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The Effects Of Stereotype Threat On Elders' Memory Performance

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**THE EFFECTS OF STEREOTYPES THREAT ON ELDERS' MEMORY
PERFORMANCE**

Honors Thesis

**Presented in Partial Fulfillment of the Requirements For the Degree of
Bachelor in Psychology
In the School of Psychology
at Salem State University**

By

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Abstract

Elders often do poorly on memory tests compared to younger adults, but this may be due in part to elders believing that memory declines with age. Previous research has found that elders who are aware of this negative stereotype freely recall and recognize fewer words than elders who are not aware of this stereotype (Chasteen et al., 2005). In a meta-analysis of previous research, young adults and elders in non-threat groups had a more liberal response criterion and produced more information about what they believe they remembered, whereas elders in the threat group had a more conservative response criterion and produced less uncertain information. This study further investigates this stereotype and how it affects elders' memory performance after watching a video. The study found that the young adult group had more correct answers from the memory test than the elder threat group and elder non-threat group. The young adult group had a higher d' than both old groups and the old threat group had the lowest d' . The response criteria fluctuated between each group but not as much as expected. Results have found that young adults do better on a memory test and a stereotype threat can be seen between elders during videos.

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Today there is an ample amount of research that shows memory decreasing with age. It has been widely noted that episodic memory declines with age and older adults perform worse on memory tasks compared to young adults. This performance difference between young and old can be seen when given either a free recall task (Colombel, Tessoulin, Gilet & Corson, 2016; Smith, Hunt & Dunlap, 2015) or recognition task (Gallo, Foster & Johnson, 2009; Naveh-Benjamin & Kilb, 2014; Spaniol, Madden & Voss, 2006) after being presented a list of words.

Colombel and colleagues (2016) found that young adults freely recalled more correct words from the list and had fewer false alarms than the older adults. Smith and colleagues (2015) added an auditory component to the visual component. In this condition, the subjects were able to see the word along with hearing the word. In a second condition, the subjects heard the word at the same time as they saw a picture that represented the word. The picture plus auditory stimuli reduced the number of false memories compared to the visual word plus auditory stimuli in both young and old adults (Smith, et al., 2015). The images were used to aid recall. The two types of sensory outputs in the first condition did not help the older adults as much as the younger adults. Older adults may have had to process what they were reading and process what they were hearing simultaneously. Older adults have more of a resource limitation for processing; therefore, they were unable to store all the information and did not have it to look back at when completing the memory task (Smith, et al., 2015). If there is any type of degrading of the visual or auditory stimuli, for example if it is unclear or not loud enough, it also increases the difficulty

of processing, which leads to an increase in false memories (Naveh-Benjamin & Kilb, 2014).

Research that has examined how elders and young adults perform on recall and recognition tasks after watching a video, has yielded the same results. Aizpurua, Garcia-Bajos and Migueles (2009) showed young and old participants a video of a robbery and then asked participants to freely recall what they remembered using a recognition test. Both age groups generally gave correct details about the video, but older adults remembered less than the young adults. One reason the authors give for these results is that old adults may not have as many retrieval strategies and less self-initiation than the young adults, which may result in older adults giving less detail.

Emotion has a great influence on memory and the confidence that the individual has that a memory, which may be false, is correct. For example, when young and older adults are shown emotional words and pictures, the way they process the stimuli is influenced by whether the stimulus is emotionally positive, negative or neutral (Gallo, Foster & Johnson, 2009). There is an increase in false recollection for both age groups when the items being presented are emotionally arousing (Gallo, Foster & Johnson, 2009). Although both ages had false memories of words or pictures they saw, the older adults had a higher confidence rating when they falsely recognized items that were emotionally positive or negative (Gallo, Foster & Johnson, 2009). Gallo and colleagues (2009) explain this phenomenon by saying that age enhances the subjective experience of illusory recollection.

