The Relationship Between Attention and the Negativity Bias in Memory

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ABSTRACT. Humans are more likely to attend to and recall emotionally salient events. Among emotional events, people are more likely to remember negative over positive or neutral events. They are also more likely to attend to a stimulus with a negative or threatening valence. This tendency is advantageous as it can alter the way in which people recognize and avoid threatening situations. Individuals are better at attending to and recalling negative feedback; this is reflective of their desire to be accepted socially. Negative stimuli are less common in everyday; the negativity bias in attention and memory is partially explained by the distinctiveness of negative events. In this review, I propose that negativity biases in memory are the result of negativity biases in attention.
Key Words: Attention, Memory, Negativity Bias

When we remember events from our past, each memory is remembered with varying amounts of detail. For some memories, we can recall vivid details about where we were, who we were with, what was said, how we felt, or even what color shirt a person might have been wearing. For other memories, our recollection is hazy, we may remember that we attended an event but not be able to recall who was there or what was discussed. You may not remember what you had for breakfast today but you may be able to recall what you ate at a dinner party one month ago.

Emotionally based events are recalled easier and with more detail than events without any emotional significance. The same is true for emotional stimuli, as emotional words are recalled more accurately than neutral ones (Mickley & Kensinger, 2008). Emotional information and memories are processed in a way that is distinct from how neutral information is processed. This is exemplified by an increased activation of the amygdala, an area of the brain associated with the processing of threatening and emotional stimuli and fear as well as in the encoding and retrieval of memories of emotional stimuli (Phelps & LeDoux, 2005). Furthermore, individuals with damage to the amygdala are likely to forget emotional and neutral stimuli equally.

In addition to emotionality itself, the valence of an emotional memory has an impact on the likelihood that the memory will be encoded and recalled. Researchers have noted a negativity bias in people's recollection of events. When it comes to specific circumstances and details, studies have shown that people are better at recalling negative events rather than positive ones (Boals et al., 2014). For example, we may be better at remembering the details surrounding an occasion when we were insulted than when we were complimented. The process of both encoding and retrieval of memories of negative events involves more activity in sensory areas of the brain than positive events (Mickley & Kensinger, 2008). It is more likely that an individual will remember negative feedback as opposed to positive feedback. This negativity bias can be beneficial. People are more likely to recognize and remember threatening stimuli than neutral stimuli in addition to being more likely to remember the negative behaviors of others. Being able to quickly recognize threatening situations allows an individual to promptly avoid the situation; therefore, increasing their chance of survival. The ability to expedite our acknowledgement of a threatening situation is reinforced by our memories of similar threatening events in our past. Understanding this negativity bias is particularly important as people are being more frequently exposed to negative events and images through television

and social media. When a negative event such as a terrorist attack or major scandal occurs, details and images of the event are presented repetitively throughout media. It is necessary that we are able to understand the mechanisms behind the negativity bias, in order to mitigate any detrimental effects of the increase in exposure to negative events.

The negativity bias in emotion has been speculated to be the result of a tendency to attend to negative/threatening emotional stimuli. Attention is a cognitive resource which involves prioritizing the processing of certain stimuli while ignoring other information in a person's environment (Anderson, 1990). Attention has a limited capacity, meaning that we are unable to perceive every stimulus in our environment simultaneously. For example, if we are performing two demanding tasks concurrently, it is more difficult to perform as well on both tasks than if we were to perform each task individually. The reason it becomes difficult to attend to multiple tasks is that each task requires the use of additional attentional resources which reflect the amount of our limited attentional capacity used in the completion of a task and the perception of an environmental stimulus. When we become more accustomed to performing a task or recognizing a stimulus through practice, it can become automatic. When a task becomes automatic, it can be performed without the use of attentional resources; tasks that require the active use of attentional resources are considered to be controlled, requiring conscious awareness (Shiffrin & Schneider, 1977). Encoding is the process by which we learn information perceived through attention so that it can be stored in our long-term memories. Retrieval is the process in which we access these memories. In short, attention plays a significant role in the memory processes.

