith, Kassin, & Ellsworth, 1989; Wells, 1993; Wells & Lindsay, 1985).

Studies examining the relationship between eyewitness confidence and recall accuracy have largely focused on memory for personal attributes in single target designs (e.g. hair color, height, weight; Ebbensen & Rienick, 1998; Tollestrup, Turtle & Yuille, 1994; Yuille & Cutshall, 1986) and show a small to moderate CA correlation for criminal events (Yarmey, Jacob, & Porter, 2002). It is important for the industrial investigators to know if this same weak relationship is found for recall of event information, enabling them to address if they should place faith in witnesses' confidence in the accuracy of their testimony. Far less research has explored the correlation of a witness's accuracy for

details of an event rather than an individual and the subsequent confidence that those memories are accurate (e.g. Robinson, Johnson & Herndon, 1997; Robinson & Johnson, 1996). Furthermore, no research has been found exploring the CA relationship in workplace accidents (Kelloway et al. 2004).

Research considering memory outside of the eyewitness literature for identification has brought the generalizability of the argument that there is a weak CA relationship into question (Read et al., 1998). It is plausible that there is a general CA relation that holds across many areas of our lives, however, the absence of this relationship in the literature is explained by the notion that it is difficult to detect in single-target research designs (Read et al. 1998). The following are some of the areas that the CA relationship has been found to be predictive: across items and not witnesses (Hollins & Perfect, 1997), between choosers and non-choosers in lineup identification tasks (Sporer, Penrod, Read, & Cutler, 1995), in optimal encoding conditions in target specific tasks (Deffenbacher, 1980), in general knowledge questioning (Costerman, Lories & Ansay, 1992; Kelly & Lindsay, 1993), and in recall rather than recognition for event information (Robinson & Johnson, 1996; Robinson, et al. 1997). Therefore, as both investigation forms in the present study utilize a recall rather than recognition format it is of interest to explore the nature of the CA relationship in this kind of a memory task.

### *Recall and Recognition*

Cognitive psychology has generally come to agree that there are at least two types of memory (Robinson, Johnson & Herndon, 1997). These two memory types have been referred to as both search-related versus fluency-based processing (Johnson, Hawley, & Elliot, 1991) and retrieval-based versus familiarity-based (Horton, Pavlick, & Moulin-



Julian, 1993). The nature of this dyad is that when an individual is attempting to answer a remembrance question they may try and elicit the answer from memory or make a familiarity judgement when presented with potential alternatives (Robinson et al. 1997).

Familiarity judgement is considered by many theorists to be central to recognition memory (e.g. Dyne, Humphreys, Bain, & Pike, 1990; Gillund & Shiffrin, 1984; Raaijmakers & Shiffrin, 1992) whereas, retrieval-based processing is required for recall of an individual or event in question (Robinson et al., 1997). Strong support is found for this relationship as clear consensus has been established that recall memory involves more retrieval-based processing than recognition memory (Gillund & Shiffrin, 1984; Morris & Gruneberg, 1994). The Standard and CI investigation forms utilized in this study use an open-ended, free recall approach to questioning. Therefore, the literature pertaining to single target identification tasks will not be considered, as both the investigation forms require the memory processes of retrieval rather than recognition.

The presence of a free recall task, which employs retrieval-based processing, can sometimes be a challenging endeavour for the witness, as seen in the “tip-of-the-tongue” phenomenon (Brown, 1991). Tversky and Kahneman (1974) proposed that information about the probability of an event is translated to the individual through ease and speed of retrieval. This judgemental heuristic is referred to as the availability heuristic. Robinson and Johnson (1996) used the availability heuristic to propose that the amount of cognitive effort required in the retrieval of information provides the person engaged in the recall task with valuable information as to the accuracy of their memory. Additionally, Robinson et al. (1997) proposed that the speed at which witnesses make decisions about the information they are recalling presents an additional cue as to their accuracy; thus, the

faster the recall, the more accurate the information is likely to be. Effort for the retrieval task may also impact witness confidence as the relative ease or difficulty with which a witness retrieves information may provide cues which manipulate their accuracy confidence (Robinson & Johnson, 1996). Thus, the hypothesis that recall memory should have a stronger CA relationship than recognition memory was supported (Robinson & Johnson, 1996) and the stronger CA relationship found in the recall condition may be a result of response time being used as a cue when evaluating the accuracy of their answers (Robinson et al., 1997).

As established previously, the Standard and CI investigation forms used in this study are recall rather than recognition tasks. Both forms contain open-ended narrative questions asking the witness to describe the witnessed incident. Previous research has shown that testing purely recognition for a witnessed incident produced CA correlations from .14 to .17 (Smith, Kassin, & Ellsworth, 1989). However, studies testing recall memory exclusively produced correlations from .53 to .64 (Stephenson, 1984; Stephenson, Brandstatter, & Wagner 1983; Stephenson, Clark, & Wade, 1986). Therefore, it is predicted that through individual assessment of their level of effort and speed of recall during memory retrieval, witnesses will have a positive CA relationship.

### ***Hypothesis 2***

**A significant positive correlation will be present between eyewitness confidence and his/her accuracy rate within all conditions of the study.**

The CA relationship has been shown to be a variable relationship. The confidence witnesses have in the accuracy of their testimony has been proven to be a malleable element and may attribute to the fluctuations seen across CA correlations. Hence,

confidence in the accuracy of a witness's testimony will be explored to determine how confidence's relationship with accuracy responds across investigation form conditions.

### *Confidence across Investigation Forms*

The confidence witnesses have in the accuracy of their testimony is a malleable construct as the identification literature has informed us that there are factors which can impact witness confidence to the exclusion of witness accuracy and visa versa (Leippe, 1980). Person identification has been found to be influenced by post-event verbal knowledge which affects the *ease* with which that knowledge is accessed (Read, 1995). Gwyer & Clifford (1997) proposed that different interview techniques could cause different amounts of information recall. They felt that the ease with which individuals access information would fluctuate with interview strategy and thus, produce higher witness confidence in the accuracy of their testimony the easier the information retrieval.

Providing information for an incident investigation is a challenging task that may be novel for the witness (Fisher & Geiselman, 1992). Not knowing definitive answers to the questions being asked may deteriorate the eyewitness's confidence in his/her ability to provide useful information. The potential impact of this low confidence is that witnesses may terminate their memory retrieval prematurely and respond with an "I do not know" response instead of presenting the information that they are uncertain about. Therefore, not providing appropriate feedback to witnesses who are uncertain about their event information can cause the further deterioration of the memory retrieval. Fisher and Geiselman (1992) state that in order to maintain eyewitness confidence it is an interviewer's job to provide appropriate feedback such as interjection of non-specific

verbal reinforcement (e.g. mm-hmmm) or non-verbal signals such as leaning slightly forward to convey interest in the witness's description of the incident.

The mnemonic techniques used in the Cognitive Interview (e.g. cognitive reinstatement, varied recall) are said to increase the ease with which witnesses recall information when compared with the Structured Interview (Gwyer & Clifford, 1997). However, in the present study a clear difference is established between the amount and in-depth nature of the questions asked on the two investigation forms. The Standard form contains few questions that are broad in nature, whereas, the CI contains these same questions with the addition of more specific follow-up probes. Thus, the ease with which witnesses in the Standard form condition are predicted to recall information is greater than those in the CI investigation condition. Furthermore, witnesses who are not comfortable with their responses and are encouraged to expand on them without the appropriate feedback, risk confidence deterioration (Fisher & Geiselman, 1992). This drop in confidence could impact the amount of accurate information obtained from the condition as well as the witness's subsequent accuracy level. Therefore, it is predicted that those in the Standard investigation form condition will have a higher confidence level than those in the CI condition.

### ***Hypothesis 3***

**Eyewitnesses completing the Standard investigation form will have a higher confidence rating in their accuracy than those completing the CI measure.**

### ***Confidence and Eyewitness Discussion***

For decades, the social psychological research has stated that an individual's beliefs about a stimulus are not only influenced by their own interpretation of the

stimulus but also by other people's reactions to the stimulus (Asch, 1955; Sherif, 1937).

Luus and Wells (1994) state that confidence in one's witness identification ability is readily influenced by social factors that can operate independently of perceptual and memory processes.

Although much research has considered elements that may impact the accuracy of eyewitness testimony, surprisingly little attention has been allocated to the influence of the independent social factor, witness discussion. The research on discussion and testimony is sparse and divergent with the witness discussion and resulting confidence relationship receiving almost no attention. Therefore, it is of interest to consider if witness-to-witness discussion impacts a witnesses' confidence in their testimony.

Research has shown that allowing individuals to discuss incidents in the context of a group enhances overall confidence in answers, even wrong ones (Puncochar, 1997; Snizek & Henry, 1989). Further support was found by Stephenson, Brandstatter and Wagner (1983), as dyads were found to be far more confident in their accurate as well as inaccurate recollections of a story. Dyads were found to be fairly certain that their inaccurate responses were accurate and certain that their accurate responses were correct. In addition, Stephenson, Clark, and Wade (1986) found the same increase in confidence pattern between dyads and four person groups, with groups displaying a further increase in confidence over dyads. The literature on feedback and its relationship with confidence is highly applicable to this area of study as it establishes how witness confidence is moulded by information received interpersonally rather than the intrapersonal approach that is generally found in the memory literature. This line of research is somewhat restrictive, however, as most feedback literature focuses on witness identification tasks as

well as a definition of feedback which presumes that the inputting information is being translated to the witness by an individual with perceived greater knowledge about the incident or situation in question (e.g. Fisher & Geiselman, 1992; Wells & Bradfield, 1998). Nevertheless, it can provide insight as we see that manipulation of confidence through interpersonal feedback can occur in a variety of settings (Puncochar, 1997, Snizek & Henry, 1989, Stephenson et al., 1983) independent of the type of task employed.

Few studies have explored the impact of variables, like feedback, on purely eyewitness confidence (Hastie, Landsman, & Loftus, 1978; Luus & Wells, 1994; Wells & Bradfield, 1998; Wells & Bradfield, 1999; Wells, Ferguson, & Lindsay, 1981, and Wells, Olson & Charman, 2003) and not the CA relationship. Luus and Wells (1994), Wells and Bradfield (1998), and Wells et al. (1981) explored the impact of post-identification feedback on witness confidence. Significant fluctuation was found in witness confidence as a result of feedback about co-witness identifications, with witness confidence considerably increasing for those who were told that co-witnesses chose the same candidate (Luus & Wells, 1994). In addition, briefing the witness about future cross examination after they have made an identification increased confidence when compared with the control group who were not briefed (Wells et al., 1981). Hastie et al. (1978) found that people asked to repeatedly guess the correct answer increased in their confidence level but not in their accuracy. However, the “postidentification feedback effect” has been found to be reduced when witnesses are asked to think privately about the identification experience (e.g. their certainty and view) before receiving feedback (Wells & Bradfield, 1999).

Thinking about a witnessed event has also been proposed to increase a witness's confidence in their testimony. Leippe (1980) discusses Tesser's research (Tesser, 1978 and Tesser & Leone, 1977) which suggests that polarization of attitude happens as a result of post-stimulus thought about the stimulus. Thus, the confident witness will become increasingly certain the more they think about the situation. Considering the previously discussed research it is proposed that feedback will be a stronger confidence enhancing technique than private thought because even though private thought has been demonstrated to increase witness confidence in identification tasks it has been shown to not enhance confidence beyond that of confirmatory feedback (Wells & Bradfield, 1999).

The lineup identification literature demonstrates that confirmatory feedback increases eyewitness confidence in his/her identification accuracy. Halbwachs (1980) stated that if our recollections coincide with those of others, our confidence in them is likely to increase; if they conflict, confidence may be undermined. Witness recollections are anticipated to coincide as the accuracy witnesses have in recalling the event is predicted to be high as witnessing conditions are optimal within this study. Migueles and Garcia-Bajos (1999) state that in field studies (Cutshall & Yuille, 1989; Yuille & Cutshall, 1986) and research on autobiographical emotional or traumatic experiences (Reisberg, Heuer, McLean & O'Shaughnessy, 1988; Wagnaar & Groeneweg, 1990), subjects have been found to have vivid outstanding recall of events. Furthermore, it is firmly established that memory deteriorates over time, however, the rate of loss and whether all experiences are lost at the same rate remains a continuing controversy (Davies, 1993). Therefore, the fact that witnesses are recalling event information as well as the short time delay between viewing and reporting should maintain that feedback

witnesses receive from one another will be reaffirming, due to a high accuracy rate across all witnesses, increasing their confidence in themselves as well as each other's testimonies.

Conversely, some research establishes memory impairment when there is increased violence (Kuehn, 1974) or amnesia for traumatic situations (Christianson & Nilsson, 1989). Therefore, because witness accuracy rate is proposed to be high, it is anticipated that witnesses in the discussion format will be supportive of one another's rendition of events as minimal discrepant information will be raised in witness discussion. Hollin and Clifford (1983) found that narrative recall lead to reporting of "easy" items (items which were spontaneously mentioned in narrative testimony) and thus were not prone to the altering effects of discussion on witness testimony. This predicted high accuracy rate should enhance confidence level amongst the group. Thus, direct feedback from co-witnesses should enhance confidence in the accuracy of recalled events.

#### ***Hypothesis 4***

**Witnesses who have conferred with one another about the viewed incident will have a stronger confidence rating than those who did not have the opportunity to discuss the event (Filler Task and Think).**

#### ***CA Relationship across Conditions***

It is proposed that witnesses to the industrial incident will exhibit a significant positive CA relationship. However, does the CA relationship vary as a function of interviewing technique? To understand how the type of investigation form may impact the nature of the CA relationship we must consider the information acquisition techniques



used in the investigation forms and how they affect group accuracy and subsequent confidence.

Varying degrees of confidence and accuracy can be obtained by varying questioning technique. The CA relationship can vary as a function of probing for specific information after a witness's free recall. Winningham and Weaver (2000) found that by pressuring witnesses with probing questions to recall more information about a witnessed event, both the number of correct and incorrect responses increased. Marshall (1966) found that specific questioning increased the amount of testimony error on certain items. These specific items were considered to be difficult as they were rarely mentioned in narrative testimony (Marshall, 1966). Alternatively, Lipton (1977) found that subjects who engaged in free recall after viewing a simulated murder were 91% accurate, however, they only recalled 21% of the facts. Additional questions asked after free recall resulted in more information being elicited at a lower accuracy rate. Thus, free recall tends to be incomplete but generally accurate (Davies, 1993).

The Cognitive Interview incorporates probing questions following free recall of testimony to create a more complete picture of events. As stated previously, the four mnemonics utilized to maintain a witness's accuracy level while eliciting more accurate information (Fisher & Geiselman, 1992), are mental reinstatement, varied recall, varied perspective recall and report all information possible. Mental reinstatement, varied recall and encouraging witnesses to report all recalled information are used in the CI investigation form as well as the cognitive strategies of probing, open-questioning and uninterrupted recall.

