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Memory for a Familiar and Unfamiliar University Logo

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Memory for a Familiar and Unfamiliar University Logo

by

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APPROVAL FOR SUCCESSFUL DEFENSE

Masters Candidate, Alicia M. Fels, has successfully defended and made the required modifications to the text of the master's thesis for the M.S. during this Spring Semester 2021.

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Abstract

Prior research found that memory is fallible and that memory for common objects is poorly encoded (Brady et al., 2008; Nickerson & Adams, 1979). Participants studied one of the logos and recalled both the familiar and unfamiliar logos. Confidence judgments were collected at pre- and post-recall for both logos. Results suggest that recall changed by study condition and logo type, studying before recall, for both the familiar and the unfamiliar logo, improved recall scores. The results also suggest that confidence judgments changed depending on the logo familiarity and time. Confidence decreased from pre- to post-recall for the familiar logo in both study conditions but increased for the unfamiliar logo in both study conditions. Prior research on schema memory and metamemory may explain why there is a difference in direction for the two logos. Schema incongruent items have better contextual memory and higher confidence (Sweegers et al., 2015).

Keywords: memory, metacognition, logos, common objects

Introduction

Memory is a fundamental aspect of everyday life. It allows us to be able to learn new things and enhance prior information we receive. However, human memory can be fallible, despite being exhaustive in capacity (Brady et al., 2008). The fallibility of human memory can cause issues when it is tested through numerous means, like eyewitness testimony or in a free recall task, as examples. Researchers have found that humans poorly encode objects that are familiar and used almost every day. These items range from coins (Marmie & Healy, 2004; Nickerson & Adams, 1979) to where the nearest fire extinguishers are (Castel et al., 2012), and even the keypads on a telephone or calculator (Rinck, 1999). This thesis project will focus on the retrieval of previously and newly encoded information of university logos.

Memory for Common Objects

Nickerson and Adams (1979) first investigated long-term memory for a penny, a familiar object. Their first experiment discovered that, despite how much exposure there is to U.S. pennies, the participants' recall memory for it was very poor. Only three out of the eight features of the penny were recalled and located accurately. The researchers also found that one participant could correctly identify and locate all eight parts, but that participant was an avid coin collector (Nickerson & Adams, 1979).

Upon further investigation of people's memory for U.S. pennies, a cued recall task did not improve participants' memories. Even recognition memory was impaired but a little better than recall. Half of the participants who saw the accurate penny stated that it was correct, while the other half deemed it an imposter. Nickerson and Adams attribute the results of their experiments to either: (a) attempting to retrieve poorly encoded information or (b) poorly retrieving perfectly

encoded information. Thus, researchers answered this question using an intentional study of an object (Marmie & Healy, 2004; Nickerson & Adams, 1979).

Role of Intentional Study

After intentionally studying a Mercury Dime before recall, memory performance significantly improved (~50% difference) compared to the unstudied coin, a penny. There was also an observed improvement after a week delay, where the studied object had proportionally higher recall scores than the unstudied object (~30% difference). Even after restricting the study time to fifteen seconds, there was still a significant difference in the proportion of features recalled correctly by coin type (Marmie & Healy, 2004).

The issue with recalling and recognizing the correct familiar object from a list of similar lures lies within incidental encoding. The researchers demonstrated this by keeping retrieval conditions the same while only manipulating encoding conditions. One possible explanation for these results is that incidental and intentional studying leads to two different encoding types. It also concluded that a short amount of deliberate study of an object could considerably improve memory recall and retention temporarily than incidental study (Marmie & Healy, 2004).

Role of Familiarity

Prior research also discovered that even a highly recognizable logo from a favored company, Apple, falls susceptible to people's poorly encoded memory for the said logo. The first experiment found that participants who indicated being primarily Apple users seemed to have a slight advantage over mixed and P.C. users in recall and recognition tasks. However, this advantage was only marginally significant for the recall and not the recognition task. Fewer than half of the participants correctly recognized the real logo among the lures. There was also no

difference in confidence levels between the three types of users and their recall scores. However, there was a marginal difference for the recognition scores, with Apple users had higher confidence than the mixed users. There was also a significant correlation between the features recalled and confidence ratings when collapsed between all users. Thus, further investigation into exploring the relationship between metacognition and memory for the Apple logo (Blake et al., 2015).

When confidence ratings were collected before and after recall, participants tended to be overly confident in their ability to draw the logo before any attempt and less confident during post-recall. Participants realized after drawing the logo that they do not know the logo as well as they thought they did. After attempting to retrieve the logo details, participants had to adjust their estimates based on their experience. There was no observed relationship between pre-recall confidence and features recalled, but there was a significant positive relationship with post-recall confidence (Blake et al., 2015).

Theories on Poor Memory

There are several different theories for human's poor memory for familiar objects. One explanation is human’s attention to the world around them, and the second relies on the Parallel Distributing Process Model and its relation to a hierarchical encoding of object's features. The third explanation touches upon existing schemas and items congruent and incongruent to said schema (Mania et al., 2005; *Parallel Distributed Processing Models of Memory | Encyclopedia.Com*, n.d.; Rumelhart et al., 1986; Schaper et al., 2019; Sweegers et al., 2015).

Theory of Inattentional Blindness

The first theory prior researchers have used to explain people's poor memory for common objects is people's attention to their surroundings. These researchers used real-world applications to describe how humans have inattentional blindness to things they see and use every day.

One such application was the locations of the nearest life-saving object, like a fire extinguisher. Faculty from a building had to explain where the nearest fire extinguisher was to them, recall task, and then they had to walk from their office to the nearest fire extinguisher to them, the recognition task. During the recall task, sixty-one percent of faculty did not know the location of the nearest fire extinguisher, and fifteen percent gave locations of the farther fire extinguishers from them. However, ninety-two percent found the nearest fire extinguisher within five seconds of exiting their office (Castel et al., 2012). These results are caused by inattentional blindness where salient objects, like the fire extinguishers in this study, are not easily remembered during recall despite years of exposure to it. Since the faculty members in this building did not focus their attention on the location of the nearest fire extinguisher every day, they only physically see them rather than notice and remember them for recall. Fire extinguishers were not the only objects used in this study; however, they were the essential objects since recalling where the nearest fire extinguisher is could one day save someone's life.

After the findings with fire extinguishers, researchers investigated other objects, like covers of college textbooks, to see if inattentional blindness caused people to see rather than notice those objects. Researchers looked to see how students encoded covers and why this information may or may not have been remembered. The researchers discovered that when the

authors of a textbook directly related the course contents to the image on the cover, students tended to remember the image more. They also found a positive correlation between the final percentage grade in the course and those who recalled the correct picture on their textbook cover (Hargis et al., 2018). The correlation found by researchers could result from students with better grades in the course studied and used the textbook more, which possibly led to more exposure to the cover compared to other students. Thus, allowing those students to have more exposure to the author connecting the cover to the course content, when and if it occurred in their textbook.

Parallel Distributed Processing Model

Prior research has found that there might be a hierarchical encoding of features. Surface features like the location of the mint year tend to be ignored during encoding, while gross features like size and coloring are encoded better (Horner & Comstock, 2005). Researchers linked this finding to the Parallel Distributing Processing Model (PDP), which is a theory that the brain causes a range of activities in tandem, or parallel, to each other rather than as a series of actions (*Parallel Distributed Processing Models of Memory | Encyclopedia.Com*, n.d.; Rumelhart et al., 1986).

There are two different versions of the PDP model: the localist and the distributed models. The localist version states that each element (known as a unit in the model) represents different cognitive units. On the other hand, the distributed version says that human memory stores information as a pattern of activation over a series of individual units rather than a cognitive unit assigned to each unit. For example, a few features are enough for accurate discriminations in simple tasks, but more complex tasks will need more parts to help improve the accuracy of biases. Meaning that while memory for surface details is lacking, the featural

information recalled is enough for real-world coin discrimination (Horner & Comstock, 2005; *Parallel Distributed Processing Models of Memory | Encyclopedia.Com*, n.d.; Rumelhart et al., 1986).

