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The Impact of Cues on Autobiographical Memory Recall in Depression

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ABSTRACT

Studies have consistently found autobiographical memory (AM) impairments in persons with depression. However, these studies have largely utilized generic word cues to elicit AMs, yet word cues do not reflect how AMs are typically represented in the mind nor how AMs are usually cued in daily life. The current two-part study employed improved methodology to provide a more comprehensive understanding of the impact of cues on AM recall and emotional functioning in depression. In part one, a set of word and image cues were developed and validated. In part two, twenty-one currently depressed and 31 never-depressed participants were instructed to recall specific AMs in response to valenced word and image cues. Process and content characteristics of the recalled AMs were examined, as well as participants' self-reported affect after each AM recall. Study hypotheses were partially supported. Findings indicated that cue type and valence impacted process and content characteristics of AMs, and these effects did not differ between currently depressed and never-depressed participants. However, cue characteristics did differentially impact depressed and never-depressed participants' self-reported positive affect after AM recall. Interpretation and implication of the findings are discussed.

THE IMPACT OF CUES ON AUTOBIOGRAPHICAL MEMORY RECALL IN DEPRESSION

The recall of autobiographical memories (AMs), or events from our personal past, is a cognitive ability that has several interrelated functions that are important for wellbeing (Fivish, 2011; Waters, 2014). Indeed, recalling an AM can promote continuity of oneself, can inform and guide one's actions in the present and future, and can facilitate social relationships (Bluck, 2003; Bluck & Alea, 2002; Bluck, Alea, Habermas, & Rubin, 2005). AM and its functions are also closely intertwined with affect. Recalling a memory can evoke an emotional response and regulate affect, and one's emotional state can impact which emotional memories are salient (Holland & Kensinger, 2010; Josephson, Singer, Salovey, 1996; Pasupathi, 2003).

The interplay between AM and affect is common in everyday life. Imagine, for instance, scrolling through your social media platforms as part of your morning ritual and stumbling upon a three-year-old post featuring a photograph of you and your best friend at a concert. This could suddenly shift your neutral mood into a happy one. In a different circumstance, imagine studying for an exam and debating whether to continue studying or take an hour-long break to watch television. In making that decision, memories of failing exams in the past may come to mind, thereby eliciting anxiety and prompting you to continue studying. Alternatively, memories of past academic success – perhaps even a memory of receiving an A on an exam you did not study for – may elicit feelings of confidence and calm and prompt you to take that break.

Because of the important relationship between AM and emotion, AM processes may be valuable for understanding major depression, a mood disorder characterized by persistent

sadness and/or anhedonia (American Psychiatric Association, 2013). Specifically, AM recall can play a role in emotional reactivity and emotion regulation, aspects of emotional functioning believed to have implications for the development, maintenance, and recurrence of depression (Rottenberg, 2017). Research shows impaired emotional reactivity and emotion regulation among depressed persons compared to controls; however, the nature of the impairment may differ by context (e.g., blunted reactivity in the laboratory and affective instability in daily life; Rottenberg, 2017)[1]. Investigating AM recall in depression can therefore contribute important insights about emotional functioning among depressed persons.

Autobiographical Memory in Depression

A large body of literature has accumulated on AM in depression, and findings suggest that dysfunction in AM may be a common, stable feature of depression (Williams et al., 2007). Specifically, depressed persons exhibit deficits in the manner in which they recall AMs (i.e., *process* deficits), as well as deficits in memory characteristics (i.e., *content* deficits) (Philippot, Kremers, Raes, & Hermans, 2006). For example, depressed individuals consistently recall AMs in an overgeneral manner[2, 3] in response to word cues compared to controls (Williams et al., 2007). In other words, instead of recalling a memory of a personal event that occurred at a specific place and time and lasted less than a day (e.g., "I felt excited when I went on a dinner cruise last Saturday"), depressed individuals recall memories that reflect a category of generic

[1] Rottenberg (2017) argues that the differing emotional reactivity patterns in the laboratory and in daily life may be due to the nature of stimuli used. Specifically, laboratory studies utilize generic emotional stimuli, while the stimuli in daily life are idiosyncratic.
[2] The literature uses varied terms to describe the specificity (or lack thereof) of an AM, including "specific," "overgeneral," "categorical," "nonspecific," and "reduced specificity" (Williams et al., 2007). Regardless of the term, the construct of "specificity" is unidimensional, and "specific" and "overgeneral" are direct opposites. In this study, the terms "specific" and "overgeneral" will be used when referring to the specificity of an AM.
[3] While studies spanning decades have consistently found this pattern of overgeneral recall of AMs instead of specific recall, a recent study by Hitchcock et al. (2019) suggests that depressed persons experience difficulties recalling both specific *and* general memories.

events or events lasting longer than a day (e.g., "I'm excited every time I go on vacation"). Further, this overgeneral memory effect is seen in response to both positive and negative cue words (van Vreeswijk & Wilde, 2004; Williams et al., 2007). Depressed participants are also slower to retrieve specific AMs compared to controls, especially for positive cues (Goddard, Dritschel, & Burton, 1996; Ridout, Dritschel, Matthews, & O'Carroll, 2016; van Vreeswijk & Wilde, 2004; Williams & Scott, 1988).

Content deficits in AMs are also consistently exhibited by depressed persons, and largely emerge for memories recalled in response to positive word/semantic cues. For example, relative to controls, the AMs recalled by depressed individuals in response to positive cues are less vivid (Werner-Seidler & Moulds, 2011), less detailed (Rottenberg, Hildner, & Gotlib, 2006), less positive and more negative in valence (Begovic et al., 2017), more remote (Kim, Yoon, & Joormann, 2018), and are recalled in an emotionally detached, observer visuospatial perspective (Kuyken & Howell, 2000). In contrast to depressed individuals, healthy persons typically exhibit a positivity bias in AM process and content characteristics (Hitchcook et al., 2020; Hitchcook, Rees, & Dalgleish, 2017).

In addition to process and content deficits, impairments in the functional uses of AM recall have also been found in individuals with depression. The use of AM recall for affect regulation purposes has garnered particular research interest. Studies suggest that recalling positive AMs is an effective and adaptive way to regulate sad mood (Josephson et al.,1996), yet individuals with a history of depression (including those who are currently experiencing a depressive episode) are less likely to spontaneously use this strategy in response to their sad mood compared to their never-depressed counterparts (Kovacs, Rottenberg,& George, 2009). Even when depressed and depression-vulnerable persons are *explicitly instructed* to recall

positive AMs, they exhibit less mood benefits from it than non-depressed persons (Joormann, Siemer, & Gotlib, 2007).

I have separately reviewed AM process/content deficits and AM-based affect regulation difficulties in depression, yet there are reasons to believe that these two kinds of problems may be interrelated. For example, there is strong evidence that sensory-perceptual details and associated mental imagery are important in eliciting strong emotional responses (Holmes & Mathews, 2010; Holmes, Mathews, Mackintosh, & Dalgleish, 2008). In the context of AM recall among depressed persons, the commonly observed AM deficits are believed to limit access to sensory-perceptual details of an event and therefore blunt the emotional impact of the event (Werner-Seilder & Moulds, 2011). In other words, a depressed person's recall of a deficient positive AM may inhibit the elicitation of positive emotions, which in turn limits their ability to repair negative mood. Critically, when trained to recall specific, sensory-rich positive AMs, depressed individuals are able to experience an improvement in mood (Arditte Hall, Raedt, Timpano, & Joormann, 2018).

Based on the extant research on AM and depression, three conclusions can be drawn about the impact of AM on emotional functioning in depression. First, with regards to process characteristics, depressed persons exhibit a general difficulty accessing specific emotional memories, regardless of the valence of the memory. Put differently, depressed persons do not show preferential access to memories of a certain valence. Second, with regards to content characteristics, depressed persons recall positive AMs with characteristics that may promote blunting of positive affect (e.g., recalling positive AMs in an emotionally detached observer visuospatial perspective [Kuyken & Howell, 2000]). Third, depressed individuals derive less mood benefits from recalling positive AMs. The affective consequences of recalling negative

AMs relative to positive AMs among depressed persons is unclear, given that studies of AM-based affect regulation primarily focus on mood improvement (and hence examine positive AMs).

The pattern of emotional functioning among depressed persons in the context of AM recall appears to provide only partial support for prominent theories of depression. Specifically, Beck (1976) argued that depressed and depression-vulnerable individuals possess negative cognitive schemas that lead to automatic negative thoughts about the self, world, and future. As such, depressed persons are predicted to exhibit a negativity bias, characterized by preferential attention to and processing of negative stimuli, as well as potentiated reactivity to negative stimuli (Gotlib & Joorman, 2010; Mathews & MacLeod, 2005). In the context of AM, a negativity bias would suggest preferential recall of negative memories. This connection is further supported by that fact that depressed individuals' tendency to ruminate (McLaughlin & Nolen-Hoeksema, 2011; Nolen-Hoeksema, 1991) would promote rehearsal and elaboration of negative experiences, thereby strengthening the memory traces and enhancing recall of these negative AMs (Kensinger & Ford, 2020). Additional, complementary theoretical accounts posit that depressed individuals would exhibit a *reduced* positivity bias, such that depressed persons would be less likely to attend to and process positive stimuli and be less reactive to positive stimuli (Carl, Soskin, Kerns, & Barlow, 2013; Mathews & MacLeod, 2005; Pizzagalli, 2014).

The extant AM literature lends support for a reduced positivity bias for AM recall among depressed individuals, but there is limited support for a negativity bias. However, a significant limitation in the AM literature – and in turn, our understanding of AM processes and emotional functioning in depression – is that research studies have converged too heavily on the use of word cues to elicit AMs. Such word cue paradigms, including the widely used Autobiographical

Memory Test (AMT; Williams & Broadbent, 1986) require individuals to call a specific AM in response to a word cue (e.g., "disappointed") within a fixed time period[4]. A key shortcoming of using cues to elicit memories is that it does not reflect how emotional memories are typically represented in the mind (i.e., in the form of images) (Paivio, 1990) nor how AMs are typically cued in daily life (Berntsen & Hall, 2004). As such, the pattern of deficits observed in response to word cues (i.e., process deficits that are not specific to AM valence, and content and affective deficits that are specific to positive AMs) may not generalize to other type of cues.

In light of research (see Rottenberg, 2017 for review) showing that emotional functioning in depression differs in the laboratory and daily life (possibly due to differences in the personal relevance of stimuli present), the use of generic word cues to study AM processes and its impact on emotional functioning in depression may not capture how these dynamics unfold in daily life. Therefore, in order to gain a more comprehensive understanding of AM and emotional functioning in depression, it is critical to simulate the factors that may impact AM recall in daily life. Manipulating the type of cues used to elicit AMs is one approach of increasing ecological validity while benefitting from the control afforded by a laboratory setting. The use of image cues, as opposed to word cues, are more likely to reflect the type of cues present in daily life. Indeed, studies show that external, non-verbal cues typically prompt AM recall in everyday life (Berntsen & Hall, 2004).There is also reason to believe that image and word cues would differentially impact the process and content characteristics of AMs, as well as the memory's affective impact (Conway & Pleydell-Pearce, 2000; Paivio, 1990; Williams et al., 2007).

[4] Alternative memory elicitation paradigms such as memory interviews have also been utilized, albeit to a lesser degree. In these memory interviews, participants retrieve and elaborate upon an AM in response to a broader cue (e.g., "describe the happiest/saddest event in your life" or a memory that occurred during a particular lifetime period) (Begovic et al., 2017; Lemogne et al., 2006; Rottenberg et al., 2006). While the memory interviews and AMT differ in format, they both use cues that are verbal/semantic in nature.

In the sections to follow, I review the theories of AM organization, storage, and retrieval. This review serves to justify the present design which focuses on potential differences between word and image cues, and their implication for AM recall and emotional functioning in depression.

Memory System

Overview

Memory is a complex cognitive function that encompasses various systems/subsystems and relies on other cognitive functions, such as perception and attention. Memory is broadly comprised of three components: (1) sensory memory; (2) working memory/short-term memory; and (3) long-term memory (Atkinson & Shiffrin, 1968; Baddeley & Hitch, 1974). Sensory memory captures the array of external stimuli present in one's environment; the capacity of sensory memory is large, but short-lasting (less than a second). The sensory information that is perceived and registered by an individual is temporarily retained (15 to 20 seconds) in working memory/short-term memory; during this time, the information can be processed and manipulated (Baddeley, Eysenck, & Anderson 2009; Baddeley & Hitch, 1974; Zhang & Luck, 2009). If and when the information is encoded, it becomes stored in long-term memory, which in principle can be retained for an unlimited length of time (Goldstein, 2018). Information stored in long-term memory can be characterized as *explicit* (memory content that can be consciously controlled) or *implicit* (content that is not accessed intentionally). Explicit long-term memory consists of episodic and semantic memory, while implicit long-term memory consists of procedural/motor memory, priming, and conditioning (Goldstein, 2018). Once information is stored in long-term

memory, the process of retrieval involves bringing the information back to working memory/short-term memory.

An important distinction has been made between episodic and semantic memory (Tulving, 1989). Episodic memory refers to memory of past experiences, and importantly, consists of a "mental time travel" component in which an individual consciously projects him or herself into the past, re-experiences the event via sensory details, thoughts, and feelings, and is aware that the event occurred in the individual's past and is being remembered in the present (Fivush, 2011; Tulving,1989; Wheeler, Stuss, & Tulving, 1997). Contextual information is thus crucial for AM. Semantic memory, by contrast, consists of knowledge or facts that are general or public (e.g., Washington D.C. is the capital of the USA) or personal (e.g., I moved to Texas in 2019). Therefore, unlike AM, semantic memory is devoid of context. AM can include elements from both episodic and personal semantic memory (Goldstein, 2018).

Organization of Autobiographical Memory

Conway and Pleydell-Pearce (2000) proposed a model of AM coined the *Self Memory System*, which has implications for process and content characteristics of AMs. The authors argue that encoding and retrieval of AM consists of two interacting components: the *autobiographical knowledge base* and the *working self*. The autobiographical knowledge base is arranged in a hierarchical manner, with three levels that vary in degree of specificity (e.g., lifetime periods, general events, event-specific knowledge). Knowledge stored in the first level pertains to general lifetime periods, which are characterized by distinguishable themes and start and end points (e.g., when I lived in Europe; when I was in graduate school). Given the broad nature of lifetime periods, autobiographical knowledge at this level is the least specific.

The second level reflects knowledge of general events and can include categories of events (e.g., all the times I went to the beach), as well as extended events (e.g., my cruise vacation to the Bahamas in 2014). Autobiographical knowledge at this level is more specific relative to the previous level and is also more varied in content. General events are often grouped together by theme, and therefore the recall of a memory of one general event can activate another related general event. This general knowledge is believed to be represented in a verbal/abstract format (Williams et al., 2007). Event-specific knowledge constitutes the third and most specific level of autobiographical knowledge. It is characterized by sensory-perceptual details of specific events, including sight, smell, sound, touch, and taste, as well as emotions related to the event (Conway & Pleydell-Pearce, 2000). Unlike general knowledge, event-specific knowledge is believed to be represented in the form of images (Conway, 2001; Williams et al., 2007).

Following this proposed structure of AM, one interpretation of the previously reviewed research findings is that depressed persons are prone to become stuck at the second level of general events, which leads them to produce general AMs rather than the specific, content-rich AMs that are sought in AMT studies (Williams et al., 2007). Several factors may contribute to why depressed persons may terminate their search for a specific AM, such as rumination, avoidance, and impaired executive functioning (Williams et al., 2007). The organization of autobiographical knowledge also supports the idea that cue type would differentially impact activation of autobiographical knowledge. Namely, a word cue is verbal/semantic (and potentially abstract) in nature and therefore would readily elicit general autobiographical knowledge/memories, which is also mentally represented in a verbal/semantic format. On the other hand, image cues more closely match the format of autobiographical knowledge stored at the third level, and thus would more readily elicit the specific AMs stored at this level.

The second component the *Self Memory System* is the *working self*, which impacts autobiographical knowledge. Conway and Pleydell-Pearce (2000) conceptualized the working self as a self-generated, hierarchically arranged set of goals that serves as a regulatory mechanism. More specifically, the working self controls the accessibility of particular autobiographical knowledge with the overarching aim of maintaining a stable, coherent self. For example, if a specific autobiographical event is incongruent with the current goals, images, or beliefs of the working self, the event will be forgotten/difficult to retrieve or will be distorted in order to be compatible with the working self (Conway, 2005; Conway & Pleydell-Pearce, 2000). In a reciprocal manner, the available autobiographical knowledge base limits the goals of the working self (Conway & Pleydell-Pearce, 2000).

Bridging theories of depression with the working self component of the *Self Memory System,* it would be expected that the negative self-schema and negative mood of depressed persons would preferentially activate negative autobiographical knowledge and memories, while suppressing or distorting positive autobiographical knowledge and memories. The available research showing that depressed individuals' recall of positive AMs are characterized by deficient content is consistent with the *Self Memory System*. However, there is limited evidence of depressed persons recalling content-rich negative AMs.

Retrieval Modes of Autobiographical Memory

Conway and Pleydell-Pearce (2000) also proposed two main ways that AMs can be retrieved or "constructed". The researchers posit that an AM can be recalled via a generative process or a direct process, and in either case, an internal or external cue is necessary to activate the autobiographical knowledge base. Generative retrieval of a specific AM is an effortful, top-down, iterative process whereby a cue undergoes a process of elaboration based on

verbal/abstract representations, and criteria is established for the type of memory that will match the specified description. The elaborate search process begins at either the first level (lifetime periods) or second level (general events) of autobiographical knowledge and proceeds down to the third level. During the deliberate search process, various autobiographical knowledge, events, and emotions may automatically be activated, given that representations in memory are embedded in an associative network (Anderson & Bower, 1973; Conway & Pleydell-Pearce, 2000; Walker, Vogl, Brown, 2011). An individual must exert effort to process the autobiographical knowledge activated, retain pertinent information in working memory for further elaboration, and inhibit impertinent information.

Unlike generative retrieval, direct retrieval is an automatic, bottom-up process. Specifically, a cue spontaneously activates the third level of autobiographical knowledge (event-specific knowledge), resulting in the automatic retrieval of a specific AM. Direct retrieval therefore requires less effort and a specific AM is reconstructed more quickly.

The nature of a cue may influence retrieval, and there is reason to believe that word cues in particular may preferentially activate generative retrieval. This would lend support for depressed persons' slow retrieval of AMs and pattern of recalling overgeneral AMs (e.g., Goddard et al., 1996; Ridout, Dritschel, Matthews, & O'Carroll, 2016; van Vreeswijk & Wilde, 2004; Williams et al., 2007; Williams & Scott, 1988). Given the cognitively taxing process associated with generative retrieval and poor executive functioning that is commonly seen among depressed persons (Snyder, 2013), it is perhaps not surprising that word cues would diminish a depressed person's ability to retrieve specific AMs. Relative to word cues, image cues are likely to have preferential activation of direct retrieval and elicit specific AMs, given that image cues match the way in which autobiographical knowledge is stored at the third level of the

knowledge base (i.e., in the form of images). Consequently, AM process deficits would be less likely to emerge when images are used to cue AMs. In other words, images cues would promote retrieval of specific AMs among depressed individuals and the retrieval would occur relatively quickly.

Because AM recall is reconstructive in nature, studies also suggest that the retrieval process would impact content characteristics. For example, Harris, O'Connor, and Sutton (2015) found that AMs retrieved via the direct mode were characterized by a first-person, field visuospatial perspective, whereas AMs retrieved via the generative mode were characterized by a third-person, observer perspective. Other findings show that directly retrieved AMs are more detailed, more personally significant, more rehearsed, and more emotional than generatively retrieved AMs (Addis, Knapp, Roberts, & Schacter, 2012; Harris & Berntsen, 2019). Findings from these studies may in part explain why depressed persons' word-cued positive AMs are less vivid, less detailed, and recalled from a detached visual perspective (e.g., Kuyken & Howell, 2000; Rottenberg et al., 2006;Werner-Seidler & Moulds, 2011).

Mental Representation of Information: Verbal and Imagery

Paivio's (1990) influential *Dual Coding Theory* provides additional support for the qualitative difference between word and image cues and differential impact on AM recall and emotional functioning. Further, while the *Dual Coding Theory* is not specifically geared toward AM, it aligns with Conway and Pleydell-Pearce's (2000) model of AM organization and retrieval. According to Paivio (1990), information from the external environment can be mentally represented in verbal and nonverbal forms in corresponding symbolic systems (*verbal*

system and *imagery system,* respectively)[5]. The two systems differ in structure and function and are independent, though they can be they can be activated simultaneously and interact.

Various factors influence the activation of verbal and non-verbal representations. A particularly strong factor is congruence between the system type and external stimuli or cue. In other words, an image cue (e.g., photograph) is more likely to activate and utilize the imagery system than a word cue, and a word cue is more likely to activate and utilize the verbal system than an image cue (Paivio, 1990). The direct activation of a corresponding cue and system is relatively fast and characterizes *representational processing*. Paivio (1990) identified two other processing types: *referential* and *associative.* In referential processing, a given system is activated by an incongruent cue (i.e., a verbal cue eventually activating the imagery system). This type of processing is theoretically more time consuming and involved, given the "crossover" between systems. Associative processing refers to activation of related/relevant representations within a given system (e.g., in the context of the verbal system, one word activates a related word). An individual can use a processing type solely or in combination with others (Paivio, 1990).

Similar to Conway and Pleydell-Pearce's (2000) model, Paivio's (1990) model is also able to account for the pattern of AM process and content deficits found among depressed individuals. More specifically, because a word cue and AM are represented in different systems (verbal system and imagery system, respectively), a "crossover" from the verbal system to the imagery system (i.e., referential processing) would inevitably have to occur at some point in order to retrieve an AM. While a word cue would not preclude an individual from retrieving an

[5] Both systems are related to sensorimotor systems (e.g., visual, auditory, haptic, taste, smell), but are represented in the verbal and imagery systems in a manner that is congruent with the system. For example, information from the visual and auditory sensorimotor inputs would be represented as visual words and auditory words in the verbal system, and as visual objects and environmental sounds in the imagery system (Paivio, 1990).

AM, the process would be effortful and time-consuming.[6] This aligns with the finding that depressed individuals experience difficulty accessing specific AMs when presented with word cues (e.g., Williams et al., 2007).

Unlike word cues, image cues would theoretically facilitate the retrieval of a specific AM. Given that image cues and AM are stored and processed in the same representational system, this match would facilitate less effortful and less time-consuming retrieval (i.e., representational processing). As such, in the context of depression, image cues would aid depressed persons in retrieving a specific AM.

Cue Type and Affective Impact

Word and image cues are likely to differ in their emotional impact as well. While no study to my knowledge has directly examined this in the context of AM, the literature on mental imagery provides indirect support. For example, Holmes et al. (2008) found that participants experienced a greater emotional response when utilizing mental imagery to process stimuli compared to verbally processing the stimuli. Further, participants were more likely to use past personal events when processing the stimuli via mental imagery compared to verbally processing the stimuli; the use of AMs in mental imagery mediated the relationship between mental imagery and emotional impact (Holmes et al., 2008). This study, in addition to other basic and applied research studies, supports theories that posit that the neural bases supporting mental imagery (vs. neural systems supporting verbal representations/ verbal processing) are more closely linked to

[6] Some studies have examined how word cue type (e.g., concrete words vs. emotion or abstract words) would impact retrieval mode. Scholars have argued that concrete words are highly imaginal and would thus facilitate easier memory recall than emotion/abstract word cues. Some studies provide support for this. For example, Uzer (2016) and Uzer, Lee, and Brown (2012) found that concrete noun word cues were more likely to activate direct retrieval than emotion word cues. While concrete, highly imaginable word cues may be similar to image cues in some respects, there is reason to believe that they are not equivalent. For instance, concrete words may be more imaginal, but likely require some effort to generate the mental image whereas an image cue reduces that burden.

affective neural systems (e.g., Ji, Heyes, MacLeod, & Holmes, 2016; Öhman & Mineka, 2001). Based on these existing studies, it would be reasonable to expect that AMs cued by image cues (vs. word cues) would be associated with greater emotional impact because it would facilitate greater use of mental imagery.

Cue Type and Autobiographical Memory Recall in Depression

In summary, theoretical accounts and empirical work strongly suggest that there are significant, qualitative differences between word and image cues, which in turn carry implications for emotional functioning in depression. The differences between word and image cues, as discussed in the sections above, are summarized in Appendix A (Table 1).

Surprisingly, the field has understudied the role of cues in the context of AM in depression. To the author's best knowledge, only one study to date has directly compared the impact of word and image cues on AM recall in a depressed population. In this study, Ridout, et al. (2016) employed two version of the AMT (original and modified) to elicit AMs among currently depressed and never-depressed participants. In the original AMT, participants were presented with 10 emotional word cues (five negative and five positive); in the modified AMT, participants were presented with 10 images (five negative and five positive). Each participant completed both versions of the AMT, with the order counterbalanced across participants. The key outcome variables included retrieval time and memory specificity.

Ridout et al. (2016) found that currently depressed participants were slower to retrieve specific positive AMs than controls, but there were no group differences pertaining to retrieval of specific negative AMs. In general, never-depressed participants exhibited faster retrieval of positive AMs compared to negative, whereas currently depressed participants showed a trend toward faster retrieval of negative AMs compared to positive AMs. Further, depressed

participants' retrieval of specific AMs did not differ based on cue type, while never-depressed participants recalled more specific AMs in response to images compared to words.[7] Ridout et al. (2016) concluded that depressed participants' tendency to recall overgeneral AMs is a stable feature and does not vary based on cue type (i.e., word or image).

While Ridout et al.'s (2016) study represents a step toward understanding how cue type may influence AM process characteristics among depressed individuals, the study was narrow in scope. Specifically, the authors did not examine AM content characteristics or how cue type may impact affect. These two domains may contribute significant insight and aid in developing a comprehensive understanding of AM recall and emotional functioning in depression. Additionally, certain methodological aspects of Ridout et al.'s study were less than ideal. For instance, it is unclear if the word and images used for the AMT/modified AMT were indeed comparable. While the authors matched word and image cues on valence and arousal, other potentially important aspects were not taken into account, such as congruence in theme and imagery. In other words, we cannot rule out the possibility the observed results were influenced by elements aside from valence/arousal. Because cue type is a core construct under investigation, a more rigorous approach for selecting word and image cues is warranted.

Current Study

The present study significantly builds and expands upon Ridout et al. (2016). The impact of cues on AM recall and associated affective consequences was investigated among persons with clinical depression. First, a set of valenced word and image cues were developed and validated. In the main study, I examined: (1) how cue type and cue valence impact the *process* of

[7] It should be noted that the *Group* x *Cue* interaction was marginally significant ($p = 0.08$), but the authors conducted these follow up analyses due to a priori predictions.

AM recall; (2) how cue type and cue valence impact the *content* of AMs; and (3) how recalled AMs impact mood.

In addition to utilizing a validated set of cues, the study featured additional methodological strengths. First, a total of 32 memory recall trials were included to ensure adequate sampling of AM characteristics. Second, memory specificity and memory retrieval time were selected as AM process characteristics, which maintains consistency with previous studies and allows for comparison. With regards to AM content characteristics, valence, sensory detail, coherence, and self-alignment were selected. These characteristics are frequently examined in the AM literature and can impact affect (Boyacloglu & Akfirat, 2015; Conway, Singer, Tagini, 2004; Sutin & Robins, 2007; Vanderveren, Bijttebier, & Hermans, 2020; Werner-Seidler, Tan, & Dalgleish, 2017). Third, process and content characteristics of AMs were rated by independent coders; the potential bias of participant self-report was therefore circumvented. Study aims and associated hypotheses are detailed below:

Aim #1

Examine the impact of cue type (word vs. image) and cue valence (positive vs. negative) on AM *process* characteristics (memory specificity and retrieval time).

Hypothesis 1a. A three-way interaction was predicted, such that the proportion of specific and overgeneral AMs recalled in response to positive/negative word and image cues would differ as a function of depression status. Unlike never-depressed participants, currently depressed participants would recall a greater proportion of specific AMs to negative image cues compared to positive image cues; this effect would be reduced for negative word cues and positive word cues. Additionally, depressed persons would recall a greater proportion of

overgeneral AMs to positive image cues compared to negative image cues; this effect would be reduced for positive word cues and negative word cues.

This prediction was based on theories suggesting that depressed individuals show a negativity bias (Beck, 1976; Gotlib & Joormann, 2010) and that image cues would more readily activate specific AMs because of the matching format (Conway & Pleydell-Pearce, 2000; Paivio, 1990). Further, depressed persons' reduced positivity bias (Pizzagalli, 2014) would support the prediction of decreased recall of specific AMs in response to positive image cues. Word cues, on the other hand, would be less likely to activate specific positive/negative AMs for depressed persons because the generative/referential retrieval mode activated by word cues would be too effortful (Conway & Pleydell-Pearce, 2000; Paivio, 1990). These same processes would support the predicted pattern for overgeneral AMs in response to valenced image and word cues.

Hypothesis 1b. A three-way interaction was predicted, such that the speed of AM recall in response to positive/negative word and image cues would differ as a function of depression status. Unlike never-depressed participants, currently depressed participants would recall AMs faster to negative image cues than positive image cues. This effect would be reduced for retrieval of positive words and positive images.

This prediction was again based on theories suggesting that depressed individuals have preferential access to negative stimuli and reduced positivity bias (Beck, 1976; Gotlib & Joormann, 2010; Pizzagalli, 2014). Image cues would preferentially activate direct/representational processing (Conway & Pleydell-Pearce's 2000; Paivio, 1990), which would facilitate faster recall. In contrast, word cues would increase retrieval time because the generative/referential retrieval mode is thought to be more effortful (Conway & Pleydell-Pearce's 2000; Paivio, 1990).

Aim # 2

Examine the impact of cue type (word vs image) and cue valence (positive vs. negative) on AM *content* characteristics (valence, sensory detail, coherence, self-alignment).

Hypothesis 2a. A three-way interaction was predicted, such that the valence of AMs in response to positive/negative word and image cues would differ as a function of depression status. Unlike never-depressed participants, currently depressed participants would recall more negative AMs in response to negative image cues than positive cues. This effect would be reduced for positive words and negative words.

This prediction was based on theories suggesting that depressed individuals show a negativity bias and reduced positivity bias for valenced stimuli (Beck, 1976; Gotlib & Joormann, 2010; Pizzagalli, 2014). Further, image cues are believed to facilitate greater use of mental imagery than word cues, which would in turn amplify the emotional impact of image cues (e.g., Foa & Kozak,1986; Holmes et al., 2008).

Hypothesis 2b. A three-way interaction was predicted, such that sensory detail of AMs recalled in response to positive/negative word and image cues would differ as a function of depression status. Unlike never-depressed participants, currently depressed participants would recall AMs with more sensory detail in response to negative image cues compared to positive image cues. This effect would be reduced for positive words and negative words.

Again, this prediction is based on theories suggesting that depressed individuals show a negativity bias and reduced positivity bias for valenced stimuli (Beck, 1976; Gotlib & Joormann, 2010; Pizzagalli, 2014). Additionally, because of the association between images and mental imagery, image cues were predicted to promote greater recall of sensory details of AMs than word cues (e.g., Holmes et al., 2008; Williams, et al., 2007).

Hypothesis 2c. A three-way interaction was predicted, such that the coherence of AMs recalled in response to positive/negative word and image cues would differ as a function of depression status. Unlike never-depressed participants, currently depressed participants would recall more coherent AMs in response to negative word cues compared to positive word cues. This effect would be reduced for positive and negative image cues.

This prediction was based on research suggesting that rehearsal and verbal processing may promote AM coherence (Vanderveren et al., 2020). Among depressed individuals, negative memories represent one common subject of rehearsal/rumination (e.g., Hertel, 2004; Lyubomirsky, Caldwell, Nolen-Hoeksema, 1998), which would theoretically promote greater coherence. Further, word cues are more likely to prompt rumination because these types of cues are verbal/semantic in nature, unlike images cues (Williams et al., 2007).

Hypothesis 2d. A two-way interaction was predicted, such that the self-alignment of recalled AMs would differ as a function of depression status and cue valence. Currently depressed participants would recall a greater proportion of self-concordant AMs in response to negative cues than positive cues, while never-depressed participants would recall a greater proportion of self-concordant AMs in response positive cues than negative cues. The opposite pattern would emerge for the recall of self-discrepant AMs.

This prediction was based on theories suggesting that depressed persons have a negative self-schema/negative working self, and thus the recall of negative AMs would align with their self-concept but positive AMs would not (Beck, 1976; Conway & Pleydell-Pearce, 2000). In contrast, for never-depressed persons, positive AMs would align with their self-concept but not negative AMs (Hitchcook et al., 2020; Hitchcook et al., 2017). No predictions were made about the impact of cue type on self-alignment, given the dearth of literature on this topic.

Aim #3

Examine the impact of AM recall on mood.

Hypothesis 3a. A three-way interaction was predicted, such that the degree of positive affect elicited by AMs recalled in response to positive/negative word and image cues would differ as a function of depression status. Compared to never-depressed participants, currently depressed participants would report greater positive affect in response to positive image cues compared to negative image cues. This effect would be reduced for positive and negative word cues.

This prediction was based on theories suggesting that image cues facilitate greater use of mental imagery, which can amplify the emotional response (Holmes & Mathews, 2010; Holmes et al., 2008). Additionally, valenced memories are thought to evoke emotions of a similar valence (i.e., positive AMs would elicit positive emotions; Buchanan, 2007).

Hypothesis 3b. A three-way interaction was predicted, such that the degree of negative affect elicited by AMs recalled in response to positive/negative word and image cues would differ as a function of depression status. Compared to never-depressed participants, currently depressed participants would report greater negative affect in response to negative image cues compared to positive image cues. This effect would be reduced for positive and negative word cues.

This prediction was based on theories suggesting that images cues evoke a greater emotional response, which is facilitated by mental imagery (Holmes & Mathews, 2010; Holmes et al., 2008). Further, the valence of a memory is believed to match the valence of the emotions evoked (Buchanan, 2007).

STUDY #1: VALIDATION OF CUES

Method

Participants

An unselected sample of 80 participants was recruited through the undergraduate research participant pool (SONA) at the University of South Florida. Exclusion criteria consisted of the following: (a) inability to read English fluently, and (2) any visual impairment. Participant characteristics are presented in Appendix A (Table 2). Participants were compensated with points for course credit.

Materials

Demographics questionnaire. The demographics questionnaire consisted of six items inquiring about general background information, such as sex, age, race, ethnicity, marital status, and years of education.

Individual cues. A pool of 132 cues (60 words and 72 images) that varied in valence (positive, negative, neutral) was compiled. Word cues were selected from various sources, including Affective Norms for English Words (ANEW; Bradley & Lang, 1999), words used in previous AMT studies, and words supplemented by the author. Image cues were selected from both standardized (e.g., International Affective Picture System [IAPS; Lang, Bradley, & Cuthbert, 1997]; Open Affective Standardized Image Set [OASIS; Kurdi, Lozano, & Banaji, 2017]; Geneva Affective Picture Database [GAPED; Dan-Glauser & Scherer, 2011]) and non-standardized sources (e.g., free and purchased stock photographs from iStock and Pexels).

Cue pairs. A pool of 72 word-image pairs was created (e.g., the word "upset" paired with an image of a young boy crying).