As people have been shown to recall a limited amount of information which is highly accurate in free recall exercises it can be presumed that allowing participants to freely recall incident information allows for reporting of information which they feel is easy to retrieve. Furthermore, the mnemonics and cognitive strategies used in the Cognitive Interview are said to enhance the ease of information retrieval for the witness (Gwyer & Clifford, 1997), thus, attenuating the pressuring effects we see when witnesses are merely asked for more specific, difficult information. The amount of cognitive effort necessary for a retrieval exercise has been shown to cue people as to the accuracy of their memory (Robinson & Johnson, 1996). Thus, the CA relationship should be significant across both investigation form conditions.

However, as confidence has been shown to fluctuate as a function of ease of information retrieval in interviewing condition (Gwyer & Clifford, 1997) and the CI investigation form is proposed to be the more challenging form, it is anticipated that those in the CI condition will have a larger variation in confidence level. Confidence is not anticipated to fluctuate to such a degree in the Standard condition because only free recall questions are asked of witnesses resulting in a less difficult exercise. This divergence in confidence will impact the strength of the CA relationship. Thus, the relationship should be stronger in the Standard condition as participants are anticipated to be highly accurate with high confidence and void of challenging elements which could alter confidence (e.g. probing questions).

***Hypothesis 5a***

**There will be a positive CA correlation in both investigation form conditions, however, the relationship will be stronger in the Standard investigation form condition than the CI condition.**

In addition to investigation form manipulation, enhanced calibration of the CA relationship (defined as the tendency to assign appropriate confidence judgements given one's mean accuracy rates; Robinson & Johnson, 1996) is predicted with the addition of witness-to-witness feedback in the discuss condition. Studies have demonstrated that eyewitness confidence in recall is malleable as a function of a witness receiving feedback (Hastie, Landsman & Loftus, 1978; Luus & Wells, 1994; and Wells Ferguson & Lindsay, 1981). However, the literature establishing how witness accuracy is influenced by feedback received in through discussion is far from uniform.

Research has illustrated that group discussion may facilitate eyewitness accuracy (Clark, Stephenson, & Kniveton, 1990; Sniezek & Henry, 1989; Stephenson et al. (1983); Warnick & Sanders, 1980) or it may act to alter correct reports (Asch, 1951). It has been found that individuals alter their original replies following group discussion to agree with the group leaders' recall (Gabbert, Memon, & Allan, 1993; Hollin & Clifford, 1983). This phenomenon could be an asset if individual recall is flawed and group leader's recall is accurate, however, the potential for incorrect information to seep into the process is additionally heightened. The research on introducing post-event information further highlights the potential manipulating effects that new knowledge and opinions may have on testimony (Barlett, 1932; Haber & Haber, 2000; Roediger & Gallo, 2002). Differing results have been found if group consensus is obtained rather than following the opinion

of the leader. Hollin and Clifford (1983) found that when agreement is not achieved on items in discussion groups, recall is less accurate than groups that did achieve agreement on those items or individual recall of the items when they were not discussed (Hollin & Clifford, 1983). This view was supported by further research that found the overall opinion of the group, termed as majority processes, may not lead to better performance by groups. The majority wins process will only lead to better performance if the probability of an individual obtaining a correct solution is greater than 0.50. This is because if individuals are prone to make an error (probability of a correct response is less than 0.50), the majority decision process will exacerbate the probability of that error occurring (Tindale, 1993). Alternatively, eyewitnesses who are permitted to discuss and answer questions, as well as discuss and make joint decisions, can improve their witness recall and minimize false identifications in some circumstances (Yarmey & Morris, 1998). And in the case of free-recall, Clark et al., (1990) found that groups outperformed individuals in terms of accuracy. Stephenson, Brandstatter & Wagner (1983) cite Hill (1982) and argue that group performance is more optimal than individual performance because groups will not be discouraged by the large task of retelling a long, complex story. Individuals within the group may feel more confident expressing information that they know is accurate while yielding to other more confident participants on information that they are doubtful of. Social validation that the individual is on the "right track" may encourage more reporting as information forgotten by one person may be recalled by another and prompt further recollection from individuals in the group. Stephenson et al. (1983) found support for their hypothesis that group recall raises the quality of

recollection performance. Thus the answer to the question, “does witness discussion improve witness recall?” is mixed and inconclusive.

The precise affect that discussion contributes to accuracy is still to be determined, however, it is clear that a relationship exists and thus, witness-to-witness discussion should affect the CA relationship. When comparing strength of the CA relationship between general knowledge (related to semantic memory) and eyewitness events (related to episodic memory). Perfect, Watson and Wagstaff (1993) state that eyewitness tests, unlike general knowledge tests, provide no objective yardstick to compare recall with. Therefore, Perfect, Hollins and Hunt (2000) proposed in order to significantly increase the CA relation people need to be provided with an opportunity to learn their relative standing. Therefore, witness-to-witness discussion is proposed as a source of additional information for witnesses to calibrate their CA relation.

Witnesses in this study should be relatively accurate in the recall of the witnessed accident. Therefore, corroboration of remembered events should be found between participants in their statements during discussion. This corroboration should work as a calibrating element further enhancing the CA relationship. Witness confidence should be maintained through informational support from the group, and witnesses should develop an understanding, a benchmark, as to their level of memory accuracy for the witnessed event. Indeed, as person identification has been found to be influenced by *post-event verbal knowledge* and the *ease* with which that knowledge is accessed (Read, 1995).

Therefore, it is hypothesised that because of the stronger positive CA relationship that should be exhibited in the Standard investigation form condition over the CI form

and because of witness-to-witness discussion's further ability to calibrate the relationship, the strongest CA relation will be found in the Standard form/ discussion condition.

### ***Hypothesis 5b***

**Participants in the Standard investigation form /discussion condition will have a stronger CA relation than those in the other conditions.**

## **Method**

### ***Participants***

One hundred and ninety six participants were recruited through the St. Mary's University psychology subject pool. Power analysis conducted prior to testing determined 204 participants were needed for a medium effect with a power at .8, alpha of .05. Sample size obtained for this study was under the recommended number, however, significant results were obtained regardless of decreased power. Of the participants, 143 (73%) were women and 53 (27%) were men; they ranged in age from 18 to 42 years, with the mean age of 21 years ( $SD = 4.9$ ). Psychology students participating received three bonus marks toward a psychology course for the time spent in the study.

### ***Materials***

#### ***The Video***

Subjects were shown a 70 second video obtained on loan from the Canadian First Aid Society (American RC Emergency Response, 1982). The scene viewed by the participants depicts an industrial accident in which 3 construction workers are drilling in a tunnel. Two foremen are evaluating cracks in the structure of the tunnel when the accident takes place. Three men are working on/or around the scaffolding when the wall caves in. The witness does not see where the men are located when the incident happens

as it occurs off camera. Participants need to infer the course of events from a series of shots depicting boards and scaffolding falling and a man yelling that the wall caved in. The cause of the incident is unclear. After the incident, the camera shows two injured workers on the ground, one pinned under the fallen scaffolding, conscious, and yelling for help, and the other unconscious and on his back. The three uninjured men move in to assess the situation.

### *Personality Questionnaires*

Participants were asked to complete two personality measures. Although research assessing personality and its impact on confidence and accuracy is still in the experimental stages, there is evidence that need for cognition and self-monitoring can impact the CA relationship. Therefore, the following measures were incorporated for control purposes. The questionnaires in their entirety are found in Appendix A.

*Need for cognition (NFC).* Cacioppo and Petty (1982) developed the 18-item Need for Cognition Scale which assesses the tendency for an individual to engage in and enjoy thinking (Appendix A, section 1). Individuals high in need for cognition have been found to recall more arguments presented regardless of argument quality (Cacioppo, Morris, & Petty, 1983). One study showed that NFC impacted the calibration of confidence and accuracy amongst participants (Greblo, 1998). Furthermore, individuals high in NFC have been found to prefer the strongest argument when presented with options, to be less influenced by the credibility of the source of information, and to take a longer amount of time to deliberate upon alternatives (Curseu, P. & Curseu A., 2001). Thus, NFC could impact the CA relationship of those individuals in the discussion condition, with those

high in NFC choosing the strongest theoretical arguments and in turn being confident in their responses.

*Self-monitoring scale.* Created by Snyder (1974), the 25 item Self-Monitoring Scale assesses one's desire and ability to monitor one's public behaviour and expressiveness to fit the cues and the requirements of the situation (Appendix A, section 2). Cutler and Wolfe (1989) found that participants who scored high on self-monitoring were found to exhibit more confidence and poorer calibration of the CA relation than those subjects assessed as low self-monitors.

#### *Filler Task*

The filler task consisted of 5 mathematical problems and 5 sentence completion tasks of moderate difficulty (Appendix B).

#### *Discussion Questions*

A series of three open-ended questions were presented to the discussion groups. The purpose of the questions was to facilitate conversation about the witnessed incident (Appendix C).

#### *Standard Investigation Form*

The Standard form was retrieved from Montgomery (1996) and used an open narrative format. Montgomery (1996) acknowledges that incident report forms will vary as a result of the organization; therefore, this study used the sample typical Standard incident report form provided in Montgomery's (1996) text. The form contained three open ended questions (one of the three questions was not scored as it asked witnesses to draw inferences) pertaining to the events which happened before, during and after the incident (Appendix D).



*Cognitive Interview Investigation Form*

The CI form was produced using the techniques outlined by Fisher and Geiselman (1992). The form used an open narrative format incorporating the mnemonics of cognitive reinstatement, report everything, and varied retrieval followed by probing questions. Topic areas of focus for the form were obtained from investigation literature (Canadian Centre for Occupational Health and Safety, 1999; Gordon, 2000). Although the CI form contained 13 open ended questions, only 5 were scored. Sections omitted from the scoring process were questions regarding individual characteristics as in industrial incidents it was assumed that people may know the individual that they were working with. Therefore, safety equipment was left in for scoring, however, physical characteristics such as height, and hair colour were omitted and were used only to identify individuals in the free narratives of the incident. The sections of “What do you think caused the incident?, Effectiveness of communication? And how do you think the incident could have been prevented?” were not scored as these sections asked participants for inferences and opinions. The scored questions pertained to what happened in the incident, the environmental conditions of the scene, the tools and equipment used and the safety gear being worn. Some limited choice response questions were provided on the form as prompts for the environmental section and as responses to questions about the overall nature of the communication. This style of question was implemented in the above sections as an attempt to clarify responses after the pilot study.<sup>1</sup> See Appendix E for CI investigation form and Appendix J for further information about investigation form scoring.

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<sup>1</sup> A pilot test was conducted (n=27) after which materials were refined for use in the current study.

*Confidence Measure*

The confidence measure consisted of 5 questions rated on a 7 point Likert scale and was used to assess the participants' confidence judgments regarding the accuracy of their statements (Appendix F). E.g. how **confident** do you feel that your statements are **accurate** regarding the worksite incident?

*Accuracy Check*

An accuracy check was presented to the participants to assess if in fact the accuracy rate that was established through the investigation form was valid. The accuracy check consisted of 10 questions about the incident with limited choice responses (e.g. The number of worker(s) injured was: 1, 2, 3, 4, 5, or 6). Therefore, assessment of the relationship between the accuracy check and the investigation forms helped to confirm that they were both assessing accurate statements about the incident. Additionally, if the forms failed to elicit accurate information this would provide a measure stating if in fact the participants were merely inaccurate in their recall of the incident or whether the forms failed to draw out the appropriate information. (Appendix G).

*Encoding Measure*

Ten questions created from Deffenbacher's (1980) optimality hypothesis and one question from Cutler and Penrod (1989) were presented to the participants to assess level of encoding optimality. The questions pertained to the optimality of lighting conditions, witness environment, as well as time between viewing the incident and completing the report form. (Appendix H).

*Manipulation Check*

The final items presented to witnesses were a six-item manipulation check. The items were administered to establish that the witnesses were psychologically engaged in the investigation form and post-event conditions to which they were assigned. Questions 1b, 2b, and 6 assessed whether individuals participated in the accurate post-event condition in which they were allocated (e.g. *Before doing the Witness Report Form* the percentage of time I engaged in thinking about the incident after watching it on the monitor was). Whereas, questions 3, 4, and 5 evaluated if witnesses engaged in their assigned investigation form condition (e.g. Rate on a scale of 1 to 5 how much mental effort you feel you expended during this experiment) (Appendix I).

### *Design and Procedure*

The design of the current study was a 2 X 3 Factorial utilizing two levels of incident investigation form and three levels of post-event condition. Incident investigation form was manipulated by using 2 incident investigation forms: the CI form and the Standard investigation form form. Post-event condition replicated a variety of possible post incident situations that witnesses may find themselves. It was manipulated in the following manner: In one condition participants were asked to complete a filler task exercise that produced a distraction and inhibited the witness from thinking about the event. The second condition asked participants to think about the witnessed incident, and in the third condition witnesses were asked to discuss among themselves what they witnessed. Groups of participants were evenly distributed throughout the 6 conditions with cell sizes ranging from 35 to 37.

Upon commencement of the study, participants were asked to complete informed consent forms. To protect the confidentiality of the participants the consent forms were

stored separately from the questionnaires. The experimenter then explained that the purpose of the study was to assess decision making.

The 70-second video was then shown to the participants followed by random assignment of groups into one of the 6 testing conditions. Witnesses were given the personality measures and then engaged in one of the three post-event condition tasks followed by one of the two incident investigation forms. Following the testing, participants were given a letter of feedback outlining the purpose of the study and contact numbers if further information was needed.

To ensure anonymity of the participants, no personal information was obtained from participants. The questionnaires were numerically labelled. The data was associated with the numerical label and not the participant's name.

The consent forms were sealed in an envelope and stored separately from the results of the questionnaires. The completed data were stored in a locked drawer in Carla MacLean's assigned lab space (Dr. V. Stinson's Lab, MM 308A).

## Results

### *Data Analytic Strategies*

Two measures of accuracy were used: participant accuracy rate on incident investigation form as well as the total number of accurate statements made by a participant on the investigation form. The accuracy rate was a calculated standardized rate found for all participants in the study, whereas, the number of accurate statements was purely the number of accurate statements made by each witness on the investigation form. Witness accuracy rate was calculated by dividing the number of accurate statements made by the participant by that participant's total number of accurate as well

as inaccurate statements. This standardized rate allowed for overall analysis between both groups and ranged from .50 (50% accuracy) to 1.00 (100% accuracy). These two measures of accuracy were obtained to satisfy the needs of the different hypotheses as hypotheses 1, 5a and 5b considered number of accurate statements and hypotheses 2, 5a and 5b used accuracy rate. Number of accurate statements ranged from 14 to 66 on the CI form and from 4 to 33 on the Standard form.<sup>2</sup>

### *Manipulation Check*

The six-item manipulation check measured whether witnesses were psychologically engaged in the investigation form and post-event condition conditions to which they were assigned.<sup>3</sup> A MANOVA was conducted and the multivariate significance of the test was assessed followed by univariate analysis of the main effects and interactions. Type 1 sums of squares was used in analysis due to unequal sample sizes.

