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False Memories for Stereotypes: Effects of Attention and Delay

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The present study investigated the conditions in which stereotype-based beliefs elicit the creation of false memories for information consistent with racial-occupational expectations and the extent to which attentional depletion increases this likelihood. This was examined in the context of racial-occupational stereotypes for White and Latino individuals. Participants were presented with pictures of faces paired with stereotype-consistent and -inconsistent occupational information. One group of participants was exposed to these stimuli while also completing an additional task designed to divide their attention. Their memory for these pairings was tested in both an immediate and delayed recognition test. Due to the social reliance on categorical-based pre-conceptions to facilitate information processing when cognitive resources are limited, it was hypothesized that the group in the divided-attention condition would produce a higher rate of stereotype-consistent false memories than the group under full attention. Results showed that both attention conditions produced similar false memory rates. However, participants displayed a propensity to generate expectancy-consistent false memories both after an immediate and delayed recognition test taken 7 days later.

KEYWORDS: attention; cognitive load; memory; stereotypes

FALSE MEMORIES FOR STEREOTYPES: EFFECTS OF ATTENTION AND DELAY

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M.C.D.

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CHAPTER I: INTRODUCTION

False Memory Research on Stereotypes

Human memory has a vulnerability to create false recollections. These memory distortions have been an ongoing point of interest in psychological research for several decades due to their illustration of the reconstructive nature of memory retrieval (Loftus & Palmer, 1974; Loftus & Pickerell, 1995). False memories consist of errors where people report memories or distorted details that were not part of the original event (Roediger & McDermott, 1995). Their repercussions on eyewitness memory and subsequent social behavior have been the subject of research in social psychology (Wells et al., 1998; Gabbert et al., 2003). Multiple experiments have demonstrated this phenomenon using procedures such as the Deese-Roediger-McDermott (DRM; Roediger & McDermott, 1995) paradigm, where themed lists of words are presented to create false memories for target theme words that are not studied.

Everyday social interactions can also create conditions that evoke false memories. In these contexts, the critical associations do not originate in the semantic structure of word lists; instead, they reside in the stereotypical (category-based) knowledge that people have about others (MacRae et al., 2002). Many cognitive theories also assume that general knowledge and expectations about the world, such as stereotypes, are likely to influence behavior when individuals fail to recollect specific information about the past. For instance, Mather et al. (1999) found that the extent to which individuals depend on stereotypes to determine the source of information is influenced by two critical factors: the manner in which they initially attended to the information upon its initial encounter and age-related changes in cognitive processing. In these settings, stereotypes affect behaviors in multiple ways, such as by creating stereotype-consistent illusory recollections (Dodson et al., 2008). From gender expectations to racial bias, multiple studies have examined the effect of different types of stereotypes on human cognition (MacRae et al., 2002; Rohner and Rasmussen, 2011; Kleider et al., 2012).

False memories can be influenced by our general knowledge and expectations about the world (Roediger & McDermott, 1995). One category of general knowledge that we have pertains to expectations about gender roles. While investigating the effect of preconceived notions of gender roles on false memories, Lenton et al. (2002) demonstrated that even indirect (stereotyped) associations, generated through the DRM paradigm, can produce false memories. In their study, the participants were shown a list of words with a series of stereotypical gender roles. In one condition, the roles were stereotypical of women (e.g., secretary and nurse). In the second condition, the roles were stereotypical of men (e.g., lawyer and soldier). The recognition test included non-studied masculine and feminine lure words. It was predicted that participants would produce a higher rate of false alarms to stereotypically related than unrelated lures. This prediction was supported, as participants who were exposed to a list of masculine or feminine roles were more likely to falsely recognize stereotypically related roles than unrelated roles. Overall, stereotypes increased the processing and encoding of stereotype-consistent information. Individuals were shown to have better list-item memory, as well, for stereotype-consistent than inconsistent or neutral content. Participants' theme awareness and use of gender information was examined using a questionnaire. 92% of participants reported that they were not aware that the word lists contained gender-related information. The participants were shown to be unaware of the influence of stereotypes on their responses, supporting the idea that the false memories created were the result of implicit associative processes.

The Fuzzy-Trace Theory

Researchers Reyna and Brainerd (1995) explain that illusory mental experiences arise partly because people retain poorly focused event descriptions in memory. While memory conveys the general gist of what was experienced, over time it fails to preserve the item-specific traces that support accurate recognition performance. As a result, people rely on gist-related representations to guide the retrieval process; this is what triggers the generation of false memories. A theory used to explain the effect of gist-related representations on false memories is Fuzzy-Trace Theory (FTT) (Reyna & Brainerd,1995).

FTT is one of the most cited theories that explains source-monitoring errors and false-alarm rates found across multiple memory studies. According to this theory, the encoding phase produces two representations for each item: verbatim and gist (Brainerd & Reyna, 2002). The verbatim representation is related to the sensory and perceptual details of the item (i.e., item-specific information), whereas the gist representation captures the meaning of the item. The theory predicts a rapid disintegration of verbatim traces that leave behind fragments of information that are no longer bound together. Strong gist memories then reintegrate verbatim fragments to produce gist-consistent memory experiences. Overall, the theory explains false memories through erroneous source attributions with a mechanism where strong gist traces produce schema- (i.e., gist-) consistent illusory source recollections (Dodson et al., 2008). FTT suggests that after experiencing rich stimuli, such as faces, with cues that convey information that include group membership, recognition errors may arise when focus is biased and placed on stereotypical individual features instead of the full structure. Thus, verbatim traces, such as specific details of people's unique facial features, rapidly disintegrate, whereas gist-traces related to stereotypical categorizations of the individual remain. In this way, false memories happen as a result of relying on gist-related categorizations.

Reversing the Incongruency Effect

It is important to note that past research has generally found higher recall for expectancy-incongruent than expectancy-congruent behaviors, also known as the incongruency effect (Srull & Wyer, 1989). According to these memory findings, behaviors that exemplify the trait (e.g., an intelligent person scores an A on an exam) are more easily interpreted and thus do not require further processing. On the other hand, behaviors that are incongruent with the central concept (e.g., an intelligent person scores an F on an exam) do not fit the initial expectation, thus requiring additional processing to understand said behaviors. This ultimately enhances the recall of incongruent behavior, resulting in the incongruency effect (Gingrich et al., 1998). However, this effect has been shown to be vulnerable amid widespread social stereotypes, including trait expectations related to race.