Rating of individual cues. A four-item questionnaire was used to rate individual word and image cues on the following dimensions: (a) affective tone, which was rated on a 11-point Likert scale ranging from *-5/Extremely Negative* to *+5/Extremely Positive*; (b) ability to trigger sensory details, which was rated on an 8-point Likert scale ranging from *0/Strongly Disagree* to *7/Strongly Agree*; (c) ability to be visualized, which was rated on an 8-point Likert scale ranging from *0/Strongly Disagree* to *7/Strongly Agree*; and (d) ability to trigger autobiographical memories, which was rated on an 8-point Likert scale ranging from *0/Strongly Disagree* to *7/Strongly Agree*

Rating of cue pairs. A one-item questionnaire was used to rate the degree to which the word and image corresponded. The item was rated on an 8-point Likert scale ranging from *0/Not at all* to *7/Very well.*

Procedure

Each participant was tested individually. The entire study was administered via Qualtrics on a desktop computer. Participants first completed the demographics questionnaire. Next, participants were presented with a cue (word or image) and the four-item questionnaire on a single screen. The word cues were presented in bold, 48-point black font, and image cues were approximately 4.5 inches x 3.5 inches in size and were in color. The individual cues were presented in a fixed-random order. Lastly, participants were presented with a word-image pair and the one-item questionnaire on a single screen. The word cue was positioned directly above the image cue. The word-image pairs were presented in a fixed-random order. The entire study session lasted approximately one hour.

Results

Ratings for each word and image cue are presented in Appendix A (Table 3 to Table 8). Ratings for the degree of correspondence for specific word-image pairs are presented in Appendix A (Table 9 to Table 11). A series of paired-samples *t* tests were conducted to examine cue dimensions as a function of cue type. Overall, word cues (M = -0.30; SD = 0.64) were rated more negative than image cues (M = -0.07; SD = 0.47), t (79) = -4.48, p = 0.000). Image cues (M = 4.45; SD = 1.03) elicited greater sensory details than word cues (M = 3.90; SD = 1.23), t (79) = -7.18, p = 0.000). Word cues (M = 5.33; SD = 1.13) and images cues (M = 5.31; SD = 1.07) did not differ in ability to promote visualization, t (79) = 0.38, p = 0.71).

A one-way ANOVA examining affect ratings as a function of cue valence was significant, F (1, 79) = 84.38, p = 0.000, partial η^2 = 0.57). Pairwise comparisons indicated that positive cues (M = 3.29; SE = 0.08) were rated significantly more positive than neutral cues (M = 0.84; SE = 0.07) and negative cues (M = -2.72; SE = 0.11), and neutral cues were rated significantly more positive than negative cues. A one-way ANOVA examining ratings of sensory detail as a function of cue valence was also significant, F (1, 79) = 1314.41, p = 0.000, partial η^2 = 0.94). Positive cues (M = 4.85; SE = 0.12) elicited significantly greater sensory detail than neutral cues (M = 4.17; SE = 0.14) and negative cues (M = 3.78; SE = 0.13). Neutral cues elicited significantly greater sensory detail than negative cues. Lastly, a one-way ANOVA examining ratings of visualization as a function of cue valence was also significant, F (1, 79) = 2047.00, p = 0.000, partial η^2 = 0.96). Positive cues (M = 5.66 SE = 0.10) promoted significantly greater visualization than neutral cues (M = 5.20; SE = 0.14) and negative cues (M = 5.11; SE = 0.13). Neutral cues and negative cues did not differ in ability to promote visualization.

Several guidelines were used to identify the final set of cues. First, the median statistic was used to account for skewed data. Second, a median affect rating of ≥ 3 and ≤ -3 was selected to identify positive and negative cues, respectively. This cutoff value was selected to ensure adequate specificity of cue valence. Third, word-image pairs were matched on median ratings for *affect*, *sensory*, and *visualize*. Cues were considered matched if there was no more than ± 1 difference on the median rating. A cutoff value of ± 1 was selected to ensure adequate congruence between cues while not being overly stringent (i.e., to avoid reducing the pool of acceptable matches). Finally, median *correspondence* rating of ≥ 6 was selected for word – image pairs to ensure that word-image pairs were appropriately matched. Ratings for *memory trigger* were not considered when identifying suitable cues. This decision was made post-hoc based on the rationale that the item assessed the degree to which participants spontaneously remembered an AM in response to the cue; the final set of cues, however, was intended to be used in a paradigm that instructs participants to deliberately recall an AM. Seventeen positive word-images cues and 12 negative image-cues met all criteria. Of this pool, the author selected eight positive word-image pairs and eight negative word-image pairs for the final set of cues (see Appendix C). The distribution of ratings for *affect, sensory*, *visualize*, and *correspondence* are displayed in Appendix B (Figure 4 to Figure 51; Figure 55 to Figure 118).

Similar guidelines were used to identify cues for the practice trials. Specifically, a median affect rating of ≤ ±0.50 was selected to identify neutral cues. The word and image cues were matched on median ratings for *affect*, *sensory*, and *visualize*. Cues were considered matched if there was no more than ± 1 difference on the median rating. A cutoff value of ± 1 was selected to ensure adequate congruence between cues but not be overly stringent (i.e., to avoid reducing the pool of acceptable matches). Fifteen word-image non-corresponding pairs met all criteria. Of this

pool, one pair was selected (see Appendix D). The distribution of ratings for *affect*, *sensory,* and *visualize* are displayed in Appendix B (Figure 1 to Figure 3; Figure 51 to Figure 54).

STUDY #2: IMPACT OF CUES ON AUTOBIOGRAPHICAL MEMORY RECALL

Method

Participants

Twenty-one currently depressed and 31 never-depressed students participated in the study between February 2019 and January 2020. Participants were compensated with points for course credit or cash (up to $25). An a-priori simulation-based power analysis (see Lakens & Caldwell, 2019) assuming an alpha of 0.05 indicated that a sample size of 25 (per diagnostic group) would provide sufficient power (99.85%) to detect a three-way interaction with an effect size of partial $\eta^2 = 0.20$.[8]

Participants were recruited using two methods: (1) an undergraduate research participant pool (SONA) at the University of South Florida; and (2) university-wide advertising via flyers posted around campus and university-affiliated off-campus housing, as well as digital flyers posted on various online platforms (e.g., CANVAS, University of South Florida Reddit page, etc.).

For participants recruited through SONA ("SONA participants"), a two-step approach was utilized. First, all participants registered with SONA completed the following two prescreening questions on the SONA website:

[8] Although four remaining currently depressed participants were required to achieve the proposed sample size, participant recruitment was terminated due to university-wide suspension of in-person research activities in response to the COVID-19 pandemic. Nonetheless, the present sample size was adequate to test study hypotheses.

(1) *During the past two weeks, how often have you felt sad, down, or depressed*? Response options included: *not at all*, *some of the time*, *more than half the time*, *all the time*.

(2) *During the past two weeks, how often have you been less interested in your usual activities*? Response options included: *not at all*, *some of the time*, *more than half the time*, *all the time*.

Participants who endorsed "*more than half the time*" or "*all the time*" to either of the questions, or those who endorsed "*not at all*" to both questions were invited to complete the first part of the laboratory study (in-person screening).

A similar two-step approach was utilized for participants recruited through flyers ("flyer participants"). Participants took part in a 15-minute screening interview via phone to determine preliminary eligibility. A subset of these participants was invited to complete the first part of the laboratory study (in-person screening) in order to make a final determination of eligibility.

Currently depressed participants were required to meet full diagnostic criteria for a current major depressive episode. The inclusion criteria for never-depressed participants included: (a) no history of a major depressive disorder and (b) score of ≤ 13 on the Beck Depression Inventory – II. The exclusion criteria for both depressed and never-depressed participants consisted of the following: (a) lifetime history of bipolar disorder or any psychotic disorder; (b) alcohol and/or substance use disorder in the past six months; (c) history of serious brain injury and/or other neurological disorders; (d) inability to speak/read English fluently, and (e) visual impairment[9].

[9] Seventy participants completed the in-person screening. Of those participants, 18 did not meet inclusion/exclusion criteria.

Procedure and Materials

The current study consisted of two parts: (1) in-person screening, and (2) laboratory experiment. Each part is described in the following sections.

In-Person Screening: Measures

Structured Clinical Interview for DSM-5 Disorders – Clinician Version (SCID-5-CV). The SCID-5-CV (First, Williams, Karg, & Spitzer, 2016) is a semi-structured clinical interview used to diagnose DSM-5 disorders. For the current study, only the mood modules were administered. The mood modules assessed for current and past major depressive disorder and bipolar I/bipolar II.

Mini-International Neuropsychiatric Interview 7.0.0 (MINI 7.0.0). The MINI 7.0 (Sheehan, 2015) is a structured psychiatric interview for the diagnoses of 15 DSM-5 disorders. For the current study, only the alcohol use, substance use, and psychotic disorders modules were administered.

Beck Depression Inventory (BDI-II). The BDI-II (Beck, Steer, & Brown, 1996) is a 21-item self-report measure used to assess the severity of depressive symptoms. Items are rated on a 4-point scale (0 to 3), and total scores range from 0 to 63. Commonly used severity cut-off scores are as follows: 0-13 (minimal depression), 14-19 (mild depression), 20-28 (moderate depression), and 29-63 (severe depression) (Beck et al., 1996). The BDI-II has demonstrated excellent psychometric properties (Beck et al., 1996). In the present sample, the BDI-II had excellent reliability ($\alpha = 0.97$).

Brain injury and neurological disorders. A 2-item self-report measure was administered to assess for history of serious head injury and/or neurological disorders.

In-Person Screening: Procedure

Upon providing informed consent, a Master's-level student trained in clinical interviewing administered the mood modules of the SCID-5-CV, three modules of the MINI 7.0.0[10], and the BDI-II. Additionally, participants were asked about a history of serious brain injury and other neurological disorders. Participants who satisfied all inclusion and exclusion criteria were enrolled in the study and went on to complete the laboratory experiment (see below), which took place immediately after the screening.

Laboratory Experiment: Measures

Demographics questionnaire. The demographics questionnaire consisted of nine items inquiring about sex, age, race, ethnicity, marital status, years of education, student status, current antidepressant use, and current participation in psychotherapy.

Affect ratings. Participants self-rated their current positive affect ("How positive, happy, or good do you feel right now?") and negative affect ("How negative, sad, or bad do you feel right now?") using an 8-point Likert scale ranging from *0/Not at All* to *7/Extremely.*

Memory self-alignment. Participants completed an item concerning whether their recalled memory was *self-concordant* or *self-discrepant*. In line with Werner-Seidler et al. (2017), *self-concordant* was operationalized as similarity between one's identity in the present (i.e., present self) and one's identity at the time of the autobiographical event (i.e., past self). *Self-discrepant* was operationalized as dissimilarity between one's identity in the present (i.e., present self) and one's identity at the time of the autobiographical event (i.e., past self).

[10] The Master's level study clinicians received extensive didactics on the administration of these structured interviews and the disorders assessed in the modules. Further, they completed numerous mock administrations, which in part served to establish acceptable interrater reliability.

State-Trait Anxiety Inventory, Trait Form (STAI-T). The STAI-T (Spielberger, 1983) is a 20-item self-report measure that assess respondents' general tendency toward experiencing anxiety. Items were rated on a 4-point scale, ranging from 1 (almost never) to 4 (almost always). Total scores range from 20 to 80, with higher scores indicating greater trait anxiety. The STAI-T has demonstrated excellent psychometric properties (Spielberger, 1983). In the current sample, the STAI-T had excellent reliability ($\alpha = 0.98$).

Verbal fluency. Verbal fluency was measured using the FAS Test, a subtest of the Neurosensory Center Comprehensive Examination for Aphasia (NCCEA; Spreen & Benton, 1969, 1977). For the FAS Test, participants are instructed to generate words that began with the letters "F", "A", and "S" over a 3 minute period (1 minute per letter). All words are permitted except for proper nouns and variations of a word (i.e., friend, friends). A total score is derived by summing the number of acceptable words produced across the three trials.

Modified AMT task. William and Broadbent's (1986) AMT was modified to include images, and this modification was in part inspired by Ridout et al. (2016). In the current study, participants were presented with the 32 word and image cues validated in Study #1. The cues were presented individually and in a fixed-random order. Word cues were printed in bold, centered, 88-point black Times New Roman font on standard size (8 inches x 10 inches) white paper in landscape orientation. Image cues were printed in color on standard size (8 inches x 10 inches) white paper in landscape orientation. The image cues were approximately 4 inches x 6 inches in size and were centered.

Participants were instructed to recall one specific AM in response to the cue. An AM was defined to the participant as "a memory of an event that occurred in your personal past". A specific memory was defined as "an event that occurred at a specific time and place and that

lasted less than a day" and participants were provided with an example of a specific and non-specific AM. The participants were further instructed that their AM could be related or unrelated to the cue, and there were no restrictions with respects to perceived importance of event or time period. Participants were asked to recall a different AM for each cue. Participants were encouraged to share the first AM that came to mind and were reminded that any memory disclosed would remain confidential. If the AM was private and the participant did not wish to share, the participant was instructed to inform the experimenter and/or identify another memory that the participant was willing to disclose.

Participants were given up to 30 seconds to identify an AM and up to one minute to describe the event in as much detail as possible. If the participant finished recalling the memory and there was time remaining, the experimenter prompted the participant for additional details using standard prompts, such as "can you recall any other details"? The experimenter was instructed to listen to participants' AM recall in an attentive and interested manner but not to provide non-verbal or verbal feedback (aside from the standard prompts). After recalling an AM in response to a cue, participants completed affect ratings and the one-item memory alignment questionnaire prior to being shown the next cue. Participants' responses during the modified AMT task were audio-recorded for independent coding.

Rating of individual cues. A three-item questionnaire was used to rate individual word and image cues on the following dimensions: (a) affective tone, which was rated on a 11-point Likert scale ranging from *-5/Extremely Negative* to *+5/Extremely Positive*; (b) ability to trigger sensory details, which was rated on an 8-point Likert scale ranging from *0/Strongly Disagree* to *7/Strongly Agree*; and (c) ability to be visualized, which was rated on an 8-point Likert scale ranging from *0/Strongly Disagree* to *7/Strongly Agree*.

Laboratory Experiment: Procedure

Participants first completed the demographics questionnaire (administered through Qualtrics), followed by the FAS Test. Next, the experimenter introduced the modified AMT task and provided detailed instructions. To ensure understanding, participants completed two practice trials using a neutral word cue and a neutral image cue (see Appendix D). The experimenter provided the participant with necessary feedback during and after each trial, and participants were expected to demonstrate recall of at least one specific AM. Once the practice trials were completed, the experimenter proceeded with the 32 AMT task trials. Lastly, participants were presented with the same cues via Qualtrics and asked to rate the cues on a three-item questionnaire assessing affective tone, ability to trigger sensory details, and ability to be visualized. The cues were presented individually and in the same order as in the modified AMT task. A cue and the three-item questionnaire were displayed on a single screen in Qualtrics. The word cues were presented in bold, 48-point black font, and image cues were approximately 4.5 inches x 3.5 inches in size and were in color. This task was included in the present study to compare ratings of the currently depressed and never-depressed participants in the current study to the unselected sample used in the cue validation study (results for this task will not reported in the present manuscript). The entire laboratory procedure lasted approximately 1.25 to 1.50 hours.

Coding of Autobiographical Memories

Transcriptions. Research assistants transcribed verbatim the audio-recordings of participants' responses to the word and images cues in the modified AMT task. Another research assistant who did not participate in the original transcription reviewed the transcription to ensure accuracy.

Memory characteristics. Participants' recalled memories were rated on four AM characteristics:

Specificity. A specific AM was defined as "an event that occurred in one's personal life that lasted a day or less and occurred at a certain place and time" (Williams et al., 2007; William & Broadbent, 1986). An overgeneral AM was defined as "an event that occurred in one's personal life that lasted longer than a day and/or is a repeated event" (Williams et al., 2007;William & Broadbent, 1986). Specificity was rated categorically: 0 (specific AM), 1 (overgeneral AM), or 2 (other: autobiographical fact; not an AM, etc). Any discrepancies between coders were resolved by the author.[11]

Valence. Valence was defined as "the emotional tone and emotional intensity of the event at the time." Valence was rated on an 11-point Likert scale ranging from *-5/ extremely negative tone and high emotional intensity* to *+5/extremely positive tone and high emotional intensity.* Interrater reliability was good (average ICC = 0.89).

Sensory detail. Sensory detail was defined as "the degree to which participants described what they sensed (sight, sound, smell, touch, taste) during the event, and the quality/detail of the descriptions". Sensory detail was rated on a 10-point Likert scale ranging from *1/low sensory detail* to *10/high sensory detail*. Interrater reliability was fair (average ICC = 0.46).

Coherence. Coherence was defined as "the degree to which the recalled AM involves a contextualized, logical storyline". Coherence was rated on a 10-point Likert scale ranging from *1/low sensory detail* to *10/high sensory detail*. Interrater reliability was fair (average ICC = 0.48).

[11] There were discrepant ratings of specificity on 41 memory trails, which represented 3% of all trials.

Training procedure. The author and research assistants collaboratively developed a detailed coding manual (Appendix C) that specified the definitions of the memory characteristics and the required elements for various ratings of a given memory characteristic. The author and research assistants coded numerous transcribed sample memories to establish interrater reliability. Once acceptable interrater reliability was achieved, the two independent coders rated each transcribed memory produced by participants.

Results

Data Management

All data were used when possible. Data from four participants (three never-depressed participants and one currently depressed participant) for the modified AMT were excluded from analyses due to the experimenter providing incorrect or incomplete instruction (n = 3) or participant's difficulty understanding/ following instructions (n =1). Additionally, the audio recording of the modified AMT was missing for one participant (never-depressed). The final sample used to test study hypotheses included: 20 currently depressed participants and 27 never-depressed participants.

Effect Sizes

In addition to reporting partial η^2 values, the traditional effect size statistic for ANOVAs, generalized η^2 values are also presented. Olejnik and Algina (2003) argue that generalized η^2 is a more useful effect size statistic for mixed-model ANOVAs, as it appropriately accounts for factor type and allows for comparison across study designs (also see Bakeman, 2005; Lakens, 2013). Furthermore, unlike partial η^2, generalized η^2 values can be interpreted in accordance to Cohen's (1988) effect size guidelines.

Participant Characteristics

Participant characteristics are presented in Appendix A (Table 12). A series of *t*-tests and χ^2 tests were conducted to test for group differences[12]. With regards to demographic characteristics, currently depressed and never-depressed participants did not differ in age (t [50] = - 0.47, $p = 0.64$), level of education (t [50] = 0.63, $p = 0.54$), marital status (χ^2 [1, $N = 52$] = 0.08, $p = 0.78$) or ethnicity (χ^2 [1, $N = 52$] = 0.96, $p = 0.33$]. However, the groups did differ in proportion of males/females (χ^2 [2, $N = 52$] = 6.79, $p = 0.03$), and racial composition (χ^2 [5, $N = 52$] = 12.65, $p = 0.03$).

A greater proportion of currently depressed participants were currently taking an antidepressant (χ^2 [1, $N = 52$] = 6.32, $p = 0.01$) and/or receiving psychotherapy (χ^2 [1, $N = 52$] = 6.32, $p = 0.01$) compared to never-depressed participants. As would be expected, currently depressed participants reported significantly higher scores on the BDI-II (t [23.90] = 13.27, $p < 0.001$) and STAI-T (t [48.43] = 15.58, $p < 0.001$) compared to never-depressed participants. Further, currently depressed participants reported higher baseline negative affect (t [50] = 11.38, $p < 0.001$) and lower baseline positive affect (t [50] = -10.33, $p < 0.001$) than never-depressed participants. The groups did not differ in verbal fluency (t [48] = - 0.02, $p = 0.99$.

Process Characteristics of Autobiographical Memories

Specificity. The entire sample retrieved a total of 1,379 AMs out of a possible 1,504 memory cues[13]. Of the 1,379 AMs recalled, 1,300 (94.3%) were coded as specific AMs and 79

[12] Analyses were also conducted to examine group differences among never-depressed participants recruited through SONA vs. flyers. Results showed that never-depressed participants recruited through flyers ($M = 33.32$, $SD = 10.75$) had higher STAI-T scores than those recruited through SONA ($M = 26.22$, $SD = 3.46$), t (28.23) = -2.77, $p = 0.01$. No other group differences emerged.

[13] Participants recalled a non-AM on six trials and were unable to recall a memory on 119 trials ("missing"). Three participants did not wish to share their memory on one trial. Participants were provided the opportunity to share another non-private memory, but they declined. Because the content of the participants' private memories were unknown, they were counted as "missing".

(5.7%) were coded as overgeneral AMs.

To examine memory specificity/overgenerality[14], separate 2 (*Group*) x 2 (*Cue Type*) x 2 (*Cue Valence*) mixed-model ANOVAs were conducted, with *Group* entered as a between-subjects factor and *Cue Type* and *Cue Valence* entered as within-subjects factors. The first ANOVA examined the proportion of specific memories recalled. Descriptive statistics are provided in Appendix A (Table 13). The hypothesized three-way interaction was not observed, F (1, 45) = 1.83, p = 0.18. However, there was a main effect for *Cue Valence*, F (1, 45) = 4.82, p = 0.03, partial η^2 = 0.10, generalized η^2 = 0.01, such that participants recalled a greater proportion of specific AMs in response to positive cues (M = 0.89, SE = 0.02) compared to negative cues (M = 0.85, SE = 0.02). There was a trend level effect for *Group*, F (1, 45) = 3.71, p = 0.06, indicating that currently depressed participants recalled a marginally greater proportion of specific AMs (M = 0.91; SE = 0.03) than never-depressed participants (M = 0.83, SE = 0.03). No other main effects and interactions were observed (all ps > 0.05).

The second ANOVA examined proportion of overgeneral memories recalled. Descriptive statistics are provided in Appendix A (Table 14). Again, the hypothesized three-way interaction was not observed, F (1, 45) = 0.208, p = 0.65. Rather, a main effect for *Cue Valence* was observed, F (1, 45) = 6.57, p = 0.01, partial η^2 = 0.13, generalized η^2 = 0.01. Participants recalled a greater proportion of overgeneral memories to negative cues (M = 0.06, SE = 0.02) than positive cues (M = 0.04, SE = 0.01). No other main effects and interactions were observed (all ps > 0.05).

[14] While specificity and overgenerality are opposites of the same construct, they were analyzed separately to account for the fact that other responses aside from a specific AM and overgeneral AM were possible in response to a given trial (e.g., recall of a non-AM and no memory).

Retrieval time. A 2 (*Group*) x 2 (*Cue Type*) x 2 (*Cue Valence*) mixed-model ANOVA was conducted to examine retrieval of AMs, with *Group* entered as a between-subjects factor, and *Cue Type* and *Cue Valence* entered as within-subjects factors. Descriptive statistics are provided in Appendix A (Table 15). The hypothesized three-way interaction was not significant, F (1, 45) = 0.14, p = 0.71. However, three main effects were significant. First, the main effect for *Group* was significant (F [1,45] = 6.36, p = 0.02, partial η^2 = 0.12, generalized η^2 = 0.10), with currently depressed participants being slower (M = 16.3 seconds, SE =1.0 second) to retrieve AMs than never-depressed participants (M = 12.9 seconds, SE = 0.9 seconds). Second, the main effect for *Cue Type* was significant (F [1, 45] = 6.08, p = 0.02, partial η^2 = 0.12, generalized η^2 =0.01), such that participants retrieved AMs faster for image cues (M = 14.2 seconds; SE = 0.7 seconds) compared to word cues (M = 15.1 seconds, SE = 0.7 seconds). Lastly, the main effect for *Cue Valence* was significant (F [1,45] = 10.33, p = 0.002, partial η^2 = 0.19, generalized η^2 = 0.01), such that participants retrieved AMs faster to positive cues (M = 14.0 seconds; SE = 0.7 seconds) than negative cues (M = 15.2 seconds, SE = 0.7 seconds. No other main effects and interactions were significant (all ps > 0.05).

Content Characteristics of Autobiographical Memories

Valence. A 2 (*Group*) x 2 (*Cue Type*) x 2 (*Cue Valence*) mixed-model ANOVA was conducted to examine valence of retrieved AMs, with *Group* entered as a between-subjects factor, and *Cue Type* and *Cue Valence* entered as within-subjects factors. Descriptive statistics are provided in Appendix A (Table 16). A main effect for *Group* emerged (F [1,45]= 9.89, p = 0.003, partial η^2 = 0.18, generalized η^2 = 0.05), indicating that currently depressed participants (M = -0.40, SE = 0.07) recalled AMs that were more negative than never-depressed participants (M = -0.10, SE = 0.06). It is important to note that memory valence was rated on a 11-point scale

ranging from -5 to +5. The means, while leaning toward negative, are close to 0, indicating neutral valence, or a combination of mildly positive/mildly negative. A main effect also emerged for *Cue Valence*, F (1,45) = 306.57, p = 0.000, partial η^2 = 0.87, generalized η^2 = 0.78. However, this main effect was qualified by a significant *Cue Type* x *Cue Valence* interaction, F (1,45) = 75.65, p = 0.000, partial η^2 = 0.63, generalized η^2 = 0.19 (see Appendix B, Figure 119). For words, AMs recalled in response to positive cues were rated as being significantly more positive/less negative (M = 1.36, SE = 0.11) than AMs recalled in response to negative cue (M =-1.87, SE = 0.10). By contrast, for image cues, the effect of *Cue Valence* was reduced (positive images: M = 0.72, SE = 0.10; negative images: M = -1.20, SE = 0.10). All other main effects and interactions were non-significant (all ps > 0.05).

Sensory detail. Although interrater reliability for sensory detail was modest, a decision was made to analyze this variable for completeness sake. A 2 (*Group*) x 2 (*Cue Type*) x 2 (*Cue Valence*) mixed-model ANOVA was conducted to examine sensory detail of retrieved AMs, with *Group* entered as a between-subjects factor, and *Cue Type* and *Cue Valence* entered as within-subjects factors. Descriptive statistics are provided in Appendix A (Table 17). A main effect for *Cue Type* was significant (F [1,45]= 13.82, p = 0.001, partial η^2 = 0.24, generalized η^2 = 0.02), indicating that AMs recalled in response to image cues (M = 4.12, SE = 0.08) were rated as having greater sensory detail than AMs recalled in response to word cues (M = 3.94, SE = 0.10). A main effect for *Cue Valence* also emerged, F [1, 45] = 21.07, p = 0.000, partial η^2 = 0.32, generalized η^2 =0.06. AMs recalled in response to positive cues (M = 4.19, SE = 0.09) were rated as having greater sensory detail compared to AMs recalled in response to negative cues (M = 3.86; SE = 0.10). All other main effects and interactions were non-significant (all ps > 0.05).

Coherence. Similar to sensory detail, AM coherence was analyzed, despite modest interrater reliability for this variable. A 2 (*Group*) x 2 (*Cue Type*) x 2 (*Cue Valence*) mixed-model ANOVA was conducted to examine coherence of retrieved AMs, with *Group* entered as a between-subjects factor, and *Cue Type* and *Cue Valence* entered as within-subjects factors. Descriptive statistics are provided in Appendix A (Table 18). A main effect for *Cue Type* was significant, F (1, 45) = 8.04, p = 0.007, partial η^2 = 0.15, generalized η^2 =0.01. Memories recalled in response to word cues (M = 4.75, SE = 0.07) were rated as more coherent compared to image cues (M = 4.63, SE = 0.07). This main effect was qualified by marginally significant *Cue Type* x *Cue Valence* interaction, F (1, 45) = 3.32, p = 0.08).

Self-alignment. To examine memory self-alignment, separate 2 (*Group*) x 2 (*Cue Type*) x 2 (*Cue Valence*) mixed-model ANOVAs were conducted, with *Group* entered as a between-subjects factor, and *Cue Type* and *Cue Valence* entered as within-subjects factors. The first ANOVA examined the proportion of self-concordant memories recalled. Descriptive statistics are provided in Appendix A (Table 19). There was a significant main effect for *Group*, F (1, 45) = 11.86, p = 0.001, partial η^2 = 0.21, generalized η^2 =0.12. Currently depressed participants (M = 0.68, SE = 0.03) recalled a smaller proportion of self-concordant AMs compared to never-depressed participants (M = 0.83, SE = 0.03). A main effect for *Cue Type* was also significant (F [1, 45] = 8.04, p =0.007, partial η^2 = 0.15, generalized η^2 = 0.02), indicating that a greater proportion of self-concordant AMs (M = 0.78, SE = 0.02) were recalled in response to word cues than image cues (M = 0.73, SE = 0.03). A significant main effect for *Cue Valence* also emerged, F (1,45) = 13.70, p = 0.001, partial η^2 = 0.23, generalized η^2 = 0.07. A greater proportion of self-concordant AMs were recalled in response to positive cues (M = 0.81, SE = 0.02) compared to

negative cues (M = 0.70, SE = 0.03). All other main effects and interactions were non-significant (all ps > 0.05).

The second ANOVA examined the proportion of self-discrepant AMs recalled. Descriptive statistics are provided in Appendix A (Table 20). There was a significant main effect for *Group* (F [1,45] = 13.80, p = 0.001, partial η^2 = 0.24, generalized η^2 = 0.14). Currently depressed participants (M = 0.32; SE = 0.03) recalled a greater proportion of self-discrepant AMs compared to never-depressed participants (M = 0.16, SE = 0.3). There was also a significant main effect for *Cue Type* (F [1,45] = 5.62, p = 0.02, partial η^2 = 0.11, generalized η^2 = 0.01). Participants recalled a greater proportion of self-discrepant AMs in response to images (M = 0.27, SE = 0.03) compared to words (M = 0.22, SE = 0.02). These main effects were qualified by a marginally significant *Group* x *Cue Type* interaction, F (1,45) = 3.24, p = 0.08. Lastly, a significant main effect emerged for *Cue Valence*, F (1,45) = 17.35, p = 0.000, partial η^2 = 0.28, generalized η^2 = 0.09. A greater proportion of self-discrepant AMs were recalled in response to negative cues (M = 0.31, SE = 0.03) compared to positive cues (M = 0.18, SE = 0.02). All other main effects and interactions were non-significant (all ps > 0.05).

Affective Impact of Autobiographical Memories

Positive affect. To examine the impact of AMs on positive affect, a 2 (*Group*) x 2 (*Cue Type*) x 2 (*Cue Valence*) mixed-model ANOVA was conducted, with *Group* entered as a between-subjects factor, and *Cue Type* and *Cue Valence* entered as within-subjects factors. Because participants' baseline affect could potentially influence the affective impact of AM recall, the model controlled for baseline positive affect and negative affect. Descriptive statistics are provided in Appendix A (Table 21). There was a significant *Group* x *Cue Type* x *Cue*

Valence three-way interaction, F (1, 43) = 10.31, p = 0.003, partial η^2 = 0.19, generalized η^2 =0.01[15].

To deconstruct this three-way interaction, a series of follow-up ANOVAs were conducted. The first set of ANOVAs were stratified by *Group*. Results indicated that the interaction between *Cue Type* and *Cue Valence* was significant for currently depressed participants, F (1, 19) = 12.06, p = 0.003, partial η^2 = 0.39, generalized η^2 =0.03. As shown in Appendix B (Figure 120), currently depressed participants reported greater positive affect in response to positive word-cued AMs (M = 4.21, SE = 0.21) compared to negative word-cued AMs (M = 2.38, SE = 0.24). The effect of *Cue Valence* was reduced for image cues (positive images: M = 3.90, SE = 0.20; negative images: M = 2.74, SE = 0.16). For never-depressed participants, the interaction between *Cue Type* and *Cue Valence* trended toward significance, F (1, 26) = 3.89, p = 0.06 (see Appendix B, Figure 121).

The second set of ANOVAs were stratified by *Cue Valence*. There was a significant interaction between *Group* and *Cue Type* for positive cues, F (1, 43) = 9.57, p = 0.003, η^2 = 0.18, generalized η^2 = 0.02. For positive cues, currently depressed participants reported significantly greater positive affect when recalling word-cued AMs (M = 5.02, SE = 0.27) compared to image-cued AMs (M = 4.36, SE = 0.29). The effect of *Cue Type* was reduced and non-significant for never-depressed participants (word cues: M = 5.29, SE = 0.22; image cues: M = 5.39, SE = 0.23). These findings are displayed in Appendix B (Figure 122). For negative cues, the interaction between *Group* and *Cue Type* was non-significant, F (1, 43) = 2.17, p = 0.15 (see Appendix B, Figure 123).

[15] When the ANOVA model was re-run without controlling for baseline positive and negative affect, this three-way interaction trended toward significance, F (1, 45) = 3.56, p = 0.07.

The last set of ANOVAs were stratified by *Cue Type*. For word cues, the interaction between *Group* and *Cue Valence* trended toward significance, F (1, 43) = 3.88, p = 0.06. For image cues, the interaction between *Group* and *Cue Valence* was non-significant, F (1, 43) = 0.29, p = 0.60.

Negative affect. To examine the impact of AMs on negative affect, a 2 (*Group*) x 2 (*Cue Type*) x 2 (*Cue Valence*) mixed-model ANOVA was conducted, with *Group* entered as a between-subjects factor, and *Cue Type* and *Cue Valence* entered as within-subjects factors. Again, because participants' baseline affect could potentially influence the affective impact of AM recall, the model controlled for baseline positive affect and negative affect. Descriptive statistics are provided in Appendix A (Table 22). A marginally significant main effect emerged for *Cue Valence* (F [1, 43] = 3.75, p = 0.06)[16], suggesting that participants reported greater negative affect in response to negative cues (M = 2.45, SE = 0.18) compared to positive cues (M = 1.30, SE = 0.11). All other main effects and interactions were non-significant (all ps > 0.05).

Discussion

The memories one recalls can significantly impact emotional functioning by evoking emotions and even serving to regulate mood (Holland & Kensinger, 2010; Josephson et al., 1996;Pasupathi, 2003). Given the strong link between AM and affect, understanding AM processes in depression may provide critical insight about the emotional functioning deficits that are implicated in the development, maintenance, and recurrence of this disorder (Rottenberg, 2017). The AM literature has consistently found AM process and content deficits among depressed persons, as well as less improvement in negative mood through positive AM recall

[16] When the ANOVA model was re-run without controlling for baseline positive and negative affect, significant main effects emerged for *Group* (F [1, 45] = 67.17, p = 0.000, partial η^2 = 0.60, generalized η^2 = 0.50) and Cue *Valence* (F [1, 45] = 53.41, p = 0.000, partial η^2 = 0.54, generalized η^2 = 0.22).

(e.g., Begovic et al., 2017; Joormann et al., 2007; Kim et al., 2018; Rottenberg et al., 2006; Werner-Seidler & Moulds, 2011;Williams et al., 2007). The overall pattern of these deficits appears to provide only partial support for theories of depression (i.e., predictions of a negativity bias and reduced positivity bias) (Beck, 1976; Pizzagalli, 2014). However, a critical limitation in the literature is that prior studies have heavily relied upon word cues. These generic word cues do not reflect how AMs are represented in the mind nor how AMs are recalled in daily life (Berntsen & Hall, 2004; Paivio, 1990). Consequently, the particular pattern of deficits observed in response to word cues (i.e., valence effects for content and affective deficits, but not for process deficits) may be *specific* to this type of cue. In other words, it is unclear if AM functioning in everyday life is characterized by a similar pattern of deficits, given that image cues are more likely to elicit AMs in this context (Berntsen & Hall, 2004). Therefore, utilizing image cues in an AM recall paradigm may serve as a proxy of AM processes in daily life. By understanding the potential pattern(s) of AM impairment in response to these more ecologically valid cues, we can gain insight about its effects on emotional functioning in depression. Ultimately, this could inform appropriate and targeted memory-based interventions.

Thus, in an effort to provide a more comprehensive understanding of AM and emotional functioning in depression, a two-part study was conducted to examine how valenced word and image cues impact AM process characteristics (Aim #1), content characteristics (Aim #2), and the affective experience of AM recall (Aim #3) among currently depressed and never-depressed participants. Importantly, the set of word and image cues were validated and matched on important characteristics (Study #1), and thus study results can confidently be attributed to cue characteristics, as opposed to confounding factors.

