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An Innocent Bystander Walks into a Bar: The Influence of Temporal Proximity and Familiarity on Unconscious Transference

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An Innocent Bystander Walks into a Bar:
The Influence of Temporal Proximity and Familiarity on Unconscious Transference

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Abstract

According to The Innocence project, 69% of DNA exonerations in the United States involved mistaken eyewitness identification as a contributing factor to these errant convictions. Psychologists have contributed towards minimizing mistaken identifications by proposing best practices that law enforcement still follow today. One understudied cause of mistaken eyewitness identification is unconscious transference (UT). UT is a memory error in which a person encountered in an innocent context becomes confused with a person seen in a guilty context (Loftus, 1976). Past research has established some boundary conditions for when UT can occur; however, the limited methodology has resulted in narrow conclusions that do not fully account for all instances of UT. This study builds upon past research to establish a novel paradigm for understanding UT. Additionally, this study introduces how familiarity may be a critical factor in causing instances of UT. The results reveal that this novel paradigm reliably captures instances of UT and demonstrates that having familiarity with a suspect can lead to UT errors. Furthermore, this study finds support for the memory blending theoretical approach of UT. Through the discussion, the stark difference between familiar suspect identification and stranger suspect identification are revealed. Additionally, I propose considerations for future research and how cases with familiar suspects should be handled in the future.

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Introduction

A major goal of our justice system is to convict those who are guilty and protect those who are innocent. One way that psychologists have contributed to this goal is through the study of eyewitness testimony. Since the 1980s, mistaken eyewitness identification has been well studied through psychological approaches. According to the Innocence Project, an organization committed to exonerating innocent people, mistaken eyewitness identification is a major contributing factor to false convictions (Innocence Project, 2020). Among this database, 70% of their exonerees had mistaken eyewitness identification play a significant role in their errant conviction. Based on this statistic, it is clear that research on eyewitness reliability is critical for determining the boundary conditions that predict when witnesses will be more or less accurate in their identifications.

Thus far, researchers have defined two major categories of boundary conditions that predict the accuracy of an eyewitness's memory. These categories are referred to as estimator variables and system variables (Wells, 1978). Estimator variables are defined as characteristics of a crime that are known to impact the accuracy of an eyewitness but are unimpacted by members of the justice system. For example, factors such as a crime taking place at night (Nyman et al., 2019), having a weapon present (Fawcett et al., 2013), or including a cross-race identification (Meissner & Brigham, 2001) are all known to harm the accuracy of an eyewitnesses. System variables are also known factors that influence the accuracy of eyewitness judgements; however, these factors are controllable by systems of law. For example, the fairness of a lineup (Carlson et al., 2008), the use of suggestive police practices (Wells, 1993), and the pre-admonishment given before an identification task (Lampinen et al., 2020), are all known to significantly impact eyewitness memory.

Eyewitness literature has been successful in studying the impact of these variables because the typical design of these studies allows for researchers to know the ground truth of innocence or guilt (Lampinen et al., 2012). These studies typically feature a phase in which the witness views a crime and are then given an identification task. The identification task is either a show-up, in which one person is shown, or a lineup containing the image of the suspect and several fillers who are known to be innocent (most American lineups contain six people—one suspect and five fillers). Again, for these studies, the researcher knows whether the suspect is innocent or guilty. If the suspect is innocent, the lineup is considered target absent (TA) because the actual culprit is not in the lineup. However, if the suspect is guilty, the lineup is considered target present (TP) because the culprit is included in the lineup. In the real-world, this ground truth of innocent is unknown. Instead, the purpose of the identification task is to gain further evidence for the innocence or guilt of the suspect. Thus, it is critical that researchers properly discern the factors that will make this task more or less reliable. Currently, this has been done through the systematic manipulation of system and estimator variables in empirical designs. However, there are still several other factors that could be influential but have not yet been thoroughly explored.

One less studied cause of mistaken eyewitness identification comes from a phenomenon called unconscious transference (UT). UT is defined as an instance in which a person encountered in an innocent context is mistakenly associated with playing a critical role in a crime (Deffenbacher et al., 2006; Loftus, 1976). In short, UT is a memory error in which an innocent person encountered in another context is incorrectly remembered as the culprit in a crime. A real-world example of this error is illustrated in Loftus (1976), a seminal paper on UT. In this example, a ticket agent, who witnessed a robbery, incidentally implicated an innocent soldier as the culprit. Though the ticket agent had no memory of previously encountering the soldier, the soldier had bought tickets from the ticket agent on several occasions. When the soldier appeared in an identification task, the ticket agent identified him as the culprit though he was innocent. In other words, the ticket agent encountered the soldier in an innocent context, but incorrectly remembered him as the culprit.

Today, researchers continue to investigate why this scenario might occur. UT can be the result of police error, however; this is not always the case. Unlike other causes of mistaken eyewitness identification, it is not as easy to identify a sole cause for why this memory error may occur. Without identifying a cause, it is unclear when these errors occur and how this error can be prevented. The goal of many researchers in the past has been to determine the boundary conditions that predict instances of UT. Some researchers have worked to establish unique paradigms to study UT. While others have worked to determine the underlining theory that explains why UT can occur.

Original Approaches for Studying Unconscious Transference

Original Paradigms

In pursuit of designing paradigms that deliberately capture evidence of UT, researchers developed two main approaches: bystander designs and mugshot exposure effect (MEE) designs (Brown et al, 1977; Read et al., 1990; Deffenbacher et al., 2006). In bystander designs, the innocent bystander would be placed in close proximity to where or when a crime occurred, and the researcher would track how many times that innocent bystander was implicated as the culprit. In MEE designs, the innocent bystander's image would appear while the witness is questioned about the events of the crime leading a witness to update their memory of the culprit's face. Deffenbacher et al. (2006), describe these designs as containing the critical manipulation of a "proximal person." According to these researchers, a proximal person is an innocent person seen in close spatial or temporal proximity to the culprit (Deffenbacher et al, 2006). Typically, MEE studies utilize temporal proximity manipulations, while bystander designs utilize a spatial or temporal proximity manipulation. In this section, I will review studies that have utilized bystander designs and MEE designs to evaluate the impact that these paradigms have had in influencing the study of UT.

Bystander Designs.

One of the earliest studies to capture UT was done by Elizabeth Loftus in 1976. In this study, participants listened to a story accompanied by pictures of the characters. Participants then came back to the lab three days later to complete a lineup task, in which they had to identify the person who "threw a paperweight." The set of images either contained the face of the culprit or the face of an innocent but previously seen character. Loftus wanted to see whether participants would be more likely to mistake the image of an innocent character as the culprit than any other person seen in the lineup. Participants given the lineup with the culprit (target present lineup) had an 84% choosing rate for the culprit. However, participants given the lineup with an innocent character (target absent lineup) choose the innocent character 60% of the time. Loftus concluded that this study showed evidence of UT because the participants chose the familiar but innocent bystander at a rate significantly greater than chance for a lineup task (16%). It is believed that the participants in this study mistook the innocent character's familiarity as an indication of guilt.

This earlier study served as a model of bystander designs. Yet, it is important to note, that this seminal study lacked a control group leading to the need of more research to further investigate the nature of this error. The next major study of this phenomenon came from Read et al. (1990). These researchers conducted several studies to capture UT but only found evidence of this phenomenon in one iteration of their experiments. In their first three experiments, participants were store clerks who interacted with both a culprit and a bystander. After interacting with both targets, the store clerks were given a lineup task in which they were asked to identify the person who requested change for a five-dollar bill (culprit). The lineups either included both the culprit and the bystander or just the bystander. Despite interacting with the bystander, the participants in this study did exceptionally well at avoiding an UT error. In short, they were able to confidently reject the lineup when it only contained the "innocent" bystander. For their fourth experiment, which took place in a classroom setting, they determined that their participants were still able to correctly reject the bystander when they were presented in a lineup. Many of the participants noted that though the bystander looked familiar they were not willing to identify them for the crime (Read et al., 1990). In other words, these participants were able to successful monitor their memory of when they encountered the innocent bystander to avoid falsely identifying the innocent bystander. In experiment five, the researchers once again tested UT in a classroom setting (Read et al., 1990). Participants saw the bystander handing out papers, while the "culprit" was seen fixing equipment in the classroom. In this case, the participants were more likely to identify the bystander when they were previously exposed to the bystander than when they were not. Thus, this study successfully captured evidence of an UT error.

Read et al., (1990) played a critical role in determining some boundary conditions that lead to UT and also displaying how UT can be avoided when these conditions are not in place. The authors determined that the final experiment successfully captured UT because the interaction between the targets and participants were shallow in nature, the event itself was not memorable, and there was a long delay between the initial exposure and lineup task. Each of these factors challenged the ability of the participant to successfully encode and retain a detailed memory of their encounter with the innocent bystander. However, this was not the case with the first four experiments and participants could easily access their memory to make a correct judgment during the lineup phase.

Further research has determined additional boundary conditions as they captured UT through different experimental contexts. One group of researchers investigated UT when there were multiple perpetrators (Geiselman et al., 1993; Geiselman et al., 1996). Particularly, Geiselman et al. (1993) found that participants often mislabeled the accomplice of a crime as the assailant, when the accomplice was presented in the lineup. In short, these authors concluded that the actions of the assailant were transferred to the accomplice. These authors additionally identified a bias for participant to label a recognizable person as central to the crime, as participants rarely mistook the assailant as the accomplice. This could suggest that if an innocent bystander is associated with a crime in any way, a witness may mistakenly believe their familiarity is attributable to the actions of the crime.

Other researchers have used more controlled bystander designs in which they show participants video recordings of a bystander appearing right before a similarly dressed culprit commits some crime (Davis et al., 2008; Nelson et al., 2011; Phillips et al., 1997; Ross et al., 1994). For example, in one study researchers depicted a scene in which a student stole money out of an envelope (Nelson et al., 2011). However, prior to the culprit stealing the money, an innocent bystander, who resembled and dressed similarly to the culprit, was seen. Additionally, moments after the innocent bystander left the scene, the culprit entered the scene and stole the money. Many participants failed to notice the change between the culprit and innocent bystander and incidentally identified the innocent bystander as the culprit.

Based on these examples of bystander designs, several potential boundary conditions for UT are exemplified. Some of these boundary conditions focused on the ease of encoding. For example, Read et al., (1990) showed that having poor encoding conditions, such as shallow interactions, unimportant events, and long retention intervals, increased the likelihood of UT errors to occur. However, these authors also noted that it is unlikely that a witness to a crime would find that interaction with the culprit to be shallow or the crime event to be unmemorable or unimportant. Thus, there is some caution in attributing these boundary conditions to causing instances of UT in the real-world. However, long retention intervals are likely to occur in such cases because often times it takes longer for investigating officers to find a suspect and give a witness a lineup. Bias was also implicated as a potential boundary condition of UT (Geiselman et al., 1993 & Geiselman et al., 1996). Particularly, a bias to attribute any person involved in a crime as playing a more central role. However, again this boundary condition applies to limited instances, in which there are two culprits. Lastly, other studies have determined that an innocent bystander must resemble the culprit, dress similarly to the culprit, and appear immediately before a crime for UT to occur. However, again these situations are highly specific and may not always be true for real-world instances of UT. Though these potential boundary conditions may not explain every instance of UT they do provide some overall themes of why UT may occur. Particularly, these boundary conditions highlight that UT can be the result of factors, such as shallow encoding, overreliance on schemas or heuristics, or general confusion. I further explore these general themes later in this paper.

Mugshot Exposure Effect.

MEE paradigms have proven to be the most reliable method of capturing and studying UT in the lab (Deffenbacher et al., 2006). For these paradigms, participants are first exposed to some crime or critical event and then are shown a series of mugshots. After some delay, participants are given a lineup or some other identification tasks and are assessed on how often they choose an innocent bystander who was shown during the mugshot exposure phase. Studies have found that when a witness views a mugshot of an innocent bystander prior to an official identification task, the innocent bystander becomes memorable to the witness and may later be mistakenly identified as the culprit of a crime (Brown et al., 1977; Davies, Shephard, & Ellis, 1979; Dysart et al., 2001; Kersten & Earles, 2017; McAllister et al., 2011; Memon et al., 2002; Perfect & Harris, 2003). These paradigms provide the most abundant and consistent evidence for UT because they typically result in a high innocent bystander identification rate (Deffenbacher et al., 2006).

MEE are commonly explained by commitment effects, which occur when a witness chooses the innocent bystander during the mugshot viewing and then chooses that suspect again during the official lineup decision (Deffenbacher et al., 2006; Dysart et al., 2001; Memon et al., 2002). A meta-analysis found that commitment effects have been shown to produce a stable increase in innocent bystander IDs across multiple studies (Deffenbacher et al., 2006). It is presumed that the witness chooses the innocent bystander out of the lineup because they have a clear memory of the suspect from the mugshot viewing phase and a poorer memory of the crime event. This behavior may additionally be driven by the participants desire to be consistent (Goodsell et al., 2015). In nature, commitment effects are conscious processes instead of unconscious processes.

Despite the strong support for commitment effects, there are several studies that have found evidence of a MEE without the presence of commitment effects (Kersten & Earles, 2017; Memon et al., 2002; Perfect & Harris, 2003). One study assessed the rate of transference errors for participants who chose a suspect during a mug book viewing versus participants who did not (Memon et al., 2002). In general, participant who choose a suspect during the mugshot viewing were more likely to also choose a suspect out of a lineup. This relationship was true even if the participant chose a suspect out of the lineup that they did not originally choose during the mugshot viewing. In other words, increased choosing during the lineup task was not limited to the suspect the participants originally "committed" to. Based on this finding, there is another cognitive process at play prompting participants to identify any familiar person shown in the lineup. Not all participants are making a conscious decision to stick with who they originally chose, but rather, participants who make an initial identification are more motivated to make a subsequent identification. Critically, these authors found that participants did not just choose any filler, but they only chose fillers that were previously seen (though not chosen) during the mugshot exposure phase.

Another study argued that MEE occurs because the witness may update their memory for the crime while viewing mugshots (Kersten & Earles, 2017). The authors propose that each time the witness views a mugshot they are subconsciously asking themselves "is this the culprit?" This provides an opportunity for the culprit to update their memory of the crime with the face of an innocent bystander. This study fits into the larger body of literature that highlights the reconstructive nature of memory, by demonstrating that memories can be updated when remembering an event or when being told suggestive information about an event (Hyman et al., 1995; Loftus, 1975). Each of these examples provide evidence that research should extend past labeling all instances of MEE as commitment effects and should look towards other explanations as well.

Theoretical Approaches

As reliable paradigms for studying UT were developed, researchers began to shift their focus towards understanding the theoretical phenomena that could explain why UT might occur. Particularly researchers produced three theoretical approaches: automatic processing, source monitoring, and memory blending (Deffenbacher et al., 2006; Phillips et al., 1997; Ross et al., 1994; Wooten, 2020). Both the memory blending approach and the source monitoring approach have received the most empirical support and are largely explained by conscious processes. The source monitoring approach predicts that a witness remembers encountering both the bystander and the culprit but confuses the actions of one with the other. While the memory blending approach predicts that the witness earnestly believes that the culprit and the bystander are the same person. For example, a witness may believe that the innocent bystander who was encountered earlier returned to commit the crime event. The automatic processing approach is the truest to the original definition of UT. In short, this approach predicts that an individual has no conscious recollection of encountering the bystander prior to the crime because the individual unconsciously encoded the face of the bystander. As a result, when the memory of the bystander is retrieved, it cannot be rejected easily and in turn the witness may associate the bystander's familiarity with the event of the crime.

Memory Blending.

All three theoretical approaches were first proposed in Ross et al. (1994). These authors conducted a study in which they presented participants with two scenes. In one scene an innocent bystander was seen reading to children and in the next scene a similarly dresses culprit was seen stealing money from a purse. Participants were then given a lineup with the innocent bystander. An UT error was clearly observed, as the innocent bystander was chosen at a much higher rate if they were previously seen than if they were not previously seen. However, in a follow up study, this transference error was eliminated by informing participants that the person reading was different from the thief. Based on these findings these authors concluded that participants mistakenly assumed the innocent bystander and the culprit were the same person. This conclusion most aligns with the memory blending approach.

Many similar studies came to this same conclusion (Philips et al., 1997; Ross et al., 1994; Wooten, 2020). For example, another study found evidence for memory blending by using a similar paradigm, in which the innocent bystander and culprit were either seen at the same time or were seen moments apart (Phillips et al., 1997). Again, participants were more likely to commit an UT error when there was no clear distinction between the innocent bystander and the culprit (they were seen moments apart), than when there was (they were seen at the same time). In other words, if the participants could not assume that the bystander and the culprit were the same person, they could avoid making the transference error. Shockingly, even if both the culprit and innocent bystander were both presented in the same lineup at test, participants still chose the innocent bystander more. The authors believed that participants committed this error because they genuinely believed the innocent bystander and culprit were the same person. In short, participants encoded the face of the innocent bystander first and did not update their memory once the culprit was seen.

More recent studies have further explained the memory blending approach using literature on change blindness. Change blindness is a phenomenon that occurs when viewers fail to notice changes between one scene and the next (Simons & Levin, 1998). When applied to memory blending, researchers believe that witnesses may fail to detect the change between the innocent bystander and the culprit and as a result the witness often believes that they are the same person (Davis et al., 2008; Nelson et al., 2011). In Davis et al. (2008), participants viewed a scene that required them to detect a change in order to distinguish between the innocent bystander and culprit. First, the innocent bystander was seen for several seconds before walking behind a box in a liquor store. Several moments later the culprit walked from behind the same box and then stole a bottle of wine. The researchers found that when participants did not detect the change between the innocent bystander and the culprit, they were more likely to choose the innocent bystander out of the lineup. This study provided excellent support that when witnesses are blind to the change between the innocent bystander and some culprit, they likely failed to update their memory with the newly presented face. This is likely what occurred in Phillips et al. (1997) when participants still chose the innocent bystander over the culprit though both were presented in the lineup. Again, this illustrates a clear failure of the participant updating their memory upon seeing the actual culprit. Levin (2002) would explain this behavior as a tendency to rely more on conceptual information than perceptual information when tracking an identity. In short, in cases of memory blending and change blindness, witnesses are not obtaining additional perceptual information when the culprit is presented, thus resulting in a lineup decision based primarily on conceptual cues. In this case, a witness may falsely rely on a conceptual cue that if they just saw a person, that person may still be present and therefore there is no need to encode additional perceptual information about how that person looks.