In their study, Gingrich et al. (1998) examined the combined effects of racial stereotypes and trait expectancies on the incongruency effect. Half of the participants were presented with a trait adjective (e.g., *intelligent*) followed by behaviors that were congruent, incongruent, or irrelevant to the trait adjective. The other half of the participants were made aware of the ethnicity of the target (e.g., African American) in addition to the trait adjective. The results showed that when no information was presented about the target's ethnicity, a recall advantage for trait-incongruent information was found. However, this advantage was reduced for both European American and African American participants when the ethnicity of the target was made known. The addition of the group-membership information altered information processing of the target's behavior and reversed the incongruency memory advantage. This showed the negative effect of racial stereotypes during information encoding and its role in people's cognitive processes.

The Effect of Attention on False Memories

Although the studies above have shown the detrimental effect of stereotypes on human cognition, the categorical meaning behind stereotypes serves a positive purpose: it helps perceivers conserve valuable resources. Stereotypes allow people to process information more efficiently, although at the risk of negative consequences that include biased responses or erroneous recollections. People's reliance on categorical knowledge for processing social information can increase in environments that impair their ability to locate item-specific representations in memory due to factors such as stress, fatigue, or divided attention (Johnson et al., 1993). MacRae et al. (2002) examined this impairment by exploring the effect that divided attention has on the incidence of false memories. Their hypothesis was that attentional depletion should impede the elaborative encoding operations that support the representation of item-specific (i.e., expectancy-inconsistent) traces in memory, but leave intact the gist-based (i.e., expectancy-consistent) representations simultaneously abstracted from the available material. Subsequent reliance on this gist-based representation to guide retrieval processes should promote the generation of expectancy-consistent false memories. In MacRae et al.s study, participants were given a series of male and female names paired with an occupation: either *mechanic* or *hairdresser*. The task was to remember the occupations that were paired with each name, as the participants were instructed that their recollections would be tested later. Prior to the presentation of the stimulus materials, the participants were randomly assigned to one of the two treatment conditions. One group was assigned to the divided-attention condition and was told to count backwards (out loud) by 3's during the presentation of the items on the computer screen. The second group was not given this instruction. The results confirmed that under conditions of divided attention, participants generated more expectancy-consistent false memories than those operating at full attentional capacity. The higher rate of false memories generated by participants in the divided-attention condition is evidence that depleted cognitive resources facilitate source-monitoring errors through stereotype-consistent information that ultimately generates false memories. A subsequent experiment in this study evidenced the effect of natural resource constraints occurring as people age, showing a high level of expectancy-consistent false memories generated by both older participants at full attentional capacity and young participants under divided attention.

Faces as Real-world Stimuli

The studies previously discussed explored the effect of stereotypes on human cognition by displaying occupations or traits on screen using written text. However, people experience stereotypes through other types of stimuli in the real world. It is important to assess the role of stereotypes in human cognition through contexts that emulate real-world conditions, as humans are social creatures that detect cues from stimulus-rich environments. These stimuli include faces, which automatically transmit information about group membership related to one's race, age, gender, etc.

Using pictures of faces as stimuli, Rohner and Rasmussen's (2011) work analyzed the effect of physical-attractiveness stereotypes on human memory by pairing target faces with negative (e.g., *disagreeable*) or positive (e.g., *nice*) character traits. Their study demonstrated stereotypes' role as a cognitive heuristic when congruent and incongruent information is presented at encoding. The researchers examined explicit memory for information that was congruent with the physical-attractiveness stereotype (i.e., attractive-positive and unattractive-negative) and incongruent with the physical attractiveness stereotype (i.e., attractive-negative and unattractive-positive). The study phase consisted of pairs made up of a face (attractive or unattractive) and a trait (positive or negative). The test phase consisted of 20 new and 20 studied (old) pairs. Participants were asked to respond “old” or “new” for each pair presented while also providing a confidence rating for their responses. The results showed higher recognition rates for attractive-positive and unattractive-negative combinations than for attractive-negative and unattractive-positive combinations. These data are consistent with the conclusion that congruent information in the form of stereotypes is often accompanied by recognition bias. Studies have shown that attitude-congruent and stereotype-congruent information results in more recognition bias, explained as a greater tendency to respond “old” to old and new congruent information than to old and new incongruent information (e.g., Payne et al., 2004). Thus, memory performance can be distorted when people are presented with stereotype-consistent information; these categorical constructs make stereotypes more accessible, with this information eliciting recognition biased responses in favor of stereotype-consistent data.

Taken together, these studies show the influence of stereotypes in human memory through implicit associative processes that can reverse the retrieval advantage previously found for incongruent information. The discussed research supports the idea that the recognition bias that results from encountering congruent information in the form of stereotypes related to gender, physical attractiveness, and race creates false memories in human cognition.

Repercussions for Eyewitness Testimony

The consequences of false memories generated because of stereotype exposure vary in their degree of social repercussions. Erroneous recollections can lead to misidentifying a subject in relation to criminal activities. Research on eyewitness identification has shown that these recollections can be distorted by factors such as feedback (Wells et al., 1998) and confidence (Wells et al., 1984). The repercussions of false memories have been a topic of study in eyewitness research for several years, as memory errors are the main cause of wrongful convictions that are later exonerated (Kleider et al., 2012). Multiple studies have assessed different possible factors that enhance errors in face recognition, which is an important process in eyewitness identification. Face identification may be influenced by facial categorization driven by racial stereotypes associated with certain face types. For example, Black men are categorized into subgroups according to the degree to which they possess stereotypically Black features (i.e., darker skin, wider nose, and fuller lips; Blair et al., 2004). Thus, specific facial features in recognition tasks can activate categorization processes that elicit stereotype-driven false recollections.

Kleider et al. (2012) examined the generation of false memories in face recognition of the most vulnerable population to eyewitness errors: African Americans. In Experiment 2 of their study, the researchers hypothesized that stereotypical facial features may assist in remembering when the face is consistent with expectations (stereotypical face presented as a criminal) and promote memory errors when the face is inconsistent with the expectations of a category (miscategorizing a stereotypical face as a criminal when it was presented as a teacher). To test this, 87 undergraduate students were told that they would see faces of actors who had applied for a variety of movie roles. Each panel shown included four faces; two faces were stereotypical, and two were atypical of African Americans. Each face was paired with either racial stereotype-consistent (drug dealer) or -inconsistent (teacher or artist) labels. After a distractor task, participants were presented with each of the original 12 faces and indicated via keypress the role that was paired with each of them at the beginning of the experiment. The results showed a significant two-way interaction between face type and category. Stereotypical faces were more accurately categorized as drug dealers rather than artists or teachers. Furthermore, stereotypical faces were more accurately recategorized than atypical faces overall. This suggests the use of facial features as cues for category membership and their use in retrieval processes. However, the use of facial features as cues led people to incorrectly categorize targets as drug dealers significantly more often than the other two labels. It was suggested that this was due to an association between face type and criminality used to guide decision processes when memory failed. These results highlight a general bias towards face types as cues to group membership, a subsequent association with stereotypical expectations and their detrimental effects on accurate recognition.