It was hypothesized that AM process and content characteristics would differ between currently depressed and never-depressed participants as a function of cue type and cue valence (Hypotheses 1a, 1b, and 2a-2d). Findings did not support this three-way interaction. It was also hypothesized that the emotional impact of recalled AMs would differ between currently depressed and never-depressed participants as a function of cue type and cue valence (Hypotheses 3a and 3b). A three-way interaction did indeed emerge but not in the predicted form. Specific hypotheses, associated results, and interpretation of results are described in detail in the following sections and are presented separately for cue characteristics (cue type and cue valence) and depression status.

Impact of Cue Type and Cue Valence

Process characteristics. For process characteristics of AMs, it was hypothesized that currently depressed participants would recall more specific AMs in response to negative image cues relative to positive image cues, while they would recall more overgeneral AMs to positive image cues than negative image cues. The effect of AM specificity would be reduced for word cues (Hypothesis 1a). Additionally, it was predicted that currently depressed participants would be faster to recall AMs in response to negative image cues than positive image cues. The effect of retrieval speed would be reduced for word cues. Among never-depressed participants, an interactive effect of cue type and cue valence would not emerge for memory specificity or AM retrieval speed (Hypothesis 1b).

While this predicted three-way interaction did not emerge, specificity and retrieval speed of AMs was impacted by cue characteristics. Participants recalled a greater proportion of specific AMs to positive cues compared to negative cues. Conversely, a greater proportion of overgeneral memories were recalled in response to negative cues compared to positive cues. These findings

are congruent with the AM literature. Individuals exhibit a preference for positive memories, such that positive memories (vs. negative memories) are more likely to undergo greater elaboration and frequent rehearsal, thereby strengthening the memory traces for specific positive events (Breslin & Safer, 2011; Kensinger & Ford, 2020; Walker, Skowronski, Gibbons, Vogl, & Ritchie, 2008). It is also possible that access to specific negative AMs is reduced as a way to minimize the negative emotions associated with the negative event ("functional avoidance", Williams et al., 2007). Studies indicate that avoidance of specific negative memories is an emotion regulation strategy utilized by individuals with and *without* clinical disorders (Debeer et al., 2012; Hermans et al., 2008; Hermans, Defranc, Raes, Williams, & Eelen, 2005; Hermans, Raes, Iberico, & Williams, 2006; Raes, Hermans, de Decker, Eelen, & Williams, 2003; Raes, Hermans, Williams, & Eelen, 2006). Either of these possibilities could explain the pattern of increased overgeneral recall of negative memories in the current study.

In regards to the speed with which AMs were retrieved, results showed that participants were faster to retrieve AMs in response to image cues compared to word cues. This finding lends support for theories that posit that image cues match the imagery-based mental representation of AMs, which facilitate fast and effortless recall via the direct/representational retrieval mode (Paivio, 1990; Williams et al., 2007). Additionally, we found that participants were faster to recall AMs in response to positive cues relative to negative cues. Again, this is consistent with the literature.

Content characteristics. For AM *valence*, it was hypothesized that currently depressed participants' recall of AMs in response to negative image cues would be rated by independent coders as more negative than AMs recalled in response to positive image cues. This effect would be reduced for positive word cues and negative word cues. Among never-depressed participants,

an interactive effect of cue type and cue valence would not emerge for AM valence (Hypothesis 2a). Again, this predicted three-way interaction did not emerge. However, an interactive effect of cue type and cue valence did impact the valence of AMs. Specifically, participants' recall of AMs in response to positive words were rated as more positive than AMs recalled in response to negative words. The effect of valence was reduced for image cues.

The correspondence between valence of the word cue and valence of AM content is perhaps not surprising; however, the finding that cue valence had a stronger effect on words than images contradicts theory. Image cues are believed to trigger the recall of more emotional AMs, given that image cues readily access the specific level of the autobiographical knowledge base, where the emotional characteristics of an event are stored (Conway & Pleydell-Pearce, 2000; Williams et al., 2007). One potential factor that may explain why the valence of word cues exert a greater impact on AM valence is the degree of elaboration required for word cues. The effortful, top-down process of reconstructing a memory in response to a word cue is more likely to activate autobiographical knowledge, events, and emotions stored in the associative network (Anderson & Bower, 1973; Conway & Pleydell-Pearce, 2000; Walker et al., 2011). This rich information can thus serve to reconstruct a memory with ample emotional content.

Of note, we found that positive and negative cues produced AMs of matching valence. As pointed out by other researchers (Williams et al., 2007, Young, Erickson, & Drevets, 2012), it is often assumed that the valence of a cue and the valence of a retrieved AM will match, but this may not be the case. For example, a positive cue could in fact trigger the recall of a negatively toned AM. In the present study, cue valence matched the valence of the retrieved AM.

For AM *sensory detail*, it was hypothesized that currently depressed participants' recall of AMs in response to negative image cues would be rated as having greater sensory detail than

AMs recalled in response to positive image cues. This effect would be reduced for positive words and negative words. Among never-depressed participants, an interactive effect of cue type and cue valence would not emerge for sensory detail (Hypothesis 2b). This three-way interaction was not found, but cue type and cue valence did impact the sensory detail of AMs. AMs that were recalled in response to image cues were rated as having greater sensory detail than AMs recalled in response to cue words. Image cues likely promoted mental imagery, which facilitated recall of sensory details (Holmes et al., 2008). I also found that AMs recalled in response to positive cues were rated as having greater sensory detail than AMs recalled in response to negative cues. This finding replicates previous research showing that positive AMs are characterized by greater sensory details than negative AMs (D'Argembeau, Comblain, & Van Der Linden, 2003), likely because positive memories are more elaborated and rehearsed (e.g., Kensinger & Ford, 2020).

Regarding AM *coherence,* it was hypothesized that currently depressed participants' recall of AMs in response to negative word cues would be rated as more coherent than AMs recalled in response to positive word cues. This effect would be reduced for positive images and negative images. Among never-depressed participants, an interactive effect of cue type and cue valence would not emerge for AM coherence (Hypothesis 2c). This three-way interaction was not found, but an effect of cue type did emerge. The results indicated that AMs recalled in response to word cues were more coherent than image cues. This finding, in the absence of a valence effect, suggests that retrieval mode may play a role in memory coherence. Since word cues are more likely to prompt generative retrieval of an AM, the systematic elaboration process that unfolds during this type of retrieval may facilitate coherence of the memory narrative (Conway & Playdell-Pearce, 2000; Williams, 2007).

Finally, for AM *self-alignment*, it was hypothesized that currently depressed participants would recall a greater proportion of self-concordant AMs in response to negative cues than positive cues, while never-depressed participants would recall a greater proportion of self-concordant AMs in response to positive cues than negative cues (Hypothesis 2d). The opposite pattern was predicted for the recall of self-discrepant AMs. Findings did not support this hypothesized two-way interaction. Cue characteristics did, however, impact AM self-alignment. Participants recalled a greater proportion of self-concordant AMs in response to word cues compared to image cues, while a greater proportion of self-discrepant memories were recalled in response to image cues relative to word cues. This finding could be explained by the fact that one's perception of self, or self-schema, is more likely to be encoded and represented in a verbal/semantic format (Lord, 1980; Paivio, 1990; but also see Brewin, 1989) and individuals have a bias toward maintaining a congruent self-concept (Conway, 2005; Conway & Playdell-Pearce, 2000).

Participants also recalled a greater proportion of self-concordant AMs in response to positive cues compared to negative cues, while a greater proportion of self-discrepant memories were recalled in response to negative cues relative to positive cues. These findings fit with previous research suggesting that individuals are motivated to maintain a positive self-concept (Conway, 2005; Taylor & Brown, 1988; Wilson & Ross, 2003). As such, recalling self-concordant positive memories and self-discrepant negative memories would serve to uphold one's positive representation of self.

Impact of Depression Status

Process and content characteristics. As previously noted, the predicted three-way interactions for AM process and content characteristics was not found. Several group differences

did emerge, though. Currently depressed participants were slower to retrieve AMs, yet nonetheless, recalled a greater proportion of specific AMs compared to their never-depressed counterparts. It is not surprising that identifying a memory was more time consuming for currently depressed participants. Research suggests that AM recall places demands on executive functioning (Williams et al., 2007), and such executive functioning is typically impaired in depressed persons (Snyder, 2013). Furthermore, slower recall of AMs could reflect psychomotor retardation, a symptom of depression (American Psychiatric Association, 2013). Interestingly, in Ridout et al.'s (2016) study, the mean retrieval times for both depressed and control participants in response to positive and negative word and image cues were notably shorter compared to the mean retrieval times in the present study (M_{range}: 5.5 - 9.9 seconds vs. M_{range} : 11.8 – 17.3). This difference may be attributed to the fact that the retrieval times reported by Ridout et al. (2016) only pertained to specific AMs, while retrieval time was collapsed across specific and overgeneral AMs in the present study.

The finding that currently depressed participants recalled a greater proportion of specific AMs is unexpected and contrary to numerous studies demonstrating a consistent pattern of reduced specificity/overgenerality (van Vreeswijk & Wilde, 2004; Williams et al, 2007). It is possible that the finding in our study could be attributed to the thorough instructions provided for the modified AMT task. Participants were provided with definitions and examples of specific and non-specific AMs; they also completed two practice trials and were provided with ample feedback. While this procedure was implemented for all participants, currently depressed participants may have especially benefitted from it. Alternatively, it is quite possible that the finding is spurious.

In terms of group differences for AM content characteristics, the memories recalled by currently depressed participants were rated as more negative than those recalled by never-depressed participants. This finding is congruent with previous research showing that depressed persons exhibit preferential recall of negative stimuli (Gotlib & Joormann, 2010). However, it should be noted that inspection of means for AM valence revealed that the valence of memories was likely more neutral in tone or a mix of mildly negative/mildly positive.

Group differences were also found for AM self-alignment. More specifically, currently depressed participants recalled a lower proportion of self-concordant AMs and a greater proportion of self-discrepant AMs compared to never-depressed participants. Scholars have argued that a depressed person's self-concept is marked by chronic self-discrepancy which in part contributes to negative mood (Higgins, 1989; Strauman, 1989). Our finding that depressed participants were less likely to recall self-concordant memories and more likely to recall self-discrepant ones appears to align with the "chronic self-discrepancy" that characterizes those with depression.

Affective impact. It was predicted that currently depressed participants would report greater positive affect in response to positive image cues than negative image cues; this effect would be reduced for positive word cues and negative word cues (Hypothesis 3a). Additionally, currently depressed participants would report greater negative affect in response to negative image cues than positive image cues, and this effect would be reduced for positive word cues and negative word cues (Hypothesis 3b). Among never-depressed participants, an interactive effect of cue type and cue valence would not emerge for positive or negative affect.

While the predicted three-way interaction was not found for negative affect, it did emerge for positive affect, though not in the predicted form. The findings showed that currently

depressed participants reported greater positive affect in response to positive word-cued AMs compared to negative word-cued AMs. The effect of cue valence was reduced for image cues. Among never-depressed participants, an interactive effect of cue type and cue valence did not emerge. Results also showed that currently depressed participants reported greater positive affect when recalling positive word-cued AMs compared to positive image-cued AMs. The effect of cue type was reduced for never-depressed participants. For negative cues, an interactive effect of group and cue type did not emerge.

Overall, these results indicate that currently depressed persons experienced the greatest positive affect when recalling AMs in response to positive word cues. These findings do not align with theory that predict that negative affect would be potentiated among depressed persons when recalling negative memories (Beck, 1976; Gotlib & Joorman, 2010). Moreover, the findings do not provide support for theories proposing that image cues elicit greater affective impact than word cues, based on the idea that images are believed to facilitate greater use of mental imagery than word cues, which would amplify the emotional impact of AMs cued by image cues (e.g., Holmes et al., 2008).

Given the consistent pattern found for positive word-cued AMs in depressed persons, it may be the case that the AM processes presumably activated by word cues may aid depressed persons in experiencing greater positive emotions. For instance, the effortful, top-down search process associated with word cues would prompt significant elaboration and reconstruction. This process would arguably be increased for positive memories, based on the rationale that depressed persons would either have a smaller sample of positive events to draw upon (Peeters, Nicolson, Berkhof, Delespaul, & deVries, 2003), or positive events would be poorly encoded and thus be more difficult to retrieve (Holland & Kensinger, 2010). In either case, this protracted period of

elaboration for positive words may confer some emotional benefits, given that this type of elaboration in some respects mirrors savoring and positive rumination. Savoring/positive rumination refers to the process of repeated focus on positive experiences or positive emotions, and is linked to wellbeing (Bryant, 2003; Feldman, Joormann, Johnson, 2008). Interestingly, studies show that depressed persons are typically less likely to engage in such savoring/positive rumination (Carl et al., 2013; Feldman et al., 2008; Li, Starr, Hershenberg, 2017; Werner-Seidler, Banks, Dunn, & Moulds, 2013).

Implications of Findings

Overall, the results largely suggest that the type and valence of a cue impact the process and content characteristics of AM, but do not differ between currently depressed and never-depressed participants. In other words, the differences in AM recall evidenced by currently depressed and never-depressed cannot be attributed to the cue characteristics. Further, these findings do not lend support for a negativity bias nor a reduced positive bias for recalled memories among depressed persons. Of note, the effect sizes (generalized η^2) for process and content characteristics ranged from 0.01 to 0.78, reflecting trivial to large effects (Cohen, 1988).

In contrast to AM process and content features, cue characteristics played a role in the degree of positive affect (but not negative affect) experienced by currently depressed and never-depressed participants following AM recall. Findings showed that positive affect among currently depressed persons was more impacted by positive word cues compared to other cues. However, the magnitude of these effects were trivial (generalized $\eta^2 < 0.04$)

Study Strengths and Limitations

The present two-part study employed improved methodology to provide a more comprehensive understanding about the impact of word and image cues on AM processes and content characteristics, as well as the affective impact of AM in depression. Several features of the study are noteworthy. For instance, the word and image cues utilized for the modified AMT task were validated and matched on key characteristics. Additionally, a larger sample of AMs were examined through the inclusion of 32 cues/recall trials. A broad range of process and content characteristics were examined; importantly, five of the six characteristics were rated by independent coders to ensure objectivity. Finally, the affective impact of both positive and negative AMs was examined, given that a key function of AM is affect regulation.

Despite these strengths, several limitations need to be acknowledged. First, the sample size was modest, and participants were students recruited from a university context. Additionally, while both male and female participants were recruited, the small sample of males in the present study precluded the ability to examine potential gender differences. Research suggest that females and males differ with respects to AM rehearsal and quality of elaboration (Andreano & Cahill, 2009; Piefke & Fink, 2005), factors that are believed to be linked to gender differences in process and content characteristics of AMs (Andreano & Cahill, 2009; Davis, 1999; Karlsson, Sikstrom, Jonsson, Senden, & Willander, 2019; Piefke & Fink, 2005). Investigating AM gender differences in the context of depression may be one fruitful area of future research.

Second, I selected AM process and content characteristics that were not only relevant and frequently examined in the literature on AM in depression (thus allowing a point of comparison), but also because these characteristics could be independently assessed. Unfortunately, other

relevant AM characteristics, such as visual perspective and vividness, were not included because of the subjective nature of these characteristics. Research suggests that AM visual perspective and vividness are strongly linked with the emotional impact of AMs (Sutin & Robins, 2007; Werner-Seidler & Moulds, 2011). As such, being able to examine how valenced word and image cues impact visual perspective and vividness would provide additional valuable insights about the relationship between AM content characteristics and emotional functioning.

Finally, an overarching assumption has been made that word cues are associated with the effortful, time-consuming, top-down generative/referential retrieval mode, while image cues are associated with the effortless, seemingly automatic, bottom-up direct/representation retrieval mode. Because participants in the current study were not queried about their subjective retrieval experience (i.e., whether the AM effortlessly popped to mind or if they needed to draw upon further information to identify an AM), the type of retrieval mode activated by word and image cues cannot be verified. Thus, it is possible that word cues could have prompted direct/representation retrieval and image cues could have prompted generative/referential retrieval. Indeed, some studies provide initial support for this (Harris & Berntsen, 2019).

Future Directions

The present study investigated the role of cues on AM recall in depression, with a particular focus on image cues, which reflect how memories are typically cued in daily life. The study's main hypotheses were not supported, and some findings were unexpected and inconsistent with the literature. There are several potential reasons why the results did not support my hypotheses. First, the use of image cues – while realistic and rich in sensory material – may have had the unintended effect of being too narrow in scope. Specifically, an image cue may have only been effective in easily eliciting a rich AM if the image *exactly* matched a

personal past experience. In this circumstance, the pool of relevant memories would be limited. On the other hand, the generic nature of the word cues may have conferred an advantage because it could have broadened the pool of relevant memories for participants to drawn upon. For future studies, it may be valuable to use image cues that are idiosyncratic (e.g., participants could use personal photographs or mementoes to serve as AM cues). Not only would these cues be more potent, the content of the cues would more closely reflect the type of cues encountered in daily life. The use of ecological momentary assessment would also be a particularly useful approach to studying AM processes as they unfold in everyday life.

The context of AM recall in the study is another factor that could have contributed to the null findings. Participants were instructed to deliberately identify and recall memories. While individuals in daily life certainly do intentionally try to recall AMs (e.g., trying to remember where you put your missing keys), memories also unintentionally pop into consciousness. The unintentional recall of AMs, also known was *involuntary* AM recall, is a frequent phenomenon in daily life, and these memories have distinct characteristics (Berstsen & Hall, 2004; Rasmussen & Berntsen, 2011; Schlagman & Kvavilashvili, 2008). Involuntary AM recall in the context of depression is limited and would benefit from further investigation given the relationship between AM and affect.

As noted, cue characteristics and recall context may play an important role in AM processes and have implications for emotional functioning in depression. There are likely other factors that warrant study. One particular area that would benefit from investigation pertains to the social function of AM recall and its consequences on mood (Bluck, 2003). Specifically, since AMs are commonly recalled with others, the process of sharing one's own AMs and listening to

other's AMs may impact interpersonal emotion regulation (Hofmann, 2014; Marroquin, 2011). Depression may both impact and be impacted by these processes.

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APPENDIX A: TABLES

Table 1. Features of Word and Image Cues

Word Cues	Image Cues
• Processed, stored, and retrieved in the verbal system • Prompts generative retrieval/referential processing • Less likely to prompt mental imagery • Evoke less emotional impact	• Processed, stored, and retrieved in the imagery system • Prompts direct retrieval/representational processing • More likely to prompt mental imagery • Evoke greater emotional impact

Table 2. Study #1: Participant Characteristics

Variable	Statistic
Sex, *N* (%)	
Female	51 (63.70%)
Male	29 (36.30%)
Age, *M* (*SD*)	20.45 (3.61)
Race, *N* (%)	
Asian	4 (5.00%)
Black/African American	15 (18.80%)
White	49 (61.30%)
Bi-racial/Multi-racial	6 (7.50%)
Other	6 (7.50%)
Ethnicity, *N* (%)	
Hispanic	62 (77.50%)
Non-Hispanic	18 (22.50%)
Marital Status, *N* (%)	
Single	77 (96.30%)
Married	3 (3.80%)
Years of Education, *M* (*SD*)	13.44 (1.38)

Table 3. Dimensions of Neutral Word Cues

	Affect		Sensory		Visualize		Memory Trigger	
Neutral Word Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
Nature	2.98 (1.71)	3.00	6.10 (1.22)	7.00	6.31 (0.94)	7.00	5.78 (1.46)	6.00
Bookshelf	0.61 (1.29)	0.00	3.34 (2.19)	3.50	5.44 (1.73)	6.00	3.83 (2.39)	4.00
Wheel	0.24 (0.83)	0.00	3.61 (2.20)	4.00	5.43 (1.87)	6.00	3.06 (2.43)	3.00
Fence	0.04 (0.70)	0.00	3.10 (2.14)	3.00	5.16 (1.97)	6.00	3.44 (2.34)	3.00
Keyboard	0.20 (0.88)	0.00	3.70 (2.14)	4.00	5.41 (1.80)	6.00	4.08 (2.47)	4.50
Kitchen	1.48 (1.67)	1.00	5.79 (1.31)	6.00	6.03 (1.34)	7.00	5.96 (1.48)	6.50
City	1.24 (1.92)	0.00	5.74 (1.38)	6.00	5.99 (1.27)	6.50	5.53 (1.85)	6.00

Table 4. Dimensions of Positive Word Cues

	Affect		Sensory		Visualize		Memory Trigger	
Positive Word Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
Faithful	3.49 (1.64)	4.00	3.35 (2.36)	3.00	5.00 (1.92)	6.00	4.78 (2.16)	5.00
Laughter	4.43 (0.78)	5.00	5.74 (1.58)	6.00	6.23 (0.94)	6.50	6.18 (1.47)	7.00
Awe	2.51 (1.76)	3.00	3.70 (2.10)	4.00	4.39 (2.07)	4.00	4.24 (2.08)	4.00
Calm	2.75 (1.83)	3.00	3.60 (2.04)	4.00	5.76 (1.57)	6.00	4.03 (2.22)	4.00
Celebrate	4.34 (1.36)	5.00	5.34 (1.68)	6.00	6.00 (1.25)	6.00	5.84 (1.34)	6.00
Friendly	3.84 (1.16)	4.00	3.88 (2.25)	4.00	5.48 (1.62)	6.00	5.43 (1.81)	6.00
Concert	3.23 (1.56)	3.00	6.09 (1.32)	7.00	6.14 (1.39)	7.00	5.98 (1.57)	7.00
Relaxed	3.50 (1.48)	4.00	4.55 (2.01)	5.00	5.63 (1.42)	6.00	5.39 (1.71)	6.00
Happy	4.36 (0.97)	5.00	4.91 (2.21)	6.00	6.01 (1.31)	6.00	6.11 (1.35)	7.00
Adventure	3.58 (1.24)	4.00	5.03 (1.68)	5.00	5.66 (1.45)	6.00	5.39 (1.62)	6.00
Vacation	4.26 (1.05)	5.00	5.51 (1.88)	6.00	6.21 (1.23)	7.00	6.40 (1.05)	7.00
Lucky	3.05 (1.45)	3.00	3.19 (2.20)	3.00	4.86 (1.82)	5.00	4.54 (1.86)	5.00
Cheer	3.50 (1.21)	3.00	4.95 (1.72)	5.00	5.56 (1.48)	6.00	5.30 (1.50)	5.00
Love	4.34 (1.26)	5.00	5.19 (2.03)	6.00	6.00 (1.52)	7.00	6.21 (1.46)	7.00
Thrill	3.03 (1.66)	3.00	5.05 (1.71)	5.00	5.66 (1.37)	6.00	5.55 (1.58)	6.00
Travel	3.63 (1.38)	4.00	5.40 (1.69)	6.00	5.96 (1.36)	7.00	6.10 (1.30)	7.00
Curious	1.64 (1.43)	2.00	2.96 (2.10)	3.00	4.53 (1.88)	5.00	4.54 (2.02)	5.00
Carefree	2.03 (2.01)	2.00	2.90 (2.20)	3.00	4.53 (1.99)	5.00	3.71 (2.15)	4.00
Party	3.09 (1.92)	3.00	5.70 (1.44)	6.00	6.24 (1.12)	7.00	5.68 (1.64)	6.00
Surprise	2.39 (1.88)	3.00	4.59 (1.99)	5.00	5.48 (1.63)	6.00	4.99 (1.97)	5.00
Success	4.31 (1.07)	5.00	3.93 (2.34)	4.00	5.58 (1.71)	6.00	5.41 (1.47)	5.50

Table 5. Dimensions of Negative Word Cues

	Affect		Sensory		Visualize		Memory Trigger	
Negative Word Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
Sad	-3.50 (1.66)	-4.00	3.68 (2.04)	3.50	5.60 (1.58)	6.00	5.61 (1.60)	6.00
Scared	-2.73 (1.84)	-3.00	4.10 (1.98)	4.00	5.35 (1.67)	6.00	5.04 (1.90)	5.50
Sick	-3.01 (1.56)	-3.00	5.05 (1.58)	5.00	5.65 (1.51)	6.00	5.93 (1.52)	7.00
Annoy	-2.55 (1.78)	-2.00	3.78 (2.00)	4.00	5.13 (1.55)	5.00	5.18 (1.68)	5.00
Aggressive	-3.00 (1.62)	-3.00	3.66 (2.23)	4.00	5.35 (1.56)	6.00	4.68 (2.09)	5.00
Hopeless	-3.98 (1.54)	-5.00	2.54 (2.07)	2.00	4.50 (2.11)	5.00	4.31 (2.15)	4.00
Upset	-3.21 (1.55)	-3.00	3.44 (2.06)	3.00	5.09 (1.75)	5.00	5.25 (1.72)	6.00
Disappointment	-3.59 (1.77)	-4.00	3.08 (2.22)	3.00	5.20 (1.74)	6.00	5.01 (1.95)	5.00
Risky	-1.15 (1.96)	-1.00	2.69 (2.10)	2.00	4.48 (1.98)	5.00	4.24 (2.04)	4.00
Damage	-3.26 (1.60)	-3.00	4.09 (2.09)	4.50	5.15 (1.73)	5.50	4.36 (1.92)	4.00
Overwhelmed	-2.98 (2.07)	-3.00	3.44 (2.12)	3.00	4.99 (1.89)	5.50	5.51 (1.57)	6.00
Fatigued	-1.96 (1.74)	-2.00	4.04 (2.01)	4.00	5.34 (1.63)	6.00	5.23 (1.73)	6.00
Blame	-2.71 (1.73)	-3.00	2.49 (2.03)	2.00	4.05 (2.09)	4.00	4.03 (1.99)	4.00
Accident	-2.38 (1.68)	-2.00	3.78 (2.11)	4.00	5.45 (1.57)	6.00	5.13 (1.76)	5.00
Distressed	-3.18 (2.10)	-4.00	3.15 (1.89)	3.00	4.93 (1.81)	5.00	4.24 (2.08)	4.00
Stress	-3.75 (1.51)	-4.00	3.76 (2.31)	4.00	5.76 (1.56)	6.00	6.35 (1.05)	7.00
Bored	-1.54 (1.65)	-1.00	1.98 (1.91)	1.00	5.15 (1.68)	5.00	5.03 (1.99)	5.00
Danger	-3.69 (1.78)	-4.00	4.04 (2.14)	4.00	5.19 (1.77)	5.00	4.35 (1.91)	4.00
Frustrated	-2.98 (1.75)	-3.00	3.16 (2.28)	3.00	5.26 (1.60)	6.00	5.15 (1.83)	5.00
Discomfort	-2.65 (1.54)	-3.00	3.78 (1.91)	4.00	5.01 (1.60)	5.00	4.90 (1.83)	5.00
Cheat	-3.70 (1.58)	-4.00	2.46 (2.27)	2.00	5.01 (1.81)	5.00	3.91 (2.35)	4.00

Table 5 (Continued)

	Affect		Sensory		Visualize		Memory Trigger	
Negative Word Cue	M (SD)	Median	M (SD)	Median	M (SD)	Median	M (SD)	Median
Humiliate	-3.66 (1.66)	-4.00	3.43 (2.04)	4.00	4.71 (1.94)	5.00	3.61 (2.25)	3.50
Punishment	-3.08 (1.84)	-3.00	3.79 (1.97)	4.00	5.09 (1.71)	5.00	4.95 (1.95)	6.00
Nervous	-2.15 (1.75)	-2.00	3.88 (2.11)	4.00	5.45 (1.48)	6.00	5.85 (1.28)	6.00
Reject	-3.16 (1.61)	-3.00	2.70 (2.13)	2.00	4.60 (1.79)	5.00	4.14 (2.10)	4.00
Clumsy	-0.95 (1.72)	-1.00	3.75 (2.11)	4.00	5.34 (1.64)	5.00	4.61 (1.98)	5.00
Hurt	-3.26 (1.75)	-3.00	3.80 (2.12)	4.00	5.10 (1.85)	6.00	5.19 (1.77)	5.00
Betray	-4.20 (1.49)	-5.00	2.31 (2.34)	1.50	4.55 (2.17)	5.00	4.09 (2.41)	4.00
Lonely	-3.59 (1.57)	-4.00	2.95 (2.24)	3.00	5.38 (1.73)	6.00	5.20 (1.91)	6.00
Grief	-3.71 (1.77)	-4.00	3.30 (2.10)	3.00	4.76 (1.98)	5.00	4.48 (2.12)	5.00
Alone	-2.38 (2.00)	-3.00	3.08 (2.11)	3.00	5.29 (1.73)	6.00	4.95 (2.03)	6.00
Failure	-4.18 (1.70)	-5.00	2.19 (2.08)	1.00	5.14 (1.75)	5.50	5.16 (1.68)	5.50

Table 6. Dimensions of Neutral Image Cues

	Affect		Sensory		Visualize		Memory Trigger	
Neutral Image Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
	2.18 (1.93)	2.00	5.08 (1.76)	5.00	5.44 (1.60)	6.00	3.11 (2.68)	3.00
	.68 (1.27)	0.00	3.49 (2.19)	4.00	4.63 (2.03)	5.00	3.00 (2.21)	3.00
	0.23 (0.68)	0.00	2.58 (2.28)	2.00	3.31 (2.36)	3.00	2.31 (2.45)	1.00
	.40 (1.38)	0.00	4.03 (1.97)	4.00	4.63 (1.84)	5.00	2.89 (2.39)	3.00

Table 6 (Continued)

	Affect		Sensory		Visualize		Memory Trigger	
Neutral Image Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
	0.01 (0.70)	0.00	3.16 (2.36)	3.00	4.48 (2.28)	5.00	2.84 (2.60)	2.00
	-0.36 (1.03)	0.00	3.35 (1.94)	3.00	4.39 (2.05)	5.00	3.19 (2.28)	3.00
	0.78 (1.88)	0.00	4.95 (1.82)	5.00	5.59 (1.40)	6.00	4.76 (2.30)	5.50
	1.96 (1.93)	2.00	4.54 (1.84)	5.00	5.79 (1.39)	6.00	4.06 (2.32)	4.00

Table 7. Dimensions of Positive Image Cues

	Affect		Sensory		Visualize		Memory Trigger	
Positive Image Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
	2.35 (1.63)	3.00	3.18 (1.57)	3.00	5.63 (1.32)	6.00	2.91 (2.14)	3.00
	4.59 (0.69)	5.00	4.84 (1.80)	5.00	5.93 (1.16)	6.00	5.05 (1.86)	5.00
	4.06 (1.04)	4.00	4.41 (2.12)	5.00	5.10 (1.51)	5.00	3.68 (2.22)	3.00
	3.43 (1.41)	3.00	5.58 (1.57)	6.00	5.89 (1.34)	6.00	4.33 (2.31)	4.50
	2.29 (2.09)	2.00	5.43 (1.43)	6.00	5.75 (1.54)	6.00	4.14 (2.60)	5.00
	4.20 (1.08)	5.00	5.36 (1.66)	6.00	5.95 (1.31)	6.00	5.40 (2.13)	6.00

Table 7 (Continued)

	Affect		Sensory		Visualize		Memory Trigger	
Positive Image Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
	3.61 (1.60)	4.00	6.18 (1.19)	7.00	6.13 (1.33)	7.00	5.74 (1.71)	6.50
	2.95 (1.80)	3.00	5.08 (1.76)	5.50	5.25 (1.86)	6.00	4.93 (2.02)	5.00
	3.58 (1.40)	4.00	5.56 (1.40)	6.00	5.90 (1.18)	6.00	4.18 (2.41)	4.00
	4.08 (1.13)	4.00	5.85 (1.42)	6.00	6.16 (1.11)	7.00	5.14 (2.16)	6.00
	2.88 (1.94)	3.00	4.09 (2.11)	4.00	5.01 (1.81)	5.00	2.81 (2.32)	2.00
	4.33 (1.08)	5.00	5.34 (1.76)	6.00	5.90 (1.34)	6.00	4.39 (2.35)	5.00

Table 7 (Continued)

	Affect		Sensory		Visualize		Memory Trigger	
Positive Image Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
	2.51 (2.23)	3.00	5.31 (1.58)	5.00	5.64 (1.49)	6.00	3.60 (2.50)	4.00
	3.91 (1.36)	5.00	5.89 (1.57)	7.00	6.16 (1.08)	7.00	5.26 (1.95)	6.00
	0.04 (2.50)	0.00	3.58 (1.89)	4.00	4.93 (1.70)	5.00	3.25 (2.50)	3.00
	3.33 (1.52)	3.50	5.98 (1.36)	6.00	5.84 (1.44)	6.00	4.60 (2.10)	5.00
	3.61 (1.24)	4.00	4.79 (1.99)	5.00	5.71 (1.38)	6.00	4.88 (2.23)	5.50
	2.21 (1.98)	2.00	4.93 (2.07)	5.50	5.69 (1.64)	6.00	5.31 (2.04)	6.00

Table 7 (Continued)

	Affect		Sensory		Visualize		Memory Trigger	
Positive Image Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
	2.41 (1.97)	3.00	5.50 (1.61)	6.00	5.79 (1.32)	6.00	4.11 (2.55)	4.50
	2.86 (1.89)	3.00	5.24 (1.81)	6.00	5.83 (1.36)	6.00	5.44 (1.92)	6.00
	0.81 (1.42)	0.50	3.60 (1.88)	4.00	5.23 (1.61)	6.00	4.53 (2.13)	5.00
	3.99 (1.23)	4.00	6.30 (1.07)	7.00	6.36 (1.07)	7.00	6.58 (0.79)	7.00
	4.01 (1.11)	4.00	4.98 (1.81)	5.00	5.79 (1.20)	6.00	4.60 (2.06)	5.00
	2.94 (1.96)	3.00	5.63 (1.55)	6.00	5.84 (1.34)	6.00	4.95 (2.12)	5.50

Table 7 (Continued)

	Affect		Sensory		Visualize		Memory Trigger	
Positive Image Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
	3.91 (1.20)	4.00	4.99 (1.66)	5.00	5.65 (1.25)	6.00	4.46 (2.10)	5.00
	4.45 (0.99)	5.00	4.86 (2.01)	5.00	5.85 (1.33)	6.00	4.88 (1.87)	5.00

Table 8. Dimensions of Negative Image Cues

	Affect		Sensory		Visualize		Memory Trigger	
Negative Image Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
	-3.51 (1.45)	-4.00	3.74 (1.88)	4.00	4.96 (1.63)	5.00	3.54 (2.50)	3.00
	-1.90 (1.63)	-2.00	3.78 (1.93)	4.00	4.88 (1.71)	5.00	3.60 (2.14)	4.00
	-3.88 (1.72)	-5.00	6.13 (1.07)	7.00	6.14 (1.36)	7.00	5.71 (1.66)	6.00
	-1.03 (2.05)	-1.00	4.05 (1.92)	4.00	5.36 (1.66)	6.00	4.38 (2.23)	5.00
	-3.96 (1.50)	-4.00	2.93 (2.08)	3.00	4.48 (2.03)	5.00	3.29 (2.38)	3.00
	-0.48 (2.01)	0.00	5.20 (1.60)	5.00	5.66 (1.56)	6.00	3.08 (2.44)	3.00

Table 8 (Continued)

	Affect		Sensory		Visualize		Memory Trigger	
Negative Image Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
	-3.73 (1.41)	-4.00	4.66 (1.92)	5.00	5.58 (1.52)	6.00	3.31 (2.59)	2.00
	-3.99 (1.38)	-4.50	4.61 (1.77)	5.00	5.49 (1.56)	6.00	5.03 (1.86)	5.00
	-0.79 (1.94)	-1.00	3.78 (2.14)	4.00	4.64 (1.96)	5.00	2.96 (2.36)	3.00
	-1.99 (2.33)	-2.00	5.30 (1.78)	6.00	5.89 (1.29)	6.00	5.44 (1.81)	6.00
	2.56 (2.33)	3.00	5.54 (1.76)	6.00	5.75 (1.44)	6.00	2.41 (2.59)	1.00
	-3.73 (1.65)	-4.00	4.54 (2.01)	5.00	5.28 (1.72)	6.00	3.06 (2.54)	2.00

Table 8 (Continued)