People have an innate desire for social inclusion and wish to gain acceptance within their community. Despite their relative infrequency, negative interactions shape the way in which people behave as they are an indicator that something they had done did not result in the desired outcome. For this reason, people spend more time looking at negative feedback over positive feedback, they are more likely to attend to faces expressing negative emotion, and they are more likely to pay attention to threatening situations (Huang et al., 2017). Individuals prioritize emotional stimuli, with a particular focus on negative stimuli, yet researchers have yet to come to a consensus on whether attention is required for emotional processing (Pessoa et al., 2002b). Some argue that certain emotional stimuli can be processed automatically while others argue that attentional resources are required to process emotional stimuli (Vuilleumier et al., 2001; Pessoa et al., 2002a). In this paper, I will argue that individuals are better at remembering the details of negative events over positive events as a result of a negativity bias in attention.

Emotion and Attentional Resources

Emotional stimuli are processed faster than neutral stimuli and among emotional stimuli, negative emotional stimuli are processed fastest. Emotional processing refers to a person's ability to recognize and comprehend the magnitude of the valence of an emotionally salient stimulus. Vuilleumier et al. (2001), found that the sight of emotional faces activates the amygdala regardless of whether participants intended to focus on them or was consciously aware of their presence. Because emotional stimuli are processed before non-emotional stimuli, an argument can be made that emotional stimuli are processed preattentively (Vuilleumier et al., 2001). This concept of a preattentive priority in the processing of emotional stimuli has led to much debate over the relationship between attentional mechanisms and the processing of emotional stimuli.

A consensus has yet to emerge among researchers regarding whether or not emotional processing even requires attentional resources. In one camp, researchers argue that the processing of emotional stimuli is independent of attentional awareness. In the other camp, researchers argue that the processing of emotional stimuli is dependent on the availability of attentional resources. Past research has not been able to clarify whether or not attentional resources are required for emotional processing as research on emotion and attention can be interpreted as providing evidence for both arguments.

In the process of attention, stimuli compete for use of attentional resources; a

person is unable to pay attention to every stimulus in their environment as once all attentional resources are being used, additional stimuli cannot be processed. Thus, a person's ability to focus on an object is dependent on their perceptual load, which refers to the amount of attentional resources currently being used by an individual (Lavie, 1995). Since emotional stimuli are preferentially processed, the relationship between attentional mechanisms and emotional processing is difficult to determine. Pessoa et al. (2002) attempted to elucidate the connection between attentional resources and emotional processing. They presented the image of faces either expressing happy, fearful or neutral emotions with bars of varying orientations at the top corners of the screen. Participants were separated into either an attentive condition where they were asked to look at the facial expression and identify if the face was male or female, or the inattentive condition where they were asked to look at and describe the orientation of the bars. They measured participants neural functioning using fMRI while they observed the visual stimuli. What they found was that emotional faces were only attended to when enough attentional resources were available as areas involved with emotional processing were significantly more active for participants in the attentive condition. This corresponded to a decrease in the amygdala activity associated with emotional stimuli, particularly the difference in activity corresponding to the valence of the emotional face. Thus the valence and impact of emotional stimuli is not processed when there is not a sufficient amount of attentional I resources available. The processing of emotional stimuli at least to some degree depends on the availability of attentional resources.

Processing Negative Emotional Events

The process of memory formation and recall is dependent on attention. When humans are less focused on a stimulus during encoding, they are less likely to be able to recall it later on, than if they were fully focused on the stimulus during encoding (Craik et al., 1996). The initial stage of forming an episodic memory is encoding, where information is initially learned. Following encoding, information will be stored so that it can be accessed during retrieval when the information is needed. The processes involved in the formation of episodic memories are impacted by the emotionality of an event (Phelps, 2006). Emotional memories are recalled more readily and with more accuracy than events with no emotional significance. Phelps and LeDoux (2005) found that emotional processing is characterized by an increase in amygdalar activity, providing evidence that emotional memories are encoded and recalled differently than neutral memories.