Schema Memory

However, a possibly better theory for poor memory for familiar objects is one's schema. Schema is a concept used in Psychology to explain how information is organized and interpreted in our brains. They tend to be helpful because they create shortcuts in our long-term memory storage to help us analyze the information we receive from our environments (Reed, 2013).

There are inconsistent findings on how schemas may or may not affect how memory is encoded. Schemas tend to exclude information we receive that does not confirm any pre-existing beliefs and ideas, which can make it difficult to retain new information, while others have found that schema-congruency causes impairments in item memory (Mania et al., 2005; Schaper et al., 2019; Sweegers et al., 2015).

Participants recognized objects consistent with the schema more than inconsistent objects, which is the consistency effect; schema-consistent items enhanced memory performance more than inconsistent items. For the confidence scores, the researchers also found that, when present and absent, consistent objects had higher confidence ratings than incompatible objects. Regardless of viewing condition, confidence scores were higher for schema-consistent items (Mania et al., 2005).

Researchers also observed the opposite effect on memory and confidence scores, called the inconsistency effect. Prior research found that memory was better for global recognition (hits on old items and false alarms on new items) than detailed recognition (hits on old items and false

alarms on lures). Schema-incongruent has better memory discriminability than schema-congruent items. For contextual memory, the researchers found that participants were more accurate in choosing the corresponding location for the faces for incongruent items than congruent items. They also had higher confidence in their choices and faster reaction times. These results suggest that schema-incongruent items and memories were contextually richer than the schema-congruent items and memories (Sweegers et al., 2015).

Prior research has also found that new information cannot improve schemas and that a schema may be resistant to change, even if there is room for improvement. Thus, having a schema for something negates the necessity of closely examining that object, supported by a study that looked at people guessing the size of a coin versus a cardboard disc. This study found that people tended to be more accurate in reckoning the size of the cardboard disc, an object they had no schema for, than they were for the coin, a thing they had a schema for (McCurdy, 1956).

There is a lack of literature investigating whether having an already existing schema for a particular object will encode a novel object with similar features. Thus, I created the current study to bridge the gap by recruiting individuals to be tested on target items both familiar and unfamiliar.

The Current Study

The goal of the present study was to expand on prior research by testing the study effect on recall memory for a familiar and unfamiliar stimulus and examine the metacognitive change in confidence. I split participants into two conditions; in each situation, participants were only allowed to study one of the two logos but recalled both. They also rated their confidence for both logos before and after recall. The current study focused on two primary outcomes.

The first primary outcome was to replicate the findings of Experiment 1 in the study by Marmie and Healy (2004) regarding the study effect on recall memory. I hypothesized that I would find a study effect on both stimuli. Specifically, the stimuli that participants studied would have higher scores than the stimuli that participants did not review. Based on results from prior research, I also predicted that recall scores for the unfamiliar stimulus, the Bearcat logo, would be lower than the recall scores for the familiar stimulus, the Pirate logo. In addition, studying would enhance memory for the Pirate logo.

The second principal outcome of the current study was to explore how participants' metacognition for confidence changes from pre- to post-recall and how it depends on which stimulus was studied. I wanted to replicate and expand on the findings of Experiment 2 in the study by Blake, Nazarian, and Castel (2015) regarding the change in participants' confidence from pre- to post-recall for the Apple logo. As this part of the current study is based on Experiment 2, I hypothesized that confidence judgments for both logos would decrease from pre- to post-recall. I also predicted that confidence judgments for the unfamiliar stimulus, the Bearcat logo, would be lower than the confidence judgments for the familiar stimulus, the Pirate logo. I also predicted that there would be a correlation between confidence judgments and recall scores, with post-recall confidence positively correlated with recall scores. As recall scores increase, post-recall confidence scores should increase as well.

Method

Participants

Participants consisted of 110 undergraduate students (67.3% women, 31.8% men, 0.9% non-binary) enrolled in psychology courses from Seton Hall University. Participants had an

average age of 19 years old (S.D. = 1.20yrs), mainly Caucasian (55.45%), in their first year of college (40.9%), and non-athletes (93.6%). Table 1 contains further demographic information for these participants.

Materials and Measures

Stimuli

The current study used two university athletic logos as stimuli for the recall task. One logo was familiar to the participants, the Seton Hall Pirate logo, which is linked here, and one was unfamiliar to the participants, the Willamette University Bearcat logo, which is linked here (*Seton Hall University Graphic Standards Manual*, 2013; *Willamette University Athletic Style Guide*, n.d.).

Recall Task

Participants were tested on two stimuli, the Seton Hall University Pirate logo and the Willamette Bearcat logo (*Seton Hall University Graphic Standards Manual*, 2013; *Willamette University Athletic Style Guide*, n.d.). I used the eleven features and locations of the Pirate logo's elements to create an 11-point rubric for scoring. I made a similar rubric for the Bearcat recall, but with a 9-point rubric instead. Two researchers on the study team scored each recall drawing for interrater reliability. These rubrics can be found in Appendix A.

Table 1

Demographics of Study Sample

Age	Mean (SD)	19.0 years (1.20)
	Range	18.0 years – 25.0 years
Gender Identity	Percent	Women: 67.3%
		Men: 31.8%
		Nonbinary: 0.9%
Grade	Percent	First Year: 40.9%
		Second Year: 38.2%
		Third Year: 14.5%
		Fourth Year: 6.4%
Semesters Attending Current School	Mean (SD)	2.73 semesters (2.10)
	Range	1.00 semesters – 16.0 semesters
Ethnic/Racial Identity	Percent	Caucasian: 55.45%
		Asian: 14.55%
		Hispanic: 14.55%
		Black/African American: 4.55%
		Multi-racial: 4.55%
		Indian: 3.64%
		Middle Eastern: 2.73%
Athlete	Percent	Non-Athletes: 93.6%
		Athletes: 6.4%
Owning Items with Pirate Logo	Percent	Yes: 89.1%
		No: 10.9%

Familiarity Questionnaire

Participants saw a questionnaire that scores individual ratings of familiarity with the Seton Hall Pirate logo and the Willamette Bearcat logo. Participants answered questions such as how many semesters they have attended their school and whether they live on campus or commute. Specific questions about logoed merchandise were asked for each logo and presented to every participant. These questions can be found in Appendix B.

Confidence Judgments

Before participants could study or recall either logo, they were asked to judge their confidence in drawing both logos, with each logo having its question. Confidence judgments were scored on an 11-point Likert scale, with zero being unconfident and ten being confident. These two scores make up the pre-recall confidence since they were asked before recall.

At the end of the study, I asked two similar questions about how confident they were that they drew the two logos accurately. These two questions were also scored on an 11-point Likert scale, with zero being unconfident and ten being confident. These two scores make up the post-recall confidence since they were asked after recall.

Design

According to an a priori power analysis with G*Power, 64 participants were needed to achieve a power of 0.8, assuming a medium effect size for a 2 X 2 ANOVA, consistent with prior research (Faul et al., 2007, 2009).

This experiment was a 2 (Logo: Pirate, Bearcat) X 2 (Study Condition: Study Pirate, Study Bearcat) mixed-factor design for the recall scores and a 2 (Logo: Pirate, Bearcat) X 2

(Time: Pre-Recall, Post-Recall) X 2 (Study Condition: Study Pirate, Study Bearcat) mixed-factor design for the confidence judgments.

Procedure

Participants signed up for a time slot through the *Sona System*. The researchers on the study team used to contact the participants and administer the Qualtrics survey through Microsoft TEAMS. The assigned study team member contacted participants through video calls. The researcher then asked the participant to share their desktop screen with them. This helped ensure that participants stayed on task and did not look up the stimuli during the recall tasks.

Once the participant shared their desktop screen with the researcher, the researcher read through the informed consent form with the participant. They were told their participation in the study was entirely voluntary, and they could stop at any point if they would like to.