Not only are there differences between ages in the development of false memories, there are neurological differences as well. It has been found that different parts of the brain are not only used differently during true memory retrieval and false memory retrieval, but age also influences the parts of the brain being used during each process (Dennis, Kim & Cabeza, 2008). Older adults showed stronger true retrieval activity in the retrosplenial cortex than young adults (Dennis, Kim & Cabeza, 2008). The retrosplenial cortex has recently become a large topic in memory. This part of the brain is affected in many neurological disorders that impair memory (Vann, Aggleton & Maguire, 2009). Older adults showed weaker true retrieval activity in their hippocampus than the younger adults (Dennis, Kim & Cabeza, 2008). During false memory retrieval, older adults had increased activation in the left middle temporal gyrus, fronto-polar cortex, caudate, amygdala, and insula regions (Dennis, Kim & Cabeza, 2008).

This knowledge about elders' decline in memory should be noted when dealing with eyewitness accounts. Eyewitness accounts are generally considered more than likely correct because the individual was actually there. But with research showing that an elder's memory is not as accurate as a young adult's, how reliable are eyewitness accounts? When subjects are shown a video of a robbery and later asked to recall what they saw, older adults make fewer correct responses and were less accurate than the younger adults (Brimacombe, Quinton, Nance, & Garrioch, 1997; Coxon & Valentine, 1997; List, 1986). Older adults also gave more "I don't know" answers compared to the younger subjects (Coxon & Valentine, 1997). One possible reason for this difference is that older adults may not have initially

encoded the event as well as the young adults (Brimacombe, Quinton, Nance, & Garrioch, 1997). Older adults may be retrieving their memories correctly and efficiently, but those memories may be compromised from the beginning. The type of memory task completed can also influence a person's response. List (1986) presented old and young adults with a shoplifting video followed by recall and recognition tests. His results showed that memory assessed under recognition instructions was more complete but less accurate than memory assessed under recall instructions in both age groups (List, 1986). List's (1986) explanation for his findings was that recognition tests are less open ended, which increases the likelihood that subjects will offer answers to questions they do not know the answers to. With a recognition test, a person is being given the questions they need to answer and they are required to choose a response. On the other hand, recall tests have decreased probability subjects will encounter an unanswerable question, therefore they will be less likely to give information for things they are not sure of (List, 1986).

Stebly and colleagues (2013) specifically looked at how well men and women were able to pick out the correct picture in a lineup of the individual in the video that they watched. Subjects had a 21% rate of incorrectly identifying the suspect in the first picture lineup (Stebly, Tix, & Benson, 2013). After the initial lineup, subjects had a second lineup to look at and pick out the guilty suspect. During the second lineup, the amount of innocent identifications went up to 31% (Stebly, Tix, & Benson, 2013). Stebly's research is evidence that an initial ID lineup can impair a second lineup (Stebly, Tix, & Benson, 2013). Megreya and Burton

