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Testing two methods to improve eyewitness testimony: Pre-interview instruction techniques
and three different types of photo line-ups.

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by

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Approval Page

Testing two methods to improve eyewitness testimony: Pre-interview instruction techniques
and three different types of photo line-ups.

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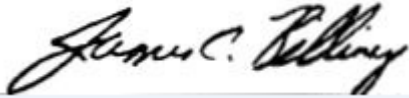


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Abstract

Data provided by the Innocence Project and psychological researchers suggest that law enforcement is using outdated interview techniques to enhance memories of victims and witnesses at crime scenes. As a result, as many as 67 percent of identifications made are inaccurate. These inaccurate identifications result in the incarceration, and in rare cases, the execution of innocent people. To investigate why innocent people are misidentified, I conducted a quasi-experimental quantitative research project using Applied Line-up Theory and theory of memory to examine ways to assist witnesses with encoding, storing, and retrieving information about crime scenes and criminal suspects. This research examined items remembered from a mock crime scene and which photographic line-up was more accurate in identifying the guilty culprit or eliminating an innocent party. A sample of 191 participants watched a brief video of a mock crime scene. They were then asked to provide a written statement, or to do another written exercise. After a distraction phase, the groups provided an additional statement to examine memory decay. Finally, each group was presented with a random suspect present or suspect absent line-up and asked if a person they recognized from the crime scene was present. Analysis was completed by coding the written statements and examining the answers on the photographic line-ups. Results suggest that a Timeline interview assists in memory preservation better than a Free Recall interview or no interview at all, and that a sequential folder method is more accurate at identifying a criminal suspect and eliminating an innocent person.

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Chapter 1: Introduction

Confident eyewitness identification has a very powerful effect on a jury (Kent & Carmichael, 2015). Walsh (2013) stated that even though eyewitness identifications are notoriously unreliable, law enforcement officers still actively use eyewitness identification procedures that do not consider or recognize current theory, scientific research, and best practices. Current research would suggest that approximately one third of all eyewitness identifications are erroneous (Wise, Sartori, Magnussen, & Safer, 2014). These erroneous identifications have resulted in wrongful convictions which in some cases have resulted in an innocent person spending years in prison for a crime they were later exonerated of by Deoxyribonucleic acid (DNA) tests (Kent & Carmichael, 2015).

Although eyewitness identification has been questioned for years, society is beginning to demand better accuracy and results (Wells, 2014). In general, the public is demanding science based procedures that reduce bias to significantly reduce the number of wrongful arrests and convictions, while still maintaining the need to bring justice to a victim. Steblay (2015) shows that even though there has been advances in scientific testing, such as DNA, the criminal justice system continues to rely in part on eyewitness identification because of the connection felt between the jury and the witness.

Over the last several decades, researchers have attempted to identify theory that applies to eyewitness identification, and in doing so, have attempted to use that research to improve law enforcement practice (Steblay, 2015). One of these theories is Applied Line Up Theory which seeks to examine all facets of eyewitness identification in an ecological or multifaceted way rather than just exploring one variable (Charman & Wells, 2007). Some of the research has changed the way photo line-ups are presented as well as the implementation of blinded or double blind standards (Steblay, 2015). Even though this research has begun to reduce the

number of people misidentified, there is still a need to complete further research in the attempts to further reduce misidentifications (Amendola & Wixted, 2015a; Wells, 2014).

As an example, eyewitness identification is a direct result of encoding, storing, and retrieving specific information (Hope, Gabbert, Fisher, & Jamieson, 2014). Hope et al. (2014) suggests that protecting and potentially enhancing witness memories using a Self-Administered Interview (SAI). During their research, Hope et al. (2014) learned that the SAI was able to assist witnesses to a crime recall specific memories about the crimes scene, and about the actions of the people committing the crime. Essentially, Hope et al. (2014) could show that correct recall was enhanced using memory preservation techniques. One of the clear concepts that Hope et al. (2014) points out is the need for cognitive style interview questions used in conjunction with temporal memory. Hope et al. (2014) suggested a timeline interview using cognitive interview techniques. Further, the SAI has taken this technique to the next level by putting these concepts of cognitive interview combined with a timeline into simple, easy to use questions, in a clear and concise written format. However, one can also use a time diary or event history method that assist in recording information of a specific period of time (Belli, Stafford, & Alwin, 2012).

The question remained as to the effect of the Timeline Interview and other memory preservation techniques could affect various types of photo line-ups to include the simultaneous photo line-up, the sequential photo line-up, and the sequential photo line-up folder method. Each of these methods are commonly used by law enforcement; however, current research suggests the sequential photo line-up of any type is better than the simultaneous photo line-up (Finley, Roediger, Hughes, Wahlheim, & Jacoby, 2015; H. Flowe, Smith, Karoğlu, Onwuegbusi, & Rai, 2016; Pozzulo, Reed, Pettalia, & Dempsey, 2016).

Statement of the Problem

Eyewitness identification should follow best practices that are based in scientific research and theory. However, it has been suggested that law enforcement officers are failing to consider the theoretical contributions of the behavioral sciences and are still following outdated procedures which hinder the arrests of criminal suspects, and unfortunately, can lead to the arrest and conviction of innocent people. Most often, photo line-up procedures lack understanding of memory (Hope et al., 2014; Palmer & Brewer, 2012; Steblay, Dysart, & Wells, 2011; Wise et al., 2014). The problem addressed by this study was the inadequate use of outdated interview techniques that are used to ultimately identify suspects in criminal cases.

Nationally, about 27,000 people have been incarcerated for crimes they did not commit (West & Meterko, 2016). There are many reasons that people are wrongfully convicted of crimes they did not commit (Hoston, Thomas, Taylor, Menconi, & Eaden, 2017; Simner, 2012). However, West and Meterko (2016) argued the number one cause for these wrongful convictions is eyewitness misidentification. These misidentifications, and other causes, have led to states compensating people who were sent to prison, negative stigmas for both the accused and the criminal justice system, and unfortunately, in some cases, even the execution of innocent people (Kent & Carmichael, 2015; Simms, 2016; Simner, 2012; Thompson, Molina, & Levett, 2012; West & Meterko, 2016; Wilkinson, 2014). Although new research has been conducted and new procedures have been put in place to limit misidentification (Stebly, 2015), misidentification rates as low as 15% using sequential line-ups and as high as 28% using simultaneous line-ups are still recorded (Amendola & Wixted, 2015a).

According to Applied Lineup Theory (Charman & Wells, 2007), eyewitness misidentification and outdated police procedures might be the result of photo line-up procedures, the memory of the eyewitness, and discriminating abilities of the eyewitness. Memory is suggestible and will conform to group think processes (Allan, Midjord, Martin, & Gabbert,

2012; Thorley, 2013). As an example, when there are two tellers in a bank when it is robbed, it is not uncommon for the description of the suspect to be very similar if the tellers are allowed to talk (Thorley, 2013). Photo line-up type will determine if a memory is spontaneous or comparative, which is one of the key reasons as to why many researchers recommend sequential line-ups rather than simultaneous line-ups, to ensure spontaneous memories rather than comparative ones (Finley et al., 2015; Wixted, Mickes, Dunn, Clark, & Wells, 2016). Evidence has shown that age, gender, and race of the eyewitness are contributing factors in accurate identification (Hope, Lewinski, Dixon, Blocksidge, & Gabbert, 2012; Wilson, Hugenberg, & Bernstein, 2013; Wylie, Bergt, Haby, Brank, & Bornstein, 2015). Research needs to examine how to increase memory strength, increase the discriminating abilities of the eyewitness, and how to use these features to improve police photo line-up practices (Charman & Wells, 2007).

Purpose of the Study

The purpose of this quasi-experimental quantitative study was to determine if memory of a suspect at a crime scene can be preserved leading to increased identification of a suspect in a sequential, simultaneous, or simultaneous folder method photo-pack. There was no current research on the effectiveness of the Timeline Interview as it specifically applies to eyewitness identification. This research study provided initial information that can lead to new procedure implantation to preserve eyewitness memories of specific people. Specifically, this research focused on determining if the Timeline Interview will preserve memories of the details of a crime scene, and of suspects, as well as determining the effects of the Timeline Interview or other memory preservations tools on either a simultaneous photo line-up, a sequential photo line-up using the folder method, or a sequential photo line-up.

This study was designed to assess the effect of the different types of memory preservation tools and photo line-up types on accurate suspect identification. The independent variables studied was memory preservation and photo line-up type. Each independent variable

will have three levels of analysis. The two factors will be as follows. Factor one was photo line-up type and had three levels. It was measured by accurate identification of a suspect (1), no identification or an I do not know response (0), and misidentification of a filler (-1). This factor is between subjects because the various experimental treatments (photo line-up type) were given to different groups of subjects who are randomly selected from the total participant pool. Factor two was the type of memory preservation tool. Memory preservation was initially examined independently from the type of photo line-up by presenting a video of a crime to participants. Once the video was watched, the participants were randomly selected into three groups: (1) timeline interview group, (2) free recall group, and (3) the control group. The first two groups were presented with a memory preservation tool and asked to describe the crime scene and the suspect. The third group was not presented with any type of memory preservation tool. Ultimately, after a distraction period, the groups returned and repeated the task of recording events from the crime scene viewed previously. The two statements were then compared numerically to determine if any of these memory preservation tools allowed for better encoding, storing, and ultimately retrieval of crime scene and suspect information.

The analysis was completed using a measure developed by Wright and Holliday (2007) and validated by Hope et al. (2014) in their study. In essence, memory preservation of the event was determined through accurate description of the details of the scene and suspect using a scoring template that relates to each item in a stimulus video presentation by identifying action events, persons, objects, or surrounding details (Wright & Holliday, 2007). As an example, if the participants were shown a video stimulus that depicts a boy riding a red bike across the lawn, it would be coded boy (1-P), riding (1-A), red (1-O), bike (1-O), across the lawn (1-S) which classify Actions (A), Person (P), Object (O), or Surrounding (S) detail (Wright & Holliday, 2007). This factor is between subjects because the various memory preservation tools were given to different groups of subjects who were randomly selected from the total participant

pool. A between subjects t-test and a chi square analysis were used to analyze the data in order to determine frequency and between subject effects.

Data was collected from a sample of convenience that I had access to a three different local colleges or universities in Jackson County, Michigan. The minimum number of participants required was determined by an a priori power analysis (Gpower; Faul and Erfelder, 1992). A total of 150 participants were required for this study. A total of 217 participants volunteered for the study; however, one failed to follow instructions, two failed to disclose that they were 17 under the requirements for participation, and 23 participants failed to return after the distraction phase, leaving the total population studied at 191 participants (n=191).

Theoretical/Conceptual Framework Overview

Applied line-up theory considers a host of other theories in an ecological combination when considering the accuracy of the eyewitness identification accuracy and line-up presentation (Charman & Wells, 2007). These theories must include theories of face recognition, decision making and judgment processes, attitudes, schemes, gender, race, as well as theories of encoding, storing, and retrieving memories (Charman & Wells, 2007). To express the theoretical framework (stimulus elicits response) one must consider eyewitness identification in a step-by-step format. Goldstein (2014) suggested that to even create a memory of an event that we must perceive the event in the first place. As an example, if a person is sitting with their friends in a shopping mall and does not perceive someone taking a purse as a crime, then the process of encoding, storing, and later retrieving the memory of what the suspect looked like will likely not occur (Goldstein, 2014).

Further, one must consider the type of photo line-up and the line-up procedures that are used by law enforcement officers to determine the effects of the line-up on the accuracy of the identification (Amendola & Wixted, 2015a; Greene & Evelo, 2015). Applied line-up theory considered type of line-up used, influences such as delay in presentation of the line-up, and the

influence of the presenter of the line-up on the identification process (Charman & Wells, 2007). These conditions are variables that can either be controlled by the criminal justice system (system variables) or cannot be controlled by the criminal justice system (estimator variables) (Charman & Wells, 1978).

Although researchers study both type of variables, by manipulating factors such as age (Fitzgerald & Price, 2015; Wylie et al., 2015), race (Connelly, 2015; Wirth, Fisher, Towler, & Eimer, 2015), the presence of a weapon (Vannucci, Mazzoni, Marchetti, & Lavezzini, 2012), stress (Hope, 2016), and the effects of co-witnesses (Kieckhaefer & Wright, 2015) there are still questions about why eyewitnesses continued to misidentify innocent people. To that end, eyewitness identification is still a major focus of study because law enforcement can use knowledge to reduce misidentification of innocent people in order to reduce the numbers of wrongfully convicted.

Two system variables which are, photo line-up presentation and administration, and one estimator variable, memory preservation tool are manipulated in this research study to understand the main effect of eyewitness identification. First, manipulation occurred to the estimator variable using memory preservation tools identified as the Timeline Interview Technique and Free Recall. The Timeline Interview Technique and Free Recall groups were then compared to a control group who received no attempts at memory preservation. Second, systems variables or type of photo line-up were randomly selected and presented in both a blinded or double blind method to determine if photographic line-up type affects identification.

Nature of the Study

The nature of this quasi experimental quantitative study was to examine memory preservation and how it relates to accurate identification of suspects in a photo line-up. A quantitative research design is the best design for this study because the study deals with a limited set of items that can be identified or valued numerically. Data was collected from a

population of 191 participants that were a sample of convenience. Descriptive statistics were used to describe the participants. The participants were randomly sampled and assigned to three different groups: (1) Timeline technique interview group, (2) Free Recall group, and (3) a control group. Each group was shown a video of a mock crimes scene in which an offenders face was clearly visible to the observer. From there, the Timeline technique interview group recorded their observations using specific documents to assist in encoding memories of the offender and the crime scene. The Free Recall group was given paper and a pencil and asked to documents the event in their own words, and the control group was given no opportunity to preserve memories of the event. After a period of distraction, each group was asked to document as many details about the event as they could remember. The groups were randomly sampled to give each participant an opportunity to have an equal chance of participating in one of three type of photo line-ups which are identified as: (1) a sequential photo line-up, (2) a sequential photo line-up using the folder method, and (3) a simultaneous photo line-up. Type of photo line-up was drawn randomly from a box containing the three types and was presented by an assistant to ensure double blind standards. Responses to the line-up were marked as identifying the suspect, identifying a filler, or identifying the suspect was not present, or stating that the witness does not know. The responses were coded appropriately. A chi square analysis was used to determine frequency of correct responses for each line-up type.

Research Questions

The research study intended to focus on the dependent variable of accurate suspect identification with the independent variables being memory preservation and photo line-up type. The study sought to answer the following research questions and hypotheses:

Q1: Is there a significant difference in memory recall for various features e.g., actions, objects, settings features, and persons from time 1 to time 2 between participants

who were in the Free Recall group (e.g. those told to recall as much they could) compared to the Timeline group (e.g. those prompted to focus on specific elements).

H1_o There was no significant difference in memory recall for various features e.g., actions, objects, setting features, and persons from time 1 to time 2 between participants who were in the Free Recall group compared to the Timeline group.

H1_A There was a significant difference in memory recall for various features e.g., actions, objects, setting features, and persons from time 1 to time 2 between participants who were in the Free Recall group compared to the Timeline group.

Q2: Is there a significant difference in frequency of accurate identification of a suspect (dependent variable) when individuals were presented with a photo line-up using a sequential, a simultaneous or a sequential folder method?

H2_o There is no significant difference in frequency of accurate identification of a suspect (dependent variable) when individuals were presented with a photo line-up using a sequential, a simultaneous or a sequential folder method.

H2_A There is a significant difference in frequency of accurate identification of a suspect when individuals were presented with a photo line-up using a sequential, a simultaneous, or a sequential folder method.

Significance of the Study

Typically, researchers have focused on how to determine the reliability of eyewitnesses, on why eyewitnesses make errors, and how these errors can be prevented (Stebly, 2015). This study is significant because it examined both system variables and estimator variables in a way that has not been completed before. Several previous studies have focused on what type of line-up is less biased, or have focused on better presentation procedures to increase the probability of an accurate identification (Amendola & Wixted, 2015a; Charman & Quiroz, 2016; Dobolyi & Dodson, 2013; H. Flowe et al., 2016). However, even after significant study, there are some

researcher who believed sequential line-ups are more accurate which again calls into question line-up practices (Dobolyi & Dodson, 2013). Other studies have focused on memory to include how one encodes, stores and retrieves memories as an estimator variable in eyewitness identification (Allen & Gabbert, 2013; Hope et al., 2016; Krix, Sauerland, Gabbert, & Hope, 2014). However, until Hope et al. (2014), examined how to preserve and protect memories in eyewitnesses, there was limited research on how system and estimator variables interacted with and influenced one another. Hope et al. (2014) examined how the Self-Administered Interview increased encoding details and enhanced recall of specific details of a crime scene. Their study showed that the SAI had a positive correlation to preserved memory and recall; however, it only focused on crime scene details rather than on eyewitness identification. In this study, the Timeline Technique Interview or event history not only focused on the crime scene details, but it also focused on individual crime suspects.

This study was significant because it also focused on system and estimator variables as it applied to memory preservation; however, rather than just focusing on the participants' ability to identify specific details of a crime scene, it also focused on the ability of an eyewitness to accurately recall a suspect of a crime (Hope, Mullis, & Gabbert, 2013). Further, this study was significant because it examined these variables as it directly applied to various types of photo line-ups.

Definitions of Key Terms

Filler: A filler is a person that resembles the suspect in physical characteristics (Bruer, Fitzgerald, Therrien, & Price, 2015). Generally, there are at least five filler positions in each type of photo line-up that are system variables under law enforcement control (Charman & Cahill, 2012; Fitzgerald, Oriet, & Price, 2015; Fitzgerald, Price, Oriet, & Charman, 2013; H. D. Flowe, Klatt, & Colloff, 2014).

Free Recall: Free recall is a process used by a law enforcement officer at the scene of a crime when the law enforcement officer hands a witness or victim a pad of paper and a writing utensil and asks the witness to write anything they remember about the crime that occurred and the suspect (Wright, Gabbert, Memon, & London, 2008).

Timeline Interview: The Timeline Interview is an interview technique that asks the simple questions of who, what, when, why, where, and how in a chronological order to activate temporal memories and have the participant's response or report in a sequence in which the event took place (Belli et al., 2012; Hope et al., 2013).

Sequential photo line-up: A sequential photo line-up was originally designed in 1985 in the efforts to reduce misidentifications (Lindsay & Wells, 1985). A sequential photo line-up requires the administrator to select fillers that closely resemble the suspect in physical characteristics. The suspect and filler photographs are then presented in a blind, blinded, or double blind procedure to the witness or victim one at a time. The witness or victim must decide immediately if the picture presented is the suspect or not. The picture can only be presented once. In most cases, the witness is required to determine their level of confidence in their choice (Finley et al., 2015; Wixted, Mickes, Clark, Gronlund, & Roediger, 2015).

Sequential photo line-up folder method: A sequential photo line-up was originally designed in 1985 in the efforts to reduce misidentifications (Lindsay & Wells, 1985). A sequential photo line-up requires the administrator to select fillers that closely resemble the suspect in physical characteristics. The suspect and filler photographs are then presented in a blind, blinded, or double blind procedure to the witness or victim one at a time. The witness or victim must decide immediately if the picture presented is the suspect or not. The picture can only be presented once. In most cases, the witness is required to determine their level of confidence in their choice (Finley et al., 2015; Wixted et al., 2015). When using the folder method, six pictures and ten envelopes are used. A picture of the suspect is placed into one of

the folders, five fillers are inserted into five additional folders, and the remaining four folders are left empty. The folders are then shuffled so the administrator does not know which folder contains the suspect. The folders are then numbered one through ten and shuffled again before presenting the sequential photo line-up to a witness.