The Effect of Delay on Schema Reliance

Memory details become less available as time passes. This inevitable and automatic process continues to be explored in a diverse range of settings. The role that time delay plays in accessing schema driven information, such as stereotypes as a consequence of memory decay, is worth examining. As previously discussed, real-life settings such as eyewitness testimony often require recalling details of information after a long period of time has passed. This makes humans vulnerable to relying on heuristics that may include the use of stereotypes, as this schematic information is more readily accessible for use.

Kleider et al. (2007) assessed the role of schematic processing in recalling actions observed in photographs, while examining the effect of delay. The experimenters showed participants 129 photographs that were consistent or inconsistent with gender stereotypes. A handyman and a housewife portrayed actions that were either in line with or contradictory to gender stereotypes related to their roles. For example, a photograph showing a stereotype-consistent action showed the housewife folding baby clothes in her house, whereas an inconsistent one showed the handyman folding the baby clothes. Using a between-subjects design, participants were tested either immediately or after a 2-day delay. Participants indicated whether action statements presented were old or new. For old action statements, they were instructed to identify which actor (handyman or housewife) had performed the action in the photograph. Results showed that hit rates were higher on the immediate test than in delayed test. Thus, a significant main effect of delay was found, with more false alarms found in the delayed test, than in the immediate one. Overall hit and false-alarm rates showed that memory faded over time, which was associated with greater schema-consistent processing. For both old and new actions, source misattributions were most often stereotype-consistent, a tendency that increased as the test delay increased. The FTT suggests that the passage of time makes people more likely to rely on gist traces in the form of stereotypes when trying to recall information; verbatim traces that represent accurate details of this memory start to decay with time and become less easily accessible.

CHAPTER II: THE CURRENT STUDY

Inspired by MacRae et. al.'s (2002) study, the current research was designed to examine whether false memories will emerge after priming occupational stereotypes while also analyzing the effect of divided attention and delay on these errors. Although MacRae et al. examined gender stereotypes' effect on false memories using word pairs (occupation and target name), the present study analyzed racial-occupational stereotypes surrounding the Latino and White racial groups, pairing a picture of a target's face with an occupation. Previous memory and social psychology research investigating the effects of racial stereotypes has mostly focused on the cognitive biases affecting people's perceptions of the African American population (e.g., Kleider et al.,2012; Gingrich et al.,1998). However, research examining the social and cognitive factors related to the perception of the Latino population has been scarce. In 2021, the U.S. Latino population reached 62.5 million, accounting for 19% of the country's population. By 2060, it is projected to increase to 111.2 million (Latino Policy & Politics Institute, 2022). Given the demographic growth of Latino population in U.S. society, it is important to understand the social and cognitive biases potentially affecting this community. Analyzing these distortions could allow to a deeper understanding of the challenges surrounding the Latino population, which could lead to a more thorough development of policies designed to address and counteract biases.

Memory accuracy was examined both after a short delay following the encoding phase during Session 1, and after a longer delay 7 days later during Session 2. Participants were assigned to one of two groups; one was exposed to a memory task under divided attention, whereas the other group completed the same task with full attention. In the study phase for both groups, a series of faces of White and Latino male individuals were shown on screen paired with one of two occupations. The occupation paired with the face was either stereotype-consistent or -inconsistent. After a brief distractor task, the recognition phase showed both old and new pictures of faces. Participants indicated whether the face appearing on screen was ‘‘old’’ or ‘‘new’’ (i.e., had or had not been seen in the earlier phase of the study). For items designated as old, participants were required to identify the studied occupation of the face in question.

The proportion of hits and false alarms were the recognition measures in both recognition tests (immediate and delayed) of the study. The false alarm scores were computed as proportion of new faces identified as “old”. Backed by findings in memory research and social psychology, the main study aimed to test three hypotheses:

Hypothesis 1: It was expected that, due to familiarity with racial-occupational stereotypes, participants would show expectancy-consistent false memories during the recognition test. Exposure to picture-occupation pairs that fulfill expectancy-based beliefs or stereotypes was predicted to produce false alarms for stereotype-consistent occupations at a higher rate than stereotype-inconsistent unstudied images as explained by FTT. An interaction between race and occupation would support this prediction; new White targets would be more likely to be erroneously identified as software developers, and Latino targets as construction laborers.

Hypothesis 2: It was predicted that this false memory difference would be larger in the divided attention group than the full attention group, because cognitive depletion would cause a greater reliance on gist-based stereotype beliefs for recognition decisions. The data were expected to show that divided attention creates a reliance on categorical (i.e., gist) processing. An interaction between race, occupation, and attention would support this prediction; new White targets would be more likely to be erroneously identified as software developers, and new Latino targets as construction laborers in the divided attention condition, than the full attention condition.

Hypothesis 3: The rate of false memories was expected to increase in the Session 2 recognition test taken 7 days after Session 1. It was expected that stereotype-consistent false memories would be higher in Session 2, because of a greater reliance on gist-based processes when compared to Session 1, with this rate expected to be higher in the divided-attention condition than the full-attention condition. A four-way interaction between attention condition, occupation, race, and delay was expected and; new White targets would be more likely to be erroneously identified as software developers, and new Latino targets as construction laborers in the divided attention condition, than the full attention condition, with this trend increasing during Session 2. These results would suggest that false alarm rates for stereotype-consistent images are exacerbated by a depletion of verbatim traces resulting from decay and limited cognitive resources, as explained by the FTT.

CHAPTER III: PILOT STUDY

The two occupations paired with each face in the main study were selected on the basis of a pilot study conducted at Illinois State University in the Spring of 2022. Thirty participants were asked to rate on a 4-point scale (1 = "very unusual" to 4 = "very usual") how usual they believed it is to find specific White and Latino individuals shown on screen performing the occupation listed next to the face. A series of male individuals belonging to these two ethnicities paired with a specific occupation was shown to the pilot participants. The pictures of the faces were taken from the *Chicago Face Database* developed at the University of Chicago (Ma et al., 2015). The occupations for each ethnicity were taken from the U.S. Bureau of Labor Statistics annual report (2022).