Among emotional memories, events surrounding negative emotions and moods are processed differently from positive or neutral events. The affect of an individual during an event can be induced by the valence of the stimuli around them and their emotion can shape what information they process from their environment. People are more likely to recall emotional words than neutral ones; this effect is even more significant for negative emotional words than positive ones (Dewhurst & Parry, 2000).

Visual stimuli can be processed both locally, based on their specific details, and globally, based on their holistic structure. Gasper and Clore (2002) proposed that individuals in sad moods were more likely to process information locally and individuals in positive moods were more likely to process information globally. In order to test this, participants were assigned to one of three groups where they were asked to write about an experience that was either negative, positive, or neutral. Participants in the negative condition reported that they experienced greater levels of sadness after completing the writing task and participants in the positive condition reported a happy mood after completing the writing task. Following the writing task, participants were asked to rate whether a target object was more like an object that had the same global features but different local features or one that has the same local features but different global features. Participants in the negative condition were more likely to match the objects based on local features than participants in the positive condition. Their results indicated that when processing stimuli, individuals in a negative emotional state are more attentive to specific details while individuals in positive emotional

state focus on more general details which can impact the information they are able to remember.

The impact of valence on the type of information that is attended to and processed can explain why there is a difference between how well people can recall positive and negative events. This difference in processing is not only behaviorally apparent as negative emotional events are processed differently in the brain. In some areas of the brain, neural activity is correlated to the processing of various emotions, the processing of positive, negative and neutral stimuli are also correlated to activity in differing regions of the brain. Mickley and Kensinger (2008) explored the neural correlates of encoding and remembering negative vs. positive emotional stimuli. They showed participants images and words that were associated with either a negative, positive, or neutral emotional valence. Then participants were scanned using functional magnetic resonance imaging (fMRI) as they were shown these images and words. Lastly, 30-minutes after being exposed to the stimuli, participants completed a surprise recognition task and were asked whether they remember the stimuli vividly or familiarly. Negative stimuli were remembered more vividly than positive or neutral stimuli. Furthermore, they found that increased activity in certain temporo-occipital sensory processing regions occurred when negative stimuli were remembered, suggesting that negative experiences are remembered differently. Thus, negative information is remembered more vividly because sensory information is processed and attended to, to a greater extent during negative events.

Survival and Recognition of Threat

Though the experience of focusing on and remembering negative emotional stimuli is unpleasant, a negativity bias in attention and memory is advantageous in certain situations. This is because having a negativity bias in attention and memory may be evolutionarily beneficial. The increased likelihood of remembering negative events is useful as it can encourage the recognition of threats in order to avoid them and therefore improve survivability. Attending to and recognizing a potentially threatening stimulus is necessary for survival as one a threatening stimulus has been detected, it can be avoided. Therefore, it is important that humans are able to prioritize threatening stimuli. People are faster and more efficient at detecting angry faces in a crowd over faces with neutral expressions or other emotions (Hansen & Hansen, 2012). Thus our brains naturally prioritize the processing of angry faces, and this is beneficial because irate individuals are more likely to behave in a threatening way toward others.

Since we prioritize the processing of angry faces, we are more likely to encode the specific attributes indicative of the threatening emotion. When people are more attentive to negative events, they are more likely to be able to recall them at a later time. The ability to remember a threatening event allows people to utilize that memory in order to recognize the warning signs, when a future event has the potential to become dangerous.