Source Monitoring.

Past studies have also found some moderate evidence for the source monitoring approach (Brown et al., 1977; Geiselman et al., 1993; Phillips et al., 1997; Wooten, 2020). Source monitoring is one’s ability to remember the details or context surrounding a particular event in memory (Johnson, Hashtroudi, & Lindsay, 1993). For example, one might remember that a face is familiar, but in order to determine *why* a face is familiar, one would have to rely on source memory. In relation to UT, a source monitoring error occurs when the witness confuses the actions of the innocent bystander with the actions of the culprit. In other words, the witness may exhibit familiarity with both individuals but would confuse the actions of the two. Evidence of this approach was observed in Geiselman et al. (1993) when participants incorrectly assigned the actions of the assailant to the identity of the accomplice. Another study found that while participants could easily identify a previously seen face, they were less successful at recalling the actions performed by each identity (Brown et al., 1977). Conversely, Phillips et al. (1997) was able to capture evidence of successful source monitoring, when participants knew the culprit and innocent bystander were separate people. In this case, participants were successful at rejecting the innocent bystander when they appeared in the lineup because they had a clear source memory for both the culprit and the innocent bystander. They successfully remembered that the bystander was another patron in the park and not involved in the crime. Having the ability to monitor the source of their memory allowed these participants to avoid committing a transference error.

The source monitoring framework was first proposed by Johnson et al. (1993). This framework provided an overview on the nature of source monitoring, its role, and how it can be impacted. Earlier work on source monitoring focused on reality monitoring, which is the ability to determine whether an event was real or imagined (Johnson & Raye, 1981). Researchers believed that distinguishing between real and imagined events is facilitated by assessing the richness of the details associated with each memory. Memories of real events would include rich details and would be contextually bound in time. In other words, it would be clear what happened before and after that remember event. Such richness and detail would be severely lacking in an imagined event. With time, the focus shifted from differentiating between real and imagined events, to just differentiating between the context surround different events more generally. Thus, the term source monitoring was introduced (Johnson et al., 1993). The source monitoring approach concerns three types of distinctions. Distinguishing between an externally perceived event and an internally generated event is called reality monitoring (e.g., distinguishing between an event that actually happened to you and something you only dreamt of). Distinguishing between two internally generated events is called internal source monitoring (e.g., distinguishing between something you said and something you only intended to say). Distinguishing between two externally perceived sources is called external source monitoring (e.g., distinguishing between something your friend told you and something your sibling told you).

Most relevant to the current context is external source monitoring. With external source monitoring, it is expected that both externally perceived events would have a high degree of richness and details, so a new challenge is presented when distinguishing between the source of these memories. Ideally, there should be some characteristics between the two memories that allow for them to be differentiated. For example, simple studies on source monitoring often test participants on their memory of word lists and present words in different colors or voices to encourage participants to generate more cues about the source (Gallo et al., 2007; Moore et al., 2020). In a simple example, if list A was presented in red font and list B was presented in blue font, remembering the color a word was presented in would be a helpful cue in determining which list the word appeared in. In the same way, remembering whether an innocent bystander was seen in one's neighborhood or seen at one's place of business might serve as an effective cue when monitoring whether that innocent bystander was involved in a crime. Our ability to retrieve and effectively utilize the details surround a memory reflects our source monitoring ability.

The application of source monitoring framework to instances of UT is clear when put in the context of MEE. Again, for this effect to occur, a witness would view an image of the innocent bystander during an identification procedure, such as a mug book viewing, a lineup, or a show-up procedure. If a witness effectively utilizes source monitoring, upon seeing the innocent bystander again, they should correctly recall that the innocent bystander is familiar because they were recently seen in an identification procedure. However, when source monitoring fails, we might expect the witness to incorrectly assign the familiarity of the innocent bystander to the events of the crime. Past studies have found evidence of this occurring as well. In Memon et al. (2002), participant completed a MEE task after 48 hours. These participants were more likely to select and familiar bystander shown during the MEE phase than any unfamiliar face. This relationship held true, even when participants did not identify that innocent bystander during the mugshot viewing. This study shows that though the participants maintained a memory of the innocent bystander without the ability to also access the source that they were encountered during the mugshot viewing phase, these participants made an erroneous judgement. In other words, they incorrectly attributed the memory of the innocent bystander to the event of a crime. An additional study found that even when participants did not identify anyone during the mugshot exposure phase, they still had a high rate of transference errors (Perfect & Harris, 2003). These authors concluded that these participants were not affected by commitment effects but instead confused the source in which they encountered the innocent bystander. In other words, these participants incorrectly attributed the familiarity of the suspect to the crime scene instead of the mugshot viewing. It is important to consider though that there are many characteristics that should allow witness to distinguish between encountering the innocent bystander in real life versus from a picture or even an in-person identification procedure. Source monitoring should be aided by retrieving the unique phenomenological details surrounding viewing a bystander in a mugshot versus in real life. For example, perhaps a witness would remember the exact picture that they saw of that innocent bystander, the voice of the investigating officer asking them about the picture, or even where they were when they saw the image. Each of these tangential memories may lead the witness to remember that they encountered the innocent bystander during a mug-book viewing instead of at the event of a crime. In fact, a meta-analysis found that when few images are shown during a mugshot viewing, people were likely better able to use source monitoring to avoid identifying the innocent bystander (Deffenbacher et al. 2006). However, there may also be overlap in the nature of these memories that would further challenge source monitoring. For example, when witnessing a crime or being questioned about that crime, a witness could encode similar characteristics about both events, such as the emotions evoked, the presence of law enforcement, and the time during which the events took place. Whether a witness encodes these events similarly or can effectively retrieve the defining characteristics about these events would significantly impact the effectiveness of source monitoring.

Turning back to the source monitoring framework, it is clear that encoding and retrieval conditions would have a significant impact on one's ability to source monitor. In Johnson et al.'s (1993) review of the source monitoring literature, the authors highlight that the ability to retrieve source memories surrounding an event can be impacted by the ease in which the events were encoded as well as the environment in which the events are remembered. Many of the boundary conditions identified in earlier research reflect the impact of poor encoding conditions. Having a shallow interaction or experiencing an unmemorable event likely leads to less effortful encoding, thus resulting in less source memories surround an event. Without enough memories surrounding the source of an event, it may make it extremely challenging to differentiate between two external events. Additionally, the boundary condition of a longer retention time could lead to the degradation of a memory making it harder to retrieve the source details. Whether a participant commits a source monitoring error could be the result of whether a study design allows the innocent bystander to be familiar enough to be recognizable, but not so familiar that the contextual details surrounding their identity are easily retrievable (Deffenbacher et al., 2006). Such a balance may be more possible in the real-world, as we encounter a range of faces throughout a day that we may or may not encode. However, the sentiment of these researchers simply suggest that UT is largely dependent on whether a source memory is successfully retrieved. The source monitoring framework states that context of retrieval could significantly influence retrieval (Johnson et al., 1993). Already, eyewitness researchers have begun to assess how to improve the accessibility of source memories. Techniques, such as context reinstatement and meditative context reinstatement have been identified as successful methods of helping witnesses to retrieve more detailed memories (Hammond et al. 2006). Both these methods require a witness to return to the scene of a crime physically or mentally and recall as many peripheral details as they can. It is possible that recalling source memories would allow witnesses to better contextualize the central events of a crime and better assess the integrity of their overall memory. This shifts the participants into using more conscious and effortful processes to remember an event than more unconscious and automatic processes.

Previous work on binding errors also provide support for the source monitoring approach. Binding is a process of grouping together or associating the separate components of some stimuli in order to create a stable representation of a singular stimulus or event (Brockmole et al., 2008; Kersten et al., 2008). For example, if we are remembering an object, we might be able to recall several features of it, such as its label, color, size, texture, and where we commonly see this object. A binding error occurs when we incorrectly associate the feature of one item with the feature of another item (i.e., we remember a green ball, but the ball was actually red, and the cube was green). The definition of binding closely relates to what one must successfully do during source monitoring. A group of researchers have begun to explore the nature of binding errors that can result when binding people with actions (Earles et al., 2008; Earles et al., 2016; Kersten et al., 2008; Kersten, Earles, & Upshaw, 2013).

In these binding paradigms, participants are typically shown a study phase in which they watch many videos of different actors performing different mundane actions. At test, the participants are shown a combination of films of new or old actors performing new or old actions. The participants were challenged to only respond "yes" to films of old actors performing the same actions they were shown doing during the study phase. However, several studies have found that it is typical for participant to incorrectly bind an old actor to an old action that was performed by someone else (Earles et al., 2008; Earles et al., 2016; Kersten et al., 2008; Kersten, Earles, & Upshaw, 2013). This is referred to as a conjunction event (old actor and old event binding error). This binding error was much more common than any binding error that included either a new actor or a new action. In short, the authors believe that participants had memory for the old actors and old actions, but it was difficult for them to correctly bind the actor to their action. Some of these studies found that actor similarity led to more false alarms of conjunction events (Earles et al., 2008). However, even when the actors were dissimilar, conjunction events still led to more false alarms than when a scene included a new actor or a new event (Earles et al., 2008). This finding is critical because the memory blending approach relies on the innocent bystander and culprit to be similar in appearance in order for a transference error to occur. But this study, as well as others, shows evidence that a transference error can occur even when actors are dissimilar (Earles et al, 2008; Kersten et al., 2008).

The authors further explain their findings using dual-process framework. The dual-process framework acknowledges that recollection and familiarity processes are utilized when making memory judgements (Brainerd et al., 1999; Jacoby, 1991; Jacoby, 1999; Jones & Jacoby, 2001; Mandler, 1980; Yonelinas, 2002). In short, they conclude that recollection processes are required to make correct binding judgements, but only familiarity processes are required to identify a previously seen actor or action. Thus, binding errors likely occur due to the participants tendency to rely on familiarity when they do not have a strong recollective memory of the actor performing some action. This idea is further supported by other studies that purposely impairs recollection to increase participant's reliance on familiarity (Brainerd et al., 1999; Earles et al., 2016; Kersten et al., 2008; Yonelinas, 2002). For example, studies using older adult samples report an increase in false alarms to conjunctive event (Kersten et al., 2008). This increase in false alarms is expected because older adults are known to rely more heavily on familiarity processes than recollective processes (Koen & Yonelinas, (2016). Similarly, for binding errors, source monitoring also requires vivid recollection. If a participant only retains a shallow memory cue that an innocent bystander was seen before but is unable to use recollective processes to remember exactly why they are familiar, it is possible that they may incorrectly bind the innocent bystander with the actions of the crime.

Automatic Processing.

The final theoretical approach, automatic processing, states that UT occurs when a witness accuses the innocent bystander due to a feeling a familiarity. Researchers believe evidence of the automatic processing approach requires a participant or witness to identify an innocent bystander as the culprit while having no memory of where they actually encountered the innocent bystander (Ross et al., 1994; Wooten, 2020). This is equivalent to what in the source monitoring literature has been called 'source forgetting.' (e.g., Chambers & Zaragoza, 2001). Imagine, for instance, if you were the ticket agent in the case the Loftus (1976) described. Imagine you look at the lineup and when you come across the soldier, something about his face jumps out at you. You do not have a conscious recollection of where or when you saw this person, but he seems familiar to you. This might lead you to infer that the reason he seems familiar is because he is the culprit. This concept is further supported by literature on Fuzzy Trace Theory (FTT) and false memories offer theoretical support on why automatic processing may lead to UT.

FTT and conjoint recognition models came about as researchers began to explore the dual function of memory. Particularly, researchers believed that both verbatim and gist processes are utilized to make memory judgements (Brainerd et al., 1999; Jacoby, 1991; Jacoby, 1999; Jones & Jacoby, 2001; Mandler, 1980; Reyna & Brainerd, 1995). Verbatim memories are clear and rich recollections, while gist memories are vague, general, or broad ideas. Often these phenomena are referred to as recollections (verbatim) versus familiarity (gist) based judgements. According to the FTT, when insufficient verbatim memories are accessed, we may make judgements based on feelings of familiarity (Brainerd & Reyna, 1999; Reyna & Brainerd, 1995) Researchers developed the conjoint recognition model to collect evidence on when participants utilize verbatim versus gist processes in decision making (Brainerd & Reyna, 1999; Reyna & Brainerd, 1995). In relation to the automatic processing theoretical approach, it is expected that a witness fails to retrieve an adequate verbatim memory of the culprit. Alternatively, the witness relies on a vague gist memory or feeling of familiarity towards the innocent bystander to make an identification. In other words, their memory judgment was based on a gist memory. FTT also acknowledges that participants can have highly vivid recollective memory towards never-before seen stimuli. This is often referred to as phantom recollection (Brainerd et al., 2001). Lindsay and Johnson (1989) suggest that it is typical to make judgments based on familiarity alone unless we are motivated to more closely monitor our memory for verbatim details.

Research on false memories further established support for the automatic processing theoretical account. The Deese-Roediger-McDermott (DRM) paradigm has been commonly used to reliably capture false memories in the lab (Roediger & McDermott, 1995). This paradigm simply has participants memorize a word list, in which each word converges on one unspoken word called the *critical lure*. Often times participants would recall seeing or hearing the critical lure during the study phase, though it was not actually presented. Some variations of this task have participants report whether they *remember*—a judgment based on verbatim/recollective processes—or *know*—a judgement based on gist/familiarity processes—that a word was presented at study. Typically, participants assign *know* judgements to the critical lure. In other words, these participants are likely making a judgement based on gist processes, similar to what is expected in the automatic processing approach. False memories have not only been captured by the DRM tasks but also are believed to be a common occurrence due to the malleable nature of memory (Hyman et al., 1995; Loftus, 1975; Lindsay & Johnson, 1989; Zaragoza & Lane, 1994). Many researchers have claimed that suggestions, schemas, word-choice, and the simply act of remembering can all lead to a memory being altered. For example, Loftus (1975) found that changing a verb when asking witnesses to report the details of a car accident impacted their memory of an event. For example, using the word “smashed” instead of “hit” after showing a scene of a car crash increased the rate in which participant reported the presence of broken glass. Critically in this study, materials did not include any clips of broken glass, so participants experienced a false memory if they reported seeing broken glass. Another study found that participants often mistook information suggested to them as information that they actually saw (Hyman et al., 1995; Zaragoza & Lane, 1994). For example, Zaragoza & Lane (1994) referred to this error as a source misattribution, which occurs when a person attributes a memory to an incorrect source. If a witness is shown or told details of a crime, whether true or false, it is possible that they may mistakenly believe that what they were told was something they actually experienced.

It is possible that a witness’s memory for a crime can become updated due to influences through law enforcement and other witnesses. For example, MEE could lead witness to update their memory for how the culprit looks. Additionally, one study showed evidence that simply asking, “is this the culprit?” while showing participants a picture of an innocent bystander was enough to update their memory (Kersten & Earles, 2017). This malleable nature of memory also explains how innocent bystanders become confused for the culprit. At some point, the witness updates their memory for the culprit’s face with that of the innocent bystander. Perhaps the boundary condition of the bias to associate any known culprit to the critical role of the crime can also be explained by the malleability of memory. As witnesses reconstruct their memory, they may incorrectly recall the role played by the innocent bystander or an accomplice. This mistake could then replace their true memory. It is also important to note that participants may be influenced to make this mistake due to overreliance on schemas or even misattributing the familiarity of a suspect to the wrong role.

Summary

UT has been studied through the lens of different theoretical perspectives as well as through well-tested paradigms. Through paradigms such as bystander designs and MEE designs, several boundary conditions have been identified as possibly causes of UT. These boundary conditions include: an innocent bystander being seen temporally close to a crime event, sharing a similar appearance to the culprit, having a shallow interaction with the witness, being involved in a non-memorable event, or being recalled after a long retention interval (Davis et al., 2008; Nelson et. al. 2011; Phillips et al., 1997; Ross et al., 1994). Additionally, researchers found a bias that any culprit identified by a witness is often remembered as playing a central role in a crime (Geiselman et al., 1993 & Geiselman et al., 1996). Upon further investigation it is clear that these identified boundary conditions are differentially supported by the theoretical approaches outlined for UT. For example, the memory blending account depends on an innocent bystander sharing close spatial or temporal proximity to the culprit and having a close resemblance to the culprit. This makes it possible for the witness to confuse or even fail to encode that the innocent bystander and culprit are two different people. The source monitoring approach is best supported when the boundary conditions include shallow interactions, unmemorable events, and longer retention intervals. Each challenge the witness's ability to maintain a strong source memory for the crime event or for the innocent bystander's face. The automatic processing account has the least support through empirical findings, but biases assumed by witnesses and suggestions offered through law intervention could provide support for this approach. Despite the differing levels of empirical support for each of these theoretical approaches, each are well supported by larger theoretical concepts and should continue to be considered as underlining causes of UT. Thus, it is the role of future research to build upon the work that has already been done.

Novel Approaches to Studying Unconscious Transference

The same paradigms have been utilized to study UT. Though these paradigms have allowed researchers to learn a lot concerning the boundary conditions surrounding UT, it is possible that researchers have also failed to capture other situations that can lead to UT errors. For example, Deffenbacher et al. (2006) suggested that the manner in which UT has been studied has largely influenced the conclusions that could be drawn on why this error occurs. The lack of support found for the automatic processing approach has already led many researchers to conclude that UT may not be an unconscious phenomenon at all (Read et al., 1990; Ross et al., 1994). However, the memory blending and source monitoring approach typically receive greater support in the literature because they are easily captured by the common UT paradigms. Lane and Meissner (2008) referred to this situation as a methodological fixation. In their original paper, these author's expressed concerns that the limited designs used in eyewitness testimony literature could limit what we can learn about these situations. In short, anytime limited paradigms are used to study a phenomenon, it is possible that we may fail to fully understand or capture that phenomenon.

For example, the memory blending approach may receive a lot of support simply because many studies incorporate an innocent bystander that dresses similar to the culprit and who is seen immediately before the crime event. In short, this paradigm makes it easier for participants to mistakenly assume the innocent bystander is the same person as the culprit. If these factors were altered, it is likely that this approach would receive considerably less support. This may explain why the memory blending approach is rarely supported by MEE designs. Additionally, the source monitoring approach typically receives support depending on the design of the study. As stated earlier, when a design makes it easy for a participant to monitor the source of their memories, significantly less source monitoring errors are expected to occur (Brown et al., 1977; Phillips et al., 1997; Read et al., 1990). However, when a design strains source monitoring through by incorporating shallow interactions, unmemorable events, and longer retention times within their studies design, it is more likely that there would be evidence for the source monitoring approach. Though situations similar to these paradigms could occur in real life, these studies may not fully capture the range of situations that could lead to instances of UT.