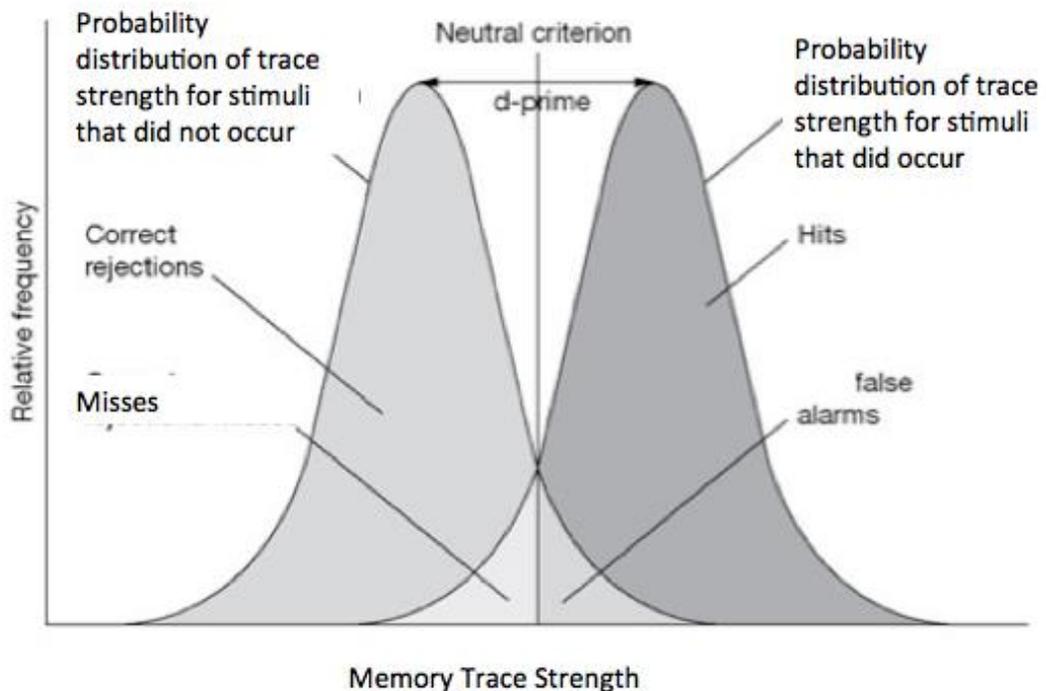
(2008) believe that the reason for such high levels of innocent identifications is due to an issue with processing of unfamiliar faces, not memory. In their initial study, participants were either shown a live person or an image of a person followed by a lineup where they had to identify the individual whom they saw previously. In this first study, 60% of the participants were accurate and chose the correct image in the lineup. In their second study, they showed subjects the live person or image while simultaneously looking at the lineup in order to choose the correct person. In this study, 66% of the participants were accurate (Megreya & Burton, 2008). In the final study, subjects were given one image along with the live person or picture and had to decide if they were the same person (Megreya & Burton, 2008). The participants in this study had a 70% accuracy rate (Megreya & Burton, 2008). Erickson, Lampinen and Moore (2015) completed a meta-analysis and found that older eyewitnesses are worse at correctly identifying perpetrators in a lineup than younger eyewitnesses; young eyewitnesses were 1.68 times more likely to make a correct lineup decision than the older eyewitnesses. Older eyewitnesses make more incorrect IDs in both target absent and target present lineups compared to young eyewitnesses.

But does older age mean poorer memory? Could there be another factor that is affecting what elders produce during memory tests? One phenomenon that could answer this question is the stereotype threat. A stereotype is a widely held and simplified image or idea of a particular type of person or thing. A common stereotype is that women do not do as well on math tests as men. This stereotype leads to a stereotype threat. Steele (1995) coined the term stereotype threat as

“being at risk of confirming a negative stereotype about one’s group.” If there are two women and one is told that she is going to complete a math test while the other is told she is going to take a reasoning test, the woman told she was going to take the reasoning test does better than the one told she is completing a math test (Finnigan & Corker, 2016). The stereotype that women do not do well on math tests influenced how well the women did on their tests. Another stereotype is that older individuals believe their memory has declined as they aged, and therefore they are less correct than younger adults in terms of their memory ability (Lineweaver & Hertzog, 1998). Recent research has shown that this negative stereotype for age and memory can lead to poorer memory outcomes (Barber & Mather, 2013; Chasteen et al., 2005; Krendl, Ambady & Kensinger, 2015; Mazerolle, Régner, Rigalleau & Huguet, 2015; Thomas & Dubois, 2011). This stereotype threat can influence responses to both free recall and recognition tasks. Chasteen and colleagues (2005) conducted a study in which a threat group and non-threat group were presented a list of sentence predicates and then asked to write down as many as they could remember. Elders in the threat group freely recalled less than the elders in the non-threat group (Chasteen et al., 2005). The same goes for research involving recognition tasks; elders in the threat group recognize fewer words actually presented than the non-threat group (Krendl, Ambady & Kensinger, 2015; Mazerolle, Régner, Rigalleau & Huguet, 2015; Thomas & Dubois, 2011).

Signal detection theory is a prevalent topic in the memory field. In the most basic terms, McNicol (2005) states that signal detection theory is “a theory about the ways in which choices are made.” Signal detection theory looks at a distribution

of trace strength; for our purposes, the strength of how correct or incorrect a memory feels. Signal detection theory involves a d' and criterion. d' is a measure of sensitivity, in our case, where the false memory and true memory overlap. The larger the d' , the further the two distributions are from each other. A larger d' means a better differentiation between the probability distribution of trace strength for stimuli that did not occur and probability distribution of trace strength for stimuli that did occur. The criterion lies somewhere along the distribution. The position of the criterion represents a degree of bias towards a true or false response (McNicol, 2005). In other words, it is how confident an individual is that the memory they have is either true or false.