Age contributes to the way in which negative memories are attended to, reflected on and recalled. Older adults are better at regulating their emotions (St. Jacques, 2009. When examining the difference between how younger adults view their negative memories in comparison with older adults, Boals et al. (2014) found a discrepancy between the two age categories. They asked participants to recollect negative memories and to subsequently complete a questionnaire. When comparing the responses of the two groups, they found that, when reflecting on negative autobiographical events, older adults experienced less of an emotional response, and significantly less negative emotions associated with the event. Their results support the idea that older adults develop more emotionally adaptive ways of handling negative emotions. Results from functional neuroimaging studies suggest that older adults process and remember negative emotional events differently from younger individuals. Older adults are less likely to remember negative stimuli. St. Jacques et al. (2009) found that when viewing and recalling negative pictures, older adults showed more activity in the right amygdala and young adults showed more activity in the left amygdala. When compared with young adults, older adults showed differing activity in areas of the brain

associated with memory. The age difference in neural activity can explain why older adults are better at regulating emotions and worse at remembering negative stimuli.

The diminished effect of the negativity bias seen in older adults may be emotionally adaptive, just as a negativity bias in younger individuals may also be adaptive as they are developing the knowledge required for survival and threat avoidance. The ability to attend to and respond to threat may become more automatic with practice and therefore there is less of a need for the negativity bias. Balthazar et al. (2012) explored whether children have a better memory for threatening social interactions. They showed young children pictures of people described as mean or nice; nice individuals were described as doing something helpful while mean individuals were described as behaving in a threatening manner. Their results indicated that children are more likely to remember the faces of threatening individuals and the specific details of their threatening actions. Children may have a more significant tendency toward the negativity bias as they are still acquiring knowledge that will be useful for detecting threats. This could explain why the negativity bias in attention is more prominent in children than older adults as this bias can be important in shaping their capacity to detect and respond to unexpected threatening stimuli. This ability becomes more automatic, requiring less attentional resources and awareness as people age.

The way in which one processes and remembers past events can shape how they respond to events in the future. With regard to negative emotional events, this means that they have a memory of how a potentially dangerous negative event was dealt with and what actions either helped or not. Being able to recall beneficial actions or avoid other actions will shape how an individual respond to similar events in the future. Therefore, it is advantageous to have a better memory for how negative events are handled, as a memory for how neutral or positive emotional events were dealt with is less likely to have the same impact on survivability. Additionally, the amount of attention paid to a threatening stimulus improves the likelihood that it will be remembered. Thus, the increased priority of attentional resources on threatening stimuli is evolutionarily beneficial.

Social Belongingness

A desire to be socially accepted can be evolutionarily beneficial. If a person is able to form more lasting emotional bonds with others, they are more likely to secure a mate, obtain communal resources, and receive assistance when threats are present (Baumeister and Leary, 1995). An individual's responses to another person's affective state can impact how they are viewed by others. For example, if you were to insult someone who was already distressed, that person and the people around you will not want to accept you into their social group. In contrast, if you were to comfort that person, others would be more likely to include you and offer resources to you (Rofe, 1985).

Not only can a negativity bias in attention and memory improve a person's physical survivability, it can also improve their likelihood of achieving social acceptance. Having a better memory for negative events can influence an individual's relationship to others and their perception of their social environment. Attending to the negative expressions and actions of others can alter how they act in response to negative facial expressions in order to improve the situation. By responding to the negative emotions of others, individuals are able to develop more positive relationships and increase their sense of belongingness within their social environment (Baumeister & Leary, 1995).

Social belongingness refers to the extent to which a person feels that they are accepted by other individuals and the quality and depth of their interpersonal relationships. Proponents of the belongingness hypothesis argue that in social situations, human beings act in response to a fundamental need for belongingness (Baumeister & Leary, 1995). In the absence of social acceptance, an individual may face many emotional consequences. When a person experiences a perceived sense of social exclusion corresponds to increased feelings of jealousy, depression, social anxiety and loneliness (Leary, 1990). Thus it is important for an individual to obtain a sense of belongingness in order to thrive socially.