Participants were asked general demographic questions, as noted in Table 1. Then, they completed the familiarity questionnaire and asked to make pre-recall confidence judgments for both logos. After they completed this, Qualtrics randomly assigned them to one of the conditions: study Pirate or study Bearcat.

Participants in the *study Pirate* condition were able to study the Pirate logo for 60 seconds. After the study time passed, the participant completed a distractor task for 5 minutes. Then, they were instructed to draw the logo to the best of their ability. Once they finished drawing, the researcher asked the researcher to hold their recall drawing up to their camera. The researcher took a screenshot of the drawing before saving it with the participants' I.D. number and logo (i.e., 1234_Pirate). After this, they were then asked to draw the Bearcat logo to the best of their ability. They held up the drawing to their camera again so the researcher could take a

screenshot of it. This condition was also counterbalanced, in which some participants recalled the Bearcat logo first before studying the Pirate logo.

Other participants were assigned to the *study Bearcat* condition, which followed the same flow as the *Pirate* condition, except that these participants were now studying the Bearcat logo. They also recalled the Pirate logo from their memory after completing the study Bearcat and recall task. This condition was also counterbalanced, in which some participants recalled the Pirate logo first before studying the Bearcat logo.

Participants used what they had available to them at the time they were participating in drawing both stimuli. The scoring of both logos was based on accurately locating and including each feature of the two logos.

After the participants from the *Pirate study and Bearcat study* conditions were finished recalling both logos, they were asked to make post-recall confidence judgments for both logos. At the end of the survey, the researcher thanked participants for their participation. They also went through a short debriefing to explain what we were investigating. They were also encouraged not to discuss the study with others. However, given the results of Nickerson and Adams (1979), unless students deliberately study the logos, they will likely not be impacted by having a preview.

Results

Recall Scores

There were 14 disagreements between raters for raw recall scores (8 for Bearcat scores and 6 for Pirate scores). The raters solved the disagreements by discussing why they chose the score they did and reviewing the recall drawings again before they agreed on a score.

I conducted a 2 (Logo: Pirate, Bearcat) X 2 (Study Condition: Study Pirate, Study Bearcat) ANOVA on participants' recall scores. Means and standard deviations for the recall scores as a function of condition are presented in Table 2.

Table 2

Mean Recall Scores by Logo and Study Condition

Study Condition	Logo	Mean (S.D.)
Study Pirate	Pirate	0.71 (0.20)
	Bearcat	0.50 (0.25)
Study Bearcat	Pirate	0.42 (0.20)
	Bearcat	0.78 (0.23)

There was a main effect of logo on recall scores, $F(1, 108) = 9.18$, $p = 0.003$, $\eta^2 = 0.021$. Bearcat recall scores ($M = 0.65$, $SD = 0.28$) were significantly higher than Pirate recall scores ($M = 0.57$, $SD = 0.25$). There was no main effect of study condition on recall scores, $F(1, 108) = 0.04$, $p = 0.839$, $\eta^2 = 0.000$. There was an interaction between logo and study condition on recall scores, $F(1, 108) = 129.97$, $p < 0.001$, $\eta^2 = 0.291$, which can be seen in Figure 2. Post hoc comparisons using Tukey's HSD test indicated that the recall scores for the Pirate-Study Bearcat condition ($M = 0.42$, $SD = 0.20$) were significantly lower than the Pirate-Study Pirate condition ($M = 0.71$, $SD = 0.20$). Recall scores for the Bearcat-Study Bearcat condition ($M = 0.78$, $SD = 0.23$) was significantly higher than the Bearcat-Study Pirate condition ($M = 0.50$, $SD = 0.25$). These differences indicate that within each logo, studying improves recall scores. However, there was no significant difference between the Pirate-Study Pirate condition and the Bearcat-Study

Bearcat condition, and the Pirate-Study Bearcat condition and the Bearcat-Study Pirate condition. Thus, participants recalled logos equivalently whether they were familiar or not, but scores increased with the study.

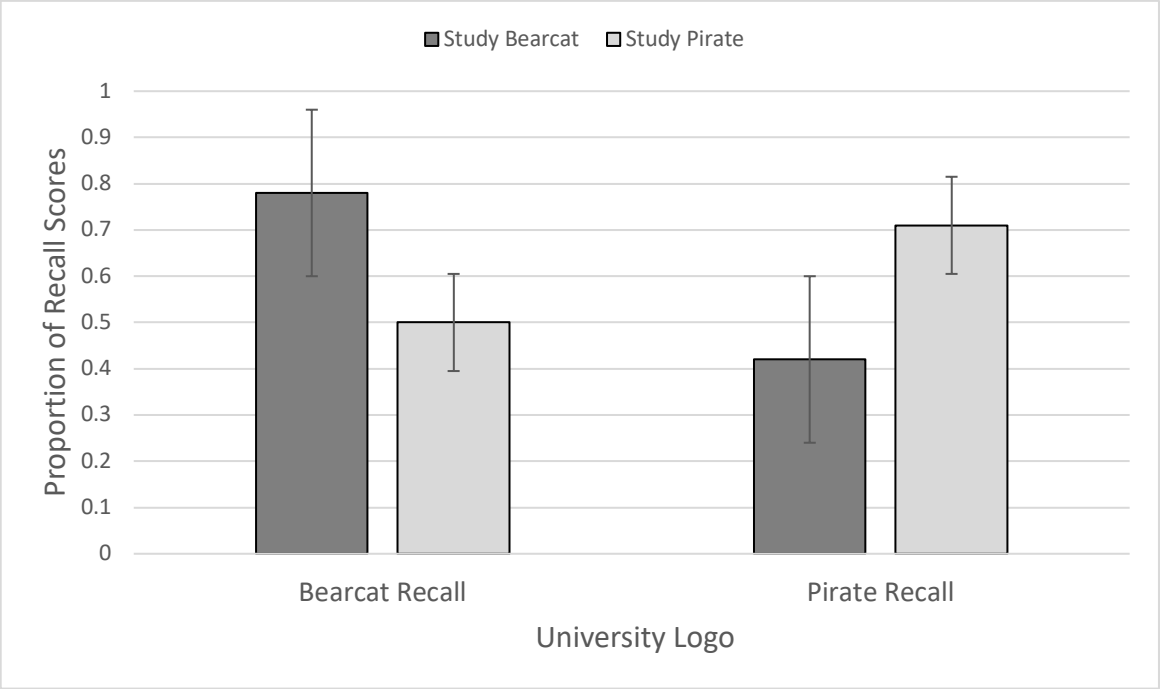

Figure 1

Proportion Recall Scores by Logo and Study Condition.

Confidence Judgments

I conducted a 2 (Logo: Pirate, Bearcat) X 2 (Time: Pre-Recall, Post-Recall) X 2 (Study Condition: Study Pirate, Study Bearcat) repeated measures ANOVA for participants' confidence judgments. Means and standard deviations for the conditions are presented in Table 3.

Table 3

Mean Confidence Judgments by Logo, Study Condition, and Time.

Time	Study Condition	Logo	Mean (S.D.)
Pre-Recall	Study Pirate	Pirate	5.20 (1.95)
		Bearcat	0.17 (0.51)
	Study Bearcat	Pirate	4.43 (2.26)
		Bearcat	0.20 (0.62)
Post-Recall	Study Pirate	Pirate	5.06 (2.54)
		Bearcat	0.67 (1.40)
	Study Bearcat	Pirate	3.41 (2.54)
		Bearcat	3.30 (2.61)

Although there was a significant main effect of time ($F(1, 108) = 16.58$, $p < 0.001$, $\eta^2 = 0.012$) and logo ($F(1, 108) = 263.16$, $p < 0.001$, $\eta^2 = 0.375$), and a significant interaction between time and study condition ($F(1, 108) = 8.40$, $p = 0.005$, $\eta^2 = 0.006$); logo and study condition ($F(1, 108) = 35.93$, $p < 0.001$, $\eta^2 = 0.051$); and time and logo ($F(1, 108) = 54.80$, $p < 0.001$, $\eta^2 = 0.045$), these were all qualified by a three way interaction among logo, time and study condition ($F(1, 108) = 29.07$, $p < 0.001$, $\eta^2 = 0.024$).

