The Effect of Age on Emotional Response to Color-Based Visual Stimuli

REVIEW OF LITERATURE

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Literature Review

Introduction

There is a need for more research in the behavioral science field regarding how age and overall positivity are connected. Several studies have shown conflicting trends regarding the age-related positivity effect, and therefore it is not known for certain the effect which increasing age has on overall positivity (Schweizer et al., 2019). Positive thinking has been shown to directly reduce stress levels, impact success, and has been directly linked to an increase in learning and academic achievement in adolescents (Chen et al., 2018). Therefore, by understanding and addressing how overall positivity changes over the lifespan of an individual, the appropriate changes in environment or lifestyle can be made in order to improve quality of life.

Emotions

Self-Reported Emotions

The validity and dependability of self-reported emotions as a means for data collection is often considered all-or-none. One of the reasons for this way of thinking is that reports of current emotional experiences are much more likely to be correct or valid than reports of emotions that are displaced from the current period of time. It is also thought that responses can be biased among certain groups of individuals who might be less willing to respond and report negative emotional states of being. For example, a person who is of a higher economic status, regardless of the anonymity of the study, would not like to be perceived as having negative emotions. In self reported states of emotion, aspects such as valence (the overall positive or negative affectivity) and arousal (being alert and attentive), or the

tendencies towards approach and avoidance, typically contain the large majority of the variance (Mauss & Robinson, 2009).

Positivity

Positivity often means that an individual has an optimistic outlook on life, approaches situations with an expectation of success, and learns from their mistakes. Some of the health benefits of positive thinking can include a lengthened life span, lowered levels of depression and stress, as well as better overall physical health, including increased cardiovascular health (Mayo Health Clinic, 2017). It is not known why these traits are commonly experienced in positive thinkers, but one current theory states that people with a positive outlook tend to live healthier lifestyles, as well as being able to deal better in stressful situations than those with a pessimistic outlook (Mayo Health Clinic, 2017).

Age

Age-Related Positivity Effect

The "age-related positivity effect" demonstrates the contradiction that as cognitive and physical decline increase with age, overall positivity tends to increase (Schweizer et al., 2019). In comparison to younger individuals, older people retain more positive than negative information. Therefore, older people place goals pertaining to their well-being in a higher regard (Reed & Carstensen, 2012). This theory implies that as people age, their emotional well-being should increase in relation. This contradiction was further supported by the development of the Aging Brain Model, shows that increased levels of positivity as age increases is the result of a decreasing sensitivity to negative stimuli in the amygdala. However, both of these findings were contradicted in a recent study, in which the data showed no support for this theory. The opposite trend was shown throughout the

experiment, where overall positivity was found to decrease across groups of increasing age (Schweizer, 2019).

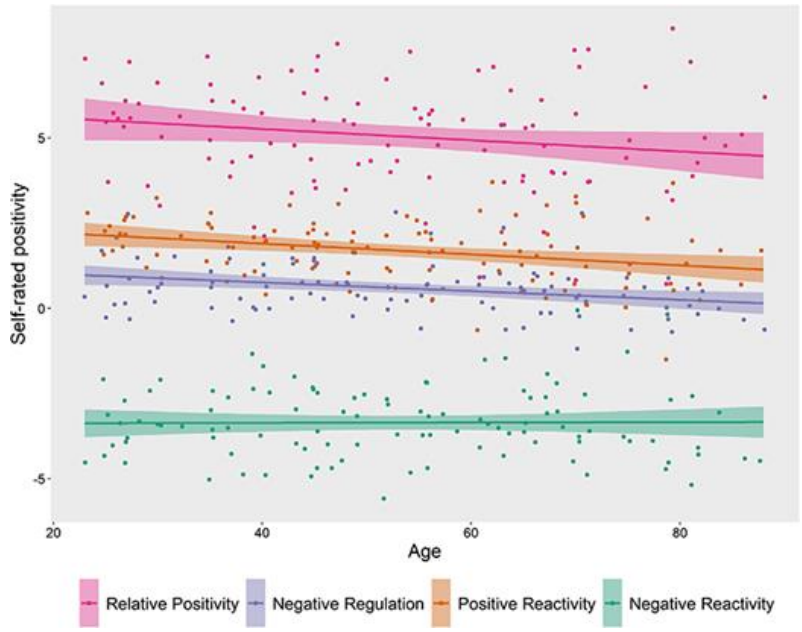

Figure #1 – the significant association between age and emotion ratings based upon Positive Reactivity, Negative Reactivity, and Negative Regulation (Schweizer, 2019).