Pilai-Bartlett Trace revealed that the manipulation check responses were significantly affected by type of incident investigation form  $F(6, 183) = 8.18, p < .001$ , as well as post-event condition,  $F(12, 368) = 17.96, p < .001$ .

The ANOVA results indicate the amount that each dependent variable (questions 1b, 2b, 3, 4, 5, and 6) contributed to the significant multivariate effects. To adjust for multiple tests, the univariate effects were evaluated after dividing the MANOVA alpha level ( $\alpha = .05$ ) by the number of dependent variables (6). Thus, the manipulation check was evaluated using  $\alpha = .05/6 = .008$ .

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<sup>2</sup> An accurate piece of information is a piece of information that aids investigators in their pursuit of determining what happened in the accident situation. For example: The white foreman had a flashlight was considered accurate. Accuracy of statement was determined by direct comparison to objective facts presented in the video taped incident, subjective statements were coded as opinion or inference.

<sup>3</sup> Questions 1a and 2a were omitted from analysis due to insufficient response from witnesses.

The significant multivariate effect of incident investigation form can be best described by the significant univariate effect on question 3 and 5. Question 3 assessed the reported amount of mental effort afforded to the study by the participant,  $F(1, 188) = 10.57, p < .008$ . Those in the CI investigation form condition felt that they expended more mental effort during the experiment ( $M = 3.4, SD = .87$ ) than those in the Standard condition ( $M = 3, SD = .79$ ). Additionally, the results of question 5 indicate that those in the CI condition felt the investigation form was more challenging to respond to ( $M = 3.1, SD = .94$ ) than those who used the Standard investigation form condition ( $M = 2.3, SD = .89$ ),  $F(1, 188) = 31.05, p < .008$ . No significant main effect of incident investigation form was found on responses to question 4 (“How well (if at all) do you feel the witness report form helped you recall information about the video taped incident?”),  $F(1, 188) = 1.98, p > .008$ .

In addition, the multivariate effect of post-event condition was reached through significant differences on questions 1b (*Before doing the Witness Report Form the percentage of time I engaged in thinking about the incident after watching it on the monitor was*),  $F(2, 188) = 19.64, p < .008$ , 2b (*Over the entire testing period, the percentage of time I spent thinking about the incident was*),  $F(2, 188) = 8.21, p < .008$ , which examined the amount of time the witnesses had to think about the incident and 6 which assessed how the witness’s thoughts compared to the other participants in the study,  $F(2, 188) = 134.53, p < .008$ . Scheffe’s post hoc analysis on the three questions revealed the following results. All questions were responded to on 5 point Likert scales ranging from the weakest value 1 to the strongest value of 5. As predicted, participants in the filler task condition differed significantly in their estimates of how much time they

spent thinking about the incident they saw. Witnesses in the filler task condition estimated a significantly smaller amount of time ( $M = 25\%$  of the time of the overall time the participant spent in the study) before filling out the investigation form than those in the thinking and discussion conditions ( $M = 50\%$  of the time of the overall time the participant spent in the study).

Additionally, participants in the filler task condition varied significantly from those in the think and discussion conditions when asked to estimate the amount of time over the entire testing period they engaged in thinking about the incident. Participants in the think and discussion conditions estimated a significantly greater amount of time ( $M = 75\%$  of the time) than those in the filler task condition ( $M = 50\%$  of the time). Furthermore, participants in the filler task and think conditions showed significant difference from those in the discussion condition when asked about how their recollection of the incident fit with the other witnesses in the study. Participants indicated which of three statements best described how their memory for the video compared to that of their colleagues. Participants in the filler task and think conditions chose C (value = 3) as their response “I do not know what the other participants thought about the incident” (Filler task,  $M = 2.94$ , Think,  $M = 2.83$ ). Those in the discussion condition significantly chose either A “Similar to the other participants in the study” (value = 1) or B “Different than the other participants in the study” (value = 2) ( $M = 1.41$ ) establishing that those in the discussion condition talked with co-witnesses in order to know how their rendition of the event fit with group opinion.

### *Hypotheses Testing*

Prior to testing the stated hypotheses, evaluations of the assumptions regarding, normality, homogeneity of variance, linearity and multicollinearity were conducted and satisfactorily met. One univariate outlier was detected and removed from data analysis. All variables demonstrated a well distributed, broad range of scores.

*MANOVA.* A multivariate analysis of variance (MANOVA) was performed on two dependent variables: level of confidence and number of accurate statements recalled by witness. Independent variables were incident investigation form (CI vs. Standard) and post-event condition (filler task, think, discussion). This powerful technique was used to test hypotheses 1, 3 and 4 and to control Type 1 error rate associated with conducting multiple univariate tests (Tabachnick & Fidell, 1996). Furthermore, Type 1 sums of squares were used in this analysis due to unequal sample sizes. Table 1 displays the means and standard deviations for each condition in regard to their scores on the dependent measures.

Table 1

*Means and Standard Deviations of Dependent Variables for Each Condition*

Independent Variables		Number of Accurate Statements			Confidence Level <sup>1</sup>	
		<i>n</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Investigation Form	CI	92	38.63	11.05	4.42	.97
	Standard	104	17.22	5.43	5.12	1.08
Post-event	Filler Task	67	26.8	13.78	4.54	1.12
Condition	Think	63	29.34	14.43	5	1.14
	Discussion	66	27.38	13.03	4.79	.96

Note: 1 = Not at all confident – 7= Extremely confident



The multivariate analysis shows support for hypotheses 1, 3, and 4. Pillai-Bartlett Trace, the most conservative of the statistical assessments, revealed that the linear combination of the dependent variables were significantly affected by incident investigation form,  $F(3, 187) = 136.35, p < .001$  as well as post-event condition,  $F(4, 380) = 2.58, p < .05$ . However, Wilks Lambda found the interaction to be non-significant,  $F(4, 378) = 0.84, p > .05$ .

To adjust for multiple tests, the univariate effects were evaluated after dividing the MANOVA alpha level ( $\alpha = .05$ ) by the number of dependent variables (2). Thus, hypotheses 1, 3, and 4 were evaluated according to the following level of significance  $\alpha = .05/2 = .025$ .<sup>4</sup>

#### *Hypothesis 1*

Hypothesis 1 predicted an effect of incident investigation form on amount of accurate information recalled such that participants in the CI condition would recall a greater number of accurate statements than those in the Standard investigation form condition. As indicated above, the MANOVA revealed a significant effect of incident investigation form on the dependent variables of number of accurate statements and confidence, which was further supported in the univariate results. Specifically, as seen in Table 2, those in the CI investigation form condition produced significantly more accurate statements ( $M = 38.63, SD = 11.05$ ) about the event than those in the Standard investigation form condition ( $M = 17.22, SD = 5.43$ ),  $F(1, 190) = 284.18, p < .025$ .

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<sup>4</sup> Gender was found to have a significant relationship with confidence, therefore, a MANCOVA was conducted controlling for gender utilizing the same dependent and independent variables used to test hypotheses 1, 3 and 4. Results indicate no difference in interpretation. The only statistical difference found in the analysis was the multivariate effect of post-event condition was rejected at  $\alpha = .10$  rather than .05 level,  $F(4, 378) = 2.14, p < .10$ .

*Hypotheses 2 and 3*

Hypothesis 2 predicted a significant positive correlation between eyewitness confidence and witness accuracy rate. A between subjects (the correlation between accuracy and confidence is determined across participants within a condition; Roberts & Higham, 2002), Pearson product-moment correlation was conducted between accuracy rate and confidence level. A significant CA relationship was found,  $r = .33$ ,  $p < .001$ .

Hypothesis 3 predicted that eyewitnesses completing the Standard investigation form should have a higher confidence rating in their accuracy than those completing the CI measure. As shown in Table 2, univariate analysis supported this hypothesis,  $F(1, 190) = 21.45$ ,  $p < .025$ . Witnesses in the Standard incident investigation condition reported significantly higher confidence ratings ( $M = 5.12$ ,  $SD = 1.08$ ) than those in the CI condition ( $M = 4.42$ ,  $SD = .97$ ).

Table 2

*Univariate Analysis of Variance of Investigation Form on Accuracy and Confidence*

Investigation Form				
Dependent Variables	<i>df</i>	<i>MS</i>	<i>F</i>	<i>Partial Eta Squared</i>
Number of Accurate Statements	1	21785.95	284.18***	.599
Level of Confidence	1	22.25	21.45***	.101

Note:  $p < .05$  \*,  $p < .01$  \*\*,  $p < .001$  \*\*\*

*Hypothesis 4*

Hypothesis 4 predicted that witnesses who conferred with one another about the viewed incident should have a stronger confidence rating than those who did not have the opportunity to discuss the event. Univariate results indicate that post-event condition significantly impacted level of witness confidence in memory accuracy,  $F(2, 190) = 4.37, p < .025$ , as displayed in Table 3. Scheffe's post hoc analysis revealed that participants who were not permitted to think about the incident (filler task condition) were significantly less confident in their responses ( $M = 4.54, SE = .13$ ) than those who had the opportunity to think about the event before doing the investigation form ( $M = 5.0, SE = .13$ ). However, no significant difference was found between participants in the discussion ( $M = 4.79, SE = .13$ ) and filler task conditions and between those in the think and discussion conditions. Thus, the prediction that the discussion condition would display the highest level of confidence was not supported.

Table 3

*Univariate Analysis of Variance of Post-event Condition on Accuracy and Confidence*

Post-event Condition				
Dependent Variables	<i>df</i>	<i>MS</i>	<i>F</i>	<i>Partial Eta Squared</i>
Number of Accurate Statements	2	61.5	.8	.008
Level of Confidence	2	4.37	4.37*	.044

Note:  $p < .05$  \*,  $p < .01$  \*\*,  $p < .001$  \*\*\*

*Hypothesis 5a*

Consideration of the CA relationship within investigation form conditions revealed low, non-significant results in both forms between accuracy rate and confidence, CI,  $r = .15$ ,  $p > .05$  and Standard,  $r = .17$ ,  $p > .05$ . Therefore, the prediction that the Standard investigation form should have a stronger CA relationship than the CI was not supported. The results indicate that there was an overall CA relationship between confidence and accuracy rate, however, it did not hold within investigation form. This finding is a product of mean differences between the groups. Witnesses in the Standard investigation form condition had a mean accuracy rate of .94, whereas, the mean accuracy rate for those in the CI condition was .76 as well as a significant difference in mean confidence values. This significant difference in means between the two groups created an overall significant relationship which was not present when explored within the investigation forms.

Assessment of CA correlational values utilizing number of accurate statements rather than accuracy rate and confidence produced results that indicate a significant positive relationship within each investigation form. In addition, the CA relationship was found to be twice as predictive in the Standard investigation form condition as what was found in the CI condition. Correlation results found between confidence and number of accurate responses on the CI form was  $r = .22$ ,  $p < .05$ , and on the Standard investigation form was  $r = .44$ ,  $p < .01$ . A pair-wise comparison using Fisher's Z transformed correlation coefficients revealed that the Standard condition had a significantly stronger CA relationship than the CI condition. Therefore, although witnesses in the CI condition were providing on average a greater number of accurate statements ( $M = 38.63$ ) than

those in the Standard condition ( $M = 17.22$ ) those in the Standard condition had a better calibration between the number of accurate statements they were providing and their confidence level.

#### *Hypothesis 5b*

Hypothesis 5 predicted that participants in the Standard form /discussion condition would have a stronger CA relation than those in the other five conditions. Pair-wise comparisons using Fisher's Z transformed correlation coefficients representing the CA relationship within each condition were used to test this hypothesis. Using transformed correlation values due to skewness, five pair-wise comparisons were performed using a  $\alpha$  of .01 per comparison to maintain a final  $\alpha$  of .05. Z-value to be obtained was + 2.28. No comparison reached the critical limit thus the null hypothesis failed to be rejected. Additionally, similar pair-wise comparisons were performed utilizing number of accurate statements and confidence; however, the results were also non-significant.

#### *Personality Measures*

Regression analysis was conducted to predict whether Need for Cognition (NFC) and the Self Monitoring Scale (SMS) predict confidence level and/or both measures of accuracy. In each of the standard regressions, both NFC and SMS were entered as predictor variables. The personality measures did not significantly predict accuracy rate [ $R^2 = .005$ ,  $F(2, 191) = .472$ ,  $NFC \beta = .001$ ,  $SMS \beta = -.001$ ,  $p > .05$ ]. These two personality measures did not significantly predict total number of accurate responses [ $R^2 = .004$ ,  $F(2, 191) = .342$ ,  $NFC \beta = .140$ ,  $SMS \beta = .075$ ,  $p > .05$ ]. In addition, NFC and SMS did not predict participants' confidence ratings [ $R^2 = .013$ ,  $F(2, 191) = 1.3$ ,  $NFC \beta$

= .013, SMS  $\beta = -.024$ ,  $p > .05$ ]. Thus, this data will not be discussed further.

### *Investigation Forms*

*Inter-rater reliability.* Inter-rater reliability was assessed by correlating two rater's accuracy rates on the investigation forms. Each rater independently assessed how many accurate and inaccurate statements were made by each participant. Once independent scoring was complete, the raters compared scores. Any disagreement was resolved through discussion and the mutually agreed upon score served as the accuracy rate for the participant.<sup>5</sup>

A positive correlation was obtained  $r = .91$ ,  $p < .001$ , with a Cronbach's alpha of  $r = .953$  for the two independent accuracy rates produced by the raters before discussion. Furthermore, to ensure that neither rater had more influence on the final number of inaccurate and accurate statements, bivariate correlations were conducted between each rater's accuracy rate and the final accuracy rate. Results revealed no bias in direction of final overall accuracy rate; a significant relationship was found between primary rater's accuracy rate and overall accuracy rate,  $r = .93$ ,  $p < .001$  and secondary rater's accuracy rate and overall accuracy rate,  $r = .93$ ,  $p < .001$ .

*Accuracy Rate and Number of Accurate Statements.* Although the total number of accurate statements recalled by participants was significantly higher in the CI investigation form condition ( $M = 38.46$ ,  $SD = 11.41$ ) than the Standard investigation form condition ( $M = 17.22$ ,  $SD = 5.43$ ),  $F(1, 190) = 284.18$ ,  $p < .025$ , the opposite was true for accuracy rate. Incident investigation form was found to have a significant relationship with accuracy rate (standardized value of the number of accurate statements

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<sup>5</sup> Blind scoring of witnesses investigation form was not done, thus, there is potential for systematic bias to be present in the data.

divided by overall number of statements),  $F(1, 193) = 222.34, p < .01$ . As shown in table 4, witnesses using the Standard investigation form produced a mean accuracy rate ( $M = 0.94, SD = 0.07$ ) that was greater than those in the CI condition ( $M = 0.76$  accuracy,  $SD = 0.11$ ).