To interpret this three-way interaction, I ran two separate two-way ANOVAs on pre-recall and post-recall confidence scores. As may be seen in Figure 3, there was no interaction between logo and study condition in pre-recall ($F(1, 108) = 3.47$, $p = 0.065$, $\eta^2 = 0.005$), there was for post-recall, ($F(1, 108) = 48.1$, $p < 0.001$, $\eta^2 = 0.147$). The impact of studying the Bearcat was to make recall confidence equivalent for the Pirate and Bearcat conditions. In contrast, those who studied the Pirate continued to show low confidence in Bearcat recall.

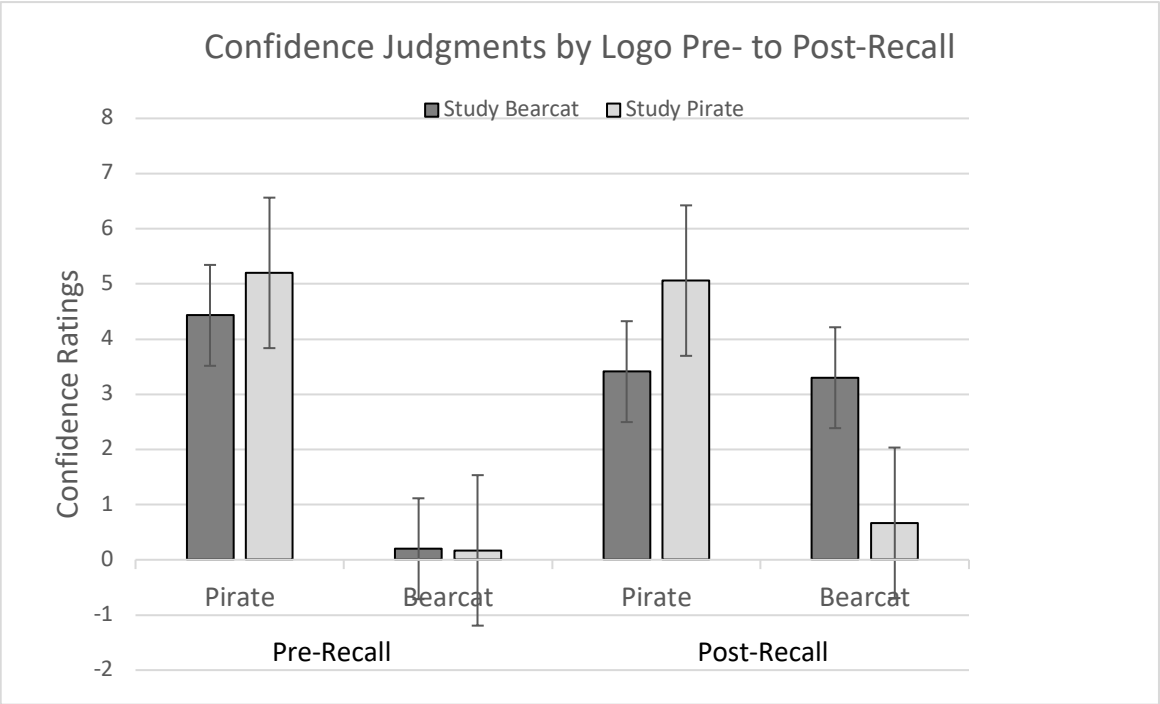

Figure 2

Confidence Judgments by Logo, Time, and Study Condition.

Relationship Between Recall Scores and Post-recall Confidence

I conducted two correlational analyses to investigate the relationship between recall scores and the post-recall confidence judgments for both logos. I separated the participants by their study condition, and then I performed a Pearson's r correlation with the scores in each study condition.

For the participants in the Study Pirate condition, there was a strong positive relationship between post-recall Bearcat confidence and Bearcat recall scores, $r(52) = 0.37$, $p = 0.0057$

(Figure 5a), and a strong positive relationship between post-recall Pirate confidence and Pirate recall scores, $r(52) = 0.42$, $p = 0.0018$ (Figure 4a). There was also a strong positive relationship between post-recall Bearcat confidence and Bearcat recall, $r(54) = 0.43$, $p = 0.0008$ (Figure 5b), and a strong positive relationship between post-recall Pirate confidence and Pirate recall, $r(54) = 0.45$, $p = 0.0006$ (Figure 4b), for the participants in the Study Bearcat condition. In both study conditions and for both logos, as the recall score for that logo increased, the post-recall confidence score increased.

Lastly, the two correlational analyses also found a positive relationship between Pirate recall and Bearcat recall in both the Study Pirate condition, $r(52) = 0.33$, $p = 0.0137$ (Figure 6a), and the Study Bearcat condition, $r(54) = 0.27$, $p = 0.0410$ (Figure 6b). Thus, in both conditions, as recall scores for the Pirate logo increased, the recall scores for the Bearcat logo also increased.

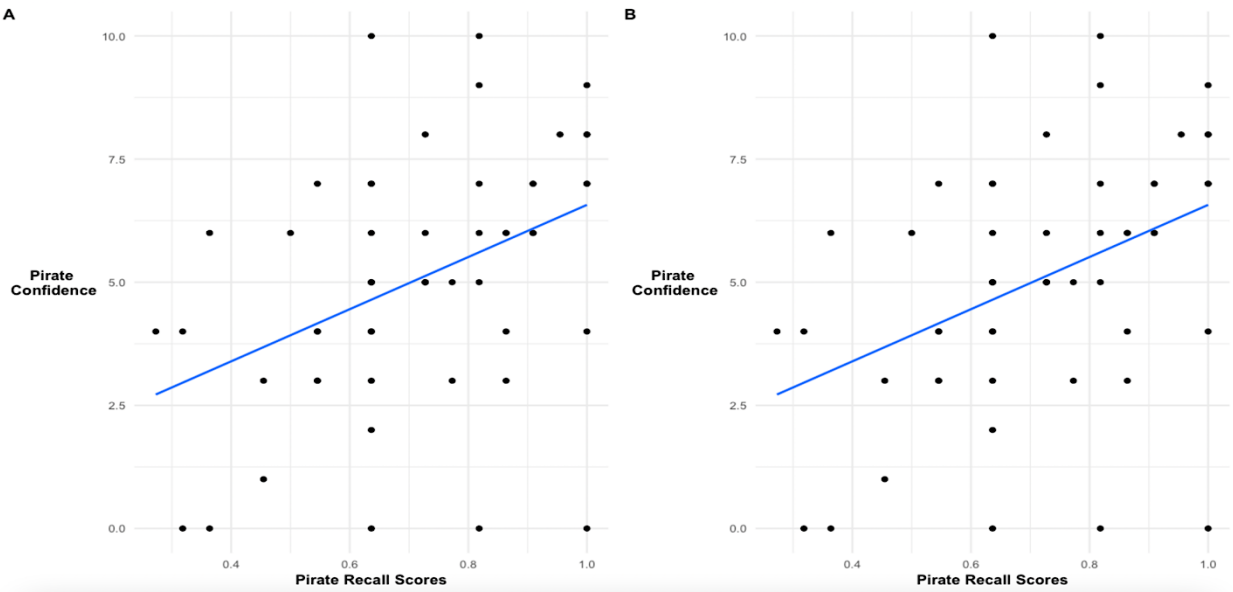

Figure 3

Pirate Recall and Pirate Confidence Correlations.

Note. The above graphs represent the correlations by the two study conditions. **(a)** Study Pirate participants had a positive relationship between Pirate recall and Pirate confidence scores, $r(52) = 0.42$, $p = 0.0018$. **(b)** Study Bearcat participants had a positive relationship between Pirate recall and Pirate confidence scores, $r(54) = 0.45$, $p = 0.0006$.