An individual's response to someone's negative emotions can have an impact on the way others view them. Responding in an appropriate and supportive way to an individual's negative emotions can deepen the quality of their interpersonal relationships. If someone were sad, then we could strengthen our relationship with them by comforting them and if someone's negative emotion was rage, we could recognize this and know to avoid them so that we do not damage the relationship with them. Thus, people may be more likely to recognize the emotions of others in order to respond to them when the emotion is negative as opposed to when it is positive or neutral.

The negativity bias for emotional stimuli is particularly salient with facial stimuli. Lagattuta and Hansen (2017), explored whether children and/or adults prioritize attending to negative faces. In their experiment, participants were asked in the first task to look at the faces on a screen; on the screen were multiple faces expressing either positive, negative, or neutral emotions. In the second task, participants were instructed to focus on the happy face. During each of the tasks, they used eye-tracking to monitor which faces participants were attending to. They found that both adults and children are most likely to attend to faces expressing negative emotion first. Both adults and children are more likely to first attend to emotional faces before neutral faces. These results suggest that people are more attentive to the negative emotions of others. This additional focus and prioritization of negative facial stimuli increases the likelihood that people will have a better memory for the negative emotions of others.

Much of the tendency to focus on the negative emotions of others may be attributed to an innate desire to please others. People are motivated by the experience of being liked and they find it rewarding to be socially included (Davey et al., 2010). The idea of disappointing or being viewed negatively by someone else is notably unpleasant. For this reason, Huang et al., (2017) investigated the relationship between attention, memory, and negative vs. positive feedback. They used eye-tracking technology to measure how long people looked at positive and negative feedback, when feedback was provided for task performance. Additionally, they had participants recall the feedback they received. Their results showed that participants spent more time focusing on negative feedback and less time focusing on positive feedback. They also found that participants were able to recall more specific details about negative feedback than specific details about positive feedback. Participants were likely able to remember more details about negative feedback because they spent more time attending to negative feedback.

It makes sense that we would attend to and remember negative feedback more than positive feedback as negative feedback is more constructive on shaping how we go about tasks or activities in the future. For example, if I was walking down the street and one person compliments my shirt and another person insults my shirt because they feel that the style is not flattering, I would be more inclined to view the shirt as unflattering and might chose not to wear it in the future. When something about a person or something they do is not well-received, they are more inclined to change their behavior as people tend to prefer to be viewed positively by others in order to obtain a sense of belongingness in within their community. Therefore, the memory of that negative feedback is more detailed than memories of positive feedback as it can impact how people view themselves in relation to their social environment along with their sense of social inclusion.

The desire for social inclusion can explain why we are more likely to attend to and therefore remember negative events. We are more likely to attend to the faces of others if they are expressing negative emotions. If we see someone in distress we can improve our interpersonal relationship with them by comforting them and if they are angry we can avoid damaging our interpersonal relationship with them by avoiding them. Much of our attention is driven towards emotional stimuli as our response to these stimuli can shape our feelings of belongingness in a social environment. This is why people are more attentive to negative feedback in comparison with positive feedback, as we strive to be liked by others.

Positive is Common

An individual's increased ability to recall specific details of negative social events may be associated with the theory that positive social interactions may tend to be much more commonplace than negative social interactions (Graf et al., 2014). Negative social interactions and negative stimuli are infrequent in the lives of most people, because of this, they are able to attract our attention and stand out when people experience them. An example of this is Graf et al.'s (2014) study of the relationship between intergroup contact and outgroup attitudes in relation to the frequency of positive and negative interactions. They administered a questionnaire to individuals of various nationalities in Central Europe asking about their interactions with people from other countries. They found that participants reported positive intergroup interactions as occurring three times more than negative intergroup interactions. Additionally, they found that the less frequent negative interactions were more instrumental in shaping outgroup attitudes. These results indicate that although positive interactions are more commonplace, it is negative interactions that are more likely to alter how an individual may perceive their environment and act based on that perception.