Participants were shown 18 faces, each with an occupation chosen from the labor report; half of them were Latinos, and the other half were White individuals. The highest rated occupation for each race was selected for use in the main study. Based on these ratings, *software developer* was deemed to be the most typical occupation for White targets ($M = 3.38$), whereas *construction laborer* was the highest rated occupation associated with Latino targets ($M = 3.10$). This data allowed me to directly confirm and violate racial-occupational preconceptions by pairing faces with either stereotype-consistent or -inconsistent occupations.

CHAPTER IV: METHODS

Participants

A total of 110 students were recruited for Session 1 via SONA at Illinois State University in exchange for course credit. The design featured a 2 (Occupation: Software Developer, Construction Laborer) x 2 (Race: White, Latino) x 2 (Delay: no delay, long delay) x 2 (Attention: full, divided) mixed design. Half of the participants were randomly assigned to an full attention condition, and half were placed in the divided-attention condition. Occupation, race, and delay were manipulated within subjects. After completing Session 1, a second recognition test took place 7 days later in Session 2. As an incentive to sign up and complete both tests, participants were added to a gift card drawing if they completed Session 2.

For Session 1, 14 participants' data were excluded due to an internet failure during the procedure (n = 1) and scoring less than 50% in the divided-attention condition manipulation check (n = 13). A total of 96 participants' data remained for Session 1 analysis, with 54 in the full-attention condition and 42 in the divided-attention condition.

Eighty-eight participants from Session 1 returned for Session 2. Sixteen participants were deleted from analysis in this session due to experimenter errors (n = 3) and scoring less than 50% in the divided-attention condition manipulation check during Session 1 (n = 13). A total of 72 participants' data remained for Session 2 analysis, with 40 in the full-attention condition and 32 in the divided-attention condition.

Participants' ages ranged from 18-31, with Session 1 and Session 2 participants having an average age of 19.5 and 19.6, respectively. Participants were primarily female, with 78% female, 20% male, and 2% reporting other. Participant racial demographics for Session 1 were 70%

White, 17% African American, 12% Latinx, and 1% Asian. The demographics for Session 2 remained consistent with Session 1.

Materials

The stimuli included 80 digitized photographs of male individuals belonging to one of two ethnicities: White or Latino. To control for salience and ensure consistency, the picture backgrounds were identical, with every individual showing a neutral expression. The target's race was the only variable that changed across pictures. The pictures were taken from the *Chicago Face Database* developed at the University of Chicago (Ma et al., 2015). The skin tones of the White faces ranged from lighter to fairer shades, whereas the Latino faces had a wider range of skin tones, including olive, tan, and darker shades. Regarding facial features, most White faces displayed lighter eye colors (i.e., blue or green) than Latinos, which tended to have darker eye colors (i.e., brown or hazel). White face targets generally exhibited hair colors ranging from blond to light brown. On the other hand, Latino targets had darker hair shades, i.e., dark brown or black. Photographs were randomly divided into two matched sets (half of each type of pairing and race) for use in counterbalancing old and new photos for the recognition tests.

Aligned with the findings in the pilot study, the main study showed four types of face-occupational pairings. Stimuli representing stereotype-consistent beliefs showed White faces paired with "Software developer" and Latino faces paired with "Construction laborer". Stereotype-inconsistent pairings showed White faces paired with "Construction laborer" and Latino faces paired with "Software developer".

Previous research has utilized various types of distractor tasks to divide attention when examining the effects of cognitive load on memory performance (Kleider et al., 2008; Lenton et al., 2001; MacRae et al., 2002). These distractors have included tasks commonly used in laboratory settings, such as instructing participants to pay attention to figures on the screen, or performing a secondary task, such as counting specific patterns of numbers. However, these activities are rarely performed in the real world. The distractor task in the present study was chosen with the purpose of emulating real-world diversions that divide people's attention. Studies have used audiobooks to test their level of interference when performing complex tasks. Researchers Nowosielski et al. (2018) found that listening to audiobooks as secondary tasks was detrimental to complex tasks such as driving. The audio of the distractor task in the present study was a 2-minute excerpt from the same children's book utilized by Nowosielski et al. (2018), *Harry Potter and the Deathly Hallows* by author J.K. Rowling.

Procedure

The experiment was conducted in the Human Memory Lab at Illinois State University between the fall of 2022 and spring of 2023. The instructions, stimuli, and tasks were programmed using the online research platform Gorilla Experiment Builder (www.gorilla.sc). Participants met with the experimenter in the lab room at an arranged time after signing up in the Illinois State University SONA system. After providing consent, participants were randomly assigned by the online experiment platform to one of two groups. The divided-attention group was exposed to the paired-associate learning task while under divided attention (listening to the audiobook excerpt), whereas the full-attention group completed the task without distractors.

Instructions on the screen directed participants through the tasks. The divided-attention group listened to the *Harry Potter and the Deathly Hallows* audiobook that played along with the pairings displayed on the screen. Participants in the divided-attention group were tested on the contents of the story passage after the presentation of the pairings as a manipulation check. The full-attention group completed the study phase with no distractors.

In the study phase for both groups, 40 pictures of male individuals of White and Latino races were shown on screen, paired with one of two occupations: construction laborer (Latino stereotype-consistent) or software developer (White stereotype-consistent). The presentation of the picture and occupation pair on screen lasted 3 s each. The two races and occupations were equally distributed in the pictures shown: 10 Latino construction workers, 10 Latino software developers, 10 White construction workers, and 10 White software developers. After the study phase, both groups completed a filler task. The full-attention group answered eight trivia questions related to the Harry Potter children's books. The divided-attention group answered eight questions about the Harry Potter audiobook excerpt they listened to while the pairings were displayed. An exclusion criterion of 50% accuracy on these questions was set for the divided attention group as part of a manipulation check.

In each recognition test, a total of 40 faces was shown: 20 old faces, and 20 new faces. The two sets of pictures were counterbalanced across the participants.