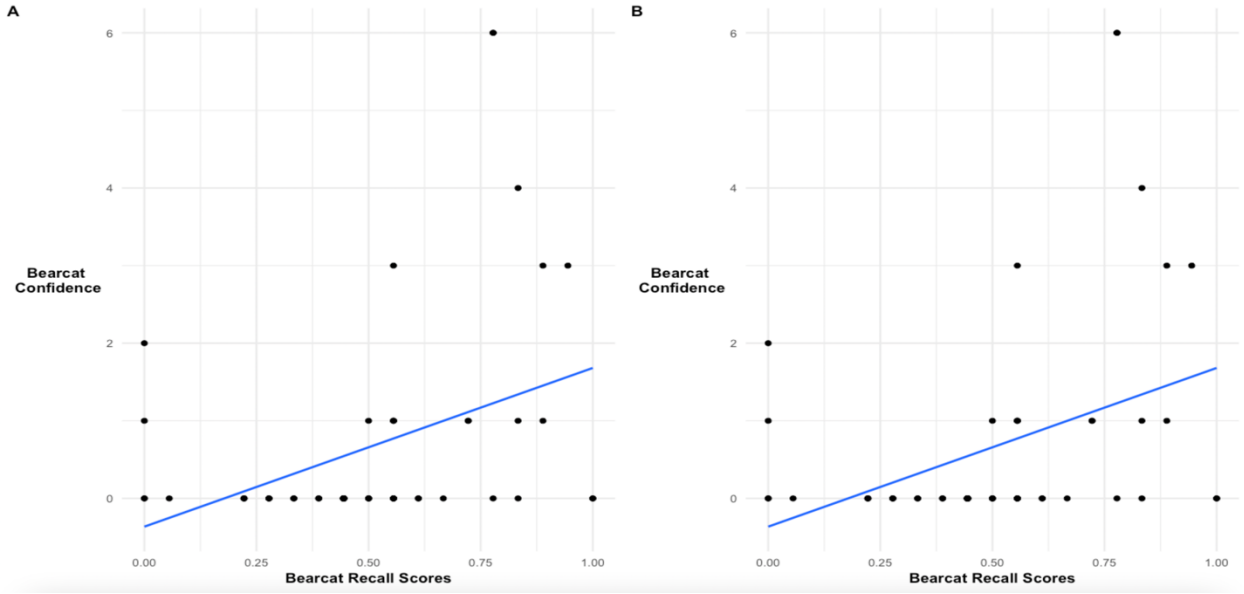

Figure 4

Bearcat Recall and Bearcat Confidence Correlations.

Note. The above graphs represent the correlations by the two study conditions. **(a)** Study Pirate participants had a positive relationship between Bearcat recall and Bearcat confidence scores, $r(52) = 0.37$, $p = 0.0057$. **(b)** Study Bearcat participants had a positive relationship between Pirate recall and Bearcat recall scores, $r(54) = 0.43$, $p = 0.0008$.

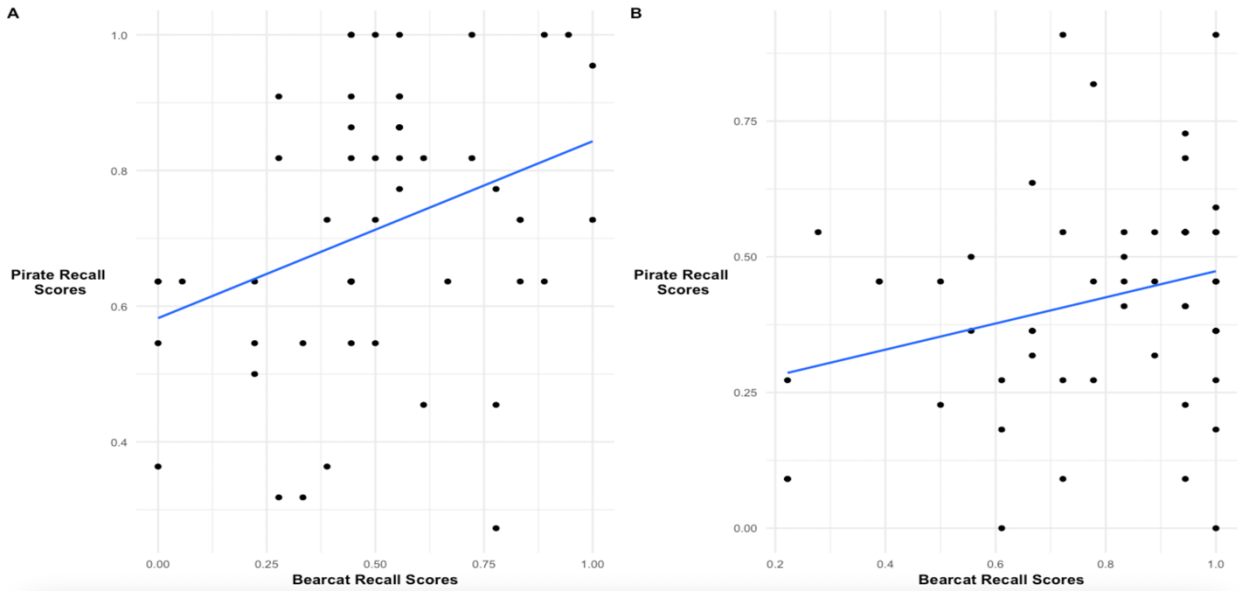

Figure 5

Pirate Recall and Bearcat Recall Correlations.

Note. The above graphs represent the correlations by the two study conditions. **(a)** Study Pirate recall scores had a positive relationship between Pirate recall and Bearcat recall scores, $r(52) = 0.33$, $p = 0.0137$. **(b)** Study Bearcat recall scores had a positive relationship between Pirate recall and Bearcat recall scores, $r(54) = 0.27$, $p = 0.0410$.

Exploratory Analyses

I conducted some exploratory analyses to see if some of the answers on the familiarity questionnaire contributed to scores for that logos' recall scores. I ran these analyses using quasi-experimental ANOVAs between some of the questions on the familiarity questionnaire and the proportion of Pirate recall scores. Though due to the uneven groups for each variable, I decided to run three separate ANOVAs instead of one large quasi-experimental ANOVA with all three variables.

The first quasi-experimental ANOVA conducted was for owning items with the Pirate logo and proportion of Pirate recall scores split by study condition, for which summary statistics

can be seen in Table 4. There was a main effect of study condition on Pirate recall scores. ($F(1, 106) = 12.97$, $p < 0.001$, $\eta^2 = 0.108$), but there was no main effect for owning any items with the Pirate logo on them ($F(1, 106) = 0.08$, $p = 0.778$, $\eta^2 = 0.001$). There was also no significant interaction between study condition and owning Pirate items ($F(1, 106) = 0.62$, $p = 0.434$, $\eta^2 = 0.005$), which can be seen in Figure 7.