Exploration of the lower accuracy rate produced on the CI revealed poor accuracy rates in the limited choice sections of Communication and Environment (Communication = .49 and Environment = .32 of statements made were accurate) as displayed in Table 4. Assessment of the investigation forms without the limited choice Environment and Communication questions revealed that even without the limited choice sections, the Standard investigation form condition ( $M = .94, SD = .09$ ) still had a significantly higher accuracy rate than the CI ( $M = .83, SD = .07$ ),  $F(1, 194) = 79.9, p < .001$ .

Worth noting is that although the CI form had 6 open-ended scored questions as opposed to 2 open-ended questions on the Standard investigation form, more accurate information was obtained on the CI form on the same question than on the Standard form. A univariate analysis of variance produced results indicating that although only one question was asked on the CI form (Describe in detail and in your own words, the events you witnessed just *before* the incident occurred, *during* the incident and immediately *after* the event), it was significantly more proficient at drawing out accurate information about what happened in the incident ( $M = 19.51, SD = 8.31$ ) than the same question as well as an additional question (Explain what you know about the injury/accident, e.g. what type of work was being done at the time of the injury/accident, what happened to cause the injury/accident, how seriously was the injured employee hurt, etc.) asked in the Standard form [ $M = 15.04, SD = 4.70; F(1, 194) = 22.12, p < .001$ ].

Table 4

*Accuracy Values of Investigation Forms*

Section of Investigation Form	Accuracy	CI Investigation Form	Standard Investigation Form
Total Form	AR	.76	.94
	NS	38	17
	NIS	12	1
What Happened	AR	.85	.93
	NS	26	15
	NIS	5	1
Environment			
Total	AR	.61	.99
	NS	6	1
	NIS	4	0
Narrative	AR	.82	.99
	NS	5	1
	NIS	1	0
Limited Choice	AR	.35	
	NS	1	
SAPE	AR	.81	.94
	NS	5	1
	NIS	1	0
Inferences		2	2
Opinions		2	0

Note. Mean Accuracy Rate = AR; Mean number of accurate statements = NS; Mean number of inaccurate statements = NIS.



Table 4 provides a breakdown of the incident investigation forms across accuracy rate as well as accurate and inaccurate statements. The significant difference in amount of information extracted by each form is presented as well as witness accuracy in each section of the forms.

### *Encoding Measure*

Assessment of 11 questions regarding the optimality of encoding conditions (Deffenbacher, 1980; Cutler & Penrod, 1989) revealed that only 8% (16/196) of participants were aware of a memory test to come. As displayed in Table 6, 99% of witnesses reported a short time interval between viewing the accident and reporting (less than an hour), furthermore only 38% of participants in the discussion condition felt that no new information was presented to them during their discussion. Discrepancy in witness reports during discussion was found as only 49% of witnesses reported that of the new information that was presented was “mostly consistent” with what they witnessed. Further results of the encoding questions are presented in Table 5a and 5b.

Table 5a

### *Participant Encoding Results*

Question	Highest Percentage Response
Q2 Participant stress level while watching the video	36% mildly stimulated
Q3 Ratings of incident lighting	63% Poor
Q4 Opportunity to view individuals in the incident	45% Moderately adequate opportunity
Q5 Level of familiarity with individuals in the incident	79% Not at all familiar
Q6 Retention interval between viewing the incident and reporting the events	99% Less than an hour

Table 5b

*Participant Encoding Results*

Question	IV	Highest Percentage Response
Q7 Amount of additionally consistent information about the witnessed incident presented between watching the video and filling out the witness report form	<u>Post-event Condition</u>  Discussion  Filler /Think	38% No new information was presented  59% No new information was presented
Q8 Of the 62% of people who felt new information was presented in question 7:	Discussion	43% Information was mostly consistent to what was presented
Q9 Environmental conditions when the participants witnessed the incident and when they were asked about the events in question		82% Surroundings had not changed at all
Q10 The types of questions asked on the investigation form	<u>Investigation Form</u>  Cognitive Interview  Standard Form	53% Majority of questions were free narrative with some limited choice responses  41% Majority of questions were free narrative with some limited choice responses
Q11 Distinctiveness of individuals in the incident		51% Workers were somewhat distinctive

## Discussion

The present study sought to examine the role of eyewitness testimony in industrial accident investigations. Specifically, the goals of this study were twofold. First, I explored the usefulness of the Cognitive Interview (modified for questionnaire format) as a tool for enhancing eyewitness recall for a workplace accident. Responses to a typical industry accident investigation form were compared to those produced by a questionnaire grounded in the principles of the Cognitive Interview. Second, I examined the role of post-event condition on eyewitness recall memory. After viewing a simulated workplace accident, witnesses were prevented from reflecting on the event (by completing a cognitively demanding filler task), asked to think about the event, or asked to discuss the event with co-witnesses.

### *Summary of Results*

***Hypothesis 1: A greater number of accurate statements will be acquired from eyewitnesses as a result of using the Cognitive Interview investigation form than the number acquired through the Standard incident investigation form.***

Accuracy for the witnessed event was interpreted in two ways in the present study: the number of accurate statements made by the witness and the accuracy rate obtained by the witness. The number of accurate statements is the summed number of correct statements obtained from the witness's investigation form. The accuracy rate is the number of accurate statements divided by the total number of statements (accurate as well as inaccurate) produced on the investigation form.

As hypothesized, more accurate information was recalled from participants completing the CI investigation form than those completing the Standard reporting form

utilized by industry. This finding is congruent with reports from the forensic literature that found the CI elicits 25% to 100% more correct statements than other forms of interview (Fisher, Brennan & McCauley, 2002).

The CI has also been reported to elicit more information about the incident at the same accuracy rate as the Standard or Structured interview (Fisher et al., 2002). This finding was not supported in the present study. The CI investigation form's accuracy rate, although good at 76%, was significantly lower than the Standard investigation form, which produced a 94% accuracy rate. This finding raises questions as to the reasons for this difference in memory accuracy. Is there something about the Standard workplace investigation form that is implicitly different from the Standard or Structured interview?, Should the effectiveness of the CI be further considered? Or, does the CI work differently when put into a paper and pencil format as opposed to the traditional interview?

*Standard investigation form versus the interview.* The Standard interview used in the original studies exploring the Cognitive Interview was documented as having loose experimental control. It was noted as being highly variable (Memon & Higham, 1999) exhibiting characteristics such as rapid fire questions, frequent interruptions (Fisher, Geiselman & Raymond, 1987) as well as a focus on information required by the crime report (e.g. what was the height of the perpetrator?; Fisher et al, 1987). Thus, both Standard methods of information retrieval (the interview and the investigation form) are characterized by their non-uniformity. Therefore consideration of the efficacy of the CI as well as its translation into a paper and pencil format is in order.

*Effectiveness of the CI.* In recent years, the effectiveness of the CI has been questioned (e.g. Memon & Higham, 1999; Memon & Stevenage, 1996). Memon and

Stevenage (1996) state that the increase in the amount of correct information recalled has been associated with a significant increase in confabulations and errors (e.g. Mantwill, Kohnken, & Aschermann, 1995; McCauley & Fisher, 1995; Mello & Fisher, 1996; Memon, Wark, Bull, & Kohnken, 1997). Research exploring accurate and inaccurate statements given by witnesses has found that although the number of accurate statements had been found to be higher in the CI, opposed to the Structured interview, it is accompanied by a higher number of inaccurate statements (Mello & Fisher, 1996). The results obtained in the present study are consistent with this branch of literature. However, this does not explain the discrepancy found between the two forms as the increase in inaccurate reporting should have maintained the same accuracy rate in the CI and the Standard or Structured interview. Thus, perhaps we should be considering the report criterion of the witness. Perhaps with encouragement to report more information witnesses' report criterion was lowered to such a degree that they began reporting more inaccurate information.

A corresponding line of research concerning police investigations reports similar findings, as witnesses are at times encouraged (even pressured) to remember more details of an event (Winningham & Weaver III, 2000). This pressure to report more details of an event that are poorly remembered may coincide with introducing false (albeit self-generated) post-event information (Winningham & Weaver III, 2000). Thus, pressuring a witness to respond to more questions than they would have answered without pressure can increase the amount of accurate as well as inaccurate information reported (Lipton, 1977; Marshall, 1966; Winningham & Weaver III, 2000).

The weaker accuracy rate and higher number of accurate statements elicited by the CI when compared to the Standard investigation form leads to the exploration of how questions were asked on the investigation forms. Did the mnemonics utilized in the CI investigation form aid in eliciting more information, or was the increase in accurate information due to an increase in number of questions asked? Furthermore, did probing for details in areas where witnesses may not have freely recalled information lead to the diminished accuracy rate?

The mnemonics used in the CI investigation form were incorporated to aid in the retrieval of information. Direct comparison of the same question on the two investigation forms was done to explore if there is support for the use of mnemonics in incident retrieval utilizing investigation forms. The question asked participants to “describe in detail and in your own words, the events you witnessed just *before* the incident occurred, *during* the incident and immediately *after* the event.”<sup>6</sup>

Intuitively, one would think that asking the same question and supplying a comparable amount of space to respond would produce no difference in the amount of accurate information obtained. However, the results indicated that although only one question was asked on the CI form, it was significantly more proficient at drawing out accurate information concerning the incident than the same question, as well as an additional question, asked in the Standard form. Participants in the CI condition had been given instruction regarding context reinstatement and report everything. Because both

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<sup>6</sup> Witnesses completing the Standard investigation form supplied information pertaining to this question in their responses to an additional question. Thus, the second open-ended question from the Standard form (Explain what you know about the injury/accident. e.g. what type of work was being done at the time of the injury/ accident, what happened to cause the injury/ accident, how seriously was the employee injured, etc.) was included when comparing the two forms.

groups of witnesses (CI and Standard) did not leave the witnessing room (82% reporting that their surroundings had not changed at all from when they witnessed the incident and reported the information) and were given a short time delay between witnessing the incident and filling out the form (99% felt that it was less than an hour between witnessing and reporting), cognitive reinstatement may not have been the primary reason for the discrepancy in number of accurate statements. It is possible that those in the Standard condition reported less because they did not receive instruction to report everything. Thus, perhaps the discrepancy was a function of goal setting by those in the CI condition. The instruction to please report everything you can recall about the incident may have encouraged witnesses to indiscriminately report as much as they could to obtain the result of the greatest amount of information possible. This may have resulted in the increase in accurate as well as inaccurate statements.

In addition to the mnemonics provided in the CI, the cognitive strategy of probing for information not mentioned in free-recall was done on this investigation form and may be another reason for the obtained lower accuracy rate on the CI. The discrepancy between the accuracy rate of the Standard investigation form and the CI form may be a result of the limited-response probes administered on the CI form. Limited-choice response questions were used in the CI form as a method of probing within the section on environment as well as retrieving information about the overall level of communication before, during and after the incident. These questions were put in the form after reviewing the pilot study results which found that witness responses on open-ended questions pertaining to the above mentioned areas were not producing the information anticipated to be acquired with the use of the questions. In an attempt to clarify and

retrieve more specific information from the witness, limited-choice questions were incorporated. This introduced a deviation from the methods utilized by the Cognitive Interview, as interviewers are encouraged to only probe information mentioned by the witness in his/her free narrative. By probing for specific information not specified in the free narrative, a lower accuracy rate could be expected as the witness may not have insight into these details (Marshall, 1966; Winningham and Weaver, 2000). The results of this study demonstrate that when it is not known what witnesses have reported in their free recall, introducing probing questions in an attempt to elicit more information can result in a poor accuracy rate for those probing questions.

The accuracy rate for environmental statements on the Standard form was 97% and 65% on the CI form.<sup>7</sup> The accuracy rate of the limited-choice questions was very poor (32%, on the CI form), therefore, if the limited-choice questions were omitted from the accuracy rate, results the CI form's environmental section jumps from a 65% accuracy rate to an 82% accuracy rate.

The accuracy rate of the limited-choice questions within the communication section produced results similar to the environmental section (48% accuracy rate). In addition to the potentially harmful impact of probing information not freely recalled by witnesses and additional explanation for the poor accuracy rate on the communication questions could be the less than ideal audio quality of the video.

If all of the limited choice response probes were omitted from the accuracy rate, the accuracy rate of the CI investigation form increases from 76% to 83%, however, it is

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<sup>7</sup> Statements about the environment in the accident scene on the Standard form were made in context when discussing what happened during the incident. In contrast, the Cognitive Interview form contained an open-ended narrative question asking for information specifically about the environment as well as 4 limited choice probing questions.



still significantly different than the Standard form. Therefore, these results corroborate Davies (1993) statement that free recall tends to be generally accurate as those in the Standard condition were highly accurate. By attempting to draw out more detailed accurate information with limited choice probes following the free narrative, the CI investigation form's accuracy rate suffered.

*CI: Translation to paper and pencil.* An additional possible explanation for the discrepancy in accuracy rates between the Standard and the CI form may perhaps lie in the paper and pencil format used to administer the CI. Witnesses engaged in free recall after viewing an event have been found to produce an accuracy rate of 91%, however, only reported 21% of the information. Additional probing of information through questioning resulted in more information being produced at a lower accuracy rate (Lipton, 1977). Therefore, allowing witnesses to recall freely information without probing produces incomplete, however, highly accurate testimony. As previously mentioned, the mnemonic devices used in the Cognitive Interview have been hypothesised to produce greater ease in recall for the witness during the interview while generating more accurate information (Gwyer & Clifford, 1997). Perhaps using these devices in the paper and pencil format reduced the interaction normally found between the witness and the interviewer in the Cognitive Interview and produced problems in the ease of retrieving information.

Witnesses may need the interaction and guidance provided by the interviewer to keep them on track. In asking the witness to report everything that comes to mind, the door is opened to guessing at information. Fisher and Geiselman (1992) instruct interviewers to ask the witness not to fabricate a response when they do not know the

answer. Thus, the relevance of the interviewer /interviewee relationship is manifested in the guidance the interviewer may provide to the witness. Participants in the CI investigation form condition may have felt pressure to produce an answer when they did not feel comfortable responding. This pressure may have lead to responding with information which was incorrect due to fabrication or inaccurate remembering.