Lastly, past paradigms consist of manipulations that makes tracking one's memory relatively simply or much too difficult. As a result, it may be harder to demonstrate evidence of the automatic processing approach. For example, Read et al. (1990) states that many of their earlier experiments did not work because the participant engaged too much with the innocent bystander and the culprit. As a result, when questioned about the crime, it was easy for these participants to monitor their memory. They could easily remember the actions and the nature of the interaction with the innocent bystander and could therefore reject their role in the crime event. Similarly, studies with just one bystander reflected the same trend (Davies et al., 2008; Read et al., 1990; Ross et al., 1994). These individuals would have no problem accurately recalling the source memory of the innocent bystander and culprit, as long as they knew that they were two different people (Davies et al., 2008; Phillips et al., 1997; Ross et al., 1994). When participants can effectively use source monitoring, their memory of a scenario would be too stable to make a judgment solely based on automatic processes such as familiarity. In other words, these participants would have access to more detailed or verbatim memories and would likely rely on those memories than vaguer or gist memories. One the other side of this balancing act, using too large a stimulus set may present its own issues as well. For example, one study on MEE showed participants up to 600 mugshots and found no evidence of a transference error (Dysart et al., 2001). These participants were just as likely to reject the lineup with the innocent bystander (who was previously seen) as someone who had not previously seen the innocent bystander. It is likely that these participants did not choose the innocent bystander at an increase rate simply because they had no memory for their face. After viewing 600 mugshots, these participants not only failed to recall the source of any of the faces presented in the lineup but also failed to develop any familiarity with the faces presented during the mugshot phase. Thus, these participants could not make any judgement based on a feeling of familiarity or gist memories. Again, for a transference error to occur, a witness must have some familiarity with the innocent bystander. To observe this phenomenon, a design must allow for the participant to achieve some minimal level of familiarity with the innocent bystander.

The paradigms commonly used to study UT have had a significant impact on the previous conclusions drawn. In order to continue the exploration of UT, we should continue to create novel paradigms to study this phenomenon that are back by well-accepted theory. By introducing novel paradigms and methods of studying UT, perhaps we can identify additional boundary conditions that predict when UT may occur. In this next section I introduce one potential approach towards understanding UT that could help to develop novel approaches towards studying UT. Particularly, I explore the potential utility of designing experiments with familiarity as a boundary condition for UT errors.

Theories on Familiar Face Recognition

One novel approach for studying this phenomenon is examining at UT through the lens of familiar suspect identifications. In Loftus (1976), UT was defined as a phenomenon in which "a person seen in one situation was confused with or recalled as the person seen in a second situation" (Loftus, 1976, p. 93). Based on this definition, it is clear that UT can only occur if the person was previously seen by the eyewitness. By definition, UT does not involve misidentification of a completely novel face. This is true of MEE and bystander designs, but these designs typically only introduce an innocent bystander who is seen once. However, it can be assumed that this error may occur for innocent bystanders when they are seen several times or even if the witness develops some level of familiarity with them. Thus, a logical next step in investigating UT might be to examine how familiar suspects could be mistakenly confused as the culprit of a crime.

The focus on familiarity suspect identifications is relatively new in the eyewitness literature. Though a field study found that 67% of cases included familiar suspects, very few eyewitness researchers have explored how familiar suspect identifications may differ from stranger identifications (Flowe et al., 2001). A recent paper by Vallano et al., (2019) attempted to draw attention to this dearth in research. One goal of this paper was to convey the urgency of increasing research in this area. Several courts of law have begun making rulings considering familiar suspects without any research to inform these decisions. These ruling include barring expert witnesses from cases involving familiar suspects (*Hagar v. United States*, 2004; *State v. Guilbert*, 2011) and using prior familiarity as evidence to have more confidence in an eyewitness's report (*People v. Rodriguez*, 1992). Additionally, some studies have found evidence that familiarity may impact a juror's decision. For example, some studies found that mock jurors perceived eyewitness as more accurate in their decision and attributed a higher probability of guilt to familiar suspects (Sheahan et al., 2017; Vallano et al., 2018).

Secondly, Vallano et al., (2019) highlighted that familiarity must be studied as a spectrum instead of as an all-or-none phenomenon. Particularly they proposed a spectrum including *stranger*, *minimal*, *moderate*, and *extensive* familiarity. Potentially the varying degrees of familiarity a witness has to a suspect may systematically change the nature of errors they can make in identifying them. If we are highly familiar with an innocent bystander, it may be easier for us to maintain the source of that suspect's identity and recall from where they are familiar. Therefore, if we only encountered them in an innocent context, we would be able to successfully reject them as the culprit. At the same time, if we cannot remember encountering a suspect at all, we would still reject that suspect because we would have no memory of their face. Thus, UT may be more likely to occur with witnesses who are minimally or moderately familiar with a suspect. In real-world cases, this balance is easier to achieve because on any given day a person encounters an array of new and old faces. Additionally, we share a range of familiarity towards the different individuals we come in contact within any given day. By successfully replicating this mid-tier familiarity in the lab, perhaps future research will be able to successfully capture UT in the lab in order to better understand the nature of this phenomenon.

Familiar face recognition has likely been largely overlooked in the eyewitness literature because it is often assumed to be less error prone that unfamiliar face recognition. For example, multiple studies have found that even under poor viewing conditions familiar face recognition is relatively unaffected (Bruce et al., 2001; Kerstholt et al., 1992; Jenkin et al., 2011). Additionally, studies find that subtle changes in hairstyle, expressions, facial hair, angle, lighting, pose and accessories such as glasses, hats, and makeup can challenge unfamiliar face recognition but has a negligible impact on familiar face recognition (Jenkins et al., 2011; Ritchie & Burton, 2017). In short, familiar face recognition is commonly believed to be stable and robust. Though, many studies find that making such a judgement is relatively accurate with familiar face recognition (Bruce et al., 2001; Kerstholt et al., 1992) there is still a point where familiar face recognition can become erroneous. Perhaps this point, in which familiar face recognition becomes erroneous, can explain certain instances of UT. Already researchers have begun to investigate the role of familiar suspects in instances of UT. One applied study using a familiarization phase found that participants adapted a more liberal decision criterion to familiar faces (Wooten, 2020). In short, these participants were more accurate at identifying familiar and guilty suspects in a lineup task but were also more likely to mistakenly identify an innocent and familiar suspect in a lineup. This study was the first to show evidence of UT error resulting from a familiar suspect identification. Another researcher conducted a similar study with an in-person familiarity manipulation but was unable to find an overall impact of familiarity (Sheahan et al., 2021). These findings warrant additional studies to continue to parse out the impact of familiar identifications and when they may be erroneous or lead to UT. Particularly, the range of familiarity should continue to be investigated and the underlining theoretical approaches should be assessed for instances of UT caused by familiarity.

It is important to further distinguish that though familiar face recognition does not typically result in the same errors as unfamiliar face recognition, it can still be erroneous. There are unique errors that result with familiar face recognition. For example, past studies have found that a common familiar face recognition error is mistaking an unfamiliar person for someone who is familiar (Bruce et al., 2001; Kerstholt et al., 1992; Pezdek et al, 2014; Read, 1995; Young et al., 1985). A diary study on face recognition errors found that this was the most frequent error made by participants (Young et al., 1985). Additionally, a study done with yearbook photos found a 34% false positive rate, in which participants mistakenly believed a never-before-seen person was someone from their high school (Pezdek & Stolzenberg, 2014). The nature of these errors is similar to what we might expect to occur in instances of UT. In short, a witness may mistake an unfamiliar culprit as a familiar innocent person.

To more fully understand how UT can be explained through the lens of familiar suspect identifications, we must turn to the literature on general face recognition. Bruce and Young (1986) created a model to best conceptualize the cognitive mechanisms underlining face recognition. One component of their model is the introduction of different codes. Codes are units of information that we encode and store about a face or a person's identity. Though their model lists several codes, for the purpose of this paper I focus on distinguishing between structural and semantic codes. Both of these codes are essential for familiar face recognition and for understanding why familiar face recognition may be erroneous.

Structural codes are units of information that capture how an individual face looks by capturing the invariant features of a person's face. Structural codes are often juxtaposed with pictorial codes, which capture a onetime view of a face, such as what you would encode from looking at a single image of a person. Structural codes, however, capture a range of variability in a person's face and are critical for maintaining a mental representation of how a person looks across a range of situations to allow for familiar face recognition. The acquisition of structural codes is believed to explain one way a face can become familiar (Bruce & Young, 1986; Jenkins et al., 2011; Ritchie & Burton, 2017). Support for the existence of structural codes come from the literature on ambient images and face matching/sorting tasks. Ambient images are characterized as highly variant images of a person's face that capture the idiosyncratic ways that face may change (Jenkins et al., 2011; Ritchie & Burton, 2017). Additionally, ambient images have been deemed important in creating stable face representations to encourage familiarity. Several studies find that matching images of familiar faces is significantly easier than matching images of unfamiliar faces (Bruce et al., 2001; Jenkins et al., 2001; Murphy et al., 2015). This is also true if a participant is recently trained with ambient images of a previously unfamiliar face (Andrews et al, 2015; Burton et al., 2016; Dowsett et al., 2016; Ritchie & Burton). This improvement in performance is believed to be the establishment of more stable structural codes. In short, with unfamiliar face recognition variable features such as, hairstyle, expression, accessories, pose, and lighting are given excessive attention though they are not truly helpful for face recognition. Alternatively, with familiar faces invariant qualities of a face are given more attention to allow for successful recognition even when a face is blurred or obscured in some way (Bruce et al., 2001; Kerstholt et al., 1992). Though structural codes are critical for developing familiarity with a person's face, higher level of familiarity likely requires more than perceptual expertise. For example, Gipson and Lampinen (2020) found that after training participants on a sample of ambient images twice the size of the set of images used at test, participants still could not reliably achieve perfect performance on a face sorting task. With higher levels of familiarity, such as the extensive category defined in Vallano et al. (2019), we would expect for participants to achieve perfect performance. However, this finding simply highlights the importance of other codes within the Bruce and Young (1986) model and the essential role they play in familiarity.

The second code that is essential for familiar face recognition is semantic codes. Semantic codes are qualities, traits, attributions, and characteristics that can be associated with a face or identity. Bruce and Young (1986) specified two unique types of semantic codes: visually derived semantic codes and identity-specific semantic codes. Visually derived semantic codes are simply attributions that are arbitrarily assigned to a face. For example, from looking at a person you may judge them to be kind, sincere, dishonest, serious, etc. without actually knowing anything else about them. These codes can be established for both unfamiliar and familiar faces. However, identity-specific semantic codes can only be established for familiar faces. These codes include information such as where a person is typically encountered, their occupation, how they dress, and other information that cues their identity. Critically, these cues are not derived from how the person looks but rather from the associations connected to who the person is (Bruce & Young, 1986). In other words, these codes are learned and require the retrieval of information from memory to access. Several, neuroscientific studies have concluded that differential activation caused when viewing familiar faces versus unfamiliar faces is likely the activation or retrieval of semantic knowledge (Gobbini et al., 2007; Herzmann et al., 2004; Megreya & Burton, 2006; Wiese et al., 2018). One study actually found evidence of increasing activation depending on whether a participant was shown a professor or a more personally familiar face such as, a friend or family member (Wiese et al., 2018). It is likely that as a person becomes more familiar, the identity-specific semantic codes become richer and vaster.

After establishing different face recognition codes, Bruce and Young went on to describe a human face processing system composed of several functional components that facilitate judgements concerning expression, speech, and identification. Again, for this paper I will largely focus on the components of this system involved in discerning identity. The first functional component is the face recognition unit (FRU). The FRU is a component that processes perceptual information in order to discern identity from a face. FRU are composed of structural codes and there is a unique FRU for each familiar face (Bruce & Young, 1986). If there is a match between the structural codes stored in a FRU and a target face, that FRU would become active. In short, an activated FRU signals that the target face matches a known person or that the target face shares resemblance with a known person. In addition to FRU, person-identity nodes also serve the purpose of discerning identity. However, person-identity nodes rely on identity-specific semantic codes to make identity judgments based on contextual information. Again, there is a unique person-identity node for each familiar face that becomes activated when a known person is seen, is believed to be seen, or is expected to be seen (Kerstholt et al., 1992; Pezdek et al, 2014). For example, when students come into a classroom it is likely that the person-identity node for their professor becomes active simply because there is an expectation that they will encounter the professor. In short, activation of the FRU or the existence of cues such as context, clothing, voice, and gait can activate the person-identity node.

Based on this model, both FRUs and person-identity nodes are utilized to make an identity judgment. Though separate, these components can influence one another in order to make a more accurate judgement. For example, if not enough structural codes are encoded to make an identification using FRUs, one might rely on contextual information (identity-specific code) to support their judgement. Alternatively, if context or expectation leads someone to believe a known person is present, perhaps encoding addition perceptual information (structural codes) would allow for a more accurate judgement. Also, it is important to acknowledge that judgements can be made based on one component without any or little influence from the other. However, this could result in less accurate judgements as shown in several prior studies on familiar face recognition (Pezdek et al, 2014; Read, 1995; Young et al., 1985). In the example of a student expecting to see their professor, it is possible that they may trust so strongly in their expectation that they fail to get additionally perceptual information to confirm their identification. Though this is useful when the person at the front of the room is indeed their professor, it could also lead to a misidentification if critical perceptual information could disconfirm the professor's identity.

Considering Bruce and Young's (1986) model and related literature on face recognition, it is clear that familiar face recognition is set apart. Familiar faces have FRUs and person-identity nodes that would not be accessible for unfamiliar identities. Additionally, familiar faces have more structural codes and identity-specific codes available. Lastly, there is neuroscientific evidence and behavioral data that suggests familiar faces are processed differently and more accurately (Gobbini et al., 2007; Herzmann et al., 2004; Megreya & Burton, 2006; Wises et al., 2018). Though instead of simply concluding that familiar face recognition is robust, it might be more accurate to conclude that based on how familiar faces are processed, familiar face recognition errors should differ substantially from unfamiliar face recognition errors. For example, though familiar faces are not yielded unidentifiable by blurriness or poor camera quality (Bruce et al., 2001; Kerstholt et al., 1992) perhaps an error would instead occur because of an overreliance on only perceptual (FRUs and structural codes) or only conceptual (person-identity nodes and identity-specific codes). For example, one study manipulated whether participants expected to see their co-workers in a set of degraded face images (Kerstholt et al., 1992). The results indicated that when expectations were high, participants were more likely to falsely identify an unfamiliar person as one of their co-workers. Similarly, another study had participants keep diary records of the face recognition errors they made and found that having an expectation of seeing a known person contributed to 33% of reported misidentifications (Young et al., 1985). Additionally, that same study found that 60% of mistaken identifications resulted from poor viewing conditions. In short, these participants made an identification primarily using conceptual information when perceptual information was less accessible.

Familiar face recognition errors are further explained by earlier psychological constructs as well. Bruce and Young's (1986) model ties in nicely with spreading activation theory.

According to spreading activation theory when certain nodes or ideas in memory become activated, related nodes receive some activation as well (Anderson, 1983; Roediger & McDermott, 1995). For a simple example, hearing the word “red” would activate nodes of related words such as “orange,” “apple,” “firetruck,” etc. If enough activation spreads to a related node, it is possible that a person may become conscious of that node. This is clearly demonstrated in the DRM task described earlier. Again, all the words within DRM lists converge on one unspoken word called the critical lure. Theoretically, as each word is spoken or read, some activation spreads to the node of the critical lure. If enough activation spreads to that node it is possible that a person would believe the critical lure appeared on the list when it indeed did not. In other words, the related words presented in the list prime participants to think about the critical lure, in turn making it easier for that word to come to mind (Roediger & McDermott, 1995). In the same way, it is possible that if enough identify-specific codes become activated, it could activate a person-identity node that is not actually relevant. For example, in Gieselman et al. (1993), the participants displayed a bias to always associate any criminal identified as the primary assailant in the crime. It could be that when asked to identify the culprit, the person-identity node for both the assailant and accomplice becomes active, making it difficult for the participant to distinguish between the roles of the two identities. Similarly, we can imagine that if a familiar person is expected to be encounter, dresses similar to the culprit, or even sounds similar to the culprit, their person-identity node may become active even if they are not actually encountered. As a result, this implicit spreading activation could cause a witness to believe a familiar person was present at a crime when they indeed were not. It is also important to note that this error is specific to familiar faces, as an unfamiliar person would not yet have a person-identity node that could become active.

Literature on heuristics also provide some evidence of recognition errors that solely occur with familiar faces. Heuristics are typically utilized because they require less cognition (Tversky & Kahneman, 1974). This allows for heuristic to be more implicit in nature and less reliant on conscious processes in some scenarios. In Tversky and Kahneman's (1974) paper they outlined three types of heuristics: representativeness, availability, anchoring. Representativeness heuristics are judgements based on probability and similarity. Availability heuristics are judgments made based on how easily a person is brought to mind. And anchoring is a judgment made based on how well information matches with an initial judgement of a person or scenario. Familiar face recognition errors can readily be explained by both availability heuristics and anchoring. Representative heuristics can be made towards unfamiliar faces because these judgements have little to do with the unfamiliar target and more so relies on how well that unfamiliar target matches a stored similar representation. However, availability heuristics and anchoring are much more person specific. Expectations, context, and other visual or auditory cues may allow a person to come to mind more readily than another encouraging a reliance on an availability heuristic. For example, after a robbery of a convenience store a frequent customer may come to mind more readily than an old classmate simply because of the context of the crime. If a witness makes a judgement based on how quickly a person comes to mind, this may lead to a mistaken identification. Anchoring judgments may influence errant familiar face recognition as well if the witness's initial judgement of an innocent bystander was negative. Anchoring could influence whether a witness believes a familiar person is capable of the committing some crime. For example, imagine a scenario where a frequent customer is often seen loitering or getting in altercations with other customers. If a crime scenario occurs, it could be possible that a shop owner who witnesses a crime could believe this frequent customer is capable of such actions and this could influence their identification decision. Alternatively, if a frequent customer is pleasant and courteous, it may be harder for the shop owner to incriminate them for a crime because such actions would fall out of the range of what would be expected of them. In short, anchoring can either encourage or discourage a witness's willingness to implicate a person for a crime or not. This heuristic would rely on more conscious judgments and could not be explained by the automatic processing account.