Table 4

Mean Pirate Recall Scores by Study Condition and Owning Pirate Items

Study Condition	Pirate Items	Mean (S.D.)
Study Bearcat	Yes	0.419 (0.190)
	No	0.455 (0.417)
Study Pirate	Yes	0.726 (0.195)
	No	0.652 (0.216)

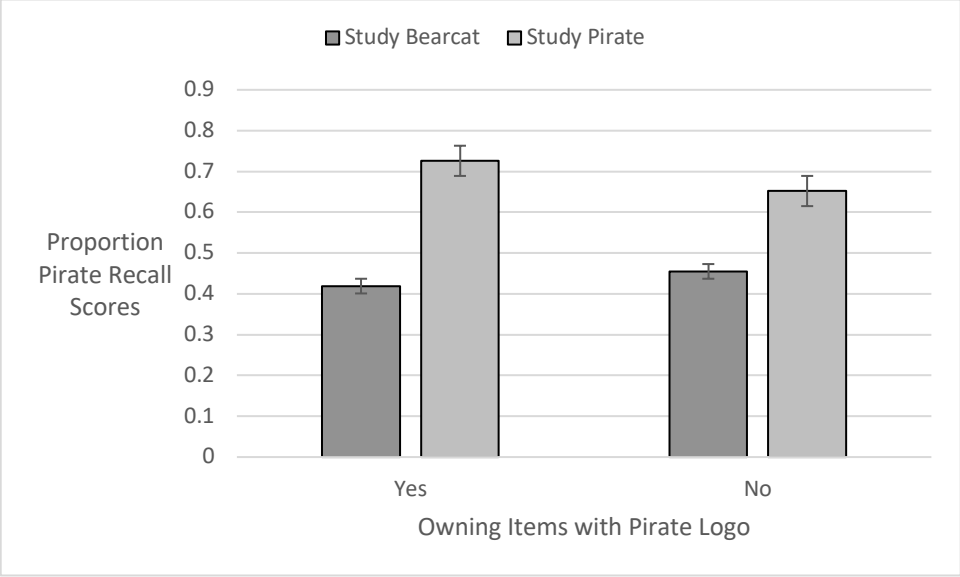

Figure 6

The Proportion of Pirate Recall Scores by Owning Pirate Logo Items.

A second quasi-experimental ANOVA for having the Pirate logo on their car and proportion of Pirate recall scores split by study condition was analyzed. Summary statistics can be seen in Table 5. There was a main effect of study condition on Pirate recall scores ($F(1, 106) = 60.12$, $p < 0.001$, $\eta^2 = 0.359$), but there was no main effect for having the Pirate logo on their car ($F(1, 106) = 1.01$, $p = 0.317$, $\eta^2 = 0.006$). There was also no significant interaction between the study condition and the Pirate logo on their car ($F(1, 106) = 0.56$, $p = 0.458$, $\eta^2 = 0.003$), visualized in Figure 8.

Table 5

Average Pirate Recall Scores by Study Condition and Owning Pirate Car Sticker

Study Condition	Pirate Car	Mean (S.D.)
Study Bearcat	Yes	0.380 (0.159)
	No	0.448 (0.222)
Study Pirate	Yes	0.709 (0.183)
	No	0.719 (0.217)

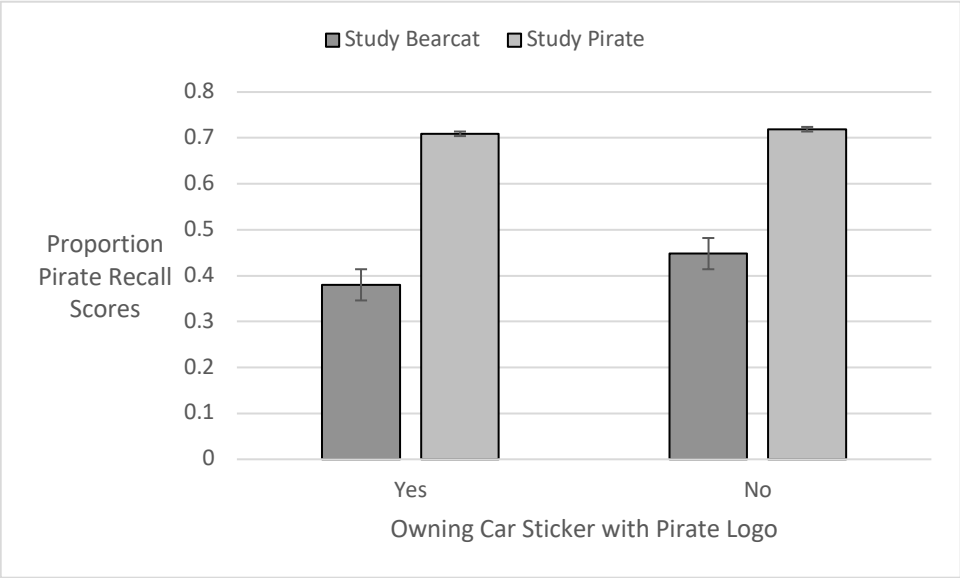

Figure 7

The Proportion of Pirate Recall Scores by Owning a Pirate Logo Car Sticker.

I ran a final quasi-experimental ANOVA for the participants' living situation (commuters or living on campus) compared to the proportion of Pirate recall scores split by study condition.

A summary of statistics can be seen in Table 6. There was a main effect of study condition on Pirate recall scores ($F(1, 106) = 49.79$, $p < 0.001$, $\eta^2 = 0.313$), but there was no main effect for being a commuter or living on campus ($F(1, 106) = 2.14$, $p = 0.146$, $\eta^2 = 0.013$). There was also no significant interaction between study condition and commuting or living on campus ($F(1, 106) = 1.01$, $p = 0.316$, $\eta^2 = 0.006$), which can be seen in Figure 9.

Table 6

Average Pirate Recall Scores by Study Condition and Housing Situation

Study Condition	Housing	Mean (S.D.)
Study Bearcat	Commuter	0.429 (0.228)
	Campus	0.411 (0.163)
Study Pirate	Commuter	0.746 (0.193)
	Campus	0.649 (0.200)

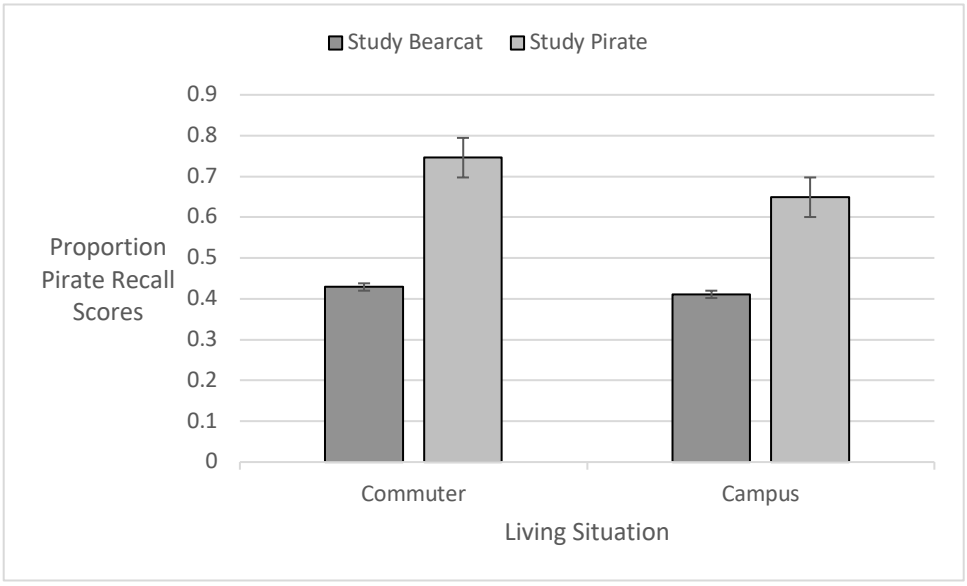

Figure 8

The Proportion of Pirate Recall Scores by Living Situation.

Discussion

Prior research found that humans' memory for familiar objects and used every day is significantly impaired. Our exposure to these ordinary objects is numerous during our day-to-day lives, yet we tend to get less than half of those features correct (Nickerson & Adams, 1979). However, with a brief intentional study of the object before recall, our memory is improved significantly (Marmie & Healy, 2004). The current study examined the effectiveness of studying immediately before recall and the metacognitive change in confidence when recalling a very familiar or unfamiliar university logo.

I found that recall scores, whether the object was familiar or not, improved when the logo was studied, which supported my hypothesis. This finding was also consistent with the results in Experiment 1 of Marmie & Healy (2004). The recall scores also depended on logo type, with

Bearcat recall being higher overall than Pirate recall, which did not support my other hypothesis that recall scores would be different depending on the logo and which was familiar.