Furthermore, if the mnemonic devices were not as effective in the paper and pencil version as in the interview, increased probing found in the CI form may have increased inaccurate responses. Roberts and Higham (2002) state that the increase in accurate as well as inaccurate information may be due to an alteration in report criterion (e.g. Koriat & Goldsmith, 1996a, 1996b, 1996c). The instruction to report everything may encourage the witness to make their report criterion liberal, thus reporting information that they have low confidence in. This low confidence may lead to a diminished discrepancy between accurate and inaccurate pieces of information (Roberts & Higham, 2002). Once the discrepancy has been reduced, probing questions may inflate the reporting of inaccurate responses. Thus, research has found a connection between the confidence level of witnesses and the accuracy of their statements (Geiselman, Fisher, Firstenberg, Hutton, Sullivan, Avertissian and Prosk, 1984; Roberts & Higham, 2002). Geiselman et al. (1984) found that confidence was higher for correct responses to both open-ended and pointed questions than it was for incorrect answers on both the open-ended and probing questions. In addition, research has found that those statements that have been assigned a high confidence rating are more accurate than the full set of statements made by the witness (Roberts & Higham, 2002). Because the Standard investigation form was a shorter form than the CI, perhaps witnesses had the luxury of

reporting only information for which they were highly confident and thus, were more accurate.

The greater challenge presented by the CI investigation form in its attempt to draw out more accurate information is corroborated in the data as witnesses in the CI condition found the questions significantly more difficult than those in the Standard condition. Furthermore, no difference was found between the two investigation forms in response to the question “How well (if at all) do you feel the witness report form helped you recall information about the video taped incident?”. Therefore, witnesses in the CI condition may have made more errors because of a perceived pressure to respond.

The accuracy of a witness is important, however, a witness’s confidence in the level of his/her accuracy is of great relevance. Establishing the strength and nature of this relationship allows a predictive element into evaluation of witness testimony in industrial accident investigations. Thus, if the witness is highly confident can we assume they are highly accurate?

***Hypothesis 2: A significant positive correlation will be present between eyewitness confidence and his/her accuracy rate within all conditions of the study.***

The Standard and CI investigation forms utilized in this study use an open-ended, free recall approach to questioning, therefore, it is theorized that the memory process needed for these tasks are retrieval based rather than recognition. It is proposed that retrieval based memory can be challenging to access as seen from the “tip-of-the-tongue” phenomenon (Brown, 1991). The more challenging the questions in the recall task, the greater the effort a witness must use to access that information. It has been proposed that the amount of cognitive effort required in the retrieval of information (Robinson &

Johnson, 1996) as well as the speed of that retrieval (Robinson et al. 1997) provides the person engaged in the recall task with valuable information as to the accuracy of his/her memory. Effort expended in a task may also affect and provide insight for the witness in regards to his/her appropriate level of confidence (Robinson & Johnson, 1996). This fulfills the criteria that, to obtain a CA relation, the variables influencing witness confidence should also influence witness accuracy (Wells, Olson, & Charman, 2003).

It was hypothesised that the findings in this study would be in concordance with the literature which proposed that the speed and amount of effort a witness places in his/her recall should provide him/her with the appropriate information for a positive CA relationship. The speed and ease of the retrieval task was not assessed in this study nonetheless a positive CA relationship was predicted. This hypothesis was supported as a positive between-subjects relationship (the correlation between accuracy and confidence is determined across participants within a condition; Roberts & Higham, 2002) was found between a witness' confidence and accuracy rate. This finding is further supported by the literature as studies exclusively exploring recall memory have produced positive CA correlations from .53 to .64 (Stephenson, 1984; Stephenson, Brandstatter, & Wagner 1983; Stephenson, Clark, & Wade, 1986).

***Hypothesis 3: Eyewitnesses completing the Standard investigation form will have a higher confidence rating in their accuracy than those completing the CI measure.***

Confidence judgements are affected by witnesses' performance during a reporting task as well as their success at retrieval. Inability to answer questions successfully causes eyewitness confidence to deteriorate (Fisher & Geiselman, 1992). Furthermore, the ease

at which a witness is able to retrieve information is proposed to provide them with a cue as to their level of confidence (Gwyer & Clifford, 1997).

Because no feedback was given to participants in either investigation form condition, and less information was asked of those in the Standard investigation form making it an easier task, it is not surprising that higher confidence in the accuracy of results was found in the Standard investigation form condition. Those in the CI condition were asked to explore their memory of the witnessed incident more thoroughly through a greater number of free recall and probing questions. This increased probing may have exposed those areas where the participant may have felt less successful and therefore, less confident in their responses. In addition witnesses may have attempted to answer probing questions which were not follow-ups to their free recall. This may have additionally impacted confidence as literature states that asking questions about information which is not salient enough to be freely mentioned in narration can have significant effects on confidence (Leippe, 1980). Therefore, those witnesses who completed the Standard investigation form were significantly more confident in the accuracy of their testimony than those who completed the CI.

***Hypothesis 4: Witnesses who have conferred with one another about the viewed incident will have a stronger confidence rating than those who did not have the opportunity to discuss the event (Filler Task and Think).***

Eyewitness confidence is malleable and can be contingent on the type and strength of post-event conditions (e.g. Luus and Wells, 1994; Snizek & Henry, 1989; Stephenson, Brandstatter and Wagner, 1983). The three post-event conditions (filler task, think, and discussion) were incorporated in this study to assess how they might impact

testimony to industrial incidents. I hypothesized that those who conferred with one another about the witnessed event would report being more confident about their responses than those who completed a filler task and those who only thought about the incident. The results support the hypothesis that post-event condition significantly impacted witness confidence, but in a manner alternate to what was hypothesized. Those individuals who thought about the incident before filling out the investigation form (did not discuss the incident) had significantly higher confidence levels than those who did not have the opportunity to consider the accident due to a filler task.

A possible explanation for why those in the think condition produced the highest confidence ratings amongst the conditions is that individuals in the think condition were able to consider their version of the accident for an uninterrupted time period. Hastie et al. (1978) found that people who were encouraged to repeatedly guess the correct answer about a witnessed street crime increased in their confidence rating but not their accuracy. This finding supports the idea that reiteration without feedback to calibrate confidence in one's accuracy enhances confidence. In addition, Wells et al. (1981) found that witnesses in a briefed condition who internally rehearsed information about the viewed event had a significant inflation in confidence in the accuracy of their testimony. This phenomenon was supported by Leippe's (1980) theoretical argument that through thinking about an incident, witnesses retrieve consistent aspects of the memory more readily than inconsistent aspects thus, resulting in higher certainty about their testimony.

Thus, internal repetition focusing on consistent elements of the witnessed industrial event could have enhanced the ease and speed at which this information was recalled during the recall task. Barlett (1932) found, that verbal repetition of the incident

by a witness can produce systematic changes in a witness' testimony. Alteration or additions of details are incorporated to aid in the overall fit of the description of the event provided by the observer. This process of enhancing the fit aids the witness in creating a more coherent story and smoothing over the conflicting parts, especially for those events which are familiar to the witness (Barlett, 1932). Results in the identification literature demonstrate that repeating target information enhances target availability, so witnesses approach an identification task with enhanced confidence in their ability to identify the suspect (Read, 1995). Therefore, the witnesses in the think condition may have used their time to create a smooth, coherent story which was easily recalled and resulted in a subsequently high confidence rating.

Witness-to-witness discussion was proposed to enhance witness confidence to a level beyond those obtained by the other groups; this hypothesis was not supported. It is possible that those in the think condition produced a confidence effect stronger than the discuss condition because they did not have the opportunity to receive interpersonal feedback. Witness-to-witness discussion may not have allowed changes in confidence judgements to the extent of the think condition because of the controlling effects that inconsistent feedback had on witness confidence. Although confidence level was not as high in the discussion condition as in the think condition, it was stronger than the filler, which produced the weakest confidence. Thus, if witnesses who receive feedback in support of their decisions increase in their confidence regarding accuracy (Luus & Wells, 1994), then it is logical that the consistent aspects of the event witnesses are retrieving through thinking about the incident (Leippe, 1980) may be acting as self-generated positive feedback, producing a stronger confidence rating than the co-witness feedback

provided in the discussion condition. However, receiving some feedback produced higher confidence levels in the discussion condition than those shown in the filler task condition. These findings are consistent with the view that confidence can be manipulated by factors independent of perceptual and memorial processes (Luus & Wells, 1994).

***Hypothesis 5a: There will be a positive CA correlation in both investigation form conditions, however, the relationship will be stronger in the Standard investigation form than the CI.***

Witnesses in both investigation forms were proposed to not differ significantly in their accuracy rates as well as have a positive CA relationship, however, those in the CI investigation form were predicted to have a greater fluctuation in confidence. This composition of relationships was hypothesized to result in a stronger CA relationship being obtained in the Standard investigation form condition. This hypothesis was not supported as neither investigation form produced a significant CA relationship between accuracy rate and confidence. A CA relationship was shown with all the participants in the study thus, it is of interest to determine why this relationship did not materialize within investigation form conditions. Mean differences were found between the two investigation form groups on accuracy rate as well as confidence, thus, exhibiting an overall relationship which could not be teased into two groups.

The CA relationship between the number of accurate statements provided by the witness and his/her confidence rating in the accuracy of those statements was explored. Results indicate that a positive CA relationship was found within each one of the investigation form conditions. Witnesses in the Standard investigation form condition produced a significantly stronger CA relation than those in the CI condition. Thus,



although witnesses in the Standard condition were only providing roughly half the amount of accurate information of those in the CI condition, they were better calibrators of their accuracy. Therefore, by providing less information, witnesses in the Standard form condition were better judges of the accuracy of their statements.

It is important to establish an understanding of why witnesses in the Standard investigation form were better at calibrating their CA relation than those in the CI condition. Perhaps the difference in amount of information derived from the two forms can be attributed to the structural difference of the two forms (Fisher et al., 2002). Providing information about a witnessed incident may be a novel task for the eyewitness resulting in a great challenge (Fisher & Geiselman, 1992). Therefore, since the CI form requires free recall with the addition of mnemonics and follow-up probing questions, witnesses found it a more challenging form. This more challenging structure may have manipulated witness confidence producing a weaker confidence rating, and as a result, a weaker CA relationship.

It is interesting to consider why witnesses were better at establishing their CA relationships when number of accurate statements is considered rather than accuracy rate. Perhaps people are better at knowing when they are accurate and thus judge their confidence on statements that they feel certain of rather than making a confidence judgment which attempts to take into consideration those statements they are sure as well as not so sure of.

***Hypothesis 5b: Participants in the Standard investigation form /discussion condition will have a stronger CA correlation than those in the other conditions.***

A significantly stronger relationship was hypothesised as a result of the Standard form producing a stronger CA relationship than the CI and the discussion condition was predicted to further calibrate the correlation. The results did not support this hypothesis; in fact, the correlation in this condition was the weakest of all the groups

Witnesses in the Standard investigation form condition were predicted to display a stronger CA relation than those in the CI investigation form condition. This relationship was expected because of a hypothesised greater fluctuation in confidence level as a result of being in the CI condition and answering more challenging questions than those found in the Standard investigation form. This relationship was not supported in the results as witnesses in both the Standard and the CI investigation forms had a non-significant, small correlation between accuracy rate and confidence. A significant relationship was found, however, within the Standard and CI investigation forms on the number of accurate statements and confidence. Those in the Standard investigation form were found to have a stronger CA relationship than those in the CI, therefore, pair-wise comparisons were done on the both sets of CA correlations.

The discussion condition was predicted to calibrate further the predicted positive CA relationship within the Standard investigation form condition as co-witness discussion was hypothesised to be highly accurate, thus, acting as confirmatory feedback for the witnesses. The short time delay between witnessing and retrieving of information as well as the free-recall nature of the task were hypothesized to produce high accuracy. The short time delay was confirmed as 99% of witnesses felt that the retention interval between watching the event and reporting it was less than an hour. As predicted witnesses were accurate, but divergent information was presented in witness-to-witness

discussion because only 7% of those in the discussion condition reported receiving information during their discussion that was totally consistent with what they perceived to have witnessed. This lack of consensus may have further weakened the relationship because witness confidence may have fluctuated as a result of hearing alternative viewpoints of the witnessed accident. This relationship is supported in Hypothesis 4 as confidence is displayed as fluctuating with post-event condition. Therefore, both CA correlations (accuracy rate and confidence and number of accurate statements and confidence) were found to be non-significant in the Standard discussion condition and did not produce a stronger relationship than those in other conditions.

#### *Limitations and Future Research*

As with all studies this one has strengths as well as limitations. Through assessing the generalizability of the results along with this study's limitations leads directly to suggestions for future research. These will be intermingled and discussed in relation to witnesses, materials and method.

#### *Witnesses*

University students with a mean age of 21 were used in this experiment. The age of this sample is not be representative of all employment sectors as the ratio of Canadians aged 15-24 to those aged 55-64 is in the process of shifting and will move from 2:1 to 1:2 by 2015 (Dumas, 1995). The restriction of witness age range may have impacted the generalizability of the results when we consider that age has been shown to influence memory. Older witnesses have been shown to have poorer recall for information about a crime than younger witnesses (Brimacombe, Jung, Garrioch, & Allison, 2003). In addition, the education level of the witnesses could be considered unrepresentative of

some higher reliability jobs, such as factory or kitchen work, where industrial accidents would be more prone to occur than, for example, in a clerical setting. An important factor for assessing the generalizability of an outcome, above that of demographic representation, is the meaning and behaviour the subjects assign to the situation (Berkowitz & Donnerstein, 1982). It can be assumed that witnesses in the present study took the tasks seriously as, in addition to testing being conducted in a professional manner, on average, participants reported that they expended a moderate amount of mental effort during the study as well as found the witness investigation forms a little to moderately challenging. Therefore, although the present study was conducted in a laboratory setting creating conditions different than what would be found in an industrial accident, the results may provide beneficial information regarding them. Thus, the purpose of this experiment is not to create an estimate of the likelihood that these responses will occur in a natural setting, rather it is to shed some light on elements of industrial accident investigations.

To enhance the generalizability of the findings, it would be beneficial for future research to explore the impact of age and education on eyewitness memory for workplace accidents, as we are facing an aging population within Canada's workforce and is beneficial to understand how memory changes with increasing age. Additionally, as stated previously, the injury rate of teenage workers in the United States is cited as twice as high as that of the adult workforce (Schlosser, 2002); therefore, how youth recall events is relevant. Thus, the demand to pursue this line of study is evident.

Safety culture within an organization, defined by Pidgeon (1997) as, "the set of assumptions and their associated practices, which permit beliefs about danger and safety

to be constructed”, can have large ramifications on how situations and events are interpreted and reported (Pidgeon, 1997). It seems reasonable then to assume that this culture may greatly impact how witnesses encode and recall information about a witnessed incident. Thus, future research should explore the impact of organizational culture on eyewitness memory for a workplace accident. Attempting to manipulate organizational culture within an experimental setting may pose a challenging task for the researcher, therefore, manipulation of employee attitudes about safety and their impact on reporting may be a beneficial place to begin. Research could assess already established participant attitudes about safety, then present them with an occupational incident. This would allow researchers to control of worker attitudes when assessing the characteristics of his/her report.

