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The Importance of Student Research

An integral part of the psychology program at Western Connecticut State University is the foundation of research. Students are given the ability to design, conduct, analyze, and report their own studies. At the undergraduate level, this type of research is not what a member of the psychological community would typically find in any academic journal or conference, though there are undergraduate students who rise above these set expectations.

Student research at the undergraduate level does more than provide students with the basis of how to properly implement a psychological experiment. At the graduate level, students are expected to work with a faculty member on a chosen topic of research. It is important for the student to demonstrate a viable and working relationship with the faculty member. By doing research at the undergraduate level, students have the opportunity to establish as well as to demonstrate such a working relationship with their psychology professors.

While working with an experienced faculty member is important to the learning process, an even more important relationship between students and members of the psychological community rests with their peers. Group work is encouraged and used within the psychology program in order to promote the vital usage of peer review. While faculty members can offer experience within the field of psychology, students can offer a fresh perspective or an outsider's point of view on ideas, situations, and theories. All undergraduate students are capable of providing a fresh perspective in research, which can lead to thoughtful and innovative ideas. Also, peer review is heavily used later on in graduate and post-graduate level research, so experiencing it at the undergraduate level helps students to understand the importance and value of input from their peers.

All psychological researchers want to achieve the goal of publication in the future, but the process involved in publishing research is not an easy one. Providing students with an undergraduate-level experience of publishing their research helps them to understand the process and hardship involved in achieving publication. When a student researcher can achieve publication at the undergraduate level, there is a sense of accomplishment that can be shared among the student researcher, psychology professor, and everyone involved in the study, including the participants. Undergraduate research has students helping their peers to understand the importance of studying psychology and contributing to the community. Every student researcher and participant contributes to our understanding of an array of fields in psychology, and the publication of this journal supports this.

Brandy Blankenship and Marc Taney
Student Editors

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Determining Eyewitness Accuracy Using Police Lineups and False Memory

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Eyewitness misidentification has long been a major contributor in wrongly convicting people of crimes that they did not commit (Norris, Bonventre, Redlich, & Acker, 2011). One possible cause for this is false memory: The recall of an event that never happened. In this experiment, 40 undergraduate participants witnessed a staged crime, then identified and described the culprit. Participants were presented with four different police lineups: Similarly-featured suspects with the culprit present, similarly-featured suspects with the culprit absent, dissimilarly-featured suspects with the culprit present, and dissimilarly-featured suspects with the culprit absent. It was hypothesized that viewing the suspects with physical differences and without the culprit actually in the lineup would lead participants to make inaccurate choices and descriptions of the culprit. This experiment showed that similarity did not affect description accuracy, which was inconsistent with previous research, but the hypothesis that culprit presence increases correct identification was supported.

Lack of eyewitness accuracy and mistaken identification are the most common factors in wrongful convictions (Norris, Bonventre, Redlich, & Acker, 2011). In 1992, a non-profit organization called the "Innocence Project" started a mass movement to free wrongly convicted prisoners using DNA evidence (What is the Innocence Project? How Did it Get Started?, 2013) 76% of the first 250 people, approximately half of the death row inmates, and inmates involved in almost 90% of rape cases that the Innocence Project helped to exonerate had court cases involving eyewitness testimony and misidentification (Norris et al., 2011).

Several possible problems with eyewitness misidentification have been identified. Extensive research has produced numerous recommended remedies regarding police lineups, including using fillers, warning the eyewitness that the culprit may or may not be in the lineup, changing the order of presentation from simultaneous to sequential, administering double-blind lineups, repeating identification lineups, and getting the eyewitness' statement of certainty at the time of making the identification (Steblay, 2009). For the purpose of this study, a suspect is "a person suspected of an offense" and a culprit is "a person who is guilty of an offense" (*Shorter Oxford English Dictionary*, 2007). A police suspect "may be the culprit or may be an innocent suspect" and fillers are "known innocents" (Fitzgerald, Price, Oriet, & Charman, 2013). According to Steblay (2009), the post-identification feedback effect can cause eyewitnesses to change their minds about the identifications they made previously if they are told that someone else in the lineup was the actual culprit. Eyewitnesses can be deliberately led to choose particular suspects, and studies have shown that the confidence of eyewitnesses in their selections of the culprit can also be manipulated (Steblay, 2009). Numerous studies have demonstrated that eyewitnesses' confidence ratings increased when other witnesses were present (Shaw, Appio, Zerr, & Pontoski, 2007), that an administrator making comments or asking questions during the lineup could influence a person's decision (Clark, Marshall, & Rosenthal, 2009), and that post-decision feedback could increase eyewitnesses' certainty about whether or not their selections were correct and cause them to exaggerate how well they remember the suspect they identified as committing the crime (Douglass & Steblay, 2006).

Many studies have been done on the order in which lineup photographs are presented. The two methods used are simultaneous and sequential viewing, in which the eyewitness looks at all of the suspects at the same time or one after another, respectively. Researchers believe that sequential lineups increase the rate of correct identifications and this type of lineup has been implemented in many legal settings. Carlson, Gronlund, and Clark (2008) conducted an experiment in which their participants witnessed a staged crime that occurred in the room with them and then were told to identify the culprit on a computer that displayed either a simultaneous or sequential lineup. The researchers found that their results did not show a significant difference in accurate identifications based on the type of lineup, which was inconsistent with previous data. They theorized that it could have to do with the suspects' similarities to the actual culprit (Carlson et al., 2008).

Charman, Wells, and Joy (2011) conducted several studies on what they refer to as "the dud effect," using duds, or suspects with

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highly dissimilar appearances, in lineups. In one of their studies, they had participants view a simulated crime and then identify the culprit from either a lineup with two possible suspects or a linup with the same two suspects and four additional duds (Charman et al., 2011). They asked their participants to rate their confidence levels in their decisions. Results showed that the subjects' confidence ratings were significantly higher when they viewed the dud lineup. Suspect similarity was shown to affect eyewitnesses' confidence levels, as well (Charman et al., 2011).

Although many of these variables have been tested independently, few researchers have examined them in combination or explored why these factors have such a strong effect. One possible explanation is what is known as "false memory." Loftus and Pickrell (1995) reported on the possibility of implantation of false memories. The researchers recruited family members of their participants to provide events that the subjects had experienced in their childhoods. Loftus and Pickrell (1995) added an additional event, such as getting lost in a shopping mall, which never occurred, then asked participants to write about all of these events over the course of four weeks. Findings confirm that when some people try to recall a possible event, they can actually create a memory of it and subsequently be able to give descriptive details about this event as time passes (Loftus & Pickrell, 1995). Because getting lost is such a common occurrence and the participants could have confused the false event with another real one, Loftus and Pickrell (1995) also conducted other experiments, in which events were suggested to participants, such as hospitalizations, making a mess at a wedding, evacuating a grocery store, and being in a car accident, and they reached the same conclusion. Based on their results, Loftus and Pickrell (1995) concluded that merely suggesting that an event happened is enough to create a memory of that particular occasion.

Other experiments on false memory have shown that false memories can be created on a short-term basis as well. Coane, McBride, Raulerson, and Jordan (2007) did an experiment on word recall using words that were similar to the words used in the Deese/Roediger-McDermott paradigm (DRM; Roediger and McDermott, 1995) and applied false memory and word recall to short-term tasks. Coane et al. (2007) asked participants to recall words that were read to them and found that response times indicated that people take more time trying to remember words that had not been said. First, these results show that false memories can be created in a short time span. Second, they indicate that even though participants are not aware that their memories are false, they have to work harder to reject newly introduced words and latency can be used to determine recall accuracy and false memories (Coane et al., 2007).

Fazio, Barber, Rajaram, Ornstein, and Marsh (2013) demonstrated the strength of false memories in an experiment in which they showed that people can become uncertain about basic facts, which they already know, simply by reading something that was incorrect. Fazio et al. (2013) had participants read a short story or a passage after warning them that what they read might be fictional and contain incorrect information. After the subjects had finished the reading, they were tested on general knowledge questions, such as that the Pacific is the Earth's largest ocean, Edison invented the light bulb, and that cheetahs are the fastest land animals (Fazio et al., 2013). When Fazio et al. (2013) compared these general knowledge scores to the ones that they collected when they tested their participants two weeks prior, the results showed that the participants were no longer certain of facts that they previously knew. The conclusion that people's memories are so suggestible raises concerns about how reliable eyewitnesses truly are.

The purpose of the present study was to examine how unreliable eyewitnesses can be by showing that false memories can be created when participants are asked to pick a suspect out of a lineup. Four different lineups were used focusing on two independent variables: Culprit presence and similarity of the suspects' appearances. One dependent variable in this experiment was the participants' ability to correctly identify the culprit in a lineup or recognize that the culprit was "not present." The choices were scored nominally using yes (correct) and no (incorrect) categories. A second dependent variable was the participants' accuracy in describing the culprit that they witnessed committing the crime, which was scored on a scale of 1-9, with 9 being the most accurate. The researcher believed that close examination of the wrong people would cause the participants to form false memories of the suspect committing the crime, and therefore cause the participants to be less accurate in describing the actual culprit. The researcher hypothesized that, when the culprit was present in the lineup, the participants would be likely to choose that person, but when the culprit was absent, they would be more likely to identify the wrong person as opposed to selecting the "not present" option. The researcher did not believe, however, that the culprit's presence in the lineup would affect the accuracy of the participants' descriptions of the culprit. It was also expected that the accuracy of descriptions of the culprit would be worse when they examined lineups with dissimilarly-featured suspects, but that suspect appearance would play no significant role in making a correct identification.

Method

Participants

Participants were a convenience sample of 44 undergraduate students (23 females and 17 males) from a public northeastern university. The students were all volunteers recruited via word of mouth and signs posted on bulletin boards in the psychology department. Compensation for participants in this experiment included receiving partial course credit, extra credit, or nothing. Data were used from only 40 of the participants because one was underage, two failed to complete the questions, and one recognized people in the video and photographs used in the experiment.

Materials

Materials for the experiment included a math worksheet as a distractor task, a questionnaire which asked the participants to select either Suspect 1, 2, 3, 4, 5, or a "not present" option and whether or not the participants knew anyone in the video or photographs, a questionnaire about the general crime (See

Appendix A), and a questionnaire about the culprit's physical appearance (See Appendix B.) Accuracy was determined by how many questions (out of 9) were correctly answered on the culprit's physical appearance questionnaire. There were four pages of staged lineups containing five individual photographs of suspects each. Two of the picture sets were with the culprit and two without, and two of the sets were with similarly-featured suspects, and two contained suspects who look dissimilar. Similarity was determined by skin color, hair color, hair length, hair style,height, and physical build. The similarly-featured suspects were all white females, approximately 20 years old, with shoulder-length brown hair. There was also a 30-second video of a staged crime. The video took place in a public library and was set up like a security camera. There were two people in the background, one of whom notices the crime but does nothing, and the victim was in the foreground. The victim received a phone call and left, putting down a book and leaving her purse on the floor. The culprit then came in and took the purse, passing the camera on her way out.

Procedure

After reading and signing the informed consent, participants watched the video of a staged theft and then worked on a math worksheet for one minute as a distraction. Participants were then randomly assigned to look at one of four lineup photographs: One with similarly-featured suspects and the culprit present, one with similarly-featured suspects and the culprit absent, one with dissimilarly-featured suspects and the culprit present, and one with dissimilarly-featured suspects and the culprit absent. They were asked to mark their choice of the culprit: Suspect 1, Suspect 2, Suspect 3, Suspect 4, Suspect 5, or Not Present. A second question on this page asked whether or not the participants recognized anyone in the video or photographs. After turning in their selections and lineup photographs, the participants answered a questionnaire about the general crime with 10 questions to take their minds off the people they had just examined. Once they completed and turned in the crime questionnaire, participants answered a second questionnaire that consisted of 9 questions about the culprit's physical appearance. The whole experiment took approximately 5 minutes to complete.

Results

A chi square test of independence proved that correct identification of the culprit or the "not present" option in a photograph police lineup was dependent on whether the culprit was present (72.2%) or absent (27.8%), indicating a significantly higher number of correct identifications when the culprit was present, $_X{}^2$ (1, N = 40) = 6.47, $p < 0.05$, Cramer's $V = 0.4$.

A second chi square test of independence determined that correctly selecting the culprit or the "not present" option in a photograph police lineup was independent of whether the lineup suspects were similarly or dissimilarly featured, meaning the number of correct identifications was not significantly affected when suspects were or were not similar in appearance, $_X{}^2$ (1, N = 40) = 0.4, $p > 0.05$.

A 2 x 2 between-subjects analysis of variance was utilized to assess how both culprit presence and suspect similarity affected the participants' accuracy in describing the culprit. The results showed that there was no significant effect of culprit presence on description accuracy, F (1, 36) = .00, $p > 0.05$. This test also revealed that there was no significant effect of suspect similarity on description accuracy, F (1, 36) = 0.05, $p > 0.05$. Furthermore, there was no significant interaction between culprit presence and suspect similarity on the description accuracy of the culprit, F (1, 36) = 0.83, $p > 0.05$.

Discussion

The results from this study provide support for the researcher's hypothesis that the number of correct identifications would be significantly higher for participants with the culprit present in the lineups. The findings were also consistent with the researcher's expectations that the similar or dissimilar appearances of the suspects would have no bearing on correct identifications or correctly choosing "not present." The results corroborated the hypothesis that culprit presence would not affect the accuracy of describing the culprit, but did not support the hypothesis that dissimilar appearances among the suspects would decrease the accuracy of the descriptions of the culprit. The only significant difference was that participants more frequently identified the actual culprit when the person was present in the lineups.

These findings are contrary to several previous studies, including one by Fitzgerald et al. (2013), in which it was found that low similarity among fillers in their lineups increased correct identifications compared to moderate or high similarity. Although little prior research was found specifically on effectiveness of culprit presence on correct identification, the results demonstrate the importance of including lineup conditions with and without the culprit to determine the reliability and accuracy of an eyewitness' ability to make a correct identification. Consistent with the results of the present study, Steblay (2009) conducted a study with colleagues testing culprit's positions in repeated lineups that led her to conclude that, when the culprit was absent from the lineup, an innocent suspect was more likely to be chosen. One aspect that could not be determined by the results is whether or not culprit absence actually created a false memory of the event or if it just confused the participants. It is highly possible that participants used a process of elimination to make their selection instead of finding a match among the suspects to their memory of the actual culprit. Norris et al. (2011) explained that it is common for eyewitnesses to choose a suspect based on who they believe looks the most like the culprit as opposed to actually identifying the correct person, which is known as "relative judgment."

Major limitations of this study were the poor quality of the video and photographs and a time constraint for how long the experiment could take. Ideally the experiment would be conducted over a longer period of time, perhaps a couple of days to a couple of weeks. As timing was limited, the results may vary depending on the amount of time given between viewing the crime, identifying the culprit, and describing the culprit.

Future research could build on this experiment's findings and retest the significance of suspect similarity. It would also be useful to test a wider variety of similarly and dissimilarly featured suspects. In this study, Caucasian females in their twenties with long brown hair were used to represent the similarly-featured suspects and females of different ethnicities with different hair colors and lengths were used to represent dissimilarly-featured suspects. The roles of age and gender especially could be expanded upon. If this study were repeated, another possible change that could be made would be altering the second distractor task from a questionnaire about the crime, which allows the participants to focus on what they saw and replay the memory more than actually distracting them from it, to questions that are more personal. Bringing up emotions, other people, and other events from a person's actual life is more likely to represent a real life situation and may skew the person's recall accuracy.

A possible follow-up study may examine not only identifying the culprit after witnessing a crime, but also after witnessing an arrest. Conditions would likely include one group witnessing the same person committing the crime and being arrested and another group witnessing one person committing a crime and a different person being arrested. Witnessing false arrests should also have a negative impact on recall accuracy. Another factor that should negatively affect memory is the different levels of trauma induced by witnessing a crime versus an arrest. Limitations of this idea that would first need to be overcome are portraying a realistic crime and arrest and ethical concerns.