	Affect		Sensory		Visualize		Memory Trigger	
Negative Image Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
	-3.60 (1.15)	-3.50	2.81 (1.98)	3.00	5.05 (1.61)	5.00	4.14 (2.03)	4.00
	1.30 (2.11)	1.00	5.13 (1.73)	5.00	5.34 (1.65)	6.00	4.73 (2.14)	5.00
	-1.71 (1.87)	-2.00	3.95 (1.81)	4.00	4.76 (1.75)	5.00	4.11 (2.20)	4.00
	-4.28 (1.15)	-5.00	5.45 (1.48)	5.00	5.74 (1.38)	6.00	3.94 (2.36)	4.00
	-3.33 (1.68)	-4.00	3.30 (1.83)	3.00	4.73 (1.76)	5.00	3.36 (2.30)	3.50
	-2.78 (1.58)	-3.00	4.09 (1.88)	4.00	5.84 (1.27)	6.00	6.13 (1.43)	7.00

Table 8 (Continued)

	Affect		Sensory		Visualize		Memory Trigger	
Negative Image Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
	-1.75 (1.46)	-2.00	3.19 (1.90)	3.00	4.44 (1.82)	4.00	3.18 (2.26)	3.00
	-3.49 (1.45)	-4.00	3.90 (2.14)	4.00	4.86 (1.84)	5.00	2.08 (2.19)	2.00
	-4.20 (1.32)	-5.00	4.49 (1.97)	5.00	4.94 (1.83)	5.00	1.89 (2.06)	1.00
	-0.76 (1.32)	-1.00	4.66 (1.65)	5.00	5.21 (1.61)	5.00	4.49 (2.20)	5.00
	-1.70 (2.01)	-2.00	5.35 (1.62)	5.00	5.73 (1.47)	6.00	5.73 (1.64)	6.00
	-4.41 (1.04)	-5.00	4.53 (2.10)	5.00	5.06 (1.69)	5.00	3.50 (2.45)	3.00

Table 8 (Continued)

	Affect		Sensory		Visualize		Memory Trigger	
Negative Image Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
	-2.06 (1.68)	-2.00	3.28 (2.01)	3.00	4.88 (1.87)	5.00	3.81 (2.28)	4.00
	-4.09 (1.25)	-5.00	4.30 (2.00)	4.50	5.51 (1.53)	6.00	3.64 (2.15)	4.00
	-2.33 (1.77)	-3.00	3.44 (1.95)	3.00	4.96 (1.79)	5.00	4.08 (2.29)	4.00
	-2.31 (1.61)	-3.00	3.91 (1.78)	4.00	4.88 (1.64)	5.00	2.81 (2.21)	2.00
	-0.38 (1.55)	0.00	3.55 (2.05)	3.50	4.74 (1.81)	5.00	3.71 (2.44)	4.00
	-3.69 (1.56)	-4.00	3.19 (2.27)	3.00	4.34 (2.15)	4.50	1.99 (2.21)	1.00

Table 8 (Continued)

	Affect		Sensory		Visualize		Memory Trigger	
Negative Image Cue	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median	*M* (*SD*)	Median
	-1.94 (1.72)	-2.00	3.46 (1.88)	3.00	4.60 (1.91)	5.00	3.26 (2.20)	3.00
	-2.96 (1.74)	-3.00	3.28 (2.05)	3.00	4.99 (1.73)	5.00	4.40 (2.17)	4.00

Table 9. Degree of Correspondence Between Neutral Word and Neutral Image Pair

		Degree of Correspondence	
Word – Image Pair		*M* (*SD*)	Median
Nature		6.53 (0.95)	7.00
Bookshelf		6.93 (0.31)	7.00
Wheel		6.58 (1.21)	7.00
Fence		6.71 (0.81)	7.00
Keyboard		6.79 (0.57)	7.00

Table 9 (Continued)

Word – Image Pair		Degree of Correspondence *M* (*SD*)	Median
Kitchen		5.54 (1.86)	6.50
City		6.85 (0.45)	7.00
Nature		4.93 (2.01)	5.00

Table 10. Degree of Correspondence Between Positive Word and Positive Image Pair

		Degree of Correspondence	
Word – Image Pair		*M* (*SD*)	Median
Faithful		5.46 (1.39)	6.00
Laughter		6.71 (0.60)	7.00
Awe		3.96 (1.96)	4.00
Calm		6.30 (1.00)	7.00
Celebrate		5.86 (1.26)	6.00
Friendly		5.71 (1.50)	6.00

Table 10 (Continued)

Word – Image Pair		Degree of Correspondence *M* (*SD*)	Median
Concert		6.90 (0.38)	7.00
Celebrate		5.64 (1.59)	6.00
Relaxed		6.69 (0.76)	7.00
Relaxed		6.53 (0.78)	7.00
Calm		5.90 (1.35)	6.00
Happy		6.41 (0.98)	7.00

Table 10 (Continued)

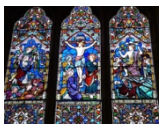
Word – Image Pair		Degree of Correspondence *M* (*SD*)	Median
Adventure		6.41 (0.79)	7.00
Vacation		6.63 (0.68)	7.00
Lucky		4.65 (1.94)	5.00
Cheer		6.30 (1.05)	7.00
Love		5.75 (1.34)	6.00
Faithful		4.86 (1.76)	5.00

Table 10 (Continued)

Word – Image Pair		Degree of Correspondence *M* (*SD*)	Median
Thrill		6.20 (1.12)	7.00
Travel		6.49 (0.91)	7.00
Curious		4.35 (1.75)	4.00
Celebrate		6.43 (0.88)	7.00
Carefree		5.35 (1.57)	6.00
Party		6.73 (0.53)	7.00

Table 10 (Continued)

Word – Image Pair		Degree of Correspondence *M* (*SD*)	Median
Surprise		5.41 (1.53)	6.00
Success		6.76 (0.62)	7.00

Table 11. Degree of Correspondence Between Negative Word and Negative Image Pair

		Degree of Correspondence	
Word – Image Pair		*M* (*SD*)	Median
Sad		6.16 (1.16)	7.00
Scared		5.46 (1.71)	6.00
Sick		5.99 (1.47)	7.00
Annoy		6.00 (1.51)	7.00
Sad		5.88 (1.31)	6.00
Aggressive		5.58 (1.38)	6.00

Table 11 (Continued)

		Degree of Correspondence	
Word – Image Pair		*M* (*SD*)	Median
Hopeless		3.98 (1.99)	4.00
Upset		6.03 (1.30)	6.00
Disappointment		4.61 (2.03)	5.00
Sick		4.53 (2.02)	5.00
Risky		6.08 (1.18)	6.00
Damage		6.69 (0.72)	7.00

Table 11 (Continued)

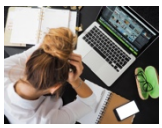
Word – Image Pair		Degree of Correspondence *M* (*SD*)	Median
Overwhelmed		5.40 (1.64)	6.00
Fatigued		4.88 (1.93)	5.00
Blame		3.74 (1.85)	4.00
Accident		6.50 (0.97)	7.00
Distressed		4.68 (1.92)	5.00
Stress		6.50 (0.87)	7.00

Table 11 (Continued)

Word – Image Pair		Degree of Correspondence *M* (*SD*)	Median
Bored		5.93 (1.26)	6.00
Danger		5.63 (1.52)	6.00
Danger		5.81 (1.45)	6.00
Frustrated		4.95 (1.99)	5.00
Discomfort		5.85 (1.26)	6.00
Sick		6.38 (1.01)	7.00

Table 11 (Continued)

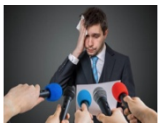
Word – Image Pair		Degree of Correspondence *M* (*SD*)	Median
Cheat		6.50 (0.91)	7.00
Humiliate		6.24 (1.09)	7.00
Punishment		6.45 (0.90)	7.00
Nervous		5.99 (1.29)	7.00
Bored		4.19 (1.94)	4.00
Reject		5.01 (2.25)	6.00

Table 11 (Continued)

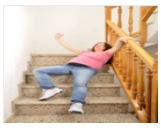
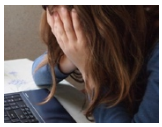
Word – Image Pair		Degree of Correspondence *M* (*SD*)	Median
Clumsy		5.36 (1.71)	6.00
Hurt		6.28 (1.11)	7.00
Betray		3.71 (2.38)	3.50
Stress		6.28 (1.02)	7.00
Lonely		4.63 (1.74)	5.00
Grief		6.30 (1.28)	7.00

Table 11 (Continued)

		Degree of Correspondence	
Word – Image Pair		*M* (*SD*)	Median
Alone		6.11 (1.28)	7.00
Failure		5.58 (1.74)	6.00

Table 12. Study #2: Participant Characteristics

	Currently Depressed (n = 21)	Never-Depressed (n = 31)
Variable	*M* (*SD*) / *n* (%)	*M* (*SD*) / *n* (%)
Recruitment Source		
Flyer	21 (100.0%)	22 (71.0%)
Sex (n, %)		
Female	19 (90.5%)	21 (67.7%)
Male	1 (4.8%)	10 (32.3%)
Other	1 (4.8%)	-
Age	21.29 (3.88)	21.94 (5.43)
Race		
American Indian/Alaska Native	-	1 (3.2%)
Asian	1 (4.8%)	2 (6.5%)
Black/African American	1 (4.8%)	6 (19.4%)
White/Caucasian	18 (85.7%)	12 (38.7%)
Bi/Multi Racial	-	7 (22.6%)
Other	1 (4.8%)	3 (9.7%)
Ethnicity		
Hispanic	6 (28.6%)	13 (41.9%)
Non-Hispanic	15 (71.4%)	18 (58.1%)
Marital Status		
Single	20 (95.2%)	30 (96.8%)
Married	1 (4.8%)	1 (3.2%)
Years of completed education	14.76 (1.67)	14.39 (2.38)
Currently taking an antidepressant for depression	7 (33.3%)	2 (6.5%)
Currently receiving psychotherapy for depression	12 (57.1%)	0 (0.0%)
BDI-II	32.65 (9.22)	3.59 (3.97)
STAI - Trait	64.10 (5.39)	31.26 (9.73)
Baseline Affect		
Positive	3.48 (1.12)	6.42 (0.92)
Negative	5.33 (1.35)	1.52 (1.06)
Verbal Fluency - FAS	35.86 (8.82)	35.90 (7.12)

Table 13. Proportion of Specific AMs Recalled by Currently Depressed and Never-Depressed Participants

	Word Cues		Image Cues	
	Positive *M* (*SE*)	Negative *M* (*SE*)	Positive *M* (*SE*)	Negative *M* (*SE*)
Currently Depressed	0.90 (0.03)	0.89 (0.04)	0.93 (0.04)	0.91 (0.03)
Never-Depressed	0.88 (0.03)	0.78 (0.04)	0.85 (0.03)	0.82 (0.03)

Table 14. Proportion of Overgeneral AMs Recalled by Currently Depressed and Never-Depressed Participants

	Word Cues		Image Cues	
	Positive *M* (*SE*)	Negative *M* (*SE*)	Positive *M* (*SE*)	Negative *M* (*SE*)
Currently Depressed	0.02 (0.02)	0.04 (0.03)	0.02 (0.02)	0.03 (0.02)
Never-Depressed	0.04 (0.02)	0.09 (0.03)	0.07 (0.02)	0.09 (0.02)

Table 15. Mean Retrieval Time of AMs (in seconds)

	Word Cues		Image Cues	
	Positive *M* (*SE*)	Negative *M* (*SE*)	Positive *M* (*SE*)	Negative *M* (*SE*)
Currently Depressed	16.5 (1.1)	17.3 (1.1)	15.05 (1.2)	16.16 (1.1)
Never-Depressed	12.7 (1.0)	13.7 (0.9)	11.76 (1.0)	13.7 (0.9)

Table 16. Mean Valence Ratings of Recalled AMs

	Word Cues		Image Cues	
	Positive *M* (*SE*)	Negative *M* (*SE*)	Positive *M* (*SE*)	Negative *M* (*SE*)
Currently Depressed	1.19 (0.17)	-2.10 (0.14)	0.63 (0.15)	-1.32 (0.15)
Never-Depressed	1.53 (0.15)	-1.65 (0.12)	0.81 (0.13)	-1.07 (0.13)

Table 17. Mean Sensory Detail Ratings of Recalled AMs

	Word Cues		Image Cues	
	Positive *M* (*SE*)	Negative *M* (*SE*)	Positive *M* (*SE*)	Negative *M* (*SE*)
Currently Depressed	4.22 (0.15)	3.99 (0.17)	4.42 (0.14)	4.08 (0.15)
Never-Depressed	3.90 (0.13)	3.64 (0.14)	4.23 (0.12)	3.75 (0.13)

Table 18. Mean Coherence Ratings of Recalled AMs

	Word Cues		Image Cues	
	Positive *M* (*SE*)	Negative *M* (*SE*)	Positive *M* (*SE*)	Negative *M* (*SE*)
Currently Depressed	4.73 (0.11)	4.79 (0.12)	4.68 (0.10)	4.65 (0.12)
Never-Depressed	4.70 (0.09)	4.77 (0.10)	4.65 (0.09)	4.55 (0.11)

Table 19. Mean Proportion of Self-Concordant AMs Recalled

	Word Cues		Image Cues	
	Positive *M* (*SE*)	Negative *M* (*SE*)	Positive *M* (*SE*)	Negative *M* (*SE*)
Currently Depressed	0.77 (0.03)	0.67 (0.06)	0.68 (0.04)	0.59 (0.05)
Never-Depressed	0.93 (0.03)	0.76 (0.05)	0.86 (0.04)	0.78 (0.05)

Table 20. Mean Proportion of Self-Discrepant AMs Recalled

	Word Cues		Image Cues	
	Positive *M* (*SE*)	Negative *M* (*SE*)	Positive *M* (*SE*)	Negative *M* (*SE*)
Currently Depressed	0.23 (0.03)	0.34 (0.05)	0.32 (0.04)	0.41 (0.05)
Never-Depressed	0.06 (0.03)	0.26 (0.05)	0.13 (0.03)	0.21 (0.04)

Table 21. Mean Self-Reported Positive Affect Elicited by AM Recall

	Word Cues		Image Cues	
	Positive *M* (*SD*)	Negative *M* (*SD*)	Positive *M* (*SD*)	Negative *M* (*SD*)
Currently Depressed	4.21 (0.96)	2.38 (1.11)	3.90 (0.93)	2.73 (0.77)
Never-Depressed	5.90 (0.79)	4.64 (1.54)	5.72 (0.87)	4.72 (1.48)

Table 22. Mean Self-Reported Negative Affect Elicited by AM Recall

	Word Cues		Image Cues	
	Positive *M* (*SD*)	Negative *M* (*SD*)	Positive *M* (*SD*)	Negative *M* (*SD*)
Currently Depressed	2.44 (1.18)	3.82 (1.30)	2.44 (1.13)	3.53 (1.12)
Never-Depressed	0.38 (0.58)	1.46 (1.33)	0.40 (0.63)	1.37 (1.23)

APPENDIX B: FIGURES

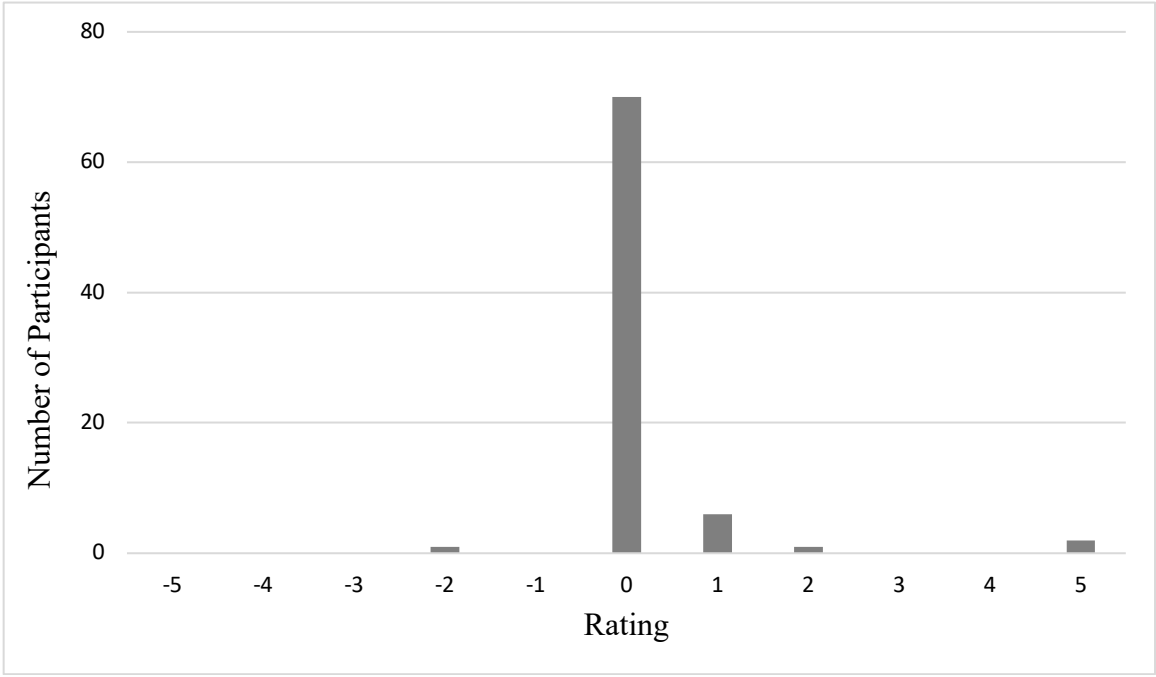


Figure 1. Distribution of Affect Ratings for "Keyboard"

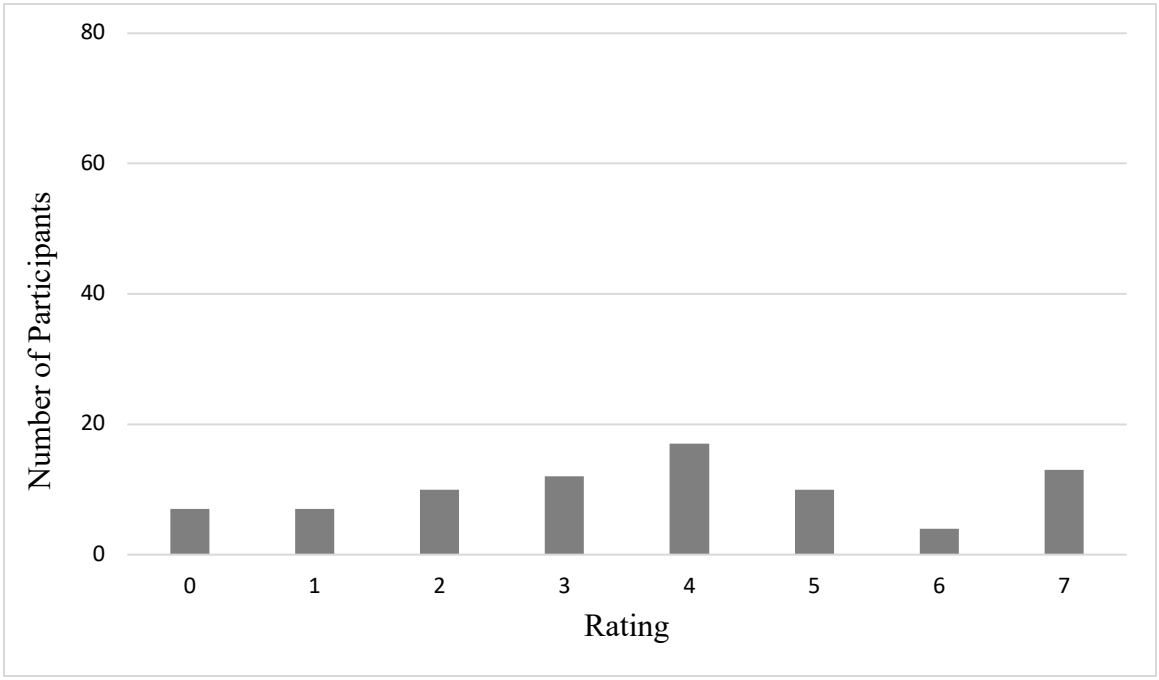


Figure 2. Distribution of Sensory Ratings for "Keyboard"

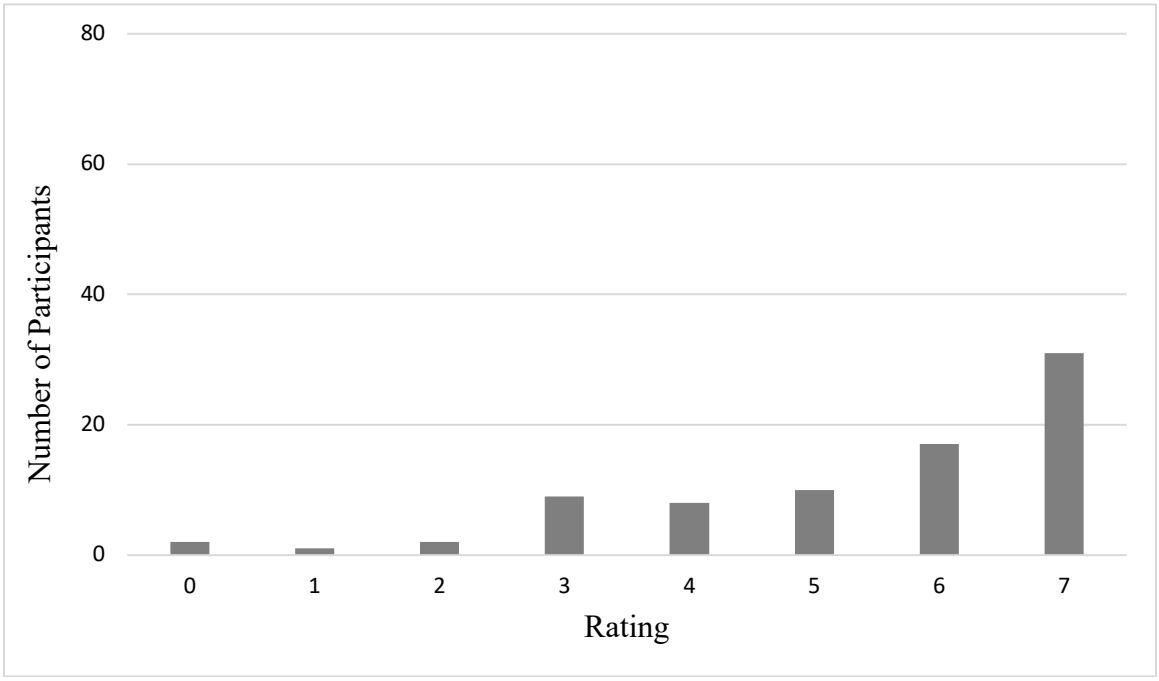


Figure 3. Distribution of Visualize Ratings for "Keyboard"

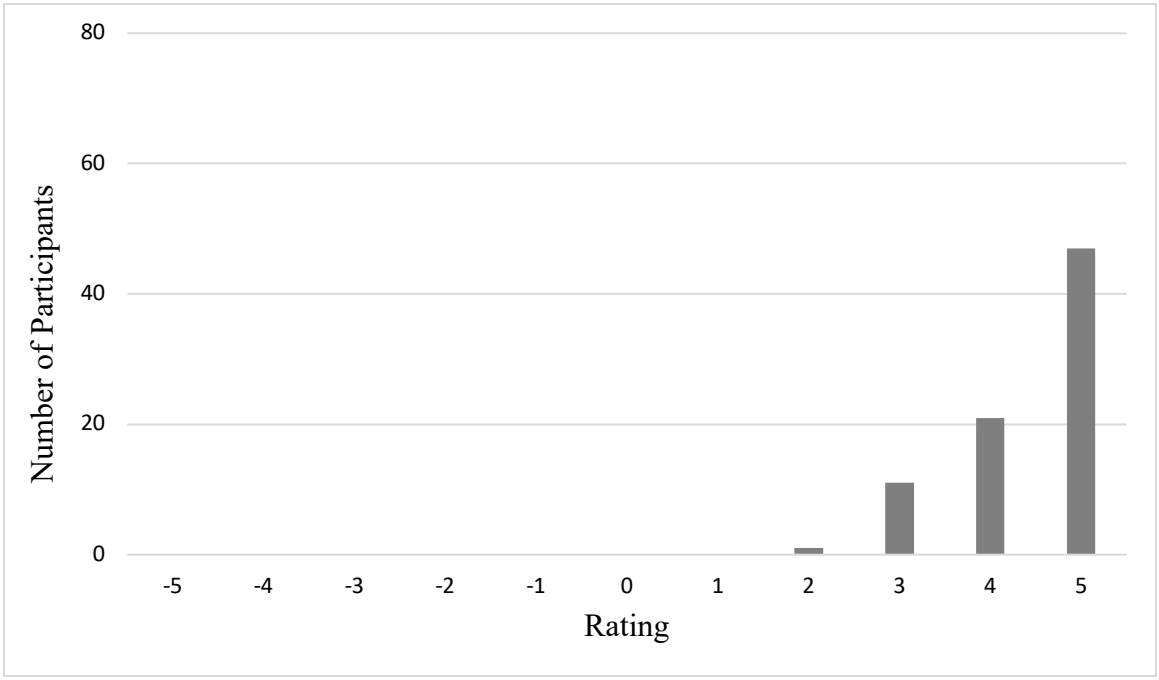


Figure 4. Distribution of Affect Ratings for "Laughter"

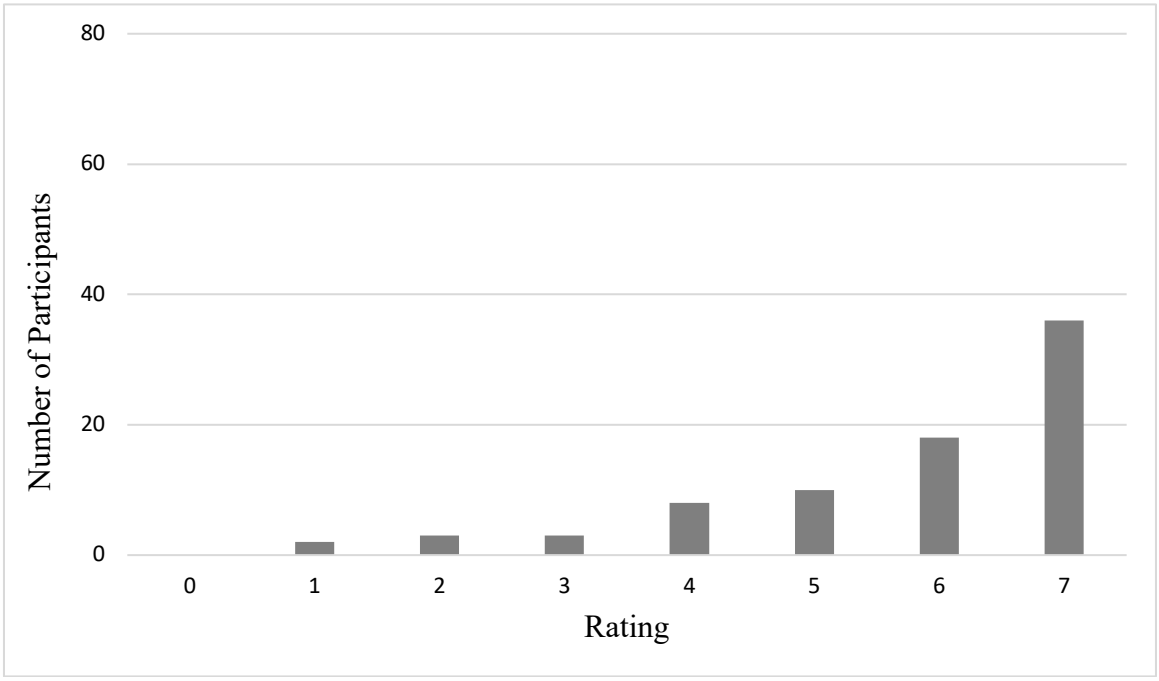


Figure 5. Distribution of Sensory Ratings for "Laughter"

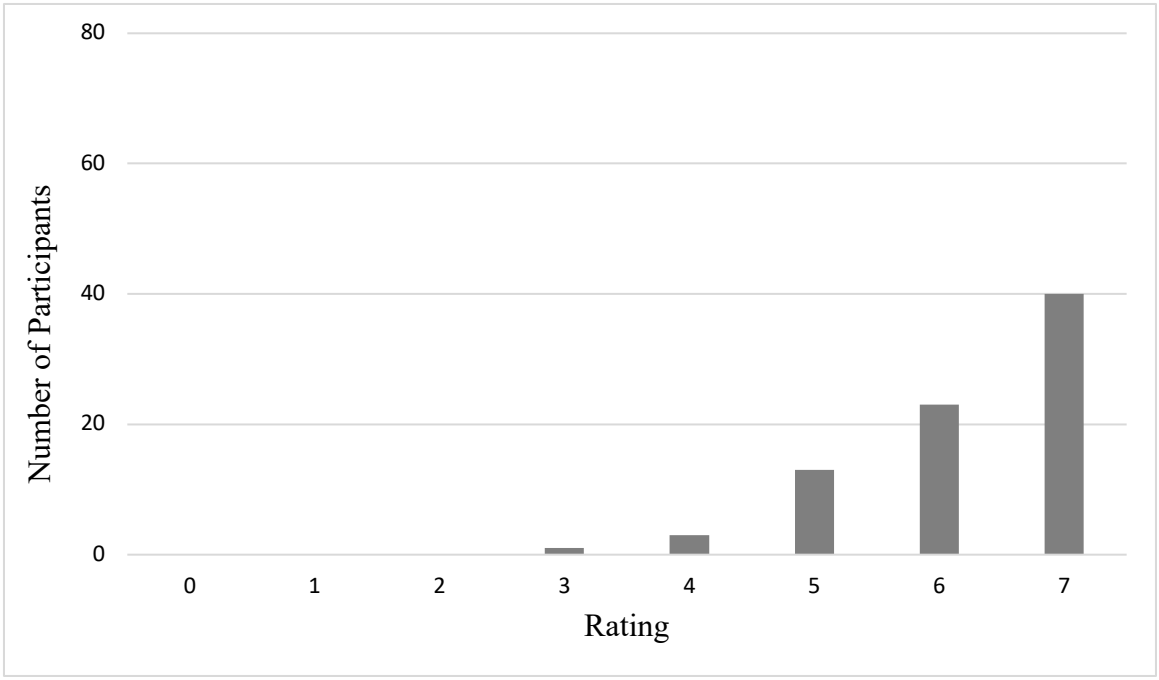


Figure 6. Distribution of Visualize Ratings for "Laughter"

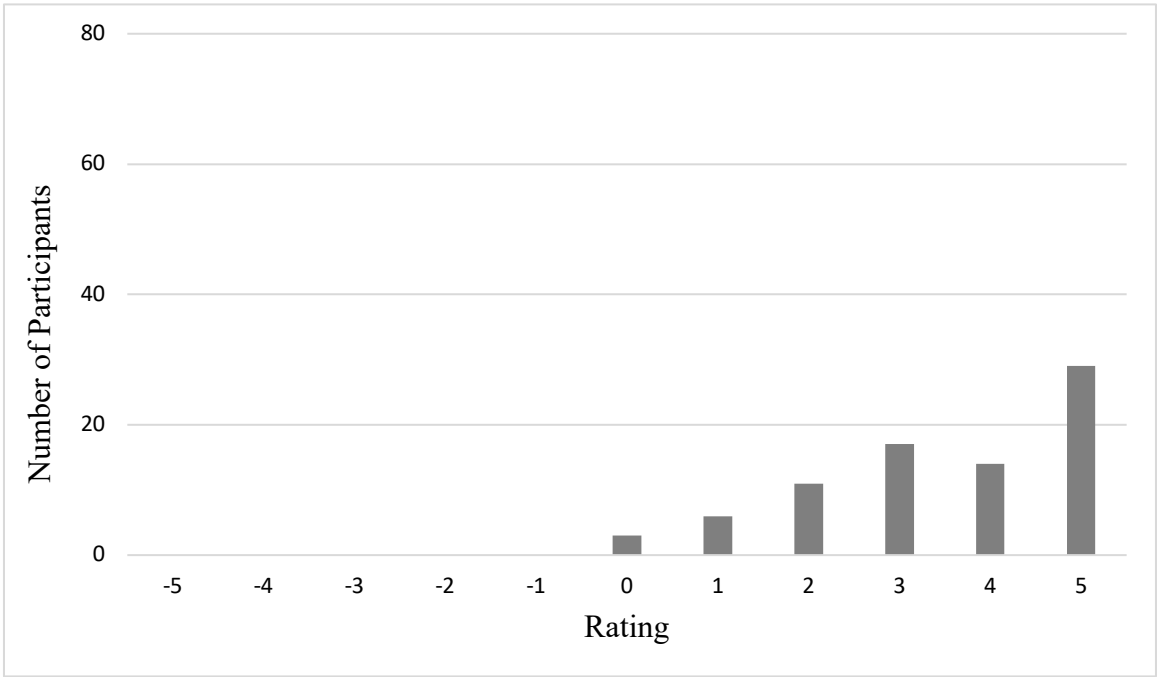


Figure 7. Distribution of Affect Ratings for "Relaxed"

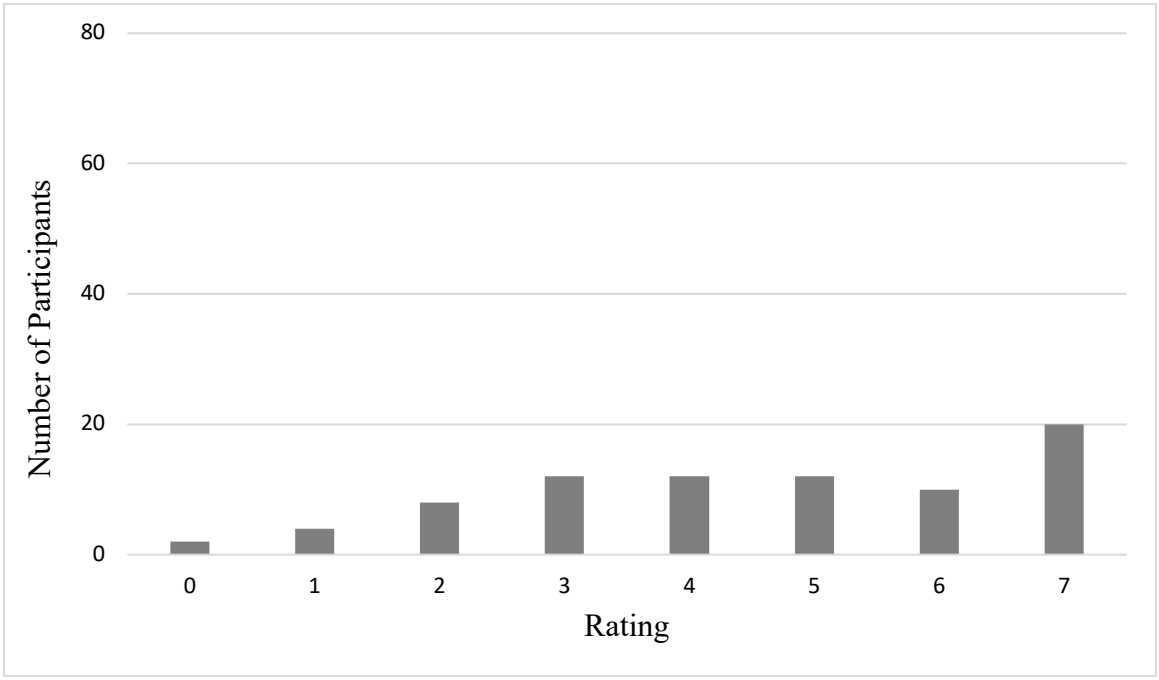


Figure 8. Distribution of Sensory Ratings for "Relaxed"