Simultaneous photo line-up: A simultaneous photo line-up is similar in nature to the sequential photo line-up in that it also uses one photograph of a suspect and five fillers. However, rather than presenting the pictures one at a time, the pictures are presented together in an array that is commonly referred to as a six pack. Blind procedures can be used with a simultaneous photo line-up (Pozzulo et al., 2016).

Summary

As forensic science improves, there is a likelihood that more people will be exonerated for crimes they were wrongfully convicted of (Kent & Carmichael, 2015). Historically, law enforcement in general, and the criminal justice system specifically, has not considered research, theory, and people when choosing best practices for eyewitness identification (Stebly, 2015). However, as people are exonerated with science, we must ask ourselves, how can science decrease the probability of innocent people going to prison for crimes they did not commit. One must consider that as forensic science becomes more publicized, that people who break the law, will take precautions to avoid leaving physical evidence behind. This in turn will potentially require eyewitness testimony in criminal cases.

In understanding how system variables and estimator variables work in conjunction with one another, researchers and theorists can potentially preserve eyewitness memory by understanding how people encode, store, and ultimately retrieve information, as well as what influences these processes. If a tool is available to enhance this process, and it is properly used, we can potentially increase the ability of the eyewitness to recall specific information more

clearly, thus allowing for a spontaneous identification of a criminal suspect rather than the widely used comparative identification that results in relative judgement (Stebly, 2015).

The purpose of this study was to focus on the practice theory gap of eyewitness identification. This study is important because it will potentially assist law enforcement officers in their investigations, and it will potentially identify specific procedures that can be used to reduce the chances of a misidentification of an innocent person. Research psychologists can clearly show that systems variables (law enforcement) can influence identification. Research psychologists can also show that estimator variables (variables outside of the researchers control) can influence identification. However, this study, for the benefit of all, showed that with an immediate appropriate response and the correct tool, that the effects of these variables can be minimized.

Chapter 2: Literature Review

Summary of the Purpose Statement

Eyewitness identification has been widely researched in both psychology and criminal justice fields (Stebly, 2015). However, concepts, theories, and procedures to conclude an accurate identification are still contested among researchers, theorists, and practitioners alike. In order to reduce the number of innocent people convicted of crimes based solely on eyewitness identification, one must understand how memories are encoded, stored, and retrieved, and how to retrieve those memories without negatively influencing the identification process.

Theoretical/Conceptual Framework

Applied line-up theory considers a host of other theories in an ecological combination when considering the accuracy of the eyewitness identification and accuracy and line-up presentation (Charman & Wells, 2007). These theories must include theories of face recognition, decision making and judgment processes, attitudes, schemes, gender, race, as well as theories of encoding, storing, and retrieving memories (Charman & Wells, 2007). In order to express the theoretical framework (stimulus elicits response) one must consider eyewitness identification in a step-by-step format. Goldstein (2014) suggests that to create a memory of an event that we must perceive the event in the first place. As an example, if a person is sitting with their friends in a shopping mall and does not perceive someone taking a purse as a crime, then process of encoding, storing, and later retrieving the memory of what the suspect looked like will likely not occur (Goldstein, 2014).

Further, one must consider the type of photo line-up and the line-up procedures that are used by law enforcement officers to determine the effects of the line-up on the accuracy of the identification (Amendola & Wixted, 2015a; Greene & Evelo, 2015). Applied line-up theory considers type of line-up used, influences such as delay in presentation of the line-up, and the influence of the presenter of the line-up on the identification process (Charman & Wells, 2007).

These conditions are variables that can either be controlled by the criminal justice system (system variables) or cannot be controlled by the criminal justice system (estimator variables) (Charman & Wells, 1978).

Although researchers study both type of variables, by manipulating factors such as age (Fitzgerald & Price, 2015; Wylie et al., 2015), race (Connelly, 2015; Wirth et al., 2015), the presence of a weapon (Vannucci et al., 2012), stress (Hope, 2016), and the effects of co-witnesses (Kieckhafer & Wright, 2015) there were still questions about why eyewitnesses continue to misidentify innocent people. To that end, eyewitness identification is still a major focus of study because law enforcement can use knowledge to reduce misidentification of innocent people to reduce the numbers of wrongfully convicted.

Two system variables which are, photo line-up presentation and administration, and one estimator variable, memory preservation tool are manipulated in this research study to understand eyewitness identification. First, manipulation will occur to the estimator variable using memory preservation tools identified as the Timeline Interview and Free Recall. Second, systems variables or type of photo line-up will be randomly selected and presented in both a blinded or double blind method to determine the main effect of both photo line-up type, photo line-up administration, and how memory enhancement effects both.

Literature Search Strategy

To review the literature that encompasses this area, I conducted several literature searches in the Northcentral University databases which includes ProQuest, PsychNet, and several other databases. I searched both historical information and current peer reviewed journal articles to not only understand previous research, but also to gain knowledge of what theoretical perspectives were used to conceptualize the research studies. Current peer reviewed journal articles are defined as articles primarily within the last five years of publication from the time the research process started. The goal of the literature search was ultimately to conduct an

analysis of historical and current literature for the purpose of exploring any practice theory gaps, to ask questions, to develop propositions and to guide research. I retained information from both current and historical publications to show specific variables that had been researched as well as to show changes in practice that had occurred or still needed to be examined. The primary focus however was on studies that had occurred within the last five years simply because these current research studies would have also considered historical data and would have taken that information into account when preparing their research.

The searches that I conducted were both roadrunner, or basic searches, as well as advanced searches containing specific keywords or phrases. Keywords for these searches were specific to line-up variables, line-ups and age, line-ups and gender, line-up presentation, weapon focus, line-up procedures, memory processes, line-up types, perception, wrongful identification, innocence project, estimator variables in eyewitness identification, system variables in eyewitness identification, theory in eyewitness identification, and line-up research tools.

The purpose of these searches was to research variables in eyewitness identification, to review current literature, methodology, and to identify any practice theory gaps. Several of these searches found what could be identified as conflicting results which were necessary to explore. Further, during these searches, it was apparent that any information gained during experimentation and the literature review itself would have relevance to real life issues as well as the behavior and mental processes of potentially several different groups of people.

I learned that the majority of previous research focused on specific types of variables to include memory, and perception. Specifically, the previous research focused on theory and variables that had been researched for associated problems such as how memory applies to learning, associated diseases, and in specific terms, and how each independent variable effected eye witness identification. However, I only found one article that considered an inclusive theory of understanding multiple variables and how these variables effected eyewitness identification.

I found the inclusive Applied Line-up Theory important as it considered a large number of variables that effected eyewitness identification and how each variable alone or in conjunction with one another still effects eyewitness identification. Further, this theory was applied, which in essence stated the theory can be taken from an educational environment or research project, and applied directly to the people who are involved in the eyewitness identification process, or the legal system that needs to evaluate these identifications.

Stebly (2015) identified four key steps a person who is an ideal witness must pass through: (1) stimuli perception, (2) encoding of the stimuli, (3) retaining the information, and (4) retrieval of the memory (Stebly, 2015). Stebly (2015) argues that these stages can be broken down in pairs where perception and encoding of information often occurs before law enforcement arrives (estimator variables) while retention and retrieval of information can be influenced by law enforcement (system variables). The key concepts of estimator variables and system variables are also address in Applied Line-up Theory (Charman & Wells, 2007). To better understand these concepts, an examination of each type of variable had to occur.

Key estimator variables that may influence eyewitness identifications are: (1) the age of the witness, (2) the gender of the witness, (2) weapon focus effect, (3) memory processes, (4) perception, (5) time of day or night, (6) distractors, and (7) the interaction of these various variables (Fitzgerald, Oriet, & Price, 2016; Sučić, Tokić, & Ivešić, 2015). Most of these variables have been individually and specifically studied over several years. They had also been studied in conjunction with one another. However, one of the key concepts to take away from the previous research is these variables individually, or in conjunction with one another, influences people differently.

Estimator Variables

Estimator variables are influences on accurate eyewitness identification that law enforcement cannot control (Charman & Wells, 1978; Mickes, 2015). Estimator variables are

specific to the individual eyewitness, which means, they also vary from person to person. As estimator variables are specific to different people, they have been researched extensively for decades, starting with Wells in 1978, to present day work by Hayne and Gross (2017).

Estimator variables need to be understood by the researcher and practitioner alike because they needed to be considered when attempting to accurately identify a suspect or eliminate a filler in a criminal investigation (Stebly, 2015). However, because these variables are inherently in the control of the witness, only one of these variables, memory recall, was the focus of this research study.

Perception.

When considering how one encodes, stores, and retrieves memories, one must first consider sensation and perception as well as how perception works with memory (Čadež, 2014; Erickson, Lampinen, & Leding, 2014; Kovshoff, Shore, Iarocci, & Burack, 2015; Matthews & Meck, 2016; Michelmann, Bowman, & Hanslmayr, 2016; Noël, van der Kamp, Masters, & Memmert, 2016; Singh, Moeller, & Frings, 2016; St-Laurent, Abdi, & Buchsbaum, 2015).

When reviewing the current literature on memories that apply to eyewitness identification, there were very few studies that discussed the link between perceiving a crime and that perception of a crime created a memory. What Goldstein (2014) told us is there is an eight-step process that needs to take place to create a memory. This specific process requires that something in our environment stimulates the senses (a crime occurring in front of us), that we had to pay attention to what was going on (paying attention to the actions of the criminal, what they look like, what they are wearing, etc.), and that these actions have to stimulate receptors in the brain that force experience or action (Goldstein, 2014). These electrical impulses then need to complete the process of transduction, transmission, and processing to be associated with the correct areas of the brain (Goldstein, 2014). If this process occurred with no interruptions, then a person will gain experience which will lead to perception, recognition, or action (Goldstein, 2014).

The ultimate goal of experience and action as it applies to memories of criminal acts or criminals in general was to be able to recall the information when needed, and to be able to recognize a person from a photo line-up. However, as Goldstein (2014) points out, there are several areas where this process can break down, one of which is in the attend stimulus. If a person recognized that a crime is occurring (environmental stimulus) their attention may shift regularly. As an example, in the case of a simple theft, the person must first recognize that a person is committing a crime, then their attention may shift from what the person is wearing, to what they are taking, and ultimately to what they look like. However, if additional attend stimuli are added to the scenario, such as a gun, a person may ultimately only pay attention to the item that through previous experience they recognize as dangerous, thus the person will revert to previous experience and focus on the firearm rather than the person. This simple example describes one major variable in eyewitness identification known as the weapon focus effect (Erickson, Lampinen, & Leding, 2014). One may be concerned, and some have argued, that distractors such as a weapon will reduce the ability of a person to make an accurate suspect identification (Erickson et al., 2014). However, one must have considered environmental stimuli and attend stimuli to even consider this assumption.

As an example, Singh, Moeller, and Frings (2106) conducted a study in which they examined the perception and actions of 31 participants. During the study the researchers introduced different shapes to the participants and later asked them to recall what the shapes were. In addition, the colors of the shapes were changed (Singh, Moeller, & Frings, 2016). What Singh et al. (2016) learned is that if a person was conditioned to recognize an object and that the different colors did not matter. What this study shows are that environmental stimuli and attend stimuli can vary depending on conditioning. As an example, a person who lives in a relatively crime free location may experience a different environmental and attend stimulus than a person who lives in a high crime neighborhood and who may be conditioned to violent acts.

This is important simply because if the stimuli are nominal and does not draw a person's attention, then a memory of the event, individual, or their actions may not occur.

Additionally, if the event is not the center of attention, then attention may shift further away from the event itself. By way of example, if a person is working as a teller at a financial institution and working with a customer, they may see a person approach a fellow teller in their peripheral vision; however, because they are paying attention to the person in front of them, the teller may not realize that the person at their fellow teller's station is committing a robbery. Even though Goldstein (2014) suggested that attention shifts, the attention is still focused on the environmental stimuli until transduction, transmission, processing, and recognition occurs. Noel, Kamp, Master, and Memmert (2016) examined this concept and found different result. During the study, a goal keeper in a soccer game was placed slightly left or right of the center of the goal (Noël, van der Kamp, Masters, & Memmert, 2016). The participants were then told to focus either to the left, center, or right of the goal and make an assessment as to the actual position of the goal keeper. What they learned was that persons' explicit perception was effected by the way a person directed their gaze (Noël et al., 2016). However, during the second phase of the study, participants were told to kick the soccer ball when they felt a clear shot at the goal was available. Findings suggested that even though participant's explicit perception had been effected by scan direction, that implicit perception was unaffected as most participants kicked the ball in the direction of the largest unoccupied area (Noël et al., 2016). Interestingly, when one considered the scenario posed about the financial institution teller not paying attention to their fellow teller's customer, one could argue that implicit perception would suggest that the witness teller may be able to provide more information than once thought. More specifically, even though Goldstein (2014) clearly argued that to attend to a stimulus that a person must clearly focus on it, that Noel et al. (2016) show that implicit perception still creates recognition or knowledge.

Rather than simply stating that one needed to recognize the environmental stimuli, and then needed to focus and pay attention to it to activate receptors so that experience and action could occur, one may likely be more accurate in simply stating that attention to the stimuli needed to occur. As an example, one could consider the concepts of selective attention and divided attention in current research (Kovshoff, Shore, Iarocci, & Burack, 2015). The research presented by Kovshoff et al. (2015) argued there are cognitive gains in selective or divided attention as one ages. As an example, Kovshoff et al. (2015) examined selective attention in school age children and adults. The researchers could verify that as people develop, they became better at paying attention to multiple stimuli at once. This is important to understand on multiple levels. First, to a certain extent, it is contrary to the information published by Goldstein (2014) who argued that one needed to actively attend to stimuli in order to create a memory of an item or event. Second, the research by Kovshoff et al. (2015) also showed that attention is age dependent which means one must consider the witnesses age as a factor when attempting to obtain an identification. Some factors that could affect a person's ability to perceive and attend to criminal activity could include the duration of the crime, disguises, time of day or night, and physical factors of the witness (Stebly, 2015).

Perception and Social Cues.

Social cues are influences from the world around us (S. Kassin, Fein, & Markus, 2014). These social cues could be anything from other race bias, weapon focus effect, facial recognition, age, alcohol use, and stress (Allen & Gabbert, 2013; Bindemann, Brown, Koyas, & Russ, 2012; Erickson et al., 2014; Fitzgerald & Price, 2015; Kneller & Harvey, 2016; Wirth et al., 2015). To understand how one perceives the world around them, one must understand how perception can be influenced by outside sources such as job, friends, and co-witnesses (Allen & Gabbert, 2013; Andersen, Carlson, Carlson, & Gronlund, 2014; Bindemann, Brown, Koyas, & Russ, 2012; Hope, Gabbert, & Fraser, 2013; Price, Roberts, & Collins, 2013; Vredeveldt & van

Koppen, 2016). Much like other fields in the study of mental processes and human behavior, a sociocultural perspective needed to be considered.

Alcohol.

Historically, researchers have believed that alcohol affects a person's memory, judgement, and ability to perform tasks (Lechner, Day, Metrik, Leventhal, & Kahler, 2016). As an example, Lechner et al. (2016) argued alcohol can decrease executive function and working memory. To test this hypothesis, the researchers recruited 41 people from the community and administered alcohol in control dosage units. What the researchers learned was that moderate alcohol use did not negatively affect working memory; however, high doses of alcohol did negatively affect working memory. Lechner et al. (2016) suggested their research applied to eyewitness identification as it is not uncommon for law enforcement to interact with people under the influence of an intoxicant. Arguably, a law enforcement officer is likely to investigate a crime when a witness is intoxicated and the perception of the officer about the ability of the witness to provide accurate information may influence the overall investigation. What this research showed was witnesses should not be discounted simply because they have been drinking alcohol.

As an example, even though there are limited studies on the topic, researchers have learned there is no significant decline in either working memory or the ability to identify a criminal suspect based on moderate intake of alcohol (Kneller & Harvey, 2016). Kneller and Harvey (2016) reported that over half of the law enforcement officers surveyed believed that alcohol consumption is a significant factor in eyewitness identification. To test the hypothesis that alcohol negatively affects a person's ability to accurately identify a criminal suspect, Kneller and Harvey (2016) recruited 120 participants who were provided with a small amount of alcohol and were either asked to positively identify a criminal suspect or eliminate a filler as a possible suspect in a target present or target absent line-up. When comparing the results of

people who ingested alcohol to people who did not, Kneller and Harvey (2016) learned that there was no significant difference between the placebo group and the test subjects in their ability to accurately identify a suspect or eliminate a filler. Ultimately, what this meant was even though alcohol consumption is a social activity that is often perceived as negative by law enforcement, moderate drinking reportedly did not affect the ability of a person to make an accurate identification. This study underscored the importance of not making assumptions about the accuracy of an identification based solely on the level of intoxication of a witness.

Other race bias.

Stabley (2015) reported that a meta-analysis of cross race effect that involved the study of 5000 participants showed that people were significantly more likely to positively identify someone of their own race as opposed to someone of another race. Racial difference can have an impact on accurate identification (Connelly, 2015). Connelly (2015) argued that cross race identifications are one of the most prevalent reasons for exonerations of wrongfully convicted people. Connelly (2015) argued that approximately 40 percent of all people exonerated are people who were inaccurately identified by a person of another race. One of the most studied estimator variables is race (Davies, Hutchinson, Osborne, & Eberhardt, 2016). As an example, Davies et al. (2016) hypothesized that a persons' race and sex can negatively affect accurate identification. To test their theory, Davies et al. (2016) recruited 340 participants who volunteered to participate in the study. The researchers presented what they claimed to stereotypical black crimes versus stereotypical white crimes. They then added an additional level where the victim was identified as a white female. After their examination of the data, the researchers learned that crime victims race and the race of the perpetrator affected the decision of the witness on who was perceived as guilty and who was not. Ultimately, the researchers learned that white participants were more likely to misidentify black people in potential crimes. One could argue because of social surroundings and individual social cues that people of

different races would likely have a difficult time identifying one another. Law enforcement officers should consider this information when attempting to identify a criminal suspect and not make a decision on their investigation solely based on eyewitness identification when additional evidence is available. As an example, Connelly (2015) suggested that when available, physical evidence should be used to support eyewitness identification.

When one considers cross race bias, we have to ask ourselves if there are any contributions to the literature that will contradict previous research, especially as it applied to memory and the ability of a person to accurately identify someone of another race (Knuycky, Kleider, & Cavrak, 2014). Marsh, Pezdek, and Ozery (2016) suggested that even though people often misidentify people who are not of the same race, there are ways to improve memory, and thus there is the ability to improve identifications of people of another race. These techniques used to access memories can be used by anyone and are not influenced by individual differences (Marsh, Pezdek, & Ozery, 2016).