Eyewitnesses play an important role for juries in finding people either innocent or guilty of committing crimes. It is especially important to learn how to improve eyewitness reliability and to encourage and nurture accuracy. Previous research has examined many aspects of police lineups to improve accurate identifications, including order, appearance, positioning, outside influences, feedback, and more. This study specifically examined culprit presence and suspect similarity, finding a significant difference in culprit presence increasing correct identification over culprit absence, but there are many more factors to take into consideration. This experiment can provide a basis for future research in order to ensure that eyewitnesses are beneficial to the justice system.

References

Carlson, C. A., Gronlund, S. D., & Clark, S. E. (2008). Lineup composition, suspect position, and the sequential lineup advantage. *Journal Of Experimental Psychology: Applied, 14*, 118-128. doi:10.1037/1076-898X.14.2.118

Charman, S. D., Wells, G. L., & Joy, S. W. (2011). The dud effect: Adding highly dissimilar fillers increases confidence in lineup identifications. *Law And Human Behavior, 35(*6), 479-500. doi:10.1007/s10979-010-9261-1

Clark, S. E., Marshall, T. E., & Rosenthal, R. (2009). Lineup administrator influences on eyewitness identification decisions. *Journal Of Experimental Psychology: Applied, 15*, 63-75. doi:10.1037/a0015185

Coane, J. H., McBride, D. M., Raulerson, B., & Jordan, J. (2007). False memory in a short-term memory task. *Experimental Psychology, 54*, 62-70. doi:10.1027/1618-3169.54.1.62

Culprit. (2007). *In shorter Oxford English dictionary* (6th ed., Vol. 1, p. 578). Oxford: Oxford University Press.

Douglass, A., & Steblay, N. (2006). Memory distortion in eyewitnesses: A meta-analysis of the post-identification feedback effect. *Applied Cognitive Psychology, 20*, 859-869. doi:10.1002/acp.1237

Fazio, L. K., Barber, S. J., Rajaram, S., Ornstein, P. A., & Marsh, E. J. (2013). Creating illusions of knowledge: Learning errors that contradict prior knowledge. Journal Of Experimental Psychology: General, 142, 1-5. doi:10.1037/a0028649

Fitzgerald, R. J., Price, H. L., Oriet, C., & Charman, S. D. (2013). The effect of suspect-filler similarity on eyewitness identification decisions: A meta-analysis. *Psychology, Public Policy, And Law, 19*, 151-164. doi:10.1037/a0030618

Loftus, E. F., & Pickrell, J. E. (1995). The formation of false memories. *Psychiatric Annals, 25*, 720-725.

Norris, R. J., Bonventre, C. L., Redlich, A. D., & Acker, J. R. (2011). "Than that one innocent suffer": Evaluating state safeguards against wrongful convictions. *Albany Law Review, 74*, 1301-1364.

O'Neill-Shermer, L., Rose, K. C., & Hoffman, A. (2011). Perceptions and credibility: Understanding the nuances of eyewitness testimony. *Journal Of Contemporary Criminal Justice, 27*, 183-203. doi:10.1177/1043986211405886

Shaw, J., Appio, L. M., Zerr, T. K., & Pontoski, K. E. (2007). Public eyewitness confidence can be influenced by the presence of other witnesses. *Law And Human Behavior, 31*, 629-652. doi:10.1007/s10979-006-9080-6

Suspect. (2007). *In shorter Oxford English dictionary* (6th ed., Vol. 2, p. 3124). Oxford: Oxford University Press.

Steblay, N. K. (2009). Maintaining the reliability of eyewitness evidence: After the lineup. *Creighton Law Review, 42*, 643-654.

What is the Innocence Project? (2013). Retrieved from http://www.innocenceproject.org/Content/What_is_the_Innocence_Project_How_did_it_get_started.php

Appendix A

General Crime Questionnaire

Please answer the following questions to the best of your ability:

1. Where did the crime take place?

___ Library
___ Cafeteria
___ Victim's home
___ The bank
___ A classroom

2. What was stolen?

___ Backpack
___ Wallet
___ Books
___ Purse
___ Soccer ball

3. How many people were in the library other than the victim and the thief?

1 2 3 4 5

4. Did anyone else notice the crime?

___ Yes ___ No

5. Why did the victim leave his/her belongings?

___ To get a book
___ Someone wanted to show him/her something
___ Got a phone call
___ She/he dropped something
___ Go to the bathroom

6. What was the victim wearing?

___ Sweatshirt and tank top
___ T-shirt and jeans
___ Flannel shirt
___ A dress
___ Vest and a tie

7. Did the victim speak to anyone she/he saw there?

___ Yes ___ No

8. Where was the victim sitting?

___ By the window
___ At the computer
___ By the checkout
___ On the floor
___ In the corner

9. What did the victim put down before leaving?

___ Book
___ Phone
___ Bag
___ Snack
___ Car keys

10. How many chairs were in the area?

1 2 3 4 5

Appendix B

Culprit Physical Appearance Questionnaire

Please answer the following questions to the best of your ability:

1. What was the gender of the culprit?

___ Male ___ Female

2. What was the culprit's race?

___ Caucasian
___ African American
___ Latino
___ Asian
___ American Indian

3. What color was the culprit's hair?

___ Brown
___ Blonde
___ Red
___ Black
___ Dyed

4. What color were the culprit's eyes?

___ Brown
___ Green
___ Blue
___ Black
___ Hazel

5. Approximately how tall was the culprit?

___ 4’5”
___ 5’
___ 5’5”
___ 6’
___ 6’5”

6. What was the culprit’s build?

___ Emaciated
___ Thin
___ Average
___ Heavy
___ Obese

7. Did the culprit have any tattoos or piercings?

___ Yes ___ No

8. Approximately how old was the culprit?

___ 10-20
___ 21-30
___ 31-40
___ 41-50
___ 50+

9. What hairstyle did the culprit have?

___ Short curly
___ Short straight
___ Long down curly
___ Long down straight
___ Long ponytail

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The Effects of Emotional Level and Gender Differences on Memorization

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This study examined how well individuals can remember information that is either emotional or non-emotional and whether gender differences exist in this task. In this experiment, subjects were instructed to read a short story. Participants were given one of two stories to read. One version contained details about a deadly ferry crash, and the other version contained details about the docking of a ferry. In group one, 13 females read the emotional story about the "deadly ferry crash." In group two, 13 females read the non-emotional story about the "docking of a ferry." In group three, 13 males read the emotional story about the "deadly ferry crash." In group four, thirteen males read the non-emotional story about the "docking of a ferry." Once each participant finished reading the story, he/she was asked to answer questions about the story. The results of this study indicated that both genders remembered more information from the emotional story than the non-emotional story. Females were also found to recall more emotional information than males.

The present study investigates how emotional information impacts memory. Previous studies have demonstrated that emotional information is better recalled than non-emotional information. Emotional information can be defined in a variety of ways. Emotional information can include feelings of happiness, sadness, anger, and excitement. Individuals are able to recall emotional information more frequently than non-emotional information because individuals can relate to the emotional information that is being learned. For example, the information learned in a history class may be better remembered than information learned in a math class. When learning about math, students may have difficulty remembering the information because there is no emotion attached to the material. When learning about Independence Day in a history class, the information is filled with emotions. Students are able to remember information about Independence Day because there is positive emotion attached to the material. In history class, students also learn about different historical wars. Historical wars are recognized as negative emotional events. Historical wars include information that is filled with emotions of sadness because many individuals have died for our country. Students are able to remember information about historical wars because there are negative emotions attached to the material being learned.

According to previous research, individuals tend to remember information that is more emotional compared to information that is non-emotional or factual (Kensinger & Corkin, 2003). Most individuals are able to recall a variety of different details from emotional events or experiences (DenKova & Dolcos, 2012). Consider the following examples: it may be difficult for an individual to remember information from a presidential speech that was based on the economy. It may also be difficult for an individual to remember information that was learned in a math class several years ago. Based on the lack of emotion in either the economic speech or the math class, individuals may find it difficult to make connections and remember this information.

On the other hand, individuals may find it easier to remember information from a presidential speech on the 9/11 tragedy compared to a presidential speech on the economy. As we know from experience, most individuals are able to remember a great amount of detail from the 9/11 tragedy. For example, individuals may remember the exact time of the incident, how old they were, and they may even remember their exact location at the time of the incident. Individuals can remember this information easily because there was emotion involved. These memories are known as flashbulb memories. According to Kensinger and Corkin (2003), a flashbulb memory is when an individual retains a vivid or "photographic" memory of an emotional event.

Research evidence continues to demonstrate how gender differences occur in the recall of emotional information. Bloise and Johnson (2007) examined whether or not females can recall more emotional information than males. In this study, participants were asked to read a variety of different scripts. For each of the scripts, participants were asked to rate the scripts as emotional, neutral, or unemotional. After reading the scripts, participants were asked to recall as much information as they remembered. Bloise and Johnson (2007) concluded that females remembered more emotional information from each script than males. They

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argue that women are able to remember more emotional information because their past experiences are found to be more emotional. It was also determined that women have the ability to recall more emotional information because they are able to organize emotional information better than men. "Women's autobiographical memories are longer and more detailed and are unusually embedded in richer context than men's descriptions, containing more references to other people and events" (Bloise & Johnson, 2007). In a similar study, Simon and Nath (2004) indicated that females are able to recall more emotional information because they are found to be more emotional than males. These authors also indicated that females express their emotions more frequently than males. In an experiment conducted by Canli et al. (2002), participants were instructed to view and rate ninety-six pictures as either emotional or non-emotional. Three weeks later, subjects participated in a recognition memory test. During the recognition test, participants viewed new pictures and pictures that were previously viewed three weeks earlier. After each picture was viewed, the participant was asked whether or not the picture was previously seen. Canli et al. (2002) concluded that gender differences exist in the recall of emotional information and that females remembered more emotional pictures than males.

In a previous study, Yang and Ornstein (2011) examined how memory for emotional images is affected by emotion-focused orientation. They demonstrated how emotion-focused orientation affects memory for emotional images rather than neutral images. In this study, participants were instructed to view 48 images. While viewing these images, the participants were instructed to focus on the emotional content of the images. The participants for this study consisted of 44 adults between the ages of 61 and 84 years old and 43 young adults between the ages of 17 and 33 years old. The participants were instructed to complete six practice trials. The practice trials consisted of negative, positive, and neutral images. After this was completed, participants took five minutes to complete perceptual speed tasks on digital symbol substitution and symbol search. Once this task was completed, participants were then asked to recall the negative, positive, and neutral images that were shown earlier in the experiment. Yang and Ornstein (2011) found that the emotional memory of older adults was not affected by the emotion-focused orientation and that individuals recalled more negative images than positive images. Individuals may have recalled more negative images because they viewed the images as more emotional.

Dolcos and Cabeza (2002) also demonstrate how emotional information is better remembered than non-emotional information. In this study, participants were asked to view a variety of pictures. Each picture was selected from the "International Affective Picture System." After viewing each picture, participants were instructed to rate the picture as unpleasant, pleasant, or neutral. After this was completed, participants were then instructed to recall as many pictures as they remembered. Dolcos and Cabeza (2002) concluded that emotional information leads to better memory formation. In a similar study, Dolcos, LaBar, and Cabeza (2004) indicated that emotional information is better remembered than neutral information because the amygdala enhances the memory system. Dolcos, LaBar, and Cabeza (2004) found that encoding activity was greater for emotional information than neutral information in the amygdala and in the medial temporal lobe.

Siddiqui and Unsworth (2011) investigated how emotion enhances memory. In this study, participants in the first condition were instructed to memorize and recall as many words as possible. Unpleasant, pleasant, and neutral words were randomly selected from the "Affective Norms for English Words." In the second condition, participants were asked to rate these words as either unpleasant or pleasant. Siddiqui and Unsworth (2011) concluded that emotion enhances memory recall. Results showed that positive and negative words were recalled more than neutral words. According to Siddiqui and Unsworth (2011), emotional items are better recalled than non-emotional items because emotional items receive greater attention from the participant. Emotional items may receive greater attention because individuals are able to form connections with these items.

Pollatos and Schandry (2008) examined interoceptive awareness and memory for emotional information. In this study, participants were first instructed to relax for ten minutes. Participants were then asked to count their heartbeat silently for a certain number of seconds. After this was completed, participants were then asked to view pleasant, neutral, and unpleasant pictures. After viewing these pictures, participants were asked to recall the pictures that were previously viewed. Pollatos and Schandry (2008) concluded that unpleasant and pleasant images were recalled more than neutral images.

In a different study, researchers examined whether individuals found it easier to remember emotional words or neutral words. In this study, participants were asked to memorize and recall a list of words. In this study, Kensinger and Corkin (2003) found that participants remembered more negative words rather than neutral words. Their results indicated that individuals are more likely to remember information from a negative event. The experiments that were previously discussed indicate that emotional information is better recalled than neutral or non-emotional information.

The goal of the present study is to examine whether individuals find it easier to remember emotional information or non-emotional information. A second goal is to evaluate whether gender differences exist in the recall of emotional information. Females may be able to remember more emotional information because they are found to have more emotional experiences (Bloise & Johnson, 2007). According to these authors, females are found to express their emotions more frequently than males. This may be the reason as to why females find it easier to remember emotional information. Previous research has found that gender differences exist in memory styles because women are able to recall more memories than men (Pillemer et al., 2003). The independent variables for the present study include emotional levels (emotional story vs. non-emotional story) and gender (male vs. female). The dependent variable for the present study is the number of questions answered correct. I hypothesized that both genders will be more likely to remember information from an emotional story rather than a non-emotional story. I also hypothesized that females will recall more information from the emotional story than males.

Method

Participants

52 participants were recruited from a public northeastern university. Students were recruited from a bulletin board notice. Students received research credit for participating in this study. Some participants received extra credit for participating in this study.

Materials

One emotional story was used in this experiment and one non-emotional story was used in this experiment. The emotional story that was used in this experiment is titled, "The Ferry Crash: Overview; 10 die as Staten Island Slams into Pier." The link to this article is, http://www.nytimes.com/2003/10/16/nyregion/the-ferry-crash-overview-10-die-as-staten-island-ferry-slams-into-pier.html?pagewanted=print. The entire article was not used in this study. Only a small portion of the article was given to participants (See Appendix A). The same article was used for the non-emotional story, but all the emotional detail was changed or removed from the article (See Appendix B). Questions were given to participants after the story was read (See Appendices A & B). The stories and questions are attached in the appendix.

Procedure

Participants were first asked to read and sign the informed consent letter. This letter explained procedures and informed participants of their rights. A short story was provided to each participant. Participants were given one of two stories to read. One version contained details about a deadly fairy crash and the other version contained details about the docking of a ferry. Each participant was instructed to read the story at their own speed. After each participant finished reading, he/she was instructed to turn the story over. Once the story was turned over, each participant was provided with questions to answer based on the story that was previously read. Individuals were not timed while they were answering the questions. In group one, thirteen females were instructed to read an emotional story. In group two, thirteen females were instructed to read a non-emotional story. In group three, thirteen males were instructed to read an emotional story. In group four, thirteen males were instructed to read a non-emotional story.

Results

A 2 x 2 between subjects ANOVA was conducted for this experiment. The independent variables for this study include emotional levels (emotional story vs. non-emotional story) and gender (male vs. female). The dependent variable was the number of questions an individual answered correct. The results indicated that there was a significant main effect for emotional levels, F (1, 48) = 18.75, $p < .05$, partial $\eta^2 = .28$. Individuals who read the emotional story recalled an average of 7.31 details (SD = 1.63). Individuals who read the non-emotional story recalled an average of 5.19 details (SD = 2.14). The results also indicated that there was a significant main effect for gender, F (1, 48) = 8.49, $p < .05$, partial $\eta^2 = .150$. Females recalled an average of 6.96 details (SD = 2.41) and males recalled an average of 5.54 details (SD = 1.63). The interaction between emotion and gender was not significant, F (1, 48) = 1.40, $p > .05$, partial $\eta^2 = .028$

Discussion

This study examined how well individuals can remember information that is either emotional or non-emotional. This study also examined whether or not gender differences exist in the recall of emotional information. Both genders remembered more information from the emotional story rather than the non-emotional story. The results also indicated that females remembered more emotional information than males. Also, there was a significant main effect for gender but there was not a significant main effect for the interaction between emotion and gender.