Additionally, motivating elements such as incentives, potential job loss or proximity to the incident (either physically or in terms of job similarity) could have additional harmful or distorting effects on recall and should be another area of future study. Some research had already shown that these issues will be relevant as research on academic incentives has found that with more incentives the overall number of responses increased which, in turn lead to an increase in number of incorrect details being reported (Dasgupta, Fisher, Hines & Larson, 1996). As well, proximity to the accident could impact recall as a witness’s memory for a highly similar victim has been found to be distorted as they tend to overestimate as well as under estimate critical elements of the crime (Marsh, 1998).

Further research should explore post-incident conditions beyond the scope explored by this study (discussion, thinking and filler) and how they impact testimony.

Employee-victim debriefing (health professionals meet with victims to discuss and debrief about the traumatic incident) happens after employees have been exposed to a violent event (Flannery, 1996). It is recommended that healthcare professionals meet with witnesses within 24 hours of the incident and again after 1 week (von Slagmott & Rapobank, 1992, as cited in Flannery, 1996). Most of the investigation literature states that witness should be interviewed as soon as possible after the event (Canadian Centre for Occupational Health and Safety (CCOHS), 1998); however, during this very loosely defined time period, valuable information may be altered. The question therefore arises, how would employee debriefing affect witness reports of the incident? Future investigation is needed into the protocol and process of investigations and how that might impact the memory reconstructive process.

#### *Materials.*

*Video.* The quality of the video used as the incident was realistic in its depiction of the accident, however, the audio quality as well as the picture quality was less than desirable. Sixty-three percent of the witnesses rated the lighting in the video taped incident as poor, and discussing the video with participants after testing revealed that they had difficulty deciphering what was being said. The poor audio could have impacted witnesses' ability to understand what was happening in the incident, and the poor picture may have disrupted participant encoding of the finer elements of the video (e.g. environmental conditions).

As well as video quality, the subject matter may have affected the results of the study. The incident in this study took place on a construction site an environment perhaps unfamiliar to the witnesses who were all university students and primarily female (73%).

In a true workplace incident, most witnesses are workers or other people familiar with the workplace where the accident happened. Future research should consider tailoring the incident to the population to explore how familiarity impacts testimony. Thus, future research should explore how university students respond to an incident which took place in a more neutral and familiar environment (e.g. university or movie theatre) as well as a less or unfamiliar environment (e.g. coal mine).

Additionally, the results obtained from this study are limited to one type of incident scene, therefore, it is unclear whether divergent results would be obtained from different types of incidents occurring in different settings. Consequently, future research should consider varying the type of work being done as well as the type of accident. Accident type could be manipulated on a number of elements that could impact encoding and reporting such as incident violence level or type of loss incurred (i.e. production/monetary vs. injury/death). The value of working within a workplace setting would be clear in this line of research, as employees in certain sectors may respond differently to incidents depending on the norms of their work environment (e.g. emergency hospital staff opposed to clerical office staff).

*Investigation form.* This study is one of a few studies that have explored the Cognitive Interview outside a forensic setting and the only one known to apply the CI to a paper and pencil format. Therefore, further investigation is needed to understand fully whether and how the CI translates to a written format.

When considering the benefits of the CI form, it is important to consider its comparison measure. In the early stages of research on the Cognitive Interview, the Standard interview was a useful comparison measure as it was beneficial to establish that

the CI was better than what was already being used (Memon & Higham, 1999). Research supported this notion, so investigators moved to comparing the CI against more specific interviewing styles (ex. the guided memory interview, the structured interview; Memon & Higham, 1999). Future research should consider the same strategy for the CI investigation form. This study established the CI's superiority in its ability to extract a greater number of accurate statements; however, this result happened at a lower accuracy rate compared to present techniques. Therefore, further research is needed to establish the most effective investigation form for industrial investigations.

Future research should endeavour to refine the investigation form modeled after the Cognitive Interview. Although successful in the present study at extracting more accurate information, improvements are needed. This process would include clarifying instructions to witnesses to deter guessing or goal-setting and obtaining a greater understanding of the information retrieved by the form. It is important to understand whether the form pulls out the "right" information from the witness or whether information critical to an investigation is being overlooked. Research should explore how many critical, moderate and inconsequential pieces of information are being drawn out by both types of forms to determine whether the CI is truly superior in all respects. Furthermore, it is of interest to understand the placing of incorrect responses on the form as well as the subject matter of those responses; are there uniform amounts inaccurate answers across all areas (what happened, environment, safety, etc.) or do they resonate stronger in certain areas creating a pattern? Research exploring the accuracy of recall in central versus peripheral information (Christianson & Loftus, 1991) could be considered as emotional events are said to draw attention to the central aspects of an incident,



leaving the more peripheral contents outside the focus of attention. Further refinement of the CI investigation form would explore the properties of the Cognitive Interview and attempt to determine, what (if any) are the differences which manifest when the Cognitive Interview is done on paper as opposed to verbally?

In addition, perhaps future research should consider the utility of the investigation form as a tool for private completion by the witness as well as a tool to be used by interviewers for conducting interviews. There are benefits to using the CI investigation form as an interview template as it may give interviewers who have little or no training in interviewing a strong jumping off point for conducting interviews. Furthermore, by using the form as an interviewing protocol, the issue of probing on information not offered by the witness would be minimized, as interviewers would be instructed to only probe deeper into areas already established by the witness.

In conclusion, due to the many variables which could potentially impact success of the CI form (witness population, type of job etc.) it is important that further development of the investigation form work in conjunction with industry to ensure a measure that has the greatest relevance for industry and investigators.

### *Method*

An additional area where further refinement is necessary is in the witness' replay of the information post-event. The strongest confidence /accuracy calibration was found in the post-event condition "think" and the weakest relationship found in "discussion". Thus it would be beneficial to explore these relationships further through varying factors such as, the amount of time people have to contemplate the events, complexity of the

incident, guided versus open discussion amongst witnesses. This exploration would aid in establishing a best practices approach to witness handling post incident.

### *Summary*

This study demonstrates that there is a substantial benefit to varying how questions are asked during industrial accident investigations. Utilization of the techniques presented in the Cognitive Interview can increase accurate recall of events beyond the Standard investigation form. However, it was found that accuracy rate decreased as a result of the CI investigation form, therefore, the two forms explored in this study should be used in different ways. The CI form could contribute the greatest benefit when the investigator has access to many witnesses who are able to give testimony. This quantity of testimonies would enable the interviewer to identify points recalled by more than one witness and extract the most accurate account of what happened. The Standard form may perhaps be of greater use when there are a limited number of witnesses and the quality of the testimony is critical. The benefits of acquiring more accurate information with the use of the CI investigation form could translate into greater safety protocol for organizations as this information could be used to identify potential hazards as well as risky employee behaviour. Recognizing workplace hazards could increase safety as identified dangers could be altered or removed.

Furthermore, this study has demonstrated how post-event conditions and questioning can impact witness confidence and the CA relationship. Investigators need to be aware of the issues that impact witness confidence to prevent damaging effects which can result from how the witness is handled after the incident. Educating investigators on these issues would establish that the most confident witness may not be the most

accurate. Witness confidence being a poor indicator of witness accuracy is further confirmed in the results of the CA relationship. Although a significant positive relationship was established it was not a strong relationship, thus, witnesses are not always good judges of the accuracy of their memory. Consideration of the previously mentioned points leads to the necessity that a protocol be developed, like those used to handle the physical evidence, to manage eyewitness memory in industrial accident investigations.

It is important to consider that although type of accident investigation form may impact information retrieval, the safety culture within an organization tends to be responsible for the success or failure of reporting systems. In the future, for the Cognitive Interview investigation form to be successful, time and priority needs to be placed on its completion. Pimble and O'Toole (1982) warn that the process of accident reporting may stop at the incident reporting form if it is too imposing or time consuming. The form may be incorrectly filled in or not returned because time will not be spared for it to be done properly (Pimble & O'Toole, 1982).

The longstanding theory of human error and accident causation has focused on the person approach, which concentrates on the unsafe acts of individuals and how they contributed to the accident (Reason, 2000). This approach is beneficial for organizations as the Canadian Centre for Occupational Health and Safety (CCOHS) state that an employer must exercise "due diligence: the level of judgment, care, prudence, determination, and activity that a person would reasonably be expected to do under particular circumstances" (CCOHS, 1999, <http://www.ccohs.ca/oshanswers/legisl/diligence.html>). "To exercise due diligence, an

employer must implement a plan to identify possible workplace hazards and carry out the appropriate corrective action to prevent accidents or injuries arising from these hazards.” (CCOHS, 1999, <http://www.ccohs.ca/oshanswers/legisl/diligence.html>). Therefore, it has been financially beneficial for organizations to exercise due diligence and proclaim human error rather than equipment or system failure. This argument is further supported when the powers and duties of governmental health and safety representatives are explored. Safety representatives are to “consider and *expeditiously dispose* of health and safety complaints” (Human Resource Development Canada, 2001, <http://info.load-otea.hrdc.-drhc.gc...ications/ohs/representatives.shtml>). This wording does not encourage thorough exploration of the circumstances surrounding the industrial incident.

However, increased empirical focus on safety culture as well as a greater understanding of the financial and health impacts of worker safety implies a change in direction for organizations. Thus, the benefits of a more thorough reporting system and the implications that such a reporting system has on the confidence and accuracy of witnesses is a powerful step towards a stronger and more effective health and safety system.

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Appendix A  
Section 1  
Need for Cognition Measure

1. I feel the reason I watched the video in this study is:

---

Below is a list of statements about yourself, if you **strongly agree**, circle **SA**. If you **agree** with the statement, circle **A**. If you **disagree**, circle **D**. If you **strongly disagree**, circle **SD**.

1. I would prefer complex to simple problems.

SA                  A                  D                  SD

2. I like to have the responsibility of handling a situation that requires a lot of thinking.

SA                  A                  D                  SD

3. Thinking is not my idea of fun.

SA                  A                  D                  SD

4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.

SA                  A                  D                  SD

5. I try to anticipate and avoid situations where there is likely chance I will have to think in depth about something.

SA                  A                  D                  SD

6. I find satisfaction in deliberating hard and for long hours.

SA                  A                  D                  SD

7. I only think as hard as I have to.

SA                  A                  D                  SD

8. I prefer to think about small, daily projects to long-term ones.

SA	A	D	SD
----	---	---	----

9. I like tasks that require little thought once I have learned them.

SA	A	D	SD
----	---	---	----

10. The idea of relying on thought to make my way to the top appeals to me.

SA	A	D	SD
----	---	---	----

11. I really enjoy a task that involves coming up with new solutions to problems.

SA	A	D	SD
----	---	---	----

12. Learning new ways to think doesn't excite me very much.

SA	A	D	SD
----	---	---	----

13. I prefer my life to be filled with puzzles that I must solve.

SA	A	D	SD
----	---	---	----

14. The notion of thinking abstractly is appealing to me.

SA	A	D	SD
----	---	---	----

15. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.

SA	A	D	SD
----	---	---	----

16. I feel relief rather than satisfaction after completing a task that required a lot of mental effort.

SA	A	D	SD
----	---	---	----

17. It's enough for me that something gets the job done; I don't care how or why it works.

SA	A	D	SD
----	---	---	----

18. I usually end up deliberating about issues even when they do not affect me personally.

SA	A	D	SD
----	---	---	----

## Section 2

## Self Monitoring Scale

**DIRECTIONS:** The statements below concern your personal reactions to a number of different situations. No two statements are exactly alike, so consider each statement carefully before answering. IF a statement is TRUE or MOSTLY TRUE as applied to you, **circle the "T"** next to the question. If a statement is FALSE or NOT USUALLY TRUE as applied to you, **circle the "F"** next to the question.

- (T) (F) 1. I find it hard to imitate the behavior of other people.
- (T) (F) 2. My behavior is usually an expression of my true inner feelings, attitudes, and beliefs.
- (T) (F) 3. At parties and social gatherings, I do not attempt to do or say things that others will like.
- (T) (F) 4. I can only argue for ideas which I already believe.
- (T) (F) 5. I can make impromptu speeches even on topics about which I have almost no information.
- (T) (F) 6. I guess I put on a show to impress or entertain people.
- (T) (F) 7. When I am uncertain how to act in a social situation, I look to the behavior of others for cues.
- (T) (F) 8. I would probably make a good actor.
- (T) (F) 9. I rarely seek the advice of my friends to choose movies, books, or music.
- (T) (F) 10. I sometimes appear to others to be experiencing deeper emotions than I actually am.
- (T) (F) 11. I laugh more when I watch a comedy with others than when alone.
- (T) (F) 12. In groups of people, I am rarely the center of attention.

- (T) (F) 13. In different situations and with different people, I often act like very different persons.
- (T) (F) 14. I am not particularly good at making other people like me.
- (T) (F) 15. Even if I am not enjoying myself, I often pretend to be having a good time.
- (T) (F) 16. I'm not always the person I appear to be.
- (T) (F) 17. I would not change my opinions (or the way I do things) in order to please someone else or win their favor.
- (T) (F) 18. I have considered being an entertainer.
- (T) (F) 19. In order to get along and be liked, I tend to be what people expect me to be rather than anything else.
- (T) (F) 20. I have never been good at games like charades or improvisational acting.
- (T) (F) 21. I have trouble changing my behavior to suit different people and different situations.
- (T) (F) 22. At a party, I let others keep the jokes and stories going.
- (T) (F) 23. I feel a bit awkward in company and do not show up quite as well as I should.
- (T) (F) 24. I can look anyone in the eye and tell a lie with a straight face (if for a right end).
- (T) (F) 25. I may deceive people by being friendly when I really dislike them.



## Appendix B

## Filler Task

*Directions: Each of the following questions begins with a sentence that has either one or two blanks. The blanks indicate that a piece of the sentence is missing. Each sentence is followed by 5 answer choices that consist of words or phrases. Select the answer choice that completes the sentence best.*

1. The yearly financial statement of a large corporation may seem \_\_\_\_\_ at first, but the resistant reader soon finds its pages of facts and figures easy to decipher.

- A bewildering
- B surprising
- C inviting
- D misguided
- E uncoordinated

2. Organic farming is more labour intensive and thus initially more \_\_\_\_\_, but its long-term costs may be less than those of conventional farming.

- A uncommon
- B stylish
- C restrained
- D expensive
- E difficult

3. Unfortunately, there are some among us who equate tolerance with immortality; they feel that the \_\_\_\_\_ of moral values in a permissive society is not only likely, but \_\_\_\_\_.