Participants indicated via keypress whether the face that appeared on screen was ''old'' (i.e., was shown before in the earlier study phase) or ''new'' (i.e., had not been seen before in the earlier phase of the study). For items designated as old, participants were asked to identify the occupation of the person in question that was studied with that face. Before leaving the lab, participants were reminded to attend Session 2 taking place exactly 7 days after the Session 1. The test format of Session 2 was identical in instructions, stimuli, and keypress procedure as the first session. However, Session 2 only included the recognition test, which displayed the remaining 40 pictures not shown in the first recognition phase in Session 1. After completion of the recognition task in Session 2, participants were debriefed, thanked for their participation, and dismissed.

Hits were determined by calculating the proportion of accurately identified old faces that were correctly associated with the respective occupation shown during the study phase. False alarms were determined by calculating the ratio of incorrectly recognized new faces and categorizing them based on the corresponding response option (a stereotype-consistent occupation, or -inconsistent occupation).

CHAPTER V: DATA ANALYSIS AND RESULTS

Session 1 Analyses

Two separate 2 (Occupation: Software Developer vs. Construction Laborer) x 2 (Race: White vs. Latino) x 2 (Attention: Full vs. Divided) repeated-measures ANOVAs were conducted to analyze the rate of false alarms and hits after a short delay across attention conditions and stereotype-consistency levels. Table 1 summarizes the mean proportion of false alarms for each attention condition.

Table 1

False Alarm Rates for each Attention Condition during Session 1

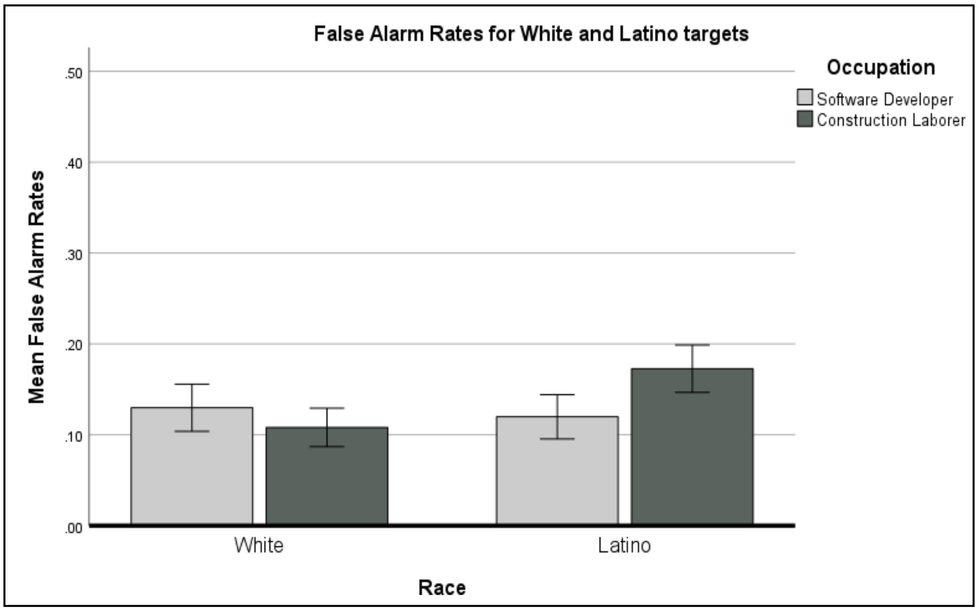
	Full Attention				Divided Attention			
	White		Latino		White		Latino	
Occupation	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Software Developer	.13	.02	.11	.02	.13	.02	.13	.02
Construction Laborer	.12	.01	.17	.02	.10	.02	.18	.02

The ANOVA conducted for false-alarm rates revealed a significant main effect of race, $F(1, 94) = 6.94$, $p = .010$, with higher false-alarm rates produced overall for Latino faces ($M = .15$, $SD = .01$) than White faces ($M = .12$, $SD = .01$). An interaction between race and occupation was found to be significant, $F(1, 94) = 8.95$, $p = .004$. A planned t-test comparison conducted to examine the difference in false alarms for occupations for each race revealed a significant difference between the occupations reported for Latino faces, $t(95) = 3.1$, $p = .003$, with participants more frequently identifying them as construction laborers ($M = .17$) than software developers ($M = .12$). This finding was consistent with Hypothesis 1. However, no difference was found between the occupations reported for White faces, $t(95) = 1.27$, $p = .206$.

See Figure 1 for a summary of mean false-alarm rates across the different race and occupation levels.

Figure 1

False Alarm Rates by Occupation and Target Race at Session 1



No significant main effect for attention was found, with both attention conditions producing similar rates of false alarms, *F*(1, 94) = .001, *p* = .982. This contrasted with Hypothesis 2, as the divided attention condition was predicted to yield higher false-alarm rates than the full attention condition. The interaction between attention condition, race and occupation was not significant, *F*(1, 94) = .027, *p* = .869. No other effects or interactions were found to be significant, all *p*'s ≥ .17.

The ANOVA conducted for Hits showed a main effect for race, *F*(1, 94) = 4.11, *p* = .05, with higher recognition hit rates found for White (*M* = .40, *SD* = .02) than Latino faces (*M* = .35, *SD* = .02). A main effect of attention, *F*(1, 94) = 29.08, *p* < .001, was found for Hits, with participants recording higher Hit rates in the full attention condition (*M* = .45, *SD* = .02) than the

Divided attention condition (*M* = .31, *SD* = .02), thus, demonstrating that the attention manipulation only affected hits, not false alarms. This result suggests that the attention manipulation was effective. No other effects or interactions were found to be significant, all *p*'s $\geq$ .21. Table 2 summarizes the mean proportion of hits for each attention condition.

Table 2

Hit Rates for each Attention Condition during Session 1

	Full Attention				Divided Attention			
	White		Latino		White		Latino	
Occupation	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Software Developer	.49	.03	.46	.03	.32	.04	.30	.03
Construction Laborer	.46	.03	.40	.03	.33	.04	.27	.04