Researchers have regularly questioned why people misidentify one another. Often, they hypothesized misidentifications are attributed to age or race. However, one of the more popular theories is based on individual differences. Individual differences include age, gender, race, socioeconomic status, etc. As an example, researchers have conducted studies to determine if female participants are more accurate in their identifications than male participants (Willmott & Sherretts, 2016). Further, researchers have questioned age as a variable in eyewitness identification when looking at individual differences (Bindemann et al., 2012; Fitzgerald & Price, 2015; Willmott & Sherretts, 2016). Ultimately, research conducted by Willmott and Sherretts (2016) is consistent with other researchers. By way of example, Willmott and Sherretts (2016) recruited a population with ages ranging between 18 to 62-years-old. The goal of this study was to determine if either age or gender, as an individual difference, influenced one's ability to accurately identify a suspect or eliminate a filler in either a sequential or

simultaneous line-up. Their findings suggested that a young adult is more likely to positively identify a suspect, yet an older adult is more likely to eliminate a filler. This research is also consistent with the findings of Bindemann et al. (2012) who investigated the relationship of face processing to individual differences. In their study, Bindemann et al. (2012) recruited 80 students who were introduced in a waiting room to a participating suspect. They were later requested to either identify this person in a photographic line-up or eliminate a filler as a potential suspect. The goal of the research was to attempt to determine if the participants could process the facial features of an unfamiliar suspect so that an accurate identification could be made. However, the findings suggested that due to individual differences and cultural cues, accurate identification could be difficult unless additional factors are considered. Some of these additional factors included if the witness was distracted, if the witness was able to see or hear clearly, the amount of time the witness observed the suspect, and if there were any other distractors such as television or other environmental factors.

Ultimately, to examine the overall effects of individual difference, Fitzgerald and Price (2015) conducted a meta-analysis of 91 different studies. These 91 studies had a total participant population of 20,244 of various ages. After analyzing all 91 of the studies, Fitzgerald and Price (2015) confirmed a host of previous results that were age significant. Primarily, Fitzgerald and Price (2015) suggested that young adults are more accurate in their identification and are better able to discriminate between fillers and the actual suspect. The researchers were also able to show that children were less likely to accurately identify a suspect, and they were more likely to misidentify a filler. Finally, Fitzgerald and Price (2015) showed that older adults were the least likely of all participants to accurately identify a suspect. One of the key concepts behind this study is to point out that individuals are different based on age, gender, cognitive abilities, and social cues. As an example, people between the ages of 35-50 regardless of gender, had a more difficult time making accurate identifications (Stebly, 2015).

Law enforcement needs to consider these factors when attempting to have a witness identify a criminal suspect. Law enforcement should clearly be able to articulate the ability of the witness to make an accurate identification based on the amount of time he or she witnessed the person or the event, if there were any other distractors present when the event was occurring, and if the witness was in a position to hear or see the event clearly.

Weapon focus effect.

A weapon used in a crime will likely have a negative effect on eyewitness memory (Carlson, Dias, Weatherford, & Carlson, 2017; C. A. Carlson & Carlson, 2014; Fawcett, Peace, & Greve, 2016; Pickel & Sneyd, 2017; Vannucci, Mazzoni, Marchetti, & Lavezzini, 2012). There are at least two different theories on what causes the weapon focus effect (Erickson et al., 2014). Per Erickson et al. (2014) some argued that a weapon is a novel object that demands attention, thus one attends to this object, and subsequently a memory is created of primarily the weapon. Others argue that a fight, flight, or freeze response created arousal that required a person focus on the weapon (Erickson et al., 2014). Erickson (2014) argued that regardless of the perspective, that over 80 percent of all research showed that the presence of a weapon significantly impaired the ability of the eyewitness to accurately identify a suspect. Steblay (2015) suggested that while memories of traumatic or frightening experiences are often not forgotten, details can be lost or not encoded correctly. Regardless of the theory that one adheres to, Erickson et al. (2014) conducted research to determine if a weapon would reduce the ability of a person to accurately identify a criminal suspect or eliminate an innocent person. To test their hypothesis that accurate identifications would be reduced, the researchers recruited 1263 undergraduate students. These participants were introduced to pictures of people who appeared to be in a bar. The people in the bar (cohorts) would show a weapon at various times so that it could be depicted in the scene temporally. Additional cohorts also presented novel items that would readily be identified as such and could easily be dismissed as a weapon. The researchers

learned that there was a significant decrease in accurate identifications when a weapon was present.

Carlson and Carlson (2014) had similar results in their study. These researchers recruited 2675 participants who were exposed to a short video of a person. The person either had a weapon, or did not, or had a distinctive mark (a sticker on their face), or did not. The participants were then randomly assigned a target present or target absent simultaneous or sequential line-up and asked to identify the suspect or eliminate an innocent person. As expected from previous research, the weapon focus effect reduced positive identification; however, unexpectedly, the sticker on the cohorts face reduced accurate identifications even more. Steblay (2015) supported these assertions and argued the mere presence of a weapon with reduce the ability of a witness to make an accurate identification. However, even though research has shown the presence of a weapon negatively affected the ability of an eyewitness to make an identification, one must consider individual differences in order to determine if this information is accurate.

Arguably, anytime a person witnesses a crime, they are likely to be exposed to a fight, flight, or freeze response. In order to examine the effects of stress on a persons' ability to make an accurate identification, Pozzulo, Crescini, and Panton (2008) examined the effects of a videotaped versus live crime scene on the ability of the eyewitness to make an accurate identification. In order to do so, they recruited 104 participants who either viewed a videotaped crime or a live staged crime. These participants were then asked to try and identify a suspect from a target present or target absent sequential line-up (Pozzulo, Crescini, & Panton, 2008). When data was collected from this 2x2 between subject's factorial design, Pozzulo et al. (2008) were able to infer that people who witnessed the live crime as opposed to the videotaped crime were likely to have higher levels of stress associated with the crime. However, the researchers were also able to infer that those participants who viewed the crime on videotape also had a

significant level of stress; however, it was associated with the anxiety of potentially having a poorer identification accuracy (Pozzulo et al., 2008). At the end of their research project, the researchers learned that both conditions created stress; however, there was no significant difference between either groups ability to identify a criminal suspect.

Individual differences, social cues, and the weapon focus effect.

People are often influenced on multiple levels (Santrock, 2008). The multiple levels of analysis used to study mental processes and behavior can also be used to study how people perceive and interact with the world around them. As an example, individual differences in eyewitness identification tell a reader that young children are less likely to accurately identify a criminal suspect than young adults (Bindemann et al., 2012; Unsworth, McMillan, Brewer, & Spillers, 2013). Additionally, people who are under stress have a reduced ability to accurately identify a person (Sauerland et al., 2016). Further, people with intellectual disabilities could be at a disadvantage when attempting to identify a criminal suspect (Wilcock & Henry, 2013). Per Santrock (2008) and other developmental psychologists, one could hypothesize that a child is unable to make an accurate identification simply because their brain is not fully developed, they may have limited social interactions with others, and they may fear a weapon the criminal suspect had in their hand. However, if we consider a child who lives in a crime ridden neighborhood, they may be able to accurately identify a suspect simply because they have been desensitized to violence and are not in fear of the weapon. These concepts are estimator variables that are individualistic and something that cannot be controlled by law enforcement.

Age as an individual difference is an estimator variable that has been examined by multiple researchers (Allen & Gabbert, 2013; Bindemann et al., 2012; Fitzgerald & Price, 2015; Price et al., 2013; Wylie, Bergt, Haby, Brank, & Bornstein, 2015). Memon and Gabbert (2003) examined the ability of an eyewitness to make an accurate identification when the criminal suspect had an appearance change. In their 2x2 between subject's factorial design, Memon and

Gabbert (2003) recruited 180 participants from the population at large. The participants were specifically categorized by age to determine if there was any difference in the ability of one person to make an accurate identification as compared to another. The participants all viewed criminal suspects and then later returned to view a sequential photographic line-up where some of the criminal suspects had different hair styles while some remained the same. The results suggested that older people (ages 58-80) were significantly more likely to make an inaccurate identification based on the appearance change of the suspect.

Memory

Often when viewing literature involving eyewitness identification one of the primary concerns and area studied is memory (Allan, Midjord, Martin, & Gabbert, 2012; Grady, Butler, & Loftus, 2016; Hope et al., 2016; Klein, 2013; Krendl, Ambady, & Kensinger, 2015; Oeberst & Blank, 2012; Pansky & Nemets, 2012; Sauer & Hope, 2016; Schwartz & Efkliedes, 2012; Unsworth, McMillan, Brewer, & Spillers, 2013; Wetmore et al., 2015; Zelinski, 2012). More specifically, researchers have examined memory conformity, encoding duration, the effects of alcohol on memory, divided attention, and retention intervals (Allan et al., 2012; Čadež, 2014; Gabbert et al., 2003; Gabbert, Memon, & Wright, 2006, 2007; Godfrey & Clark, 2010; Morgan et al., 2004; Sauer & Hope, 2016; Thorley, 2013; Unsworth et al., 2013; Wetmore et al., 2015). In fact, variables such as age, and how age effects memory are concerns for all parties involved in the criminal justice system. To that end, age, and factors associated with memory and age have been studied extensively (Beaudoin & Desrichard, 2017; Hargis & Castel, 2017; Kim & Suh, 2017; Mammarella, DiDomenico, Palumbo, & Fairfield, 2016; Nespollo, Reschetti, Pollo, Lebre, & Martínez, 2017; Nittrouer, Lowenstein, Wucinich, & Moberly, 2016; Otgaar, Scoboria, Howe, Moldoveanu, & Smeets, 2016; Robin & Moscovitch, 2017; Schreiber et al., 2017; Zhang, Zhang, Luo, & Geng, 2016). These variables, along with others, have been the focus of groups such as the Innocence Project and assorted researchers simply because they can have a drastic

effect on the outcome of a criminal case and potentially assist in incarcerating an innocent person (Krieger, 2011; Walsh, 2013). Ultimately, the goal of research should be to improve processes by examining any practice theory gap to improve the lives of others. However, memories, and how memories are encoded, stored, and retrieved can be either estimator variables or system variables. To understand how memories can be considered estimator variables, one must consider how memories are created and effected.

Theory of Memory.

To consider the accuracy or inaccuracy of eyewitness identification, one must consider the ability of a person to remember events and individuals in detail enough that he or she may later recall specifics. According to Goldstein (2014), in order to create a memory, one has to first perceive an event. However, what one perceives is the basis for how the memories are created. Baddeley (2015) suggested that memories are created through an environmental stimulus, which passes to sensory memory, then to short term memory, and ultimately to long term memory. The form of stimulus in the environment was ultimately what created implicit or explicit memories. Bower (2014) suggested that traumatic events are likely to form implicit memories, while the answers to a test are the result of studying and creating explicit memories. As one considered how memories are created, one must consider the other estimator variables to include individual differences. Individual differences will influence perception and ultimately how memories are created, stored, and later retrieved. However, one should also consider perception and memory processes as holistic and working together (Čadež, 2014). Although there are many different terms for describing memory processes, this paper will primarily refer to implicit (spontaneous memories that occur with little or no effort) and explicit (memories that are formed with conscious effort) memories (Bower, 2014).

Implicit and explicit memories.

Conway (2014) suggested that two types of memories assist in remembering details of events: (1) implicit memories, and (2) explicit memories. Although both types of memories are a process of encoding, storing, and retrieving information, Conway (2014) suggested that memories are created in different ways. Memories can be purposeful or automatic but the specific way of encoding depends on individual differences and their perception of the event.

Per Conway (2014) implicit memories are like flashbulb memories, and as such, predominately happen without conscious effort. Interestingly, flashbulb or implicit memories are also influenced by negative emotion (Day & Ross, 2014; Kraha, Talarico, & Boals, 2014). Kraha et al. (2014) recruited 329 participants for an experiment in order to determine if positive emotions created flashbulb memories. In order to conduct the experiment Kraha et al. (2014) used an autobiographical memory questionnaire to obtain information about the memories of an event that was perceived as being positive (the death of Osama bin Laden). The questionnaire was repeated two additional times throughout the next year. After all data was collected, a comparative analysis was completed to determine if memories had changed overtime. Interestingly, the researchers were able to show that flashbulb memories that were specifically tied to positive emotions did change over time and that less details were remembered. This research has two implications for law enforcement and eyewitness identification. First, if the emotions tied to the memory are either neutral or positive, the implicit memory will likely not be encoded with specific details. Second, memories change over time.

These implications were confirmed by research conducted by Day and Rose (2014). In order to conduct their research, Day and Rose (2014) recruited 135 participants for their study. The participants were asked to give seven specific details about their lives when they heard about the death of Michael Jackson. Of the original 135 participants, 75 completed a second survey one year later. The researchers learned two things: (1) if the participant identified as a fan of Michael Jackson and had a perceived emotional link with him, then their initial memories

were specific, and they had more confidence in their subsequent recall, and (2) if there was no emotional link to Michael Jackson (neutral or negative feelings) the memories of these seven specific questions faded over time unless there was specific rehearsal of the memories (Day & Ross, 2014). This research information had direct implications for the identification of a criminal suspect and the elimination of a filler from a photographic line-up by a witness. The research completed by Day and Ross (2014) told us that if there is no direct emotional link to the event that even implicit memories will fade over time. Additionally, Kraha et al. (2014) supported this information and told us the emotional tie to the memory is more resilient if it is negative. When applied directly to eyewitnesses, the research suggested that a person who was directly involved in the event and who had negative emotions about it will likely remember details of the suspect and crime better than a person who was a casual observer. These inferences suggest two things: (1) a direct victim will likely be a better witness than a casual observer to a crime, and (2) the sooner law enforcement is able to present a photographic line-up supported by other evidence to the witness, the more likely they are to accurately identify the culprit from the line-up. However, one still must consider other influences such as memory conformity when working with eyewitnesses.

Memory Conformity.

Memory conformity is a process that occurs when outside influences change the way people remember events, people, or things (Gabbert et al., 2003). Gabbert et al. (2003) argued that memory conformity effects younger people more frequently than older people; however, during their study 71% of the total population, regardless of age, was susceptible to memory conformity. Memory conformity occurred when an outside influence changes ones' memories of an event or person Stabley (2015). An example of both co-witnesses and memory conformity can happen during a bank robbery when witness tellers communicate about what they saw as

individuals and arrive at the same or a similar description of the criminal suspect (Stabley, 2015).

Memory conformity and co-witnesses have been studied by various researchers. As an example, co-witnesses often believe that people who witnessed a crime scene or criminal for longer than they did are more accurate and are likely to conform to their co-witnesses' views (Gabbert et al., 2007). To test their hypothesis on memory conformity and co-witnesses, Gabbert et al. (2007) recruited 92 undergraduate students. They presented these participants with slightly different pictures of a criminal suspect. A portion of the participants were given half the time to observe the pictures as their counterparts. Half of the participants were told they had half the amount of time to view the picture as compared to the others. All parties were then allowed to talk to one another before they were asked to give a description of the criminal suspect. The findings suggested that the people who had half the amount of time were influenced by the others to change their description even if they were accurate in their initial reporting.

In a similar study, 96 undergraduate students were recruited to determine the extent of memory conformity between individuals and groups (Allan et al., 2012). The participants were randomly assigned to one of three groups: (1) 30-second group, (2) 60-second group, and (3) 120-second group. The participants were asked to describe a scene. Once completed they were shown the results from another randomly selected participant. They were then told by the researcher if the other participant accurately described the scene or if they inaccurately described the scene. Additionally, a portion of the participants were told that their counterpart either viewed the scene for a longer or shorter time than they did. The results suggested that people who viewed the scene for 30 seconds and were told that their counterpart viewed the scene for 60 or 120 seconds were more likely to change their description and conform to the description of another.

However, the question remained as to what extent co-witnesses influence one another. Kieckhafer and Wright (2015) suggested that likeable co-witnesses increase accurate identifications. To test their hypothesis, the researchers recruited 130 undergraduate students, who together with a likeable colleague participant, examined pictures and were then later asked to describe what they saw. The results suggested that if the colleague was likable, accuracy increased and suggestibility decreased (Kieckhafer & Wright, 2015). Interestingly, this information shows that social cues such as likability can influence others in a positive way rather than just inferring that co-witnesses are a negative influence on eyewitness identification. Memory conformity can also be attributed to the eye witnesses' confidence or lack thereof (Eisen, Gabbert, Ying, & Williams, 2017).

Integration of memory and perception.

Memory processing is complex and dynamic (Čadež, 2014). When considering perception, attention, and memory, one must understand that there are multiple systems all working together to form memories (Čadež, 2014). These systems are almost always individual dependent as noted when discussing estimator variables; however, there are constants when considering various models of memory encoding (Edmond et al., 2017; Erickson, Lampinen, Frowd, & Mahoney, 2017; Fernández-Ballesteros, Bustillos, & Huici, 2015; Luo et al., 2014; Maguire, Intraub, & Mullally, 2016; Paulo, Albuquerque, Saraiva, & Bull, 2015; Ponce-de-León, Pierre-Lévy, Fernández, & Ballesteros, 2015; Weigelt et al., 2014). Memories are serial in formation, which in essences state that they occur in time and along a time continuum. Three models of memory that explain this process are: (1) chaining models, (2) ordinal models, and (3) positional coding models (Čadež, 2014).

Chaining models described a process in a person makes an association between items that are generally encoded in a list format from which the list can then be reconstructed. Ordinal models suggested items are stored based on their relative strengths or their level or importance.

Positional coding models suggested items are stored in a way that memories form context to a given item or given event (Čadež, 2014). These models are all based in time and can be related to both temporal and positional distinctiveness which both ultimately carry information that creates memory (Baddeley, 2014; Čadež, 2014; Goldstein, 2014). However, there are also additional influences that one must consider when attempting to retrieve stored or encoded information.

Memory retrieval is a process of bringing a target memory into awareness through one or more cues (Anderson, 2014). What Anderson (2014) described is following a set of cues that bring a person back to a specific memory, at a specific serial time. The retrieval process is very similar if not identical to the encoding process, and works by a similar set of patterns and positioning's (Anderson, 2014; Craik, Naveh-Benjamin, & Anderson, 2014).

In order to retrieve memories that have been stored, one must follow cues to where the original memory is, in order to bring it to the surface, and be able to work with it. Baddeley (2014) suggested that cues have associative strengths on the target memories. As an example, if one does not attend to the crime that is going on in their presence, then there are weaker cues associated with the memory, which ultimately meant that priming of the target memory may need to be more specific. Priming is a concept that assists a person in remembering details of an event that can require a person to look back from a different perspective. (Baddeley, 2014). Often times this involved the cognitive interview style questioning using a sequential or temporal order (Baddeley, 2014). Priming is when one assessed similarities between current events and past events so that memories can be more easily retrieved (Park & Donaldson, 2016).

To reinforce this concept, one only needs to examine the work of Park and Donaldson (2016). Park and Donaldson (2016) wanted to determine if there was a relationship between priming and implicit and explicit memory recall. In order to conduct their study, Park and Donaldson (2016) recruited 34 right-handed students who were exposed to 524 concrete nouns

that were 4-9 letters in length. The nouns were presented in blocks of 60 with some of the nouns being primed by repeating a noun or not being primed with a blank before the word. Some groups were not given previously seen words while other groups were. Ultimately, masked priming was not significant in the study; however, overt priming, showed a statistical significance in the participants' ability to remember previous words. Finally, priming increased the speed of recollection (Park & Donaldson, 2016). Park and Donaldson (2016) were able to show through the use of fMRI's that neurologically, the brain was faster when primed.