The hypothesis was supported for the recall of emotional information. This hypothesis was supported because both genders remembered more information from the emotional story rather than the non-emotional story. Individuals may have found it easier to remember this information because they may have made connections to the material. The emotional story may have been easier to relate to because many individuals understand the feeling of losing a loved one. Individuals, who read the emotional story, may have felt sympathetic or empathetic towards the victims or towards the families of the victims. Details from the non-emotional story may have been difficult to retain because individuals may have categorized the story as uninteresting or irrelevant. According to Siddiqui and Unsworth (2011), emotional items are better recalled than non-emotional items because emotional items are found to receive greater attention. Details from the emotional story may have been easier to remember because of the encoding activity in the brain. According to Dolcos, LaBar, and Cabeza (2004), encoding activity is greater for emotional information than neutral information in both the amygdala and in the medial temporal lobe.

The hypothesis about gender differences was also supported. This hypothesis was supported because females were able to recall more emotional information than males. According to previous research, females may have recalled more emotional information than males because females are found to have more emotional experiences (Bloise & Johnson, 2007). Also, Simon and Nath (2004) indicated that females are found to be more emotional than males. Bloise and Johnson (2007) also indicated that females express their emotions more frequently than males because females are found to include more emotional information in their conversations than males. According to Bloise and Johnson (2007), women have the ability to recall more emotional information because they are able to organize emotional information better than men. For the present study, this may have been the reason why

females remembered more emotional information than males.

As a result, this study examined the impact of emotional information on memorization. The purpose of this study was to examine how well individuals can remember information that is either emotional or non-emotional and whether or not gender differences exist in the recall of emotional information. This study demonstrates how emotional information is better recalled than non-emotional information and how gender differences exist in the recall of emotional information.

References

Bloise, M. S., & Johnson, K. M. (2007). Memory for emotional and neutral information: Gender and individual differences in emotional sensitivity. *Memory, 2*, 192-204.

Canli, T., Desmond, J., Zhao, Z., & Gabrieli, J. (2002). Sex differences in the neural basis of emotional memories. *Proceedings of the National Academy of Sciences, 16,* 10789-10794.

Denkova, E., Dolcos, S., & Dolcos, F. (2012). Reliving emotional personal memories: Affective biases linked to personality and sex related differences. *Emotion, 3*, 515-528.

Dolcos, F., & Cabeza, R. (2002). Event-related potentials of emotional memory: Encoding pleasant, unpleasant, and neutral pictures. *Cognitive, Affective, & Behavioral Neuroscience, 3*, 252-263.

Dolcos, F., LaBar, K., & Cabeza, R. (2004). Interaction between the amygdala and the medial temporal lobe memory system predicts better memory for emotional events. *Cognitive Neuroscience, 42*, 855-863.

Kensinger, E. & Corkin, S. (2003). Memory enhancement for emotional words: Are emotional words more vividly remembered than neutral words? *Memory & Cognition, 8*, 1169-1180.

Pillemer, D., Wink, P., DiDonato, T., & Sanborn, R. (2003). Gender differences in autobiographical memory styles of older adults. *Memory, 6*, 525-532.

Pollatos, O., & Schandry, R. (2008). Emotional processing and emotional memory are modulated by interoceptive awareness. *Cognition and Emotion, 2*, 272-287.

Siddiqui, A., & Unsworth, N. (2011). Investigating the role of emotion during the search process in free recall. *Memory and Cognition, 39*, 1387-1400.

Simon, R., & Nath, L. Gender and emotion in the united states: Do men and women differ in self-reports of feelings and expressive behavior? *Journal of Sociology, 5*, 1137-1176.

Yang, L., & Ornstein, T. (2011). The effect of emotion-focused orientation at retrieval on emotional memory in young and older adults. *Memory, 3,* 305-313.

Appendix A

Emotional Story

Instructions: Please read the story below. Once you are finished reading, turn the story over and I will give you questions to answer based on the story you have read.

A Staten Island ferry moving at a rapid clip in gusting winds crashed into a pier at the St. George ferry terminal yesterday afternoon, killing 10 people and injuring dozens of others as the concrete and wood pier sliced through its side, mowing down tourists and commuters.

The pilot, identified by city officials as Assistant Capt. Richard J. Smith, survived and was in critical condition at a local hospital, where detectives were waiting to interview him. Mr. Smith was in charge of the boat when it neared the Staten Island terminal at a high speed, and his captain noticed that the ferry was off course, according to one police official. The captain tried to get control of the boat, the official said, but it slammed into a concrete maintenance pier about 400 feet from the nearest ferry slip.

Investigators were trying to determine last night whether Mr. Smith had been drinking or taking drugs, had fallen asleep or was perhaps incapacitated as a result of a medical condition, a law enforcement official said.

Mayor Michael R. Bloomberg, speaking at a news conference, called the crash a tragic accident, but declined to speculate on the cause. He said that 10 people had been killed, and that all the crew members were alive and were being questioned.

The accident occurred as the 3 p.m. ferry from Manhattan approached the terminal near the end of the 25-minute trip. Some passengers said later that they had noticed that the ferry appeared to be traveling at an unusually high speed, was approaching at an odd angle and had not slowed down as it normally would when it neared the shore.

As pandemonium reigned on board, the boat was moved away from the damaged pier with the help of tugboats. After 20 minutes, it docked in a ferry slip and passengers were able to leave.

Last night, administrators at St. Vincent's Staten Island Hospital said 22 people were being treated for injuries that ranged from bruises to amputations. Five people were admitted to the hospital and three underwent surgery, including Mr. Smith.

About 100 people gathered at a family assistance center in a municipal office building on Stuyvesant Place behind Staten Island Borough Hall. It offered information from the police and hospitals about the identities of the dead.

Some 1,500 calls poured in to the city's 311 information number from people seeking information about victims and survivors, said Edward Skyler, a spokesman for Mayor Bloomberg.

Instructions: Please circle the best answer for each of the eleven questions.

1. Where did the ferry crash?

A. Into a pier, at the Golden Gate ferry terminal.
B. Into a pier, at the St. George ferry terminal.
C. Into a pier, at the WSDOT Anacortes ferry terminal.
D. Into a pier, at the East River ferry terminal.

2. Where were detectives waiting to interview Mr. Smith?

A. At the terminal
B. At the food court
C. At the dock
D. At a local hospital

3. What did the passengers notice?

A. The ferry was traveling at a slow speed due to the weather conditions.
B. The ferry was traveling at an average speed.
C. The ferry was traveling at an uncomfortable speed.
D. The ferry was traveling at an unusually high speed.

4. How long did it take the ferry to dock in its slip?

A. 20 minutes
B. 15 minutes
C. 30 minutes
D. 40 minutes

5. How many people were being treated for injuries?

A. 25 people
B. 35 people
C. 22 people
D. 12 people

6. How many people were admitted to the hospital?

A. 11 people
B. 5 people
C. 7 people
D. 9 people

7. How many people underwent surgery?

A. 3 people
B. 6 people
C. 9 people
D. 12 people

8. How many people called the city's 311 information number?

A. 5,000 people
B. 2,000 people
C. 1,500 people
D. 3,000 people

9. Why did the captain try to get control of the boat?

A. He noticed that the pilot fell asleep.
B. He noticed that the ferry was off course.
C. He noticed something wrong with the ferry.
D. He noticed an iceberg ahead.

10. How many people died from the crash?

A. 12 people
B. 16 people
C. 10 people
D. 11 people

11. Please circle whether you are a male or a female.

A. Male
B. Female

Appendix B

Non-Emotional Story

Instructions: Please read the story below. Once you are finished reading, turn the story over and I will give you questions to answer based on the story you have read.

A Staten Island ferry moving at a delightful speed in gusting winds arrived at the St. George ferry terminal yesterday afternoon. When the ferry arrived, ten people gathered their luggages and dozens of others followed. The concrete and wood piers were designed so beautifully that the passengers couldn't help but to stare.

Richard J. Smith was the pilot of the Staten Island ferry. When Mr. Smith is not working, he enjoys exercising at a local gym. One day, when he left the gym, individuals were waiting outside to interview him on how he does his job as a ferry pilot. Mr. Smith was in charge of the boat when it arrived at the Staten Island terminal at a delightful speed. Mr. Smith's captain noticed that he was doing an excellent job operating the ferry. The captain tried to get Mr. Smiths attention by notifying him of his excellent operating skills. Unfortunately, the boat arrived in the ferry slip before he could tell him.

Individuals were trying to determine where Mr. Smith learned his great skills.

Mayor Michael R. Bloomberg, speaking at a news conference, called the ferry arrival something special. He indicated that the arrival was fantastic. He said that 10 people were waiting to get their luggages, and that all the crew members were asked to help people gather their belongings.

The arrival occurred as the 3 p.m. ferry from Manhattan approached the terminal near the end of the 25-minute trip. Some passengers said later that they had noticed that the ferry appeared to be traveling at a delightful speed. The ferry arrived on time at the St. George ferry terminal. Passengers said the arrival was relaxing and wonderful.

After 20 minutes of waiting to exit the ferry, it docked in a ferry slip and passengers were able to exit.

Last night, administrators said 22 people purchased coffee, five people purchased soda and three people purchased lemonade after the ferry arrived in the slip. Approximately, 100 people purchased beverages or food after the ferry arrived.

Once the ferry arrived, about 1,500 people called the city's information number to find good restaurants in the area.

Instructions: Please circle the best answer for each of the eleven questions.

1. Where did the ferry arrive?

A. At the Golden Gate ferry terminal.
B. At the St. George ferry terminal.
C. At the WSDOT Anacortes ferry terminal.
D. At the East River ferry terminal.

2. Where were individuals waiting to interview Mr. Smith?

A. At the terminal
B. At the food court
C. At the dock
D. At a local gym

3. What did the passengers notice?

A. The ferry was traveling at a slow speed.
B. The ferry was traveling at an average speed.
C. The ferry was traveling at a comfortable speed.
D. The ferry was traveling at a delightful speed.

4. How long did it take the ferry to dock in its slip?

A. 20 minutes
B. 15 minutes
C. 30 minutes
D. 40 minutes

5. After the ferry arrived, how many people purchased coffee?

A. 25 people
B. 35 people
C. 22 people
D. 12 people

6. How many people purchased soda?

A. 11 people
B. 5 people
C. 7 people
D. 9 people

7. How many people purchased lemonade?

A. 3 people
B. 6 people
C. 9 people
D. 12 people

8. How many people called the city's information number?

A. 5,000 people
B. 2,000 people
C. 1,500 people
D. 3,000 people

9. Why did the captain try to get the pilots attention?

A. He wanted to inform him that he was traveling to fast.
B. He wanted to inform him about his excellent operating skills.
C. He wanted to inform him that there was something wrong with the ferry.
D. He wanted to inform him of an oncoming iceberg.

10. When the ferry arrived, how many people gathered their luggages?

A. 12 people
B. 16 people
C. 10 people
D. 11 people

11. Please circle whether you are a male or a female.

A. Male
B. Female

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Gender Differences in Word Recall for Auditory and Visual Stimuli

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This study investigated gender differences in word recall for auditory and visual stimuli. Forty undergraduate students from a public northeastern university were recruited for the study with 20 males and 20 females. The first group of 20 participants, 10 males and 10 females, head three non-associated word lists and were asked to recall as many words as possible in any order after hearing each list. The second half of the participants underwent the same procedure but viewed the word lists instead of hearing them. The results showed that auditory information was more accurately recalled than visual and that there were no gender differences in recall. This means that males and females better recalled auditory information than visual information.

Word recall has been a topic thoroughly tested in many domains. There are multiple factors that may affect word recall, including the meaning of the words themselves, the modality in which the words are presented, the gender of those participating, and the level of education and age of a person. Theories of dual-processing systems in which visual and auditory stimuli are stored and recalled through separate processes have become prevalent over the years. Mousavi, Low, and Sweller (1995) tested the dual-processing theory that auditory information may be more accurately learned than visual due to different systems for auditory and visual processing. The major theory presented in Mayer and Moreno (1998) was that there are two separate networks for processing auditory and visual information. Gibbons, Velkey, and Partin (2008) studied the presence of the modality effect in free and serial recall. Goldstein et al. (2005) and Ryan, Kreiner, and Tree (2008) studied the theory that there are sex differences in terms of working memory. These theories suggest different characteristics that may be responsible for differences in working memory and word recall.

Mousavi et al. (1995) investigated whether auditory and visual information may be stored and processed by different systems, resulting in one set of information to be more accurately learned than the other. Mousavi et al. (1995) hypothesized that auditory information would be more accurately learned than visual information because of the way it is processed. The independent variable was the type of group, which included simultaneous, visual-visual, and visual-auditory, and the dependent variable was the number of problems answered correctly. Participants were presented with either geometric pictures accompanied with both verbal and auditory proof statements, geometric pictures with a visual proof statement, or geometric pictures with auditory proof statements. They were then given a test to measure which group retained the greatest amount of accurate information. Experimenters found that learning was enhanced or better than the other two groups when auditory proof statements alone were present. This means that auditory information was more accurately remembered than visual information.

Mayer and Moreno (1998) tested the theory that there are separate networks for remembering auditory and visual information. They hypothesized that auditory information would be more accurately recalled than visual information because pictorial and verbal information can be processed at the same time through auditory and visual working memory while visual information may cause cognitive overload since the information cannot be processed at the same time (Mayer & Moreno, 1998). In experiment one, participants were presented with a computer presentation depicting the process of lightning. Half of the participants heard auditory information accompanying the presentation; the other half just viewed the presentation. In experiment two, participants underwent the same procedure, except they learned about a car's braking system. Half of the participants heard auditory information along with the presentation and the other half only viewed the presentation. The independent variable for both was the type of information received (receiving visual or auditory and visual stimuli), and the dependent variable was the number of questions answered correctly on the assessment. Results indicated that participants learn better when visual information was accompanied by auditory stimuli rather than just through

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visual stimuli. These findings suggest that there is a difference between recall of auditory and visual information versus just visual, and that auditory information in combination with visual information is more accurately recalled than just visual.

Gibbons et al. (2008) conducted an experiment investigating the presence of a modality effect for both free and serial recall. They hypothesized that a person's age, education, and gender would play a role in word recall and memory. Participants received one of four tests of modality: A visual test with dots, a visual test with numerals, an auditory test with beeps, and an auditory test with numerals. After each of the tests, participants were asked to participate in free recall. The same procedure was used for the second experiment with one change; The participants in this experiment were asked to participate in serial recall. The independent variable for these experiments was the type of modality, and the dependent variable was recall. This study found that in both free and serial recall, there was a modality effect. Recall of auditory information was better and more accurate than recall of visual information.

Goldstein et al. (2005) studied the theory that there are gender differences in terms of working memory. They hypothesized that females and males would show differences in working memory since the area has shown sex differences in the regions that working memory takes place in. In this experiment, 7 men and 7 women participated in a study using an fMRI to measure brain activity during working memory. Participants heard information and performed a test of their memory while being measured by an fMRI machine. The independent variable in this study was gender and the dependent variable was performance on a test task. Participants were presented with auditory information while being scanned. They were then given a question and answer test task. Significant gender effects were found in the pattern and magnitude of brain functioning during working memory with females having greater signal intensities in certain regions of the brain than men. Although these gender effects in brain functions were apparent, there were no comparable differences in task performance between males and females.

Ryan, Kreiner, and Tree (2008) also studied the presence of sex differences in terms of working memory. Over 2,000 males and females participated in this study. Participants were grouped into three education levels, three ethnic groups, three age groups, and three IQ groups. Participants then took a pairing and free recall test. The results of the test showed that male and female scores differed on both of the tests, but not significantly when age and education were factored in. According to this experiment, there should be no differences in free recall between males and females if they are of the same age and have acquired the same level of education.

The current study is investigating gender differences in word recall for auditory and visual stimuli. The independent variables are gender (male or female) and type of stimuli (auditory or visual). The dependent variable is word recall. It is hypothesized that there will be a significant difference in word recall for auditory and visual stimuli, and there will be no significant differences in word recall between genders. It is also hypothesized that more words will be recalled for auditory versus visual stimuli and that there will be no differences between males and females in recall.

Method

Participants

A convenience sample of 40 students, 20 males and 20 females, from a public northeastern university were used in this study. They were recruited by a poster located on a bulletin board in the psychology department of the university. Individuals received partial course credit and/or extra credit for participating in this study.