- A decline.....possible
- B upsurge.....predictable
- C disappearance.....desirable
- D improvement.....commendable
- E deterioration.....inevitable

*Directions: Each of the following questions begins with a mathematical statement. Each statement is followed by 4 answer choices that allows you to choose the truth of the relationship. Select the answer choice that best describes the mathematical relationship.*

4. 
$$\frac{(2 \times 10) + (3 \times 5)}{7} =$$

- A 3
- B 5
- C 15
- D 17
- E 20

5. Column AColumn B

$X(X - 1)$

$X^2 - X$

- A The quantity in Column A is greater
- B The quantity in Column B is greater
- C The two quantities are the same
- D The relationship cannot be determined from the information given

6.  $\frac{(2 \times 35) - 4}{18 - 15} =$

- A 22
- B 33
- C 48
- D 24

7. If  $m - n = 5$  and  $2m + 3n = 15$ , then  $m + n =$

- A 1
- B 6
- C 7
- D 10
- E 15

8. Column AColumn B

$4a + 3 = 7b$

$20a + 10$

$35b - 5$

- A The quantity in Column A is greater
- B The quantity in Column B is greater
- C The two quantities are the same
- D The relationship cannot be determined from the information given

9. Column AColumn B

$W > X > 0 > Y > Z$

$W + Y$

$X + Z$

- A The quantity in Column A is greater
- B The quantity in Column B is greater
- C The two quantities are the same
- D The relationship cannot be determined from the information given

Appendix C

Discussion Questions

**In a group format please discuss:**

The events that happened before the incident occurred

What happened in the incident.

The events that happened immediately after the incident occurred.

Appendix D  
Standard Investigation Form

Age: \_\_\_\_\_

Sex: M / F

Date of injury: \_\_\_\_\_

Does the witness have knowledge of the accident or injury? ☐ yes ☐ No

Did the witness see the injury happen? ☐ yes ☐ No

*If yes to either of the above, please explain below:*

1. Explain what you know about the injury/accident. e.g: what type of work was being done at the time of the injury/accident, what happened to cause the injury/accident, how seriously was the injured employee hurt, etc.

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2. Please identify what you saw before the injury/ accident, during the injury/accident and immediately after the injury/accident.

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3. Give your *opinion* as to how this injury/accident could have been prevented.

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## Appendix E

## Cognitive Interview Investigation Form

To be completed by:   The injured person  
                                  All persons who witnessed the incident  
                                  The relevant supervisor

Please read the questions below and answer any you think are relevant. Any information you provide will help us to better understand the underlying causes of incidents and prevent them from occurring again.

It is important that you answer the following questions honestly and accurately. We need your feedback about this incident so that we can discover where there are deficiencies in the company's system as well as determine what happened in the incident.

***Do not rush*** and that you answer the questions as ***accurately*** and as ***thoroughly*** as possible. The duration of the study is estimated to be **90 minutes**. Once you have completed the form I ask that you sit quietly as to not disrupt the other participants in the study.

Please follow the instructions carefully and answer the questions as accurately and as thoroughly as possible.

Age: \_\_\_\_\_

Sex:                Male    Female

Date of injury: \_\_\_\_\_

Please take a moment to put yourself back into the situation when you witnessed the incident.

What were you feeling?

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---

What were you thinking about?

---

---

Where were you when you viewed the situation?

---

---

What did your environment look like when you were watching the video taped incident?

---

---

Please answer in as much detail as possible the following questions. Please report all facts as this information is important for determining what happened in the incident.

Please try to concentrate. The details of the event are stored in your mind, but you may find it difficult to recall the particulars.

*1. People*

1. How many people were involved in the incident you witnessed? \_\_\_\_\_

2. Please describe in detail the characteristics of each one of the individuals involved in the incident. Please finish describing one individual before describing another.

*(Feel free to number each individual as you describe them for future reference in the form)*

Feel free to refer to each individual for the rest of the questionnaire by the number you have assigned them.

Please describe to the best of your ability the following characteristics of *all* the individuals involved in the accident scene. This is a standard incident report form, therefore, the number of spaces allotted on this form does not reflect the number of individuals involved in the accident.

[illegible]



2. *What Happened*

1. Describe in detail and in your own words, the events you witnessed just ***before*** the incident occurred, ***during*** the incident and immediately ***after*** the event.

Before

During

After

*(If you are in need of further space, please continue on the back of the page)*

2. To the best of your ability, did you clearly identify how each individual was involved?  
If no please indicate below.

*(If you are in need of further space, please continue on the back of the page)*

3. To the best of your ability, describe in detail and in your own words, the activities you witnessed in *backwards order* beginning with the incident outcome, moving step by step to the events that transpired just previous to the event occurring.

Last thing that you saw happen:

The first thing that you saw happen:

4. As best as you can, please identify the cause or causes of the accident.  
What do you think contributed to this accident?

*3. Tools & Equipment*

1. Please describe the tools or instruments being used in the scenario. If you do not know what they are called please do your best to describe them.

If tools were being used:

2. What was the safety equipment being used or worn (if any)?

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---

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*4. Environment*

1. What were the environmental conditions in the worksite *before, during* and *post* accident?

Environmental conditions before:

Environmental conditions during the accident:

Environmental conditions after the accident:

2. **Before** the accident occurred, the visibility within the working environment was .....  
*(Was the workers' vision restricted by anything in the atmosphere?)*

1	2	3	4	5
Extremely poor	poor	adequate	good	Extremely good

3. The visual clarity due to lighting in the incident scene was.....

1	2	3	4	5
Too dark to see what was happening in the scene	Were able to see what was happening with some difficulty	Could see what was happening	It was no problem seeing what was happening in the scene	Could see what was happening in the incident scene with exceptional clarity

4. The floor was.....

1	2	3	4
Very slippery	Somewhat slippery	Not at all slippery	I did not notice the floor <i>(move to question 5)</i>

You think the floor was slippery, was it slippery due to:

- ☐ Oil  
☐ Water/ Fluid  
☐ Other \_\_\_\_\_  
 \_\_\_\_\_

5. Consider the *temperature* of the worksite. Would you say that the workers were.....

1 Were comfortable with the temperature	2 Somewhat uncomfortable with the temperature	3 Very uncomfortable with the temperature	4 Did not notice the temperature in the scenario ( <i>move to Communication, section 5</i> )
---	---	---	--

If you responded Yes:

The workers were experiencing an uncomfortable degree of:

- ☐ Heat
- ☐ Cold
- ☐ Humidity



*5. Communication*

1. Consider how the workers communicated with each other. Please comment on the communication of the workers on the worksite.

2. What did the workers say *before, during, and after* the incident?

Before: \_\_\_\_\_

\_\_\_\_\_

During: \_\_\_\_\_

\_\_\_\_\_

After: \_\_\_\_\_

\_\_\_\_\_

3. Were questions asked by any of the individuals involved in the accident scene?

☐ Yes ☐ No

If yes, please explain:

\_\_\_\_\_

\_\_\_\_\_

4. In your opinion how well did the workers listen to each other?

1 Listened very well	2 Listened well	3 Did not listen well	4 Did not listen well at all
-------------------------	--------------------	--------------------------	------------------------------------

5. Consider the directions and orders given during the events in question. In your opinion, would you say that they were:

1 Very confusing	2 Somewhat confusing	3 Somewhat clear	4 Extremely clear
---------------------	----------------------------	---------------------	----------------------

6. Consider how the workers on the scene communicated with each other about what needed to be done. Would you say their communication was .....

1 Very effective	2 Somewhat effective	3 Somewhat ineffective	4 Very ineffective
---------------------	-------------------------	------------------------------	-----------------------

*6. Preventing Reoccurrence*

If you were to watch this scene again, what would you have the workers do differently to avoid the accident that occurred?

## Appendix F

## Confidence Measure

1. How **confident** do you feel that your statements are **accurate** regarding the worksite incident?  
(please circle your choice) reasonably

1	2	3	4	5	6	7
<b>Not at all confident</b>	Low in confidence	Somewhat unconfident	<b>Moderately confident</b>	Reasonably confident	Highly confident	<b>Extremely confident</b>

Directions: Below is a list of statements about yourself,

If you **strongly disagree**, circle **SD**.

If you **disagree**, circle **D**.

If you **moderately disagree**, which means you disagree a little more than you agree circle **M/D**

If you **agree about 50% and disagree about 50%** circle **A/D**.

If you **moderately agree**, which means you agree a little more than you disagree, circle **MA**.

If you **agree**, circle **A** and

If you **strongly agree** with the statement, circle **SA**.

2. My statements do not correctly depict what happened in the incident scene.

1	2	3	4	5	6	7
<b>SD</b>	<b>D</b>	<b>M/D</b>	<b>A/D</b>	<b>M/A</b>	<b>A</b>	<b>SA</b>

3. I believe that I have stated accurately what transpired in the incident.

1	2	3	4	5	6	7
<b>SD</b>	<b>D</b>	<b>M/D</b>	<b>A/D</b>	<b>M/A</b>	<b>A</b>	<b>SA</b>

4. I am confident that I have reported the events correctly.

1	2	3	4	5	6	7
<b>SD</b>	<b>D</b>	<b>M/D</b>	<b>A/D</b>	<b>M/A</b>	<b>A</b>	<b>SA</b>

5. I expect that you will find that the accuracy of the statements that I have made is high.

1	2	3	4	5	6	7
<b>SD</b>	<b>D</b>	<b>M/D</b>	<b>A/D</b>	<b>M/A</b>	<b>A</b>	<b>SA</b>

### Appendix G Accuracy Check

Please mark the boxes that display accurate information regarding the industrial incident viewed on the video. You could select as little as two or as many as 45:

<p>1. The workers in the scene were wearing:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Hard hats</li> <li><input type="checkbox"/> Harnesses</li> <li><input type="checkbox"/> Coveralls</li> <li><input type="checkbox"/> Brightly coloured safety vests</li> <li><input type="checkbox"/> Long sleeves</li> </ul> <p>2. The tools they were using were:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Hammers</li> <li><input type="checkbox"/> Ladders</li> <li><input type="checkbox"/> Saws</li> <li><input type="checkbox"/> Welding equipment</li> <li><input type="checkbox"/> Scaffolding</li> </ul> <p>3. Before the incident happened the workers were:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Talking almost constantly</li> <li><input type="checkbox"/> Silent</li> <li><input type="checkbox"/> Joking around with the equipment</li> <li><input type="checkbox"/> Told to stop hammering and didn't</li> <li><input type="checkbox"/> Not told to stop hammering</li> </ul> <p>4. The sex and ethnicity of the workers was:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> All Caucasian</li> <li><input type="checkbox"/> Some Caucasian, some dark skinned</li> <li><input type="checkbox"/> All males</li> <li><input type="checkbox"/> All females</li> <li><input type="checkbox"/> Some males and some females</li> </ul> <p>5. The number of worker(s) injured was:</p> <table style="width: 100%; border: none;"> <tr> <td><input type="checkbox"/> 1</td> <td><input type="checkbox"/> 4</td> </tr> <tr> <td><input type="checkbox"/> 2</td> <td><input type="checkbox"/> 5</td> </tr> <tr> <td><input type="checkbox"/> 3</td> <td><input type="checkbox"/> 6</td> </tr> </table>	<input type="checkbox"/> 1	<input type="checkbox"/> 4	<input type="checkbox"/> 2	<input type="checkbox"/> 5	<input type="checkbox"/> 3	<input type="checkbox"/> 6	<p>6. The worker(s) who were injured:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Were both unconscious</li> <li><input type="checkbox"/> One was conscious and one was unconscious</li> <li><input type="checkbox"/> Were both conscious</li> <li><input type="checkbox"/> Had visible blood coming from their injury (s)</li> <li><input type="checkbox"/> Were physically mangled from the incident</li> <li><input type="checkbox"/> Had no visible blood from their injury (s)</li> </ul> <p>7. After the incident happened:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> The non injured workers stood there and did not know what to do</li> <li><input type="checkbox"/> Two workers attended to the injured employees</li> <li><input type="checkbox"/> Some workers stated they were going for help while others remained at the scene</li> <li><input type="checkbox"/> All evacuated stating that the area was unsafe</li> </ul> <p>8. The conditions in the tunnel were:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Wet and slippery</li> <li><input type="checkbox"/> Dry</li> <li><input type="checkbox"/> Extremely cold</li> </ul> <p>Lighting was:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Extremely dark</li> <li><input type="checkbox"/> Moderately dark</li> <li><input type="checkbox"/> Well lit</li> </ul> <p>Noise level before the incident happened was:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Extremely loud</li> <li><input type="checkbox"/> Somewhat loud</li> <li><input type="checkbox"/> Quiet</li> </ul>
<input type="checkbox"/> 1	<input type="checkbox"/> 4						
<input type="checkbox"/> 2	<input type="checkbox"/> 5						
<input type="checkbox"/> 3	<input type="checkbox"/> 6						

## Appendix H

## Encoding Measure

Below is a list of statements about the accident scene you witnessed on the video. Please circle the number of the statement which you feel best represents your opinion.

2. While watching the video I was:

1	2	3	4	5
Relaxed	Mildly stimulated	Moderately stimulated	Aroused	Highly stimulated

3. The lighting in the incident scenario was:

1	2	3	4	5
Very poor	Poor	Adequate	Good	Excellent

4. The video provided me with:

1	2	3	4	5
Less than adequate opportunity to view the individuals in the scenario	Moderately adequate opportunity to view the individuals in the scenario	Adequate opportunity to view the individuals in the incident	Ample opportunity to view the individuals in the incident	More than ample opportunity to view the individuals in the scenario

5. The individuals in the scene were:

1	2	3	4	5
Not familiar to me	Somewhat familiar to me	Fairly familiar to me	Quite familiar to me	Highly familiar to me

6. The amount of time which passed between when I viewed the video and when I was asked to report what I had witnessed was:

1	2	3	4	5
Less than and hour	1 hour to 5 hours	5 hours to 24 hours	24 hours to 72 hours	More than 72 hours

7. The amount of new information presented to me between witnessing the incident and filling out the incident report form was:

1	2	3	4	5
No new information was presented to me (move to question 9)	Some new information was presented to me	A moderate amount of information was presented to me.	Quite a bit of new information was presented to me	A lot of new information was presented to me

If new information was presented:

8. The new information presented was:

1	2	3	4	5
Totally different than what I witnessed	Somewhat different from what I witnessed with some information which was consistent	An equal mix of what I witnessed and information which I perceived as different from what I witnessed	Some different information but mostly information consistent with what I witnessed	Information which was totally consistent with what I witnessed.