Priming of cue-based retrieval information such as letters or numbers have shown priming is effective for remembering physical identity, nominal identity, and categorical identity (Schneider, 2016). Schneider (2016) examined task switching, conceptual priming, and perceptual priming effects to determine if these concepts were valid and if they would have an effect on memory. In order to conduct his research, Schneider (2016) recruited 96 participants who were either presented with letter cues or number cues on a computer. Ultimately, Schneider found that all effects were present and that the time the stimulus was presented (longer time versus shorter time) did not have a statistical bearing on the outcome. Schneider (2016) supported the concepts presented by Goldstein (2014) and other researchers when he suggested that cue encoding begins with perceiving an item. Schneider (2016) also stated that the more similar items are, the faster, and more likely the items are to be encoded. Finally, Schneider (2016) pointed out that a physical repetition creates a perceptual overlap which created stronger encoding and resulted in better priming. This research had direct implications about time frames and how eyewitnesses can be interviewed to better encode memories at the initial crime scene. This concept will be discussed later in this paper.

Priming can also be used to moderate the cross-race effect or cross race bias (Marsh et al., 2016). Marsh et al. (2016) suggested that historical models examining the cross-race effect have primarily focused on perceptual and sociocultural efforts. However, Marsh et al. (2016)

suggested priming a person to focus on a specific cultural identity can reduce the cross-race effect. In order to test their hypothesis, Marsh et al. (2016) recruited 119 monoracial Latino-American college students. These students were primed with sentences that would in essence force them to identify with either their Latino or American heritage. In their research study, the cultural prime varied between subjects; however, the results indicated that the cultural priming allowed for accurate identification of the race that the person identified with (Marsh et al., 2016). The significance of this study showed that people can be primed to recognize faces that are from various cultures.

Equally important, priming can reduce memory decay (Jiang, Shupe, Swallow, & Tan, 2016). When considering memory decay of eyewitnesses, one could suggest that simply stating to the eyewitness that they may be asked to attempt to identify the criminal suspect in a photographic line-up at a later date could be considered priming. This concept was also examined by Jiang et al. (2016) who suggested that memories are rapidly forgotten because declarative memory is in high demand during normal processing. However, Jiang et al. (2016) suggested that memories are often encoded and stored, at least in part, until needed and through priming, can be recalled. In order to test this hypothesis, Jiang et al. (2016) conducted three experiments for which they recruited 20 people each. The participants were shown monitors that contained either letters or numbers that were also associated with specific colors. As an example, a screen would have four numbers in various colors showing to the participant. The participant would be cued to identify a specific number. Later, they would be given a surprise test and asked which number was the target number. What Jiang et al. (2016) determined was that if a person was primed, even when given large amounts of numbers, they were more likely to remember the surprise test numbers because they had already seen them.

Summary of Estimator Variables

Estimator variables are variables not in the control of law enforcement that can affect eyewitness identifications. Although there is various research on each of the variables, we know that information contained therein is evolving. Previous literature in the field of eyewitness identification has examined variables to include: (1) perception, (2) social cues, (3) alcohol, (4) other race bias, (5) weapon focus effect, (6) individual differences, and (7) memory and memory processes. As we have reviewed these areas, we have learned that perception is based on the individual and several processes to include attending to what is occurring around them. Perception and the ability to attend to a crime or criminal suspect can vary depending on the social cues in a person's surroundings. As an example, we have learned that people perceive violent acts differently depending on where they live and the social norms and rules.

We have also learned that although once perceived as a potential problem, moderate alcohol usage did not effect a person's ability to perceive and attend to what was going on around them or to create memories of the event. However, in addition to learning that moderate alcohol consumption did not inhibit a person's ability to encode, store, and retrieve memories, we have learned that heavy alcohol usage did inhibit the association areas of the brain and thus memories of who a criminal suspect is can be degraded.

Other race effect or bias is widely documented and has resulted in the misidentification of many people who were convicted of crimes they did not commit. As discussed, although there are ways to improve eyewitness identification, when considering other race bias, one should rely on additional investigative techniques rather than just eyewitness identification (Gould, Carrano, Leo, & Hail-Jares, 2014). However, in stating that, recent research has pointed to priming as a method for increasing the probability of an accurate identification of a criminal suspect who is of another race.

Weapon focus effect is based on individual difference. There are some people who find a weapon as a novel item that requires attention; however, there are others that deem it as a

specific threat or an item that initiate a fight, flight, or freeze response. Individual responses vary to the weapon focus effect; however, this literature review found that regardless of the individual response a person will perceive, attended to, encode, stored, and be able to retrieve at least some information from memory even if a weapon is present.

Individual differences are one of the most important and most studied estimator variables (Charman & Wells, 1978, 2007; Steblay, 2015). Individual differences are encompassing of social influences, social cues, age, gender, race, and one's ability to perceive and attend in order to transfer information to memory. Individual difference account for how some people may identify with one particular races as opposed to another, ultimately leading to potentially a more conclusive identification of a criminal suspect. Individual differences determine if we are a likable co-witness, which in turn can have a positive effect on the ability of a person to recall a criminal suspect or a crime scene. Conversely, individual difference also determines if we are the type of witness that will change our perspective, and conform to what others believe they may have witnessed.

Finally, individual differences also apply to how implicit and explicit memories are created. If one has an emotional tie to an event, they are more likely to create and implicit memory than someone who does not. An example of this type of implicit memory is the research conducted by Day and Ross (2014) that suggested even people who had no direct affiliation with Michael Jackson maintained implicit memories of his death simply because of an emotional response they had with him as a performer. Ultimately, research has shown us that memories can be both implicit and explicit; however, they are encoded in a logical order and thus can be retrieved in a logical order using memory cues and priming. Priming and memory cues, understanding memory decay, along with moderating system variables, can assist law enforcement with improving eyewitness identification.

System Variables

System variables are within the control of law enforcement (Charman & Wells, 1978; Mickes, 2015). However, in order to control these variables one first has to recognize these variables exist and influence mental processes and behavior (Stebly, 2015). The most commonly studied system variables are the type of photographic line-up, how the photographic line-up is made, the presentation of the line-up, witness confidence statements, and methods used to retrieve memories of the event itself. System variables must be accounted for and best practices must be implemented in order to significantly reduce the number of people who are misidentified (Findley, 2016).

Photographic Line-up Types

Recently, one of the largest system variables that has been researched is the type of photographic line-up used in eyewitness identification (Amendola & Wixted, 2015a; Dobolyi & Dodson, 2013; Finley et al., 2015; H. Flowe et al., 2016; Gronlund et al., 2009; Lindsay & Wells, 1985; Pozzulo et al., 2016; Steblay, Dietrich, Ryan, Raczynski, & James, 2011; Steblay, Dysart, Fulero, & Lindsay, 2001; Steblay, Dysart, et al., 2011). Historically, law enforcement has used a simultaneous photographic line-up when attempting to identify a criminal suspect; however, within the last few years, this identification method has come under attack by attorneys and the criminal justice system alike (Gould et al., 2014; Kent & Carmichael, 2015; Steblay et al., 2001). Steblay (2001) argued that even the International Association of Chief of Police understood the research and as such believed that all law enforcement organizations should be using the sequential line-up in order to avoid more frequent misidentifications. However, there are still several arguments as to which line-up to use and the procedures surrounding those line-ups (Davis, Gibson, & Solomon, 2014; Havard & Memon, 2013; Horry, Palmer, & Brewer, 2012; Kent & Carmichael, 2015; Kneller & Harvey, 2016; Palmer & Brewer, 2012; Porter, Moss, & Reisberg, 2014).

One of the largest arguments against simultaneous photographic line-ups is that they allowed for a comparative analysis of faces. This concept is when the witness will make a comparison of the people in the photographic line-up, and pick the person, who most resembles the criminal suspect. This process of comparative analysis used relative judgement rather than the absolute judgement used in a sequential line-up (Stebly, 2015; Stebly, Dietrich, et al., 2011). A sequential photographic line-up of either type ultimately requires a witness to view one picture at a time without going back to a previous picture, for the comparative analysis, thus resulting in a spontaneous identification, or the elimination of a filler, using absolute judgement (Lindsay & Wells, 1985; Stebly, 2015; Stebly, Dietrich, et al., 2011). There are disadvantages and advantages of both types of line-ups. There are also findings the research associated with each type of line-up that has been uncovered, and that can ultimately be used as best practices when presenting a photographic line-up.

Sequential and Simultaneous line-up.

The most widely suggested type of photographic line-up is the sequential line-up (Findley, 2016). For the purpose of this research project, there will be two different types of sequential line-ups used, a standard sequential line-up and the sequential line-up folder method. The only differences between the two line-ups is the delivery method and back loading. The standard sequential line-up is used at larger departments. When a standard sequential line-up is used, the investigator for the case will prepare the line-up by placing the suspects' picture and pictures of five fillers in one folder. These folders will then be given to an investigator who knows nothing about the case, or the suspect, for presentation to the witness to avoid any undo influences. The folder method is similar in nature; however, it is used at small departments where the investigator may have to present their own line-up. In this case, each picture is put into its own individual folder or envelop and backloads at least four additional empty folders with blank pieces of paper. The folders are shuffled prior to presentation, thus reducing the

knowledge of where the suspect is in the order for both the presenter and the witness. Either of these methods will drastically reduce misidentification of innocent people (Stebly, Dietrich, et al., 2011; Steblay et al., 2001; Steblay, Tix, & Benson, 2013). As I continued to explore which type of line-up is better, I decided I must first define what a line-up advantage is. For the purpose of this paper, a line-up advantage is when correct criminal suspects are identified at a higher rate and innocent fillers or target absent line-ups are rejected at a higher rate (Clark, Moreland, & Gronlund, 2014).

In order to discuss why either the sequential or simultaneous photographic line-ups may have an advantage over one another, we must first examine the research in this area. As previously discussed, research into estimator variables and system variables began decades ago (Charman & Wells, 1978). During his initial research, Wells (1978) concluded that any scientific research into the field of eyewitness identification would best come from examining and influencing system variables rather than estimator variables because law enforcement can understand the implications of research and best practices, and control the variables associated with their jobs. As the research continued into these system variable, and how they can influences identification, the sequential photographic line-up was developed and determined to be reliable and valid (Lindsay & Wells, 1985). However, as research into this area continued people began to question if the sequential line-up was overall a better mechanism than the simultaneous line-up because some argued that less and less people were being identified by a witness. Although there are different types of line-ups, such as the elimination line-up, the simultaneous and sequential type line-ups were examined in this study (Dempsey & Pozzulo, 2013). In order to determine if there was an advantage one way or the other, researchers began comparing and contrasting the two types of line-ups with two primarily different focuses: (1) which line-up type better identified criminal suspects, and (2) which line-up type reduced the misidentification of innocent people (Amendola & Wixted, 2015a; Charman & Quiroz, 2016;

Dobolyi & Dodson, 2013; Goodsell, Gronlund, & Carlson, 2010; Greene & Evelo, 2015; Gronlund et al., 2009; Horry, Brewer, Weber, & Palmer, 2015; Horry, Palmer, & Brewer, 2012; Mansour et al., 2012; Pozzulo et al., 2016; Steblay, Dietrich, et al., 2011; Steblay et al., 2001; Steblay, Dysart, et al., 2011; Wells, Steblay, & Dysart, 2015).

For several years, there have been varying points of view on what line-up type is more successful; however, the first meta-analysis of previous research did not happen until 2001 (Steblay et al., 2001). Steblay et al. (2001) examined 23 papers that contained various tests with over 4000 participants. What the researchers learned was that there was a minimal difference between positive identification of a suspect under real world conditions, and a sequential line-up was more likely to reject an innocent person (Steblay et al., 2001). Years later, in 2011, Steblay et al. confirmed the findings of the 2001 meta-analysis by examining 72 tests of simultaneous and sequential line-ups. During their investigation, over 13,000 participants and various tests were examined. The findings showed a significantly reduced error rate using a sequential line-up (Steblay, Dysart, et al., 2011). Not only did the researchers determine that error rates were significantly reduced, they also showed that accurate identifications were comparable with the simultaneous line-up.

As part of the response to the research findings, several theorists, legislatures, and professional groups determined it was necessary to change the way law enforcement officers used eyewitness identification and how juries were instructed about eyewitness identification (Gould et al., 2014; Kent & Carmichael, 2015; Krieger, 2011; Walsh, 2013). These challenges ultimately led to more questions about the research in eyewitness identification, and more specifically to the system variables that law enforcement can control. Additionally, because of these reforms, researchers began investigating the validity of the findings of previous research projects.

Findley (2016) pointed out that the sequential photographic line-up is part of an on-going and larger reform in eyewitness identification research and testimony. Historical advantages of the sequential line-up include compound-cue activation and compound-cue activation theory in which memories cues are directed at a single target memory rather than a broad spectrum of potential memories (Ratcliff & McKoon, 1994). Further, Ratcliff and McKoon (1994) argued that free association does not accurately predict priming effects. If accurate, this information has implications for not only the identification process itself, but also for any initial or subsequent priming efforts by law enforcement.

In order to continue the examination of the sequential advantage that was posed by Stabley et al. (2001), further research was conducted to compare and contrast various system variables. One of the questions that still plagued researchers is if there is an advantage as posed by previous research to using a sequential line-up (Gronlund et al., 2009). To further examine the differences, if any, Gronlund et al. (2009) recruited 2529 participants to examine several factors in eyewitness identification. In their 2x2x2x2x3 between subject's factorial research design, Gronlund et al. (2009), among other things, examined the sequential line-up advantage that had been reported by Stabley (2001). Gronlund et al. (2009) showed the participants a video of a mock crime scene. They then presented either target present or target absent photographic line-ups to the participant and looked for either a positive identification, a correct rejection of a target absent line-up or a response that would indicate the participant did not know of the suspect was present or absent. The findings suggest that there is no significant difference between a sequential or a simultaneous line-up for both correct rejections or positive identifications, which nullified the suggestion of sequential superiority.

However, there were still other researchers who suggested that one of the types of photographic line-ups would be better than others. To continue this exploration, Goodsell, Gronlund, and Carlson (2010) viewed four different variables in a factorial exploration of a

computer model identified as WITNESS. The factors included: (1) quality of encoding, (2) quality of innocent suspect, (3) level of line-up fairness, and (4) choosing rate (Goodsell et al., 2010). In order to explore the advantage of either a sequential or simultaneous photographic line-up, Goodsell et al. (2010) obtained data from previous research and entered it into WITNESS. During the majority of the study, there was no clear advantage of either process; however, Goodsell et al. (2010) suggested that there is ultimately an advantage to a sequential photographic line-up because the process requires an absolute judgement rather than a relative judgement. Interestingly, one of the researchers who participated in this study had within a year prior to this study claimed there was no distinct advantage for a sequential line-up (Gronlund et al., 2009).

As part of the exploration of which type of photographic line-up had an advantage, several researchers have added estimator variables as part of their overall project. One of these estimator variables is disguise (Mansour et al., 2012). During their research project, Mansour et al. (2012) attempted to determine if there was a particular line-up advantage to either a sequential or simultaneous line-up while the suspect wore different types and levels of disguises. In order to determine if there was an advantage, the researchers conducted two experiments. The first experiment was a 2x2x2x2 between subject factorial design in which line-up type, target presence or absence, presence or absence of sunglasses, or presence or absence of a toque were examined. The second experiment was a 2x2x4 between subject's factorial design in which type of line-up, target presence or absence, and level of disguise was examined. The results suggest that there was no distinct advantage for correct identification in either the sequential or simultaneous photographic line-ups. However, there is a distinct advantage for the sequential line-up in correct rejection of either the entire photographic line-up or the filler (Mansour et al., 2012).

Dobnolyi and Dodson (2013) argued against the sequential line-up and stated that it is less accurate and produces a higher confidence rate which subsequently produces higher rates of false identifications. In order to investigate their hypothesis, Dobnolyi and Dodson (2013) recruited 320 participants and conducted a 2x2x2 between subjects mixed factorial design. The goal of their research was to examine the relationship if any between line-up format (sequential or simultaneous), encoding repetitions, and if the target was present or absent in the line-up. The participants used a computer process to observe suspects and then attempted to identify or eliminate a person in either a sequential or simultaneous line-up. The researchers examined positioning effect, choosing effects, and confidence ratings (Dobolyi & Dodson, 2013). Ultimately, their hypothesis was supported and suggest that sequential line-ups are less accurate and produce higher confidence in the witness which results in higher levels of misidentification.

Amendola and Wixted (2015) supported the research of Dobolyi and Dodson (2013). In order to determine if one line-up type was superior to the other, Amendola and Wixted (2015) examined the prior meta-analyses and observed what they believed was a flaw in the findings. In essence, what they argued was that the identification rates and the diagnostic ratios were incorrect because they did not examine the line-ups that were eliminated by a neutral response. In order to examine this hypothesis, Amendola and Wixted (2015) obtained data from a 2011 American Judicature Society study. The researchers argued that in reality, if one line-up procedure was better than the other, then criminal convictions or pleas of guilt should be higher for either a sequential or simultaneous line-ups. The data studied to examine this hypothesis was 151 previous cases (75 sequential line-ups and 75 simultaneous line-ups) from the American Judicature Society study. In order to examine these previous cases, the researchers recruited 26 people who were all involved in the criminal justice system as either investigators, prosecutors, defense attorneys, or judges. The data that was obtained allowed the researchers to make inferences and suggested that odds of guilt are higher with a simultaneous line-up as

opposed to a sequential line-up. The researchers supported their argument by stating that their results were consistent with current laboratory research that examined receiver operating characteristics that show sequential line-ups make it more difficult to tell the difference between innocent and guilty parties (Amendola & Wixted, 2015a). The final conclusions drawn from this research study suggested findings that contradict the previous meta-analyses.

In order to examine actual experience with real eyewitnesses, Wells, Steblay, and Dysart (2015) conducted research in the field rather than in laboratory conditions in order to examine sequential and simultaneous line-up superiority. In order to examine the superiority of either line-up type, the researchers recruited 494 actual eyewitness victims to crime in four different locations throughout the United States (Wells et al., 2015). In order to complete the research project, the researchers worked with various police agencies in order to create actual photographic line-ups for assorted crimes. The line-ups were created using what can be determined to be best practices and a computer based program that allowed for the viewing of these line-ups remotely by the participants. Best practices will be discussed later in this paper. The researchers examined the number of laps or views by the witness, the type of photographic line-up used, the rejection of a target present or target absent line-ups, and the position of the criminal suspect. The results from the data collected suggested rates for non-identification of a filler were similar between photographic line-up types, that there was no significant difference in identifying a criminal suspect in either line-up type, but the sequential photographic line-up produced significantly lower rates of misidentification than the simultaneous line-up. However, Wells et al. (2015) also noted that the differences in misidentification in the field as compared to the laboratory testing was smaller than previously believed.