Materials

Three different lists containing 15 words each were heard (See Appendix). The lists were taken from the Paivio, Yuille, and Madigan word generator (Friendly, 2012).

Procedure

The first group of 20 participants, 10 males and 10 females, heard three lists of 15 non-associated words. After each list they heard the word "recall" and were asked to recall as many words as possible, in any order, during a two-minute period. They were asked to put an "F" for female or an "M" for male at the tops of their papers. Their data was collected and used for analysis. The second group of 20 participants, 10 males and 10 females, viewed each of the three lists (the same lists used for group one) word-by-word on a power point. They were also asked to recall as many words as possible in a two-minute period after each list was finished and the word "recall" appeared on screen. They were asked to put an "F" for female or an "M" for male at the tops of their papers, and their data was collected for analysis.

Results

A two-way between subjects analysis of variance was conducted with the number of words correctly recalled being the dependent variable, and the type of stimuli (auditory or visual) and gender (male or female) as the independent variables. The results showed that there was only a significant difference in word recall between the auditory and visual groups, $F\,(1, 36) = 13.72$, $p < .05$, partial $\eta^2 = .276$ with those in the auditory group ($M = 15.95$, $SD = 2.43$) performing significantly better than those in the visual group ($M = 13.00$, $SD = 2.55$). There were no significant differences for gender, and the interaction was not significant.

Discussion

The results of this study show that auditory information is more accurately recalled from working memory than visual information and that there are no gender differences. These results are consistent with both the hypothesis that there would be a significant difference in word recall for auditory and visual stimuli and that

there would be no significant differences in word recall for genders. The results are also consistent with previous research.

The results are consistent with the experiment conducted Mousavi et al. (1995) that found auditory information to be more accurately remembered than visual. Mayer and Moreno (1998) and Gibbons et al. (2008) found that there is a difference between recall of auditory and visual stimuli, and more specifically, auditory information is more accurately recalled than visual; these results are also consistent with the results of the current experiment. Goldstein et al. (2005) and Ryan, Kreiner, and Tree et al. (2008) both found that there are no significant differences between genders on memory tasks when of the same age and education level; there was no difference between genders for the current study as well.

According to previous hypotheses, the auditory group may have performed better than the visual because there may be different systems for remembering the two types of information. To further test this hypothesis and similar hypotheses, future experiments should reduce the presence of distractors by having individuals perform the tasks alone so that the performance of others does not influence the participants. They should also include a large sample size along with a diverse group of participants ranging in age, education level, and ethnicity in order to see if the results can be applied across cultures and different demographics.

The investigation of whether visual or auditory information is better recalled has been tested in numerous instances. This study tested college-aged student on free recall of both visual and auditory word lists. The results of the study show that auditory stimuli are more accurately recalled than visual and that there are no differences between genders. The results of this study add to the many that aim to find the most accurate forms of recall for working memory. This information proves both vital and useful in everyday life.

References

Gibbons, J. A., Velkey, A. K., & Partin, K. T. (2008). Influence of recall procedures on the modality effect with numbers and enumerated stimuli. *The Journal of General Psychology 135*, 84-104.

Goldstein, J. M., Jerram, M., Poldrack, R., Anagnoson, R., Breiter, H. C., Makris, N., Goodman, J. M., Truang, M. T., & Seidman, L. J. (2005). Sex differences in prefrontal cortical brain activity during fMRI of auditory and verbal working memory. *Neuropsychology, 19*, 509-519.

Friendly, M. (2012). Word List Generator. Retrieved from http://www.math.yorku.ca/SCS/Online/paivio/.

Mayer, R.E., & Moreno, R. (1998). A split-attention effect in multimedia learning: Evidence for dual processing systems in working memory. *Journal of Educational Psychology, 90*, 312-320.

Mousavi, S.Y., Low, R., & Sweller, J. (1995). Reducing cognitive load by mixing auditory and visual presentation modes. *Journal of Educational Psychology, 87*, 319-334.

Ryan, J. J., Kreiner, D. S., & Tree, H. A. (2008). Gender differences on WAIS-III incidental learning, pairing, and free recall. *Applied Neuropsychology, 15*, 117-122.

Appendix

Word List 1:	Word List 2:	Word List 3:
Portrait	Answer	Assault
Proxy	Contents	Student
Disease	Picture	Excuse
Rattle	Hostage	Artist
Trumpet	Painter	Dummy
Machine	Elbow	Maiden
Army	Exhaust	Body
Banner	Speaker	Cigar
Rosin	Mammal	Gingham
Tidbit	Garments	Lemon
Volume	Impulse	Boulder
Pressure	Bagpipe	Circle
Hardship	River	Prison
Revolt	Sunburn	Welfare
Sadness	Blister	Drama

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Will Studying in Color Help on a Black and White Test?

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Students are constantly trying to find the best way to study their test content; the easier recall is on an exam, the better students perform. The current study measured the effect on test score as a result of the interaction between study materials and test materials. It was hypothesized that participants who studied in the same color that they tested in would have higher test scores. Forty undergraduates participated in the study; half of the participants studied in red ink and the other half studied in black ink. Half of each group of participants was either tested in red ink or black ink. Results showed no significant difference between studying and testing in congruent or incongruent conditions. Results suggest that color may not be a determining factor in memory recall.

When studying for a test, students use different kinds of tactics in order to help them remember the test content. For example, color is often used to aid studying whether it is used in highlighting, writing in color, or color coding the content. This is done to help students remember the content with more accuracy and to make studying easier, but in the end, is it helping or hurting students? Spector and Maurer (2011) found that English-speaking adults can consistently map specific colors to the letters of the alphabet. If colors can be mapped to letters, then color should be able to be mapped to content made up of letters. On the other hand, the encoding specificity effect states that the environment one studies in should be similar to the environment one is tested in (Zeelenburg, 2005). If this is the case, then studying in color will not help on a test that is in black and white.

Perhaps when people study in color, despite knowing that they will be tested in black and white, they are trying to replicate a synesthesic experience. Synesthesia is a rare phenomenon that involves a perceptual experience of color as a result of physical stimulation. For example, grapheme-color synesthetes are people who report that they feel a specific color as the result of reading a letter or a word (Smagt, 2009). Replication of such an experience by people who do not report such feelings, however, has proven to be difficult. In one study, synesthetes and controls were paired up and given the same priming tasks. In order to begin, synesthetes' subjects were asked to view every letter of the alphabet and the single digits, and then they were to describe the color that they felt for each one. One hundred and eleven days later, they were asked to repeat this procedure. It was found that synesthetes were able to replicate original responses. The next step included priming both the synesthetes and a control group. Priming consisted of participants being shown a letter or digit and what color corresponded to it. This was done in the hope that participants would be able to recall the color when given the appropriate cue. Finally, all participants were presented with the task of selecting the target color that corresponded to the particular letter or digit. It was reported that while synesthetes were able to accurately recall the color that was meant to be associated with a particular letter or digit consistently, the control participants were unable to do so (Spruyt, Koch, Vandromme, Hermans, & Eelen, 2009). Arnold and Wegener (2012) reported similar results. Their experiment also consisted of color synesthetes and controls. The color synesthetes were previously tested to determine what colors they perceive as a result of grapheme and then retested to find the accuracy of what the color synesthetes originally reported. The next step required that the controls and the color synesthetes be matched up and then take the same test. First participants were primed to know what color corresponded with which letter. They were then presented with a letter on one side of the screen and a color wheel on the other side. They were asked to use the wheel to show what tint corresponded to that letter. It was found that synesthetes produced more accurate matching of color hue and saturation (Arnold & Wegener, 2012). These results provide further support that unless a person perceives colors as a result of grapheme, replicating such experiences in relating colors to letters is rather difficult.

Although grapheme-synesthetes have reported no sensation of a letter or word as a result of perceiving a color (the opposite of what they generally experience), studies have found evidence

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refuting such claims. In other words, studies have found support of bi-directionality of grapheme-color synesthesia (Weiss, Kalckert, & Fink, 2008). This leads one to believe that although the sensation may not be recognized consciously, grapheme color synesthetes may still experience the feeling of a letter or digit as the result of a perception of the color (Gebuis, Nijboer, & Van der Smagt, 2009a). Even when primed in the opposite fashion, synesthesic participants sill outperformed the control participants. Such priming consisted of participants having to say the name of the color while also looking at a particular number and sometimes saying the name of number while also looking at a particular color. After priming, participants were cued with colors to recall numbers and cued with numbers to recall numbers. As predicted, color-grapheme synesthetes were able to recall a number as a result of the perception of a color with significant consistency. Controls, however, were still unable to consistently recall the colors or numbers accurately in either fashion (Gebuis, Nijboer, & Van der Smagt, 2009b).

While it was found that grapheme-color synesthetes were able to unconsciously recall a number as the result of a color, other studies have found that unconsciously recalling two features is not easily, if ever, done by anyone. A study was conducted in order to test whether the form and color of an object could be unconsciously recalled in a task after priming (Tapia, Breitmeyer, & Shooner, 2010). The priming consisted of showing participants a shape and a particular color. That shape and color would always correspond to one another. In the task, participants were either presented with a congruent figure, one that corresponded to the correct form or an incongruent figure. The incongruent figure could have had a color that did not correspond to the form, a form that did not correspond to the color, or a figure that was incongruent in both color and form. Participants performed the task twice each time under a different time constraint. It was found that when participants had a longer time to respond, or time to consciously think about their answer, they were able to accurately identify the figures whether the figures were congruent or not. When participants were given a short amount of time to respond, they were not accurate when asked for both form and color. When asked for one or the other, however, participants were able to consistently do so. These results indicate that while people can unconsciously respond or recognize either form or color, they must consciously recognize a combination of the two (Tapia et al., 2010). If this is the case that it requires more time to process both the form and the color, then participants who are given a test in the same form and color they studied in should be able to process it with greater accuracy as a result of less conscious thinking.

Zeelenberg (2005) found that the retrieval of information depends on what information relates the cue and target stimuli together. In the study, participants were required to study a set of paired words. They would then be provided a word in the test section and asked to recall its pair. Some participants were given a word they had studied while others were given a word related to both words of the intended pair. In other words, some participants were tested on the same words provided for them to study with, and some participants were given words that were correlated with the words they were given to study. It was found that participants who had the exact words that they had studied were significantly more accurate than participants who were given related words (Zeelenberg, 2005). This suggests that study materials are most effective when test materials accurately match them. In addition, Poirier et al. (2012) found further support that a cue cannot lead to a successful retrieval unless it was encoded in the same form that it is being presented in during testing. This raises the question: Why encode study materials in one form if the cue to recall them on the test will be in another form?

The present study examines whether studying in color is an effective means of studying when one will be tested with black and white testing materials. In the study, phase participants were assigned to the color level or the black and white level. After this, the levels were split in half and one half was given the test in black and white while the other half was given the test in red and white. It was predicted that the participants in the congruent groups, those who tested in the same format that they studied in, would produce higher scores than those in the incongruent group who studied in one format and were tested in another. The independent variables included the study materials of either black ink or red ink in addition to the test material, which was also either black ink or red ink. The dependent variable of the study was the test score.

Method

Participants

The experiment included 40 participants who were students from a public northeastern university. Participants either learned about the study from a bulletin board or from a professor. Most of the participants received some sort of extra credit or partial course credit for their participation in the experiment.

Materials

The test materials included a list of 10 nonsense words with made up definitions. The words were presented in either red or black (See Appendix). The words were made up by the investigator and were cross-referenced with Merriam-Webster's dictionary to make sure that the words did not already exist.

Procedure

Participants first read and signed informed consent sheets. They were then handed one of two sheets to begin the study phase of the experiment. For one group, participants received the words in red print. For the other group, participants were given the words in black print. Once the participants were given the sheets of paper, they were told that they would have two minutes to examine the sheet and study the words and their definitions. Once the two minutes were up, they were asked to place the paper face down on the table in front of them. At this point, a timer began to measure out one minute. As the one-minute wait time ticked by, the instructor retrieved the study papers and handed out

the tests face down. Half of the participants from each group were given the test in black print, and the other half received the test in red print, creating four conditions. When the minute was up, participants were told to flip over their paper and follow the printed instructions. The instructions asked participants to please write the definitions that corresponded to the words below. The test portion of the study was not timed. Participants were free to leave once they felt that they had recalled as many definitions as they could.

Results

A 2 x 2 between subjects ANOVA was conducted to evaluate the effects of the color of materials in the study phase and the color of materials used on the test on the test score. The analysis showed that participants who studied in black did not have significantly different test scores than participants who studied in red, F (1, 36) = 1.01, $p > .05$. The color that participants tested in also did not produce a significant difference in tests scores, F (1, 36) = 1.01, $p > .05$. Finally, the analysis failed to identify a significant interaction between the color participants studied in and the color participants tested in, F (1, 36) = 1.01, $p > .05$.

Discussion

Students strive to do the best that they can on exams, and they will look for the fewest steps to make that happen. As previously discussed, it is often believed that studying in color will help a person remember the material with more ease and accuracy. The current study, however, failed to find significant results either way. The results indicate that scores of participants who studied in the same color that they tested were no different from the scores of participants who studied in a different color than they were tested in. It was predicted that, based on the encoding specificity principle, participants in the congruent levels would outperform participants in the incongruent levels. No support for this hypothesis, however, was found.

Furthermore, the previous finding that non-synesthetes cannot consistently recall the color they were primed to associate with particular graphemes suggest that participants who studied in color would not be able to recall their definitions with as much accuracy as participants who studied in black. Perhaps this was a misinterpretation and these results were suggesting that non-synesthetes do not take color into consideration. Maybe they cannot consistently recall color even after being primed because color is a factor that cannot be encoded with as much accuracy. Support for this interpretation has been found in a study where synesthetes have been found to have overall superior memory for color information when compared to non-synesthetes (Radvansky, Gibson, & McNerney, 2011). It appears that non-synesthetes may not be able to remember color with as much accuracy even if they wanted to do so.

The previous argument that the requirement of conscious thinking about both form and color would produce lower test scores in the incongruent group must also be reevaluated. After finding evidence that suggests non-synesthetes do not have the same capacity for color memory, it must be considered that perhaps as a result of this required conscious thinking is why non-synesthetes do not remember color with such accuracy. In other words, when non-color synesthetes store in their brains the content of the information they are studying, it is stored in a color-blind manner, meaning that there is no color attachment to the information. As a result of this, when content is recalled, the color of the cue would not be relevant. Future research must be done to support or refute this theory.

Future studies should also consider adding an additional independent variable of time to determine if color ink or black ink is encoded quicker and with more accuracy. In addition, adding more levels to the original study could be done in order to see if a different color other than red would produce better results. This study could potentially determine the best color to study in when tested in black and white.

With so much stress on the success of students and the grades they attain these days, any aid in attaining these grades could help reduce such stress. It is important to keep stress levels as low as possible, and if determining the best study conditions is one way to do so, then this is a topic that more investigation should be done on. Currently, without much scientific support, students try to find the best way to study. Studying in color is a popular choice, but as this current study has questioned, is it really helping? The current investigation tackled this question by having participants study in red ink or black ink and then test in red ink or black ink. The study did not find statistically significant support, however, but perhaps with the suggested changes, future studies will be able to do so.

References

Arnold, D. H., & Wegener, S. V. (2012). Precision of synesthesic color matching resembles that for recollected colors rather than physical colors. *Journal of Experimental Psychology, 38*, 1078-1084.

Gebuis, T., Nijboer, T. C. W., & Van der Smagt, M. (2009). Multiple dimensions in bi-directional synesthesia. *European Journal of Neuroscience, 29*, 1703-1710.

Gebuis, T., Nijboer, T. C. W., & Van der Smagt, M. (2009). Of colored numbers and numbered colors. *Experimental Psychology, 56*, 180-187.

Poirier, M., Nairne, J. S., Morin, C., Zimmerman, F. S., Koutmeridou, K., & Fowler, J. (2012). Memory as discrimination: A challenge to the encoding-retrieval match principle. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 38*, 16-29.

Radvansky, G. A., Gibson, B. S., & McNerney, M. (2011). Synesthesia and memory: Color congruency, von Restorff, and false memory effects. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 37*, 219-229.