Before concluding this section, it is important to consider how research with familiar face recognition could garner support for the automatic processing theoretical approach. Support for the automatic processing approach requires a witness to accuse an innocent culprit while having no memory of where they originally encountered that person. In other words, an FRU may exist for a familiar face with little to no person-identity nodes available to determine more about their identity. In such an example, the witness would only choose the innocent bystander on the basis of them being familiar. The witness has no memory for why the innocent bystander is actually familiar to them but assumes their familiarity is related to the crime event. Wooten (2020) found little support for the automatic processing approach when using a familiar suspect design. Only 9% of the participants in the study indicated that they chose an innocent bystander due to familiarity alone. Instead, more support was found for the source monitoring and memory blending approach. Again, this could be due to the experimental design making it too difficult for the encounter with the innocent bystander to be truly forgotten. Only six identities were trained during the familiarization procedure, which may have allowed participants to more easily keep track of each target identity. Additionally, perhaps a shallower familiarity induction would have provided more or less support for the automatic processing approach. Such interactions are perhaps more likely in the real-world than within the lab setting. Additionally, such interactions still lead to the creation of weak person-identity nodes. If these weak nodes become activated through spreading activation, the witness may make an identification decision simply because a person came to mind. In this scenario, spreading activation theory and availability heuristics interplay to cause an unconscious error. In short, an overreliance on the accessibility of an innocent identify could lead to an error most readily explained by the automatic processing theoretical approach. It is possible that a witness may be more willing to make an identification decision if a face is more easily retrieved or recognizable even if they cannot necessarily articulate why a familiar face comes to mind.

Familiarity in Real-world Cases of UT

One archival study attempted to investigate the role of familiarity in real-world instances of UT. Interestingly, this study found that 69% of cases of UT showed no evidence of the witness having prior familiarity with the innocent bystander (Gipson et al, 2021). Additionally, the majority of cases that showed evidence of prior exposure, involved minimal degrees of interaction between the innocent bystander and witness, such as being seen around the neighborhood. Yet, in many of these cases witnesses make high confident identification though they report having no prior familiarity with the innocent suspect. In many of these cases, the witness is not given a lineup or influenced by law enforcement in their decision. Instead, these witnesses are so confident that they immediately go to the police to report their identification.

Their experience can be described as an errant spontaneous recollection of the culprit's face after coming in contact with an innocent bystander. This is similar to the memory error called *phantom recollection* from the conjoint recognition literature (Brainerd et al., 2001). According to the fuzzy trace conjoint recognition model, phantom recollection occurs when an unseen item or word is identified with high confidence. In short, participants believe they have a clear verbatim memory of seeing a never-before-seen item. In this model, high confidence is often assigned to seen words, while unseen words are typically assigned lower confidence values (Brainerd et al., 1999; Reyna & Brainerd, 1995). However, there are times when an unseen word is rated with the same level of high confidence as a never-before-seen word. In cases of UT, witnesses have high confident responses to faces that they do not have memory of seeing before. Phantom recollection is one plausible theoretical reason behind these instances of UT. In Brainerd et al., (2001), phantom recollection was shown to occur often with the critical lure when participants were tested with DRM list. Thus, the authors concluded that words having a high degree of relatedness could evoke a phantom recollection. Perhaps there is some aspect of the innocent bystander that causes them to be highly related to the actual culprit. The incidental activation of person-identity nodes through context or FRUs through resemblance, provides one explanation for UT in these real-world scenarios.

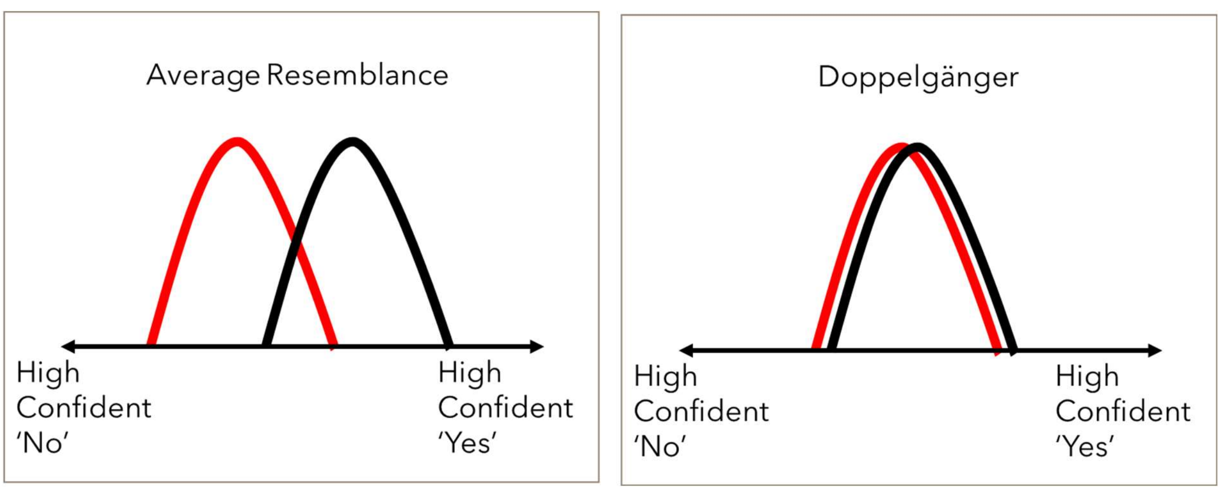
Alternatively, the witness may have sincerely forgotten their original encounter with the innocent bystander. This is similar to the case found in Loftus (1976) Again, the ticket agent reported no prior familiarity with the soldiers, but further investigation showed that the soldier had bought tickets on several occasions from the witness. Similarly, in Mr. Harrell's case the witness did not report that Harrell was often seen at her place or business. This fact came out later in the course of the investigation. Thus, perhaps these witnesses are truly making an identification on the basis of familiarity alone. Without having adequate source memory to reject the reason for why the innocent bystander's face is familiar, witnesses may incorrectly attribute their familiarity to the context of the crime. If this is the case, these examples provide evidence for the automatic processing theoretical account.

Some additional theoretical support for this account comes from signal detection theory (SDT). Based on SDT, it is very unlikely that an unfamiliar or never-before seen face would be identified with high certainty. Instead SDT predicts that on average items or faces seen before should receive higher confidence ratings than items that were not seen (Snodgrass & Corwin, 1988). Also, without knowing exactly why a witness may relate an innocent bystander to a crime, it may be wise to be cautious in believing this error is always the result of phantom recollection. SDT looks at recognition judgements as belonging to one of two distributions: a signal distribution and a noise distribution (For a thorough review on Signal Detection Theory view Snodgrass & Corwin, 1988). Regarding UT, we can imagine that the signal distribution includes faces of culprits, while the noise distribution represents faces of innocent bystanders. The degree to which the noise and signal distributions overlap depends on how discriminable the culprit is from the innocent bystander. For example, in a doppelgänger case, in which the culprit and innocent bystander are practically identical, we would expect there to be a great deal of overlap between the two distributions. In a case where the innocent bystander does not resemble the target at all we would expect little overlap. The cases within this database do not clearly state how similar the innocent bystander was to the culprit, so we might assume that on average the innocent bystander and culprit moderately resemble one another. Thus, there would be a moderate amount of overlap between the two distributions when plotted. An illustration of these instances is depicted in Figure 1. The space that these distributions are mapped onto is represented with the Y-axis capturing frequency and the X-axis capturing evidence of familiarity. Evidence of familiarity in this model refers to the strength of the feeling of familiarity the witness might have towards a face. Both the signal and noise distributions are normally distributed so the average level of familiarity for those groups falls within the middle of the respective curve. The Signal Detection model also incorporates plotting a threshold for responding called the criterion. The criterion is determined based on how willing a witness or participant is to respond ‘yes’ to a given face. The further right a point falls, the more likely it would receive a ‘yes’ response and the further left a point falls, the more likely it would receive a ‘no’ response. Thus, the signal distribution always falls further right of the noise distribution because people would have stronger feeling of familiarity for faces they have seen before than faces they’ve never seen before. Responding ‘yes’ to items within the signal distribution represent a *hit* while responding ‘yes’ to items within the noise distribution represents *false alarms*. False alarms in this context represent when a transference error occurs. In addition to determining a ‘yes-no’ threshold, additional criterions can be plotted along the X-axis to represent varying levels of confidence, with higher confidence responses falling further right. Examining Figure 1 it is clear that high confidence responses are unlikely to occur to items within the noise distribution, unless the suspect and the culprit are relatively identical (in the doppelgänger model). Thus, in cases of moderate resemblance between the innocent bystander and the culprit, we would not expect witnesses to provide high confident responses to the innocent bystander. In support of this, Memon et al. (2002), found that participants in their study were actually less likely to choose a never-before-seen filler from a lineup than a person they showed during the mugshot viewing phase. Future research may benefit from further investigating the likelihood of seeing high confidence responses to never-before-seen faces.

It is also important to acknowledge that many of these real-world instances of UT do not involve the witness first identifying the innocent suspect via a lineup. Instead, these cases of UT commonly involved the witness recognizing the innocent bystander in an innocent context and immediately reporting that individual to police (Gipson et al., 2021). These scenarios are similar to perspective person memory (PPM) tasks, in which participants view a series of faces and must perform a task upon seeing a target's face (Lampinen et al., 2009). It is simply a test of the participant's memory to do something in the future and a test of how well they can remember a target's face. In cases of UT, the witness purposes to contact the police upon encountering the culprit. Yet, the failure occurs in that they performed the critical task in response to the wrong face. Factors such as adopting a lenient response criterion (Lampinen et al., 2018) or having expectations of encountering the target (Moore et al., 2016) have been shown to increase the number of false sightings in PPM studies. We can imagine that witnesses may also be more likely to report innocent bystanders due to the criterion they set for resemblance and due to whether they expect to encounter the culprit again.

Figure 1

Signal Detection Theory and Resemblance



Note. A depiction of Snodgrass and Corwin's (1988) Signal Detection Theory Model. The red distribution represents 'noise' or innocent bystanders, while the black distribution represents "signals" or culprits. The graph on the left represents the degree of confusion between an innocent bystander and culprit who share some average resemblance. The graph on the right represents an innocent bystander and culprit who are almost identical.

Study Overview

The main purpose of this dissertation project was to create and test a novel paradigm for studying UT. The literature review revealed that there has been much progress in studying UT, yet our understanding of UT is limited by the few paradigms used to study this phenomenon. In short, limited designs have led to limited conclusions that potentially fail to reflect all instances of UT. This study also aimed to assess whether understudied factors, such as familiarity, largely influence instances of UT. By crafting a novel paradigm, not only does this dissertation project inspire a deeper understanding of UT, but it also introduces a controlled way to observe the influence of familiarity in instances of UT. Furthermore, I examined whether this novel paradigm demonstrated support for any of the theoretical approaches of UT. In establishing this novel paradigm, I incorporated boundary conditions established by prior research, such as, integrating a shallow familiarity manipulation, and adapting the reliable MEE design to a broader scenario.

Original Boundary Conditions

The design of this study incorporated the boundary conditions already established by prior research. By incorporating past literature in the design of this novel paradigm, I increased the likelihood of observing UT to begin answering additional questions about this phenomenon. It is critical for a paradigm to produce UT reliably to determine how new boundary conditions might differentially impact the occurrence of UT. The boundary conditions that I incorporated in this novel paradigm include shallow interactions, non-memorable events, long retention intervals, and an innocent bystander resembling the culprit.

As stated earlier, it is unlikely that the interaction of the theft itself would be categorized as unimportant and non-memorable to the witness. Yet perhaps it is not the crime event itself that must be unmemorable for UT to occur, but rather the innocent encounter with the innocent bystander must be shallow and unmemorable. With this in mind, the participant's encounter with the innocent bystander was the same as their encounter with the other mock patrons. Thus, the target did not stand out leading to poorer encoding. I expected that poor encoding would make it harder for participants to retrieve the source of their encounter with the innocent bystander. As a result, the participant might fail to reject the innocent bystander's involvement in the crime if they have no additional information associated with the target's face. These participants might be unable to use their memory of encountering the target in an innocent context to explain why they are familiar in the lineup. I also used a relatively small sample of faces in order to increase the likelihood that participants may maintain some faint recollection of the innocent bystander's face.

I also included a longer retention interval. Due to methodological constraints, the retention interval was approximately 30 minutes for each participant. This was a shorter time than what has been proposed by previous studies which encourage retention intervals that lasts for hours to days (Deffenbacher et al., 2006; Read et al., 1990). In order to further challenge memory during this retention interval, participants engaged in two cognitively demanding working memory tasks. Ultimately longer retention intervals have led to more instances of UT because the initial memory of the crime may begin to degrade making it harder to access. By utilizing cognitively taxing distractor tasks, I aimed to mimic a similar effect in further challenging the participant's memory. In the real-world, a witness's memory of a crime event may similarly degrade because they are usually not given lineups until days or weeks after a crime.

The last boundary conditions I implemented in this novel paradigm is ensuring the innocent bystander and culprit shared a moderately high degree of resemblance. In short, I matched them for race, hair color, eye color, height, and built. The goal was to ensure that it is plausible that the innocent bystander could be mistaken as the culprit. I also wanted to ensure that I do not create a doppelgänger scenario. As stated earlier, even if a participant never saw the innocent bystander before, they could theoretically identify the innocent bystander with high confidence simply because they strongly resemble the culprit. By creating such a scenario, it would be difficult to disentangle the influence of familiarity in cases of UT from the influence of a genuine perceptual confusion due to resemblance. Thus, based off of the ratings of independent observers, I chose a target and target lookalike pair that was rated as moderately familiar.

Adapted Mugshot Exposure Effect Design

According to an earlier meta-analysis, MEE designs produced the most reliable evidence of UT (Deffenbacher et al., 2006). Thus, I modeled this novel paradigm based on a typical MEE study while avoiding the police intervention typically found in MEE designs. Again, MEE studies require a participant to witness some crime event and then immediately view a series of mugshots. Critically, these mugshots contain an innocent suspect who shows up in a later identification procedure. After seeing the innocent suspect in the mugshot phase, participants are more likely to choose the innocent suspect in an official lineup decision. In short, UT results from the memory of the innocent suspect becoming mistakenly connected to the memory of the culprit. The mugshot viewing produces a shallow enough encounter with the innocent suspect that their face is memorable, but the context of the encounter is forgettable.

Though this design reliably captures UT, it only explains limited examples of UT. Understanding the theoretical principles that yields stable effects in MEE designs may allow researchers to expound past design limitations to determine why witnesses make UT errors in a variety of scenarios. The goal is to put this to the test by adapting critical factors from typically MEE to create a broader scenario to capture UT. First, viewing mugshots after a crime event is a key factor that has resulted in UT errors from MEE paradigms. Thus, in adapting a novel paradigm, I incorporated a phase in which the participants encounter multiple faces after a crime occurs. Furthermore, a past study found that UT errors were more likely to occur during MEE designs when participants were explicitly asked "is this the culprit" when shown each mugshot (Kersten & Earles, 2017). Thus, viewing an innocent bystander after a crime and actively considering their guilt may lead witnesses to update their memory of the culprit with an innocent bystander. These witnesses are simply creating a new memory due to the malleable nature of memory (Hyman et al., 1995; Loftus, 1975; Lindsay & Johnson, 1989; Zaragoza & Lane, 1994). If these factors lead to instances of UT with MEE designs, when applied to another scenario they should still reliably predict instances of UT to allow for a novel approach of studying this phenomenon.

Some previous archival research I conducted found some similarities between MEE and other UT errors. Critically, that data reflected that both phenomena typically occurred with unfamiliar suspects (Gipson et al., 2021). This finding is surprising because it implies that many real-world witnesses fail to remember any previous encounter with the innocent bystander. Similarly with MEE, witnesses see a mugshot once, forget that they had encountered that picture, yet still maintain a memory of the innocent bystander's face. Upon encountering the innocent bystander again, they mistakenly attribute their familiarity to the crime. In this same way, seeing an innocent bystander after a crime may lead to a memory error, in which the witness updates their memory of the culprit with this innocent individual. Again, the witness may forget the innocent encounter and later mistake the bystander's familiarity with their involvement in the crime.

Familiarity Manipulation

Familiarity is the last factor manipulated in this novel paradigm. As discussed, familiarity falls on a spectrum and at one or several points of that spectrum UT errors may be differentially represented. As many real-world examples of UT often results in cases of no or minimal familiarity, I assessed how having limited familiarity might impact the likelihood that UT might occur. Particularly, I manipulated whether the participants encounter the target prior to the crime. Again, this manipulation of familiarity is relatively shallow in nature but is purposed to determine whether UT can result from such minor levels of familiarity.

Theoretically, FRUs and person-identity nodes exists for those who we share minimal, moderate, or extensive familiarity. Even if a person is encountered once, we may establish a weak FRU or person-identity node for that person; however, these weaker nodes may quickly degrade with time leaving the person unrecognizable. This is another balance that the novel paradigm has to take into account in order to successfully capture instances of UT. If the retention interval results in the complete degradation of the memory of seeing the innocent bystander, then UT cannot occur. At the same time, the more we interact and encounter a target person the more sophisticated and robust these nodes may become. Thus, for individuals who we share extensive familiarity with we should be better able to identify them and correctly reject their look-a-likes. Or even use contextual cues about what we know about that person to reject their involvement. For UT to occur, a person must be familiar enough to recognize but not so familiar that their identity can easily be tracked and corrected. Participants only encounter the innocent bystander once or twice, so they would not achieve this high degree of familiarity.

Thus, the aim for this paradigm is to create an interaction that allows the innocent bystander to have an FRU and/or person-identity node established and to prevent that node from completely degrading. Understanding the complicated role of familiarity and UT is critical in establishing whether familiarity is a boundary condition for UT.

Hypotheses

Using this novel paradigm, I attempted to reliably induce UT errors in order to learn more about the nature of these errors and why they occur. Critically, I hypothesize that encountering an innocent bystander before or after a crime would differentially result in UT errors. First, encountering an innocent bystander before a crime would cause some shallow degree of familiarity. I hypothesize that this degree of familiarity would still result in UT errors. Second, encountering an innocent bystander after a crime creates a scenario similar to what is observed in MEE designs. Thus, I hypothesize that this encounter would also lead to UT errors. Based on the reliability of MEE designs in capturing UT, I hypothesize that encountering the innocent bystander after a crime would lead to significantly more UT errors than encountering a bystander before a crime. However, when a participant encounters the innocent bystander both before and after the crime, there would be a greater increase in UT errors. Lastly, I hypothesize that this novel paradigm would demonstrate support for the automatic processing approach of UT.