Finally, in 2016, in order to expand on previous research, researchers examined additional types of line-ups other than, and in comparison to, simultaneous and sequential line-ups. The four types of photographic line-ups that were used in this research study were

simultaneous, sequential, elimination, and wildcard (Pozzulo et al., 2016). In order to conduct their research, 269 participants were recruited. The participants were presented with a mock videotaped crime scene. After a delay, the participants were then presented with a randomly selected target present or target absent line-up based on one of the four types of line-ups. The correct identification rates for the types of line-ups were compared. The researchers learned that there was no significant difference in the correct identification rates between the four types of line-ups; however, the elimination rate of innocent fillers was highest in the elimination line-up. Ultimately, what this research showed is that even though there are two primarily used types of line-ups, there may be better options for elimination of innocent parties than simply using the simultaneous or sequential line-ups.

Fillers

In order for a photographic line-up of any type to be presumed as valid, one must consider the fillers or the pictures contained in the line-ups that are known innocents. Best practices suggest that all persons depicted in the photographic line-up resemble one another. Ultimately, photographic line-ups that contained highly dissimilar fillers can and should be considered biased (Charman, 2013). Charman (2013) points out there are several convictions of innocent people because of fillers that were dissimilar to the criminal suspect. Several authors argued that in order to be objective, that a researchers and practitioners alike need to remember that psychology, like other sciences, needed to conduct research and practice in a scientific method in order to obtain the best results (Cole, 2013; Dror, Kassin, & Kukucka, 2013; Haber & Haber, 2013; Heyer & Semmler, 2013; Houston, Hope, Memon, & Read, 2013; S. M. Kassin, Dror, & Kukucka, 2013). Some of the practices that are discussed by these authors are a fair, practical, and unbiased line-up.

In order to show the importance of an unbiased line-up using appropriate fillers, Charman (2013) recruited 110 undergraduate students who examined photographic line-ups that

contained fillers who were extremely poor (dud) and extremely good in order to examine the confidence of the selection of the suspect. Of the participants who viewed the photographic line-ups with the duds as compared to those who viewed a photographic line-up without the duds was significantly higher. This research is important because it points out a system variable that is in control of law enforcement, that can affect a photographic line-up, and may determine the conviction of an innocent person. As a system variable, non-similar fillers can elicit a response from a witness for misidentification (Fitzgerald et al., 2013). In order to make this statement, Fitzgerald et al. (2013) conducted a meta-analysis that examined seventeen studies with 6650 participants. Upon examining the previous research, Fitzgerald et al. (2013) determined that the only factors that differentiated identification between one study to another was the type or similarity of fillers. Ultimately, the results showed that the more dissimilar the filler, the more likely the participants were to pick a person who did not look like the others, most often the criminal suspect or the person believed to be the criminal suspect.

Administrator Influences

The person who administers the photographic line-up can influence the decision of the eyewitness either verbally or non-verbally (Clark, Brower, Rosenthal, Hicks, & Moreland, 2013; Gurney, 2015; Rodriguez & Berry, 2014). Administrator influences are a system variables that are within the control of law enforcement and thus needs to be explored. Clark et al. (2013) suggests that when administrator influences happen, that they are generally frowned upon by the criminal justice system, so they are hidden or minimal at best. However, administrator influences could be more than just guiding an eyewitness to pick a specific person from a photographic line-up. They could also include influencing the witnesses' confidence on the choice they made. As an example, Clark et al. (2013) conducted research on administrator influence. In order to complete their research, Clark et al. (2013) recruited 145 undergraduate students as participants and six undergraduate students as line-up administrators. The

researchers created six photographic line-ups (three of which contained a suspect and three of which that did not) and told each of the administrators that the suspect was present and in which position the suspect was located. All suspect and fillers resembled one another, so there was no dud effect on the line-ups. The participants were shown a movie of a mock crime scene. Once the movie was viewed, a brief project was undertaken in order to allow for time between the viewing of the crime, and the viewing of the photographic line-up. When comparing the data received from the control group, and the experimental group, Clark et al. (2013) determined that the administrators were able to steer the eyewitnesses' choice in suspect.

Additionally, current research showed that administer influence can be non-verbal as well as verbal (Gurney, 2015). In order to determine if nonverbal information influenced people as much as verbal information, Gurney (2015) recruited 92 adult participants for his experiment. The participants were shown a video of a mock crime scene and then told they would be taking part in an experiment to test their memory. Gurney (2015) examined non-verbal and verbal factual information that was presented to the witness, as well as non-verbal and verbal misleading information that was presented to the witness by the interviewer. Verbal influence as described by Gurney (2015), could be the interviewer stating that the suspect was on the telephone, and no verbal influence could be the interviewer gesturing that the suspect was on the telephone. The results suggest that both verbal and non-verbal influences can be suggestive to a witness. This is important as it applied to eyewitness identification because a simply negative shake of the head during the presentation of a photographic line-up can be a non-verbal cue that the eyewitness had picked someone that the presenter did not believe to be the correct person.

Double-blind Procedures

Double-blind eyewitness procedures occur when neither the administrator or the eyewitness know if the suspect is present or not (Charman & Wells, 2007). Double blind procedures are important when applied to eyewitness identification because undue influences

from the administrator is a system variable that is within the control of law enforcement. Garrett (2013) suggested that blind eyewitness identification procedures have become more widespread throughout the years, as research has pointed out that administrator influences can unduly change the confidence level of the eyewitness, as well as their choice of suspect. Garrett (2013) went on to show through his research that more states have required double blind procedures in order to reduce the numbers of people who are potentially influenced by the administrators of photographic line-ups.

To examine these statements Rodriguez and Berry (2014) conducted an experiment to determine influences, if any, between single blind and double blind procedures. In order to complete their study Rodriguez and Berry (2014) recruited 249 participants who were assigned to one of four conditions in a 2x2 between subject's research design. The participants were line-up administrators that were either told the location of the suspect, or were not told where the suspect was, in the simultaneous photographic line-up. Once the administrator presented the line-up, they were instructed to fill out a Likert type scale rating the viewers' confidence. The results suggested that the administrator was more likely to record a high level of confidence, when the witness chose the correct person, and was also likely to rate the witness as not credible when they chose a filler.

Research in this area suggested that eyewitnesses can be influenced through both non-verbal and verbal cues. In order to avoid any type of bias, researchers, theorists, and criminal justice professionals recommend double blind procedures for eyewitness identification (Charman & Quiroz, 2016; Fitzgerald, Oriet, & Price, 2016; Garrett, 2013; Rodriguez & Berry, 2014; Wells et al., 2015). It is also important to understand that double blind administration has become a part of best practices in many states, and individual police organizations, and is strongly recommended (Charman & Wells, 2007; Steblay, 2015; Wells, 2014).

Eyewitness confidence

Eyewitness confidence in their selection has a direct correlation to the accuracy of the identification (Wixted et al., 2015). However, eyewitness confidence can be influenced by estimator and system variables alike. As an example, the time between when an event such as a crime occurring, and when the witness views the line-up, has a direct effect on the confidence of the eyewitnesses' choice if one was made.

Horry, Colton, and Williamson (2014) conducted an experiment to determine if time influenced eyewitness accuracy and confidence. In order to test their hypothesis, two experiments were conducted (Horry, Colton, & Williamson, 2014). In the first experiment, 77 participants viewed a video tape of a mock crime with a misleading narrative. Each person was reasonably able to view the suspect. After either a slight delay or a longer delay, each participant was told that they would be attempting to identify the suspect from a photographic line-up. They were also told that a misleading narrative was used during the initial display of the mock crime scene. The results suggested that the participants who had a longer delay before viewing the line-up had a decrease in confidence and accuracy (Horry et al., 2014). The second experiment was directed at 42 participants and showed that source monitoring declined but that there was no effect on memory. Horry et al. (2014) pointed out that confidence and accuracy are higher when a witness observes a line-up as soon as possible. A presentation that is completed sooner, reduces undue influences, such as peers, media, and memory decay.

The research from Horry et al. (2014) is supported by Wixted, Read, and Lindsay (2016). In order to explore the relationship between eyewitness confidence and accuracy, the researchers conducted a meta-analysis of four retention interval studies. The findings suggested several concepts with the most important being that even after nine months of having to retain information, that the relationship between confidence and accuracy remains strong (Wixted, Don, & Stephen, 2016).

Components of Applied Line-up Theory

Charman and Wells (2007) suggested there are many components that should be considered when considering an applied line-up theory. One must consider estimator variables such as social influences and how these variables effect memory. Additionally, one must completely understand the purpose of a line-up. As seen in this literature review, the goal is not to identify a suspect, but to test a hypothesis about if the perpetrator is in the line-up. Thus, if an eyewitness confirms that the suspect is present, then it is hypothesis confirming only. Further, Charman and Wells (2007) argued that a line-up should be designed to eliminate an innocent person, and identify a suspect, and that these distinctions can be made mathematically. Additionally, each line-up presented needs to consider four responses: (1) identification of a suspect, (2) a not present response, (3) identification of a known filler, and (4) a do not know response.

Further, when considering an applied line-up theory, one needs to considered memory processes that are either automatic or deliberative. In essence, does the person viewing the line-up immediately recall the suspect from memory, or do they eliminate all other parties then choose who the suspect is. Regardless of the type of line-up, this recognition task should be automatic and deliver absolute judgement rather than relative judgement. Charman and Wells (2007) argued that an automatic response is more closely associated with accuracy, whereas a deliberate examination of the suspect, reduce accuracy. Finally, the quality of the memory must be considered. If the memory is implicit and detailed, the witness is more likely to make an accurate and more confident identification. In order to assist in retrieving memories, one must

consider how memories are retrieved and more specifically, what law enforcement, as a system variable, can do to assist in the retrieval of memories.

Interview Types

In order to assist in recalling information from memory, one must consider how the information is encoded, stored, and retrieved. Additionally, one must consider memory cues and aids such as priming. One could argue that the interview type initially used at the scene of the crime, and any subsequent interview, could influence encoding of memories, and at a minimum, the ability to retrieve the memories at a later time. As it applies to this research project, I suggested that a Free Recall style of interview is often used by police at a crime scene. Often times, this type of interview may be considered a question and answer interview, or simply, an interview that allows the interviewee to respond as they see fit. Free Recall interviews may be effective for solving immediate crimes; however, one could argue there are better techniques to employ (Fisher & Geiselman, 1992, 2010). Fisher and Geiselman (2010) suggested that a cognitive interview will elicit more information and better benefit the victim or witness of a crime. In order to have an appropriate interview, the interviewer should ask the interviewee to mentally recreate their state of being (cognitively, emotionally, and physiologically) that they were in at the time of the event. Emotional recall should not be discouraged because it is tied to implicit and flashbulb memories and can be therapeutic for the person talking. Witness and victims should be allowed to close their eyes when concentrating on an answer to reduce visual interference (Fisher & Geiselman, 1992, 2010). Interviewers should defer questions until a later time, depending on the witnesses emotional and mental state, and should structure questions around what the eyewitness or victim was talking about rather than where the interviewer wants them to go. Witnesses can be asked to describe the events from their perspective as well as from another's perspective multiple times through the interview, thus facilitating recall. Fisher and Geiselman (1992, 2010) encouraged the

interviewer to tell the interviewee not to guess. These types of cognitive interview questions, using a timeline interview technique, should be used in order to prime memory and preserve it for later use. Ultimately, the goal of memory retrieval is not to just recall information, it is to recall detailed information when needed.

Free Recall

A Free Recall interview is in essence non-leading and is specific to the individual. As used by Gabbert et al. (2009), a Free Recall interview is in essence providing a pad of paper and a pencil to the person being interviewed and asking them to provide a written statement of the crime in question. Additionally, a Free Recall interview or instructions can be used across ages and social influences, as it specifically targets a persons' memories of what they saw (Gawrylowicz, Memon, & Scoboria, 2014; Gawrylowicz, Memon, Scoboria, Hope, & Gabbert, 2014). However, there are inferences that can be made that a Free Recall style of interview, because it is non-directive, can be affected by stress (Krix et al., 2016). However, Free Recall does not provide retrieval support for memories (Krix, Sauerland, Merckelbach, Gabbert, & Hope, 2015). In order to examine the concept of why this interview style is widely used by law enforcement, I referred to the research of Krix et al. (2015). In their research project Krix et al. (2015) examined data from two other experiments in which 125 participants were either provided with recall support using the Self-Administered Interview (SAI), or they did not have retrieval support, and simply provided an interview using Free Recall. A portion of the participants from the previous experiments participated in a divided attention group, which is even more important when examining this type of interview, as a witness to a crime will likely have divided attention. In their overarching analysis, Krix et al. (2015) recognized that a mock crime scene film had been shown to all participants and that each participant was asked to complete a SAI or a Free Recall statement. The statements provided by all participants were then coded and evaluated. In their study Krix et al. (2015) report there was no significant

difference in working memory capacity between the participants who had retrieval support and those who did not. In essence, Krix et al. (2015) argued that Free Recall is an appropriate method of information gathering; however, their other research suggested that recall support using cognitive interview style questions allows a person to recall more information over time (Krix et al., 2016). This research is supported by Unsworth (2008) who examined both delayed, and final Free Recall, and learned that although output position may vary, information is recalled in context. Further, his work suggested that there are temporal-contextual cues that assist in memory recall (Unsworth, 2008). Research into Free Recall of memories must still consider various theories that state memories are chained, ordinal, or positional, all of which show an order that can be viewed as temporal in nature.

Timeline Interview

As previously discussed, memory can be viewed in a chaining, ordinal, and positional theories (Henson, 1998). In essence, these theories stated that memories are chained together and rely on one another to get to each successive memory, are in order with the strongest memory first, or are in a specific position that will link to the next memory. Henson (1998) suggested that the most recent memory may be the starting point for one person while another person may work from the oldest memory and work forward in a chronological fashion. Henson (1998) suggested a start-end model of encoding and argues that memories are in order from the beginning to the end of a sequence. Still others would suggest that memories have a beginning, end, and an overlap in time making memories temporal. (Shulan, Harter, & Graesser, 2009). Baddeley (2014) supports Henson (1998) and Shulan et al. (2009) and stated that episodic memories are temporally ordered, and thus, context in time plays an important role in

retrieving information. The most important concept of these theories is that memories are generally in order, regardless, of the starting point of the person trying to retrieve the memories.

Calendar and time diaries as well as event history timelines have been used in social science research and as part of various therapies (Belli, 2009). According to Belli (2009) time diaries summarize events in time and is based in temporal sequencing. Additionally, Belli (2009) suggested that calendar interviewing focuses on an event history, and encouraged the person being interviewed, to remember events in time and in autobiographical order.

Hope, Mullins, and Gabbert (2013) suggested a Timeline technique and argued that not only does it facilitate recall, it is person centered using cognitive interview components. The researchers argued that their technique facilitated context and recall mnemonics as suggested by Fisher and Geiselman (1992, 2010). The Timeline technique involved temporal ordering and context (Hope et al., 2013). The process included three elements which are: (1) a large piece of cardboard with a line running across the midpoint that symbolizes temporal spacing from start to finish, (2) person description cards, and (3) action cards. The people assigned to the Timeline technique in their research project were allowed to start where they wanted to in time, were allowed to take their time describing the people on the person cards, and were allowed to give description of actions that each person took on an action card. The participants were then allowed to move these cards around until they were satisfied with the order, thus completing the event timeline. The participants then used this event timeline to complete a report of what occurred. No time restrictions were placed on either the Timeline group or the Free Recall group of participants in this research (Hope et al., 2013). Hope et al. (2013) were able to show that the Timeline technique group remember more specific details of a crime in progress than the Free

Recall group. However, they did not explore the ability of the participants to identify a suspect in a photographic line-up, or the effects of the Timeline technique on this process.

Best practices

There are several concepts that can be considered as best practices located during this literature review. These best practices were used during this research project in order to reduce the number of system and estimator variables that could potential effect the results. First, regardless of the type of photographic line-up being prepared, an independent observer will verify that all fillers are reasonably similar in physical description and characteristics. Additionally, all backgrounds of the pictures will be similar in nature and have no distinct characteristics that would differentiate one background from the other. This process will work to reduce the dud effect (Charman, Wells, & Joy, 2011).

Second, this research project used blind or double-blind procedures in presenting eyewitnesses with photographic line-ups (Beaudry et al., 2015). These procedures were used to ensure the person administering the line-up did not know who the potential criminal suspect was, or where they were placed in the order, so administrator influence will be reduced (Charman & Quiroz, 2016). Additionally, double blind procedures allowed for accurate recording of eyewitness identification decisions without the interpretation of a person who is vested in the results (Rodriguez & Berry, 2014). Third, all sequential folder method line-ups will be back loaded to ensure that the eyewitness, and the administrator, do not know which folder or envelope is empty, or where the potential suspect is in the order, to ensure a more conservative response and reduce the perception of the eyewitness or the administrator that the next envelope or folder is the criminal suspect (Horry et al., 2012).

Fourth, the number of laps or times the eyewitness is able to view any photographic line-up was limited to one time. As shown in the previous research, confidence rates increase with the number of times an eyewitness is allowed to look at a photographic line-up. However, as

confidence increases, so does the rate of choosing and so does the number of inaccurate identifications (Horry et al., 2015; Steblay, Dietrich, et al., 2011).

Finally, written directions to include appearance change instructions, instructions that the suspect may or may not be present, and that the eyewitness does not have to select anyone were used (Steblay, 2015). Eyewitness confidence statements were used to determine how confident the person was in choosing a criminal suspect, if they made a choice. Both of these forms were given to the eyewitness by the person administering the photographic line-up in order to reduce undue influences.

Summary

Although there is continued debate in the literature about which type of photographic line-up is superior to the other, there is little doubt that flaws exist when using either the sequential or the simultaneous photographic line-up for eyewitness identification purposes. Some of these issues are the result of estimator variables that law enforcement does not control. These estimator variables include age, alcohol use, weapon focus effect, other race bias, individual differences, and social cues or influences.

Other influences are system variables that law enforcement can control. These system variables are type of interview, type of photographic line-up, the creation of the photographic line-up with appropriate fillers, witness confidence scales, witness instructions, double blind or blinded procedures, and the ability to support the eyewitness identification or rejection with other evidence.

Many researchers and theoretical perspectives suggested that interviews conducted by law enforcement need to be completed using appropriate cognitive interview or similar strategies. As shown, the interviews discussed by several of the researchers are based in applicable theory and scientific discovery and promote better recall, as well as being more person centered. One practice theory gap identified suggested that even though better interview

techniques are available, law enforcement still ignores science, and focuses simply on an end goal of getting the information they deem necessary. Although law enforcement in general, is starting to identify this gap, significant changes still need to occur (Kent & Carmichael, 2015; Krieger, 2011; Walsh, 2013).

As Charman and Wells (2007) suggested, the goal of an applied line-up theory is not to identify a criminal suspect. The goal is to simply test a hypothesis to determine if a person in a line-up was involved in a crime. If they were not, the line-up and people therein should be rejected, if the eyewitness can clearly and confidently confirm that none of the depicted people were involved. However, if the eyewitness does not reject the line-up, and simply states they do not know if the suspect is present or not, the hypothesis is not rejected and alternative methods of suspect identification should be explored. Ultimately, the goal of applied line-up theory is to present best practices, basic knowledge, and procedures to reduce wrongful convictions based on eyewitness identifications.