For confidence judgments, I found that confidence decreased from pre- to post-recall for the Pirate logo only, while confidence increased from pre- to post-recall for the Bearcat logo. This finding only partially supported my hypothesis because I predicted that confidence would decrease for both logos from pre- to post-recall since that finding would be in line with prior results found by Blake and colleagues (2015). However, I found support for my other hypothesis that confidence scores were higher for the Pirate logo than the Bearcat logo. Also, studying the Pirate logo helped to mitigate the change in confidence from pre- to post-recall, but there was still a minimal decrease.

This increase in Bearcat confidence from pre- to post-recall for each logo might explain the participants' effect on the two logos. Affect is a term the refers to the underlying experience of feeling, emotion, or mood of individuals about situations, other people, or things. I believe that affect may have played a role in influencing the confidence and scores because research has found that you will attend to it more than something you do not like when you like something. For example, Nickerson & Adams (1979) found that the only participant who recalled and located all the penny features accurately was an avid coin collector as a hobby in their first experiment. While no research thus far has explicitly looked to see the relationship between one’s hobby and their memory performance for objects related to their amusement and things unrelated to their hobby, I believe that this may be a start at looking at this relationship. Since the participants recruited were from Seton Hall, they may have a stronger connection (positive affect) with the Pirate logo than the Bearcat logo (no affect). This may be why their overall

confidence ratings were higher for the Pirate logo even when they did not study that logo. However, more research would be needed to see if participants from Seton Hall University feel like they have a stronger connection or more positive affect towards their school's mascot logo compared to their relationship and affect towards the Bearcat logo. It would also be essential to see if Willamette participants show an identical change in confidence as the Seton Hall participants, except with a decrease for the Bearcat logo and an increase in the Pirate logo.

For both study conditions, participants' confidence significantly increased from pre- to post-recall for the Bearcat logo, which is interesting since prior research would suggest that there should have been a decrease, like the change observed with the Pirate confidence. This finding might be explained by when participants made confidence judgments within the experiment. There are different monitoring processes for metamemory or confidence; they depend entirely on when they occur in the learning and retrieval process. I used both prospective and retrospective metamemory monitoring (*Metacognition About Memory | Encyclopedia.Com*, n.d.). Future monitoring occurs before retrieval, and there are three types: *ease-of-learning judgments, judgments of learning,* and *feeling-of-knowing judgments*. The pre-recall confidence judgments in my study seem to be a combination of the ease-of-learning decision before encoding, and the judgments of learning, after encoding because the participants were asked before encoding the Bearcat and after incidental encoding of the Pirate logo. The pre-recall confidence also asked participants to predict how accurate their recall will be in the future (Arbuckle & Cuddy, 1969; Leonesio & Nelson, 1990; Underwood, 1966). Both types of monitoring are above chance but not perfect judgments for future accuracy. However, the judgment of learning is more accurate than ease-of-learning since they have already encoded the information, which might be the

reason for the change in confidence from pre- to post-recall (Nelson & Dunlosky, 1991). These pre-recall confidence scores could have been more accurate if I had asked participants to rate their confidence right after studying one of the logos, thus gathering a more accurate prediction on future performance than what I collected. Overconfidence might also affect the post-recall scores because prior research found that this is the case. For example, if participants rated an 80 percent likely to be correct, the actual percentage would be lower than that. When asked about their accuracy on individual items, researchers found that overconfidence impaired their answers, which I asked in my study (Fischhoff et al., 1977). Prior research suggests using aggregate confidence judgments, which ask about lists of items, to counteract overconfidence. Aggregate confidence judgments tend to be rated underconfident compared to individual confident decisions (Griffin & Tversky, 1992).

Participants' schemas for these two logos might also explain the confidence increase from pre- to post-recall observed for the Bearcat logo. Overall, with repeated exposure to the Pirate logo on campus and pirate visuals in stories and movies, participants may only have a schema for this logo. For the most part, the real-life bearcat animal is not well known, which may cause this logo to be very novel, so not having a schema may play a role in the metacognitive changes. Having an already existing schema for an object may cause someone to be overconfident in their ability to recall it beforehand. Still, then afterward, they realize that their memory for it is not as complete as they initially thought. However, when they did not have an existing schema for the object, the Bearcat, participants had no prior experience for this logo to help judge their ability to recall it. Afterward, there was a confidence boost when participants felt they knew what the logo looked like, even when they did not study it. Though most of the recall drawings for the Bearcat

logo tended not to be as accurate when they did not look at it, participants' drawings ranged from cat-like paws to a bipedal cat and bear hybrid.

On the other hand, past research on consistent and inconsistent items for schemas could also explain these confidence scores. One such study found that inconsistent faces tended to have better contextual and discriminability memory and higher confidence ratings (Sweegers et al., 2015). The Bearcat logo would be inconsistent with participants' schemas for a real-life bearcat due to the stylized image of the logo (Figure 1).

Since I did not explicitly test participants on their existing schema for bearcats and pirates, these can only be a tentative explanation of why the confidence may have increased from pre- to post-recall for the Bearcat only. One possible way to explicitly test participants' schemas is to either do a free recall to draw what they believe a bearcat looks like and what they think a pirate looks like. Another possible way to test their schema is with a visual recognition task, where participants are exposed to various stimuli related to pirates and bearcats before being tested on them. Both would show if they had a schema for bearcats or not, which would help to explain the logo difference in the metacognitive change.

The current study has a limitation of being unable to control for the study environment. None of the experiments that looked at memory for familiar objects or memory performance in schemas were conducted online in prior research. Each experiment participants were in a room reserved by the researchers to complete their studies, allowing them to control the testing environment. Also, the only experiments conducted on a computer or electronic display were the two schema research articles, but they were still conducted in a laboratory-controlled by the researchers (Mania et al., 2005; Sweegers et al., 2015). Prior researchers conducted all of the

primary research on familiar object recall in laboratories with paper and pencils (Blake et al., 2015; Horner & Comstock, 2005; Marmie & Healy, 2004; Nickerson & Adams, 1979). Due to the current health risk of the COVID-19 pandemic, I could not conduct my study in person with participants. Which meant each participant was either in their room (either a dorm room or their private bedroom), the library, a classroom on campus, or any other space they could find with an internet connection to join a Teams video call. Participants could have been distracted by those around them, especially if they were in a room with other people, like the library, for example. They could have also been distracted by other external factors like the lighting, using certain writing utensils, etc.

However, I believe that this may not be a limitation, but a good thing because it improves the validity of the observed study effect. Since my results still show improved memory performance after studying for both logos, even when the environments were not controlled, it shows that the potential external distractors did not negatively impact the recall scores. It also proves that you do not need to have participants in a controlled laboratory to produce the study effect on recall scores.

Another factor that prior studies were able to control for, but I was unable to do so entirely, was making sure participants did not have access to the stimuli in the experiment (Blake et al., 2015; Horner & Comstock, 2005; Marmie & Healy, 2004; Nickerson & Adams, 1979). In prior studies, researchers were able to make sure the target object of the study was not near the participants during the recall portion of the experiments. In contrast, for my research, I was unable to control for this entirely. However, I did try to mitigate this limitation by asking participants to share their desktop screens with the researchers on my study team when they were

in the video calls. Sharing one's desktop screen allows other people to see what is occurring on that person's computer, which would show if the participant decided to look up the logos in their browser. I also tried to prevent participants from using their phones to look up the stimuli by asking them to put their phones away for the study duration.

One primary implication of these results is the study effect based on recall scores in each study condition. I found that no matter which logo, studying said logo improves recall performance, consistent with prior research. However, that study found this effect in a controlled laboratory environment, while my research found this effect even when the testing and study environment varied between participants. Some participants were in their rooms, the library, or an empty classroom, where there may or may not have been outside distractors. Thus, showing a practical implication for studying in various environments still improving scores compared to not studying. This result can help students understand that intentionally learning course or test material does not have to be done exclusively in controlled environments.