9. From when I viewed the video my surroundings have:

1	2	3	4	5
Not changed at all	Changed slightly	Changed about 50%	Changed quite a bit	Almost completely changed

10. When filling out the investigation forms the way I answered was:

1	2	3	4	5
I was to choose between limited options presented for each question	Most of the questions I had to make a forced choice between options. I was only able to answer a few freely	I was able to answer about half of the questions freely and about half with forced choice answers	I was able to answer most of the questions freely with a couple having limited choices.	I was able to answer all the questions any way I chose

11. The workers involved in the incident scene were:

1	2	3	4	5
Not distinctive at all	Somewhat distinctive	Moderately distinctive	Quite distinctive	Highly distinctive

## Appendix I

## Manipulation Check

1. *Before doing the Witness Report Form* the percentage of time I engaged in thinking about the incident after watching it on the monitor was:

\_\_\_\_\_ minutes

1	2	3	4	5
0% of the time	25% of the time	50% of the time	75% of the time	100% of the time

2. Over the *entire testing period*, the percentage of time I spent thinking about the incident was:

\_\_\_\_\_ minutes

1	2	3	4	5
0% of the time	25% of the time	50% of the time	75% of the time	100% of the time

3. Rate on a scale of 1 to 5 how much mental effort you feel you expended during this experiment.

1	2	3	4	5
No effort	A small amount of effort	A moderate amount of effort	Quite a bit of effort	A great deal of effort

4. How well (if at all) do you feel the witness report form helped you recall information about the video taped incident?

1	2	3	4	5
Did not help at all	Helped a little	Moderately helped	Helped quite a bit	Helped a great deal

5. Rate on a scale of 1 to 5 the how challenging you found answering the questions on the incident report form.

1	2	3	4	5
Not challenging	A little challenging	Moderately challenging	Quite challenging	Greatly challenging

6. In general, my thoughts about the incident were:

- A Similar to the other participants in the study
- B Different than the other participants in the study
- C I do not know what the other participants thought about the incident

## Appendix J

## Witness Report Scoring Criteria

What is a piece of information?

An accurate piece of information is a piece of information that aids investigators in their pursuit of determining what happened in the accident situation. An inaccurate piece of information hinders that progression.

The Scoring Form

The scoring form is made up of 15 cells each representing a category to put a piece of information retrieved from the form.

	1. Accurate piece of Information (A)	2. In accurate piece of information (IA)	3. Inference (I)	4. Opinion (O)	5. Comments
6. What Happened (WH)					
		Inaccurate People: 7. Element(e) 8. Whole (w)			
9. Environment (E)					
10. Safety, Appearance, People and Equipment (SAPE)					
11. Communication (C)					

1. Accurate Piece of Information

An accurate piece of information is an item that we can objectively verify with certainty that it happened/ did not happen, was (not) said or was (not) present in the video tapped situation.

Example: The white foreman had a flashlight or the men were not wearing harnesses.

For elements of the situation with a subjective component, such as darkness or noise level, inter-rater agreement was used to determine accuracy of the statement.

Example: The work environment was dark.

## 2. Inaccurate Piece of Information

An inaccurate piece of information is an item that we could verify with certainty did not happen, was not said or was not present in the video tape. Once again elements with a subjective component were rated as inaccurate if we felt we had enough information to determine with certainty that it was inaccurate.

Example: Mo ran to the workers on the scaffolding right before the accident happened.

## 3. Inference

An inference is a statement made by the witness that incorporates a jump in logic to fill in a blank spot in their memory of the event. These are usually environment related and theoretically objective in nature.

Example: The workers were working an *underground* tunnel.

## 4. Opinion

An opinion is a personal judgement made by the witness about an element in the scene. These are subjective in nature.

Example: The foreman was racist or the workers weren't being safe.

## 5. Comments

This section was to be used to communicate any abnormal characteristics about the data.

## 6. What Happened

This category encompasses all information which lets the investigator know what transpired in the incident. As it would be exceptionally challenging to tease out the communication elements of the “what happened” category (ex. Worker needed the drill or worker said “pass me that drill”) information about the communication during the incident was scored in this section with the exception of the 4 questions on the CI Form designed to assess the overall communication of the workers on the site. Pieces of information that would be found in this category are as follows:

### What Happened

<p><b>Ac</b> 2 Men working on scaffolding</p> <p><b>Ac</b> 1 man on ground handing stuff to guys on the scaffolding</p> <p><b>C</b> “This is going to cost you guys”</p> <p><b>Ac</b> 2 foremen enter the tunnel (one white and one black)</p> <p><b>C</b> White foremen mentions “there might be a problem here I wanted you to see” to the black foreman.</p> <p><b>Ac</b> Man on ground climbs on to scaffolding</p> <p><b>Ac</b> Three men now on scaffolding</p> <p><b>Ac</b> White foreman views the tunnel with flashlight</p> <p><b>Ac</b> Black foreman standing beside him with a clipboard</p> <p><b>Ac</b> White Forman starts pointing out the cracks in the ceiling</p> <p><b>S</b> White Forman - “I have got theses guys reinforcing this part of the tunnel”</p>	<p><b>S</b> One of the guys on scaffolding states “Hand me that drill Lou”</p> <p><b>Ac</b> White foreman states he is concerned about the cracks</p> <p><b>Ac</b> Black foreman confirms the cracks in the structure of the tunnel</p> <p><b>C</b> White foreman - “looks weak to me”</p> <p><b>C</b> Black foreman states “they look bad”</p> <p><b>C</b> Black foreman states “better get some reinforcements”</p> <p><b>Ac</b> Black foreman states “tell the guys to stop hammering too”</p> <p><b>C</b> White foreman - “hey Mo get over here for a minute”</p> <p><b>C</b> Black foreman - “Causing vibrations in the walls, could be dangerous”</p> <p><b>Ac</b> Mo comes over, which leaves two men on the scaffolding.</p> <p><b>C</b> Mo – “what can I do for you for you count?”</p>
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<p><b>C</b> White foreman “hey tell those guys to stop hammering”</p> <p><b>S</b> Sound of boards crashing down</p> <p><b>Ac</b> Dust is flying</p> <p><b>Ac</b> Scene of boards dropping through scaffolding</p> <p><b>S</b> Sound of someone yelling</p> <p><b>Ac</b> Black foreman and Mo hold back white foreman from moving forward</p> <p><b>C</b> Mo yells “hold it that wall caved in”</p> <p><b>C</b> Black foreman – “Watch your step as that stuff might be coming down”</p> <p><b>Ac</b> The three men (white/black foreman and Mo) move to where the other two are in the tunnel.</p> <p><b>S</b> “Are you Okay? Lou, Lou” (not aware of who is stating this)</p> <p><b>Ac</b> Picture of Black man (Jesse) with left leg pinned under scaffolding.</p> <p><b>Ac</b> He is on his right hip propped up on his right arm.</p>	<p><b>Ac</b> He is conscious and has a pained look on his face.</p> <p><b>C</b> Jesse – “Get me out of here, my leg quick”</p> <p><b>Ac</b> Mo goes to Jessie</p> <p><b>Ac</b> Black foreman comes to where Mo is squatted beside Jessie.</p> <p><b>Ac</b> White foreman does not come over to help the injured. Viewer does not know what he is doing or where he is.</p> <p><b>Ac</b> Mo is told by black foreman to help the other white workman (Lou)</p> <p><b>S</b> Black foreman – “Go help Lou, go help Lou, I’ll get Jessie”</p> <p><b>S</b> Jesse - “I think it is broken”</p> <p><b>Ac</b> Mo walks to where Lou is</p> <p><b>Ac</b> Scene is of Lou unconscious/motionless on his back with scaffolding beside him</p> <p><u>Extra</u></p> <p><b>C</b> Workmen in background almost constantly talking</p> <p><b>S</b> occasional drilling sounds and hammering</p>
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### 7. What Happened/ Inaccurate/ People/ Element

This category is a subcategory of the inaccurate section. This section is to be utilized if the participant has made a statement which is correct (assessing the cracks in the wall with a flashlight) but has stipulated the wrong individual doing the action (Mo was assessing the cracks in the wall with a flashlight when in fact it was the white foreman). The description of the action would be scored in the “What Happened/

accurate” category with the individual scored in the “inaccurate /people /element” category.

#### 8. What Happened/ Inaccurate/ People/ Whole

The participant receives a mark in this category if after they have identified each character in the scene as a number (White Forman = 1, Black Forman =2) they mix up the identities when describing the scene (White Forman = 2, Black Forman =1). Therefore, they could be completely correct in their rendition of the events just have the wrong individuals doing the actions. *This mark, however, is not taken into account when adding up the total inaccurate statements for the scoring grid, rather this is a descriptive item meant for informative purposes not scoring purposes.*

#### 9. Environment

The environment section was used to identify how accurate the participants were in their depiction of the environmental conditions in the incident scenario. Therefore, what the workers did with the crack in the wall is relevant in “what happened” but the fact that the participant mentioned the cracked wall is relevant in environment.

##### Environment

<u>Before the incident</u>	<u>During the incident</u>
Work was being done in a tunnel	Louder than previously
Wall of tunnel is cracked	Dust in the air
Moderately dark or Dark	Dangerous
Ground is cement	
Noise quiet moving to louder as the incident approached ending in loud	<u>After accident has occurred</u>
Worksite busy, average level of activity	Boards on the ground
Ground is dry	Scaffolding on the ground (metal pipes)
Dirty	Dusty
	Rubble on the ground
	Atmosphere is tense



**10. Safety/ Appearance/ People/ Equipment (SAPE)**

The SAPE condition is not to be used when referring to what people did with the equipment or ownership of the equipment. By ownership I mean that if a participant was to state that Mo had the flashlight, the flashlight would be scored as accurate in this condition and the incorrect statement that Mo had it would be scored in What Happened/People/Element. It is purely to be used to identify if the participant mentions if the element was in the scene. All other mention (accurate or inaccurate) of the equipment is to be put in the “What happened” category.

<u>Safety /Appearance/ People</u>	<u>Equipment</u>
All men in hard hats	Hammers
Flashlight.	Drills
Clip board	Extension cords/ Rope
Two men wearing safety goggles	Scaffolding
Black foreman is the more senior in status	Spot lights
Five men are involved in the scene	
All men in tool belts	
All men in work gloves	
Boots	

**11. Communication**

Communication was scored on questions 3 to 6 in the communication section of the CI Form. These questions assessed the overall communication of the workers on the job site with limited choice responses.

### Rules for Scoring

1. Do not score appearance. The appearance section of the CI is in the questionnaire for the scorers to identify the workers which the participants are referring to in their narrative about the scene. This does not mean not to score if they identify someone with an element of their appearance in their narrative section. For example, if they state that the black foreman did something this would be an accurate piece of information as they are giving the investigator relevant knowledge as to who did what. To expand further, the participant would receive the same point if they stated “the 6’1 black foreman with the large hands, and short hair cut” as they would if they stated “the black foreman” as it is only used for identification purposes.
2. Individuals receive 1 accuracy point each time they stipulate who is doing the action as well the action itself. If they keep reaffirming who is doing the action they keep getting points, however, if they state that “workers 1, 2 and 3 were *talking*” (4 accurate “What Happened” points), then they mention “then *they* heard a crash, then *they* saw debris falling” each time they mention “they” the participant does not get another point as it is assumed that we are still discussing workers 1, 2 and 3.
3. Communication Questions 3, 4, 5, & 6 will be scored in the communication section of the scoring form.
  3. Were questions asked by any of the individuals involved in the scene? (1 accuracy point for yes, 1 inaccuracy point for no)
  4. In your opinion, how well did the workers listen to each other?  
(1 accuracy point for 1 or 2, 1 inaccuracy point for 3 or 4)

5. Consider the directions and orders given during the events in question. In your opinion would you say the workers were:

(1 inaccuracy point for 1 or 2, 1 accuracy point for 3 or 4)

6. Consider how the workers on the scene communicated with each other about what needed to be done. Would you say their communication was:

(1 accuracy point for 1 or 2, 1 inaccuracy point for 3 or 4)

4. Sections to be scored:

Cognitive Interview Investigation Form:

Probes: Q 2.2, Q 3.2, Q 4.2, Q 4.3, Q 4.4, Q 4.5, Q 5.3, Q 5.4, Q 5.5, Q 5.6

Open-Ended (Free-Narrative): Q 1, Q 2.1, Q 2.3, Q 3.1, Q 4.1

Standard Investigation Form:

Open-Ended (Free-Narrative): Q 1, Q 2

5. Sections not to be scored:

People: Section 1, question 2 & 3

Appearance was not scored as accurate or inaccurate as in investigations the individuals in the scene would most likely be known, therefore, a physical description would not be necessary other than relevant safety gear.

What Happened: Section 2, question 4

I am asking the participants to make an inference as to what they think happened; therefore, it was not scored.

Communication: Section 5, questions 1 & 2

As there was no way of verifying correct or incorrect responses, these two questions were not scored as participants were largely stating opinions about the communication.

Preventing Reoccurrences: Section 6, question 1

I am asking the participants to give opinion and generate ideas therefore; this was not scored as accurate or inaccurate.

5. Once a point has been allotted to a piece of information it can not be given another accuracy point unless new information is attached to it. For example participant states, “The black worker was pinned under the scaffolding” participant would receive one more accuracy point for “Black worker’s *leg* was pinned under the scaffolding”.

6. If the word “probably” is used when describing an inaccurate element of the scene it is considered an inference.

7. Highlighters will be used to code the narratives: Yellow: Inferences; Blue: Wrong responses;

Pink: Accurate responses

Examples

	A	IA	I	O
WH	Workers leg was stuck.	Workers arm was stuck	Worker was off the scaffolding when it fell, which is why his leg was stuck	Worker was not following safety protocol
		e- <i>White</i> workers leg was stuck (in reality it was the black worker) w- Every time he refers to something the black worker did he says it was the white worker		
E	Tunnel	Extremely wet	Underground	Ugly
SAPE	Hard Hats	Harnesses	Steel Toed Boots	Wearing the wrong colour hard hats
C	The correct response to the questions 3-6 in the Communication section of the CI form	The incorrect response to the questions 3-6 in the Communication section of the CI form		

1. *"The ground was wet in the tunnel",*

The ground was wet- 1 inaccuracy point for "Environment"

Tunnel - 1 accuracy point for "Environment"

2. *"The black foreman enters the tunnel and points his flashlight at the cracked ceiling."*

Black foreman – 1 point for "What happened"

Enters the tunnel – 1 point for "What happened"

Tunnel – 1 accuracy point for "Environment"

His flashlight – 1 inaccuracy point for "What happened/inaccurate/people/element"

Flashlight – 1 accuracy point for "SAPE"

Cracked – 1 accuracy point for “Environment”

Ceiling – 1 accuracy point for “What Happened” (letting us know what was cracked)

3. “Were *discussing* the *dangerous* environment”

Were discussing – 1 accuracy point for “What Happened”

The dangerous environment - 1 accuracy point for “What Happened”

4. “The *white foreman*, *black foreman* and *Mo* all ran over to the *injured workers*”

The white foreman, - 1 inaccuracy point for “what happened” (did not attend to the injured workers)

Black foreman - 1 accuracy point for “What Happened”

Mo - 1 accuracy point for “What Happened”

All ran - 1 accuracy point for “What Happened” (see all three run)

Over to the injured workers - 1 accuracy point for “What Happened”