Individuals are better at remembering stimuli that are distinct. Over time we are more likely to remember events that are unusual rather than events that occur frequently in our daily lives. Schacter et al. (1998) explored whether memory accuracy was improved or hindered by the similarity of stimuli and if the effect could be altered by encoding similar stimuli through distinct features. They instructed participants to familiarize themselves with a set of either word or picture stimuli. After a delay, they asked participants to state whether they were exposed to a word or picture using a list of stimuli that combined those which they were originally shown along with a set of lure stimuli that were either related or unrelated to the original set. They found that participants were more likely to falsely recognize a lure stimulus if it was semantically related to stimuli they had previously been exposed to than lure stimulus that was distinct from the original stimuli. Therefore, the distinctiveness of a stimuli can improve the accuracy of recall and therefore the memory of an experience is strengthened by the distinctiveness of the event in relation to everyday experiences. As negative experiences are distinct from everyday events, they capture our attention and are more likely to be remembered.

Conclusion

Human beings are more likely to remember the specific details of negative events from their past and hold less detailed memories for positive and neutral events. This negativity bias in memory can be attributed to an attentional preference for negative stimuli. When stimuli are attended to, they are more likely to be encoded and stored in long-term memory. The emotional processing mechanism of an event differs depending on the valence of environmental stimuli. When we have experienced negative events, we are more likely to remember specific, local details of the event. Additionally, the activity levels in various brain regions vary based on the valence of an observed stimulus. Negative stimuli are attended to a greater extent than positive or neutral stimuli during encoding, thus our memory for them can be more detailed. This is evolutionarily beneficial as being able to retrieve and attend to specific details of a threatening situation can allow us to better respond to and avoid them in the future.

How we respond to negative emotional situations can determine the level of social acceptance a person receives. An appropriate response to the negative emotions of others can facilitate a deeper connection in social relationships. Furthermore, negative emotional stimuli tend to be less commonplace, making their presence distinct, allowing them to stand out amongst other memories. Future research should address the connection between the negativity bias in attention and memory and an individual's perceptions of life events, in addition to ways to overcome this negativity bias when it may not be beneficial.

The negativity biases in attention and memory are particularly important to understand as people are being more frequently exposed to negative events through television and social media. When major negative events, such as terrorist attacks, occur, images of the event and aftermath are scattered throughout media. Many

people find themselves repetitively exposed to negative events, such as the videos of planes crashing into the world trade center during the 9/11 attacks or the audio recordings of the 911 emergency calls from the Columbine High School Massacre, increasing the salience of their memory for the event. The repeated exposure to these images can create a sense of an impending threat, resulting in behavioral changes, as seen in the integration of lockdown drills in schools following the Newtown Shooting (Trevelyan, 2014).

Many people actively choose to expose themselves to negative images, they share posts about negative events with their social media followers or choose to watch documentaries about serial killers or natural disasters. The negativity bias in attention can explain why people struggle to avoid looking at negative stimuli such as car accidents despite the unpleasant emotions they elicit. Future research should address the effect of the increase in exposure to negative events, how knowledge of the mechanisms behind the negativity bias in attention and memory can be used to counter the effects of repeated exposure to negative stimuli, and whether there is a difference in this negativity bias in individuals who choose to experience negate events.

References

Anderson, J. R. (1990). *Cognitive psychology and its implications* (3rd ed.). New York: W.H. Freeman.

Arndt, J., & Hirshman, E. (1998). True and false recognition in MINERVA2: Explanations from a global matching perspective.*Journal of Memory & Language*,39, 371–391.

Baltazar, N. C., Shutts, K., & Kinzler, K. D. (2012). Children show heightened memory for threatening social actions. *Journal Of Experimental Child Psychology*, 112, 102-110.

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117(3), 497-529.

Boals, A., Hayslip, B. J., & Banks, J. B. (2014). Age differences in autobiographical memories of negative events. *The International Journal Of Aging & Human Development*, 78, 47-65.