Although the stereotype threat leads to less information recalled, it does not necessarily mean that elders are not remembering everything; it could be that

elders are not reporting everything that they do remember. In terms of signal detection theory, when an older individual is conscious of stereotype threat, they can change their typical liberal response criterion to a more conservative criterion (Barber & Mather, 2013; Thomas & Dubois, 2011). Having a more conservative criterion means that individuals are reporting less because they are only saying things that they are definite about. Stereotype threat decreases the quantity of information given, but it can increase the quality (Barber & Mather, 2013).

Meta-analysis:

To evaluate the signal detection theory explanation of the memory difference between ages, I conducted a meta-analysis in order to see if there was a criterion change between the older and younger subjects in the stereotype threat group or the non-threat group. To do this I searched journal articles studying the effects of stereotype threat on the memory outcomes of elders. The articles I used to complete the meta-analysis were articles that contained false alarm rates and hit rates for the experimental groups. In order to find the d' and c (criterion), I extracted the hit and false alarm rates and plugged them into a signal detection calculator. Results can be found in the tables below.

Barber & Mather Paper

	Threat group (old adults)	No threat group (old adults)
Hits	0.64	0.67
False Alarms	0.2	0.28
d'	1.2	1.023
C	0.242	0.071

Chasteen Paper

	Threat (old)	No Threat (old)	Threat (young)	No Threat (young)
Hit rate	0.71	0.75	0.86	0.88
False Alarm rate	0.28	0.22	0.22	0.15
d'	1.136	1.447	1.853	2.211
C	0.015	0.049	-0.154	-0.069

Krendl, Ambady & Kensinger Paper

	No Threat (old)	Threat at Encoding (old)	Threat at Retrieval (old)	No Threat (young)	Threat at Encoding (young)	Threat at Retrieval (young)
Hits (+)	0.78	0.83	0.76	0.86	0.86	0.85
FA (+)	0.15	0.25	0.33	0.18	0.15	0.10
d' (+)	1.809	1.629	1.146	0.1996	2.117	2.318
C (+)	0.132	-0.140	-0.133	-0.082	-0.022	0.123
Hits (-)	0.79	0.79	0.81	0.86	0.82	0.80
FA (-)	0.31	0.35	0.42	0.31	0.24	0.24
d' (-)	1.302	1.192	1.080	1.576	1.622	1.548
C (-)	-0.155	-0.211	-0.338	-0.292	-0.105	-0.068

Hits (n)	0.68	0.68	0.67	0.78	0.84	0.85
FA (n)	0.09	0.16	0.24	0.05	0.10	0.07
d' (n)	1.808	1.462	1.146	2.417	2.276	2.512
C (n)	0.437	0.263	0.133	0.436	0.144	0.220

In both Chasteen and Krendl's studies, d' values followed a similar pattern. The young adults always had the largest d' compared to the older adults; meaning their ability to discriminate between old and new items is higher than the older adults. After analyzing the response criteria from all three studies, it is difficult to say if there is a general pattern. If looking at the response criterion for the Barber and Krendl studies, the elder threat groups had a greater C value than the elder non-threat groups; meaning the threat groups had a more liberal response bias. The opposite effect was seen in the Chasteen study; the elder non-threat group had a more liberal response criterion compared to the elder threat group. In general, the young adult groups had the most conservative response criteria.

The purpose of the present study is to look into the effects of stereotype threat on recognition tasks. Past studies that investigated stereotype threat on elders used lists as the stimulus. I did not find any stereotype threat studies that used videos or pictures as the stimulus as the premise for the memory task. There has been memory research with video within the area of eyewitness accounts, but in these cases, the videos are portraying atypical events such as robberies or muggings. I wanted to see if the same effects from the eyewitness research can be replicated with more neutral videos depicting things that are seen every day. I specifically looked at how the stereotypical attitude that memory declines with age

affects elders' memory by presenting young adults and elders a video followed by a memory quiz. From the participants' responses, I computed measures of memory performance and response bias. I hypothesize that the elder non-threat group will have a more liberal response criterion than the elder threat group. Because of this change in response criterion, I also believe that the elder non-threat group scores should be similar to the young adult group's scores.