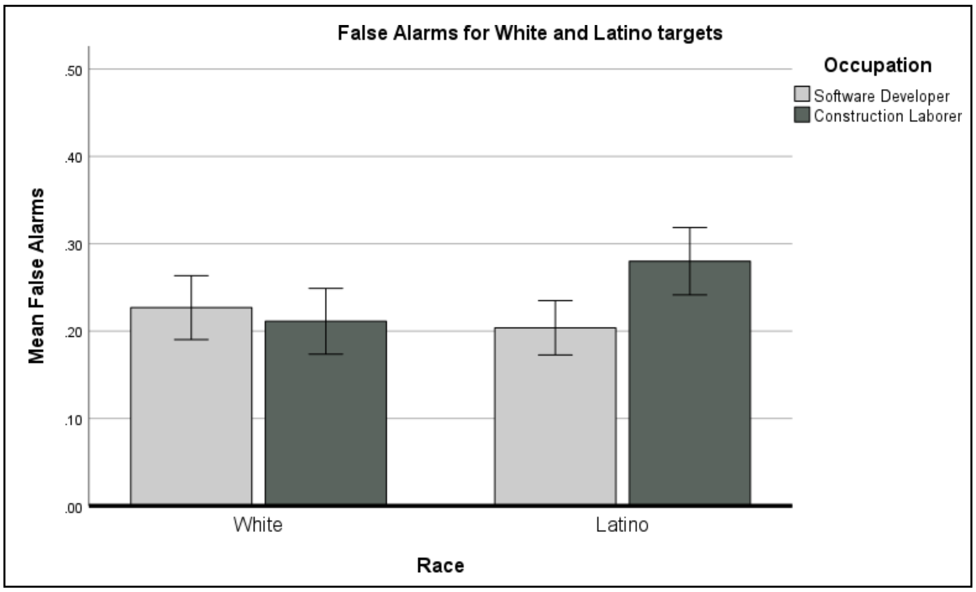
Session 2 Analyses

Two separate 2 (Occupation: Software Developer vs. Construction Laborer) x 2 (Race: White vs. Latino) x 2 (Attention: Full vs. Divided) repeated-measures ANOVAs were conducted to analyze the rate of false alarms and hits after a long delay across attention conditions and stereotype-consistency levels.

The ANOVA conducted for false-alarm rates revealed a significant interaction between occupation and race, $F(1, 70) = 4.56$, $p = .036$. A planned t-test comparison conducted to examine the difference in false alarms for occupations for each race revealed a significant difference between the occupations reported for Latino faces, $t(71) = 2.76$, $p = .007$, with participants identifying them as construction laborers (*M* = .28) more frequently than software developers (*M* = .21). However, no difference was found between the occupations reported for White faces, $t(71) = .57$, $p = .58$. See Figure 2 for a summary of mean false-alarm rates across the different race and occupation levels. Coinciding with the results for Session 1, there was no main effect found for attention, $F(1, 70) = 2.01$, $p = .161$. Participants produced similar rates of false alarms in Session 2 regardless of the attention manipulation experienced.

Figure 2

False Alarm Rates by Occupation and Target Race at Session 2



The ANOVA conducted for Hits showed a main effect for race, $F(1, 70) = 5.08$, $p = .03$, with higher recognition hit rates found for Latino ($M = .14$, $SD = .01$) than White faces ($M = .102$, $SD = .01$). The analysis also revealed a significant interaction between attention and occupation, $F(1, 70) = 4.01$, $p = .05$, showing significantly higher Hit rates for software developers ($M = .14$, $SD = .02$) than construction laborers ($M = .08$, $SD = .02$) in the divided attention condition. No other effects or interactions were found to be significant, all p's $\geq .07$

Combined Analyses

To assess the effect of delay on false alarms and hit rates, two separate 2 x 2 x 2 x 2 mixed ANOVAs were conducted, with delay (Short vs. Long), occupation (Software Developer vs. Construction Laborer), race (White vs. Latino) and attention (Full vs. Divided) as independent variables. The data from the 72 participants that returned for Session 2 were utilized for this analysis; their performance across Sessions 1 and 2 was examined as a within-subjects factor.

The ANOVA conducted for false alarms revealed a main effect of delay, $F(1, 70) = 109.07$, $p < .001$, such that higher false-alarm rates were found for the delayed recognition test ($M = .23$, $SD = .01$) than the immediate test ($M = .13$, $SD = .01$). This was expected, as decay increases forgetting rates over time. No significant interaction between attention, race, occupation, and delay was found, $F(1, 70) = .072$, $p = .789$, which contrasted with Hypothesis 3.

The ANOVA conducted for Hits showed a main effect of delay, $F(1, 70) = 175.32$, $p < .001$, such that higher recognition rates were recorded in the immediate test ($M = .38$, $SD = .02$) than the delayed test ($M = .12$, $SD = .01$). An interaction between delay and attention was found to be significant, $F(1, 70) = 11.24$, $p = .001$, showing significantly higher Hit rates for those in the full attention condition ($M = .45$, $SD = .02$) than those under divided attention ($M = .30$, $SD = .02$), during Session 1. A pairwise comparisons analysis revealed that participants in Session 2 produced comparable Hit rates regardless of attention condition, $p = .367$.

Attention and the Cross-Race Effect

The ANOVA for False Alarms in both sessions also revealed a three-way interaction between attention, delay and race, $F(1, 70) = 7.51$, $p = .008$. Further analysis of this finding showed a Cross Race Effect (CRE) in both sessions, where Latino targets were less accurately recognized than White targets. The CRE suggests that individuals are more likely to recognize faces of their own race compared to faces of other races (Tanaka et al., 2004). In this three-way interaction, participants in the divided attention condition produced significantly higher false alarms in the immediate test for Latino targets (*M* = .16, *SD* = .02) than White targets (*M* = .10, *SD* = .02). However, participants in this attention condition produced comparable false alarms during the delayed test for Latino targets (*M* = .21, *SD* = .02) and White targets (*M* = .22, *SD* = .02). See Figure 3 below for a summary of the false alarm rates in the divided attention condition across delays for each target race.

In contrast, participants in the full attention condition produced significantly higher false alarms in delayed test for Latino targets (*M* = .27, SD = .02), than White targets (*M* = .22, SD = .02). However, participants in this attention condition produced comparable false alarms during the immediate test for Latino targets (*M* = .14, *SD* = .01) and White targets (*M* = .12, *SD* = .01). See Figure 4 below for a summary of the false alarm rates in the full attention condition across delays for each target race.