Craik, F. I. M., Govoni, R., Naveh-Benjamin, M., & Anderson, N. D. (1996). The effects of divided attention on encoding and retrieval processes in human memory. *Journal of Experimental Psychology: General*, 125, 159 –180

Davey, C. G., Allen, N. B., Harrison, B. J., Dwyer, D. B., & Yücel, M. (2010). Being liked activates primary reward and midline self-related brain regions. *Human Brain Mapping*, 31(4), 660-668.

Graf, S., Paolini, S., & Rubin, M. (2014). Negative intergroup contact is more influential, but positive intergroup contact is more common: Assessing contact prominence and contact prevalence in five Central European countries. *European Journal Of Social Psychology*, 44(6), 536-547.

Hansen, C. H., & Hansen, R. D. (1988). Finding the face in the crowd: An anger superiority effect. *Journal of Personality and Social Psychology,* 54, 917–924.

Huang, P., Liu, C., & Chen, H. (2017). The influence of Outcome Status on the attending and memory of positive and negative feedback. *Bulletin Of Educational Psychology*, 48, 469-486.

Lagattuta, K. H., & Kramer, H. J. (2017). Try to look on the bright side: Children and adults can (sometimes) override their tendency to prioritize negative faces. *Journal Of Experimental Psychology*, 146, 89-101.

Lavie, N. (1995) Perceptual Load as a Necessary Condition for Selective Attention. *Journal of Experimental Psychology: Human Perception and Performance*, 21, 451–468.

Leary, M. R. (1990). Responses to social exclusion: Social anxiety, jealousy, loneliness, depression, and low self-esteem. *Journal Of Social And Clinical Psychology*, 9(2), 221-229.

Mickley, K. R., & Kensinger, E. A. (2008). Emotional valence influences the neural correlates associated with remembering and knowing. *Cognitive, Affective & Behavioral Neuroscience*, 8(2), 143-152.

Pessoa, L., Kastner, S., & Underleider, L. G. (2002). Attentional control of the processing of neutral and emotional stimuli. *Cognitive Brain Research*, 15, 31-45.

Pessoa, L., McKenna, M., Gutierrez, E., & Ungerleider, L. G. (2002). Neural processing of emotional faces requires attention. *Proceedings of the National Academy of Sciences of the United States of America*, *99*(17), 11458–11463.

Phelps, E. A. (2006). Emotion and cognition: Insights from studies of the human

amygdala. *Annual Review of Psychology,* 57, 27-53.
Phelps, E. A., & LeDoux, J. E. (2005). Contributions of the amygdala to emotion processing: From animal models to human behavior. *Neuron,* 48, 175-187.
Ritchie, T. D., Sedikides, C., & Skowronski, J. J. (2017). Does a person selectively recall the good or the bad from their personal past? It depends on the recall target and the person's favourability of self-views. *Memory*, 25(8), 934-944.
Rofe, Y. (1984). Stress and affiliation: A utility theory. *Psychological Review,* 91, 235-250.
Schacter, D. L., Israel, L., & Racine, C. A. (1999). Suppressing false recognition in younger and older adults: The distinctiveness heuristic. *Journal of Memory & Language*,40, 1–24.
Shiffrin, R. M., & Schneider, W. (1977). Controlled and automatic human information processing: II. Perceptual learning, automatic attending, and a general theory. *Psychological Review,* 84, 127-190.
St. Jacques, P. L., Dolcos, F., & Cabeza, R. (2009). Effects of aging on functional connectivity of the amygdala for subsequent memory of negative pictures: A network analysis of functional magnetic resonance imaging data. *Psychological Science*, 20(1), 74-84.
Trevelyan, Laura. "US Children Learn 'Lockdown Drill'." *BBC News, BBC*, 9 Feb. 2014, Retrieved from www.bbc.com/news/magazine-26085368.
Vuilleumier, P., Armony, J., Driver, J., & Dolan, R. (2001). Effects of attention and emotion on face processing in the human brain: An event-related fMRI study. *Neuron*, 30(3), 829-841.