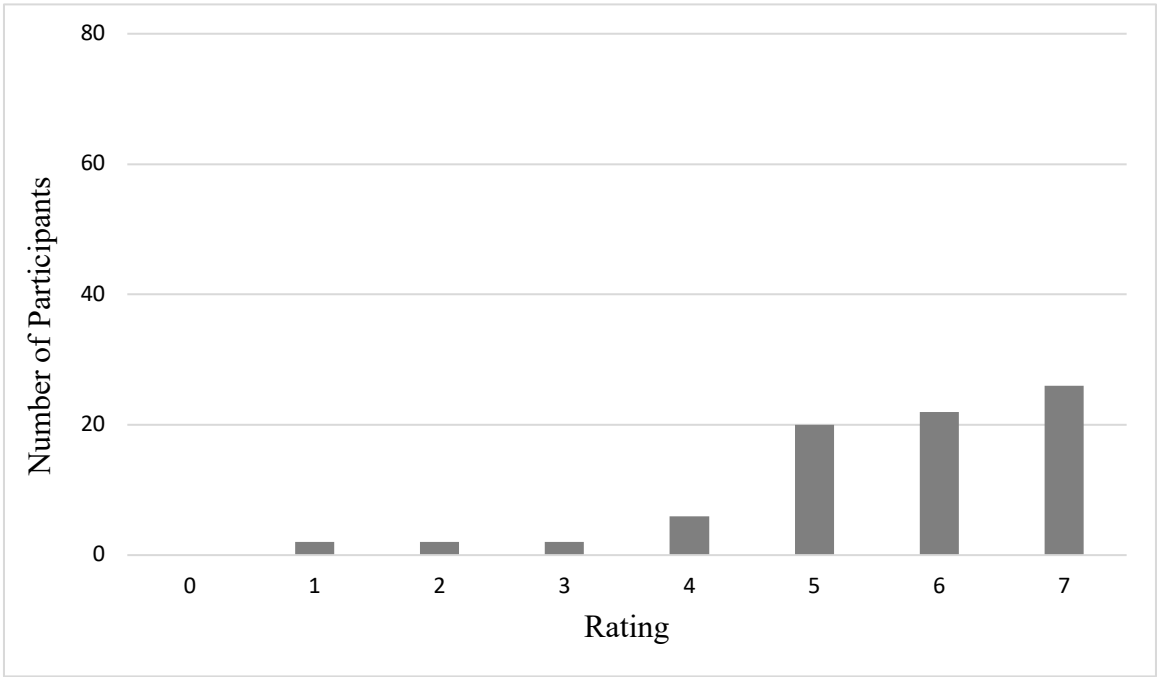


Figure 9. Distribution of Visualize Ratings for "Relaxed"

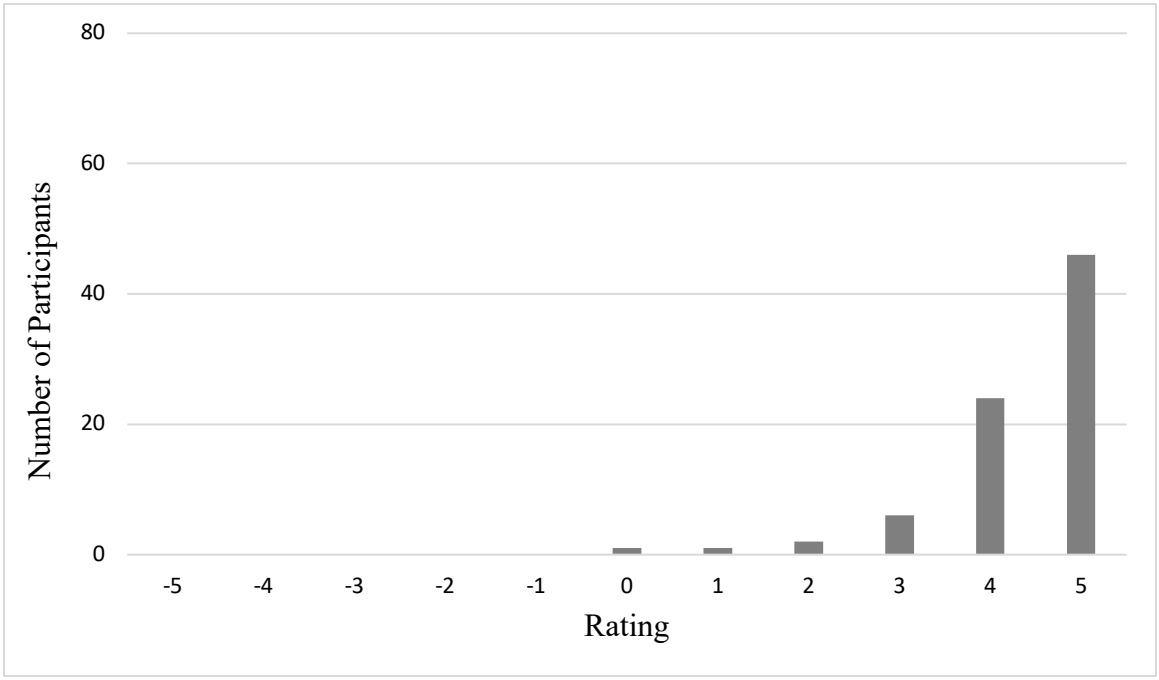


Figure 10. Distribution of Affect Ratings for "Happy"

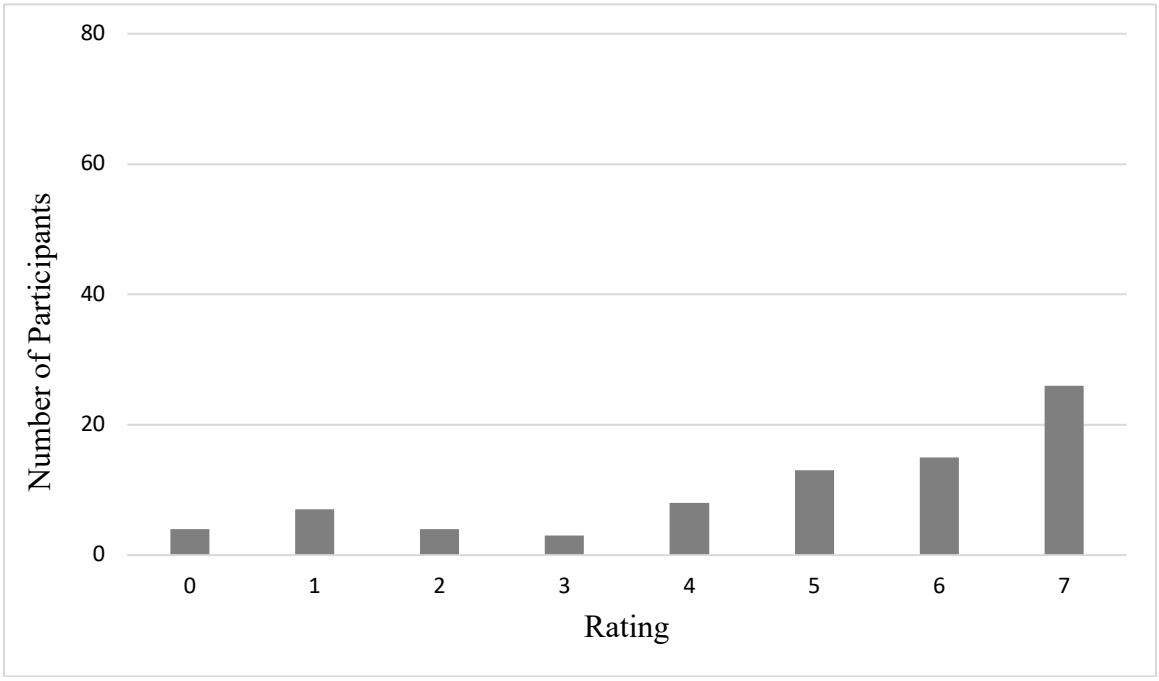


Figure 11. Distribution of Sensory Ratings for "Happy"

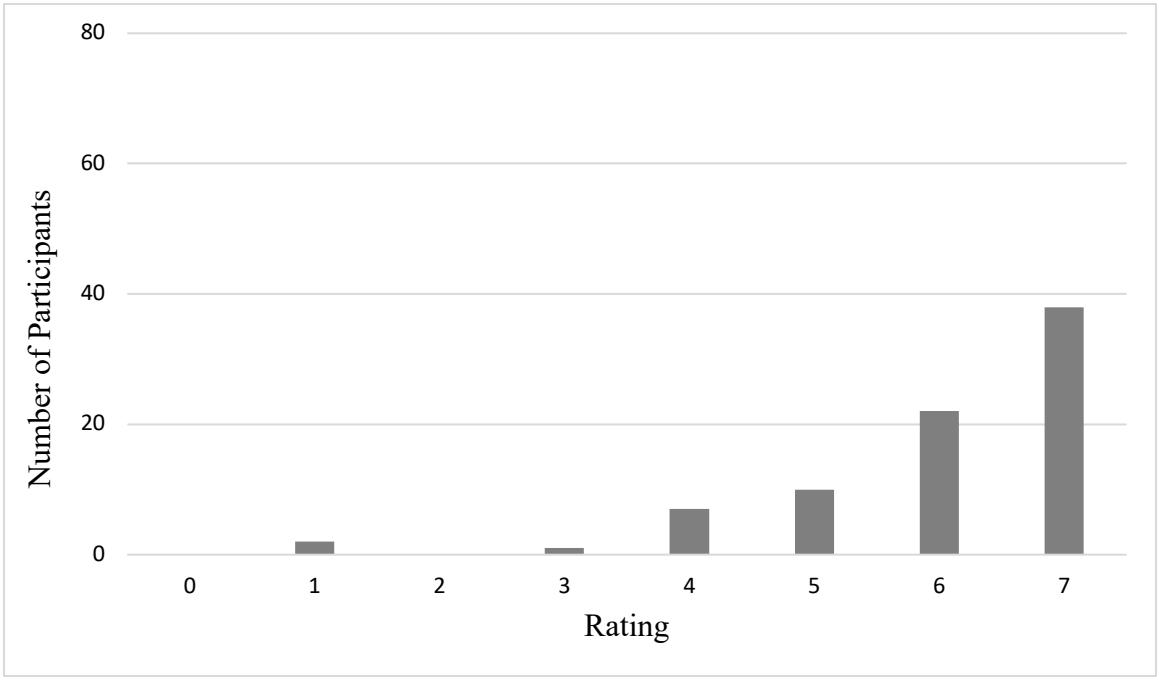


Figure 12. Distribution of Visualize Ratings for "Happy"

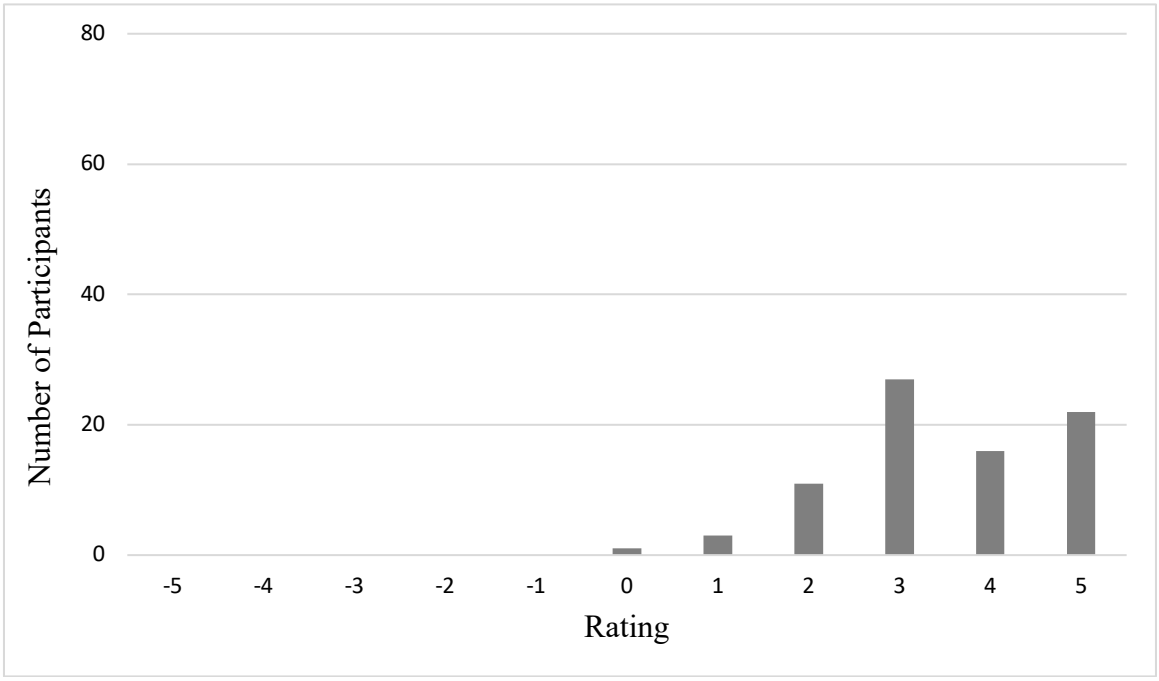


Figure 13. Distribution of Affect Ratings for "Cheer"

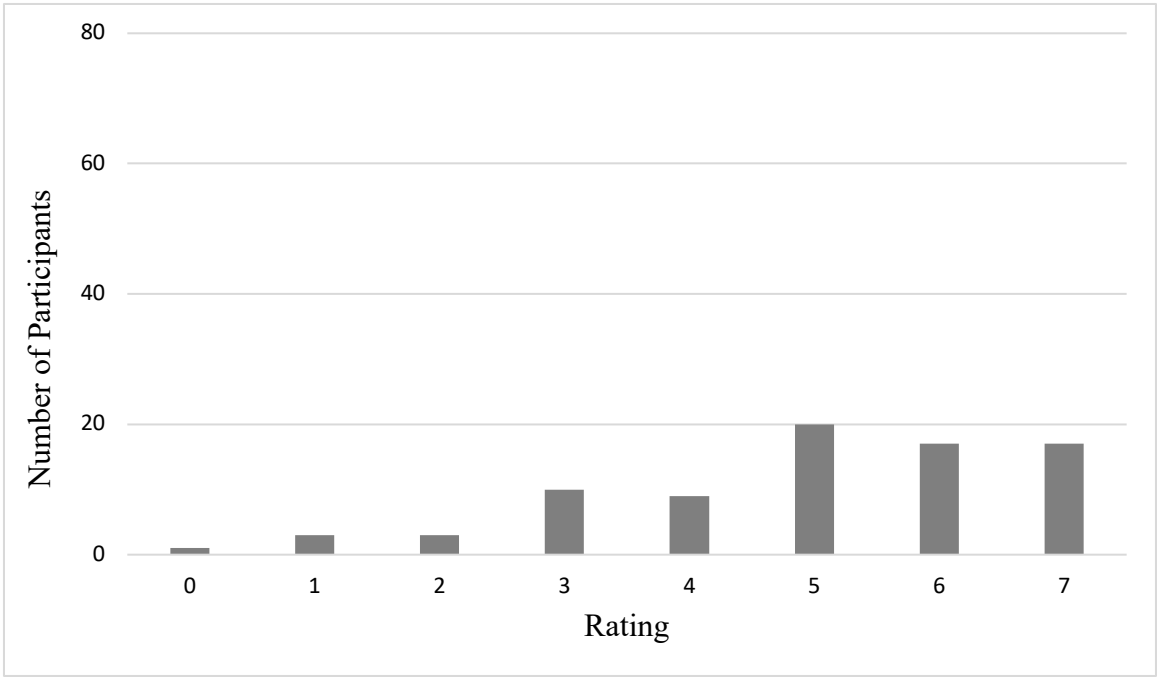


Figure 14. Distribution of Sensory Ratings for "Cheer"

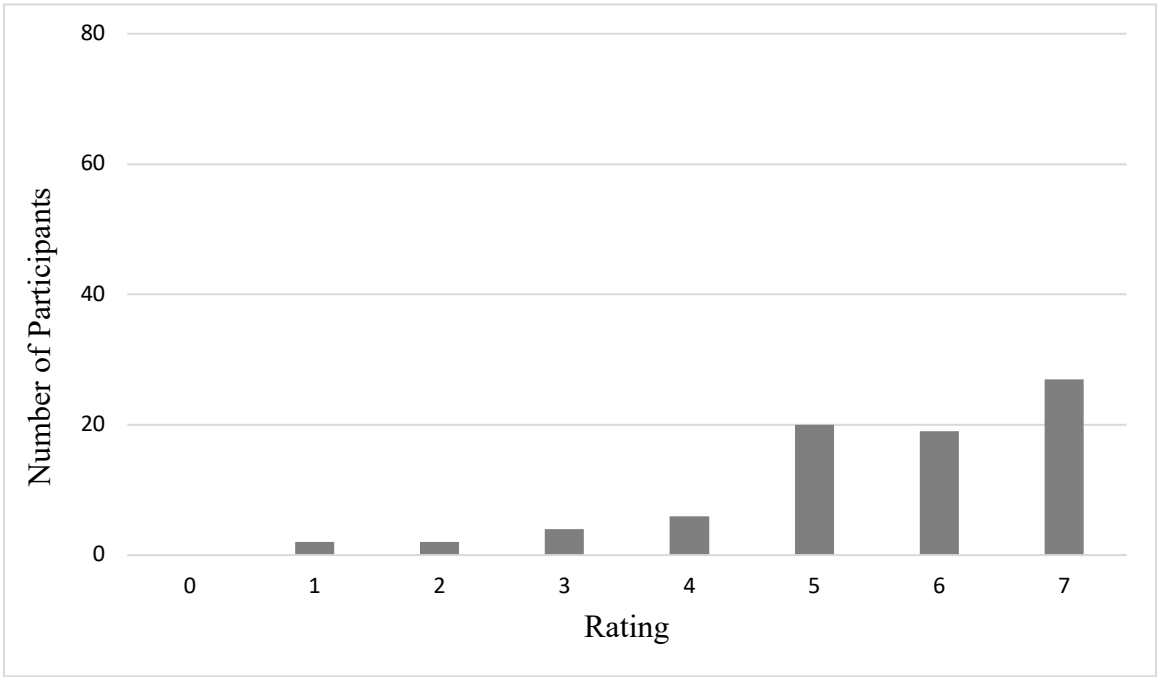


Figure 15. Distribution of Visualize Ratings for "Cheer"

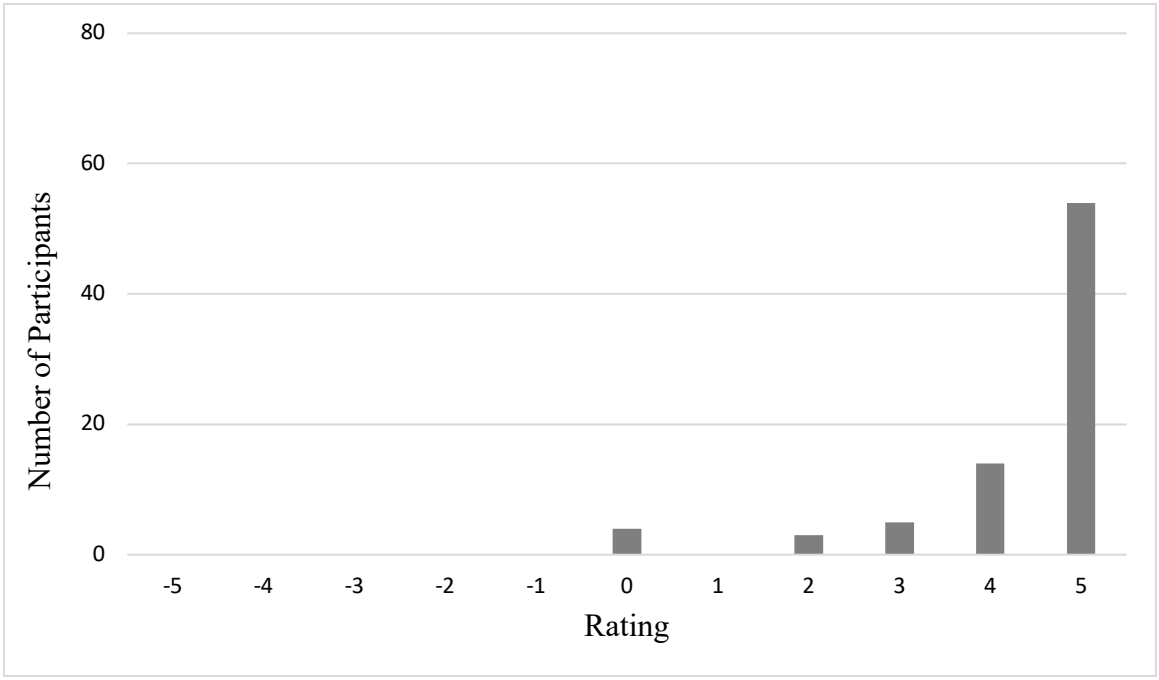


Figure 16. Distribution of Affect Ratings for "Love"

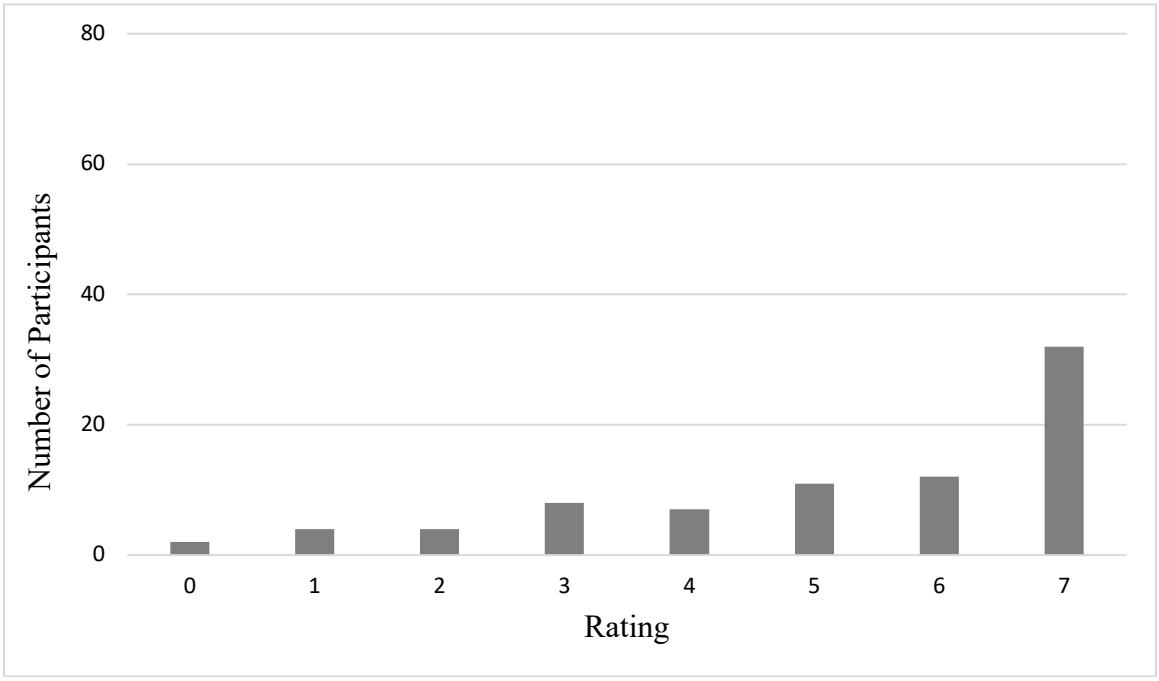


Figure 17. Distribution of Sensory Ratings for "Love"

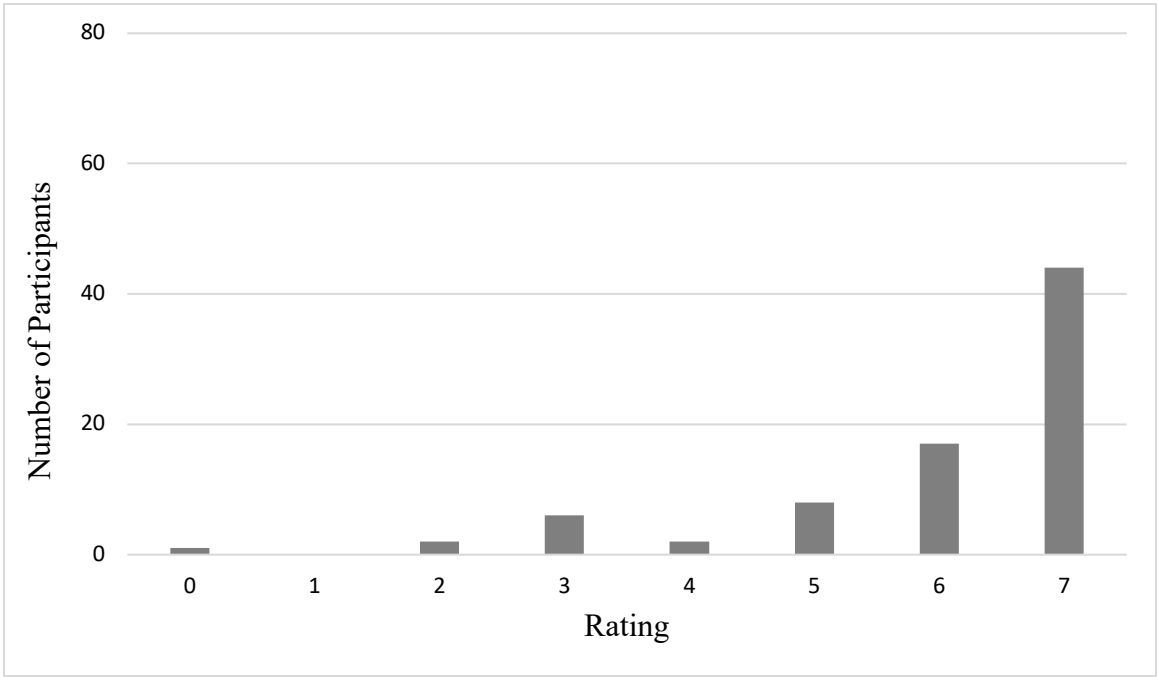


Figure 18. Distribution of Visualize Ratings for "Love"

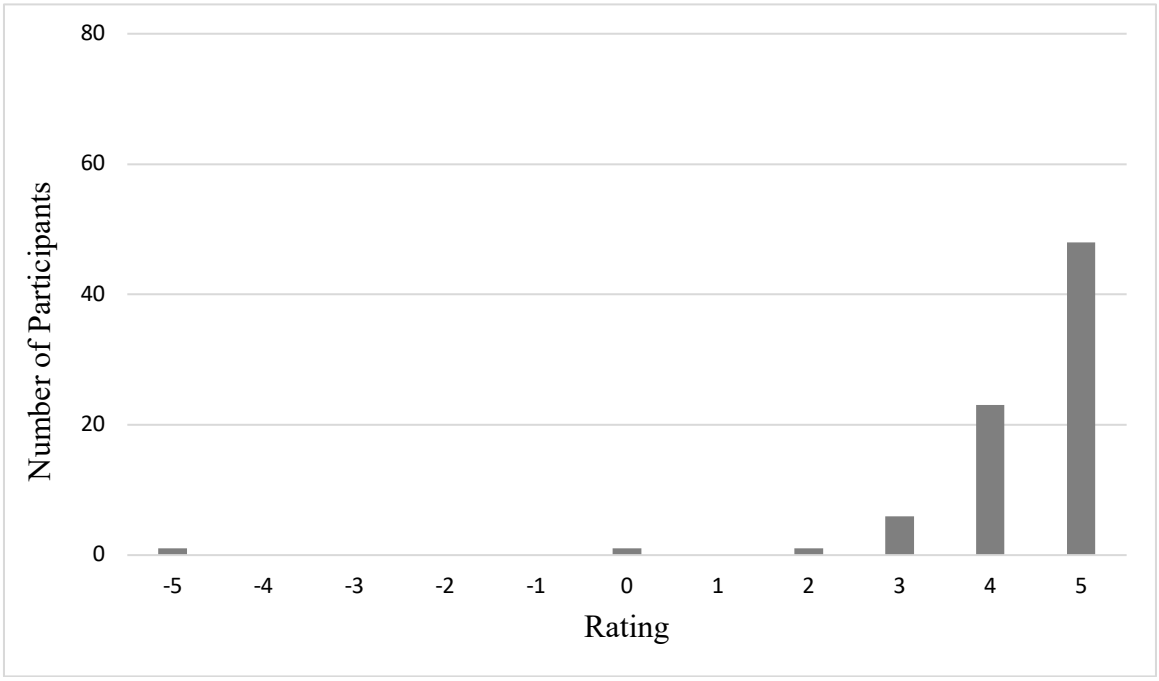


Figure 19. Distribution of Affect Ratings for "Celebrate"

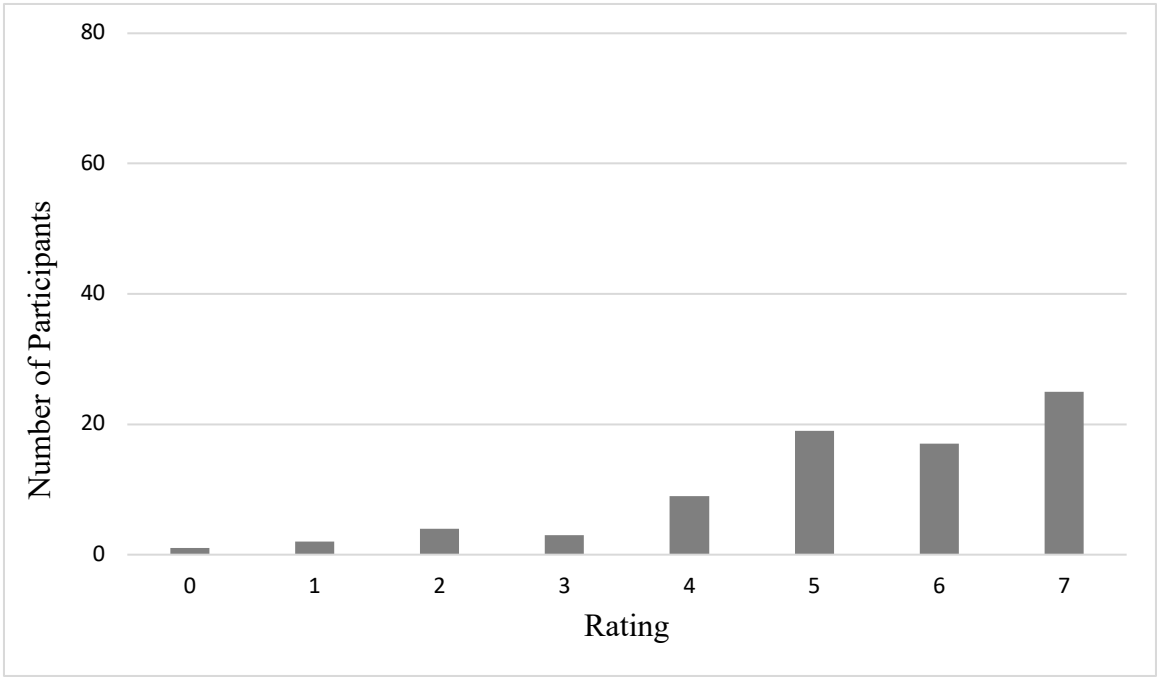


Figure 20. Distribution of Sensory Ratings for "Celebrate"

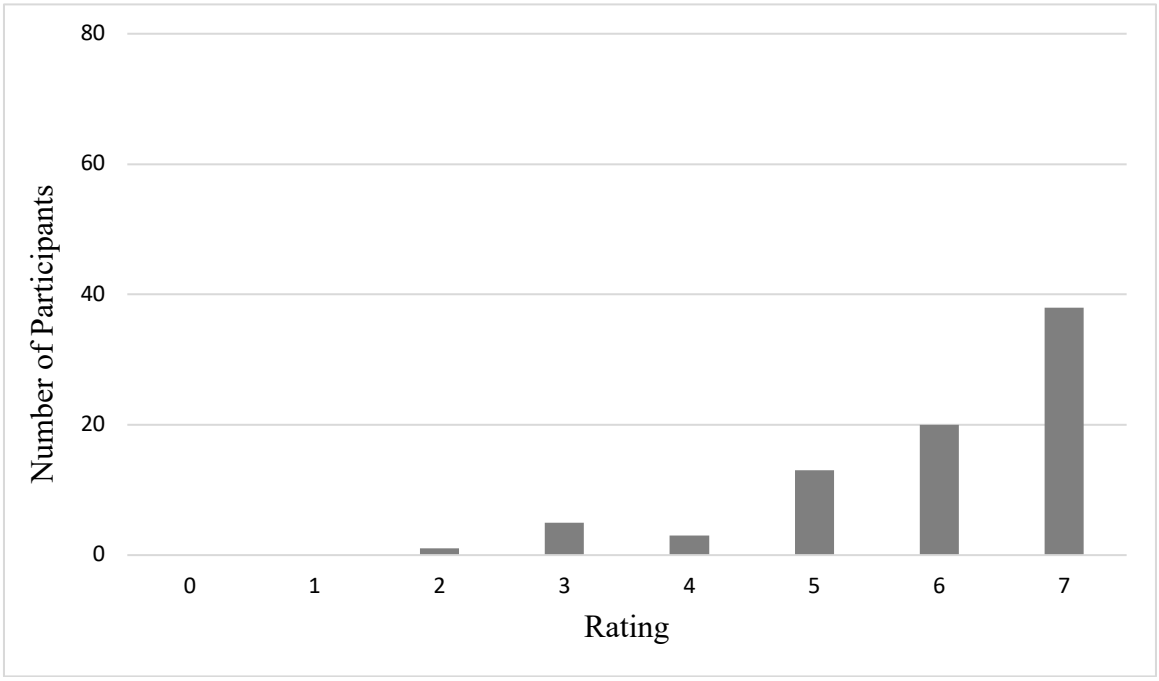


Figure 21. Distribution of Visualize Ratings for "Celebrate"

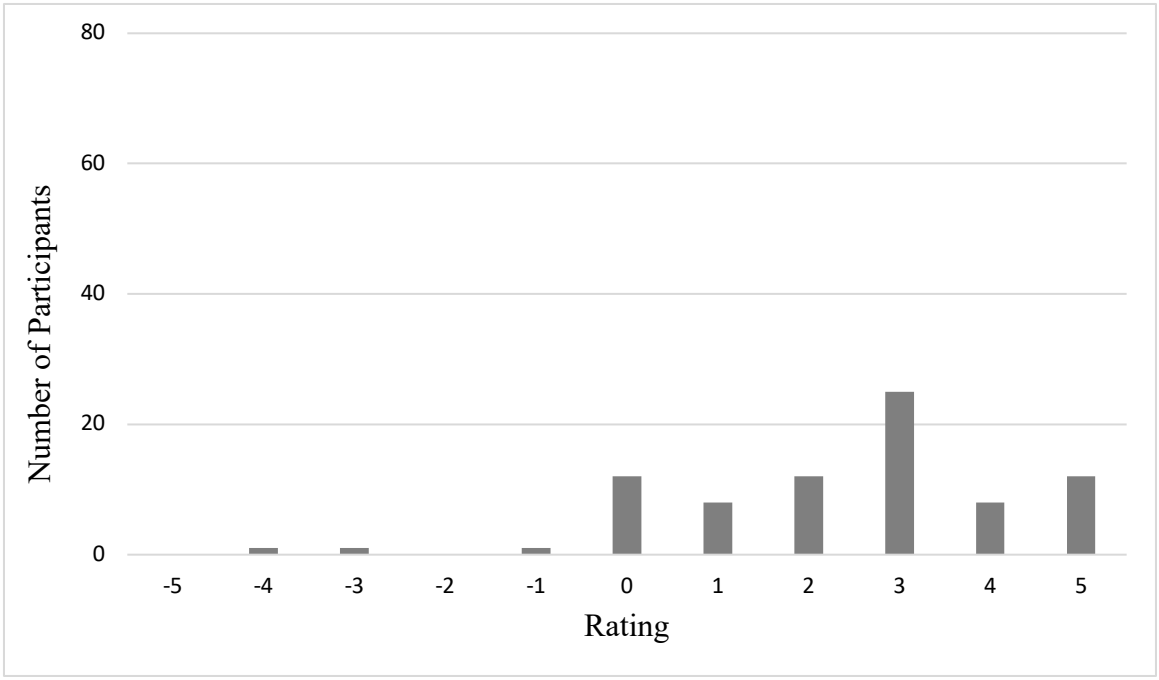


Figure 22. Distribution of Affect Ratings for "Surprise"