Methods

Participants

I recruited 1,332 participants from four separate participant pools. The majority of these participants were recruited from the general psychology participant pool at my university via online recruitment ($n = 928$). Then a subset of the sample was also recruited from my university but took part in the study in the lab ($n = 115$). Another subset of the sample was recruited through a colleague's university (n = 193). The final subset of the sample was a paid sample that was recruited via Prolific (n = 96). Some participants were removed from the final analysis due to having duplicate entries (n = 56), failing to complete the lineup task (n = 75), or experiencing a technical difficulty (n = 64). Thus, the final sample was 1137 participants. The final sample was predominantly white (85.05%) and female (67.72%). The mean age of participants was 19.86 (*SD* = 2.93).

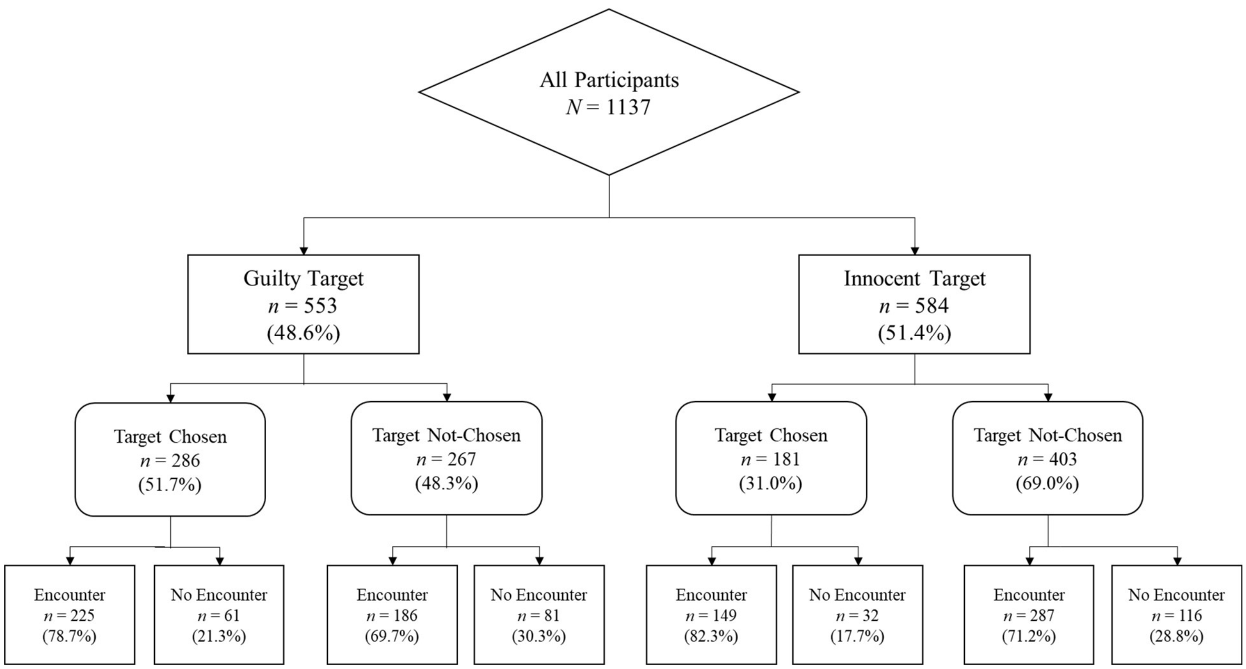
Prior to collecting data, I performed a power analysis by simulating a logistic regression analysis that I planned to conduct as a primary analysis. For this simulation I created a model with choosing rate as the outcome variable, and encounter and guilt as the predictors. I included interaction terms in this model. I conducted a pilot version of this study using static images to determine the β-values for my predictors and the intercept. Then, I ran 10,000 simulations with samples ranging from 1000 to 1200 increasing by 20 units. I aimed to determine the sample size I would need in order to achieve 80% power when alpha was set to .05. The simulation revealed that I would need at least 1120 participant in order to achieve 80% power. Thus, upon reaching the sample size of 1137, I concluded data collection. A flowchart of the smaller groups participants fell into can be found in Figure 2.

Materials

All materials were coded and presented via Inquisit Millisecond. Participants viewed a series of 70 films. The 70 films were divided between seven blocks with ten films shown during each block. The footage for this project was filmed in a bar lab to depict a more realistic setting that supported the cover story. One of the films depicted a robbery. While the remaining 69 films depicted mock patrons walking up to a bar. During these non-crime videos, the participant viewed a mock patron walking up to the counter and asking, "do you need to see my I.D.?" After providing a response, the mock patrons were shown again, simply saying "thank you" before walking off-camera. There are 43 identities who solely played the role of mock patrons. There are 27 patrons that appeared one time, ten patrons appeared twice, and six patrons appeared three times. Two other identities could appear during this phase as well and they were the target and a target look-a-like. In short, there are 45 unique identities featured throughout this project.

Figure 2

Flowchart of Participant's Group Assignments



Note. This flow chart depicts the groups participants were randomly assigned to and a group they self-selected into. Participants were randomly assigned to the guilty or innocent target conditions, and they were randomly assigned to the encounter (before, after, or both) or no encounter group (never). Depending on their lineup decision they either fell into a group that chose the target or a group that did not.

Depending on the condition, the target was shown as a mock patron once, twice, or not at all. When the target was a mock patron, they only appeared during the second and/or the sixth block. When the target was not shown as a mock patron, a designated replacement filler was shown in the target's place. Additionally, depending on the condition, the target or the look-a-like appeared as a thief at the end of the fourth block. The robbery was identical whether the culprit was the target or the look-a-like. Keep in mind that culprit is a term that refers to the person who actually committed a crime. So, the identity of the culprit would change depending on whether the target or lookalike committed the robbery. For the present study, the robbery scene featured the culprit stealing a wallet. Off-camera the participant would hear the culprit shout “give me your wallet.” The culprit would then be seen retreating with a knife and a wallet in their hands. Before exiting, the culprit briefly turned around and said, “don’t call the police” and then disappeared behind a wall. For both videos the robber’s face was visible for approximately five seconds.

To choose the target lookalike, a group of independent raters were shown a crime video of the target. Then they were shown nine mugshots of individuals who matched the description of the target and told to rate each on how similar they were to the target. These ratings were on a Likert scale with one indicating no similarity and seven indicating very similar. The target lookalike was chosen because their mugshot received the highest similarity rating at 4.77. I then showed another group of independent raters the lookalike video and had them rate the similarity of the targets mugshot and several other mugshots to the selected lookalike. Again, the target’s mugshot received the highest similarity rating at 4.6.

After each non-crime video, participants were shown a response screen with several questions. The response screen simply asked them to guess the age range of the patron. They continued to respond to this prompt for the first four blocks until the robbery scene occurred. After the robbery, they viewed a screen with space for two free-response questions. The first question asked them to provide a description of the crime. The second free response asked them to provide a description of how the culprit looked. Then participants continued onto their original task of guessing the age of patrons. However, now the response screen now included two additional questions after each non-crime video. First, participants guessed the age of the patron. Then participants answered, “is this the person who stole the wallet?” Lastly, participants rated how confident they were in their second response. They rated their confidence using the following options: “absolutely certain not,” “somewhat certain not,” “unsure,” “somewhat certain yes,” “absolutely certain yes.”

Once participants completed the entire bar phase, they engaged in two working memory tasks before they are given a final lineup. These two tasks come from the Inquisit Millisecond’s library of pre-programed working memory tests. The first test was titled the *Short-Term Memory Binding Test (STMB)* (Brockmole et al., 2008). For this task two screens with an assortment of shapes appeared back-to-back. The participants were asked to determine if the shapes presented on the first slide matched the shapes presented on the second slide. There were 48 trials in total, and three separate variants of this binding task. For one variant, only the shapes could change, for the second only the color could change, and for the third both the color and shape could change. There were three separate practice sessions for each of these variants with ten example trials each. Additionally, half of the trials were matched, and the other half were mis-matched. The second test was titled the *Visual Digit Span Test – English*, which included a forward and backward digit span task (Lumiley & Calhoon, 1934). This task simply featured a list of numbers sequentially presented. After each trial, participants were directed to immediately recall the list in order or in reverse-order. As the participant progressed, the list of to-be-remembered numbers gradually increased.

Lastly, participants proceeded to the lineup task. Prior to the lineup task, they were presented with a set of fair pre-lineup instructions. They were explicitly told that, “the perpetrator may or may not be present." Participants then viewed a standard six-person simultaneous lineup with the pictures presented in a random order and an explicit 'not present' option. Each lineup photo was presented in color. I used the single lineup procedure recommended by Oriet and Fitzgerald (2018). That is, I varied the person who committed the crime – either the critical target or someone similar in appearance to the critical target (lookalike) – but I kept the lineup constant. Thus, the lineup always included an image of the critical target and five description matched fillers. The functional size of this lineup was determined to have a Tredoux's E of 4.44. Following the lineup decision, participants provided their confidence on a scale from 0% to 100% in 10% increments.

It is important to note that in a lineup task, suspect is a term that refers to the person within a lineup that police believed committed a crime. In this study, the suspect in the lineup is always the target. However, the guilt of the suspect or target varies depending on whether the participant observed the target committing the crime or the lookalike committing the crime. Thus, sometimes the lineup with feature an innocent suspect/target or a guilty suspect/target. In the broader literature, a culprit present lineup is a lineup that features a guilty suspect/target. A culprit absent lineup is a lineup that features an innocent suspect/target. Again, the term culprit refers to the person who actually committed the crime. For example, if the lookalike was seen committing the crime but the target is included in the lineup as the suspect, then the lineup would be culprit absent. This situation could also be likened to a case involving an innocent bystander, if the target appeared innocently at another point of the study. An innocent bystander is someone who was seen in close proximity to a crime but was not involved in the crime. If this innocent bystander appeared as a suspect, they would be an innocent suspect. The term innocent bystander appeared several times throughout the introduction of this paper, but I interchangeably used this term as well as innocent target throughout the rest of this manuscript. Additionally, for the current study, I used the term guilty target and innocent target when referring to the lineup task and the experimental conditions.

Procedures

This study was based on a novel adapted MEE design. Again, in these studies, participants were witnesses of a crime event, then are immediately shown a series of mugshots, and after a delay are given a lineup of the guilty suspect or some innocent suspect. The variable of interests was how often the innocent suspect was chosen from the lineup. Critically, these designs incorporated a phase in which participants view a series of faces after a crime event. I hypothesized that viewing faces after a crime event was a key predictor of UT. Particularly, during this post-event exposure a person may incidentally update their memory of a crime. To test this, I created a naturalistic scenario where participants encountered the target either before the crime, after the crime, not at all, or both before and after the crime. They then saw a series of short videos in which a person entered a bar environment and approached a counter, so that their face was clearly visible. To distract the participant from the true nature of this task, I created a cover story where participants acted as a bouncer in a bar monitoring the ages of mock patrons. They were told that they would be assessed on how well they can accurately guess ages and determine whether people are under 21 years of age. Specifically, their task was to guess the age of each mock patron who entered the bar. Participants performed this task for seven blocks. At the end of the fourth block, a thief was heard robbing someone off-camera before retreating. As the thief exited, the participants got a brief glance at their face. Participants were then immediately asked to provide a description of the crime and of the thief. Upon answering these prompts, they went back to their original task of monitoring the ages of the mock patrons.

However, now participants were additionally tasked with determining whether each mock patron was the thief.

Following this phase, they completed a 30-minute working memory distractor task. For one task they did a short-term memory binding task. For the second task, they did a forward and backward digit span task. After which, all participants viewed the same standard six-person lineup, which contained a picture of the target. Again, the target was either innocent or guilty depending on the condition. After making their lineup decision, the participants rated their confidence in their decision on a scale of 0%-100%. I then asked participants to state in their own words why they selected the person they selected or why they selected 'not present'. I also asked them to state in their own words why they gave the confidence value they gave. Following these judgments, participants answered whether they had previously seen the person they picked as a patron in the bar. If they responded "Yes", they were asked to indicate when they saw the target. They responded via a multiple-choice question with the options: "before the crime," "after the crime," "both before and after the crime," and "unsure." After this judgment, participants completed a brief demographic questionnaire before being debriefed and thanked for their participation.

Results

The current study explored the lineup behavior of witnesses when they are exposed to a target bystander temporally close to a crime event. Critically, I manipulated whether that exposure occurred before the crime, after the crime, both before and after the crime, or not at all. Additionally, I varied the guilt of that target bystander by showing a video of that target stealing a wallet or showing a video of someone who looks like the target stealing a wallet (target look-a-like). For the final task, all participants viewed a lineup that featured the target as the suspect.

Again, if the target was seen stealing the wallet, that lineup would be culprit present; however, if the look-a-like was seen stealing the wallet, then the lineup would be culprit absent. I additionally collected data on the participant's behavior prior to the lineup task and examined the predictability of that behavior on whether the target was chosen out of the lineup. For each analysis, alpha was set at .05. Nagelkerke's R^2 was used as the effect size measure for each logistic regression analysis. This measure correlates with pseudo R^2 so an effect size is considered small when > .01, it is considered medium when > .09, and it is considered large when > .25. Some analyses were followed up with bootstrapping to determine confidence intervals. For all bootstrapping, I programed the software to resample my data 10,000 times and to provide 95% confidence intervals. The 95% confidence interval was determined using the fitted normal density because each resampling led to normally distributed populations. The analyses for this study were preregistered with the Open Science Framework (osf.io/5q94n).

Impact of Temporal Proximity and Guilt

Lineup Choosing

For the initial analysis, I examined the predictability of target encounter and guilt on choosing in the lineup. In short, I ran a logistic regression with critical target choosing as the outcome variable (chosen v. not chosen) and the critical target's guilt (guilty v. innocent) and encounter (never, before, after, both) as the predictors. The interaction term was included in the model. The output of this analysis is in Table 1. An omnibus chi square analysis found this logistic regression to be statistically significant, χ^2 (7) = 71.87, $p < .001$, $R^2 = 0.08$. The effect was small. Further assessing the Wald Criterion found that both guilt (χ^2 (1) = 14.70, $p < .001$) and encounter (χ^2 (3) = 10.38, $p = .02$) significantly predicted whether the critical target was chosen out of the lineup. The interaction term did not significantly predict choosing, χ^2 (3) =

1.45, *p* = .69. Follow-up test found that when the critical target was guilty (*M* = .52, *SE* = .02), they were 2.73 times more likely to be chosen out of the lineup than when innocent (*M* = .31, *SE* = .02). Additionally, upon further investigating the influence of group, I found that when the never condition (*M* = .32, *SE* = .03) was set as the reference group, only the both group (*M* = .50, *SE* = .03, *p* = .002) predicted significantly higher choosing rate of the target (before *M* = .41*, SE* = .03, *p* = .29; after *M* = .41, *SE* = .03, *p* = .10). The critical target was 2.15 times more likely to be chosen in the both condition than in the never condition.

Table 1

Logistic Regression Output of Effect of Guilt and Encounter on Choosing

Variable	B weight	Wald	p value	Odds Ratio	95% CI for OR
Guilt	-1.00	14.70	p < .001	2.73* (0.37)	[0.22, 0.61]
Encounter		10.38	p = .02		
Before	-0.25		p = .29	1.29	[0.80, 2.07]
After	0.40		p = .10	1.50	[0.93, 2.40]
Both	-0.77		p = .002	2.15	[1.34, 3.49]
Interaction		1.45	p = .69		

Note. The results from a logistic regression with target choosing as the outcome variable. The reference groups are guilty for guilt and never for encounter. An * denotes an inverse odds ratio, the original odds ratio is in the parentheses.

To conceptualize the data differently, I ran a similar but exploratory analysis using orthogonal contrasts to parse out more differences between the groups. I conducted three contrasts comparing the never group to all other conditions collapsed as one, the both group to the single encounter conditions collapsed as one, and the before group to the after group. First, I found confirming results that the never group had significantly less target identifications than the combined average of the other three groups ($p < .001$). Participants were 1.72 times more likely to pick the critical target out of the lineup when in the other groups than when in the never group. Additionally, I found that the both group was significantly different from the single encounter groups ($p = .02$). Participants were 1.42 times more likely to choose the target in the both condition than the single encounter conditions. I did not find a significant difference between the before and after groups ($p = .96$).

For the next set of logistic regressions, I separated the guilty target condition from the innocent target condition. Target choosing in these two conditions mean two different things. When the target is guilty, choosing the target indicates a correct identification. However, when the target is innocent, choosing the target indicates a false identification and provides evidence that a transference error might have occurred. Given that the interaction term was not significant in the original model, it is possible that encountering the target prior to the lineup lead to increased choosing of the target regardless of their guilt. I conducted these follow-up logistic regressions to observe whether the same pattern of results was maintained when assessing the guilt conditions separately. The output for this follow-up analysis is in Table 2.

For the first analysis, I examined the data from the guilty condition. I performed a logistic regression with target choosing as the outcome variable. The only predictor included in this model was the encounter with the target. The encounter participants had with the target prior to the lineup decision significantly predicted whether they correctly choose the target, χ^2 (3) = 10.58, $p = .01$, $R^2 = 0.03$. This was a small effect. For group comparisons, the never condition (*M* = .43, *SE* = .04) was set as the reference group. Only the both condition (*M* = .62, *SE* = .04) significantly differed from the never condition ($p = .002$). Those in the both condition were 2.15

times more likely to correctly identify the target than those in the never condition. Neither the before condition (*M* = .49, *SE* = .04, *p* = .30) nor the after condition (*M* = .53, *SE* = .04, *p* = .10) was significantly different from the never group. Figure 3 displays the means for the guilty and innocent conditions. Once again, I ran an exploratory orthogonal contrast, with data from the guilty condition only. The same three contrasts were made. The never condition had a significantly lower choosing rate than the combined average of all other conditions (*p* = .02). Additionally, the both condition had a significantly higher choosing rate than the combined average of the single encounter conditions (*p* = .04). Lastly, the before and after conditions did not significantly differ from one another (*p* = .54).