Spector, F., & Maurer, D. (2011). The colors of the alphabet: Naturally-based associations between shape and color. *Journal of Experimental Psychology: Human Perception and Performance, 37*, 484-495.

Spruyt, A., Koch, J., Vandromme, H., Hermans, D., & Eelen, P. (2009). A time course analysis of the synesthetic colour priming effect. *Canadian Journal of Experimental Psychology, 63*, 211-215.

Tapia, E., Breitmeyer, B. G., & Shooner, C. R. (2010). Role of task-directed attention in nonconscious and conscious response priming by form and color. *Journal of Experimental Psychology, 36*, 74-87.

Weiss, P. H., Kalckert, A., & Fink, G. R. (2009). Priming letters by colors: Evidence for the bidirectionality of grapheme-color synesthesia. *Journal of Cognitive Neuroscience, 21*, 2019-2026.

Zeelenburg, R. (2005). Encoding specificity manipulations do affect retrieval from memory. *Acta Psychological, 119*, 107-121.

Appendix

Please study the following words. You will have three minutes to look over them and will be asked to recall the definitions in a later task.

- Gogly – A pair of mismatched socks
- Teencgy – A group of angry monkeys
- Cantun – A crown for a prince
- Kengi – A tropical stripped fish
- Brentew – A rare fruit tree
- Faxin – A foot disorder found in athletes
- Plyzo – A bundle of pencils
- Halix – A bag for jewelry
- Rewty – A collection of bottle caps

Please define the following words. All words not defined will be marked as an error. You will not be timed.

- Gogly –
- Teencgy –
- Cantun –
- Kengi –
- Brentew –
- Faxin –
- Plyzo –
- Halix –
- Rewty –

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Changing the Formula for Academic Achievement by Stressing the Importance of Positive Emotions

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College students face many challenges managing their busy lives. Why is it that some students are capable of achieving academic success while others are not as capable? Past experiments have been designed to analyze the adverse effects of negative emotions on academic progress. In this experiment, it was hypothesized that students primed with positive emotions would perform better on memory tasks and that students with higher happiness scores would report higher grades. Thirty-one students participated in this experiment with 15 students in the positive emotions priming group and 16 students in the negative emotions priming group. A one-way between subjects ANOVA was used to analyze the memory task performance of the participants. A Pearson's r correlation was also used to analyze the students' Subjective Happiness Score, which was related to their overall academic success. There were no significant differences or relationships found in this experiment.

Many people have the mindset that if they become successful, then they will become happier. For example, if one buys a new car, then his or her life will have more pleasure, or if a person loses ten more pounds, then his or her life will have more happiness. The problem with this equation is that if people follow this formula where goals are being set in order to obtain happiness, then happiness can never be achieved. The reason that happiness cannot be achieved is that when one goal is reached, one's happiness levels are only increased for a short amount of time until they dissipate back to one's baseline happiness. In order to increase happiness to higher levels again, the person needs to create another goal to reach. This cycle is continuous and because people tend to enjoy the rewards of success rather than the journey to success, true and lasting happiness is sometimes difficult to obtain.

The Hedonic Adaptation (HA) is the theory that a human emotion will not last forever and will eventually decrease (Sheldon & Lyubomirsky, 2012). When a person experiences trauma or negative events in his or her life, HA states that the feelings of sorrow and depression will eventually decrease, and the person should eventually return to his or her baseline happiness levels (Sheldon & Lyubomirsky, 2012). Research has primarily viewed HA as a positive attribute, though this adaptation can have a negative effect on positive emotions because happiness is only increased for a limited amount of time before it returns to a stable level. If an increase in emotion is only temporary, then is it possible to have lasting happiness?

Lyubomirsky and Layous (2013) found that even though 50% of a person's happiness is due to hereditary factors, by practicing gratitude a person can avoid negative influences of HA. Regardless of a person's predisposition or background, increased happiness can be maintained by appreciating what a person has in the moment and not look ahead at what he or she could have or what he or she lacks in his or her life. Psychologists have described in countless self-help books theories on how a person can improve his or her life satisfaction and overall happiness in ways that seem complicated and challenging. According to new research, however, cumulating life satisfaction does not need to be problematic or confusing. Increasing overall levels of happiness can be as easy as writing down events that a person is appreciative of or by showing kindness to others (Lyubomirsky & Layous, 2013).

Why should someone be motivated to be happy in the first place? Past research has shown that, contrary to what people believe, happiness can be the cause of success and not just a result of success. Happier people are more optimistic, are better at solving problems, and they adapt to changing situations better than those less happy, and for these reasons, happier people tend to be more successful in their academics and later on in their careers (Lyubomirsky & Layous, 2013). Individuals who are not as happy are not as able to make meaningful and enhanced interactions with others, and there are more health risks associated with unhappiness (Lyubomirsky & Layous, 2013). This theory of happiness leading to success has directed researchers to develop an interest in students' positive emotions in school as a means to improve academic performance. Mega, Ronconi, and Beni (2013) developed a model based on the

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control value theory, which states that students' emotional status can sway their enthusiasm and determination that they have in school (Perkrun et al., 2009). Their study tested approximately 6,000 undergraduate students and discovered that students who experience positive emotions were more organized, had higher perceptions of themselves, and because they believed in themselves, their motivation was higher than peers with lower happiness levels (Mega et al., 2013). Even more importantly, the study was able to predict GPA scores by the students' emotional levels (Mega et al., 2013). This prediction shows that not only is there a strong relationship between emotions and academic performance, but also that positive emotion were positively related to higher scoring in school (Ahmed, Werf, Kuyper, & Minnaert, 2013). This research shows how the traits of students with more positive emotions develop skills that are beneficial in a school setting, and this is why they are able to overcome more challenges than others. The broaden-and-build theory by Fredrickson states that positive emotions help a person to cultivate habits of adapting to diverse circumstances and managing skills that can assist the individual with their performances in work or college settings (Lyubomirsky, Sousa, & Dickerhoof, 2006). One of the downfalls that people who experience negative emotions face is an unhealthy cognitive function known as dwelling. This can be described as the repetitive action of concentrating on negative events and sad experiences, which have adverse effects on students because then they become distracted from the task at hand. This pessimistic thought process can interfere adversely with memory tasks, the ability to resolve conflicts, reason critically, and preserve enthusiasm (Lyubomirsky et al., 2006).

The current study wanted to explore the effect of positive and negative emotions on explicit memory functions. In the past, research has found that, in the long run, happier people are more successful because of the skills they develop and their ability to adapt to difficult situations. It was hypothesized in this study that students who were primed with positive emotions would be able to recall more letters during the memory task than students who were primed with negative emotions. It was also hypothesized that if this prime did not have an effect, students who scored higher on the Subjective Happiness Scale created by Lyubomirsky and Lepper (1999) would also report that they receive higher grades on average. The independent variable in this study was the positive or negative prime that the participants were exposed to, and the dependent variable was how well they performed on the memory task. The Subjective Happiness Scale scoring was a covariate variable. This study sought to discover if emotions could impact basic cognitive functions that occur during short-term memory and recall.

Method

Participants

Thirty-one students from a public northeastern university participated in this study. Fifteen students were put in the positive emotions priming group and sixteen students were put in the negative emotions priming group. The participants were recruited using a poster located on the Psychology Department bulletin board and by word-of-mouth. In exchange for their participation, students were able to receive extra credit.

Materials

Each participant was given a packet. The first page of the packet was the Subjective Happiness Scale (Lyubomirsky & Lepper, 1999). The second page included the priming cue that told the participant to meditate on either a positive (expressing gratitude) or negative (remembering a sad/depressing time) reflective task depending on if they were assigned to the positive priming group or the negative priming group. On this page, participants would write down three instances or people who provided them with a positive influence or a negative influence depending on their assigned group. The third page was an answer sheet where participants could put down what letters they remembered from the memory task. The final page included follow-up questions that asked what the participants' average grades were, if they believed that emotions could influence academic achievement, if being happy was an important trait to them, and if they believed that happiness was a choice.

A PowerPoint slideshow presented the memory task. The first slide gave the participants instructions to get ready to recall as many letters that were presented on the screen and write them down in the packet after they disappeared off the screen. There were 10 slides with a variety of either 7-9 letters on each that had been randomly selected so as to not look like any English words. The letters were intentionally random because actual words would be easier to remember than random letters. For example, one of the slides showed the letters "T Y F W R I J," and these letters do not represent a word in the English language and would be harder to memorize than seeing the word "butterfly" on the screen. The slides with letters were timed to appear to the participants for five seconds each. See Appendix for all materials.

Procedure

Students from campus volunteered to participate in the experiment by signing up on a bulletin board located outside of the Psychology Department. As participants entered, they were given an informed consent sheet, and once they read and signed the form, they were randomly assigned one of the packets that represented the two emotional conditions. Each participant stated by filling out the first page of the packet, the Subjective Happiness Scale. The next page that the participants filled out was the emotional reflective task where they were given five minutes to read the instructions and then think and write down three experiences in their lives that made them happy or depressed. The students then participated in a memory task presented on a projection screen. The participants were shown a series of letter and after the letters disappeared from the screen, participants were asked to recall and write down the letters. After the memory task, participants completed the four follow-up questions.

Results

A one-way between subjects ANOVA was used to analyze the data. The number of letters recalled did not vary by the emotional prime used, $F(1, 29) = .01$, $p > .05$. The first hypothesis was not supported. A Pearson r correlation was used to analyze the Subjective Happiness Scores with the average grades participants reported. There was not a significant relationship between the Subjective Happiness Scores and the grades reported, $r(29) = -.18$, $p > .05$. None of the follow-up questions showed a significant correlation with memory performance, Subjective Happiness Score, or grades.

Discussion

The experiment conducted did not yield data to support either of the hypotheses. Emotional priming did not have an effect on the memory performance of participants. The grades reported by participants also did not correlate with how they rated themselves on the Subjective Happiness Scale. The data collected was not significant and did not discredit previous research.

There are many reasons as to why the data did not reflect previous research. For one, the inconsistencies presented in the data could have been from some of the participants taking the instructions seriously and taking time to write down specific experiences while others did not seem to take as much care in writing down their experiences and wrote minimal information. There was no way to determine if participants were fully invested into feeling the emotional priming. If the priming failed to arouse feelings of gratitude or negativity, then it would not affect the participants' scores.

The second reason for inconsistencies was that the design of the memory task was poor. The task was too simple, and participants from both conditions did not seem to have trouble recalling the letters. In order to improve upon this issue, the slides could be shown for 2.5 seconds instead of 3.5 seconds. Also, there could be more letters on each slide and all vowels could be removed so that none of the series of letters could resemble English words in any way.

An additional way to improve this experiment would be to make the test a one-between-one-within ANOVA by having each participant take the memory test before the prime and after the prime. This would allow the participant's individual scores to be analyzed in order to see if there was any effect of the prime on each individual. These results may be more in line with previous research by detecting if emotional priming had an effect and that individual memory was not solely being measured. Participants are not always honest during experiments, and they could have reported that they received higher grades on average than what they really receive. Dishonesty could be a huge factor in explaining why the results did not show a correlation between Subjective Happiness Scores and reported grades. Future research needs to improve upon the current study by taking these variables into account.

Kuhbander, Lichtenfeld, and Perkrun (2011) demonstrated that information processing at its earliest stages can be influenced by positive or negative emotions. At these beginning stages of cognitive functioning, the brain is only able to take in a limited amount of information. If a person is experiencing negative emotion, he or she will be focused on whatever is making him or her sad and will be distracted. This distraction will interfere with taking in new information during iconic memory, which precedes short-term memory (Kuhbander et al., 2011). This is why it is important to focus on students of all age groups' emotional wellbeing because negative emotions can have an influence on even the smallest cognitive function.

Researchers and teachers should also be concerned with students' emotional well being because of all the positive long-term effects positive emotions have in many areas in a person's life. Though the current research does not show any significance in memory task performance or having higher grades, past research has found that happy people are more successful in a school setting, are more likely to graduate from college, and show better work performance than non-happy people (Lyubomirsky, Diener, & King, 2005). Happy people are also found to be able to build stronger and supportive social relationships, they are physically and mentally healthier, they have higher coping skills, and they are more creative (Lyubomirsky et al., 2005). A person's Subjective Happiness Score is very important to continue to examine in future research, especially in correlations with academic achievement.

According to research, it is now known that becoming a happier person is really not that difficult. Parks et al. (2012) identified simple and short steps to increase a person's level of happiness. The study conducted was an online application for the iPhone where a person could practice different activities that improve happiness on their own time for as long as they liked. The study found that increasing happiness is as easy as remembering happy days, savoring the moment, participating in random acts of kindness, and the most important activity was practicing gratitude (Parks et al., 2012). While the current research does not examine how a person becomes happier, future research should take this into account as a part of positive psychology. Today in positive psychology, there is a focus to not only improve happiness scores of those who fall below the average level, but instead aims to find ways to improve individuals who experience average happiness levels and go a step further to make them even happier.

References

Ahmed, W., Werf, G., Kuyper, H., & Minnaert, A. (2013). Emotions, self-regulated learning, and achievement in mathematics: A growth curve analysis. *Journal of Educational Psychology, 105,* 150-161.

Kuhbander, C., Lichtenfeld, S., & Pekrun, R. (2011). Always look at the broad side of life: Happiness increases the breadth of sensory memory. *Emotion, 11*, 958-964.

Lyubomirsky, S., Boehm, J., Kasri, F., & Zehm, K. (2011). The cognitive and hedonic costs of dwelling on achievement-related negative experiences: Implications for enduring happiness and unhappiness. *Emotion, 11*, 1152-1167.

Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin, 13*1, 803-855.

Lyubomirsky, S., & Layous, K. (2013). How do simple positive activities increase well-being? Current Directions in *Psychological Science, 22*, 57-62.

Lyubomirsky, S., & Lepper, H. (1999). A measure of subjective happiness: Preliminary reliability and construct validation. *Social Indicators Research, 46*, 137-155.

Lyubomirsky, S., Sousa, L., & Dickerhoof, R. (2006). The costs and benefits of writing, talking, and thinking about life's triumphs and defeats. *Journal of Personality and Social Psychology, 90*, 692-708.

Mega, C., Ronconi, L., & Beni, R. (2013). What makes a good student? How emotions, self-regulated learning, and motivation contribute to academic achievement. *Journal of Educational Psychology, 106*, 121-131.

Parks, A. C., Della, P., Matthew, D., Pierce, R. S., Zilca, R., & Lyobomirsky, S. (2012). Pursuing happiness in everyday life: The characteristics and behaviors of online happiness seekers. *Emotion, 12*, 1222-1234.

Sheldon, K. M., & Lyubomirsky, S. (2012). The challenge of staying happier: Testing the hedonic adaptation prevention model. *Personality and Social Psychology Bulletin, 38*, 670-680.

Appendix

SHS

By: Sonja Lybomisrsky, Ph.D.

For each of the following statements and/or questions, please circle the point on the scale that you feel is most appropriate in describing you.

1. In general, I consider myself:

1	2	3	4	5	6	7
Not a very happy Person						A very happy Person

2. Compared to most of my peers, I consider myself:

1	2	3	4	5	6	7
Less Happy						More Happy

3. Some people are generally very happy. They enjoy life regardless of what is going on, getting the most out of everything. To what extent does this characterization describe you?

1	2	3	4	5	6	7
Not at all						A great deal

4. Some people are generally not very happy. Although they are not depressed, they never seem as happy as they might be. To what extent does this characterization describe you?

1	2	3	4	5	6	7
Not at all						A great deal

5. Please reflect in a time where you found yourself unhappy. This memory can be as far back as your early childhood to a situation that you are currently involved in. Examples of times that you were sad could include any time in your life where your parents expressed that they were disappointed in you. It could be a memory of a time where you were rejected, either by a job, college, romantic partner. One other example of a time that could have upset you could be a time your friends flaked out on you, when you were really excited to go out for an activity with them but at last minute they say they have to reschedule.

Please write down an experience that made you particularly unhappy. You can be as vague or anonymous as you would like.

_____
_____
_____
_____

Follow Up

1. In general, what grade did you receive the most in the past?

A	B	C	D	F

2. Do you think that your mood can have an effect on you academic performance?

1	2	3	4
Strongly Disagree			Strongly Agree

3. Happiness is a choice.

1	2	3	4
Strongly Disagree			Strongly Agree

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The Relationship Between Pictures, Words and Memory
Do Pictures Enhance Memory?