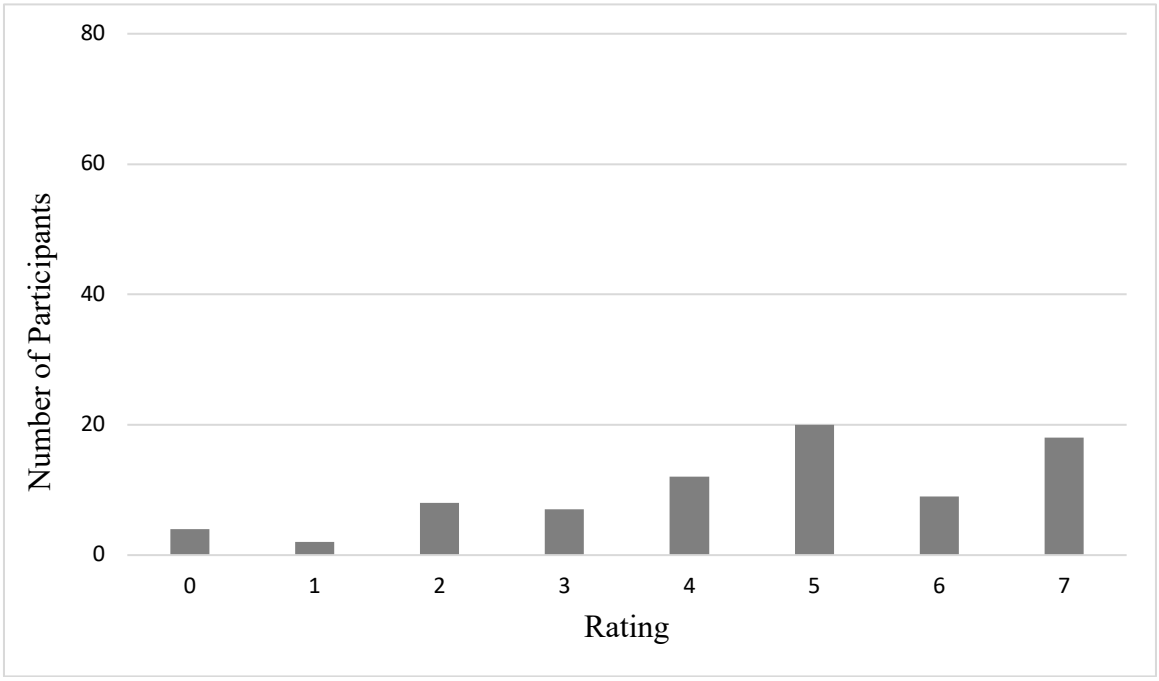


Figure 23. Distribution of Sensory Ratings for "Surprise"

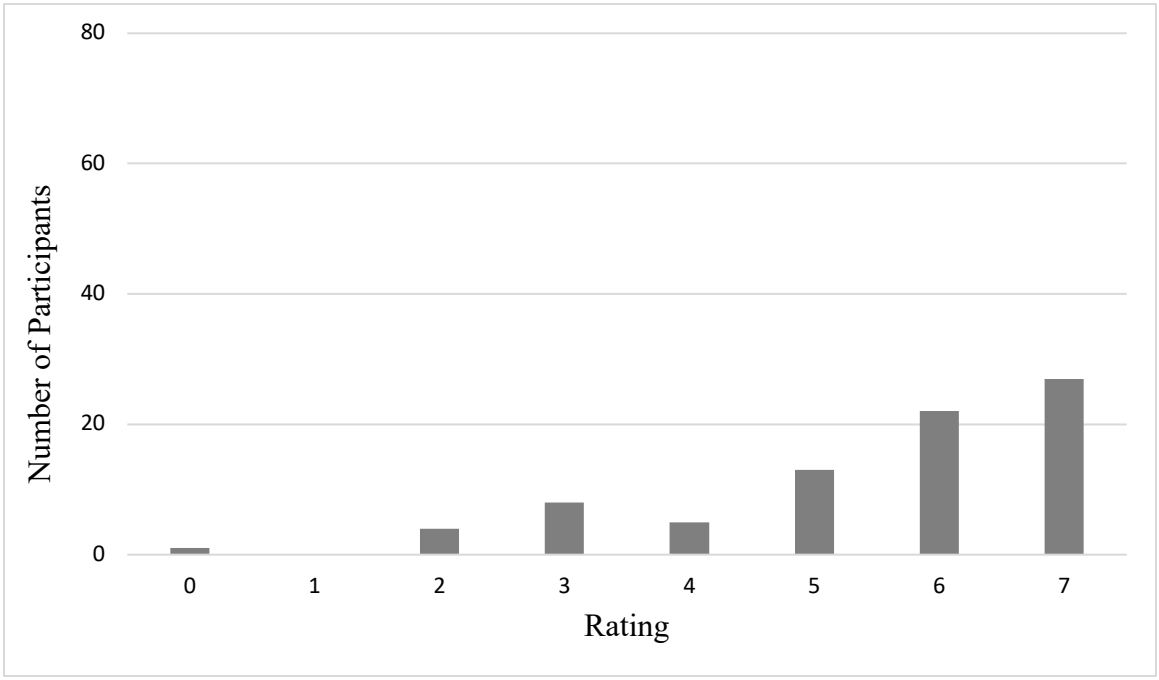


Figure 24. Distribution of Visualize Ratings for "Surprise"

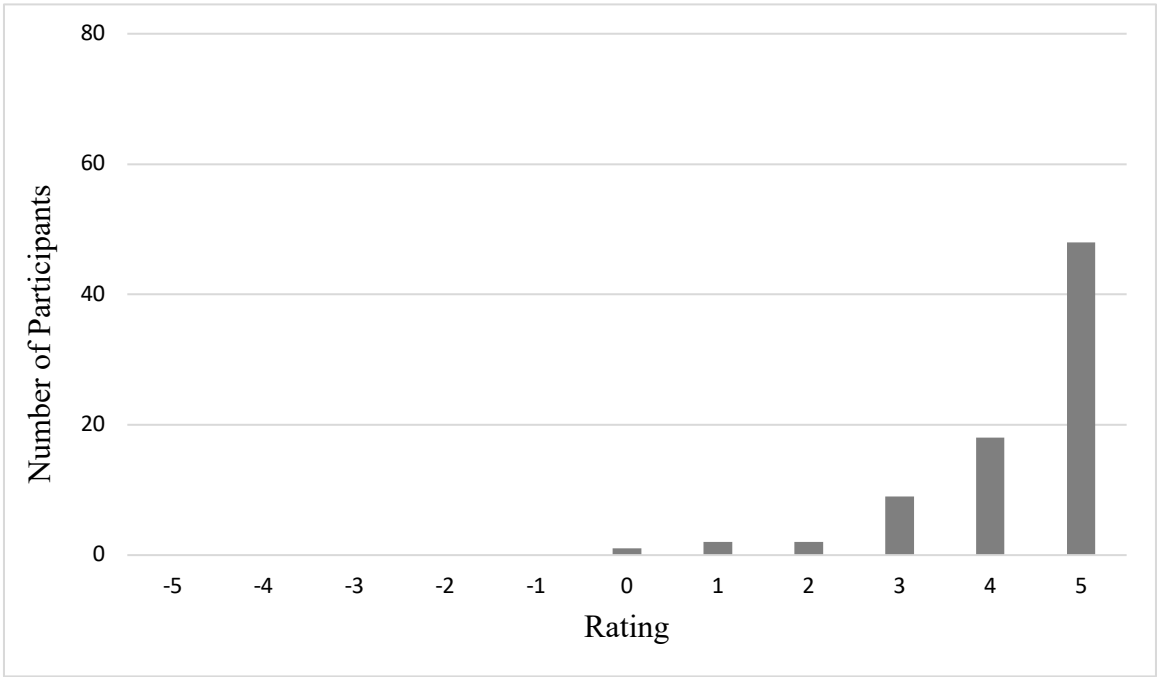


Figure 25. Distribution of Affect Ratings for "Success"

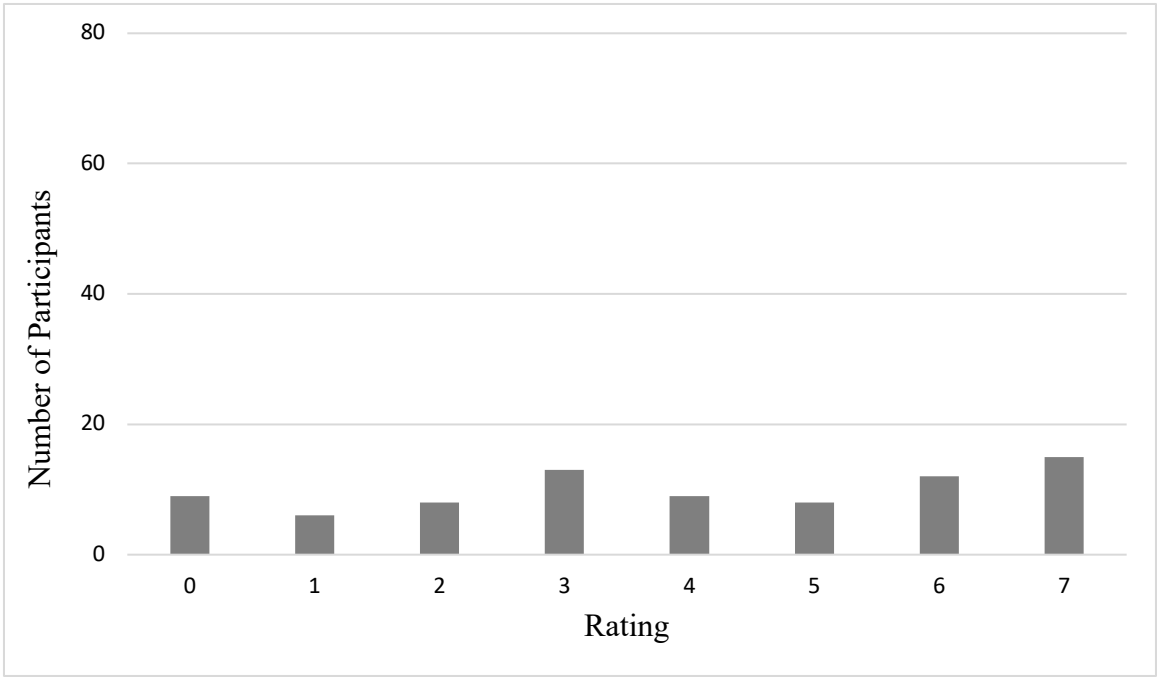


Figure 26. Distribution of Sensory Ratings for "Success"

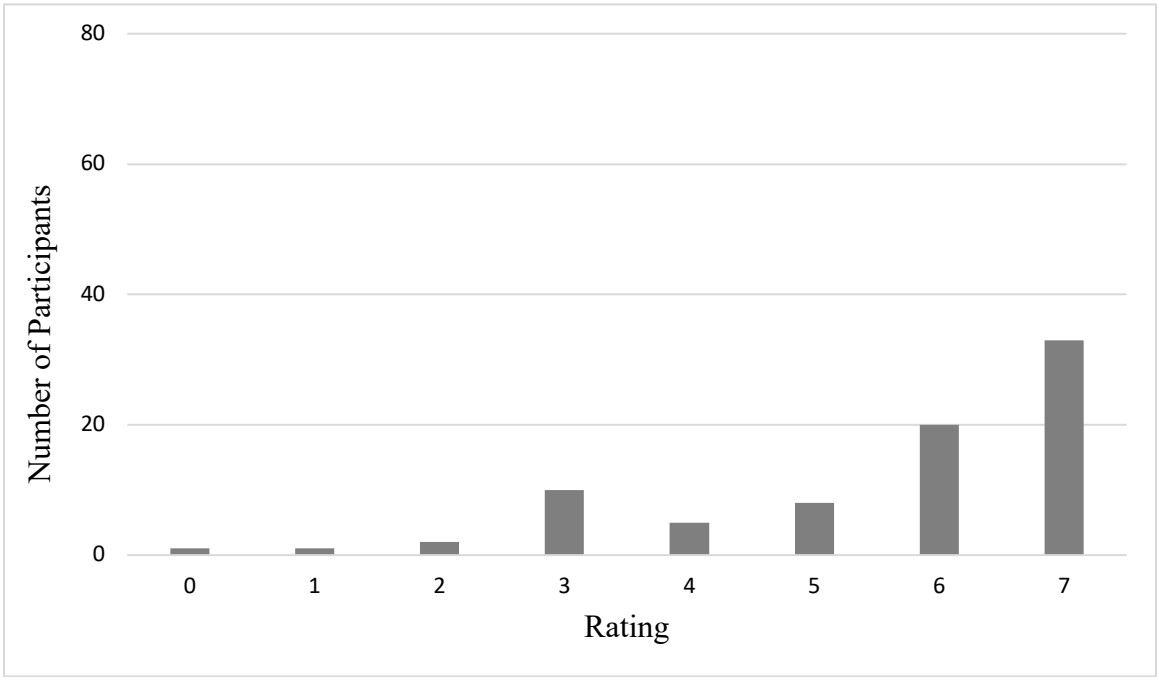


Figure 27. Distribution of Visualize Ratings for "Success"

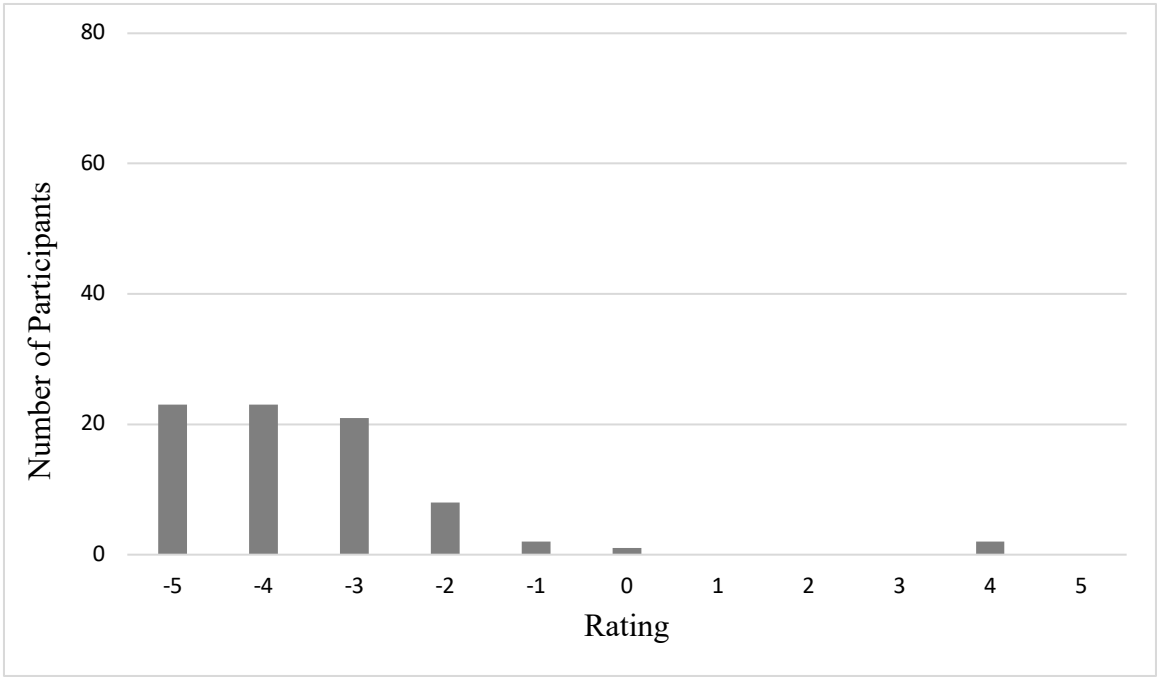


Figure 28. Distribution of Affect Ratings for "Sad"

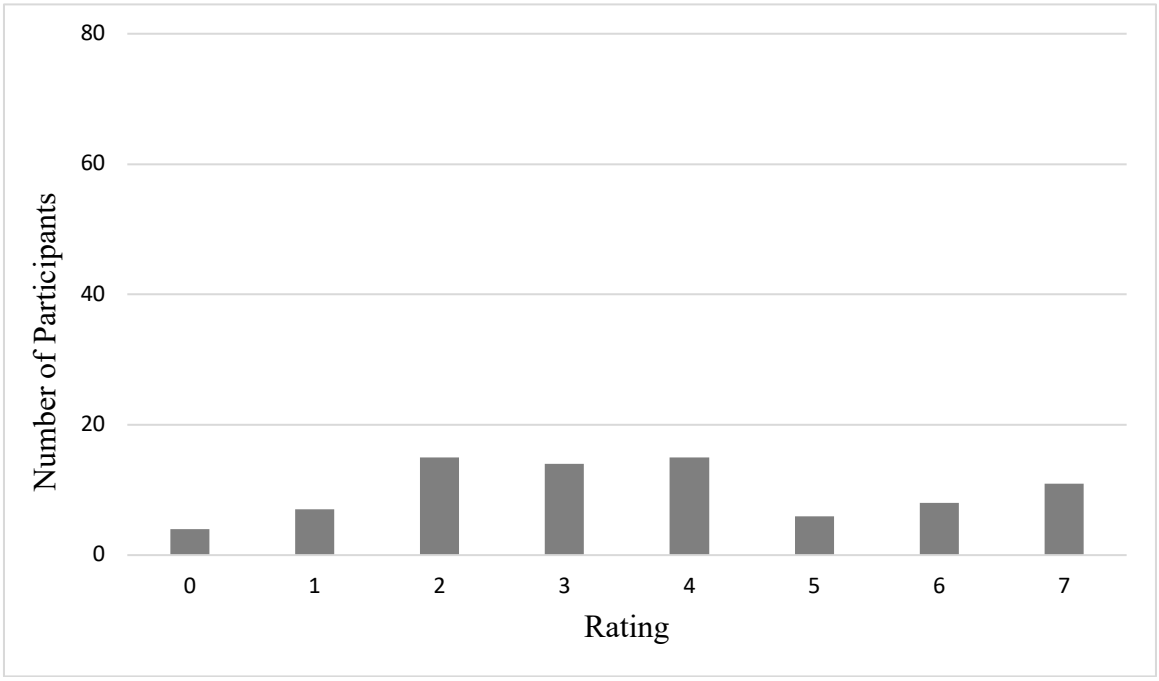


Figure 29. Distribution of Sensory Ratings for "Sad"

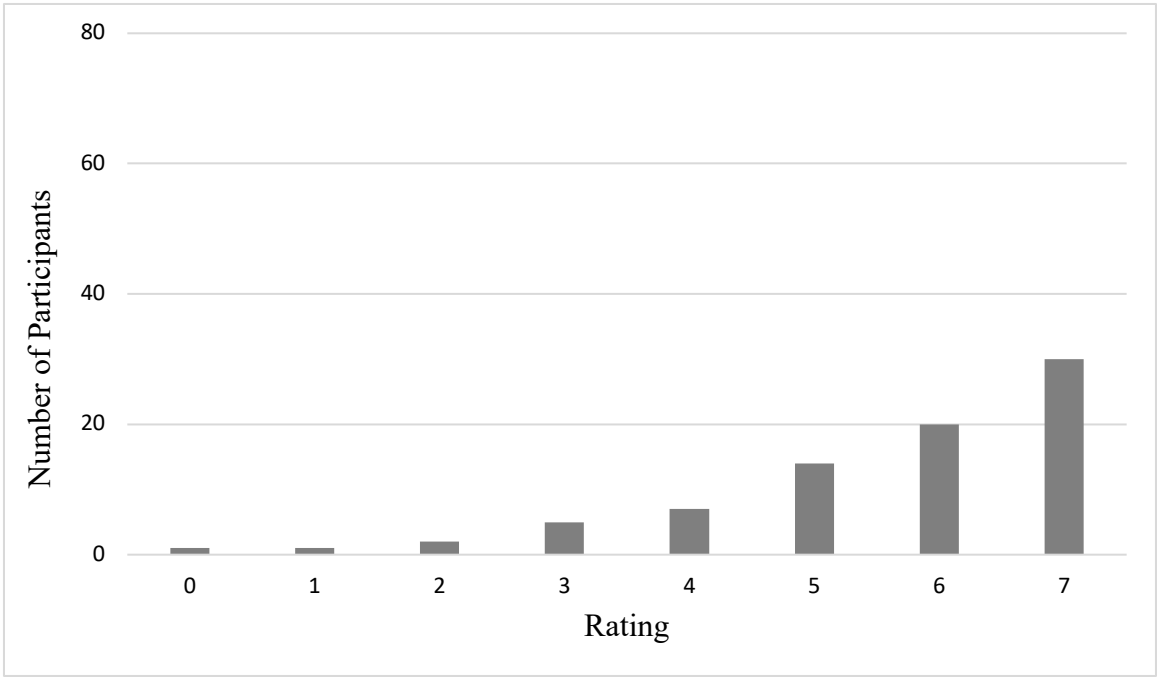


Figure 30. Distribution of Visualize Ratings for "Sad"

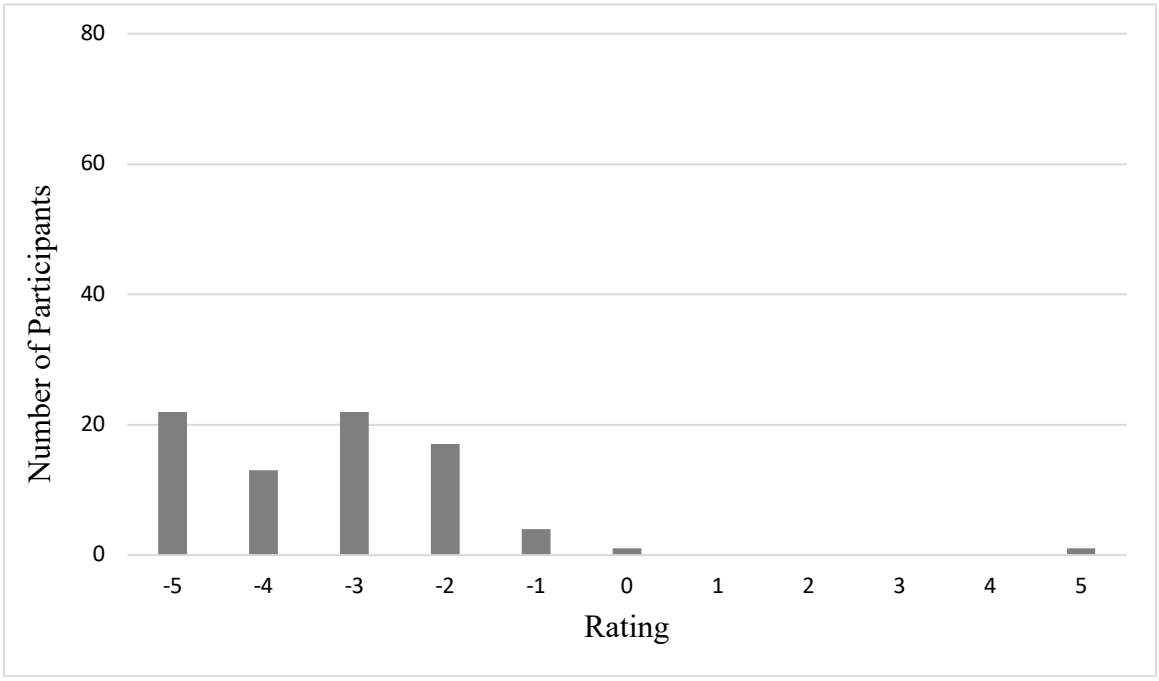


Figure 31. Distribution of Affect Ratings for "Damage"

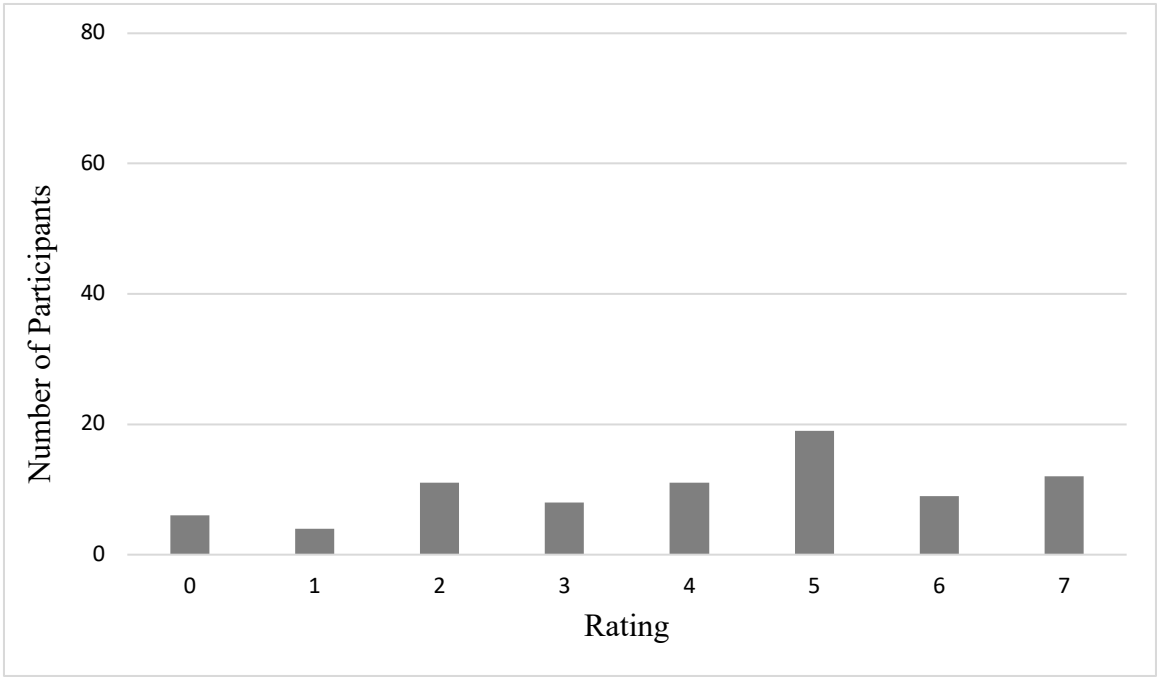


Figure 32. Distribution of Sensory Ratings for "Damage"

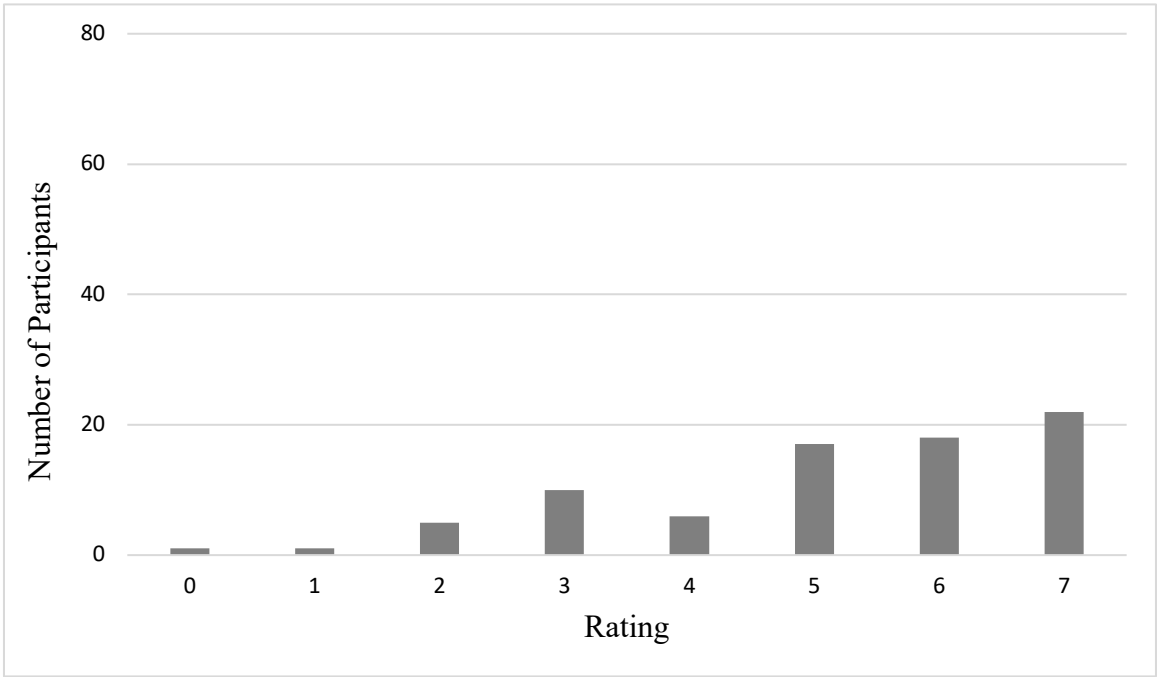


Figure 33. Distribution of Visualize Ratings for "Damage"

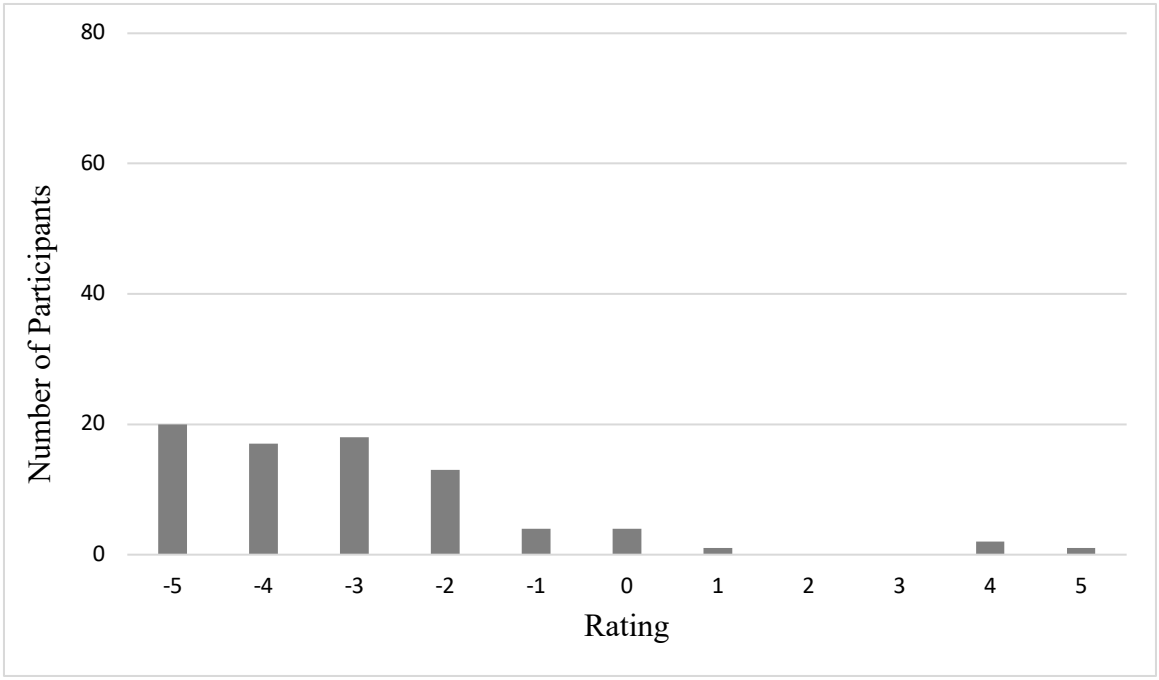


Figure 34. Distribution of Affect Ratings for "Overwhelmed"

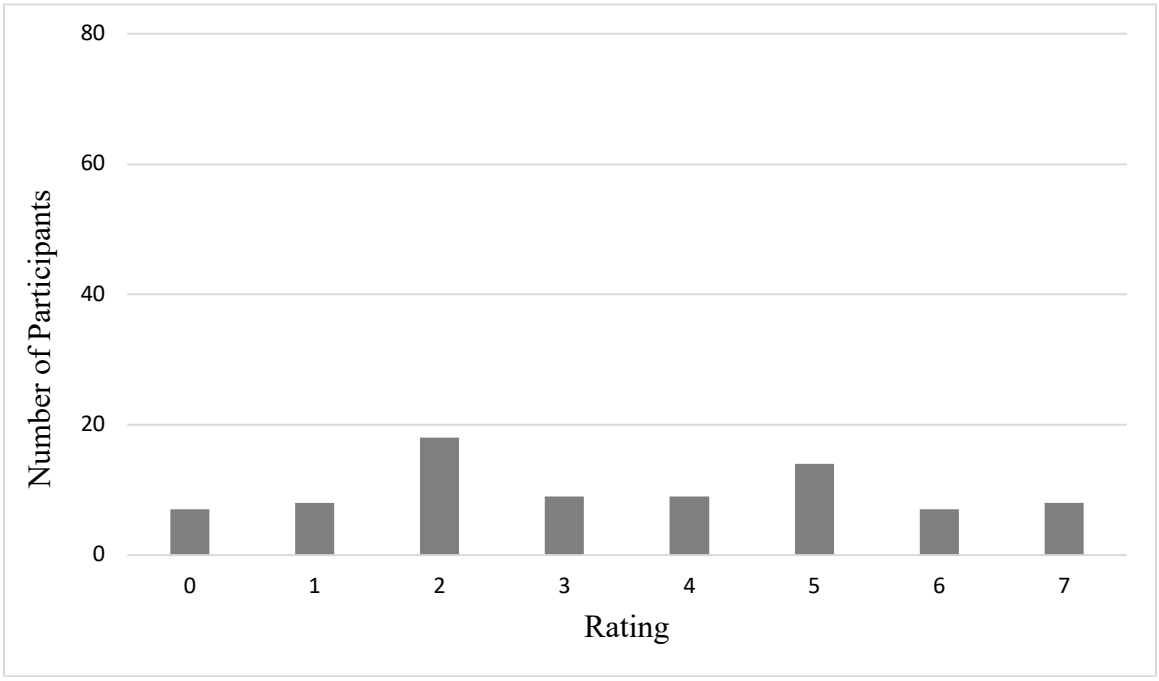


Figure 35. Distribution of Sensory Ratings for "Overwhelmed"

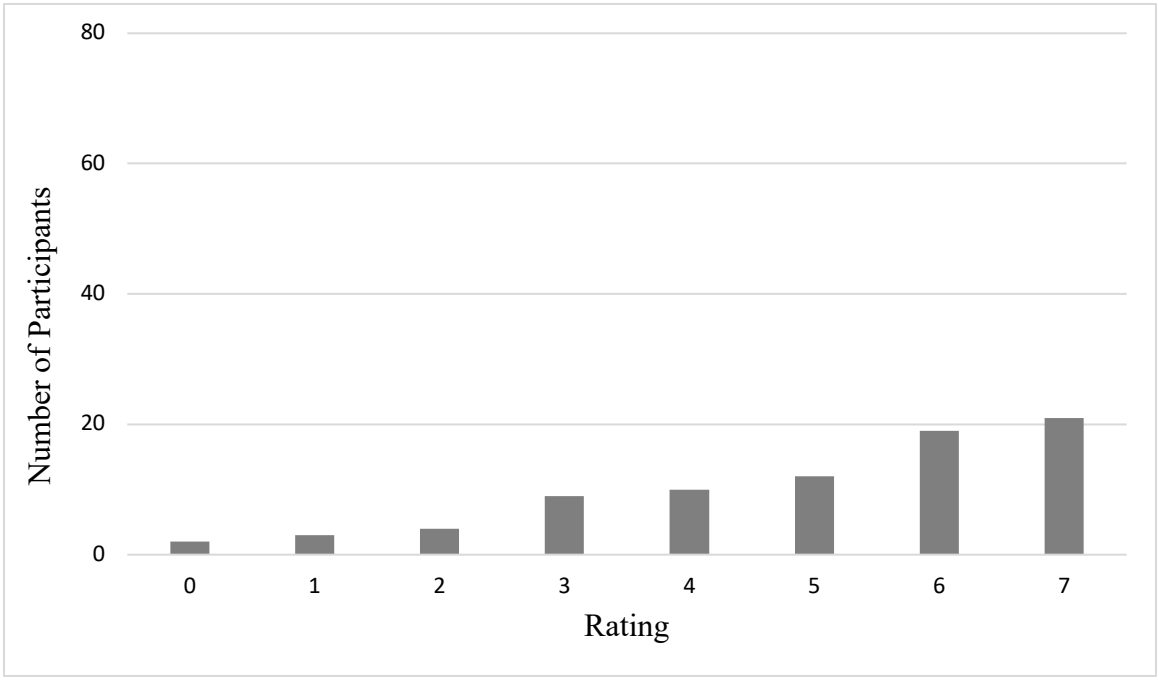


Figure 36. Distribution of Visualize Ratings for "Overwhelmed"

