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## **Blake Mitchell**

Change Blindness and Eyewitness Testimony: The Effects of Instruction, Time Intermission, and Gender-matched Observers

**Faculty Sponsor**

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## **Abstract**

The purpose of this research was to further examine the parameters of change blindness and its relevance to eyewitness identification by investigating the effects of instruction, time intermission, and gender-matched observers. Participants were shown a short video depicting an opportunity theft in which the identity of the burglar, and that of his accomplice, changed throughout the film. Half of the participants were given instructions to pay close attention, while the other half were not. All were tested for awareness of change and content recall. As hypothesized, 82% of participants did not notice substitutions among the perpetrators. Awareness of change had some unexpected but interesting relationships with our other independent variables, the results of which are discussed in detail along with corrective measures for future research. Collectively, the findings of this study delve deeper into the mechanics of change blindness, thereby further illuminating the sophisticated interrelation between change blindness and eyewitness testimony.

Note from author: This study was a collaborative effort to fulfill requirements for a PSYCH Stats & Research class at the University of Memphis Lambuth Campus. While this paper is solely authored by me, the conception, preparation, and execution of its contents are credited to each contributor equally: Naomi Adams, Mary Church, Kathryn Cochran, Brittney Goode, Penny Hensley, Madison Kuykendall, Blake Mitchell, Brianna Morton, Dianna Moss, Andrew Rush, Christy Williams, with faculty sponsor Dr. Cheryl Bowers.

## Introduction

Change blindness is a psychological phenomenon that occurs when a change in a visual stimulus goes unnoticed by its observer. This phenomenon can be likened to continuity errors in movies, where an object might erroneously change location or position from one cut to another (e.g. a vase is knocked over in one frame but then is standing upright in the next). In most cases, this change in the background, or even foreground, is not often noticed by the audience until after it is pointed out to them; in psychology, this is known as change blindness. In recent years, research has been conducted on this phenomenon in efforts to better understand some of its qualities. In one of the earliest studies involving change blindness (Levin & Simons, 1997), participants watched a short video of a person getting up to answer a telephone call. Just before the actor reaches the phone, a change in camera positioning coupled with a film cut allows the actor to swap identities with a completely new actor. Even though these two actors differed dramatically in appearance, most of the viewers did not report noticing this rather substantial, but intentional, continuity error. The findings of this study raised awareness of change blindness and ignited a great interest within the scientific community, especially from groups who were particularly interested in selective attention and short term memory.

Researchers were eager to explore the boundaries of change blindness. Some posited that the awareness of change existed in the observer's subconscious but simply wasn't available for retrieval (Simons, et al., 2002). With regard to subconscious retention, "the observer must form a consciously accessible visual representation of the original stimulus that can be tracked over time and form a basis for later recognition" (Most, et al., 2005). Subsequent work began to address on the seeming interrelation between change blindness and eyewitness testimony. The idea was that this flaw in our attenuation system had some relevance to the clockwork behind faulty eyewitness testimony and the misidentification of perpetrators. Recent research has illustrated this interrelation between the eyewitness and change blindness literatures (Davies & Hine, 2007), identifying multiple risk factors of change blindness. In their study, Davies and Hine created a 2-min video clip depicting an opportunity theft from a student house. Midway through the film, the burglar's identity changed (aided by filming techniques). The participants in this study were split randomly into two groups: the intentional group and the incidental group. Participants in

the intentional group were told to pay close attention to the contents of the film because they would be tested later on. Participants in the incidental group were given an ominous description of the video along with a false pretense for its purpose. The paradigm was set up this way in order to test whether or not priming participants to focus and pay attention would have a significant effect on awareness of change rates and content recall scores. In total, only 39% of all the participants noticed the burglar's identity change during the film. Participants who noticed the change were, as described by Davies and Hine, "drawn disproportionately from the intentional condition, a highly significant effect" showing that the priming received by the intentional group was effective. Participants who were in the intentional group also received significantly higher content questionnaire scores than did those in the incidental group. Lastly, in an effort to explicitly demonstrate the interrelation between change blindness and eyewitness testimony, Davies and Hine also created a photo lineup from which participants were asked to identify the perpetrator. The results confirmed that participants in the intentional condition were significantly more likely to correctly select both actors than were participants in the incidental group. Davies & Hine report that "all the participants who recognized both actors detected the change, whereas none of participants who did not notice selected both burglars from the lineup." From this research, one can reasonably conclude that priming participants to pay attention does in fact have a positive effect on notice of change and content recall. Furthermore, Davies and Hine adequately demonstrated a significant relationship between change blindness and eyewitness testimony by incorporating a photo lineup in their paradigm. The current research wishes to build on these ideas—further testing their validity—and also incorporate new independent variables such as time intermission and gender-matched observers.