Generational Theory

The Strauss-Howe Generational Theory states that there are groups called generations that tend to exhibit similar patterns of behavior that correlate with specific events in the history of the United States of America. Morris Massey, a sociologist, argued that these behaviors are created and driven by an individual's system of values, and that people within a generation are more likely to share those values and beliefs (Strauss-Howe Generational Theory, 2019). Another explanation for the generational theory is that a generation might share collective memories, as they have shared life experiences of significant events (Parry & Urwin, 2017). These events do not impact either the previous or the following generations of the one in question, and therefore create a difference in the

outlooks of the groups. At the conclusion of one study regarding generational differences, the researchers concluded that society is evolving as one entity, and that generations are the result of continuing trends that become more and more noticeable over time (Parry & Urwin, 2017). As a result of this, people that belong to one generation will have noticeable differences in mindset, values, behaviors, and life experiences when placed in comparison to an individual that belongs to a different generation. Therefore, the overall positive outlook of an individual should correlate with others in the generation they were born into, and what important events they have experienced as a group.

Anatomy

The Amygdala

The amygdala is a part of the limbic system, which is a part of the brain that deals with both behavioral and emotional responses. The amygdala consists of right and left amygdalae, both of which play a critical role in emotional processing and response. Some of the emotions that it typically deals with include anxiety, fear, and pleasure. The amygdala also has influence on an individual's memory systems, where it typically influences episodic memory. Episodic memory consists of events that occurred at a specific time or place, and are easily recalled by the individual. The amygdala influences this type of memory by attaching a specific emotion to the event that the individual thereby associates with it ("The limbic system").

The amygdala also plays a very important role in processing fear in particular. When it registers stimuli as possibly threatening or dangerous, it sends signals to other parts of the brain that control the body's physical response, such as the "fight-or-flight" mechanism. This reflexive response in the face of dangerous situations often occurs before the person is consciously aware of what is happening. As a

result, the amygdala also is able to associate this fear with events or memories that induced the emotion, creating an awareness of future events that may cause that same fear ("The limbic system").

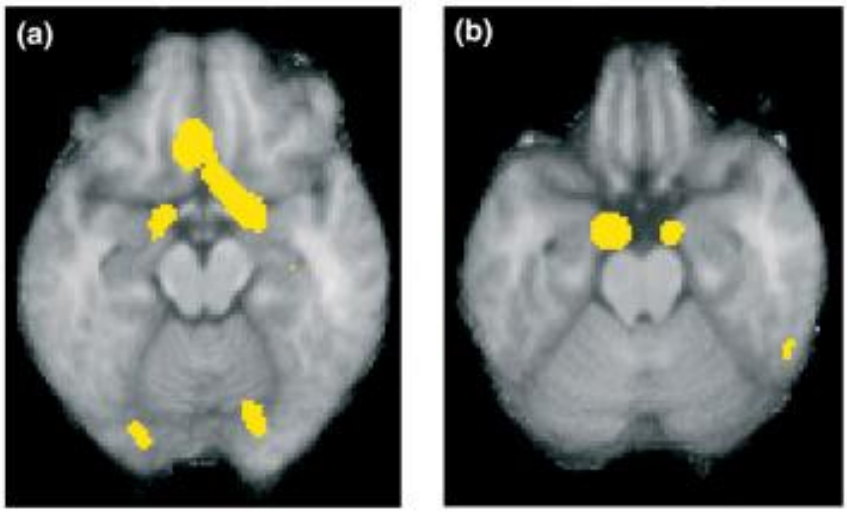

Figure #2 - Amygdala activity during positive (a) and negative (b) visual stimuli (Phelps, 2004)

The Hippocampus

The hippocampus is also a part of the limbic system, and deals with most of the memories that the brain forms. There are also two parts, each located on one of the two hemispheres. One of its functions is to attach certain senses to memories, such as smell or auditory stimuli. The hippocampus registers this information, and processes it in a way that the brain can understand and store in long-term memory. It is here that episodic memories are formed and sorted into memory storage. The rear part of the hippocampus, in particular is believed to play an important role in spatial memories and awareness ("The limbic system").