Chapter 3: Research Method

Introduction

The main purpose of this experiment was to determine if memory preservation tools influence eyewitness identification. In order to determine if one memory preservation tool influences memory better than another, the participants were exposed to a video of a mock crime scene. Immediately after exposure, the Free Recall group (no guided memory preservation), and the Timeline technique group (memory preservation using the timeline technique) were given the opportunity to preserve memories to protect against memory decay. The second part of the experiment challenged current practice in eyewitness identification by considering photo line-up type. Even though most researchers believe a sequential line-up was more effective in reducing misidentification (Stebly, Dysart, et al., 2011), there were still researchers who believe that a simultaneous line-up was needed because it was more helpful in positively identifying a suspect (Gronlund et al., 2009; Steblay, Dietrich, et al., 2011; Steblay et al., 2001; Steblay, Dysart, Fulero, & Lindsay, 2003; Steblay, Dysart, et al., 2011).

This experiment considered variables such as change blindness (Fitzgerald et al., 2016), individual differences of the observer (Andersen, Carlson, Carlson, & Gronlund, 2014), the observers gender (Davies et al., 2016), the observers race (Connelly, 2015; Davies et al., 2016), the observers age (Memon & Gabbert, 2003), as well as several more scientific advances that have taken place over the last several years (Stebly, 2015). This experiment considered system variables (variables that are controlled by law enforcement) and estimator variables (variables that cannot be controlled by law enforcement) that have been previously researched to include double blind procedures (N. Steblay, Wells, & Douglass, 2014). Further, this experiment used the previous research as a baseline to examine the effectiveness of memory preservation tools to increase spontaneous identification and minimizing reminiscence by considering how estimator variables can result in an inaccurate identification.

Research Methodology and Design

This quasi-experimental between subject's design examined two factors. This experiment was defined as quasi-experimental because the participants are a sample of convenience, are not randomly selected from the population as a whole, and are only randomly assigned (Black, 2009; Trochim & Donnelly, 2008; Trochim, Donnelly, & Arora, 2016). A quantitative analysis was appropriate for this study as it removes individual feelings, interpretations, and subsequently reduces potential biases. Factor one was photo line-up type which has three levels (simultaneous, sequential, and sequential photo method). Factor two was memory preservation which also has two levels (Timeline technique and Free Recall). In this study, the sample or population was located at various sites, in various classes, at three different colleges or universities. I attempted to locate qualitative research designs or methodologies; however, I ultimately stopped the search simply because all previous research compared at least two groups directly, and a statistical analysis that was data driven rather than person or interpretation driven was more logical.

Population/Sample

GPower requires a total of 150 participants (Gpower; Faul and Erfelder, 1992). However, to ensure completeness an additional thirty participants will be attempted to be recruited. Participants (N=191) were recruited from the student population at local colleges and universities in Jackson County, Michigan. Participants were recruited in accordance with the regulations of each college or university and in accordance with institutional review board requirements at Northcentral University. Letters of permission from the colleges and university are attached in the appendix. Participants provided general biographical information to include ethnic background, gender, age, education level, for descriptive statistical analysis purposes as well as for further examination of the main effect. Participation was completely voluntary in order to eliminate any perception of coercion from this experiment. Participants were randomly

assigned to one of the three memory preservation groups. Additionally, a description of the study to include requirements, benefits, and anonymity intentions are attached in the appendix.

Materials/Instrumentation

Targets

The targets for this experiment was a white male in his late teens who was recruited to act as “criminal suspect”. The “criminal suspect” in the staged crime scene will also be used as a target or suspect in the various photographic line-ups. For that purpose, the target was photographed to show the top of his shoulders to the top of his head using a front view.

Video recorded staged crime

The video recorded staged crime was recorded in a shopping mall during non-peak business hours. The video shows a teenage girl actor (family member of the author who volunteered to help with this experiment) sitting in a common area. The actor was depicted using her cellular telephone briefly, and then she got up to continue shopping. The actor left behind her purse. The criminal target entered the scene, looked around to verify that no one was coming back for the purse, took the purse, and left the scene. The total length of the video was 13 seconds.

Photographic line-ups

I created six, six person photographic line-ups. Three line-ups will be target present, and three will be target absent. The target present photographic line-ups contained five fillers and the target. The target absent photographic line-ups contained six fillers (in the target absent photographic line-ups, the five fillers from the target present photographic line-ups were used; however, I also used an additional filler). For the photographic line-ups, the target was not wearing the same clothes he wore during the making of the video. Additionally, the fillers were selected based on their physical similarities to the target (Stebly, 2015).

Photographic line-up instructions

There were two sets of instructions for the photographic line-ups. These instructions were typed out and presented based on the type of photographic line-up used. These instructions were typed so they could be read aloud by an assistant which will ensure double-blind standards. The instructions were based on recommended language and included the following for simultaneous photo line-ups (Stebly, 2015):

1. You are going to be shown a set of photographs.
2. You may take as much time as you need to examine the line-up; however, once you view and/or dismiss the line-up, you will not be allowed to view it again.
3. If you see the person you saw commit a crime, please identify that person.
4. If you do not see the person you saw commit a crime, please tell me that he is not present in the line-up.
5. If you are not sure the person you saw commit a crime, please tell me that you do not know if the person is present.
6. After you decide, you will be asked to tell me in a percentile, how certain you are of your decision.
7. Remember, the guilty person may or may not be in the photographic line-up, and he may or may not have taken steps to change his appearance such as altering his hair length, shaving, losing weight, or changing his clothes.

Sequential photographic line-up instructions:

1. You will be shown a series of photographs, one at a time.
2. The photographs are in a random order.
3. For each photograph, you must determine if the criminal suspect is the person you just saw.

4. You can take as much time as you want with each photograph; however, once you move on to a different picture, you may not go back to a previous picture or change an answer that you may have given.
5. All photographs will be shown to you even if you have already selected a person from the photographic line-up.
6. If you see the person who committed the crime, please identify him.
7. If you did not see the person who committed the crime, please say that the person is not present.
8. If you are not sure if the person who committed the crime is present, please say so.
9. After you decide, you will be asked to tell me in a percentile, how certain you are of your decision.
10. Remember, the guilty person may or may not be in the photographic line-up, and he may or may not have taken steps to change his appearance such as altering his hair length, shaving, losing weight, or changing his clothes.

Memory preservation tool

Memory preservation tools included Free Recall and the Timeline technique. Free Recall is when an observer is given an eight and a half by eleven pad of lined paper and a black ink pen. The observer was told to write as much about the crime scene and the criminal suspect as they remembered. The Timeline technique is in essence a duplication of the research of Hope, Mullis, and Gabbert (2013). This technique used cognitive interview style instructions in order to enhance the eyewitnesses' ability to recall information and to provide specific details of the crime and criminal suspect (Fisher & Geiselman, 1992, 2010; Hope et al., 2013)

Operational Definitions of Variables

There were two independent variables in this study, one has two levels and the other has three. The first variable with two levels is "type of memory preservation tool" and the levels are

as follows. The main group is the timeline technique or the timeline technique group (memory preservation using the timeline technique). In this group, the randomly assigned participants were given this memory preservation tool immediately following the playing of the crime scene video. They used this tool that is closely designed after the cognitive interview and event history or timeline diaries (Gabbert, Hope, & Fisher, 2009; Hope et al., 2013) to encode and store and later retrieve information about the crime scene. The second group was the free recall group (no guided memory preservation). The free recall process is when a randomly assigned participant is provided a pad of paper and a writing instrument and are told to write everything they can remember about the crime scene and the suspect and not to worry about making mistakes (Wright et al., 2008). The randomly assigned participants wrote in their own terms, using their own observations and memories with no guided preservation. The third group is the control group (no memory preservation). This randomly assigned group had no memory preservation. This group did not have the opportunity to record their memories in writing and was requested to attempt to identify or exclude a criminal suspect without any type of memory preservation to assist in determining if memory preservation as it applies to crime scene and criminal suspect identification is possible. The working hypothesis was that memory will be better in group one relative to group two and relative to group three.

The second factor is type of line up and there were three different line-ups that included, sequential, simultaneous and sequential folder method. In the sequential line-up, the randomly assigned participant were shown an eight and a half by eleven black and white photograph of a filler or a criminal suspect. These photographs were presented one at a time. Once the picture was presented, the participant was required to determine if the picture is that of a criminal suspect or a filler or to provide an answer of I do not know. The picture was of the filler or criminal suspect from the shoulders up and was a front view of the person rather than a profile. In this sequential line-up, a total of six pictures were presented (Stebly et al., 2001). The

primary goal of a sequential photo line-up of any type is to increase the chances of a spontaneous identification (Stebly, 2015; Stebly, Dietrich, et al., 2011).

In a simultaneous photo line-up, six pictures were presented to the participant at the same time (Dobolyi & Dodson, 2013). These pictures contained a criminal suspect and five fillers, or six fillers. Historically, the simultaneous photo line-up has been used by law enforcement for criminal suspect identifications; however, it has also led to false identifications more often than the sequential line-up (Wixted, Mickes, et al., 2016). For the purposes of this study, six pictures were embedded into one eight and a half by eleven piece of paper. All pictures were the same size, were black and white to hide any irregularities, and were similar in description. The participants were able to look at all six photographs at the same time and were asked to either identify the suspect, state the suspect is not present, or state that they are not sure if the criminal suspect is present.

The final level is the sequential photo line-up folder method. This identification method requires that the sequential photo line-up is presented randomly and blinded (Stebly, 2015). This method is used as smaller departments when not enough law enforcement officers are available to present a double blinded photo line-up. In a sequential photo line-up folder method, ten folders are selected. Six of the folders contained photographs that included the criminal suspect and five fillers or six fillers. The remaining folders contained a blank white piece of paper to ensure backloading (Horry et al., 2012). The folders were shuffled in front of the randomly assigned participant to ensure randomness. The participant was then required to open all folders, one at a time, and view either the photograph or the blank white piece of paper. The participant was required to view all photographs and to decide if the criminal suspect was present, was not present, or if they do not know. Once each photograph was viewed, the participant was not able to view the photograph again in order to ensure a spontaneous identification and to reduce the number of laps or presentations (Stebly, 2015; Stebly,

Dietrich, et al., 2011). Black and white photographs were used to reduce differences in hair color, eye color, complexion, and other estimator variables.

The target location or schema in this study was a crime scene. The dependent variables being examined are memory preservation and accuracy of identification. Therefore, to determine if memory had been preserved, stimulus items needed to be given a rating or numerical value to operationalize the dependent variable of memory and accuracy of identification. In order to complete this operationalization for memory preservation, each free recall statement and timeline statement were reviewed and coded by me to determine how many people, actions, objects, or setting details were recorded in accordance with previous cognitive interview tools (Wright & Holliday, 2007). The second dependent variable, accuracy of identification, was also defined as target present (accurate identification), target absent (accurate identification that the criminal target is not present), false identification (inaccurate identification of a filler), or do not know (not indicating one way or the other). Each response will be coded numerically (1-accurate identification of the criminal suspect or elimination of all fillers, 2 – no identification or an I do not know response, and 3 – misidentification of a filler).

Study Procedures

All Institutional Review Board requirements were met and IRB approval was obtained before initiating the research study. Before beginning the experiment, each of the participant was presented with, read an informed consent statement, and I read the informed consent statement aloud. The informed consent statement is attached in the appendix. All participants are identified as numbers only to ensure anonymity. After the participant's consent to their involvement in the study, the target videos stimulus was display by an assistant and took approximately 13 seconds. The mock crime scene was a non-violent theft to safeguard against any trauma the participants was subjected to.

The participants were then randomly assigned to either the Timeline technique group, the Free Recall group, or the no memory preservation control group. This process was completed when the participants left the room and randomly obtained a packet from a box by the door. The participants left the meeting room and went to a testing center with their packets. Those who chose to participate did so, while those who chose not to participate simply sat and left after a few minutes. This accounts for the unequal number of participants in each group.

The no memory preservation group was provided with a number search puzzle while any other participants completed their assigned task by following the written instructions contained within the packet. This was done so no random person who was witnessing another in the testing center would know not only who was participating, but what group the person may or may not have been assigned to. An assistant who has not been involved in the presentation of the video stood by outside of the testing center to collect the packets from the counter when the participants were completed. This ensured that even the assistant did not know who was participating in the study. Once all data was collected, they were code, analyzed, and the data was transferred to a spreadsheet. This documentation was for data collection one.

After a distraction, the same procedures of documenting the scene were completed again for all groups. Twenty-three participants in the first group chose not to repeat the procedures and were thus eliminated from the participant pool. Three failed to follow instructions and were also eliminated from the participant pool, thus 191 total participants completed the second phase of data collection. All documents from the second phase were also collected and coded to determine if memory decay occurred or if there was an increase in details remembered (reminisce).

All three groups (timeline technique, free recall, and no memory preservation) were then presented with a randomly selected type of photographic line-ups from their packet immediately after time two. The participants read the instructions and were also read the instructions by an

assistant. The participants were then present with the line-up. Responses were coded in accordance with the operationalization of the variable. A post-line up questionnaire that includes confidence level was completed by the participants who selected a suspect. All data obtained from this study was collected immediately from both the participants and assistants to safeguard not only the study itself, but the data collected.

Data Collection and Analysis

As described, this experiment had three sets of data (memory preservation data in both time one and time two, and photographic line-up data) that was used to study the research hypotheses. Memory preservation data was collected through the analysis of the description provided by the participants. As an example, if the participants were shown a video stimulus that depicts a boy riding a red bike across the lawn, it would be coded boy (1-P), riding (1-A), red (1-O), bike (1-O), across the lawn (1-S) which classify Actions (A), Person (P), Object (O), or Surrounding (S) detail (A. Wright & Holliday, 2007). The analysis required the documentation of inaccurate information as well as the documentation of accurate information. In order to complete this process, inaccurate responses were subtracted from the total number of accurate responses. By way of example, if a person successfully identified eight people but inaccurately identified two, then the total score for people was six. Photographic line-up responses were also coded numerically and followed these procedures: 1-accurate identification of the criminal suspect or elimination of all fillers, 2 – no identification or an I do not know response, and 3 – misidentification of a filler. Group means were calculated from the data. Data was analyzed to determine if there is a mitigating variable that provided a memory preservation advantage. As to research question one, a between subjects t-test was used to analyze the data (Bennett, Briggs, & Triola, 2012). An analysis of the data allowed conclusions to be drawn about the memory preservation tool and the ability to recall information from a crime scene. Additionally, because the number of accurate versus inaccurate identifications is a simply frequency count, Chi-

Squared analysis was used to answer research questions two. All data collected was analyzed using SPSS for Windows. All data is currently being kept and maintained on an encrypted external hard drive to ensure confidentiality of data. Data will be maintained for seven years only.

Assumptions

There are several assumptions that were made to conduct this study. First, it is assumed that all participants were willing to put forth effort to view, recall, and document their observations. Further, it is assumed that all answers provided by the participants were accurate to the best of their belief rather than just guessing. Further, it is assumed that the population of the participants is representative of the population as a whole. Finally, it is assumed that the information obtained from the participants was coded and analyzed appropriately (Black, 2009; Trochim & Donnelly, 2008; Trochim et al., 2016; Vogt, 2007).

Limitations

There are several limitations to this study. First, the population being studied is a sample of convenience, and thus may not be representative of the population as a whole. Secondly, although this study attempted to mitigate system and estimator variables, it is likely they were not all mitigated. By way of example, a portion of the population was not of the same race as the criminal suspect, thus there are likely going to be cross-racial identification issues (Connelly, 2015). To mitigate these limitations, an appropriate statistical analysis that considers type I and type II errors was used.

Delimitations

For this research study, a quantitative research design was most appropriate because the research study is based around variables that can be manipulated to determine potential influences whereas a qualitative or mixed methods design may not be the most appropriate as some system variables and estimator variables are not prone to observations (Black, 2009).

Variables selected to be researched are not only critical to social science research, but they are also critical in law enforcement practice. By way of example, memory is suggestible, will potentially decay, and can conform with others memories (Allan et al., 2012; Allen & Gabbert, 2013; Charman & Wells, 2007; Thorley, 2013). However, this research study suggested that memory decay, suggestibility, and conformity can be mitigated by an appropriate memory preservation device that in turn can be analyzed quantitatively (Charman & Wells, 2007).

Theoretically, Applied Line-up Theory considers all of these variables and offered ways to mitigate misidentifications (Charman & Wells, 2007). Conceptually, when these variables are controlled or mitigated, one may potentially enhance the body of knowledge in social science research. Finally, the population studied is relevant to real world practices and was representative of real world variables. As an example, the population studied varies in ages, races, and genders, thus allowing for an examination of how these variables may affect accurate identification (Andersen et al., 2014; Bindemann et al., 2012; Connelly, 2015; Davies et al., 2016).

Ethical Assurances

Everything required by the institutional review board (IRB) was completed before the research study began. Informed consent was defined, and all requirements were put in writing for the participants. IRB requirements and informed consent are attached with the dissertation manuscript and submitted to Northcentral University for review. Additionally, although concepts such as weapon focus are variables in eyewitness identification (Carlson & Carlson, 2014), a weapon was not used in this study in order to mitigate any trauma a participant may feel. Only a non-violent video was used. Additionally, confidentiality was maintained. All research participants are identified as a number only, the data collected, and the research results are maintained on an encrypted external hard drive to maintain confidentiality of the participants and data to ensure a quality experience.

Summary

It is apparent that forensic science has shown that eyewitness identification has been faulty (Beety, 2015; Kent & Carmichael, 2015; Steblay, 2015). However, there are ways to ensure that eyewitness identification becomes more robust, by identifying practice theory gaps, and continuing to research these areas. This research study focused on a specific way to eliminate confounding variables such as age, ethnicity, and duration of time by focusing on memory enhancement (Andersen et al., 2014; Beety, 2015; Bindemann et al., 2012; Canter, Hammond, & Youngs, 2013; Clark et al., 2013; Hope et al., 2012).

When considering the various types of research designs available to a social science researcher, I decided to use a quantitative research design. A quantitative research design limits the amount of input the researcher has by reducing influences such as likableness of the participants, bias, and observational influences (Black, 2009; Trochim & Donnelly, 2008; Trochim et al., 2016). This research project utilized a quantitative research design that was able to code observations through a validated and reliable method by appropriate coding responses given by the participants (Steblay, 2015; Wright & Holliday, 2007).

Once the coding of the responses was completed, the data was entered into SPSS for windows to process both the descriptive statistics as well as to complete a between subjects t-test and chi-square analysis. A between subjects t-test is an appropriate statistical analysis as there are two independent variables being studied in order to test the hypotheses (Bennett et al., 2012). A chi-square analysis is appropriate because it is a frequency analysis. Ultimately, using an appropriate research design, competent data collection and analysis, one will be able to make inferences as to how memory preservation interacts with accurate criminal suspect identification.

Chapter 4: Findings

Overview

The general aim of this study was to investigate whether different techniques could facilitate memory for events and reduce misidentification when participants were eye-witnesses at crime scenes. The study investigated two elements of eye-witness testimony. In one element, participants were allocated to one of two memory groups, a Free Recall group or a Timeline group. The Free Recall group were asked to review a scene and recall as many features of that scene as possible. The Timeline group were asked to focus on specific features. A series of between-subjects t-tests examined if the number of features participants recalled after watching a crime scene was different depending on which memory preservation group participants were in. Each group were tested twice, once in week one of the research project and then again, a week later. It would have been possible to just ask participants to do the task once but it was felt that asking participants to do the task twice would allow some within-study replication just to be sure any differences were consistent across the different times. Participants were given a distraction task between testing as well to optimize that recall was not just remembering what they remembered before.