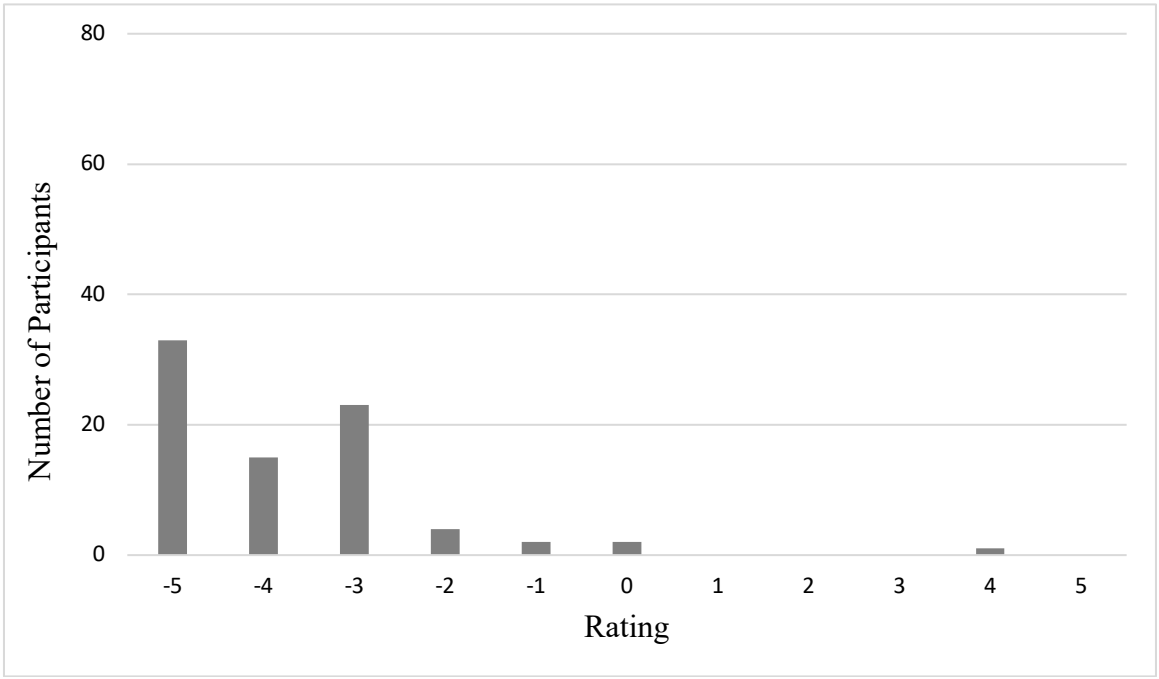


Figure 37. Distribution of Affect Ratings for "Stress"

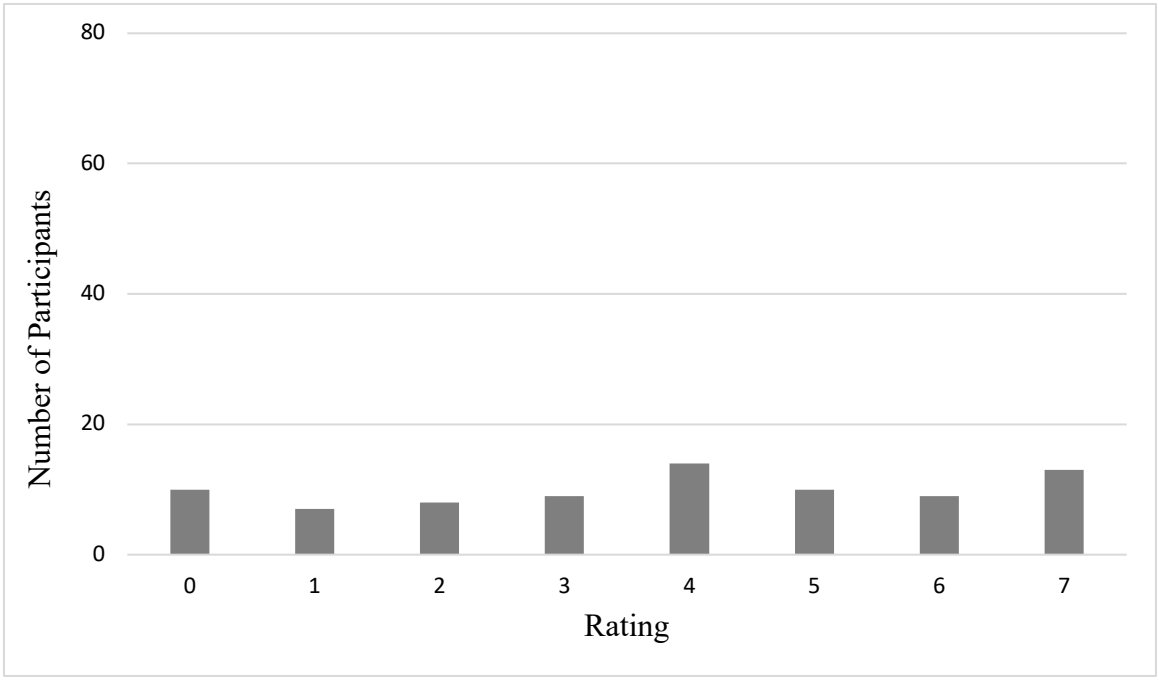


Figure 38. Distribution of Sensory Ratings for "Stress"

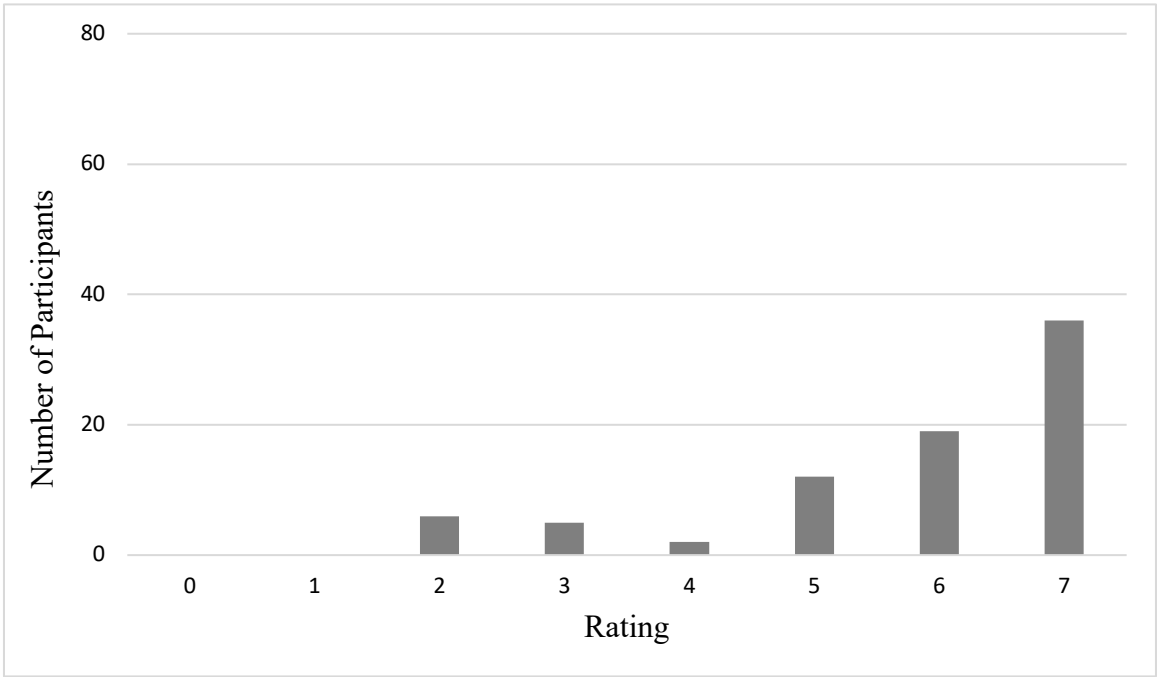


Figure 39. Distribution of Visualize Ratings for "Stress"

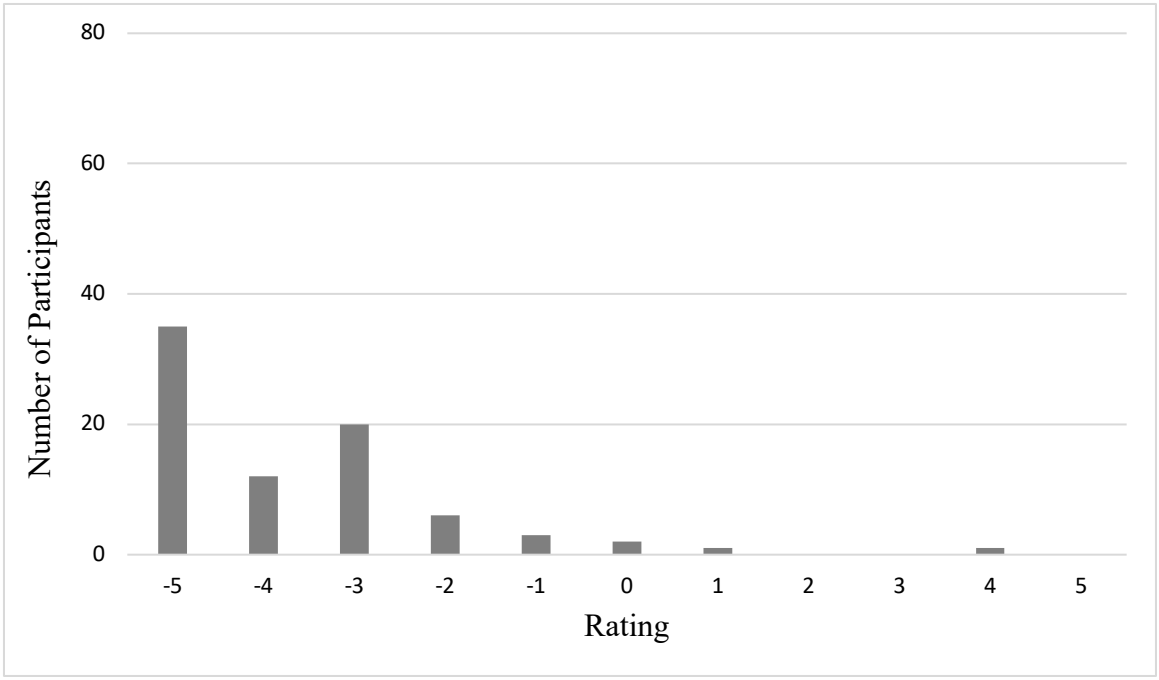


Figure 40. Distribution of Affect Ratings for “Humiliate”

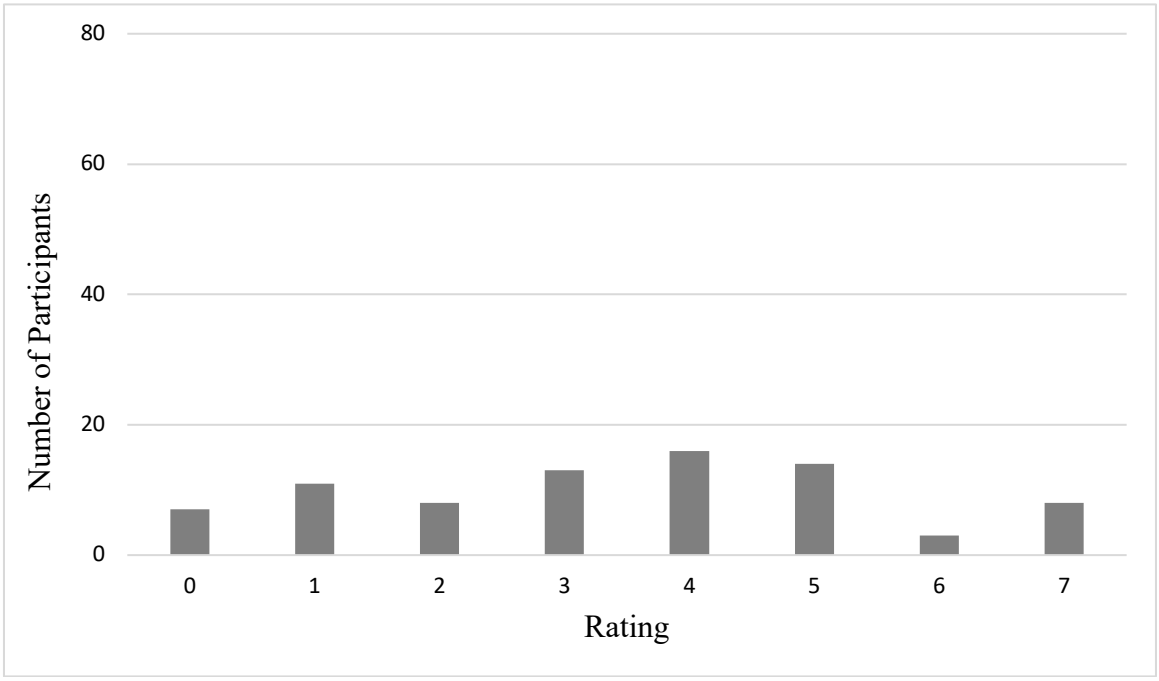


Figure 41. Distribution of Sensory Ratings for “Humiliate”

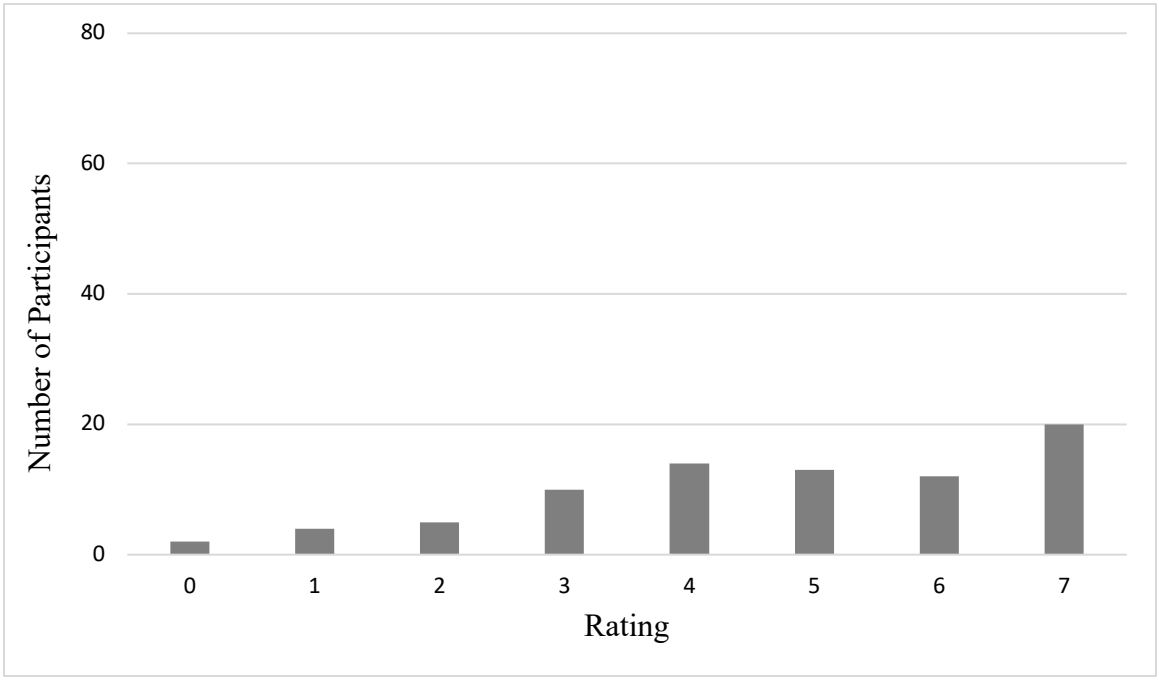


Figure 42. Distribution of Visualize Ratings for "Humiliate"

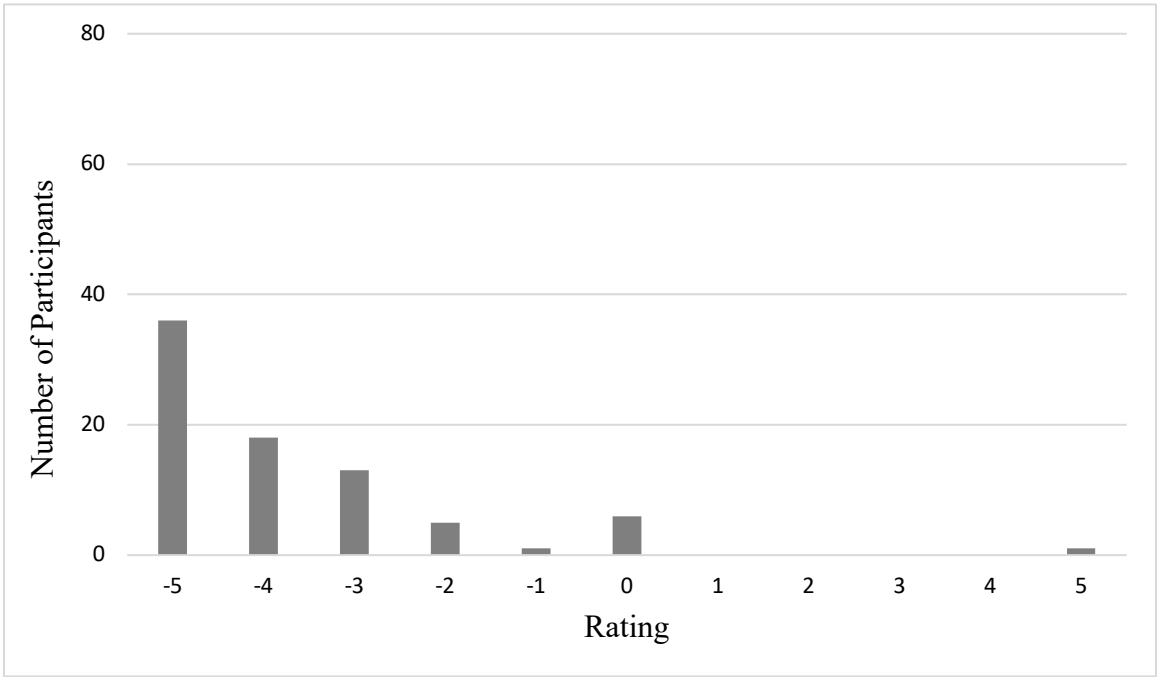


Figure 43. Distribution of Affect Ratings for "Grief"

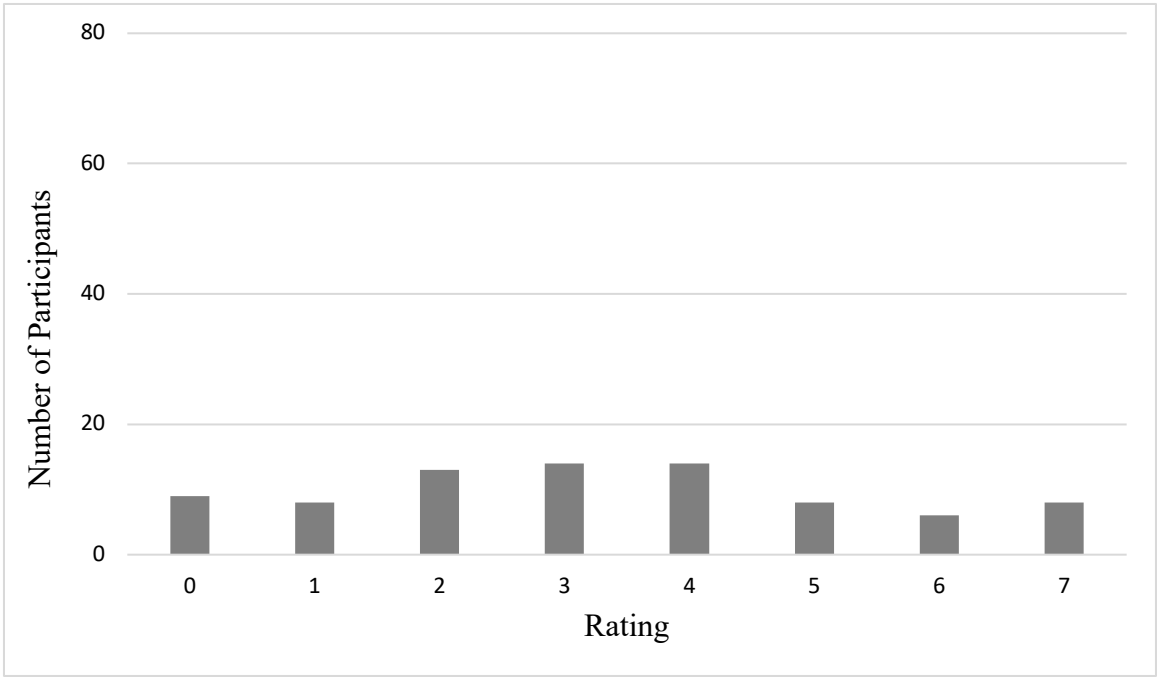


Figure 44. Distribution of Sensory Ratings for "Grief"

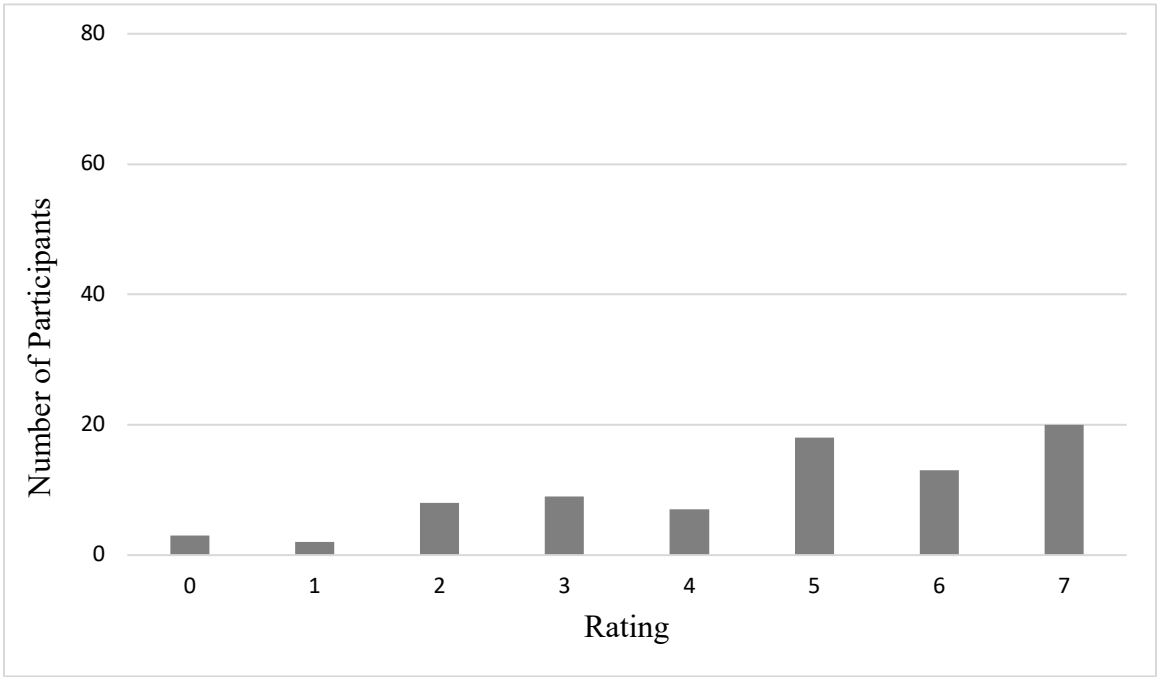


Figure 45. Distribution of Visualize Ratings for "Grief"

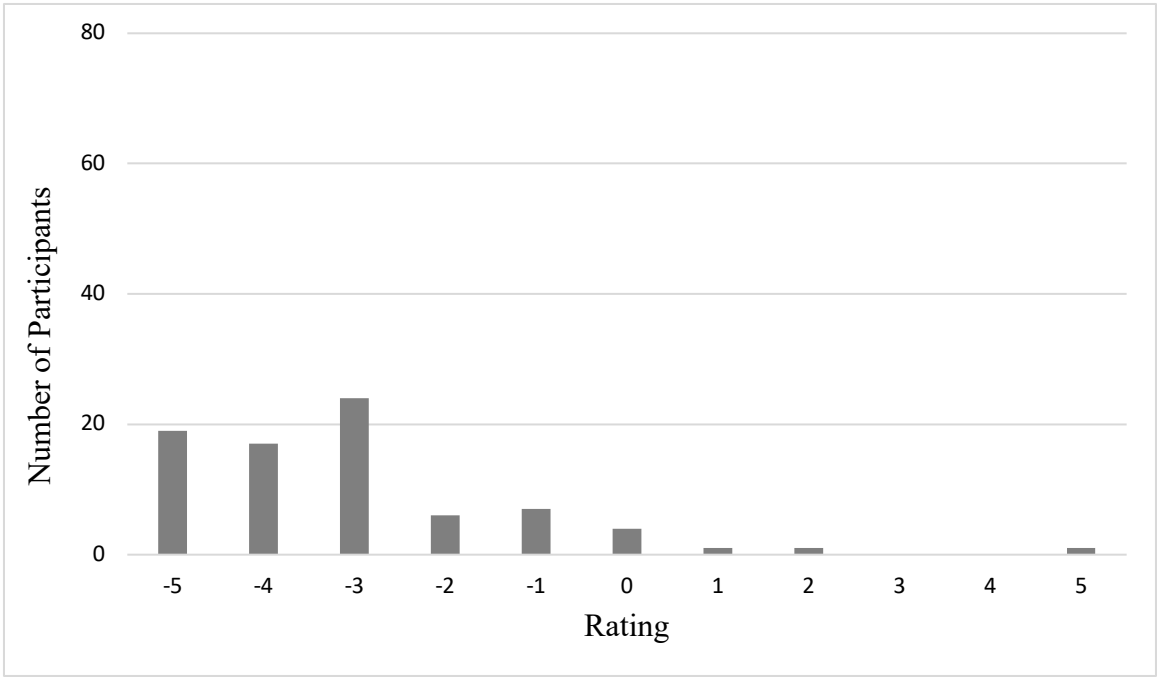


Figure 46. Distribution of Affect Ratings for "Punishment"

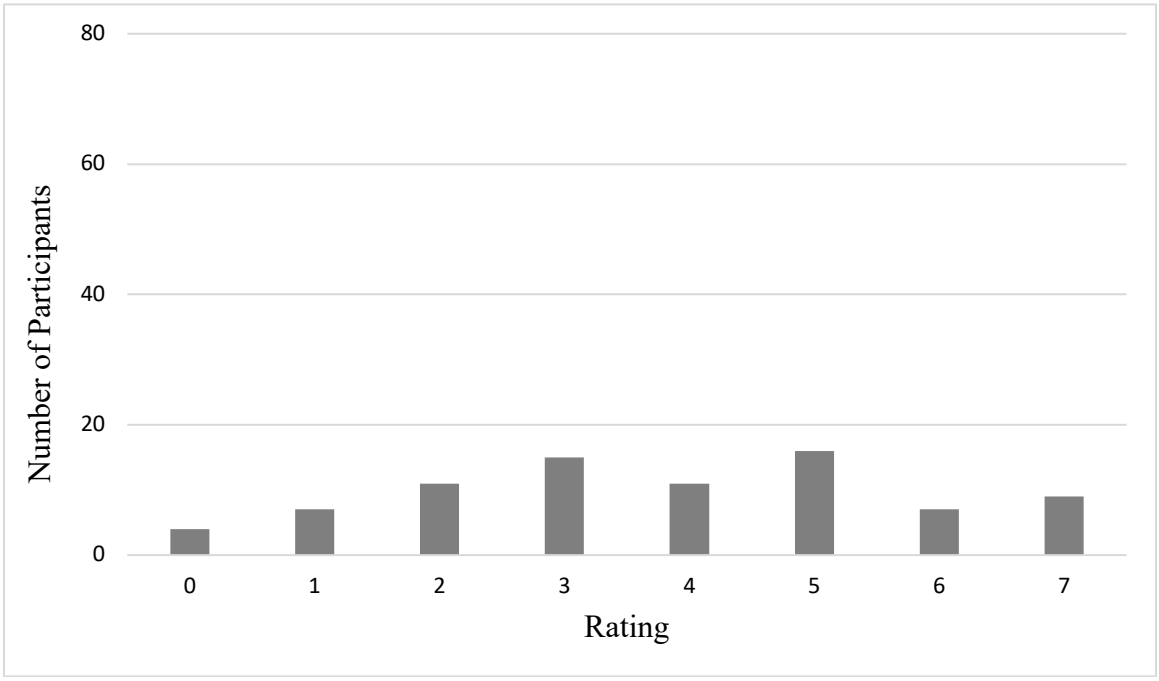


Figure 47. Distribution of Sensory Ratings for "Punishment"

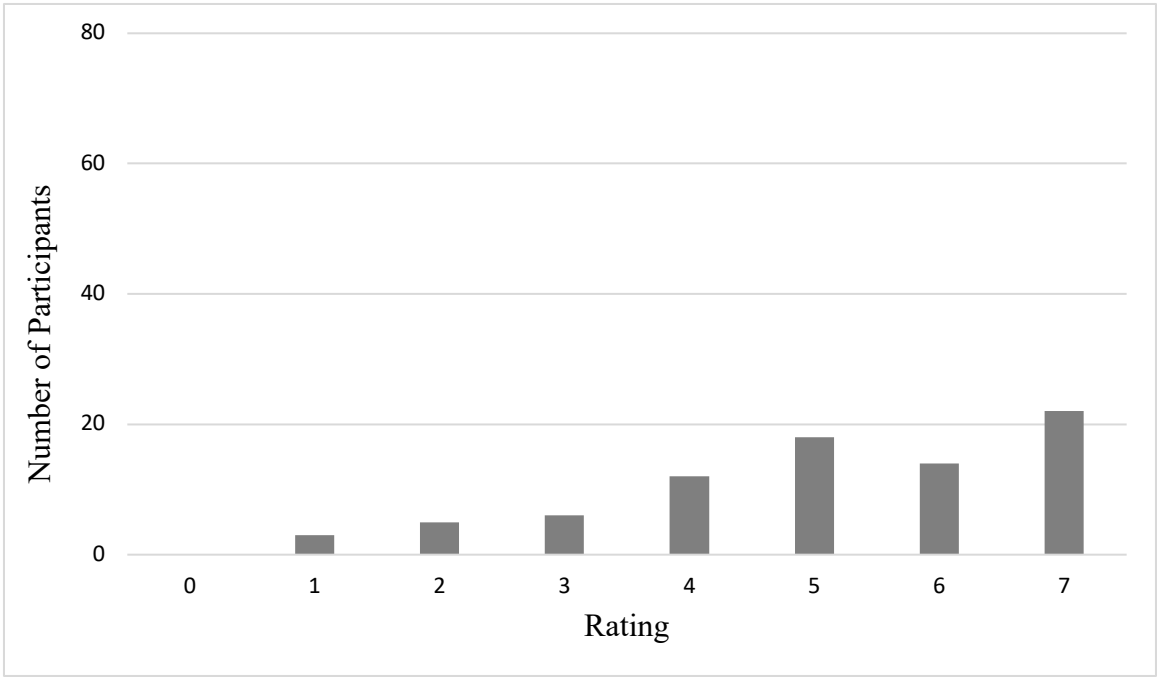


Figure 48. Distribution of Visualize Ratings for "Punishment"

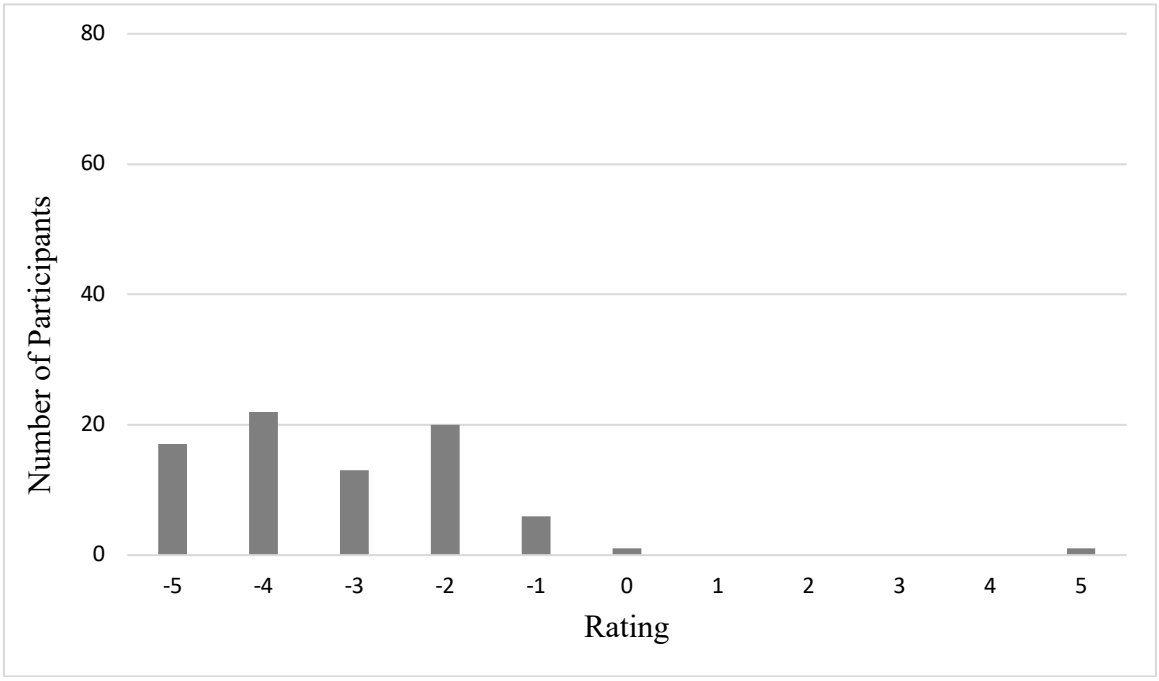


Figure 49. Distribution of Affect Ratings for "Reject"