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The present study investigated the influence pictures have on a memory task, as well as the influence of how well a word is remembered. The memory task used word lists of 12 common and 12 rare words in the English language. There were four conditions: common words presented alone, rare words presented alone, common words presented with pictures, rare words presented with pictures. Each picture gave a depiction of the word it was paired with; for example, when viewing the word 'army', those in the picture groups saw three men in uniform holding weapons in addition to the word 'army". One hundred undergraduate students participated in this study. Each type of list (either words alone or words with pictures) was presented on a slideshow in front of each group. The students were then asked to view each slide and to memorize as many words as possible. The results show that common words presented alone were better recalled than rare words presented alone. In regards to the common and rare word lists presented with pictures, no findings were significant. Pictures did not assist in the memorization of either common or rare words. Future studies should try to focus on using a reading comprehension memory test as demonstrated in past research rather than a word list to measure the relationship between pictures and memory.

The ability to remember is vital to day to day living. Memories allow a person to think about the past, make sense of our present times, and plan for our future accordingly (Barlow, Jolley, & Hallam, 2011). Therefore, discovering the best ways to properly store items in our memory is important. Research has shown that when trying to retain information, the presence of pictures to represent what you are reading or memorizing helps when it is time to recall the information (Marschark & Hunt, 1989). This finding is predicted by Paivio's dual-coding theory (Carpenter & Olson, 2012) which is based on the idea that the human mind processes and codes information in two separate ways, verbally and visually, hence dual coding.

Another interesting finding regarding memory is the word frequency effect. Research has shown how words of high frequency in our native language are easier to recall and remember compared to low frequency words (Watkins, LeCompte, & Kim, 2000). Word frequency is measured by how often the word is used in a written context or a verbal context (Miller & Roodenrys, 2012). Words that are used frequently are considered "high frequency words" and words that are used rarely are considered "low frequency words" (Miller & Roodenrys, 2012). High frequency words are more easily remembered due to the common usage in everyday conversations and written texts.

According to dual coding theory, pictures are favored over words in a retention task because of the use of two mental routes: the verbal and visual pathways (Whitehouse, Mayberry, & Durkin 2006). When viewing a picture, your mind connects to the imagery portion as well as the verbal portion of the image which is the message the picture conveys; therefore both the verbal and the visual routes are being activated at the same time to store the information. Once you are ready to recall the information, your brain is able to retrieve necessary elements from your visual memory and your linguistic memory to help arrive at the right answer (Carpenter & Olson, 2012). The visual stimuli provided by the picture is translated into verbal form, but is first established by what is seen with the naked eye (Whitehouse et al., 2006). When viewing just a word, your mind is restricted to only the verbal route (Whitehouse et al., 2006). An interesting notion provided by Whitehouse et al. 2006 is the fact that inner speech is required for a person to get the full effect of pictorial content. In order for dual coding to occur, a person must have both functioning verbal and visual pathway in their minds when they engage in a memory task involving imagery (Whitehouse et al., 2006).

A study by Whitehouse et al. (2006) examined the picture superiority effect, which occurs when pictures are recalled more than words in a verbal recall task, to see whether the picture superiority effect has the same impact among various age groups. In fact, dual coding theory is the first theoretical account to explain the picture superiority effect (Carpenter & Olson, 2012). According to Whitehouse et al. (2006), a person must engage in inner speech in order to activate both the verbal and the visual route in memory. Inner speech occurs when a person engages in "self-talk" and can internally connect with a stimulus and understand its verbal label (Whitehouse et al., 2006). Talking to oneself is apparent around the pre-school ages, so Whitehouse et al. (2006) conducted an experiment to see the difference in the effectiveness of pictures in a memory task with children, who

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have little use of inner speech, and older participants, who engage in inner speech regularly. Eighty participants were recruited from grades 2 to 11 and were divided into four groups (each group consisted of the same ages). The pictures shown were black and white line drawings and were presented in the middle of a computer screen individually every two seconds. The participants underwent three trials individually including 20-items, 10 pictures and 10 words. The 20-items were different in each of the three trials and all four groups saw both pictures and words (Whitehouse et al., 2006). The students were then told to orally recall as many words and pictures as they could remember within one minute. The results of the experiment show that pictures had a higher advantage over words in a memory task across all ages but this effect was much more profound for older ages (Whitehouse et al., 2006). This study provides the notion that inner speech is vital to properly engage in dual coding of a picture. Inner speech allows for a person to go over a situation in their minds without speaking out loud. If a person lacks inner speech, the dual processing of visual and verbal stimuli is hard to accomplish. Even though children in grades 2-3 also remembered more pictures than words, the impact was much greater with grades 7-11 (Whitehouse et al., 2006).

A similar study focused on children and the impact of animations. Seyit (2011) tested the impact of interactive storybooks on elementary school student's recall of a text. Reading a black and white text can be uninteresting to readers due to the lack of adequate stimulation. Researchers have wondered whether a more interactive relationship will have an effect on the reading process. Seyit (2011) assessed whether animations help elementary school students comprehend the text they are reading. Seventy-seven fourth grade students ages 9 to 11 participated in this study; 48 were female and 29 were male. The students were divided into three groups to read and study a story: Interactive storybook with animations, interactive storybook without animations, and a print version of the storybook. The students were then required to answer 13 multiple choice questions within 20 minutes without referring back to the material. The questions included both inferential and factual questions about the story (Seyit, 2011).

A significant difference was found between the groups. The interactive storybook with animations group produced higher levels of recognition on the multiple choice test with the print version coming in second, and the interactive storybook without animations coming in last (Seyit, 2011). The author hypothesized the cause of the findings to be due to rich visual information imbedded in the illustrations and the graphics. Pictures of the written words help when trying to comprehend the information, and accurately remember it (Seyit, 2011).

A similar study focused on the impact of drawing and interactive conversation on the ability of children to remember an event (Barlow, Jolley, & Hallam, 2011). The study consisted of 80 participants between the ages of five years to six years old. In the first meeting, the children saw a video about gravity and were told to return the next day to engage in an interview about what they saw the previous day (Barlow et al., 2011). They were then divided into four groups: tell only, draw and tell, interactive draw and tell, and interactive tell only. The interactive groups involved more elaboration from the children about what they were drawing (Barlow et al., 2011). Results show that children in the interactive draw and tell group produced the most accurate information when compared to the other three groups (Barlow et al., 2011). "Furthermore, because the drawing is a permanent and public record, unlike speech, the interviewer can refer the child's attention back to a previously drawn item that is presently available, thereby probing further the child's memory" (Barlow et al., 2011). Even though the interactive conversation is what aided in the child's memory the most, the drawing aspect is also very important. The drawing brought a visual depiction back to the child's short term memory and when the child was asked about a drawing, the drawing provided the child with the visual and verbal connection to answer the interviewer's questions. Barlow et al.'s study covers a different topic than the present study; however, it does give significant insight to the idea that illustrations can be influential to memory retrieval under various conditions of memory testing.

Erfani (2012) conducted an interesting experiment regarding the use of pictures in an ESP (English for speaking purposes) textbook. This study examined the use of pictures in a textbook used for teaching a foreign language. Erfani (2012) randomly recruited 65 students majoring in physics at a university. The experimental group read a textbook with pictures, and the control group read a textbook with no pictures (Erfani, 2012). After twelve weeks of studying the material, a posttest was given regarding the material. The results of the study revealed a significant difference between the experimental group and the control group (Erfani, 2012). Those who studied the ESP textbook with pictures received higher scores on the posttest than those who studied the ESP textbook with no pictures. The researcher concluded that pictures do aid in reading comprehension and memory (Erfani, 2012).

Storing information into memory is also more successful when you are studying or memorizing familiar items (Watkins, LeCompte, & Kim, 2000). An experiment by (Watkins et al., 2000) tested whether the familiarity of a word influences memorization. Thirty-two undergraduates participated in their study. Ninety-six concrete nouns were presented to the participants, 48 of which were common and 48 were rare. A within subjects design was conducted with each participant viewing both common and rare words. Participants remembered common words more than the rare words supporting the idea that frequency influences memory storage (Watkins, 2000).

Due to dual coding theory, and the word frequency effect, the present study tested their reliability. The independent variables in this study are the type of list: words or words with pictures and the type of word: common or rare. The dependent variable is the number of words recalled in each condition. Participants shown the common words alone will produce the highest level of recall when compared to participants shown the rare words alone. Also, participants shown a list consisting of words with pictures (both common and rare) will produce higher levels of recall compared to participants shown only words with no pictures (both common and rare).

Method

Participants

The study consisted of 100 participants from a public northeastern university. Each participant was at least 18 years of age. They were compensated by receiving partial course credit in their psychology courses.

Materials

Each participant received a blank sheet of college ruled paper and a writing utensil. On a PowerPoint, the word or the word with a picture was presented one at a time for three seconds. There were 12 common words and 12 rare words. Each picture was a close reference to the word provided. Examples of the common words are tractor, money, army, and children (See Appendix). Examples of rare words are gainsay, carouse, burnished, and shun (See Appendix).

Procedure

At the beginning of the experiment, the participants were informed that they would see a list of 12 words presented one by one on a PowerPoint presentation. One group saw a list of common words, one group saw a list of rare words, another group saw a list of the same common words with a picture depicting the word, and the last group saw the same list of rare words with a picture depicting the word. Each word or word/picture combination was presented for three seconds one after the other. Once all the words or word/picture combinations were presented, a final slide appeared with the word "recall." The participants were told to immediately recall as many words as they could. They had three minutes to recall.

Results

A 2 x 2 between subjects ANOVA was conducted with word recall as the dependent variable and type of word (common or rare) and type of list (words alone or words with pictures) as the independent variables. The results indicated that there was a significant main effect for the type of word, $F\,(1, 96) = 192.67$, $p < .05$, partial $\eta^2 = .67$, with those who viewed the common words list ($M = 8.8$, $SD = .21$) recalling more words than those who viewed the rare words list ($M = 4.20$, $SD = .26$). There was not a significant main effect for list type, $F\,(1, 96) = 2.03$, $p > .05$. There was also no significant interaction between the type of word and the type of list, $F\,(1, 96) = 9.49$, $p > .05$. Overall, common words are better remembered than rare words, and having a picture present has little impact on performance.

Discussion

This study examined the effects of pictorial content and word frequency on recall. The results indicate that common words are more easily remembered than rare words. Results also indicated that pictures do not help in the memory process. Those who viewed the common and rare lists with pictures recalled just as many words as those who viewed the common and rare lists with no pictures.

These results are consistent with the hypothesis that common words are more easily remembered than rare words due to the word frequency effect; however, the results are not consistent with the dual coding theory. The presence of pictures did not help the participants as the researcher hypothesized at the beginning of this experiment.

The results regarding common words being more easily remembered than rare words is consistent with a previous study done by (Watkins et al., 2000.) They were able to support the word frequency effect when they found a significant effect in their study. A more recent experiment done by Miller and Roodenrys (2012) studied the effect of word frequency in a serial word recall task. Participants studied a pure list of high frequency words, a pure list of low frequency words, and two mixed lists. Their results for the pure lists were consistent with the results in the present study. Common words were more easily recalled than rare words.

Some possible explanations for the inconsistencies with the hypothesis regarding pictures could be that this study used word lists as the memory task and previous research used textbooks and stories to evaluate the effectiveness of pictures. Barlow et al. (2011), Erfani (2012), and Seyit (2011) all used written texts in their studies. All found that pictures aided in memory. Future studies should try to mimic previous research procedures to ensure significant findings. A study by Jalilehvand (2012) evaluated the effects of text length and pictures on reading comprehension. This study consisted of four conditions: long text with pictures, long text without pictures, short text with pictures, and short text without pictures. 79 students were told to read the text and answer five multiple choice questions and ten true/false once they were finished. The length of the reading had no significance on their reading comprehension but the presence of pictures did. The present study is inconsistent with Jalilehvand's (2012) findings and a possible reason for that could be that they used a text and not a word list. Another possible reason could be that the rare words were too easy to remember. Future research should evaluate the how rare these words really are to the participants involved. A pre-test regarding the words could have been conducted to eliminate this confounding variable.

The goal of this study was to see whether pictures are an aid in a memory task regarding a list of common and rare words. One hundred students were included in this study with four conditions: common words alone, rare words alone, common words with pictures, rare words with pictures. The four different lists were presented one at a time on a PowerPoint slide in a classroom setting. The results indicate that the word frequency effect was validated with common words being more easily recalled than rare words. However, the dual coding theory was not supported. The picture groups did not recall more words than the non-picture groups. Despite the findings, pictures have been proven to help with a memory task. As previous studies have demonstrated, pictures can aid in memory recall when using a reading comprehension text rather than a word list. Written texts

tend to have a solid context to them, whereas a list of words can seem too broad or vague to properly memorize. Future studies should consider the idea of having one group memorize a list of words with pictures and one group memorize a storyline with pictures to see if there is a difference between the type of independent variable.

References

Barlow, C. M., Jolle R. P., & Hallam, J. L. (2011). Drawings as memory aids: Optimizing the drawing method to facilitate young children's recall. *Applied Cognitive Psychology, 25*(3), 480-487.

Carpenter, S. K., & Olson, K. M. (2012). Are pictures good for learning new vocabulary in a foreign language? Only if you think they are not. *Journal Of Experimental Psychology: Learning, Memory, And Cognition, 38*(1), 92-101

Erfani, S. (2012). Pictures speak louder than words in ESP, too! *English Language Teaching, 5*(8), 164.

Jalilehvand, M. (2012). The effects of text length and picture on reading comprehension of Iranian EFL students. *Asian Social Science, 8*(3), 329-337.

Marschark, M., & Hunt, R. (1989). A reexamination of the role of imagery in learning and memory. *Journal of Experimental Psychology: Learning, Memory, And Cognition, 15*(4), 710-720.

Miller, L. M., & Roodenrys, S. (2012). Serial recall, word frequency, and mixed lists: The influence of item arrangement. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 38*(6), 1731-1740.

Seyit, E. (2011). The impact of interactive storybook on elementary school students' recall.*US-China Education Review A*, (1a), 140-146.

Watkins, M. J., LeCompte, D. C., & Kim, K. (2000). Role of study strategy in recall of mixed lists of common and rare words. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 26*(1).

Whitehouse, A. O., Maybery, M. T., & Durkin, K. (2006). The development of the picture superiority effect. *British Journal of Developmental Psychology, 24*(4), 767-773.

Appendix

Rare Words
- Drear
- Carouse
- Gainsay
- Gloaming
- Burnished
- Outworn
- Upheave
- Raiment
- Shun
- Spinney
- Forespeak
- Bole

Common Words
- Army
- Children
- Police
- Music
- Doctor
- Kitchen
- Tractor
- Farm
- Fire
- Football
- Garden
- Money

Rare words with pictures
- Drear
- Carouse
- Gainsay
- Gloaming
- Burnished
- Outworn
- Upheave
- Raiment
- Shun
- Spinney
- Forespeak
- Bole

Common words with pictures
- Army
- Children
- Police
- Music
- Doctor
- Kitchen
- Tractor
- Farm
- Fire
- Football
- Garden
- Money

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Effects of Priming on Reaction Times and Memory for Targets in Flanker Tasks

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Forty-seven students from a public northeastern university completed a flanker task. It was hypothesized that priming with distracters in a flanker task would lead to slower reaction times and that participants would recall more letters than images. Also, it was hypothesized that distracter primed stimuli would be recalled more often. The target and distracters for one group was letters, and the target and distracters for another group were pictures. Participants were asked to identify the center or target item, or they were asked to identify the corresponding category to which the item belonged. Reaction time was recorded, as was the number of targets recalled following the experiment. Within the trials, the relationship between the target and its previous distracters was manipulated. Results showed that the way the stimulus was presented effected reaction time and recall, but the target/distracter relationship did not, so there was no support that distracter priming leads to negative or hindered results.