## **Method**

### **Hypotheses and Design**

The research detailed by this paper was modeled after the research done by Davies & Hine (2007), including the creation of a video that depicts an opportunity theft and a follow-up content questionnaire. In our study, there were two main dependent variables: (a) awareness of change and (b) memory score on the content questionnaire. In addition to Davies and Hine's burglar, we added another factor to the paradigm: a lookout

for the burglar. As Davies and Hine did, we hypothesized that those in the intentional group would be more likely to notice the changes and less prone to change blindness. Going beyond Davies and Hine's research, we also hypothesized that the interval between change, or the time intermission that occurred between the identity swaps, would have an impact on awareness of change. Specifically, participants were expected to identify the change in the burglar more often than the lookout because the burglar change happened within a few seconds. Alternatively, participants were expected to fail to notice the change in the lookouts since approximately two minutes elapsed between the switch. Also, beyond Davies and Hine's analysis, we intentionally selected male actors to play the burglar and female actresses to play the lookout. We hypothesized that male and female participants would perform differently on their notice of change based on the gender of the target. While expecting a difference, we did not predict whether males would do better at noticing the male burglar or female lookout identity change. Likewise, while expecting a difference, we did not predict whether females would do better at noticing the change in the male burglar or female lookout.

### **Participants**

A community college sample of 55 participants were pooled together from four separate General Psychology classes. We designated two of the classes to the intentional group, while the remaining two classes became the incidental group. The groups were not perfectly equal in volume, although they were relatively close, and they did not contain an equal ratio of male to female participants (40 males and 15 females).

### **Materials**

We filmed a 4-min video specifically for this experiment that depicted an opportunity theft from a vacant house. The film consists of four actors: two males (burglar) and two females (lookout). The first female actress who played the lookout in the first scene was of average build with brown hair and a rounded face; she wore a dark shirt with bold white letters on the front; she sat with casual posture and appeared tranquil. The second female actress who played the lookout in the final scene was of slim build with brown hair and a narrow face; she wore a black shirt with small letters on the front; she sat with poor posture and appeared worried. The first male actor who played the burglar on screen for the first half of the film had a heavier build with dark brown hair and a rounded face;

he wore a black hoodie with blue jeans, green shoes, and carried a black backpack; he moved at a slow pace and conducted himself calmly. The second male actor who played the burglar on screen for the second half of the film had an average-to-heavy build with light brown hair and a rounded face; he wore a black hoodie with black pants, blue shoes, and carried the exact same backpack; he moved with haste and was in much more of a hurry than the first actor.

The film opened with a long shot of a white SUV cruising up the street toward the camera. A cut is made to the driver's side of the parked vehicle, in which Lookout 1 is seen glancing down at her phone. The film then shows Burglar 1 walking down the street toward a house. The burglar uses a crowbar to enter the house and begins searching for valuables. He searches the living room and finds a camera, a laptop, and a gaming controller. Burglar 1 then walks into the kitchen and disappears around a corner. The camera then changes position to the inside of a bedroom where Burglar 2 is seen entering. He searches the room and finds an iPad, a stack of cash, jewelry, and headphones. He glances at his phone for a moment and then leaves the room and exits the house. The film cuts to an outside view of the burglar leaving and pans over to the driver's side of the white SUV, where Lookout 2 is seen watching the burglar approach her. The burglar proceeds to load the vehicle with the stolen items and drives off with the lookout. The female lookout actresses were on screen for approximately 20 seconds each and the male burglar actors were on screen for approximately 90 seconds each.

We created a content questionnaire that was prefaced by open-ended questions about what the participant saw. The first questions, ("Did you notice anything unusual about the burglar throughout the film? If so, describe.") and ("Did you notice anything change about the burglar throughout the film?") probed for evidence of awareness of changed identity with regard to the male burglar. This was followed with a set of mirrored questions related to the female lookout. The rest of questionnaire featured questions that tested content recall such as ("In the blanks below, please list 6 items that you remember being stolen in the film), which we converted into a memory score.