Table 2

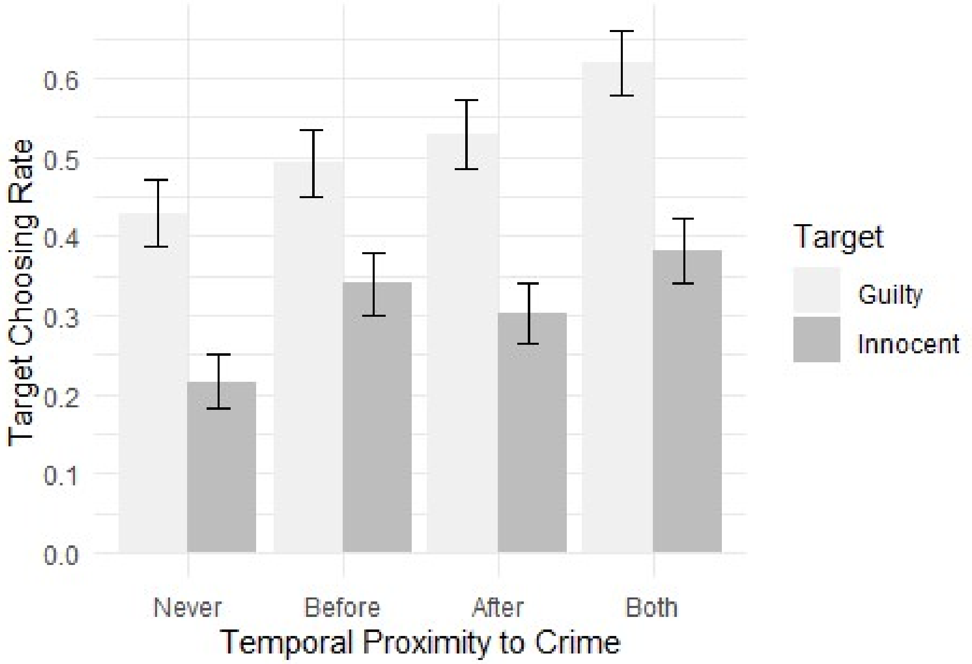
Logistic Regressions Output Separated by Guilt

Variable	B weight	p value	Odds Ratio	95% CI for OR
		Guilty		
Before	0.25	p = .29	1.29	[0.80, 2.07]
After	0.40	p = .10	1.49	[0.93, 2.40]
Both	0.77	p = .002	2.15	[1.34, 3.49]
		Innocent		
Before	0.62	p = .02	1.87	[1.12, 3.15]
After	0.45	p = .09	1.57	[0.93, 2.69]
Both	0.81	p = .002	2.24	[1.34, 3.78]

Note. The results from two logistic regressions with target choosing as the outcome variable. The first logistic regression captures data from the guilty condition and the second logistic regression captures data from the innocent condition. The never group is the reference group for the encounter variable.

Figure 3

Target Choosing Rate by Encounter and Guilt



Note. The choosing rate represents how often the target was chosen during the lineup task. The lineup procedures from Oriet & Fitzgerald (2018) were used in this study. So, target was always the suspect and the guilt of the target varied depending on whether they were seen committing the crime or not. A guilty target was seen committing the crime while an innocent target was not seen committing the crime. The error bars represented 95% Confidence intervals.

For the next analysis, I examined the data from the innocent condition. Again, I performed a logistic regression with target choosing as the outcome variable and encounter with the target as the only predictor. The encounter participants had with the target prior to the lineup significantly predicted if they incorrectly choose the target, χ^2 (3) = 10.52, p = .01, R^2 = 0.03. This was a small effect. For group comparisons, the never condition (M = .22, SE = .03) was set as the reference group. The both condition (M = .38, SE = .04, p = 002) and the before condition (M = .34, SE = .04, p = .02) had significantly higher choosing rates than the never condition. Those in the both condition were 2.24 times more likely to falsely identify the target than those in the never group. Similarly, those in the before group were 1.87 times more likely to falsely identify the target than those in the never group. But the after condition (*M* = .30, *SE* = .04, *p* = .09) did not significantly differ from the never condition. I again ran the same exploratory orthogonal contrast with the data from the innocent condition. The never condition had a significantly lower choosing rate than the combined average all other conditions ($p = .005$). But the both condition did not significantly differ from the single encounter conditions ($p = .21$), nor did the before and after conditions differ from one another ($p = .50$).

Confidence

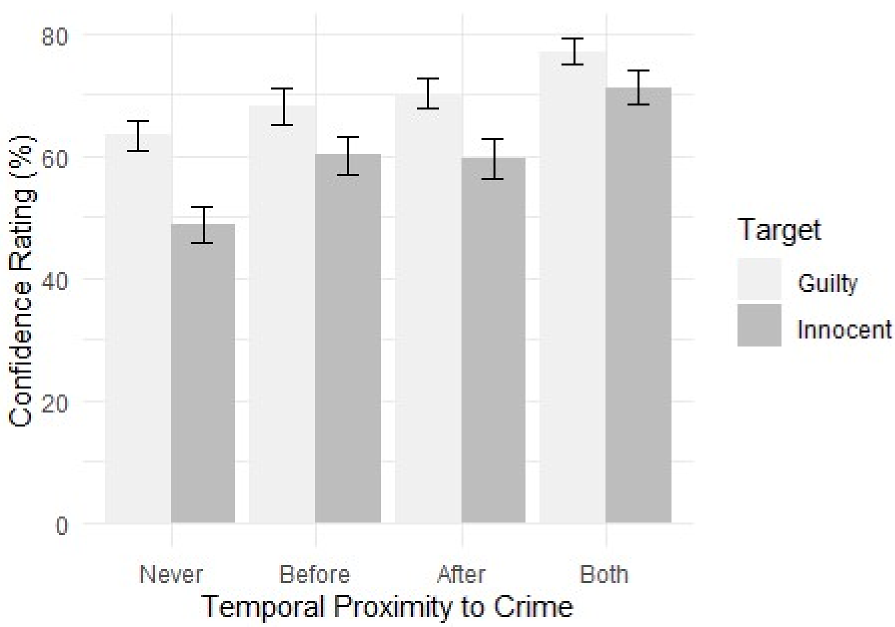
To examine the confidence data, I only included participants who chose the target during the lineup task so that the analysis only reflected confidence ratings toward the target. This distinction is important because the target was always the suspect in the lineup. In real-world police lineups, only the confidence towards the suspect would be recorded and potentially impact a court decision. Therefore, it is essential that the analyses on confidence focus on these identifications solely. I ran a linear regression with confidence as the outcome variable, and target guilt and target encounter as the predictors. The interaction term was included in the model. This model was significant, F (7, 459) = 8.83, $p < .001$, $R^2 = .11$. Participants provided higher confidence ratings when the target was guilty (*M* = 70.42, *SE* = 1.26) rather than when they were innocent (*M* = 61.44, *SE* = 1.64), $p = .001$. The never condition (*M* = 58.39, *SE* = 2.09) served as the reference group for this analysis. The results revealed that the never group had significantly lower confidence ratings than the both group (*M* = 74.89, *SE* = 1.66), p <.001. The difference between the never group and after group (*M* = 66.35, *SE* = 2.02) was only marginally significant with higher confidence ratings in the after group, p = .06. The difference between the never and before group (*M* = 64.75, *SE* = 2.17) did not reach significance, p = .20. Additionally, none of the interaction terms reached significance. The confidence means are plotted in Figure 4.

Once again to examine whether these differences are found whether the target was guilty or innocent, I separated these conditions and ran two more linear regressions. Particularly, each linear regression had confidence as the outcome variable and target encounter as the predictor. For both analyses, the never condition was the reference group. When only analyzing data from participants in the guilty target condition, the model was overall significant, F (3, 282) = 5.57, p = .001, R^2 = .05. The never condition (M = .63, SE = .26) had significantly lower confidence ratings than the both group (M = .77, SE = .21, p < .001). Though the never condition also had a lower confidence rating than the after condition (M = .70, SE = .24), this was only marginally significant, p = .06. And the never condition did not significantly differ from the before condition (M = .68, SE = .29), p = .20. When only analyzing the data from participants in the innocent target condition, the model was once again significant, F (3, 177) = 8.18, p < .001, R^2 = .11. The never group (M = .49, SE = .30) had significantly lower confidence than the before group (M = .60, SE = .32, p = .02), the after group (M = .60, SE = .33, p = .02), and the both group (M = .71, SE = .27, p < .001).

I again conducted additional exploratory analyses on the confidence data by performing orthogonal contrasts. Particularly, I compared the never condition to all other conditions combined, the both condition to the before and after conditions combined, and the before and after conditions to one another. When examining the guilty target data, the specified model was significant, F (3, 282) = 5.57, p = .001, R^2 = .05. The never group reported significantly lower confidence than the combined average of all the other conditions, p = .005. Also, the both group reported significantly higher confidence than the combined average of the single encounter conditions (before and after), p = .006. However, the before and after conditions did not significantly differ, p = .60. When examining the innocent target data, the specified model was also significant, F (3, 177) = 8.18, $p < .001$, $R^2 = .11$. The same pattern of results was found. The never group reported significantly lower confidence than the combined average of all other conditions, $p < .001$. Additionally, the both group had significantly higher confidence ratings than the combined average of the two single encounter conditions, $p = .002$. There was no difference between the before and after conditions, $p = .92$.

Figure 4

Confidence Rating by Encounter and Guilt



Note. This figure only includes data from participants who chose the target during the lineup task. Their confidence was recorded immediately after making their selection. A guilty target was seen committing the crime while an innocent target was not seen committing the crime. The error bars represented 95% Confidence intervals.

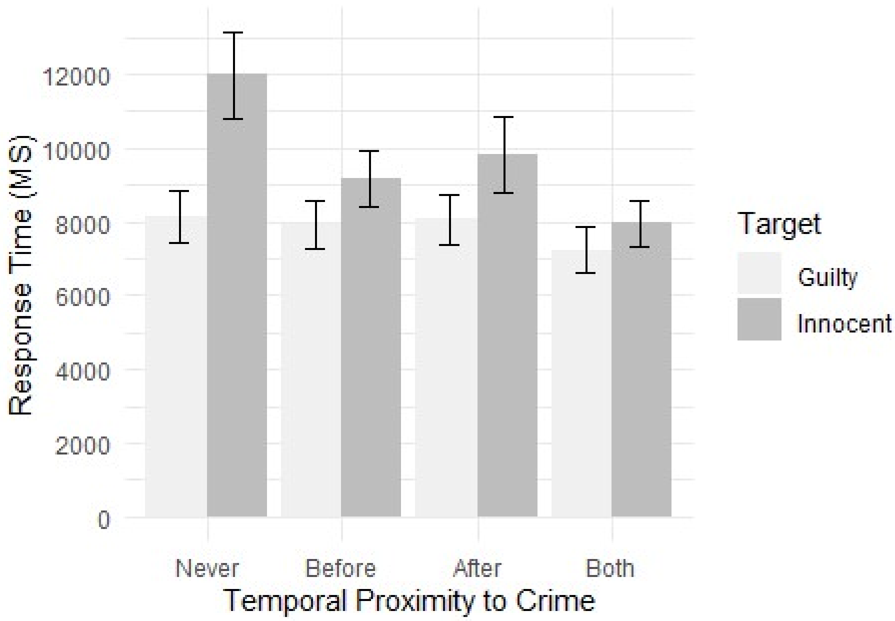
Response Time

I then examined the response time data using a similar linear regression model. Any participant who had a response time that fell three standard deviations above the mean response time was considered an outlier and their data were removed from the analysis. There were nine outliers removed in total. Once again, I only ran data from participants who chose the target so that the results reflected how quickly the target was chosen out of the lineup rather than simply how quickly any lineup decision was made. For this linear regression, the outcome variable was response time for the lineup task, and the predictors were guilt of target and encounter with target. The interaction term was included in the model. The model was found to be significant, $F(7, 450) = 2.95$, $p = .005$, $R^2 = .03$. Participants took significantly longer to identify an innocent target ($M = 9.41$ *sec.*, $SE = .435$) than a guilty target ($M = 7.81$ *sec.*, $SE = .329$), p = .002. There were no significant differences observed between the never condition ($M = 9.41$ *sec.*, $SE = .627$) and the before ($M = 8.46$ *sec.*, $SE = .500$, $p = .81$), after ($M = 8.73$ *sec.*, $SE = .587$, $p = .94$), nor both ($M = 7.53$ *sec.*, $SE = .440$, $p = .34$) conditions. Only one interaction term reaches marginal significance, p = .05. Particularly, the both condition showed a smaller difference in response time when choosing a guilt versus innocent target, than what was observed when comparing these groups in the never condition. Response time averages are plotted in Figure 5.

To make sense of this interaction, I followed up with several pairwise comparisons. These comparisons assessed whether response times significantly differed when choosing a guilty target or innocent target for each experimental condition for encounter. For the never condition, participants demonstrated significantly faster response times when identifying a guilty target than when identifying an innocent target, $p = .006$. This pattern of results was not found among any other condition. Neither the both ($p = .40$), before ($p = .22$), nor after ($p = .17$) conditions captured any difference in response times when comparing guilty versus innocent targets.

Figure 5

Average Response Time by Encounter and Guilt



Note. This figure only includes data from participants who chose the target during the lineup task. Inquisit Millisecond software has the capability to capture accurate reaction time data. A guilty target was seen committing the crime while an innocent target was not seen committing the crime. The error bars represented 95% Confidence intervals.

I again separated the guilty and innocent data to examine more specific comparisons. The linear regression including only data from guilty conditions assessed whether the encounter with the target predicted how quickly the participants choose the target. This model was not significant, F (3, 276) = 0.42, p = .73. In summary, neither the before (M = 7.92 *sec.*, SE = .650, p = .81), after (M = 8.07 *sec.*, SE = .698, p = .94), nor both (M = 7.24 *sec.*, SE = .609, p = .33) conditions differed from the never condition (M = 8.15 *sec.*, SE = .694). The linear regression including the innocent condition data also assessed whether the encounter with the target predicted the participant's response time in choosing the target. This model, however, was significant, F (3, 174) = 3.30, p = .02, R^2 = .04. The participants in the never condition (M = 11.98 *sec.*, SE = 1.155) had a significantly longer response times than those in the before condition (*M* = 9.17 *sec.*, *SE* = .776, *p* = .03), and those in the both condition (*M* = 7.97 *sec.*, *SE* = .613, *p* = .002). There was no difference found between the never condition and the after condition (*M* = 9.81 *sec.*, *SE* = 1.033, *p* = .11). Thus, response time was only influenced by encounter when the target was innocent.

Reports of Familiarity

Unprompted

For this study, participants provided a description of the thief and the crime directly after witnessing the wallet theft. A group of independent coders examined this qualitative data to determine if the participant spontaneously reported having any familiarity with the culprit. However, only 3 of the 1137 participants spontaneously reported that they believed they saw the culprit in the bar prior to the crime. For example, one participant included in their description of the crime that "she was one of the girls that came into the bar but who I thought was underaged." Another participant commented that "they had been there once before." Only one of these participants observed the lookalike commit the crime, while the other two observed the target commit the crime. Despite their earlier recollection of the suspect, each of these participants choose the "not present" option when given the lineup task. Ultimately, it was rare for participants to spontaneously report having prior familiarity with the culprit when providing a description. Due to such a small sample, I could not run any further analyses on the effects of how unprompted claims of familiarity impacted choosing.

Prompted

Participants were also explicitly asked whether they believed they saw the culprit in the bar prior to the crime. This prompt was included with a series of other crime related prompts so the participant would not be cued to the purpose of this study. The results reveal that 329 participants (29%) believed that they saw the culprit prior to the crime event. Another 387 participants (34%) did not believe they saw the culprit prior to the crime. And the remaining 421 participants (37%) were unsure whether they saw the culprit or not. I transformed the responses to this prompted question into a binary variable to run further analyses. All “no” and “unsure” responses were recoded as “no” and all “yes” responses remained the same. All confidence intervals reported in this section were determined using bootstrapping.

First, I ran a logistic regression with prompted familiarity response as the outcome variable. Whether the target was seen prior to the crime and whether the target was seen committing the crime were predictors. The interaction term was included in the model. This analysis allowed me to assess whether participants response to this prompt was influenced by what they actually saw. The omnibus chi square analysis was significant, χ^2 (3) = 81.79, $p < .001$, $R^2 = 0.10$. This was a medium effect. Participants were indeed more likely to report “yes” if the target was shown prior to the crime ($M = .40$, $SE = .02$) than if they were not seen ($M = .18$, $SE = .02$), χ^2 (1) = 59.31, $p < .001$ (Odds Ratio = 4.96 [3.25, 7.41]). The identity of the culprit only marginally predicted the response to this prompt with greater “yes” responses in the guilty condition (target commits the crime, $M = .30$, $SE = .02$) than the innocent condition (lookalike commits the crime, $M = .28$, $SE = .02$), χ^2 (1) = 3.40, $p = .07$. The interaction term was significant as well, χ^2 (1) = 10.33, $p = .001$ (Odds Ratio = 2.47 [1.40, 4.30]). The interaction shows that participants in the guilty condition were more sensitive in responding to this prompt. If these participants saw the target prior, they would reply “yes” at a much higher rate ($M = .46$, $SE = .03$), but if they did not see the target prior, they would reply “yes” at a much lower rate ($M = .15$, $SE = .02$). Those in the innocent condition did not have as dramatic a difference in their responding as a function of whether they saw the target previously. For these participants, they responded "yes" at a similar rate whether they saw the target prior to the crime (M = .34, SE = .03) or if they did not (M = .21, SE = .02). Again, those in the innocent condition were making a determination if they saw the lookalike previously. This lookalike was never seen prior to the crime, so these participants should have all responded "no" to this prompt. In the guilty condition, participants would have had the opportunity to see the culprit before the crime. Therefore, it is logical that their responding better reflects whether they had a prior encounter or not.

Figure 6

Belief of Prior View and Prior View on Target Choosing

Note. Participants were asked after providing a description of the thief whether they saw the thief before. Their response to this prompt is plotted on the Y-axis and was used to predict target choosing in the lineup task. This variable was then crossed with whether the participant saw the target. The error bars represented 95% Confidence intervals were determined using bootstrapping.

Next, I ran an exploratory logistic regression that only included data from participants who actually had a prior encounter with the target prior to the crime event. For this analysis, the outcome variable was the participants response to the prompted familiarity question with only the guilt of the target as the predictor. The results suggest that participants were 1.63 [1.16, 2.30] times more likely to report that they saw the culprit before when the culprit was the target (*M* = .46 *sec.*, *SE* = .03) and indeed someone they saw before, versus when the culprit was the lookalike (*M* = .34 *sec.*, *SE* = .03), who simply looked similar to the previously seen target, χ^2 (1) = 8.23, $p = .004$.