Figure 3

Cross Race Effect for Divided Attention Condition at Session 1

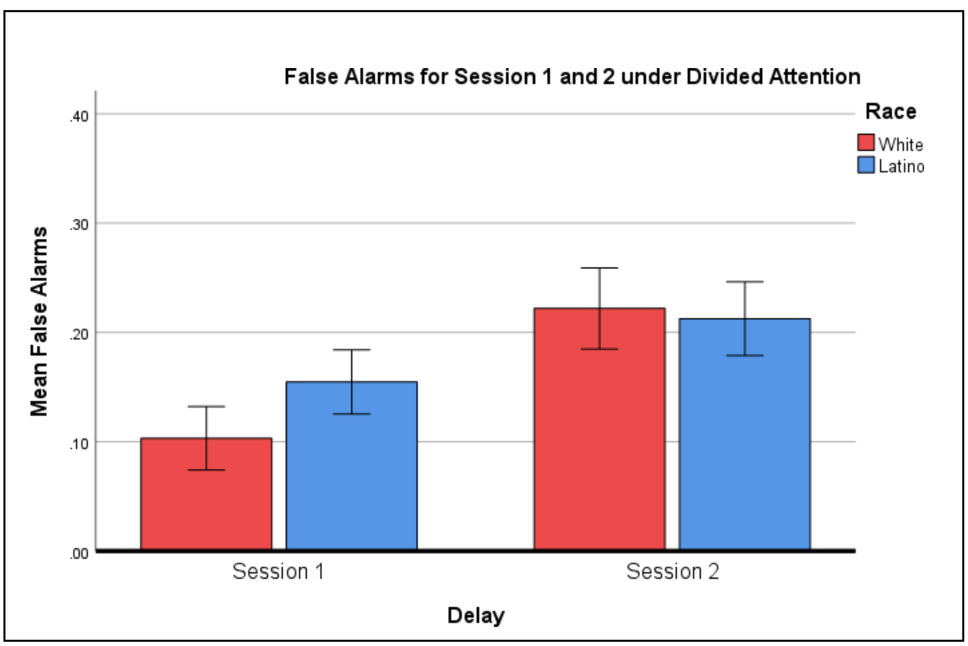
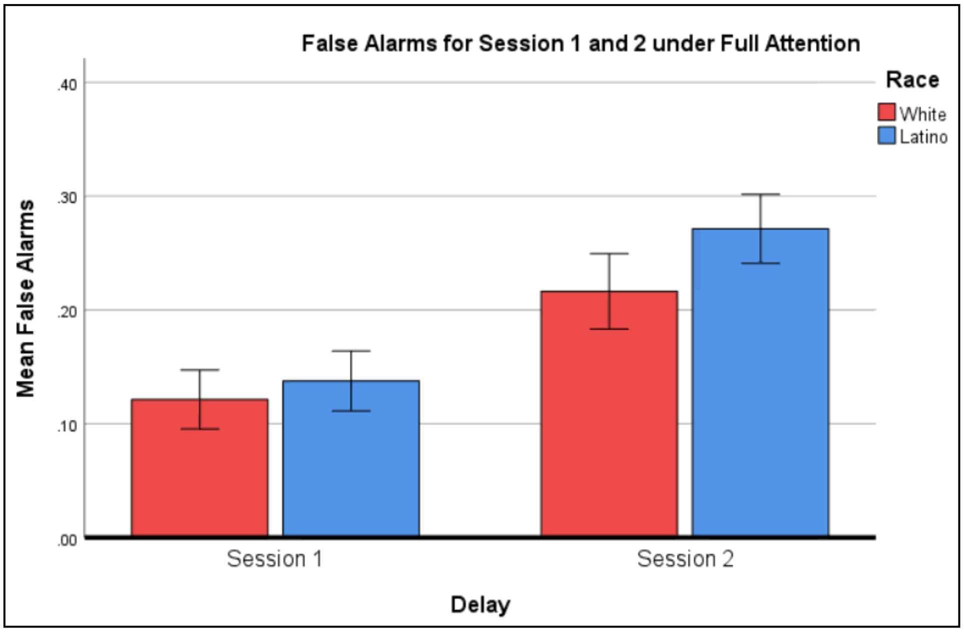


Figure 4

Cross Race Effect for Full Attention Condition at Session 2



An additional ANOVA performed only with data from White participants (*n* = 51), also showed the significant three-way interaction between attention, delay and race, $F(1, 49) = 4.291$, $p = .044$, with the same pattern of results, and thus confirmed the CRE findings.

CHAPTER VI: DISCUSSION

The present study was designed to examine the effect of stereotype exposure on stereotype-consistent false memories. Support for these categorical memory illusions is found in the social cognition literature, where studies have confirmed that priming stereotypes encourages categorical thinking and decision making (MacRae et al., 2002). In the current study, significantly higher false memories were produced for stereotype-consistent pairings than inconsistent ones for Latino targets, supporting previous findings on this cognitive bias (Gingrich et al.,1998; Kleider et al. 2012; Rohner & Rasnussen, 2011) and supporting Hypothesis 1. This can be attributed to the magnitude of this bias in our social cognition, signaling how strong and prevalent the effects of racial-occupational stereotypes are, even in young adults, such as those who were in the current sample.

The current study also tested the effect of divided attention on these heuristic-driven errors. According to MacRae et al. (2002), when attentional depletion makes it difficult to individuate others, people rely more on categorical preconceptions to guide the processing of information. However, no effect of attention was found in the current study, with participants in both attention conditions producing similar rates of false memories. In contrast, MacRae et al. (2002) reported a higher rate of false memories consistent with stereotypes from individuals who encoded under divided attention than those who encoded under full attention. The contrasting results found between the current study and MacRae et al.'s (2002) can be attributed to methodological differences. For instance, in the current study participants were exposed to pairings comprised of faces and occupations testing the effect of racial-occupational stereotypes. In contrast, MacRae et al. (2002) exposed participants to lists of names and occupations, testing the effect of gender-occupational stereotypes. The faces that participants studied in the present study were new to them and represented unique facial structures that are harder to encode than names that already exist in a language. Additionally, MacRae et al. (2002) utilized a different manipulation procedure to divide attention, instructing participants to count by 3's during the encoding phase. In an attempt to expose participants to a more ecologically valid distraction task, participants in the current study instead listened to an audiobook while being exposed to the face pairings. It can be argued that participants in the current study were more used to this type of multitasking activity in their everyday lives, and it therefore did not interfere with their encoding as much as the counting task used by MacRae et al. However, the attention manipulation was successful in affecting their accurate memory, with those in the full-attention condition performing better than those under divided attention. Thus, it is possible that the effects of racial stereotypes on memory errors are stronger than those of gender stereotypes, leading to high levels of false alarms even under full attention at encoding. Even though I was not able to replicate the findings of MacRae et al. (2002) regarding the effects of cognitive depletion in the current study, I was able to successfully replicate the generation of false memories for stereotype-consistent information using a modified version of their paired-associate learning task.