Another implication is the metacognitive changes seen between the two logos. Theoretically, my study suggests that having no schema causes an increase in confidence and improved memory performance. There is not an extensive amount of research on the relationship between schemas and metacognition. Still, the results from the current study could help to provide further explanations on how having a schema for something could influence someone's confidence before and after recall. The present study can also help expand on research on the type of metacognitive questions asked and the change in metacognition. However, further research is needed to see if one's schema or the type of questions influenced these results more.

Future Directions

The results from the current study have generated some new questions and directions for future research. One such approach is to replicate this study with Willamette participants instead to see if the results would be consistent with this study. Would the confidence for the unfamiliar logo for Willamette participants increase from pre- to post-recall, similar to the observed change in this study?

Another direction for future research could further investigate if the duration of study time influences the confidence judgments from pre- to post-recall. Based on the results in this study, post-recall confidence scores may change depending on the duration and familiarity of the logo.

Thirdly, what would happen to confidence and recall scores if we delayed recall by a day or a week? As suggested by prior research, the studied logos would have overall higher recall scores despite the retention interval compared to the unstudied logos (Marmie & Healy, 2004). However, it would be interesting how confidence judgments may change depending on the retention interval.

Lastly, future research can investigate why the confidence increased from pre- to post-recall for the Bearcat logo in both study conditions. The first method could explore manipulating at what point before recall the prospective metamemory monitoring questions asked and the type of retrospective questions. These questions would help clear up if the future monitoring was the reason for the change and if the retrospective questions elicited overconfident judgments from participants when asked about the individual logos (Arbuckle & Cuddy, 1969; Fischhoff et al., 1977; Griffin & Tversky, 1992; Leonesio & Nelson, 1990; Nelson & Dunlosky, 1991;

Underwood, 1966). The other way to investigate the change in confidence is by testing participants' existing schema for bearcats to see if the increase in confidence is due to the *inconsistency effect* or the *consistency effect* of schema on memory performance and metamemory (Mania et al., 2005; Sweegers et al., 2015).

Overall, human memory is fallible; researchers have found that humans poorly encode objects that are familiar and used almost every day. The current study examined the effectiveness of studying immediately before recall and the metacognitive change in confidence when recalling very familiar or unfamiliar objects. I found that recall was higher for the unknown logo but improved with intentional study for both logos. The metacognitive change differed between the two logos; Pirate confidence decreased while Bearcat confidence increased from pre- to post-recall. One implication for these findings is that studying in various environments with external distractions still improves scores compared to no studying.

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Appendix A

Scoring Rubrics for Pirate and Bearcat Recall Drawings

Pirate Recall Rubric

Use the image linked here to compare to corresponding participant recall drawings (*Seton Hall University Graphic Standards Manual*, 2013). They may not use the same colors the logo is pictured in, but it would be fine if they used different colors. Answer the following questions with YES or NO and jot down what was missing, added, or incorrect.

Features:

Earing Present?

Earing Correct Place?

Bandana Present?

Bandana correct place?

Eye patch present?

Eye patch correct place?

Mustache present?

Mustache correct place?

Outline present?

Ear present?

Ear correct place?

TOTAL: Add up every yes from above, and that will be the total recall score for that participant. The maximum number of points a participant can score is 11, and the minimum is 0.

Bearcat Recall Rubric

Use the image linked here to compare to corresponding participant recall drawings (*Willamette University Athletic Style Guide*, n.d.). They may not use the same colors the logo is pictured in, but it would be fine if they used different colors. Answer the following questions with YES or NO and jot down what was missing, added, or incorrect.

Features:

Nose present?

Is nose correct?

Ears present?

Are ears correct?

Eyes present?

Are eyes correct?

Fur present?

Is fur correct?

Is it a cat/bear-like figure?

TOTAL: Add up every yes from above, and that will be the total recall score for the Bearcat logo. The maximum number of points a participant can score is 9, and the minimum is 0.

Appendix B

Familiarity Questionnaire

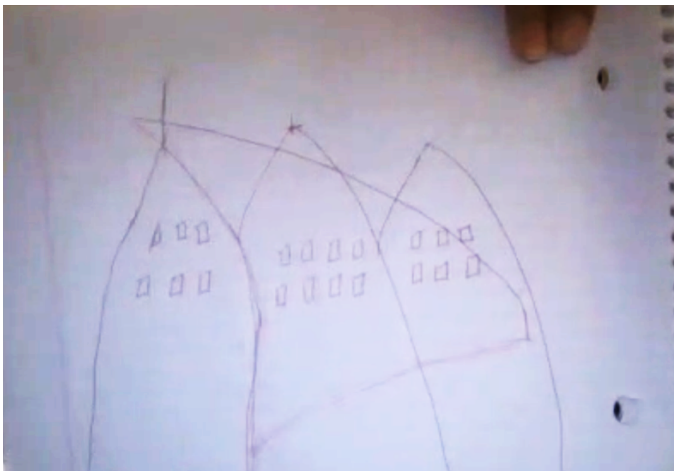
1. Are you a collegiate athlete? YES NO
    a. If yes, do you have your school's mascot on your gear? YES NO
2. Are you a commuter, or do you live on campus? Commuter Campus
3. Do you have the Seton Hall pirate logo on your car? YES NO
4. Do you have the Willamette bearcat logo on your car? YES NO
5. Do you own other items (clothing, keychain, drinkware, etc.) with the Seton Hall pirate logo? YES NO
6. Do you own other items (clothing, keychain, drinkware, etc.) with the Willamette bearcat logo? YES NO

Appendix C

Highest and Lowest Scoring Recall Drawings

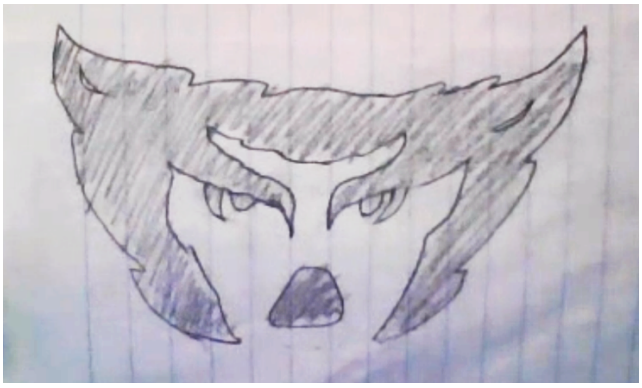
Sample of Highest and Lowest Pirate Recall Drawings

Study Pirate
Recall Score: 11



Study Bearcat
Recall Score: 0

Sample of Highest and Lowest Bearcat Recall Drawings



Study Bearcat
Recall Score: 9

Study Pirate
Recall Score: 0

Appendix D

Seton Hall University Institutional Review Board Approval Form

SETON HALL UNIVERSITY
1 8 5 6

October 6, 2020

Alicia Fels
Seton Hall University

Re: Study ID# 2021-141

Dear Ms. Fels:

At its September 2020 meeting, the Research Ethics Committee of the Seton Hall University Institutional Review Board reviewed and approved your research proposal entitled "*Memory for a Familiar and an Unfamiliar University Logos*" as submitted. Enclosed for your records are the stamped original Consent Form.

The Institutional Review Board approval of your research is valid for a one-year period from the date of this letter. During this time, any changes to the research protocol, informed consent form or study team must be reviewed and approved by the IRB prior to their implementation.

You will receive a communication from the Institutional Review Board at least 1 month prior to your expiration date requesting that you submit an Annual Progress Report to keep the study active, or a Final Review of Human Subjects Research form to close the study. In all future correspondence with the Institutional Review Board, please reference the ID# listed above.

Thank you for your cooperation.

Sincerely,

Mara C. Podvey, PhD, OTR
Associate Professor
Co-Chair, Institutional Review Board

Phyllis Hansell, EdD, RN, DNAP, FAAN
Professor
Co-Chair, Institutional Review Board

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