A flanker task is when a target stimulus is presented in the center of a display, and the participant must identify the target as quickly as possible. The display also contains two distracters or flankers to the right and left of the target stimulus (Hübner & Lehle, 2007). Participants were instructed to ignore these flankers and only identify the target. This investigation demonstrates an example of negative priming in a typical flanker task. Negative priming is when priming has a negative effect on participants' reaction times. In the described flanker task, participants were primed to ignore a variable rather than to focus on it. According to the dual mechanism theory of negative priming, both selective inhibition and episodic retrieval play a part in negative priming (Tse, Hutchinson, & Li, 2010). Selective inhibition refers to the way the brain encodes information during priming and is involved in priming cases without target repetition where the target does not repeatedly and consistently show in the same spot. According to Tse et al. (2010), in selective inhibition, the brain only store into memory parts of events that it finds to be important at the time and forgets distracting information. Episodic retrieval refers to the way that the brain retrieves primed information in future circumstances. Episodic retrieval is more relevant when target repetition is involved in the priming task. In episodic retrieval, the brain recalls a certain entire event that happened and brings it back into its memory. These two mechanisms help to explain why when one completes a flanker task, the brain subconsciously remembers what has occurred in the previous tasks and links targets to the previous flankers. For example, in Tse et al.'s (2010) study, participants completed a typical flanker task in which the researchers used triplet displays of letters. In the cases of ignored repetition, where the target letter was displayed and on the following serves as one of the distracter letters, reaction times to identify the new target stimulus were significantly slower than in cases in which the targets and distracters presented in triplets immediately following one another were unrelated. This shows that when the brain is primed to ignore a stimulus in one event, it remembers this and sets this up as a general rule subconsciously. The participant's brain must reevaluate when in the following the task, since the stimulus is now the target and should not be ignored. This process of reevaluation is an example of the inhibitory process, which is the process in which a stimulus cues the brain to retrieve previously stored information (Tipper, 2001). The participant sees the stimulus on the screen and cues the brain to recall which stimuli in the previous trials were distracters and which were targets in order to accurately identify the new target stimulus. The Houghton-Tipper Model describes this process through a neural network model in which the brain creates a template that it uses to compare the different inputs it perceives. For example, in the flanker task, the brain creates a template with the distracters it has seen and uses this in evaluating subsequent stimuli. The brain reminds the participant to ignore these distracting stimuli in future trials. As mentioned in Tipper's (2001) review, negative priming leads to slower reaction times due to the extra processes needed to distinguish between the new information and past information. Tse et al.'s (2010) experiment and Tipper's review provide evidence to support the theory of episodic retrieval, in which the brain retrieves previous information and uses that information, sometimes to one's detriment, to complete current tasks.

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Episodic retrieval can be influenced by the different characteristics of stimuli. One characteristic is the stimulus type. The type of stimulus or way that the stimulus is presented can have an effect on the participant's ability to identify and remember the stimulus. Wells and Hamm (2009) studied the effects of inverting stimuli in flanker tasks. They presented their stimuli at different angles and in different directions. Their study showed that commonly recognized stimuli, which were rotated to an angle different from their upright position, lead to slower identification by participants. This is an example of how the way the stimuli is presented can affect the time it takes participants to identify the subject matter.

Wells and Hamm (2009) conducted a second experiment using a categorical stimulus type. The stimuli presented in their flanker tasks were all included in the same category, which were quadruped animals. Participants were asked to identify the specific name of the animal presented in the center as the target animal. All animals were similar since they were in the same category, but participants needed to be able to ignore the flanker animals with similar characteristics to the target and only identify the target quadruped. Wells and Hamm (2009) predicted that the group that needed to sort through the similar images and determine the difference between the target and distracters in order to determine the specific image presented as the target would have slower reaction times since this would require more time to do. This is an example of how using categorical stimuli leads to a more complicated identifying process. The brain must focus on not only determining the correct category, but also the specific image presented, leading to a slower reaction time.

Many studies have shown that the brain's ability to recall or remember is altered by the memory block effect. In would fragment completion tasks, being primed by viewing a similar word hinders the retrieval of the following known word (Landau & Leynes, 2006). In this study, participants were given a fragmented common word and asked to fill in the blanks to complete the word. Before being given this word, they were primed with a similar word that would also fit in the blanks, but it was actually not the correct word. After seeing this word, participants found it very difficult to identify the fragmented word. Landau and Leynes (2006) found that participants were able to complete more of the words that were not primed. This is an example of the memory block effect because after being primed with a word similar to the word needing to be completed, one's memory becomes blocked and is unable to piece together the word needing completion. Rass and Leynes (2007) explored the generality of the memory block effect by proving that it can be seen not just in a specific set of stimuli used in multiple experiments of word fragment completion tasks. In their experiment, different types of stimuli previously found to trigger the memory block effect were tested as well as new stimuli. Participants were asked to complete words with missing letters, and before being presented with these incomplete words, the participants were presented with the memory blocking stimuli. They found that reaction times were significantly slower for completing the given word fragments. This showed that many other types of stimuli causes memory to be blocked when completing tasks, not just in specific word lists found in past research. As long as the primed words had similar characteristics to the target word, memory was inhibited. This supports the idea that having a distracter become the target stimuli in flanker tasks will cause the identification reaction time to be slower because the distracter primes are the same as the target prime in cases in which there is a relationship between distracters and targets.

In addition to the memory block effect, another theory of focus in the current study is the congruency effect. The congruency effect describes the resulting decline in performance on incongruent trials as compared to congruent trials. Although the flanker stimuli are meant to be ignored, the participant's brain still processes these items in order to confidently identify the target variable (Nieuwenhuis et al., 2006). The brain processes the flankers in order to eliminate flankers from the identification so that only the target variable is left, and to also make sure that the target and flanker variables are not the same. This is why in incongruent trials where the target becomes the flanker, participants take significantly longer to identify the target stimulus.

With this information, I believe that priming with distracters in a flanker task will lead to slower reaction times of participants, as will using categories as related stimuli as compared to independent stimuli. I also believe that when asked to recall the target variables from the completed flanker tasks, participants will recall more letters than object stimuli, as the objects will only make them think of categories, so they will not remember the exact objects shown, whereas with the letters, the specific independent object will be remembered. I also think that the distracter-primed stimuli will be recalled more often for both letters and objects, as it shows repetition of the stimulus and causes the brain to think more about those specific stimuli. In the categorical group, items primed with distracters will be recalled more than the items that were not primed at all. The independent variables will be stimulus type and the target-distracter relationship. The stimulus types will be the use of independent letters versus categories of pictures in the flanker tasks. The dependent variables will be the reaction times of identifying the target variables in flanker tasks and the memory recall of target stimuli afterwards.

Method

Participants

The participants were students from a public northeastern university (47 students with the age range of 18 and up). They were recruited from the campus with flyers and by their instructors. Students were compensated with partial course credit or extra credit. The sample was one of convenience, and participants were randomly assigned to one of two groups.

Materials

The experiment was conducted with the SuperLab program.

Procedure

Each participant was assigned randomly to a stimulus type group before sitting at the computer. All participants were shown a group of three characters and asked to identify the center stimulus while ignoring the distracter or flanker stimuli on either side of the center stimulus. First, the participants did a practice round of 36 trials, and then they completed the official round of 72 trials. Each trio of characters were presented on the screen until the participant responded by pressing the corresponding key on the keypad. For participants in the letter group, the characters were a trio of letters, and the participants identified the center letter. The letters consisted of J, O, W, and F. For participants in the categorical group, the characters were a trio of pictures, and the participants had to identify the category of the center image. The categories consisted of animals, fruits, vegetables, and people. In both stimulus groups during the practice round for 18 of the trials, targets and distracters are independent, and for another 18 of the trials, targets and distracters were related. Thirty-six trials did not exhibit a target-distracter relationship, while another 36 of the trials did exhibit a relationship between the target and distracter through previously used targets and distracters. Reaction times will then be measured.

After completing the flanker task, participants were asked to recall as many of the target stimuli as possible. For the letter group, participants listed all of the target letters that they remembered. They had two minutes to list all of the letters. For the categorical group, participants were asked to identify all of the target items that they remembered, which could only be the exact target picture. These results provide the information needed to determine if the type of stimulus had an effect on the participants' ability to recall the target stimulus and if the negative priming had an effect on the participants' ability to remember the target items.

Results

A 2 x 2 one-between-one-within subjects ANOVA test on reaction time was conducted with stimulus type (independent, categorical) as the between subjects factor and target-distracter relationship (relationship, no relationship) as the within subjects factor. The results showed that there was no significant effect for target-distracter relationship, F (1, 45) = 3.17, $p > .05$. This meant that the relationship between the current target and previous distracters did not have a significant effect on the participants' reaction time. The results also showed a significant main effect for stimulus type, F (1, 45) = 159.16, $p < .05$, partial η^2 = .78, with those tested using the letters (M = 713ms, SD = 137ms) producing significantly faster reaction times than those tested using the categorical stimulus type (M = 1490ms, SD = 263ms).

A second 2 x 2 one-between-one-within subjects ANOVA test on target recall was conducted with stimulus type (letter, categorical) as the between subjects factor and target-distracter relationship (relationship, no relationship) as the within subjects factor. The results showed that there was no significant effect for target-distracter relationship, F (1, 45) = .17, $p > .05$. The relationship between the current target and previous distracters did not have a significant effect on the participants' ability to recall the target variables. The results also showed a significant effect for stimulus type, F (1, 45) = 49.94, $p < .05$, partial η^2 = .53, with those tested using the letters (M = 100%, SD = 0.00) resulting in significantly more target stimuli recalled than those tested using the categorical stimulus type (M = 80%, SD = 13.90).

Discussion

This experiment studied how the organization of items and the relationship between items viewed affect the brain's ability to recognize and identify them. The results showed that the relationship between the current target stimulus and previous distracter stimuli did not have a significant effect on the time it took participants to identify the current target stimulus. The hypothesis that priming with distracters in a flanker task would lead to slower reaction times of participants was not supported. The results did show that the letter targets elicited faster identification reaction times than the categorical targets. The second part of the experiment showed that the letter targets were recalled significantly more often by participants than the categorical targets. The results showed that the relationship between the current target stimulus and previous distracter stimuli did not have a significant effect on the participant's ability to recall the target stimuli. The hypothesis that the distracter primed stimuli would be recalled more often due to repeated exposure to the stimuli and cause the brain to think more about those specific stimuli was not significantly supported with this data.

The difference in reaction time between different stimulus types was similar to that observed in previous studies (Wells & Hamm, 2009) and thus supported the idea that categorical stimuli take more time for the brain to process due to their complex nature and leads to slower identification reaction times compared to letter stimuli. According to Tse et al. (2010), when participants are primed with a target-distracter relationship, their reaction time should become slower due to the effect of previously stored information. Studies have supported the Houghton-Tipper Model, which argues that the brain creates a template with information that it retrieves for future tasks (Tipper, 2001). This would mean that the participant should respond slower to data when there is a relationship between the past distracters and current target because the brain must adjust its template, which also correlates with the response competition paradigm that explains how changes in reaction time occur due to the activation of competing responses in the brain (Eriksen, 1995). The difference in the recall ability across stimulus types was consistent with the idea that simple data is easier to recall than more complex data as it takes less effort and concentration to remember in order to retrieve it from memory (Tse et al., 2010). According to Landau and Leynes (2006), being primed by viewing similar information to the target information should hinder the retrieval of the target. Therefore, being primed by seeing an item go from being a distracter to a target should actually make it easier for the brain to recall due to

repetition and increased focus on this item, but that does not seem to be the case in the current study.

One problem with investigating the effect of the target-distracter relationship is that many trials must be presented. For example, in Nieuwenhuis et al.'s (2006) study, 40 practice trials were given followed by 16 blocks of 40 trials each. The current experiment only displayed 36 practice trials followed by 2 blocks of 36 trials each. Significantly more trials may have elicited the desired response to the target-distracter relationship. This task was also completed in a small room that, at times, was filled with multiple participants waiting their turn. The noise level may have caused more distractions that caused both trials with a target-distracter relationship and with no target-distracter relationship to require more time to think before a response was given. When it comes to the recall portion of the study, due to the use of both letter and categorical targets and wanting to keep the reaction time responses limited to four options, there ended up being only a total of four items needing to be recalled in the independent group compared to the 10 specific item names that were asked to be recalled in the categorical group. As previous research on short-term memory indicates, the typical storage capacity for short-term memory is seven plus or minus two items (Miller, 1956). It is very likely that participants would easily be able to recall four letters as compared to ten different images. This could be why the current study's results showed a strong significant difference in memory recall across the two different stimulus types.

After conducting this study, in order to further our knowledge on priming with distracters, a second study should be conducted and focused on the target-distracter relationship rather than combining this with the stimulus type. We have seen differences in stimulus type, so now an experiment should be done using solely letter targets and focusing solely on the reactions times rather than recall as well. The experiment should contain close to 800 trials in order to get an accurate result and be sure that the participant really experienced the priming rather than that the participant was not paying attention. Distracter and target repetition would demonstrate the effects of stimulus repetition priming on participants' reaction time, similar to the study done by Purmann, Badde, Luna-Rodriguez, and Wendt (2011). Their study examined how participants responded when they viewed a series of flankers with target stimulus repetition, and then they were given a different or incompatible target stimuli. Participants' responses were slower once the stimulus as changed. The effects of target repetition on other activities, such as reading or writing, should also be looked at since the task is more complicated than just identifying variables, and the time it takes someone to read or write and excerpt with distracters would most likely be significantly slower than reading or writing without interference from distracters.

In summary, the present findings provide further evidence that stimulus type influences target identification reaction time as well as the ability to recall stimuli in flanker tasks. They also do not confirm the findings that the target-distracter relationship and the ability to recall stimuli in flanker tasks. The investigation combined the use of flanker tasks and the SuperLab program to test the effects of priming on reaction time and recall, hoping to demonstrate an example of negative priming. The current study does not dismiss the idea of negative priming, but rather makes it clear that more research is needed on this topic to strengthen the idea that flankers or distracters serves as a priming tool and can, in fact, affect the participants' response. The results suggest that distracter priming may only lead to negative priming in specific item flanker tasks. An important question for future research is how can one overcome these distractions and improve one's reaction time even after being distracter-primed in order to prevent negative priming.

References

Eriksen, C. W. (1995). The flanker task and response competition: A useful tool for investigating a variety of cognitive problems. *Visual Cognition, 2*, 101-118.

Hübner, R., & Lehle, C. (2007). Strategies of flanker coprocessing in single and dual tasks. *Journal of Experimental Psychology: Human Perception and Performance, 33*, 103-123.

Landau, J. D., & Leynes, P. A. (2006). Do explicit memory manipulations affect the memory blocking effect? *American Journal of Psychology, 19*, 463-479.

Miller, G. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *The Psychological Review, 63*, 81-97.

Nieuwenhuis, S., Stins, J. F., Posthuma, D., Polderman, T. J., Boomsma, D. I., & de Geus, E. J. (2006). Accounting for sequential trial effects in the flanker task: Conflict adaptation or associative priming? *Memory and Cognition, 34*, 1260-1272.

Purmann, S., Badde, S., Luna-Rodriguez, A., & Wendt, M. (2011). Adaptation to frequent conflict in the Eriksen flanker task: An ERP study. *Federation of European Psychophysiology Societies, 25*, 50-59.

Rass, O., & Leynes, A. (2007). When do primes go bad? A corpus of orthographically related primes that inhibit fragment completion. *Behavior Research Methods, 39*, 870-875.

SuperLab 4.0 Manual. (1990-2008). San Pedro, CA: Cedrus Corporation.

Tipper, S. (2001). Does negative priming reflect inhibitory mechanisms? A review and integration of conflicting views. *The Quarterly Journal of Experimental Psychology, 54A*, 321-343.

Tse, C., Hutchinson, K. A., & Li, Y. (2010). Effects of contextual similarity and target-repetition proportion on negative priming in RT distributional analyses. *Journal of Experimental Psychology: Human Perception and Performance, 1*, 1-13.

Wells, I., & Hamm, J. (2009). The effects of inverting natural stimuli in a flanker task. *Canadian Journal of Experimental Psychology, 63*, 33-39.

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Is Work Experience or the School One Attends Relevant When Applying for a Job?