I also predicted lower memory accuracy at the longer delay than the immediate memory test, such that participants would produce more stereotype-driven memory errors in the delayed test than the immediate test. This prediction was supported by both false-alarm and hit rates, which confirms the findings from Kleider et al. (2007), where source misattributions were most often stereotype-consistent, with this tendency increasing along with test delays. Likewise, the present study found a larger effect of stereotype consistency in false memories 7 days after encoding, demonstrating that decay facilitates source-monitoring errors through stereotype-consistent information.

The last hypothesis predicted that false memories for stereotype-consistent pairings would increase significantly more across delays for participants in the divided attention condition, compared to those under full attention. This would have demonstrated that social memory errors based on stereotypes are enhanced by lapses in attention and decay that result in a greater reliance on categorical expectations emulating gist-related processes suggested by the FTT. However, comparable false alarm rates were found across attention conditions, suggesting that memory errors based on stereotypes and other types of categorical knowledge structures occur through automatic memory processes, with similar chances of occurring regardless of our cognitive resources.

Whereas the effects found for gist-related categorizations and delay are consistent with the FTT, the comparable false alarm rates found across attention conditions seem to support the Activation Monitoring Theory (AMT) as a potential explanation for social memory errors. The AMT explains that when a stereotype-consistent pairing is presented, its representation (stereotype associated with that race) is semantically activated (Roediger et al., 2001). This leads to an unconscious association between the stereotype and the unstudied faces presented.

This association has been described as an automatic process where complex stimuli activate the representation of stereotypes present during the encoding phase into the recognition phase. Because participants in my study experienced similar rates of stereotype-consistent false memories regardless of their attentional resources, it can be argued that the activation of the categorical schemas during stereotype priming in the encoding phase automatically activated the representations of the stereotypes for participants that affected retrieval during the recognition phase. This effect could have happened even when individuals were not dedicating their full attention to the face pairings on screen, and thus participants produced similar rates of false memories regardless of their attention condition. Thus, the production of false memories for stereotypes can be understood as robust automatic events driven by categorical thinking processes.

The current study uncovered an unexpected finding that should be discussed. An additional pattern was found for false memories experienced by participants across delays, where experiencing specific attention conditions negatively impacted their recognition accuracy for Latino targets. The pattern found for participants under divided attention suggests that they experienced a Cross-Race effect only during Session 1, as higher rates of false memories were found for Latino targets than White targets. This decreased accuracy rates for Latino faces could be explained by the attentional depletion experienced by participants during the encoding phase, creating higher false alarm rates for unstudied Latino faces during Session 1. However, this effect was no longer present for individuals in this attention condition during Session 2, with participants yielding comparable false alarm rates for both White and Latino targets.

The pattern found for participants in the full attention condition indicates that they experienced a Cross-Race effect only during Session 2, as higher rates of false memories were found for Latino targets than White targets. In contrast, participants in this group yielded comparable accuracy rates for both races during Session 1. The similar memory accuracy performance for both race targets at Session 1 could have been aided by the full attentional resources available for participants in the full attention group, allowing them to more accurately source monitor unstudied items. However, delay could be attributed as a possible factor for the decline in recognition accuracy for Latino targets at Session 2. In other words, attentional resources impacted false memory rates for Latino targets differently across delays. More research is needed to understand the extent to which attention and delay influence accurate recognition for cross-race targets.

Overall, it was expected that priming social beliefs and expectations would increase the likelihood that participants falsely recollect information that is consistent with racial-occupational stereotypes. The findings in this main study supported this prediction both after an immediate and delayed recognition test. The findings of this study correlate to everyday situations where people rely on categorical expectations to make decisions and show how easily stereotype-driven errors happen. From eyewitness testimony to police officer responses, our decision-making processes rely on our memory to accurately describe events we have experienced. However, external factors such as social expectations, passage of time, and distractions may make our memory more vulnerable to false recollections. Understanding these processes and their repercussions on frequently stereotyped groups may help conscientize society about the dangers of these memory shortcuts.

CHAPTER VII: STRENGHTS AND LIMITATIONS

This study investigated the effects of racial-occupational stereotypes on false memories, contributing to an understanding of how social and cognitive processes interact. Although different psychology fields have provided insights into the Latino population, there is need for further investigation in the memory and cognitive research area. This study aimed to fill this research gap to better understand the memory processes involved within the context of Latino individuals in the U.S.

One of the strengths of this research is the comparison of memory performance between two-time intervals. This allowed me to examine and compare the impact of time on stereotype-driven false memories after a short and long delay. This type of comparison can shed light on the long-term effects of stereotype exposure on human memory.

An additional strength included the ecological distractor task designed to divide participants' attention. Incorporating an audiobook as a distractor emulated real-world conditions individuals face when attempting to assess and remember the information around them. This in turn allowed me to directly examine the degree to which participants were engaged during the distractor task intended to divide their attention by including a manipulation check that tested their attentiveness.

One of the limitations of this study is the lack of evaluation of participants' awareness of the stereotypes primed during the study phase. This constraint limits the understanding of how participants' knowledge or recognition of the stereotypes may have influenced their responses during the study. Participant reactivity towards detecting the stereotypes could have influenced them to distance themselves from stereotype-consistent answers. A way to address this issue in a future study is by including a standardized stereotype awareness test to fully capture the cognitive processes, attitudes, or potential biases related to the primed stereotypes.

Another limitation is that the sample of participants was not demographically diverse, as a large proportion of individuals were young adults who in majority identified as White and female. This demographic makeup limits the generalizability of my findings. Analyzing the effects of stereotypes on a more diverse sample in a future study could help better understand how different demographic factors influence behavior within the context of social schemas.

Lastly, future studies in social memory research focusing on the effects of stereotypes should also explore intangible factors, such as language, religion and culture. By doing so, researchers can gain a more comprehensive understanding of the way stereotypes operate in human cognition and measure the degree to which individuals' behavior is nuanced towards more tangible aspects such as physical characteristics, or intangible ones such as culture.

Despite the previously outlined limitations of the study, the findings reveal meaningful insights about our social cognition. The hypothesis that stereotypes affect individuals' memory processes was supported. Across a short and long delay, participants exhibited a bias to erroneously identify Latino individuals as construction laborers. This finding shed light on the impact of stereotypes on our cognitive frameworks and the challenges that the Latino community faces today. Social heuristics or generalizations can influence how individuals interpret and remember information, which can potentially lead to discriminatory attitudes and behaviors. Understanding and addressing these cognitive biases is a step towards promoting fair and equal treatment of individuals from different social backgrounds.

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