Lastly, I ran a logistic regression with target choosing as the outcome variable. For this analysis, the prompted familiarity response and prior encounter with the target were the predictors. The interaction term was also included. Ultimately, this analysis would determine whether claiming to have seen the culprit prior to the crime, might led to more liberal choosing on the lineup task. Once again, I ran two separate logistic regressions to capture choosing rates when the target was guilty and when they were innocent. The graph capturing the summary results for both these analyses can be found in Figure 6. For guilty target identifications, this model was significant in predicting more about target choosing than a model without these predictors, χ^2 (3) = 8.66, $p = .03$, $R^2 = 0.02$. However, only the interaction term reached marginal significance, χ^2 (1) = 3.14, $p = .08$. The interaction captures that when participants did not believe they saw the culprit prior to the crime, their choosing was not impacted by whether they actually seen them or not. However, if they did believe they saw the culprit prior to the crime, having actually seen the target led to significantly high choosing of the target. When considering only innocent target identifications, this model is significantly more predictive than the base model, χ^2 (3) = 10.59, $p = .01$, $R^2 = 0.03$. Yet when following up the omnibus chi square with a Wald's Chi Square analysis, only the main effect of actual prior encounter reached marginal significance, χ^2 (1) = 3.18, $p = .07$. Keep in mind that these participants never seen their culprit (lookalike) in the bar prior to the crime. So, it makes sense that their belief that they had, did not predict their later lineup choosing. However, some of these participants did in fact see the target prior to the crime, but in this condition the target was innocent. Yet this marginally significant effect shows that simply seeing the target prior to the crime increased choosing of the innocent target on the lineup task.

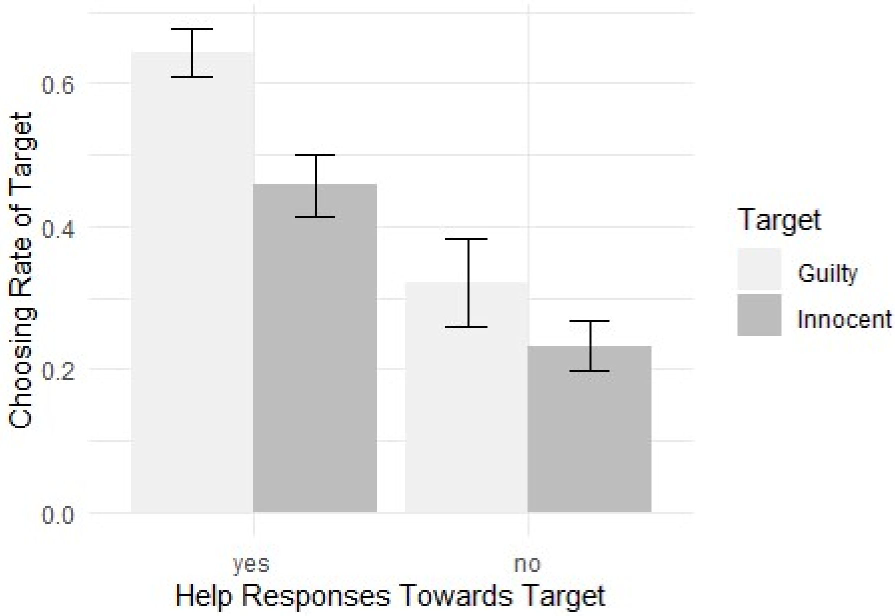
Help Responses

Another way participants could identify the culprit was by pressing the “H” key if they believed they saw the culprit return to the bar. Once, again only the target could appear after the crime, the lookalike would not appear at all. Also, only half of the participants encountered the target after the crime. For the initial analysis of help responses, I assessed whether the identity of the culprit predicted if participants would hit the help key upon seeing the target. This analysis only included participants who seen the culprit after the crime. Additionally, a binary categorical variable for help responses to non-target mock patrons was included in the model as a covariate. The results revealed that participants were 3.76 [2.55, 5.40] times more likely to hit the help key in response to the target if the target was the culprit (M = .79, SE = .02) than if the lookalike was the culprit (M = .49, SE = .03), χ^2 (2) = 55.14, p < .001, R^2 = 0.13. The confidence interval was determined using a bootstrapping technique.

Next, I assessed whether participants providing a help response influenced the choosing rate of the target. For a clearer interpretation, I conducted two separate logistic regression based on the guilt of the target. When considering only the instances when the target was guilty: participants were 3.80 [2.06, 7.07] times more likely to choose the guilty target out of the lineup if they first identified the target with the help response, χ^2 (1) = 18.22, p < .001, R^2 = 0.09. When only including trials when the target was innocent a similar pattern of results was found. Participants were 2.77 [1.66, 4.58] times more likely to choose the innocent target out of the lineup if the participant also identified them with the help response, χ^2 (1) = 15.51, $p < .001$, R^2 = 0.08. These confidence intervals were also determined using a bootstrapping technique. The choosing rate of the target as a function of help responses is plotted in Figure 7.

Figure 7

Target Choosing Impacted by Guilt and Help Response



Note. This graph captures help responses made towards the target. So, only data from participants who saw the target after the crime were included in this analysis. The error bars represented 95% Confidence intervals were determined using bootstrapping.

Distractor Tasks

I also wanted to assess if either of either of the distractor tasks predicted performance. The short-term memory binding task provided a measure of how well participants can source monitor. Particularly, it measures how efficiently participants kept events separate in short term memory or if they had the tendency to combine events together. The digit span test provided a measure of short-term memory as well. First, I assessed whether accuracy on the same or different trials of the short-term memory binding task, predicted performance on the lineup. For guilty target identifications, neither measure of the binding task predicted accuracy on the lineup task, χ^2 (2) = 2.23, *p* = .33. Similarly, for innocent target identifications, neither measure predicted accuracy, χ^2 (2) = 0.65, *p* = .72. Next, I examined whether performance on the digit span task predicted accuracy on the lineup task. In this analysis, I included performance data from both the forward and backward digit span task as predictors. Once again, this measure failed to predict lineup performance when the target was guilty (χ^2 (2) = 1.15, *p* = .56,) and when the target was innocent (χ^2 (2) = 2.97, *p* = .23).

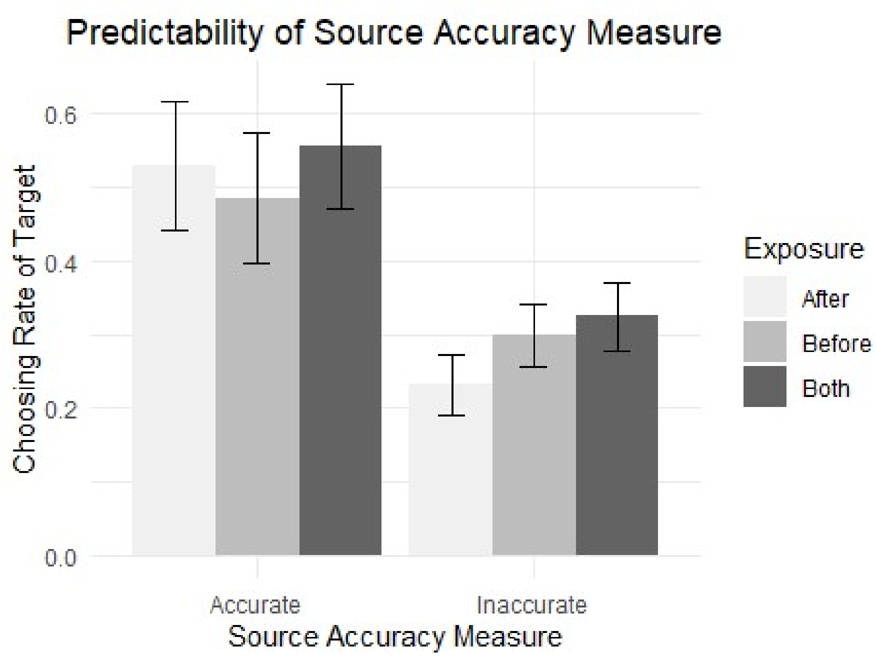
Source Accuracy

Source monitoring failures are believed to be one cause of unconscious transference (UT) errors. For the current project, I created a source accuracy measure to observe the impact of demonstrated source accuracy behavior on the likelihood of choosing an innocent target. This measure simply captured whether participants could accurately recall when they saw the target outside of the crime event. For example, if a participant only saw the target prior to the crime and then properly reported that they saw the culprit prior to the crime, they would have demonstrated accurate source monitoring. However, if a participant saw the target prior to the crime, yet they reported seeing the target after the crime or not at all, then they would have demonstrated inaccurate source monitoring. This coding resulted in a binary measure that labeled participants as accurate or inaccurate in source monitoring.

For this analysis, I examined whether this source accuracy measure predicted instances of UT. Thus, this analysis was limited to only those participants who could experience an UT error. These participants were those who were in the innocent target condition and those who saw the innocent target outside the crime (each condition except the never condition). For this subset of participants, they would have experienced an UT error if they saw the target in an innocent context only (as a customer in the bar) but still choose the target during the lineup task. For this set of participants, I created a model with suspect choosing as the outcome variable and the source accuracy measure and encounter condition as the predictors. The model showed overall significance, χ^2 (5) = 22.09, $p < .001$, $R^2 = 0.07$. The results revealed that participants who demonstrated accurate source monitoring (*M* = .52, *SE* = .05) were 2.61[1.21, 5.71] times more likely to incorrectly choose the innocent target than those who demonstrated poor source monitoring (*M* = .29, *SE* = .02), *p* = .01. In short, having accurate source monitoring increased the likelihood of these participants committing an UT error. The encounter participants had with the target did not predict choosing rate (*p* = .30) and there was not significant interaction term (*p* = .65). For clarity, Figure 8 depicts the distribution of target choosing rate from this analysis.

Figure 8

Predictability of Source Accuracy Measure



Note. This data only includes participants who could experience of UT error. Thus, these participants had to have an innocent encounter with the target and had to witness the lookalike commit the robbery. The error bars represented 95% Confidence intervals.

Discussion

The intended goal of this study was to develop a novel paradigm for studying UT and to explore the impact of familiarity on instances of UT. Ultimately, I found support for one out of my three original hypotheses. First, I hypothesized that this paradigm would successfully capture evidence of UT errors. When examining the data, each experimental condition resulted in more UT errors than the control condition. In short, participants identified the innocent target less when they were never seen before (likened to a stranger ID). But if they had an encounter with the innocent target before, after, or both before and after the crime, then they were more likely to select the innocent target from the lineup. The second hypothesis predicted that there would be significantly higher rates of UT in the after conditions than the before condition. I hypothesized this because the after condition was designed after MEE studies, which reliably capture evidence of UT. However, the results reveal that there was no difference between the before and after conditions. Only the both condition resulted in more instances of UT. Lastly, I hypothesized that this study would capture evidence of automatic processing. The results captured little evidence of this theoretical approach and instead showed more support for the memory blending theoretical approach.

In addition to successfully answering the questions presented by my hypotheses, this study also provides interesting insights to the nature of UT, particularly in instances involving a familiar suspect identification. Critically, the major predictor of UT in this study is having familiarity with the innocent target. The results show that participants were more likely to choose the innocent target out of the lineup as their innocent encounters with the culprit increased. It did not matter whether the participants saw the innocent target before nor after the crime, but what mattered was that the participants saw the target and were able to build some faint familiarity with them. In short, we see an increase in UT errors when the number of encounters with the innocent target increases from one encounter to two. Looking at the data it is clear that UT errors are lowest in the never condition. Then these error increase when the participants encounter the target once. Then the biggest degree of change in UT rates appears when the participants encounter the target twice.

Having familiarity with the target appears to be advantageous only when the target in the lineup is guilty. In these examples, having increased degrees of familiarity led to more accurate choosing. In short, the guilty target was chosen the least in the never condition, then significantly more in the single encounter conditions, and the most in the condition with two encounters. The data reflect that choosing rates of the target increased as a function of encounter regardless of whether the target was innocent or guilty. However, target choosing in the guilty condition was significantly higher than target choosing in the innocent condition. This project captures that familiarity has a differential impact depending on whether the target in the lineup is innocent or guilty. Familiarity leads to an easier identification of a guilty suspect but also can lead to more confusion and inaccurate choosing of an innocent suspect. This finding should lead those in the justice system to be more cautious of using familiar eyewitnesses. Especially when these witnesses report very minimal levels of familiarity with a suspect. In this next section, I further contextualize the results of this study into the larger body of eyewitness literature to more thoroughly explore how this study contributes to better understanding familiar suspect identifications and UT.

Stranger Suspect IDs Verses Familiar Suspect IDs

Often familiar face recognition is believed to be robust and less likely to be erroneous (Jenkin et al., 2011; Murphy et al., 2015). However, it is better to consider that familiar face recognition results in errors that are different in nature from those errors resulting from unfamiliar face recognition. For example, familiar faces are easier to recognize when a face image is degraded (Bruce et al., 2001; Kerstholt et al., 1992). This same advantage is not observed with unfamiliar face recognition though. At the same time, familiar face recognition allows for the possibility of misidentifications more readily. In short, most unfamiliar face recognition tasks only require participants to be able to report whether a person is recognizable. But familiar face recognition tasks often require the additional judgement of why a face is familiar.

In the current study, the design captured three unique scenarios. The never condition captures situations involving stranger suspect identifications. This is typically the cases studied in eyewitness literature. In these scenarios, the first time the participant is exposed to the target is during the crime event. Thus, participants are tasked with identifying whether the suspect appearing in the lineup is a person they would have only seen once before. This task largely hinges on the ability of the participant to recognize the culprit once they are encountered again. The next situation illustrated in this study is a typical bystander design. Particularly, the before and after condition captures a scenario when an innocent or guilty target is seen moments before or after a crime event. For this scenario, participants must not only be able to recognize the culprit in the lineup task but also must remember the role that any recognizable person played. In other words, it is expected that both the culprit and the bystander would be recognizable to the participant, so their decision should not be made solely based on feelings of familiarity. The third scenario is once again likened to a bystander paradigm, but with more emphasis on developing familiarity with the target. This is captured by the both condition. Though this familiarity manipulation is faint, it is understood that the more views we get of an individual the larger our representation of that person becomes (Andrews et al., 2015; Bruce & Young, 1986; Gipson & Lampinen, 2020; Murphy et al., 2015). Once again, in this scenario the participant cannot solely make their decision based on feelings of familiarity because both the innocent and guilty culprit would illicit feelings of familiarity. The target's face could, in theory, produce a stronger signal strength than the actual culprit because the participant has had more views of the target than the lookalike. If the participant cannot accurately recall the role that the familiar target played, they may incorrectly choose that target based on familiarity alone.

Exploring the data there is evidence the participants are potentially making decisions based on familiarity alone. Many of the patterns typically observed in stranger suspect identifications wash away with as little as one innocent encounter with the culprit. For example, past work has established that confidence predicts accuracy, in that highly confident witnesses are more likely to be accurate as well (Wixted & Wells, 2017). Though the sample size was inadequate to complete a confidence-accuracy characteristic (CAC) analysis, the pattern of results within the confidence data reflects interesting trends. Particularly, confidence appears to increase as a function of encounters. This pattern is most pronounced in the innocent target condition. When choosing the guilty target, the participants' confidence ratings only differ when comparing the never and both conditions. However, when choosing the innocent target, the participants confidence ratings was significantly higher in the before and after condition than the never condition. The never condition also differed from the both condition. As little as one encounter with the innocent culprit bolstered the participant's confidence in choosing them out of a lineup. Additionally, confidence ratings between innocent and guilty suspects are most pronounced in the never condition, suggesting that the diagnosticity of confidence might only be limited to cases of stranger suspect identifications. Further research is needed to determine if this is truly the case.

A similar finding is observed within the response time data. Like confidence, past research has shown that response time can be used as a method of distinguishing between accurate and inaccurate choosers (Robinson et al., 1997; Sporer, 1992; Sporer, 1993). Particularly, past research shows that accurate eyewitnesses typically make their decisions quickly, while inaccurate eyewitnesses take more time with their judgements, likely because they are engaging in more effortful cognitive decision making. I found support for this when comparing guilty and innocent target identifications within the never condition. When identifying the guilty target, these participants made a faster decision than when they were identifying the innocent target. However, the other conditions did not capture evidence of this. When the target was seen as little as one time outside of the crime event, response time was no longer diagnostic of accuracy. Participant identified both guilty and innocent targets with similar response times. This suggests that participants are making these quick judgements based on feelings of familiarity rather than knowledge of whether the familiar suspect is innocent or guilty. Perhaps this is all that response time is truly capturing. These results highlight the need to encourage familiar eyewitnesses not to treat a lineup task as a simple judgement of whether any of the faces are familiar. But rather to treat this task as a judgement of familiarity as well as accurate source monitoring, where the witness can confidently determine why a face is familiar.

Support for Theoretical Approaches

I hypothesized that this paradigm would be better equipped to capture evidence of automatic processing. Ultimately, the hypothesis was developed because past studies were designed in such a way that they may have resulted in a methodological fixation (Lane &

Meissner, 2008). In short, I argued that there may be better support for the memory blending and the source monitoring theoretical approaches because past studies were designed in such a way to best capture these approaches. For example, many studies that found evidence of memory blending incorporated scenes that would make it relatively easy to mistake the innocent bystander for the guilty culprit. Aspects such as having them wear the same clothes and/or aligning the continuity of their actions (i.e., the innocent bystander leaves the scene from the same location where the guilty culprit immediately appears), encouraged participants to believe the culprit and bystander were the same person. Similarly, certain manipulation in past studies made it easier for participant to either monitor the source of their memory of the bystander contributing to evidence for the source monitoring theoretical approach. The current paradigm is designed is such a way to mimic a more real-world scenario of UT in order to determine which of the theoretical approaches are best supported. Though, I hypothesized the automatic processing approach would garner the most support, this study actually provided the best support for the memory blending account.