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This experiment was conducted to determine if the school one graduates from or work experience plays a bigger role in the hiring process of potential employees. Participants in this study received one of six scenarios. The scenarios provided the participant with information about a potential employee, the work experience the potential employee has, and the corresponding school that the potential employee graduated from. After participants read over the given scenario they were asked to complete a short questionnaire asking them a number of questions to determine how they feel about the potential employee and if the potential employee would be a candidate that this participant would consider for hire. The results showed that if a potential employee has any type of relevant work experience, this potential employee is a desirable candidate for hire no matter what school they graduated from.

Whenever an individual begins the process of applying for a job, this individual is constantly trying to determine what elements stand out the most that would put this individual at an advantage over other candidates. Previous research suggests that applicants were more likely to be recommended for subsequent interviews when their resumes included descriptions such as job related information (Tsai, Chi, Huang, & Hsu, 2011). This shows that work experience can be a key factor in how higher executives view, and go about their respective hiring processes. Students enrolled in or coming right out of college want to have an advantage going out into the work force. Gaining the proper work experience can be seen as going down the right path when a student is thinking about their future. The student's grades may or may not be as good as their competitors, but the asset of work experience can possibly compensate for the lack of good grades. An article by Thomas Brock exemplifies the importance of interacting between students, faculty, and staff while attending college and goes more in depth about how these contribute to success after college (Brock, 2010). This can be compared to how well a student can perform in the work place, and can somewhat predict how well they will be evaluated while working. Take a second to think about the individual who works with the department faculty day in and day out, as opposed to the individual who does not form a relationship with faculty. The individual who is closer to the faculty can be seen as having a better sense of the real world, having dealt with many demands given by the department and other students. Brock's research can relay to the lay person in a way as to why businesses want references from previous work experience to determine how well a potential employee can perform in their company. References can be very vital, and can make or break a potential employee's chances of getting hired. Previous research has also suggested that some good characteristics of early work experiences that stand out are the number of previous jobs, the length of the jobs, and the different types of experiences (McDonnall & O'Mally, 2012). A potential employee may have worked at one specific place for a very long period of time throughout his or her life, possibly symbolizing loyalty, while an individual who has bounced around from different job to different job could possibly symbolize poor work skills. This type of information about a potential employee can very well factor in to the decision of hiring a potential employee or not, and is also very important to the higher executives who are in charge of the hiring process.

When a student is working towards his or her degree, some may say that they are in a period of "emerging adulthood," which is usually when most men and women become more socially dominant, warm, responsible, agreeable, and emotionally stable (Arnett, 2000). Most men and women who are in the process of applying to jobs out of college may fall within this category of development because they are constantly changing, not only cognitively, but socially as well. It is important for employees to understand this concept, because they want individuals with reliable personality traits and individuals working for them who can get the job done efficiently. It is noted that personality is thought to be resulting from a combination of ongoing participation in social roles and social interactions (Aldwin & Levenson, 1994). Previous research has found that job characteristics may be related to changes in personality

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(Brousseau & Prince, 1981). This can indicate to employers that depending on an individual's work experience, employers may be slightly able to tell how a potential employee may fit in, or how hard the potential employee might work, by their personality. If a potential employee possesses an unfavorable personality, they may have negative job characteristics attached to them, as opposed to a potential employee with a more energetic personality who may possess a more reliable work ethic.

The theory for this experiment is that individuals responsible for hiring potential employees will favor applicants with varying amount of work experience who graduated from prestigious universities over potential employees with any amount of work experience who graduated from a not so prestigious university. The two universities that will be compared throughout this study are State University of New York (SUNY) Geneseo and SUNY Old Westbury. The former is considered more selective and prestigious than the latter, according to specific SAT scores, ACT scores, selection criteria, and other admissions criteria from the College Board. The hypothesis for this experiment is that a potential employee with work experience will hypothetically be chosen for employment no matter the particular school one attended. Specifically, overall work experience is more crucial to the outcome of a company considering long term goals than a potential employee's grade point average or than the college one attended.

Method

Participants

There were thirty-seven individuals who participated in this experiment. Thirty-five of these participants were students at Western Connecticut State University. The other two participants in this experiment were staff members at Western Connecticut State University. One of the participants did not complete the experiment and no data were collected for this participant.

Design

The design of this particular experiment was a 2 x 3 between subjects factorial experiment. Participants were randomly assigned to one of six different scenarios, and all participants had to answer the same questions no matter what scenario these participants were given. The independent variables in this experiment were the school one graduated from (two levels, SUNY Geneseo, a prestigious university, and SUNY Old Westbury, a not so prestigious university), and the different type of work experience the potential employee possessed (three levels, No experience, Non-relevant experience, Relevant experience). In this experiment, prestigious is simply talking in the context that one school is more competitive than the other, and that students from the less prestigious school happened to have lower admissions criterion than the more prestigious university. All information provided to the participants about the universities can be found encompassed in the scenarios given to them. The dependent variable in this experiment was the actual score of the questions that the participant answers at the end of the experiment. The lower the overall question sum, the better the score for that potential employee.

Materials

There were a total of six different scenarios randomly assigned to individuals who participated in this experiment. Each scenario presented the participants with information telling them that they were hypothetically responsible for the hiring of the potential employee in the scenario that was distributed to them. Each scenario talked about a different potential employee, and gave relevant information about the school the potential employee attended (SUNY Geneseo, SUNY Old Westbury), such as the selectiveness level of the university, how many incoming students that were in the top tenth of their graduating class, and how many incoming freshman had a cumulative high school grade point average equal to a 3.75 or over. The participants were also presented with information letting them know the average SAT math and critical reading scores for incoming freshman, as well as the average SAT scores for these subjects among all incoming freshman attending college, and the average ACT score for incoming freshman as well (See Appendix) At the end of the scenario, the participants were given knowledge about the work experience of the potential employee, and were asked six different questions about the potential employee (See Appendix).

Procedure

Participants were first given two Informed Consent forms telling them background information about the experiment, who the researcher was, and approximately how long the experiment would take. They were asked to keep one of these forms for their own personal records. The beginning of the data collection started as soon as the participant handed the researcher one of the two informed consent forms back with their signature. The participant was presented one of the scenarios. After reading this scenario, the participants were then asked to answer the provided questionnaire. Upon completing the questionnaire, the experiment was over.

Results

A reliability scale reveals that the questions asked were quite reliable (Cronbach's Alpha = .89). A between subjects factorial analysis of variance showed a main effect of work experience; F (2, 30) = 5.15, $p < .05$, partial $\eta^2 = .26$. This tells us that work experience is one of the most important factors determining if a potential employee would be hired or not. There was no main effect on the type of school an individual graduated from; F (1, 30) = 1.80, $p > .05$. This means that the school a potential employee graduated from did not matter when participants were making decisions relating to hiring of the potential employee. The interaction between which school a potential employee graduated from, and what level of experience the potential employee had did not show a significant difference in whether a potential

employee would be hired or not; $F(2, 30) = .41$, $p > .05$. In other words, these results show us that work experience was really the most important factor for participants. These results did support the original hypothesis presented by the researcher.

Discussion

An important aspect of this experiment would be to note that the interaction between work experience and the school one graduated from did not necessarily matter. These two variables, when taking into context with each other do not seem to be significant, and do not affect the outcome of the experiment. When one interprets the significant main effect of work experience, and the non-significant main effect of the school one graduated from, one can see that this was consistent provided with the findings of the interaction. The research for this experiment may have had several limitations. The experiment was only limited to the campus of a small public, northeastern university. If the participants in this study were more diverse, (such as being from different financial companies, or part of a Human Resources department), the results of this experiment may have changed, considering that these individuals would possibly have more knowledge on work experience that would mesh effectively in order to perform well for their respective companies. A more diverse sample would provide various perspectives on how potential employees' work experience, or lack there of, could affect their fit for a particular company. For future research, adding what major a potential employee graduated with could provide even more accurate results, as well as adding what particular position the potential employee was applying for. Previous research shows that greater emphasis is being put on the role of practical work experience (Gammie & Joyce, 2008). This can tell the general audience that the individuals responsible for the hiring of potential employees would prefer to see relevant work experience on the resumes of their potential employees to make an educated decision on whether to hire them or not.

The problem that was being sought after in this study is to find out if work experience plays a bigger role than the school one graduates from when applying for a job. An investigation was conducted to see if different kinds of work experience were favorable to individuals acting as higher executives of a company responsible for the hiring of potential employees. As depicted from the results of this study, work experience does matter when applying for a job, taking into consideration what school one graduates from as well.

References

Aldwin, C. M., & Levenson, M. R. (1994). Aging and personality assessment. In M. P. Lawton & J. A. Teresi (Eds.), *Annual review of geron-tology and geriatrics: Focus on assessment* (pp. 182–209). New York: Springer Publishing Company.

Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist, 55*, 469-480.

Brock, T. (2010). Young adults and higher education: Barriers and breakthroughs to success. *The Future Of Children, 20*, 109-132. doi:10.1353/foc.0.0040

Brousseau, K. R., & Prince, J. B. (1981). Job-person dynamics: An extension of longitudinal research. *Journal of Applied Psychology, 66*, 59-62.

Gammie, E., & Joyce, Y. (2009). Competence-based approaches to the assessment of professional accountancy training work experience requirements: The ICAS experience. *Accounting Education, 18*(4-5), 443-466. doi:10.1080/09639280902719465

McDonnall, M., & O'Mally, J. (2012). Characteristics of early work experiences and their association with future employment. *Journal Of Visual Impairment & Blindness, 106*,133-144.

Tsai, W., Chi, N., Huang, T., & Hsu, A. (2011). The effects of applicant résumé contents on recruiters' hiring recommendations: The mediating roles of recruiter fit perceptions. A*pplied Psychology: An International Review, 60*, 231-254. doi:10.1111/j.14640597.2010.00434.x

Appendix

Scenario 1:

You are a manager of a financial hedge fund in Norwalk, CT. You are responsible for the hiring of potential employees. Jon applied for an opening in your firm and is a potential employee. Jon is 22 years, has a 2.9 grade point average, and graduated from SUNY Geneseo in Geneseo, New York. This university is classified as being very selective. According to collegeboard.org, at this particular school 54% of incoming freshman were in the top tenth of their graduating high school class. Fifty percent of incoming freshman have an overall high school grade point average of 3.75. Incoming freshman who were admitted had an average SAT score of 635 on the critical reading, and 650 on the math section. The average SAT critical reading score and the average SAT math scores for all test takers are 500. The average ACT score was 28 for incoming freshman.

Jon has also worked many financial internships with hedge funds, and has relevant experience prior to applying for this job. He also has previous relevant experience with stocks and the financial markets, and was a financial analyst the summer after his freshman year in college.

Scenario 2:

You are a manager of a financial hedge fund in Norwalk, CT. You are responsible for the hiring of potential employees. Joe applied for an opening in your firm and is a potential employee. Joe is 22 years, has a 2.9 grade point average, and graduated from SUNY Geneseo in Geneseo, New York. This university is classified as being very selective. According to collegeboard.org, at this particular school 54% of incoming freshman were in the top tenth of their graduating high school class. Fifty percent of incoming freshman have an overall high school grade point average of 3.75. Incoming freshman who were admitted had an average SAT score of 635 on the critical reading section and 650 on the math section. The average SAT critical reading score and the average SAT math scores for all test takers are 500. The average ACT score was 28 for incoming freshman.

Joe has non-relevant experience with other jobs prior to him applying for your opening. He spends his summers being a local camp counselor and works as a waiter on the weekends. He often delivers newspapers occasionally as well.

Scenario 3:

You are a manager of a financial hedge fund in Norwalk, CT. You are responsible for the hiring of potential employees. Jim applied for an opening in your firm and is a potential employee. Jim is 22 years old, has a 2.9 grade point average, and graduated from SUNY Geneseo in Geneseo, New York. This university is classified as being very selective. According to collegeboard.org, at this particular school 54% of incoming freshman were in the top tenth of their graduating high school class. Fifty percent of incoming freshman have an overall high school grade point average of 3.75. Incoming freshman who were admitted had an average SAT score of 635 on the critical reading section and 650 on the math section. The average SAT critical reading score and the average SAT math scores for all test takers are 500. The average ACT score was 28 for incoming freshman.

Jim has not had a job his whole life and has no prior experience. He played football in college and was the star running back. He spent a lot of his time playing the guitar and other instruments. He was also in various organizations on campus, such as the Rotaract (community service) club, and the Future Leaders of America club.

Scenario 4:

You are a manager of a financial hedge fund in Norwalk, CT. You are responsible for the hiring of potential employees. Justin applied for an opening in your firm and is a potential employee. Justin is 22 years old and has a 2.9 grade point average, and graduated from SUNY Old Westbury in Old Westbury, New York. This university is classified as being somewhat selective. According to collegeboard.org, at this particular school 12% of incoming freshman were in the top tenth of their graduating high school class. Six percent of incoming freshman have had an overall high school grade point average of 3.75. Incoming freshman who were admitted had an average SAT score of 485 on the critical reading section and 490 on the math section. The average SAT critical reading score and the average SAT math scores for all test takers are 500. The average ACT score was a 23 for incoming freshman.

Justin has also worked many financial internships with hedge funds, and has relevant experience prior to applying for this job. He also has previous relevant experience with stocks and the financial markets, and was a financial analyst the summer after his freshman year in college.

Scenario 5:

You are a manager of a financial hedge fund in Norwalk, CT. You are responsible for the hiring of potential employees. Jacob applied for an opening in your firm and is a potential employee. Jacob is 22 years old and has a 2.9 grade point average, and graduated from SUNY Old Westbury in Old Westbury, New York. This university is classified as being somewhat selective. According to collegeboard.org, at this particular school 12% of incoming freshman were in the top tenth of their graduating high school class. Six percent of incoming freshman have had an overall high school grade point average of 3.75. Incoming freshman who were admitted had an average SAT score of 485 on the critical reading section and 490 on the math section. The average SAT critical reading score and the average SAT math scores for all test takers are 500. The average ACT score was a 23 for incoming freshman.

Jacob has non-relevant experience with other jobs prior to him applying for your opening. He spends his summers being a local camp counselor and works as a waiter on the weekends. He often delivers newspapers occasionally as well.

Scenario 6:

You are a manager of a financial hedge fund in Norwalk, CT. You are responsible for the hiring of potential employees. Jackson applied for an opening in your firm and is a potential employee. Jackson is 22 years old and has a 2.9 grade point average, and graduated from SUNY Old Westbury in Old Westbury, New York. This university is classified as being somewhat selective. According to collegeboard.org, at this particular school 12% of incoming freshman were in the top tenth of their graduating high school class. Six percent of incoming freshman have had an overall high school grade point average of 3.75. Incoming freshman who were admitted had an average SAT score of 485 on the critical reading section and 490 on the math section. The average SAT critical reading score and the average SAT math scores for all test takers are 500. The average ACT score was a 23 for incoming freshman.

Jackson has never had a job before in his whole life prior to applying for this job. He played football in college and was the star running back. He spent a lot of his time playing the guitar and other instruments. He was also in various organizations on campus, such as the Rotaract (community service) club, and the Future Leaders of America club.

Please circle all that apply:

1. How fit do you feel your potential employee is for the given job?

A. Absolute Best Fit
B. Good Fit
C. Absolute Worst Fit

2. Would you hire your potential employee?

A. Highly Likely
B. Likely
C. Highly Unlikely

3. How confident are you when it comes to your potential employee's performance after reading the scenario?

A. Highly Confident
B. Confident
C. Highly Unconfident

4. How do you feel about your potential employee's strength to excel at your company?

A. Very Strong
B. Strong
C. Not Very Strong

5. How effective do you think the potential employee would be at your company?

A. Highly Effective
B. Effective
C. Highly Ineffective

6. How much of an impact do you feel the potential employee will make based on the readings?

A. High Impact
B. Average Impact
C. No Impact

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Statement of Purpose

The *Journal of Undergraduate Psychological Research* was created to serve two primary purposes: to give WCSU undergraduate students an outlet in which to publish original psychological research and to provide undergraduate authors the opportunity to learn firsthand about the manuscript submission and publication process. The WCSU Psychology Department wanted to encourage student-led research and to reward outstanding individuals for their quality efforts. In addition, undergraduates serving as editors and/or reviewers may gain valuable insight into and personal experience with the management of a scholarly journal. Finally, the published journal serves as a pedagogical tool for students enrolled in and faculty teaching WCSU psychology courses.

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