Age has been found to also have a major effect on the structure and functioning of the hippocampus. As an individual continues to age, the hippocampus will shrink in size, causing a decline in memory recall and overall performance. In one study, the researchers concluded that as age

increased and hippocampal volume decreased, the following factors also significantly declined in overall performance: episodic memory, working memory, processing speed, and executive function (O'Shea et al., 2016). Alzheimer's patients specifically had a smaller hippocampus and a much greater decline in volume than people with a normal rate of hippocampal volume loss.

Color Associations

Ecological Valence Theory

The ecological valence theory (EVT) states that an individual's preference for a certain color is derived from biological adaptations, and therefore will like colors that are associated with objects or things that they like (Palmer & Schloss, 2011). In nature, this is mimicked by colors that attract or deter other organisms, such as the colors that a flower uses to attract pollinators, or conversely, the bright colors that a poisonous toad uses to avoid predators. This theory also states that preferences for a certain color are adaptive, and appeal to natural selection. This stems from the idea that individuals would be more likely to survive if they avoid objects that look dangerous, and did so by associating them with a "bad" color that they would not be likely to approach. Conversely, objects with "good" colors would be advantageous to the individual's survival and eventual ability to reproduce. In relation to emotions, if an individual receives positive or happy feelings from an experience with a particular color, they will be more likely to have a preference for that color (Palmer & Schloss, 2011).

Hue Preferences

There are three basic components of color typically used: brightness, hue, and colorfulness. Hue, more specifically, refers to the correlating wavelength on the electromagnetic spectrum (in nm). In previous studies conducted, it was found that individuals preferred blue hues most of the time, and

showed an overall dislike of yellow hues (Palmer & Schloss, 2011). Regarding the other two attributes of color, it was found that more vivid (colorful) and lighter colors were preferred over less colorful and darker colors. Therefore, all three components play some role in color preferences, and should all be taken into account when conducting inquiries into this field. In the duration of this study, it was also found that in comparison to the most chosen preferred colors, the least preferred were chosen at a faster pace, and were less likely to be linked with a specific concept or object (such as in the EVT).

Overall, when asked to choose between colors, whether in an entire sample, or in a forced choice, paired comparison test, individuals most often chose yellow-green colors as their least preferred color in comparison to all of the other hues. In conjunction with other experiments, the overall preferred hues tended to be of a blue hue (Palmer & Schloss, 2011).

Photoreceptors

Photoreceptors are located in the retina, and are made up of cells that respond to the presence of light. It consists of densely packed membrane, that holds a photopigment called rhodopsin. The tightly packed membrane is necessary in order to create a high density within the photopigment. This is needed in order for a larger amount of the light photons to be absorbed by the photoreceptors. The two types of photoreceptors that are in the retina are called rods and cones (Land, 2019).

Rods typically are able to perceive changes between light and dark, as well and shape and movement. They are not used for color vision, and only have one type of light sensitive pigment. When there is a lack of good lighting, such as in a dimmed room, the rods are mainly used, rather than the cones. There are many more rods in the retina than cones (Land, 2019).

The cones are not typically used for changes in light, as they are much less sensitive to those shifts. They are mostly sensitive to changes in different colors, being red, green, or blue. When signals

are received from the cones, they are sent to the brain to be processed and translated into what the individual perceives as color. Cones only work in bright, not dimmed light, which is the reason why color is not easily seen in dark places. People who are color blind do not have one type of cone in their retina, or that cone may simply be damaged (Land, 2019).

Conclusion

While there are many studies that show a correlation between increased age and increased positivity, information that contradicts this trend can still be found in other experiments. Therefore, more research is needed in this field in order to address these controversies in how age affects the mindset of an individual. Few studies discuss this increased positivity in conjunction with color associations in particular. Overall, trends in positivity are important to research and consider, as they have been shown to correlate with several life-improving factors, such as lower levels of depression and stress, and increased physical health. This research might be able to be applied by therapists or others who work with people, and are looking to increase overall positivity of their clients. However based on the age of the individual they are working with, the methods that they should use will vary.

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