The second element of the analysis examined if presenting information using three different form of photographic identification types resulted in better positive identifications. The three different forms of photographic identification were: (1) simultaneous photographic line-up, (2) sequential photographic line-up, and (3) sequential folder method photographic line-up. The dependent variable was dichotomous and simply assessed if the person was right in choosing the right target (out of a possible six targets). A chi-square analysis examined if there were significant differences between the groups in the frequency of successful responses in identifying a suspect present in a line-up or eliminating a filler from a suspect absent line-up.

Q1: Is there a significant difference in memory recall for various features e.g. actions, objects, people, and setting items at time 1 and time 2 between participants who were in the Free Recall group (e.g. those told to recall as much they could) compared to the Timeline group (e.g. those prompted to focus on specific elements).

Q2: Is there a significant difference in frequency of accurate identification of a suspect (dependent variable) when individuals were presented with a photo line-up using a sequential, a simultaneous or a sequential folder method?

This chapter discusses results of the research project by organizing the findings into two primary sections. The first section are the findings as it applies to research question one and the second section will focus on the findings for research question two. After examining the initial findings associated with research question one, there was the opportunity for some finer grained additional analyses so this was conducted.

Validity and Reliability of Data

For the first research question, there were two groups, a Free Recall group (Recall) and a Timeline (Timeline) group. Both these groups were shown a scene and asked to memorize features of the scene. The features were broken down into categories. The features were categorized as action, person, object and setting features. The total number of features participants recalled were recorded for each category. The measures were taken twice, one in the first week of the research project and again a week later. This was done for each category of feature i.e. action, person, object and setting and then a pooled value for all the categories combined i.e. the total number of features they remembered.

Before conducting any analysis, because the number of items recalled is a continuous variable, assumptions of normality were tested for each variable in research question one i.e. mean action, person, object and setting features recalled plus the total number of objects recalled. When examining normality, there are three keys to examining distribution: (1) the

histogram has a single peak, (2) the histogram is symmetrical, and (3) the histogram is bell shaped (Bennett et al., 2012). Bennett et al. (2012) articulate that if a frequency falls under a normal curve then it is normally distributed and can be described by the mean and standard deviation. The findings revealed that all variables were normally distributed and appropriate for analysis using a paired samples T-Test.

Table 1

Skewness and Kurtosis

	Skewness	Kurtosis	<i>n</i>	<i>M</i>	<i>SD</i>
Time 1 All	.039	-.429	130	50.08	23.42
Time 2 All	.476	-.544	130	50.88	24.09

Participants

A total of 217 participants were recruited for this study. However, there were several participants who either failed to return after the distraction period or who failed to follow instructions. Thus, a total of 191 participants (144 females and 47 males; 18-31 years of age; $M=21.29$ years, $SD=8.35$) completed the research study. Of the 191 participants, each was a college student with a minimum of one year and a maximum of five years of education ($M=2.48$, $SD=.983$). Additionally, 151 of the participants were Caucasian, 35 were African American, and five were Hispanic ($SD=.483$).

Answering research question one

Is there a significant difference in memory recall for various features e.g. action, object, person, and setting either from time 1 or time 2 between participants who were in the Free Recall group (e.g. those told to recall as much they could) compared to the Timeline group (e.g. those prompted to focus on specific elements)?

Table 2

Means and standard deviations for the different features at Time 1 and Time 2.

	Research Phase	Group Assignment	<i>n</i>	<i>M</i>	<i>SD</i>
All Items	Time 1 All	Free Recall	62	44.35	27.19
		Timeline	68	55.31	18.03
	Time 2 All	Free Recall	62	45.10	25.57
		Timeline	68	56.15	21.51

Table 2 shows that in general, the Timeline group remembered more items (objects, persons, settings, and actions) in total than the Free Recall group. In examining the means for each group, it was apparent that the Timeline group remembered approximately 25 percent more items than the Free Recall group. This resulted in an additional question, which was, are there specific types of items that the Timeline group is remembering better than the Free Recall group. To examine if there were significant differences between the Timeline and Free Recall group in terms of the number of features, several analyses were conducted using a between subjects t-test where the independent variable was group type i.e. Timeline v Free Recall and the dependent variable was the number of items recalled. The findings from these analyses appear in Table 3.

Table 3

Results of significance tests for the number of items recalled

	Free Recall			Timeline			<i>t</i>	<i>p</i>
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>		
Time1All	62	44.35	27.19	68	55.31	18.03	-2.680	.009 *
Time2All	62	45.10	25.57	68	56.15	21.51	-2.674	.008 *
ActionAll	62	18.82	14.07	68	30.78	11.83	-5.217	.000 *
PersonAll	62	37.61	21.14	68	40.32	16.61	-.808	.421
ObjectAll	62	22.87	13.61	68	21.74	10.41	.537	.592
SettingAll	62	10.15	10.43	68	18.62	8.76	-5.030	.000 *

Results

Table 3 shows the results from the between subjects t-test. Participants took the test twice, once in week one and then again in week two. A between subjects t-test was conducted to compare the ability of the Timeline group and Free Recall group (group type independent variable) to recall various features e.g. action, objects, persons, and settings (dependent variable) at time one or time two. There was a significant difference in scores for time1all for the Free Recall group ($M=44.35$, $SD=27.19$) and the Timeline group ($M=55.31$, $SD=18.03$) conditions; $t(104.44)=-2.680$, $p=.009$. There was a significant difference in scores for time2all for the Free Recall group ($M=45.10$, $SD=25.57$) and the Timeline group ($M=56.15$, $SD=21.51$) conditions; $t(128)=-2.674$, $p=.008$. There were significant differences in scores for actionall for the Free Recall group ($M=18.82$, $SD=14.07$) and the Timeline group ($M=30.78$, $SD=11.83$) conditions; $t(119.68)=-5.217$, $p < .001$. There were no significant differences for personall for the Free Recall group ($M=37.61$, $SD=21.14$) and the Timeline group ($M=40.32$, $SD=16.61$) conditions;

$t(115.63)=-.808, p=.421$. There were no significant differences for objectall for the Free Recall group ($M=22.87, SD=13.61$) and the Timeline group ($M=21.74, SD=10.41$) conditions;

$t(128)=.537, p=.592$. There was a significant difference in settingall for the Free Recall group ($M=10.15, SD=10.43$) and the Timeline group ($M=18.62, SD=8.76$) conditions; $t(128)=-5.030, p=.000$.

The significant findings suggested a Timeline interview allows a person to encode, store, and retrieve more items seen than a Free Recall interview. As the data shows, the timeline group remembered significantly more in total in both time one and time two. By examining the means of the Timeline group and the Free Recall group, one could infer that people who are focused on remembering various aspects of what was going on around them remembered more details after a distraction period.

Answering research question two

Is there a significant difference in frequency of accurate identification of a suspect (dependent variable) when individuals were presented with a photo line-up using a sequential, a simultaneous or a sequential folder method?

For research question two, the null hypothesis was tested using a Chi-Squared to examine if the frequency of correct identifications was different between the three photographic line-up types. The frequencies for each line-up type are displayed in Table 4

Table 4

Accurate identifications and line-up type

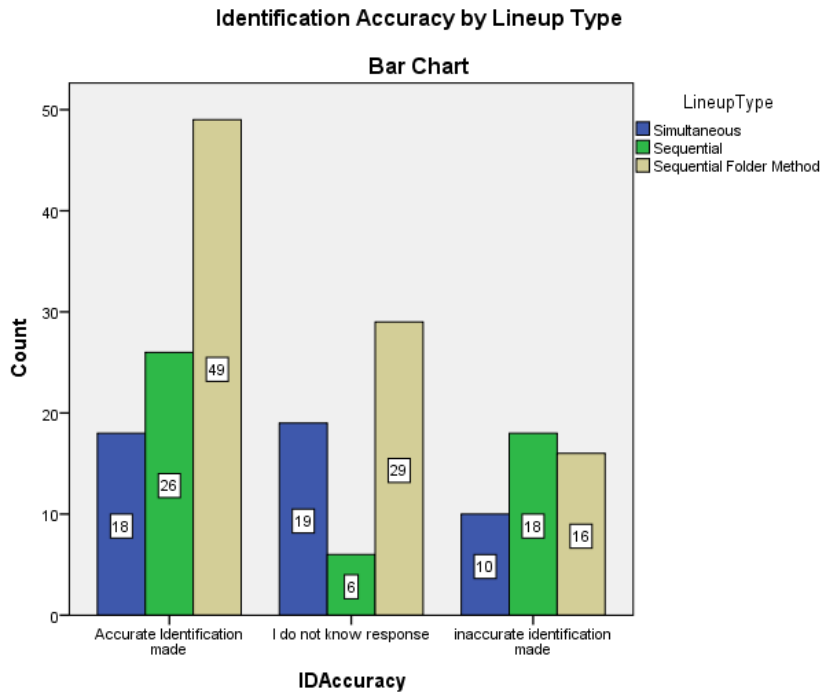
	Line-up Type			Total
	Simultaneous	Sequential	Sequential Folder Method	
Accurate Identifications	18	26	49	93

Table 4 shows the frequency or count of identifications by individual line-up types.

Table four indicates the total number of accurate identifications made (93). A Chi-Square test was performed and a significant relationship was found between photographic line-up type and number of targets correctly recalled which resulted in a more accurate identification, $X^2 (4, N=191) = 13.93, p < .005$, thus the null hypothesis was rejected.

The question posed by examining previous research simply asked, which photographic line-up type is more accurate in identifying a criminal suspect. In this research project, I expanded on previous research by including a sequential folder method photographic line-up. In examining the data, the sequential folder method produced more accurate identifications than any other type of photographic line-up. It was followed by the sequential photographic line-up, and ultimately by the simultaneous line-up.

Figure 1. Identification Accuracy by Lineup Type



Evaluation of the Findings

Within the context of social science and law enforcement research, there have been significant studies that examine both eyewitness identification using photographic line-ups as well as eyewitness memory of crime scenes and criminal suspects (Stebly, 2015). Both applied eyewitness research and applied line-up theory discussed the need to reduce bias, eliminate variables, and use cognitive interview questions to increase the long-term memory while at the same time either significantly reducing or eliminating mistaken identities (Charman & Wells, 1978, 2007).

Even though previous research was generally working in the same direction, there were still some disagreements about line-up type between researchers. These disagreements were not

necessarily about which line-up type was better but about which line-up type was more accurate (Finley et al., 2015; H. Flowe et al., 2016; Goodsell et al., 2010; Steblay, Dietrich, et al., 2011). Often the question posed by previous researchers was what type of photographic line-up was more accurate in identifying a criminal suspect; however, I agreed with Steblay (2015) who argued the more appropriate question was what type of photographic line-up was better at eliminating an innocent person. In this case, data suggested that the sequential folder method was more accurate in eliminating an innocent person.

An additional issued posed by previous research was eyewitness memory for not only specific content, but also context. What is no longer in question is that an interview by law enforcement needs to be completed to assist in encoding information. However, researchers questioned the type of interview that was needed, and in this case, those interview types have been narrowed to Free Recall or Timeline interview techniques. Some argued that Free Recall allows the viewer to interpret the world around them and then provide a statement, while other argued it provided erroneous information and semantic distraction (Howard & Kahana, 1999; Lohnas, Polyn, & Kahana, 2011; Marsh et al., 2015; Wright et al., 2008). Still others argued a cognitive interview style interview provided specific details of the crime scene while using multiple senses to assist in encoding, thus suggesting that retrieval would be better later (Fisher & Geiselman, 2010; Gabbert et al., 2009; Gabbert, Hope, Fisher, & Jamieson, 2012; Hope et al., 2016; Hope et al., 2014; Hope et al., 2013; Marsh et al., 2015). The findings in this research study were examined and evaluated in context of the previous research, not as to which photographic line-up is more accurate in identifying a criminal suspect, but in which photographic line-up is more accurate in eliminating an innocent person.

Evaluation: Memory preservation

Research question one asked which technique, if any, resulted in more details of suspected criminals and crime scenes being retained. As the results apply to memory

preservation, the findings were consistent with previous research (Fisher, 1995; Fisher & Geiselman, 1992, 2010; Hope et al., 2013). Previous research suggested that cognitive interview style questions elicited more information, used more senses, and ultimately assisted in encoding, storing, and retrieving memories to be used later. Overall, a visual inspection of the written statements concluded that participants in the timeline group remembered more information than those in the free recall group. This observation was supported by a between subjects t-test that showed the timeline group remembered more items in time one ($M=55.31$, $SD=18.03$) than the free recall group ($M=44.35$, $SD=27.19$). Additionally, the timeline group outperformed the free recall group in time two ($M=56.15$, $SD=21.51$, as opposed to $M=45.10$, $SD=25.57$).

However, interestingly, the data also told us there were no significant findings between the free recall group and the timeline group as it applied to remembering objects or people. The only significant findings suggested the timeline group remembered more information regarding action and setting items. Ultimately, the findings suggested using a timeline interview to remember details about a crime scene; however, a free recall statement or a timeline interview may both be equally effective in remembering details about specific people in a crime scene.

Evaluation: Photographic line-up type

Research questions two asked which type of line-up was more accurate. At the core of these results is a philosophical debate on what constitutes an accurate line-up. In this research project an accurate line-up was a result of an identification where an innocent party was not identified as a guilty culprit. When examining accuracy and line-up type, the results of the chi-square analysis were statistically significant $X^2(4, N=191) = 13.93, p = .008$. The sequential folder method photographic line-up was most accurate (49 accurate identifications), followed by a sequential photographic line-up (26 accurate identifications) with the simultaneous

photographic line-up (18 accurate identifications), producing the least amount of accurate identifications.

Summary

The purpose of this research study was two-fold, investigate which photographic line-up type, if any, was superior, and to investigate which memory preservation technique, if any, resulted in more details of crime scenes and criminal suspects. As it applied to research question one, the between subjects t-test showed a recognizable trend, that the Timeline Interview Technique resulted in more items remembers than a Free Recall Technique. It also showed (other than in one specific category) that any memory preservation resulted in no memory degradation, but in a slight amount of reminiscence. In reviewing the data collected and analyzed for research question two, it was apparent that a simultaneous line-up was less accurate than a sequential folder method photographic line-up or a sequential photographic line-up for accurate identifications only.

Organization and analysis of the data ultimately resulted in two major themes: (1) if one was simply looking for an accurate identification, then the sequential folder method and the sequential photographic line-up are more accurate than the simultaneous line-up, and (2) memory preservation using the Timeline Interview Technique resulted in more details of a crime scene being remembered than the Free Recall technique.

Chapter 5: Implications, Recommendations, and Conclusions

This research project attempted to address the problem of inadequate and outdated interview techniques that are being used to identify suspects in criminal cases. These outdated techniques have resulted in misidentifications. When a misidentification occurs, the victims of crime suffer, the innocent person who was misidentified suffers, the criminal justice system suffers, and the researchers and theorists who developed best practices suffer.

The purpose of the quasi-experimental quantitative study was to determine if memory of a suspect at a crime scene can be preserved leading to increased identification of a suspect and the elimination of the innocent person in a sequential, simultaneous, or sequential folder method photographic line-up, while at the same time preserving memories of a crime scene. Using a sample of convenience, I collected data from 191 participants. The data was analyzed using a series of between subjects t-tests and chi square analyses.

To conduct data collection, I used a process in which a short video clip of a made up, non-violent crimes scene was shown. The control group did not get an opportunity to record a statement of any type, while the two other groups, using different techniques, did record statements. After a distraction period, the Free Recall group and the Timeline group again provided a statement as to the original made up crime scene and the suspect who committed the crime. All three groups were then shown random types of photographic line-ups. The purpose of the line-ups was twofold: (1) to determine which line-up type was potentially more accurate, and (2) to determine if memory preservation potentially assisted in accurate identifications of criminal suspect, the elimination of the innocent filler, and the accurate description of the crime scene itself.

The results suggested that if one was simply looking to determine what type of interview technique assisted a witness in recalling more details of a crime scene, then the Timeline group was more successful. However, the results also suggested that any type of interview would

assist in memory preservation as opposed to no memory preservation. Finally, the results also suggested that a sequential folder method style is more accurate in identifying culprits, followed by a sequential photographic line-up, and ultimately a simultaneous line-up.

There are several limitations to consider when considering this study. First, to have optimal results using the sample size should have been more than 300 participants. Second, arguments could be made that the sample itself is not representative of the population as a whole, but when comparing demographic data from Jackson County Michigan to the population of the study, the percentages are approximately the same. However, one could also argue that the sample is not representative of the population as a whole, simply because the population is college students and not everyone who is a witness or victim of a crime is getting or has received a college education.

Overview

This study supported, and was supported by, previous research into an area that still has a practice/theory gap. This study exemplified previous research in interview techniques, memory, perception, and a host of other psychological concepts. However, it also showed that this area of study must be approached holistically. This approach is best exemplified by Applied Line-up Theory that took into consideration more than just a few concepts, but addressed many areas in an approach that allows researchers and practitioners alike to become more effective.

Implications

Stebly (2015) suggested that a sequential photographic line-up is more accurate in identifying a criminal suspect and eliminating an innocent person. However, there are others in the scientific literature that still questioned the validity of Stebly's arguments (Amendola & Wixted, 2015b; Finley et al., 2015). To investigate the line-up types, I began by researching memory, perception, various theories, as well as other influences such as backloading, other race

bias, weapon focus effect, and blind or double blind line-up presentation. Ultimately, through this research, I could conclude that a practice/theory gap still existed today. This gap was twofold. First, Applied Line-up Theory told us, amongst other concepts, that a sequential line-up reduced suggestibility, and resulted in a more accurate identification; however, I learned there are still police departments that are using a simultaneous line-up, which suggested, their practices are not based in current theory (Goodsell et al., 2010; Greene & Evelo, 2015; Steblay, Dysart, et al., 2011). I also explored theory of memory which suggested that in order to encode, store, and retrieve memories, one performed better when they have memory cues; however, there are police departments that are not interviewing people immediately, are not providing any type of memory support, and who do not understand current theory as it applies to memory (Hayne & Gross, 2017; Hope et al., 2013; Korralo et al., 2012; Marsh et al., 2015; Scoboria, Memon, Trang, & Frey, 2013).

Once I realized there was still a debate as it applied to photographic line-up type, and that there had been limited research completed on how memory enhancement could affect line-up type, I developed my research questions. Research question one asked if memory preservation techniques assisted the participant in remembering details of the crime scene and the criminal suspect. Much like Hope, Mullis, and Gabbert (2013), I learned the Timeline Interview Technique increased the amount of details (actions, persons, objects, and setting details) a person remembered. This study showed the participants who used the Timeline Interview Technique remembered approximately 25 percent more than the Free Recall group about the details of the crime scene. I found these results important, as the statements were not labeled by group type, had no names on them, and were ultimately only interpreted by me to avoid any type of bias between more than one interpreter. Visually, one could see the difference between the statements. However, as previously discussed, sample size may have played a role in the significance of the findings. Overall, a visual inspection of the written statements

concluded that participants in the Timeline group remembered more information than those in the Free Recall group. This observation was supported by a between subjects t-test that showed the Timeline group remembered more items in time one ($M=55.31$, $SD=18.03$) than the Free Recall group ($M=44.35$, $SD=27.19$). Additionally, the Timeline group outperformed the Free Recall group in time two ($M=56.15$, $SD=21.51$, as opposed to $M=45.10$, $SD=25.57$). Data collection was completed two separate times simply to show the results were not by chance.