Memory Blending

The memory blending theoretical approach predicts that UT occurs when the witness mistakenly believes that the innocent bystander and guilty culprit are the same person. In short, evidence for this theoretical approach is reflected when a participant cannot recall that the actions of the innocent person was separate from the actions of the guilty person. In this study, I observed exactly that. Participants were given an additional memory check after the lineup to determine whether they believed they saw the target outside the crime and at what point. Ultimately, this measure was used to assess the ability for the participants to remember each encounter they had with the target. Of most importance was whether this ability was observed among participants committing an UT error by choosing the innocent target out of the lineup. The results show that many of these participants were able to successfully remember when they encountered the target. In short, some of the participants demonstrated strong source monitoring ability. However, having this ability to source monitor did not protect these participants from making an UT error. Instead, participants were more likely to commit a UT error if they demonstrated successful source monitoring ability. This finding demonstrates evidence against the source monitoring theoretical approach. I will discuss this in more detail in the next section. But this finding also demonstrates support for the memory blending approach. These participants demonstrate that they have memory of first encountering the innocent target and they are aware that this person was seen performing an innocent act (acting as a patron in the bar). However, upon seeing the lookalike commit the crime, these participants fail to acknowledge that the lookalike is a different person. Instead, the participants believe that the same person who they saw entering the bar innocently is the same person that they saw performing a theft. The participants falsely believe that these actions were carried out by one individual.

This support for memory blending is exceptionally compelling because the paradigm does not easily lead participants to make this conclusion. The lookalike is not seen wearing a similar outfit to the target and there are at least ten distractor mock patrons that are presented between the presentation of the innocent target and the guilty lookalike. Additionally, the lookalike and target were only moderately similar to one another. Independent raters rated the similarity between the two as a 4.77 on a seven-point scale. Again, these individuals were matched based on hair color, race, height, and built. Thus, the study was designed in such a way that participants would not easily confuse the lookalike and target. Ultimately, due to these design features, I did not predict to find evidence of memory blending. However, this was not the case. Memory blending can occur even without cues such as clothing and continuity. This novel paradigm supports the memory blending approach.

Source Monitoring

While this study finds support for the memory blending approach, it offers no support for the source monitoring theoretical approach. The source monitoring approach predicts that the witness maintains a memory for both the innocent bystander and the guilty culprit. However, the witness would confuse the actions of the two resulting in an UT error where the innocent bystander is accused of performing the actions of the culprit. Critically, the source monitoring approach predicts that the witness should have a memory of the culprit and bystander as two distinct individuals. Thus, in the context of the current study, it is expected that participants would only have memory of the innocent target committing a theft but not of them appearing in the bar as a customer. In short, the participant would swap the actions of the innocent target with those of the lookalike (culprit). These participants failed to retrieve the correct source memory surrounding why the innocent target was familiar.

It is important to consider that the current study did not find evidence of source monitoring because it did not establish mutual exclusivity in the design. In designs with mutual exclusivity, the participant is explicitly told that if the target is seen in one context, they cannot be seen in another. For example, in Ross et al. (1994) the researchers informed the participants that the culprit and the bystander were not the same person. As a result, participants were able to reject the bystander when they appeared in the lineup. Particularly, these participants could use their memory of seeing the bystander in the innocent context to determine that they could not have appeared during the crime as well. In memory literature, this judgement is referred to as *Recollection Rejection* (Brainerd et al., 2001; Brainerd et al., 2003; Gallo, 2004; Jacoby, 1991, Lampinen et al., 2004). Recollection rejection occurs when we can use memory of a given event to determine the validity of another event. In cases of mutual exclusivity this judgement is particularly helpful because one event effects the other. Again, these situations ensure that the target can only be seen in one scenario. However, the current study allows for the target to commit several different acts. In short, it is true that a participant could see the target as a patron in the bar or as a thief. These events are not mutually exclusive. This scenario is also more realistic because mutual exclusivity likely does not exist in most situations in the real-world. A person could be a frequent customer as well as a thief. One's memory of a suspect performing an innocent action cannot be used to rule out their involvement in another scenario.

This highlights some flaws in capturing evidence of the source monitoring approach. This approach may only become apparent if the scenario involved mutual exclusivity. Mutual exclusivity may only be realistically introduced in situations involving two culprits, such as what was captured in Geiselman et al. (1993). In this study the actions of the assailant and accomplice were often confused. Mutual exclusivity was introduced in this design because both targets were shown at once and one played the role of the aggressor. You can imagine that participants could use their memory of the placement or actions of the accomplice to later reject a false memory of the accomplice playing a more central role in the crime. For example, in Geiselman et al. (1993) the accomplice was shown driving the car while the assailant was in the passenger seat. Perhaps, recalling that the accomplice drove the car could be used as a memory cue that they could not also be the person who stole the purse. A similar logic may be applied to other cases involving two culprits or a scenario where an innocent bystander is seen during a crime. Additionally, such situations easily lend themselves to the possibility of the actions of the two players central to the crime being swapped. This discussion highlights that the source monitoring theoretical approach is best captured in situations with two culprits or any other situations that naturally introduce mutual exclusivity. Then, perhaps, the memory blending theoretical approach explains most other instances of UT.

Automatic Processing

Though I hypothesized that there would be evidence of the automatic processing theoretical approach, this study found little support for this approach. This approach predicts that witnesses have no memory of encountering the target in an innocent context and therefore simply chooses the target out of a lineup based on their perceived familiarity. In the context of the current study, if a participant chose the innocent target out of the lineup and failed to acknowledge that they saw them as a customer in the bar, it would demonstrate evidence of the automatic processing approach. However, the majority of participants did report seeing the target as a patron. Particularly, I found that out of the 149 participants who committed UT errors, 98 reported that they saw the innocent target in the bar. The remaining 51 participants demonstrate some evidence of the automatic processing approach. But again, this was the minority of participants, so this approach does not explain what occurred for most participants. It is also important to note that perhaps our design still made it too easy for participants to recall most of the faces they saw during the bar task. A total of 43 unique identities were presented during this task, and perhaps this number was too low to allow participants to forget the target's face enough to show evidence of the automatic processing approach. Future research should continue to test this theoretical approach to determine if there are situations that capture evidence of it.

Boundary Conditions Predicting UT

Another key aspect of the current experiment was that I pulled from past experiments on UT to determine a set of boundary conditions that predict when this error might occur. The following boundary conditions have been observed in prior research: an innocent bystander being seen temporally close to a crime event, sharing a similar appearance to the culprit, having a shallow interaction with the witness, being involved in a non-memorable event, or being recalled after a long retention interval (Davis et al., 2008; Nelson et. al. 2011; Phillips et al., 1997; Ross et al., 1994). The current study found support for some of these boundary conditions, while demonstrating that others may not be necessary for UT to occur.

Critically, I manipulated when the innocent target was seen in relation to the crime event. Many bystander design studies feature the innocent bystander being seen right before a crime event occurs (Nelson et al., 2011; Phillips et al., 1997; Ross et al., 1994). While MEE designs, feature the innocent bystander being seen after the crime event while viewing a series of mugshots (Brown et al., 1977; Deffenbacher et al., 2006; McAllister et al., 2011; Memon et al., 2002; Perfect & Harris, 2003). This study finds that there is no difference in the rate or nature of UT errors whether the innocent bystander is introduced before or after the crime. Simply having the innocent bystander appear temporally close to the crime seems to predict UT errors. Thus, the current study found support for this boundary condition. Future research should consider further manipulating this variable of temporal proximity. Particularly, now that seeing the innocent bystander before or after a crime has been deemed inconsequential in leading to more UT errors, perhaps increasing or decreasing the time between the presentation of the innocent bystander and crime could better predict when this error might occur.

I also made a point to utilize a shallow and non-memorable event when introducing the critical target to the participants in this study. The critical target was just another mock patron in the bar and did not stand out in any way from the other mock patrons. Critically for these boundary conditions to lead to UT errors, the scenario must allow for the target to become memorable but not so memorable that they can easily be rejected for the crime (Deffenbacher et al., 2006). In other words, the participant must first be able to have some memory of the targets face, so they have a sense that the target is familiar. Second, the participants must not know so much about the target that they can rationalize or reason that they were not involved in the crime because their familiarity can be tied to another event. This study was somewhat successful in achieving this balance. First, participants showed evidence of recognizing the target, with as little as one innocent viewing of them. However, participants did seem to successfully recall encountering the innocent target as a mock patron. Thus, the participants developed enough familiarity to recognize the target and enough to recall encountering the target in the innocent context. Based on these results the shallow or non-memorable innocent encounter does not need to leave the participant without any source memory of the event in order for UT to occur. It is most critical that the participant recognizes the target. Once again without the introduction of mutual exclusivity in this design, the participants being able to recall the innocent encounter offers no protection against UT. This finding suggests that if the target is remembered and mutual exclusivity does not exist, then UT can still occur when the innocent encounter is shallow in nature. It is also important to note that this study featured a relatively low number of distractor identities. There were 45 unique people featured in this study, so perhaps it was not a challenge for the participants to have a faint memory of the mock patrons after going through the procedures. Perhaps increasing the number of distractor faces could prevent participants from developing any familiarity with the target as observed in Dysart et al. (2001), which used up to 600 distractor faces.

Another boundary condition I investigated in the current study was the degree of similarity between the target and lookalike. In past studies, the innocent bystander and culprit would appear in the same clothing (Nelson et al., 2011; Ross et al., 1994). However, for this study, I simply matched the general description of the target and lookalike and did not choose a pair that was too highly similar. Despite only incorporating moderate levels of similarity, this design still led to UT errors. Thus, once again this study reveals that the boundary conditions for UT errors do not have to be so limited in scope. Studies no longer need to incorporate matching clothing to capture this effect. Participants appear to make this error with much less leading circumstances.

Lastly, this study incorporates a retention interval lasting approximately 30 minutes. Evidence that UT errors are observed with as little as a 30-minute retention interval is integral in the design of future studies investigating this phenomenon. I made the decision not to incorporate a longer retention interval in order to reduce attrition in my sample. However, this decision was risky because it is unclear how short a retention period must be to still observe reliable rates of UT. Particularly, a metanalysis by Deffenbacher et al (2006) found that longer retention intervals lead to more UT errors. But the studies included in this metanalysis had retention intervals that ranged from one minute to one week. By demonstrating that a 30-minute distractor task provides a sufficient retention interval to observe UT, future researchers can more easily study UT errors with less costly designs. At the same time, future research should continue to investigate the impact of retention interval on UT. In the real-world, the time between witnessing a crime to receiving a lineup is likely to exceed 30 minutes. If the rates of UT are expected to increase with retention interval, that is an important insight for determining the credibility of the testimony of minimally familiar eyewitnesses.

Though I did not originally include commitment effects as a boundary condition that is required for UT to occur, it is clear that commitment effects predict higher rates of UT in MEE designs. Commitment effects have yet to be demonstrated in bystander designs. Thus, for the present study, it was of interest to determine if there was any evidence of commitment effects. The results revealed that there was indeed evidence of this phenomena. When participants hit the help key in response to seeing the innocent target, they were more likely to choose the innocent target out of the lineup. Just like in MEE designs, this pre-selection of the bystander led to increased instances of UT. This suggests that commitment effects occur not only in MEE designs but also bystander designs. If a participant makes any determination of the culprit's identity prior to the official lineup identification, then it is not appropriate to give that witness a lineup. This is already well-known in instances of mugshot exposure, but it should be extended to scenarios when witnesses accuse someone they are familiar with or accuse someone they encounter after a crime. By making this pre-identification, the lineup task becomes void. The lineup task is a test of familiarity. In short, this task measures whether the suspect's face stands out more than the other known-innocent members in the lineup. If the witness already displays that they are familiar with a target, the results of the lineup are less clear. In short, the participant may become motivated to choose the suspect out of the lineup because they recognize the suspect and have already identified them, rather than due to their clear memory of that person committing the crime.

Limitations

One limitation of the current study is that the familiarity manipulation is shallow. The participants could only get two innocent views of the target at most. Thus, the participants did not develop a strong level of familiarity with the target. With this in mind, the results may only describe situations when familiarity is minimal. Perhaps at greater levels of familiarity a different pattern of results would be observed. Though the shallow familiarity manipulation is a limitation of this study, it also demonstrates the strength of minimal levels of familiarity on impacting decisions on lineup tasks. Particularly, with as little as one view, target choosing increases significantly. This is true when the target is guilty and also when they are innocent. Prior research that I have conducted found the same pattern of results with four, eight, sixteen, and twenty prior views of the culprit leading to increased choosing of an innocent target (Gipson et al., 2022). Future research should continue to explore whether this pattern changes at higher levels of familiarity.

It is also important to note that the decisions made by participants may have alternative explanations and the current study is limited in rejecting some of these explanations. Ultimately, the results demonstrate evidence of the memory blending theoretical approach. However, it is also possible that participants were using more conscious decision-making processes when making their lineup selection. The experimental designed limited the influence of suggestibility, but suggestibility likely plays a role in real-world instances of UT and may have also led some participants in the current study to their conclusions. Particularly, after participants provided a description of the crime and culprit, they were explicitly asked if the culprit was seen prior to the crime. This prompt may have suggested to participants that the culprit should have been someone they saw prior. Again, I attempted to lessen the impact of this question by including it in a list of other crime related prompts. Though the results cannot explain away this variable, similar research that I conducted found evidence of a UT error even when there were no post-description questions (Gipson et al., 2022). Thus, it is likely that this study would yield a similar pattern of results if that prompt was omitted from the design.

Another alternate explanation from the misinformation effect literature suggests that memory blending may be better explained by a "deliberate compromise" (McCloskey & Zaragoza, 1985a; McCloskey & Zaragoza, 1985b). In short, participants may not actually combine their memory of the innocent target with that of the culprit, but instead they may be making the intentional decision to assume that these two individuals are the same person. Such a conclusion made by the participants could again occur if they found the design of the study to be too leading. For example, participants may have originally believed that the culprit and the target were two separate people. But upon only seeing the person they believed to be innocent in the lineup, they may have rationalized that their original conclusion of innocence was incorrect. In short, it could be easy to rationalize that a researcher or an officer would not put someone innocent in the lineup. Such logic could allow participants or witnesses to make conclusions that do not line up with their memory. Typically, to prevent witnesses and participants from using similar logic, lineup admonishments are designed to inform participants that the actual culprit "may or may not appear in the lineup" (Malpass and Devine, 1981). The current study makes use of this admonishment and includes a "not present" option in the lineup. Both of these factors should reduce the likelihood that participants would rely on a deliberate compromise rather than their memory on this task by allowing the participants to reject the lineup altogether. However, it is important to consider that this explanation might still influence the participant's decision.

Conclusion

The current study successfully utilizes a novel paradigm to demonstrate the nature of UT errors and this discussion houses these observations into the existing body of literature. The strengths of this paradigm rests in its incorporation of an applied setting and its incidental method of face learning. In short, I limited the leading nature of this design by preventing the target from standing out from the other mock patrons. This allowed for me to still utilize a bystander design while incorporating more of the realism found in a MEE design. Additionally, I used this opportunity to begin to further explore the nature of familiar suspect lineup identifications. This paper directly answers the call for research presented in Vallano et al. (2019). Particularly, this paper investigates the link of familiar suspect identifications in instances of UT. Ultimately, the results of this study provide important implications regarding the credibility of minimally familiar eyewitnesses.

An important take away from the current study is that having prior familiarity with a suspect does not predict that an eyewitness would be more accurate in making a lineup decision. The current study reveals two interesting aspects about familiar eyewitnesses. First, they can more easily and reliably identify a familiar and guilty suspect out of a lineup. But also, that they are more likely to confidently and reliably choose a familiar and innocent suspect out of a lineup. So, though familiar eyewitnesses are advantageous when a case involves a guilty suspect, they also present a greater risk of false identifications for innocent suspects. In the real-world, there is no way of knowing the ground truth of guilt, so it is unclear whether the testimony of a minimally familiar eyewitness could be beneficial or risky to a court case. Wells et al. (2012) argues that the cost of incarcerating an innocent person is greater than the cost of letting an innocent person go. Both errors result in a guilty person being let free; however, the former error also results in an innocent person losing years of their life in prison for a crime they did not commit. Based on this logic, it is best to limit the use of eyewitness testimony from witnesses who are minimally familiar with a suspect. Again, witnesses, who are familiar with the suspect, have an increased chance of choosing the suspect when they are guilty, but they also have an increased chance of choosing the suspect when they are innocent.

Furthermore, perhaps the results of the current study more clearly demonstrate the need to exhibit caution when using a lineup task with familiar suspects. I propose that lineups are not appropriate to use when a witness is at all familiar with the suspect presented in the lineup. Particularly, one major function of a lineup is to protect the suspect. By included description-matched fillers in the lineup, the suspect of the lineup should not stand out any more than any other filler. By ensuring this, investigators can have more faith that when a witness chooses a suspect out of a lineup it may be indicative of the suspect's guilt. However, when the suspect is familiar, they will always stand out from the group of unfamiliar fillers. In short, there is a new problem presented in the lineup where the fillers fail to protect the suspect because the suspect will stand out due to familiarity. Unlike stranger IDs, participants cannot use feelings of familiarity at all when making their lineup decision. Instead, these participants would notice that one face stands out and would then have to determine if that person is guilty. Essentially, the task becomes likened to a show-up, which has been shown to lead to poorer eyewitness identification accuracy. Thus, in cases of familiar suspect identification, lineups are unfair unless all fillers are equally as familiar. This idea is supported by the findings of the current study and should continue to be investigated. Perhaps familiar eyewitnesses are better suited for alternative identification tasks, such as identifying a familiar person from a CCTV, or other blurry or degraded images (Bruce et al., 2001; Mileva & Burton, 2019). However, they are not effective witnesses when recruited for lineups.

Identifying familiar suspects is not free from errors. I agree with the conclusions drawn in Vallano et al. (2019) that researchers must continue to determine the best practices that should be used in cases involving familiar suspects. Future research will benefit from adopting and further modifying the paradigm of the current study to continually investigate the nature of UT errors. Furthermore, research should extend towards investigating how to prevent UT and offering suggestions of how these cases can be handled in the court room.

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Appendix

UNIVERSITY OF ARKANSAS

To:	Nia I Gipson
From:	Justin R Chimka, Chair IRB Expedited Review
Date:	08/10/2021
Action:	**Exemption Granted**
Action Date:	08/10/2021
Protocol #:	2107346762
Study Title:	Transference Errors in the Lab

The above-referenced protocol has been determined to be exempt.

If you wish to make any modifications in the approved protocol that may affect the level of risk to your participants, you must seek approval prior to implementing those changes. All modifications must provide sufficient detail to assess the impact of the change.

If you have any questions or need any assistance from the IRB, please contact the IRB Coordinator at 109 MLKG Building, 5-2208, or irb@uark.edu.

cc: James M Lampinen, Investigator