Method

Participants

A total of 30 older adults, ages 60 and above, were recruited from local senior counsels on aging in Massachusetts. In addition, 33 young adults were recruited from undergraduate programs at a university in Massachusetts, aged 19 to 30. The older participants were given a mini-mental state examination after the completion of the memory test to ensure that they did not have a memory disorder. All participants provided informed consent by filling out a consent form.

Materials and Procedures

The older adults were divided randomly into 2 groups, the threat group and non-threat group. Participants are presented with a short video of an elderly woman getting her winter gear in preparation for a walk outside. Participants in the threat group were told, "we are investigating memory ability through the life span. Research has shown that younger adults do better on this due to lack of memory loss". Participants in the non-threat group were told, "we are investigating how relatable this video is to an audience. Research has shown that an extensive life

experience increases how much an individual relates to the subject." Participants in the young adult group were told that they are completing a memory test. After watching the video, participants then completed a memory test involving recognition questions. Some questions included images where the participants needed to identify whether it was from the video, questions asking if they remember seeing a specific action or item in the video, and a lineup where they need to identify which outfit the individual was wearing. All participants were debriefed followed by completing the memory quiz.

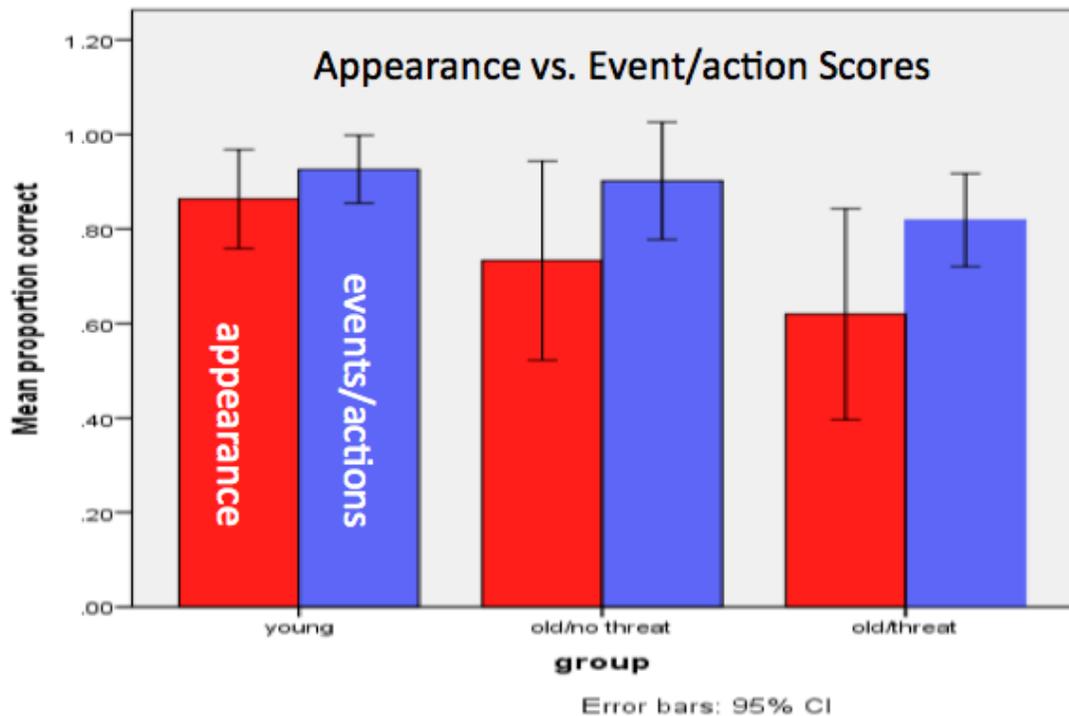
Results

As a whole, the young adults did better on the memory test than the older adults. As expected, the young group had the highest mean proportion correct on the test (89.8%), the older no threat group had the second best mean score (82.6%) and the older threat group had the worst (79.95%). Both older groups did worse than the young group which has been seen in previous research such as Colombel et al., 2016, Smith, Hunt & Dunlap, 2015, Gallo, Foster & Johnson, 2009, etc.