## **Procedure**

The participants were tested one class at a time by two experimenters: one to handle materials and one for presentation. When the intentional

condition was being tested, the participants were instructed to pay close attention to the film because there would be a content questionnaire to fill out afterwards. Participants in the incidental condition were simply given an ominous description of the film they were about to watch: "A short film depicting an opportunity theft that conveys the importance of increased campus security." After the film, all participants were given the same content questionnaire to complete. The experimenters stressed that everyone should work on their own and remain silent until everyone had completed the questionnaire. As a precaution, we made sure to delay debriefing until all of the participants had been tested to maintain internal validity.

## Results

### Notice of Change vs. No Notice of Change

A chi-square goodness-of-fit test was calculated comparing the frequency of occurrence of participants who *noticed* the male burglar change to those who *did not notice* the change. It was hypothesized that most participants would not notice the male burglar change. A significant difference was found ( $\chi^2 (1) = 22.273, p < .01$ ) between participants who did not notice a change ( $\underline{n} = 45$ ) and participants who did notice a change ( $\underline{n} = 10$ ). As hypothesized, most participants were affected by change blindness and did not notice the male burglar change.

A chi-square goodness-of-fit test was also calculated comparing the frequency of occurrence of participants who noticed the female driver change to those who did not notice a change. It was hypothesized that most participants would not notice the female driver change. A significant difference was found ( $\chi^2 (1) = 36.818, p < .01$ ) between participants who did not notice a change ( $\underline{n} = 50$ ) and participants who did notice a change ( $\underline{n} = 5$ ); as hypothesized, most participants were affected by change blindness and did not notice either change.

### The Effect of Instruction on Change Blindness

A chi-square test of independence was calculated comparing the frequency of participants who noticed the male burglar change and female driver changes in the intentional condition to that of the incidental condition. It was hypothesized that significantly more participants in the intentional condition would notice the male burglar and the female driver changes than participants in the incidental condition. No significant relationship was found between condition and whether or not the participant



noticed the female driver change ( $\chi^2(1) = .066, p > .05$ ). A significant relationship, however, was found between condition and whether or not the participant noticed the male burglar change ( $\chi^2(1) = 3.194, p < .05$ ). The results show that participants who were primed to pay attention were more likely to notice the change in the male burglar, but not the female driver.

### **The Effect of Instruction on Memory Score**

An independent-sample t-test was computed to compare the memory scores of participants in the intentional condition to memory scores of participants in the incidental condition. It was hypothesized that memory scores would be significantly higher for participants in the intentional condition. No significant difference was found ( $t(53) = 1.187, p > .05$ ), however, between the memory scores of participants in the intentional group ( $M = 7, sd = 1.56$ ) and the memory scores of participants in the incidental group ( $M = 6.5, sd = 1.42$ ). Being primed to pay attention, therefore, did not have a significant impact on content memory.

### **The Effect of Time Intermission on Change Blindness**

A chi-square test of independence was calculated comparing the frequency of participants who noticed a change in the male burglar (no time interval) to that of the female driver (two minute interval). A significant difference was found ( $\chi^2(1) = 6.466, p < .05$ ). The results show that significantly more participants noticed the male burglar change ( $n = 10$ ) than the female driver change ( $n = 5$ ). This result suggests that time-intermission had a significant impact on change blindness, but this interpretation is not fully supported by the statistics used (full analysis found in the discussion section).

### **The Effect of Gender-Matched Observers on Change Blindness**

A chi-square test of independence was also calculated comparing the frequency of male participants who noticed the male burglar change to female participants who noticed the male burglar change. It was hypothesized that there would be a significant interaction between male participants and recognition of male burglar change. No significant interaction was found ( $\chi^2(1) = .490, p > .05$ ), however. Gender matched participants did not differ significantly from non-gender matched participants in whether or not they noticed the male burglar change.

A chi-square test of independence was also calculated comparing

the frequency of female participants who noticed the female driver change to male participants who noticed the female driver change. It was hypothesized that there would be a significant interaction between female participants and recognition of female driver change, but no significant interaction was found ( $\chi^2(1) = .636, p > .05$ ). Gender matched participants did not differ significantly from non-gender matched participants in whether or not they noticed the male burglar change.

## Discussion

As expected, 82% of participants did not notice the identity change of the male burglar and 91% of participants did not notice the identity change of the female lookout. In other words, most participants, regardless of which condition they were in, did not show signs of awareness of the changes made in identities throughout the film. Although this result had the highest expectation, we were still surprised by how high the rates were for change blindness. The changes in clothing and appearance, even if argued as subtle, were accompanied by radical changes in demeanor between the actors. We therefore recommend that future research push change blindness further by creating even more discernable differences between actors (perhaps incorporate a shift from dull colored attire to brightly colored attire).