In focusing on research question one, the null hypothesis suggests there would be no difference between groups in remembering the details of either a criminal suspect or of a crime scene. The null hypothesis was rejected because there was a difference. These findings were similar to the conclusion draw by various researchers in their investigations of how to enhance memory (Gawrylowicz, Memon, & Scoboria, 2014; Gawrylowicz, Memon, Scoboria, et al., 2014; Krix et al., 2015; Krix et al., 2016).

Research questions two asked which line-up type was more accurate. A Chi-Square test was performed and a significant relationship was found regarding photographic line-up type, $X^2(4, N=191) = 13.93, p=.008$. The frequency analysis showed the sequential folder method resulting in more accurate identifications (49) than the sequential line-up (26) and the simultaneous line-up (18). Additionally, in considering the purpose of this research study is to reduce inaccurate identifications, I took note that 30.9% of the participants who were presented with a sequential line-up folder method provided an I don't know response. In total 83% of the participants who viewed a sequential line-up folder method did not make an inaccurate identification.

Unexpected findings

Two findings were unexpected. First, research suggested that cognitive interview style questions would significantly increase a person's memory of the crime scene which also inferred the criminal suspect. However, identification accuracy had not been tested. In this study,

although the Timeline group significantly outperformed the Free Recall group in items remembered at a crime scene, the Free Recall group outperformed the Timeline group in identification accuracy or the elimination of an innocent party.

Second, although there are several researchers who still argue the superiority of the simultaneous line-up, more current literature sides with a sequential line-up. However, there is limited research on sequential folder method photographic line-ups. In this study, the sequential folder method outperformed the other types of line-ups. As to the superiority of the sequential folder method, one possible explanation for increased accuracy could be back loading of the envelopes with blank pieces of paper. An additional explanation is the blinded and double-blinded procedures used in combination with the presentation.

Recommendations for Practice

First, legislative branches and the criminal justice system must recognize this practice theory gap and take proactive steps to change negative practices (Gants & Doughty, 2016; Grusin, 2014; Leverick, 2016; Moreland & Clark, 2016; Mu, Chung, & Reed, 2017; Newirth, 2016; Rapp-Ellis, 2016; Rodriguez & Berry, 2016; Safer et al., 2016; Stenzel, 2017; Valentine & Fitzgerald, 2016; Wells & Quigley-McBride, 2016; Wong, 2015). Within the last two years, research in the field of eyewitness identification has exploded, and as such, legal procedures have changed in many states. Each government unit needs to be aware of these changes and needs to examine the science to determine how this type of evidence will be brought forth to a jury. Fortunately, some states have already taken note of research and theory and adopted procedures to reduce wrongful identifications (McNabb, Farrell, & Brown, 2017). Further, one needs to stay current on legal cases involving wrongful convictions and learn from the mistakes of other by observing what procedures they did not use (Findley, 2016).

Previous literature and this study supported law enforcement interviewing witnesses and victims of crimes. Although both a Free Recall interview and a Timeline interview supported

encoding, storing, and ultimately the retrieval of information, the Timeline interview method was more effective in obtaining details of the scene (Hope et al., 2013; Scoboria et al., 2013; Sheridan, Chamberlain, & Dupuis, 2011). While the Free Recall interview allowed a person to put their own words in writing, the participants in this study simply focused on the criminal suspect rather than the context of the setting and the suspects' actions, all of which potentially matter in a criminal investigation or ultimately the court process. The Timeline interview technique focused on simple, yet effective, cognitive interview style questions (Davis, McMahon, & Greenwood, 2005; Hope et al., 2013). The findings in this study showed Timeline interview methods increased the number of items that a participant remembers, around 25 percent, as opposed to the Free Recall group. Equally interesting was there was only memory decay in one specific area (object) for the Timeline group (Time1All to Time2All), which suggested memory is properly encoded, stored, and retrieved.

Applied Line-up Theory discussed several important factors that should be applied in the criminal justice system today. These factors included, back loading, limiting the number of laps a person must view the line-ups, double blind or blinded procedures, specific directions the witness can read, and limiting interaction with the presenter of the line-up (Charman & Wells, 1978, 2007). Ultimately, as it applied to using photographic line-ups, law enforcement needs to change their perspective on what a photographic line-up is designed to do. First, although it is used as a tool to identify a criminal suspect, law enforcement needs to be aware that approximately 67 percent of all identifications are inaccurate (Stebly, 2015). Photographic line-ups need to be verified and used in a way in which the law enforcement officer is sure of who the fillers are, and can provide them with an alibi. As an example, fillers for a photographic line-up can be someone who you know were out of town, at another location, or potentially were even incarcerated at the time of the crime. Knowing this, the investigator will be able to readily identify an inaccurate line-up if one of the fillers are selected. Additionally,

photographic line-up procedures and policies need to be established so that variables are limited. Finally, law enforcement and the criminal justice system in general need to understand theory behind line-ups and memory, and how to use the research to conduct better line-ups (Carlson, Carlson, Weatherford, Tucker, & Bednarz, 2016; Cochran, Greenspan, Bogart, & Loftus, 2016; Curley, MacLean, & Murray, 2017; Dodson & Dobolyi, 2016; Havard, Laybourn, & Klecha, 2017; Kaminski & Sporer, 2017; Mickes, 2016; Rush et al., 2014; Sharps, Herrera, & Price-Sharps, 2014; Theunissen, Meyer, Memon, & Weinsheimer, 2017).

Recommendations for Future Research

Based on the framework, findings, and implications, future researchers can build upon this existing study by examining the link, if any, between eyewitness confidence and eyewitness accuracy. Recent research located during the literature review found a positive correlation between eyewitness accuracy and their confidence in choosing (Horry et al., 2014; Wixted, Don, et al., 2016; Wixted et al., 2015). However, accuracy and confidence was not explored in this initial study.

Future researcher can improve on this study by limiting the research to line-up types and accuracy only. In this study, the mock crime scene consisted of a video where there were several distractors. For the purpose of this study, the video and the statements received provided valuable information about memory enhancement, but future studies should focus on identifying a suspect only using both the Timeline Interview Technique and the Free Recall interview. This will allow future researchers to investigate any findings specific to eyewitness identification without potentially asking participants to remember too many things.

The logical next step in this line of research is to expand the participant population to complete an additional between subjects t-tests. Additionally, I would like to expand the participation pool to include all members of Jackson County, Michigan who would like to volunteer to examine the effects of socioeconomic status on eyewitness identification. This

research, in part, is an expansion of previous research in eyewitness identification, but it can be taken further.

Additional research in the field of identification can focus on face matching. Face matching has been successfully used by several different law enforcement agencies in identifying criminals, illegal immigrants, and other people, and has been studied by multiple researchers. Areas of study included specific police disciplines, border patrol, matching of still pictures to still pictures, matching of video to still pictures, forensic reconstruction of facial features, and facial recognition based on feedback (Alenezi & Bindemann, 2013; Altes, 2016; Bobak, Dowsett, & Bate, 2016; Bobak, Hancock, & Bate, 2016; Devue & Barsics, 2016; Dowsett & Burton, 2015; Estudillo & Bindemann, 2014; Kemp, Caon, Howard, & Brooks, 2016; Lee & Wilkinson, 2016; Liu, Chen, Han, & Shan, 2013; McIntyre, Hancock, Kittler, & Langton, 2013; Megreya, Sandford, & Burton, 2013; Moore & Johnston, 2013; Robertson, Noyes, Dowsett, Jenkins, & Burton, 2016; Stephens, Semmler, & Sauer, 2017; Towler, White, & Kemp, 2017; White, Burton, Kemp, & Jenkins, 2013; Wirth & Carbon, 2017; Ye, Oyekoya, & Steed, 2015). Equally important, future research can continue to test current variables that may still be in question. The variables include age, intoxication, eyewitness confidence, and co-witnesses (Flowe et al., 2017; Zajac, Dickson, Munn, & O'Neill, 2016; Zajac & Jack, 2016). Ultimately, as technology changes and expands, researchers may see a change in a person's ability to perceive, encode, store, and retrieve memories of another person.

Conclusion

This study in general addressed the use of outdated and inadequate interview techniques that are used to potentially identify or eliminate a suspect in a crime. This study shows that interviews and ultimately the statements provided by both a witness and a victim can assist in preserving memories of criminal suspects and crime scenes. However, this study also examine how memory preservation can affect eyewitness accuracy in identifying or eliminating a

potential suspect or filler in a photographic line-up. Ultimately, this study is important because it shows if proper interview techniques are not utilized, and if proper procedures that are based in theory and research are not followed, there is a high likelihood that an innocent person will be identified as a criminal suspect. One must consider how memories are formed.

Ultimately, one should take away two concepts from this entire study. First, any interview is better than no interview when attempting to identify specifics about crime scene or criminal suspects. Second, one must consider what previous research has shown and how theory is developed when attempting to apply knowledge. Theory is grounded in research that is subjected to peer review and potential replication. If, having been subjected to these standards, research develops theory, then theory must be followed and expanded upon. In this study, theory of memory and Applied Line-up Theory ultimately provided grounding in science and psychological principles. (Amendola & Wixted, 2015; Charman & Wells, 1978, 2007; Davis, McMahon, & Greenwood, 2005; Finley, Roediger, Hughes, Wahlheim, & Jacoby, 2015; Gawrylowicz, Memon, & Scoboria, 2014; Gawrylowicz, Memon, Scoboria, Hope, & Gabbert, 2014; Goodsell, Gronlund, & Carlson, 2010; Greene & Evelo, 2015; Hayne & Gross, 2017; Hope, Mullis, & Gabbert, 2013; Horry, Colton, & Williamson, 2014; Korallo, Foreman, Boyd-Davis, Moar, & Coulson, 2012; Krix, Sauerland, Merckelbach, Gabbert, & Hope, 2015; Krix et al., 2016; Marsh, Hughes, Sörqvist, Beaman, & Jones, 2015; Scoboria, Memon, Trang, & Frey, 2013; Sheridan, Chamberlain, & Dupuis, 2011; Steblay, 2015; Wixted, Don, & Stephen, 2016; Wixted & Mickes, 2015).

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Appendices

Appendix A: Crosstab Identification Accuracy by Group Type

Summary Statistics for Accuracy by Group Type

		Control Group	Free Recall Group	Timeline Group	Total
Accurate Identification Made	Count	25	36	32	93
	Percentage within Group	41.0%	58.1%	47.1%	48.7%
I do not know response	Count	22	21	11	54
	Percentage within Group	36.1%	33.9%	16.2%	28.3%
Inaccurate Identification Made	Count	14	5	25	44
	Percentage within Group	23.0%	8.1%	36.8%	23.0%
Total	Count	61	62	68	191

Appendix B: Crosstab Identification Accuracy by Line-up Type

Summary Statistics for Accuracy by Line-up Type

		Simultaneous	Sequential	Sequential Folder Method	Total
Accurate Identification Made	Count	18	26	49	93
	Percentage within Group	38.0%	52.0%	52.1%	48.7%
I do not know response	Count	19	6	29	54
	Percentage within Group	40.4%	12.0%	30.9%	28.3%
Inaccurate Identification Made	Count	10	18	16	44
	Percentage within Group	21.3%	36.0%	17.0%	23.0%
Total	Count	47	50	94	191

Appendix C: Recruitment Flyer



NCU

Northcentral University

Are you interested in psychological research?

Do you believe you could identify a criminal suspect?

Do you want to help innocent people?

You may be eligible to participate in a research study about ways to identify criminals.

To participate you must:

1. Be able to read and write.
2. Be a student at Siena Heights University, Baker College of Jackson, or Jackson College.
3. Are between the ages of 18 and 64.
4. You are not legally blind or vision impaired. What does the study involve?
 1. Watching a 30 second video of someone stealing a purse.
 2. Writing down what you saw in the video.
 3. One week later writing down what you saw in the video again.
 4. Looking at pictures to either pick out the suspect in the video, or saying that the suspect is not there.

Your participation in voluntary. All queries are confidential.

For more information, please contact:
Christopher Boulter (Doctoral Student)
Phone: 517-581-7752

Email: C.Boulter7610@email.ncu.edu

Appendix D: Informed Consent

Introduction:

My name is Christopher R. Boulter. I am a doctoral student at Northcentral University. I am conducting a research study on ways to increase a persons' memory of a criminal suspect. I am completing this research as part of my doctoral degree. I invite you to participate.

Activities:

If you participate in this research, you will be asked to:

1. Watch a video of a non-violent, made up, crime in progress where a person takes a purse from a person shopping at the mall (approximately 30 second).
2. Fill out a form that gives me basic information about you (approximately 2 minutes).
3. Write what you remember about the made-up crime and the person who took the purse (approximately 10-15 minutes).
4. One week later, write what you remember about the made-up crime and the person who took the purse (approximately 10-15 minutes).
5. Look at pictures and tell the person who is presenting the pictures to you if the person who took the purse is in one of the pictures or not (approximately 5-10 minutes).

Eligibility:

You are eligible to participate in this research if you:

1. Are a college or university student at Siena Heights University, Baker College of Jackson, or Jackson College.
2. You are 18 to 64 years old.
3. You can read and write.

You are not eligible to participate in this research if you:

1. Are legally blind or visually impaired. I hope to include 180 people in this research.

Risks:

There are minimal risks in this study. Some possible risks include: watching a fictional or made-up video of some stealing a purse.

To decrease the impact of these risks, you can: not watch the video and stop participation at any time.

Benefits:

If you decide to participate, there are no direct benefits to you other than learning about how research is completed.

The potential benefits to others are: learning how to better identify people who commit crimes or eliminate people who did not commit a crime.

Confidentiality:

The information you provide will be kept confidential to the extent allowable by law. Some steps I will take to keep your identity confidential are: I will use a number to identify you.

The people who will have access to your information are: myself, and to a limited extent two research assistants. The Institutional Review Board may also review my research and view your information.

I will secure your information with these steps: All documents will be scanned and destroyed. All electronic data will be encrypted and stored on one external hard drive. If I must transport any papers, it will be in a locked case.

I will keep your data for 7 years. Then, I will delete electronic data.

Contact Information:

If you have questions for me, you can contact me at: C.Boulter7610@email.ncu.edu or 517-581-7752.

My dissertation chair's name is Dr. Richard Remedios. He works at Northcentral University and is supervising me on the research. You can contact him at: rremedios@ncu.edu or 703-779-0110.

If you have questions about your rights in the research, or if a problem has occurred, or if you are injured during your participation, please contact the Institutional Review Board at: irb@ncu.edu or 1-888-327-2877 ext. 8014.

Voluntary Participation:

Your participation is voluntary. If you decide not to participate, or if you stop participation after you start, there will be no penalty to you. You will not lose any benefit to which you are otherwise entitled.

Appendix E: Directions for Free Recall Statement

Direction for Free Recall

On the pieces of paper provided, using the pen provided, please write everything you remember about the theft of the purse on the video you watched including anything you can remember about the person who stole the purse. Please be as detailed as you can.

Appendix F: Directions for Timeline Technique Statement

Direction for Timeline Technique

You have been given kinds of paper. Please find the piece of paper with the black line through it and place it in front of you so the line runs from the left side to the right side of your desk. Please remove the yellow and green post-it notes from the envelope.

Think back to the video you watched about the person stealing the purse.

Using the yellow post-it notes, please write as much as you can remember about the people you saw. It may help to think about if the person was male or female, their hair color, height, weight, clothes, and age.

Using the green post-it notes, please write as much as you can remember about what the people in the video were doing. It may help to use one or more post it notes per person.

Some things that may help you to remember are thinking about what you heard, saw, or felt when you were watching the video.

Once you have filled out all the post-it notes, please place them in order on the line on the large white piece of paper with the black line through it. Start on the left side of the paper and end on the right.

Once you are done with your order, please use these notes to help you remember what happened.

Using the lined pieces of paper, the pen, and your notes, please write as detailed of a description as possible about crime and the person who stole the purse.

Appendix G: Demographics Questionnaire

Demographics Questionnaire

Please answer all the following questions as they describe you.

1. Gender (circle one):
 - a. Male
 - b. Female
 - c. Other
2. Age_____
3. Number of years at a college or university_____
4. What kind of area were you raised in (circle one):
 - a. Rural
 - b. Small town
 - c. Suburban
 - d. Urban
 - e. Other
5. Please circle one of the following to indicate your primary ethnicity:
 - a. African American
 - b. Asian American
 - c. White, non-Hispanic
 - d. White, Hispanic
 - e. Middle Eastern
 - f. Other: _____



January 17, 2017

Dear Sir or Madam,

As Jackson College's liaison for Human Subject Research inquiries, I have reviewed Christopher Boulter's research proposal entitled "*Examining Eyewitness Reliability Through Conscious Memory Preservation using the Self-Administered Interview*", including his methodology and any letters of consent. I believe this research to be consistent with "normal educational practices".

I understand what he is asking of the individuals, I believe there is minimal risk, and, that this minimal risk is acceptable. I grant him permission to conduct his study at Jackson College, including access to the site (JC) as well as allowing him to procure data from the site.

If I have any further questions about this research study I can be reached at the contact information provided below.

Sincerely,

A handwritten signature in black ink, appearing to read "Kristi Hottenstein", written in a cursive style.

Kristi Hottenstein, Ph.D
Vice President for Student Services
2111 Emmons Rd
Jackson, MI 49201
(517) 796-8409
hottenskristin@jccmi.edu



**Baker College of Jackson
Criminal Justice Program**

2800 Springport Road Jackson, MI 49202 – (517)990-6970 – jon.johnston@baker.edu

January 17, 2017

To Whom It May Concern:

Ref: Site Permission for Christopher Boulter

Please allow this letter to serve as permission for Christopher Boulter to gain access and procure data from this site as it pertains to his dissertation with NCU. I have reviewed the methodology and informed consent form. Based on this review, I believe the research is consistent with “normal education practices”.

My contact information:

Jon Johnston
Program Director of Criminal Justice
Baker College of Jackson
2800 Springport Road
Jackson, MI 49202
(517)990-6970
jon.johnston@baker.edu

Please don't hesitate to contact me if you need anything further.

Respectfully,

Jon Johnston
Program Director



Christopher Boulter <cboulter0140@gmail.com>

IRB Application

1 message

Cynthia Wachtel <cwachtel@sienaheights.edu>
To: CBOULTER-forward <cboulter0140@gmail.com>
Cc: SHU Institutional Research Boarb <IRB@sienaheights.edu>

Tue, Mar 7, 2017 at 10:26 AM

APPROVAL OF APPLICATION

Congratulations, Christopher, your research project is approved by the Siena Heights IRB. You may begin working with human subjects in your research project following the protocol detailed in the IRB application. As a reminder, if you need to change the project you will need to submit the changes for review. Approval is good for a year, after which time any work with human subjects or the data collected (further analysis) requires a request for an extension. Keep a copy of this email as your official notice.

Cynthia Wachtel, MSN, RN, CDE

Instructor of Nursing, Chair - Siena Heights IRB

Siena Heights University

Nursing Division

1247 E. Siena Heights Drive

Adrian, MI 49221

517-264-7244

cwachtel@sienaheights.edu<mailto:cwachtel@sienaheights.edu>