The questions in the memory test were divided into different categories for analysis. The first analysis compared appearance versus events and action questions. Any questions asking about the individual's appearance in the video or details about the environment are considered appearance questions and any questions that asked about any events or actions that occurred are considered event and action questions. All three groups did worse on the questions about appearance than the event and action questions. The young adults did better with both categories compared to the old adults. The old threat group had the lowest means

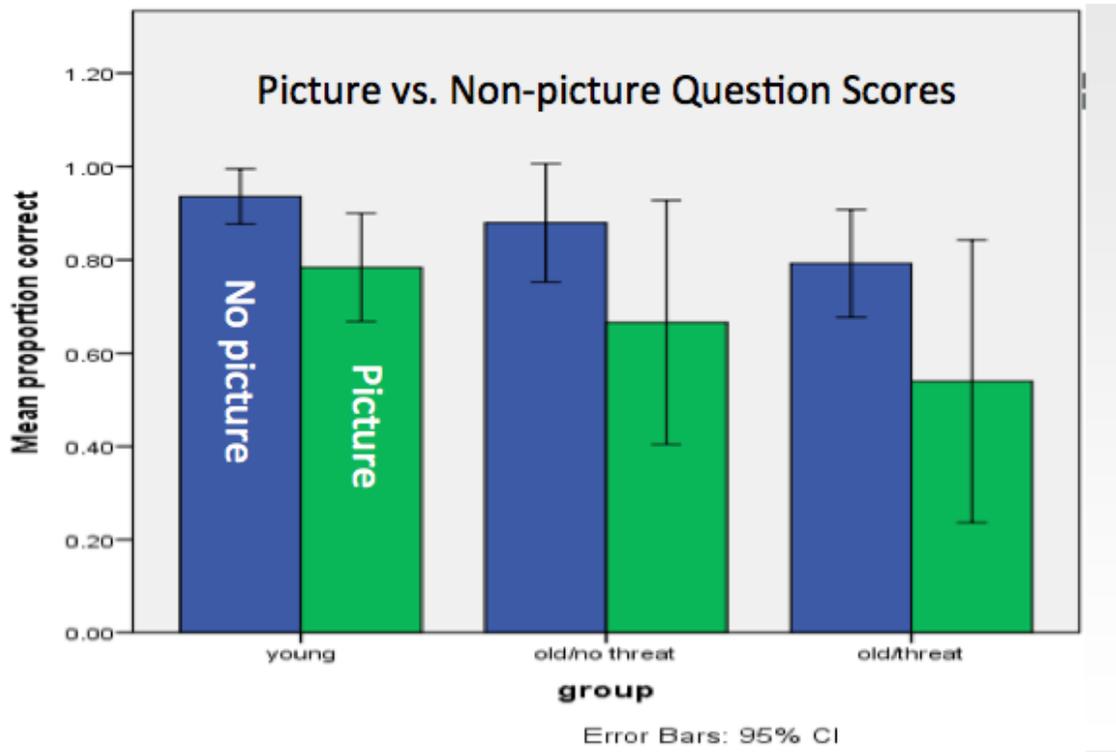
for both categories of questions. The main effect of group was statistically significant ($F(2, 54) = 3.945$, $p = .025$) and the main effect of appearance and events were statistically significant as well ($F(1, 54) = 7.9$, $p = .007$) but the interaction between them was not. A graph of the results can be seen below, in figure 1.

Figure 1:



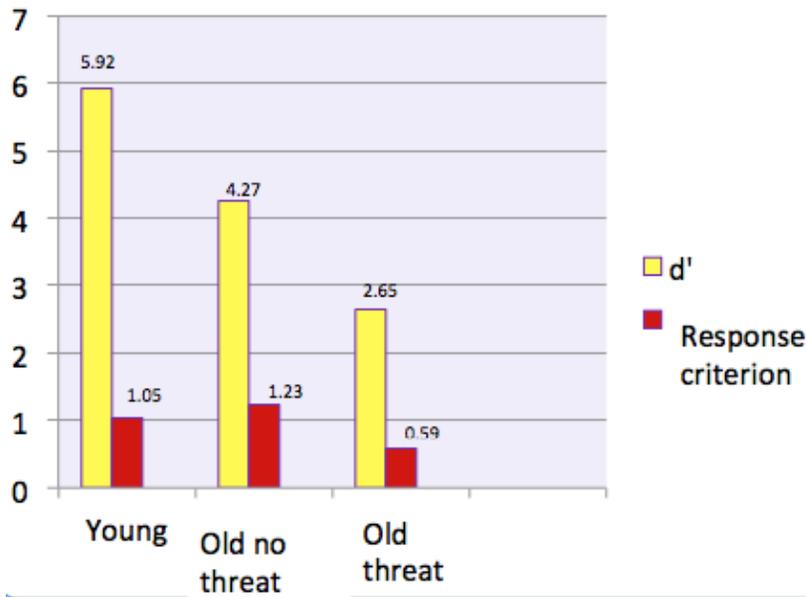
The memory questions were also divided by whether it contained a picture or not. As seen in figure 2, there is a gradual decline in how well the groups did with both types of questions. All three groups did worse on the questions that included a picture compared to the questions that did not contain a picture. The older threat group had the lowest mean scores for both picture questions and no picture questions. The main effect of group ($F(2,54) = 3.905$, $p = .026$) and picture ($F(1,54) = 13.214$, $p = .001$) were statistically significant, but the interaction between the two was not.

Figure 2:



After computing the mean d' and C scores for each group, it was found that the young adults had the greatest d' of 5.92 and the older threat had the smallest d' of 2.65. The response criterion fluctuated a little between each of the groups; young was 1.05, older non-threat was 1.23, and older threat was 0.59, but it was not as much as anticipated. Results can be seen in figure 3 below. There was no statistically significant differences between the groups.

Figure 3:



Discussion

The purpose of this study was to see whether the stereotype that memory declines with age affects elders' memory performance after watching a video. Results showed that the stereotype does influence how well older adults do with a recognition task. It was also found that young adults did the best on the test compared to both elder groups. These results coincide with past research on memory decline and age (Colombel, Tessoulin, Gilet & Corson, 2016; Smith, Hunt & Dunlap, 2015, Gallo, Foster & Johnson, 2009, Naveh-Benjamin & Kilb, 2014, and Spaniol, Madden & Voss, 2006). This is evidence that memory might actually decline as you age.

Although the response criterion shifted between groups, the differences were not statistically significant. The shift of response criterion between the two elder groups is evidence that supports the hypothesis that there is a stereotype threat activated when older adults watch a video and complete memory questions about it. The d' values were interesting to see as well. The young group had the highest d' while the old threat group had the smallest value. These results concur with the meta-analysis described in the introduction. The meta-analysis for Chasteen and colleagues' study (2005) also followed the same pattern where the young group had the largest d' while the old threat group had the smallest.

After completing this study, it is still difficult to say whether memory does decline with age, or if the difference in memory test results is strictly based on the stereotype threat, or if it is a combination of the two. One other possible explanation for the difference between ages may have to do with decoding and visual processes. If older adults process what they see differently than young adults, then even when they retrieve something from their memory correctly, that memory may be incorrect because it was processed incorrectly to begin with. Further research needs to be done to better understand the real reason behind the difference in age and memory outcomes.

If this study is completed again, there are some things that should be changed to get better results. Some of the old subjects were talking during parts of the video and they were not giving their full attention, which may have influenced how well they did on the memory test. To eliminate this issue, it may be beneficial to tell the subjects that they should be paying full attention to the video and there

should not be any talking while viewing it. It would also be valuable to have more subjects in the old no threat and old threat groups. Due to the results of the study, it may be interesting to look at a variety of types of questions asked during a recognition test. There is evidence from this study that pictures did not aid subjects' memory performance, but actually hinders it. Does the memory stereotype affect how an individual does on certain types of questions more than others? Does the length of the video or the memory test affect how well young and old adults perform? Does the stereotype that memory declines with age begin to arise in the old no threat group as they are completing the memory test because they have become aware that it is a test based on memory? These are all questions that are still out there on memory and aging.

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