With regard to the effects of instruction, there was a significant relationship between awareness of change of the male burglar's identity and condition, indicating that priming participants to pay close attention had a positive effect on change blindness. This result was anticipated due to results obtained by Davies & Hine (2007). However, awareness of change of female lookout did not share the same relationship with condition. At this point in the analysis, a bit of ambiguity surrounds this result, for it could be caused by the time intermission variable that distinguishes the burglar from the lookout identity swaps, or it might be related to the gender of the actors. Further speculation also raises a concern of overlay between our variables, which would justify further study.

In terms of the interaction between instruction and memory score, we were surprised to find that there was no significant difference between the memory score of participants who were instructed to pay close attention and that of participants who were not, indicating that 'priming' participants to remember content did not significantly affect their memory score. This result was perhaps the most unexpected because it disagrees with

Davies' research. We believe this result may be due to the difficulty of our content questionnaire. Our memory score was heavily based on how many stolen items the participant could 'recall' from their memory after watching the film. In any situation, we know that content recall (fill in the blank) is much more difficult than content recognition (multiple choice). Furthermore, it could be argued that the items stolen in the video were not comprised of prototypical objects in their respective category. For instance, the camera that was snatched up was a digital camera that was small and compact; it could have been mistaken for something else. Some of the objects were also displayed in poor lighting, which should be addressed in future paradigms of similar nature. Lastly, we propose a more dynamic memory score be created for future research, one that includes a mixture of both recognition and recall questions; this should yield a more effective tool for accurately conveying both the quality and quantity of content retention.

In addressing one of our unique hypotheses, awareness of change appears to be significantly related to the time intermission between each identity change. This interpretation derives from the data analysis showing that significantly more participants noticed the male burglar identity change (no intermission) than the female driver change (two-and-a-half minute intermission), which would indicate that change blindness is, at the very least, somewhat dependent on time intermission. This result seems to alleviate our confusion about an earlier result—the absence of a relationship between awareness of change of female lookout and condition. However, upon review, this result should still be treated with caution due to a reasonable possibility of variable confounding. It is possible that other variables, such as the burglar's gender or his role in the film, might have contributed or had an unwelcomed effect on the recorded result. Therefore, the analysis does not serve as sufficient evidence to support the claim that time-intermission significantly affected awareness of change within our study; however, it does not evoke a rejection of our hypothesis, either. Future research should further investigate the relevancy of time-intermission on change blindness by taking greater care in controlling for this variable, for there are still adequate reasons to pursue this facet of change blindness.

Lastly, no significant interaction was found between gender-matched participants and awareness of change, indicating that awareness of change of either the male or female perpetrators was not influenced by the participant's gender. This result was neither expected nor unexpected, as we did not have predictions for this variable. It is also worth noting

that our participant pool was not made up of an equal number of male and female participants, which we fear may have skewed the results on this particular test. Of course, future research would do well to control for an equal ratio of male to female participants when testing for this variable.

Nevertheless, these results mostly strengthen the findings of prior research conducted by Davies & Hines (2007) and adequately demonstrate the relevance of change blindness on eyewitness identification literature. At this point in the investigation, it would be logically indefensible to deny the validity of change blindness or the fact that primed individuals are less likely to experience it. This study succeeds in further examining the infrastructure of this phenomenon and makes laudable attempts at exploring the relevancy of two unique variables—the effects of time intermission and gender-matched observers. Although certainty was not obtained from every result, the groundwork has certainly been laid for future research to build on these ideas and learn from the limitation mentioned above.

The study of change blindness is certainly important in understanding more about how attention, perception, and memory are intertwined, but this line of research has an even greater practical application in our justice system—where eyewitness misidentification has led to a staggering number of wrongful convictions. The change blindness found in this study builds on previous research in demonstrating the fallible nature of memory and reveals that eyewitness testimony may not be the most reliable resource in ascertaining the truth. Unfortunately, this is contrary to what many judges, litigators, and active jurors may currently believe. Eyewitness testimony is currently held in high regard in terms of accuracy and reliability; more disturbingly, it has served as the turning point in securing thousands of successful, but wrongful convictions. A first step in minimizing this problem begins with encouraging researchers in eyewitness testimony to take a closer look at the relevance of change blindness, and to begin disseminating their findings to the public and to our judicial officials. The goal is to reform public predispositions about eyewitness testimony by revealing the fallible nature of memory and instances where change blindness comes into play.

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