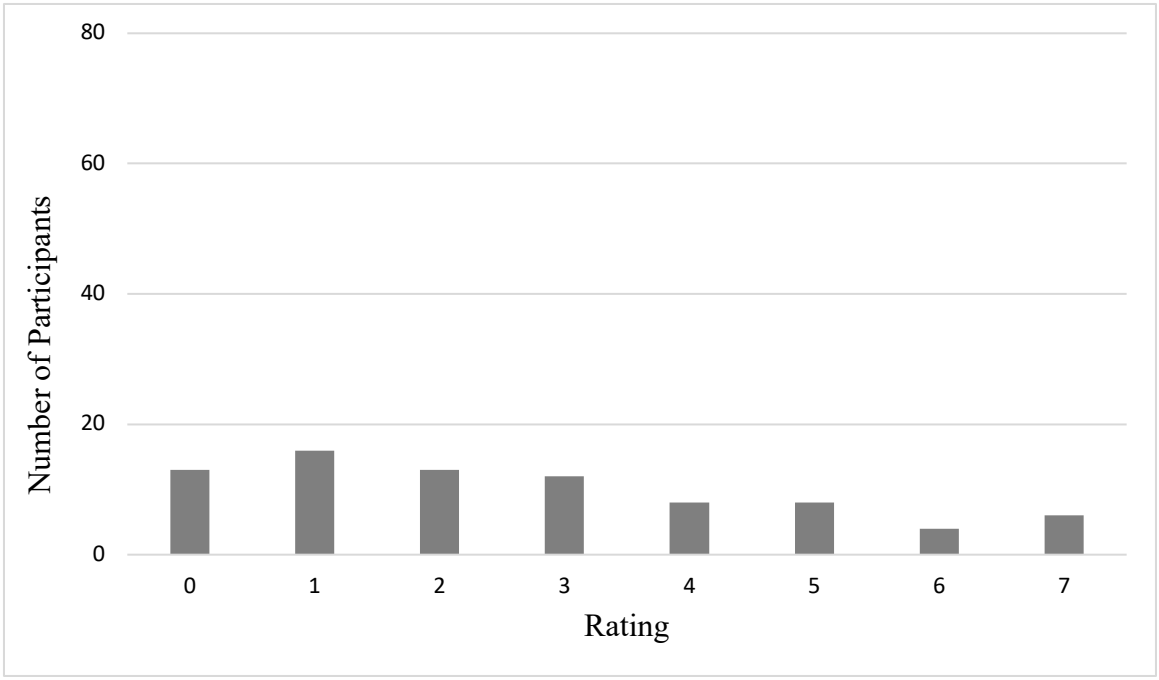


Figure 50. Distribution of Sensory Ratings for "Reject"

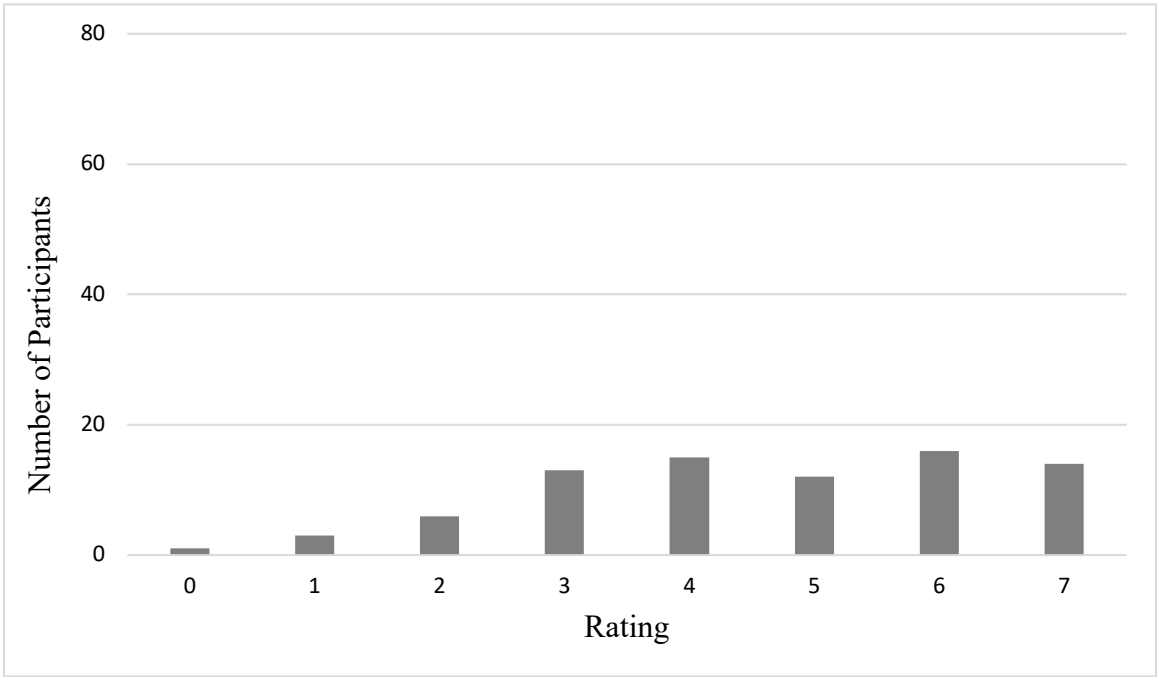


Figure 51. Distribution of Visualize Ratings for "Reject"

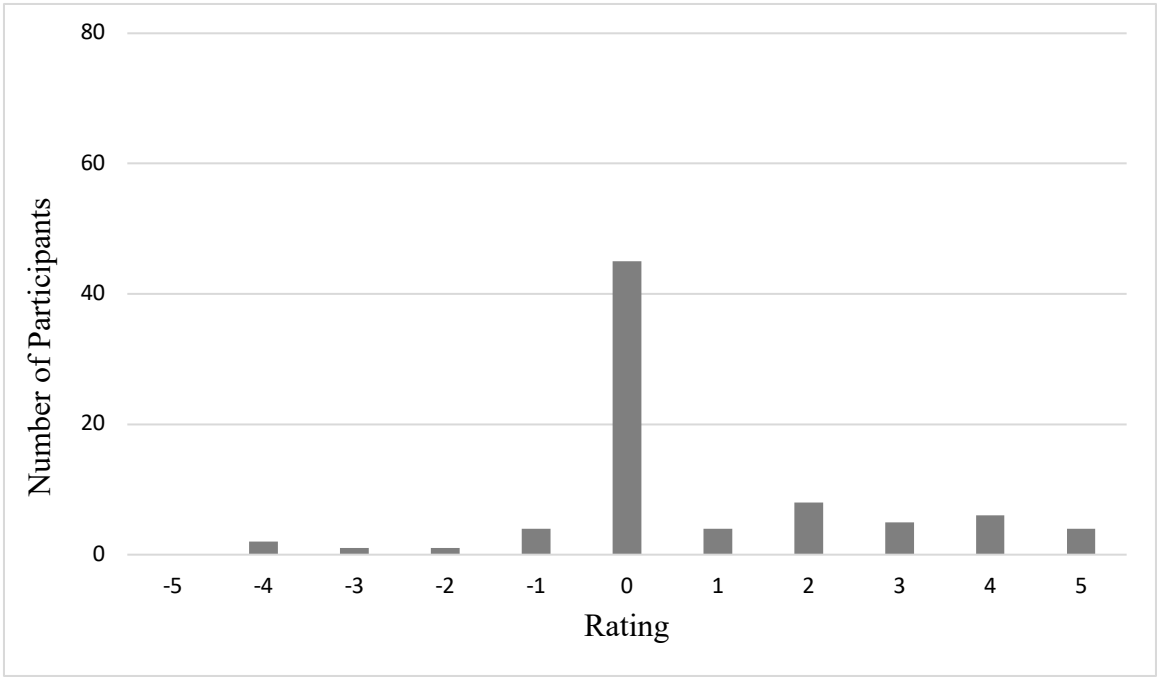


Figure 52. Distribution of Affect Ratings for Neutral Image – 1

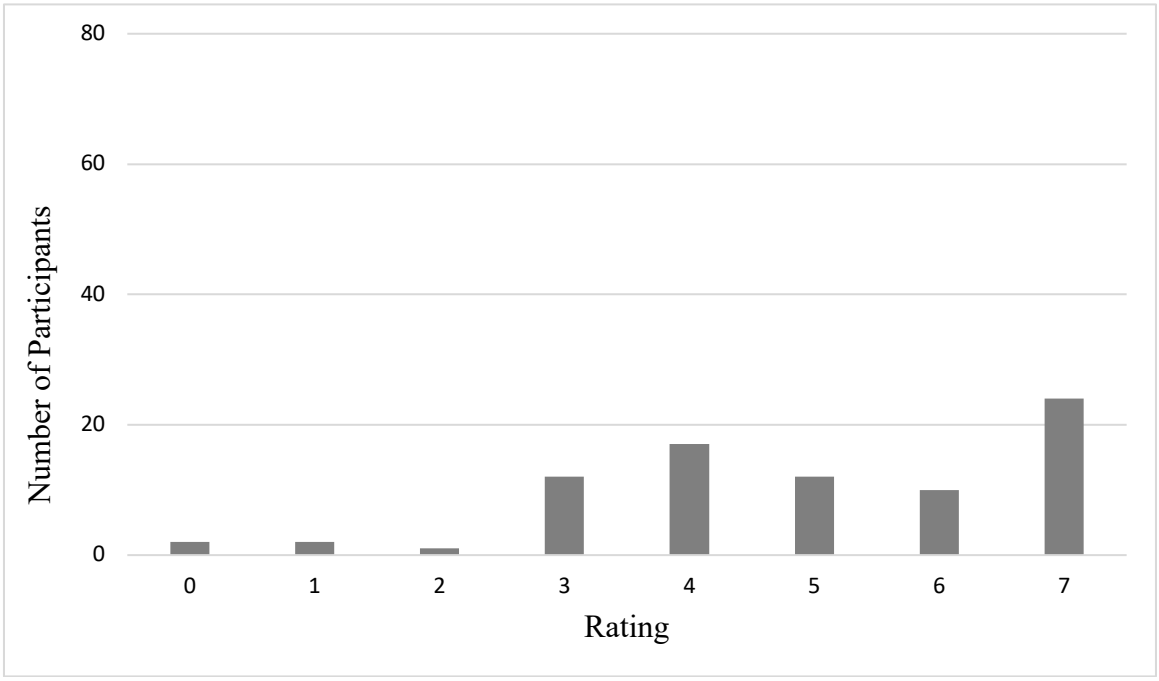


Figure 53. Distribution of Sensory Ratings for Neutral Image – 1

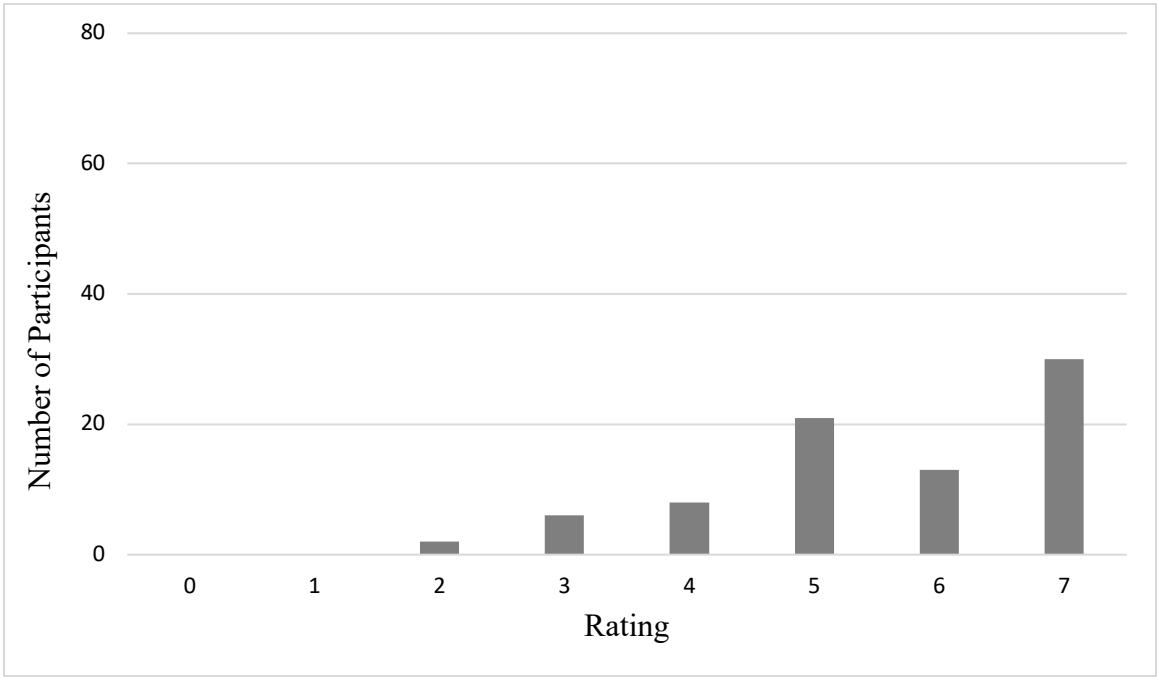


Figure 54. Distribution of Visualize Ratings for Neutral Image – 1

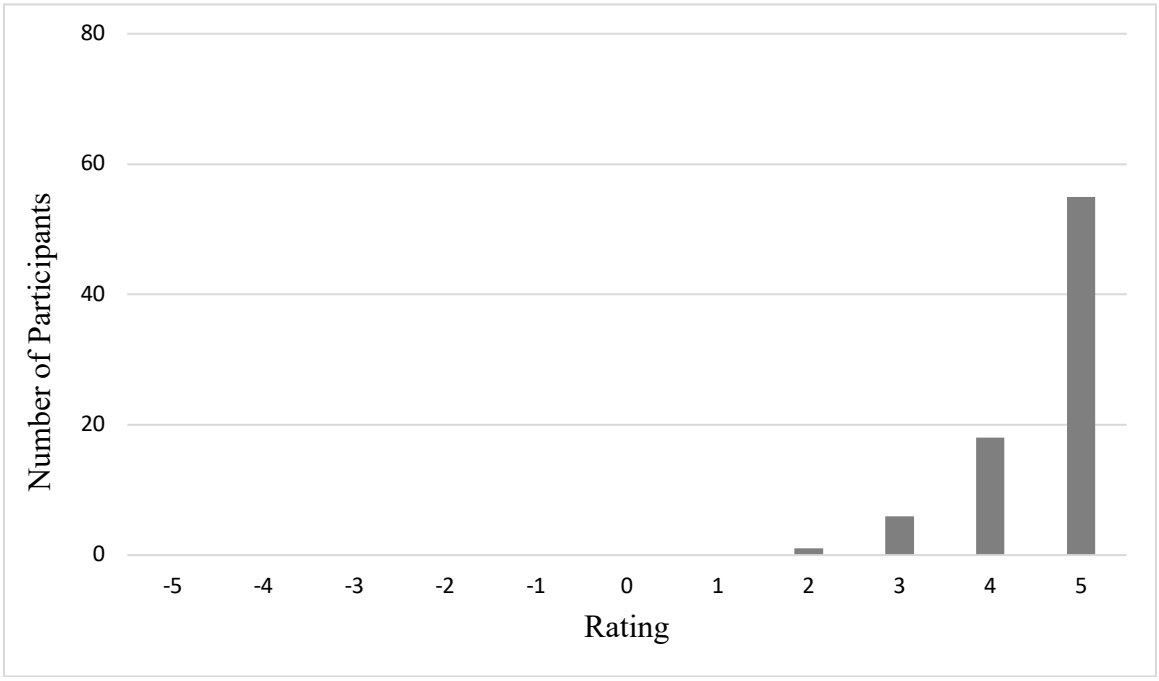


Figure 55. Distribution of Affect Ratings for Positive Image – 1

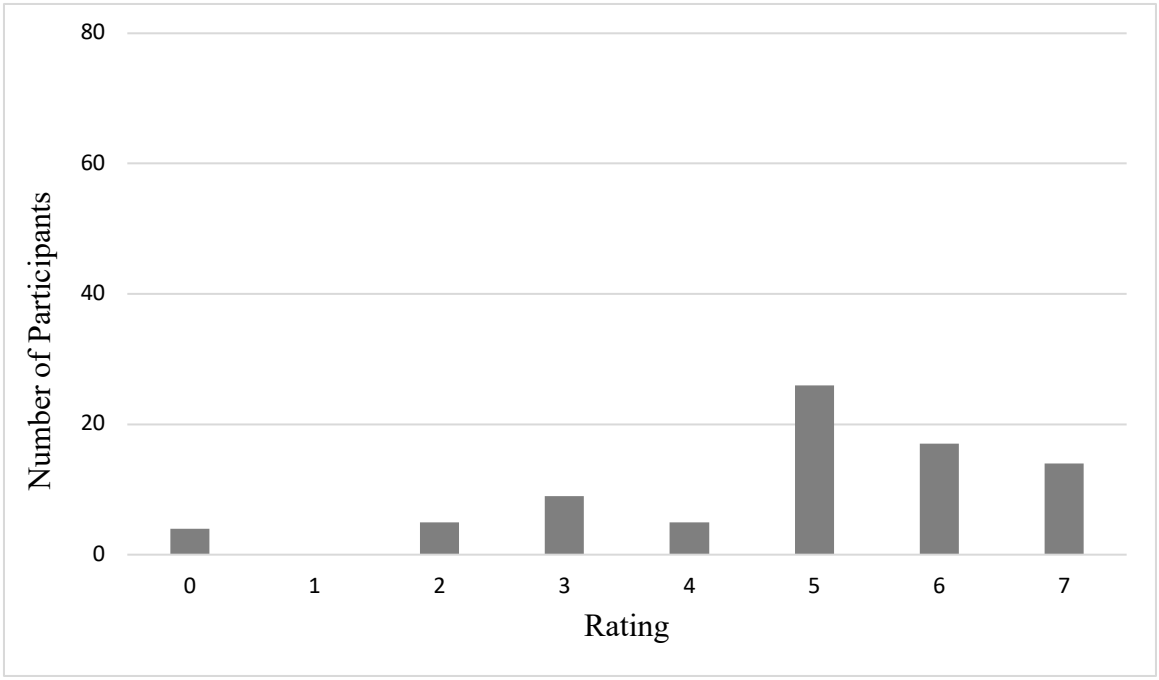


Figure 56. Distribution of Sensory Ratings for Positive Image – 1

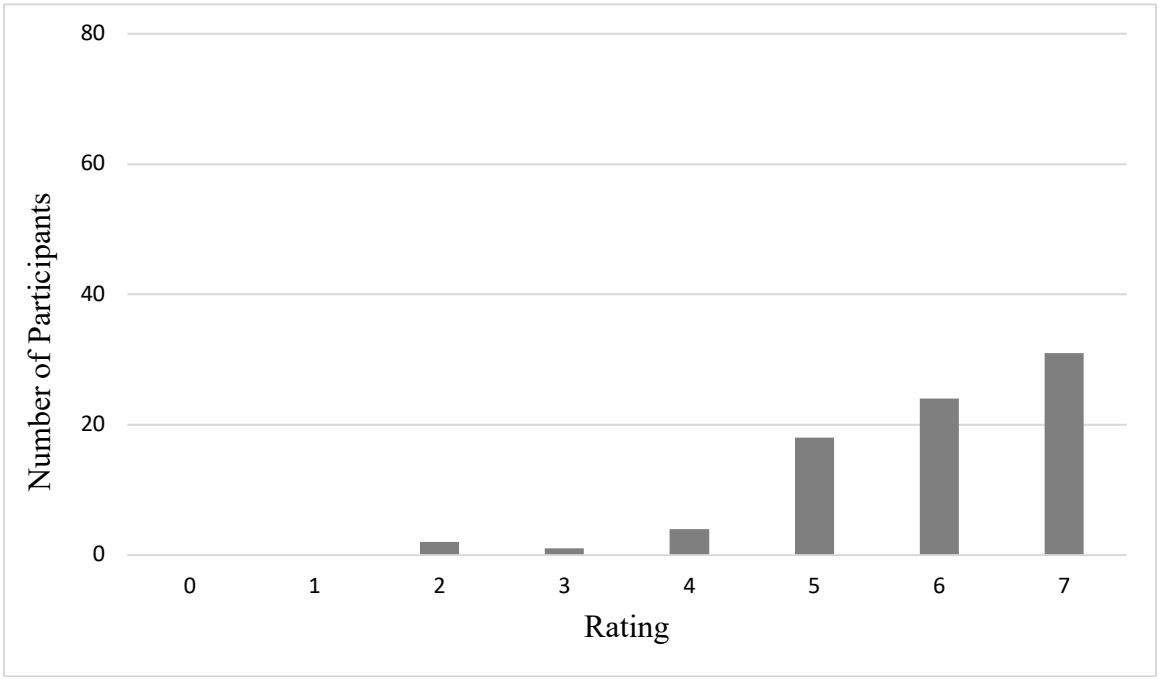


Figure 57. Distribution of Visualize Ratings for Positive Image – 1

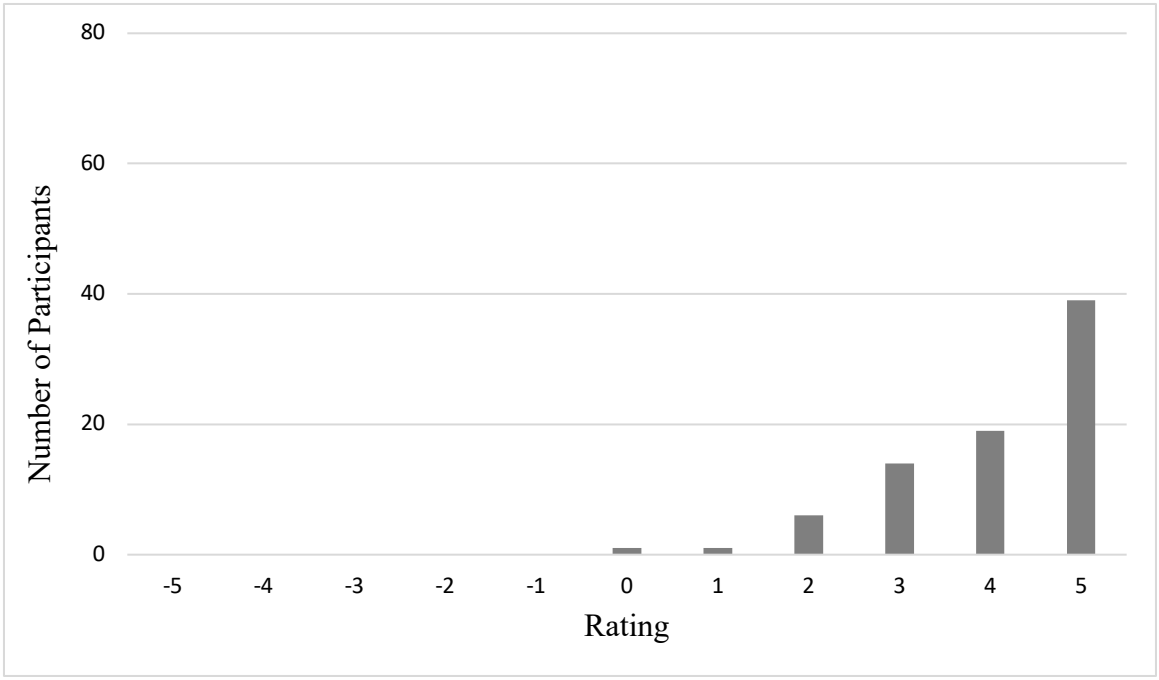


Figure 58. Distribution of Affect Ratings for Positive Image – 2

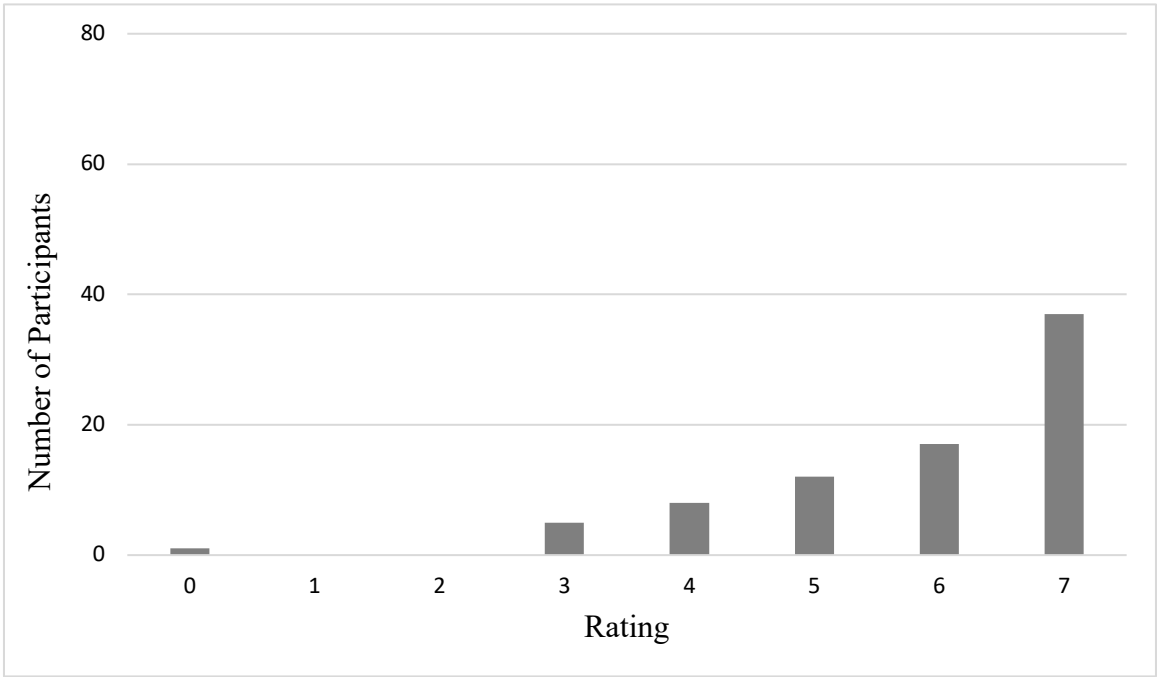


Figure 59. Distribution of Sensory Ratings for Positive Image – 2

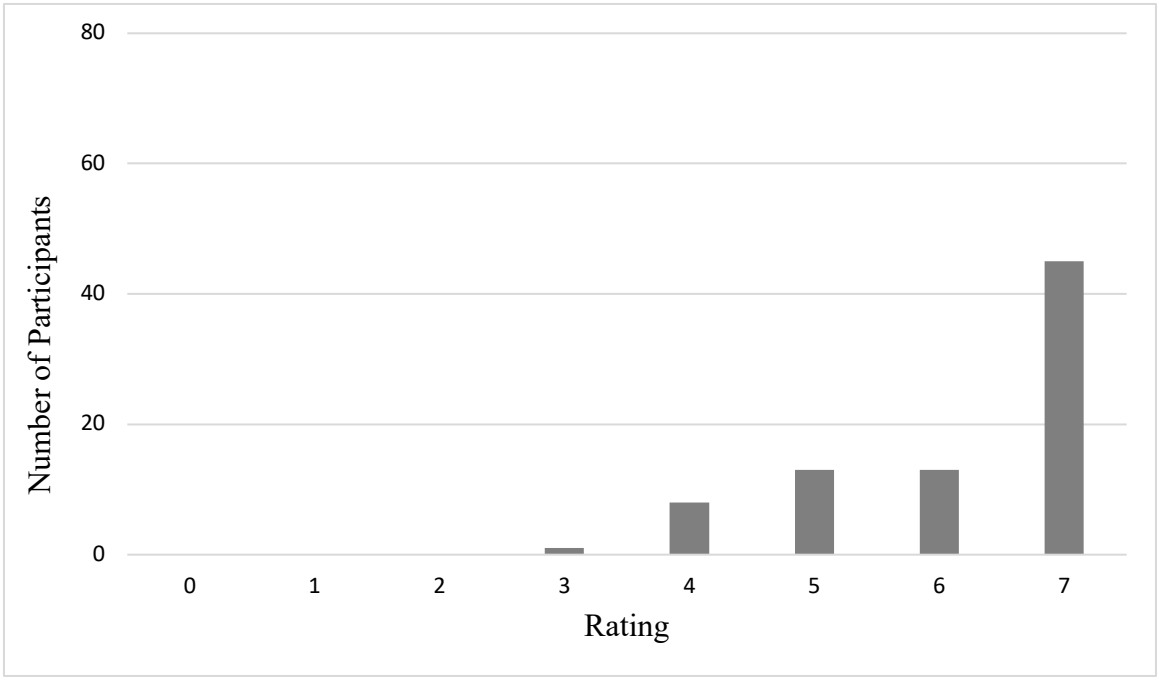


Figure 60. Distribution of Visualize Ratings for Positive Image – 2

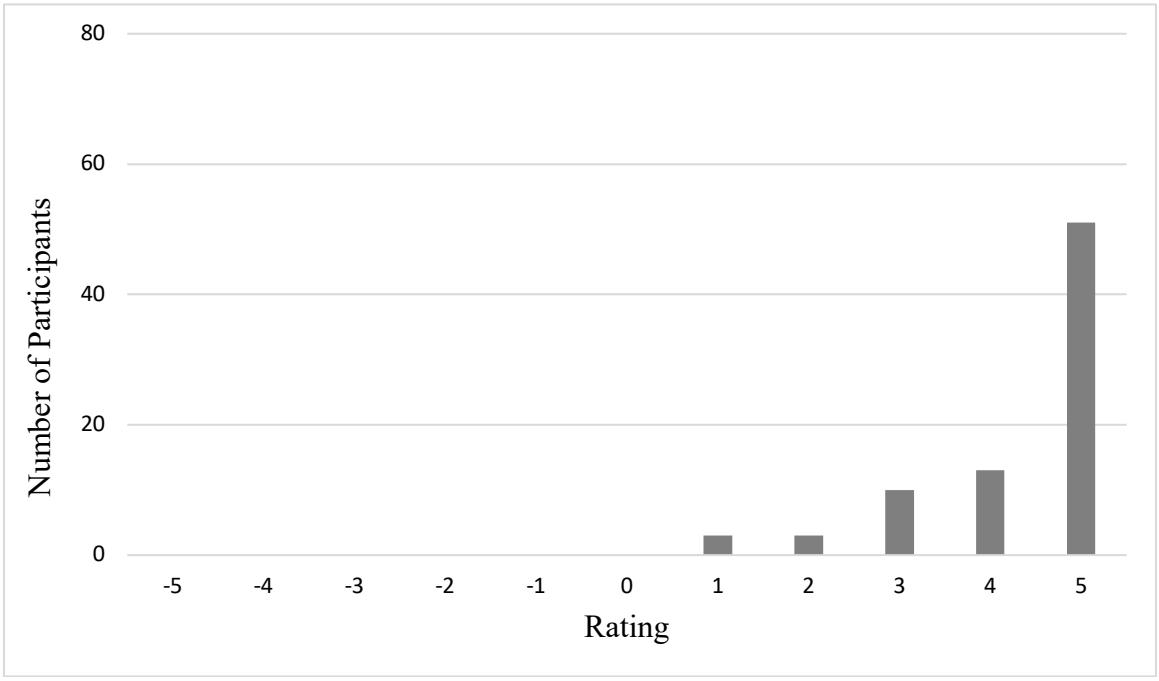


Figure 61. Distribution of Affect Ratings for Positive Image – 3

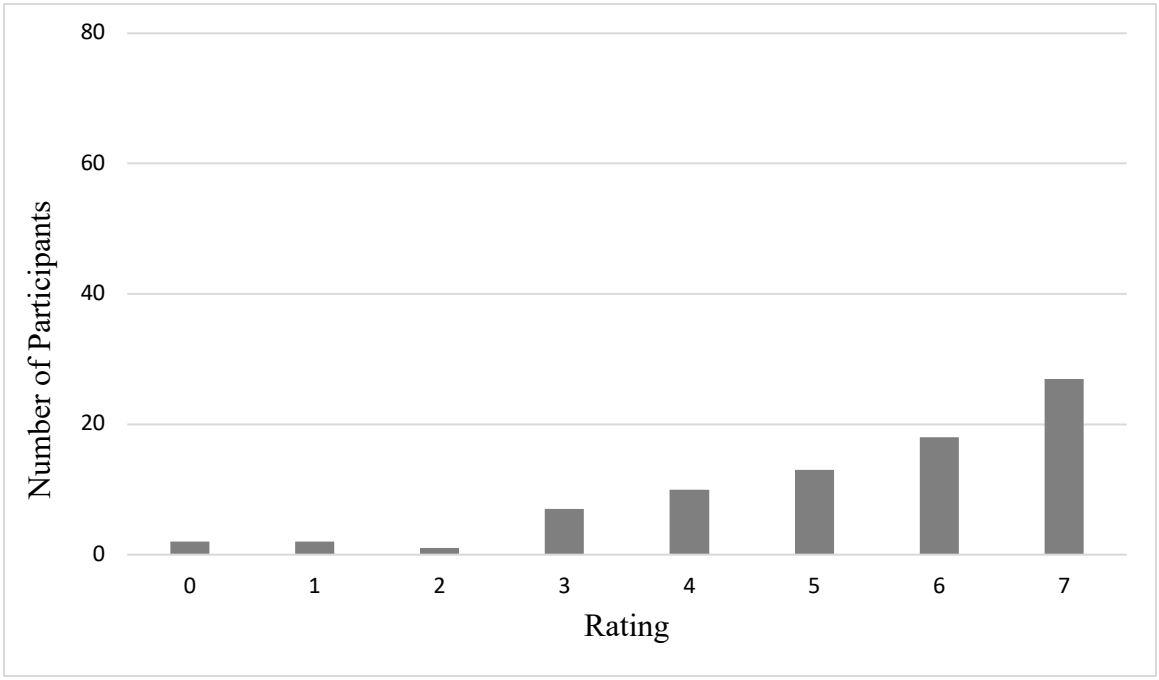


Figure 62. Distribution of Sensory Ratings for Positive Image – 3

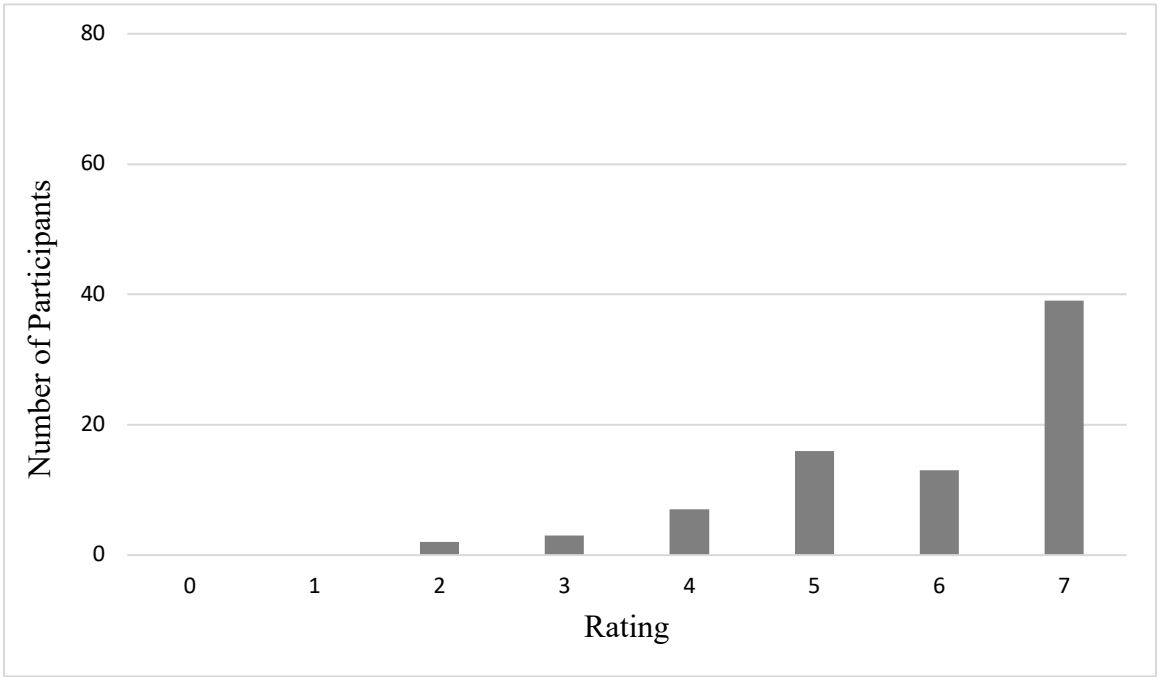


Figure 63. Distribution of Visualize Ratings for Positive Image – 3

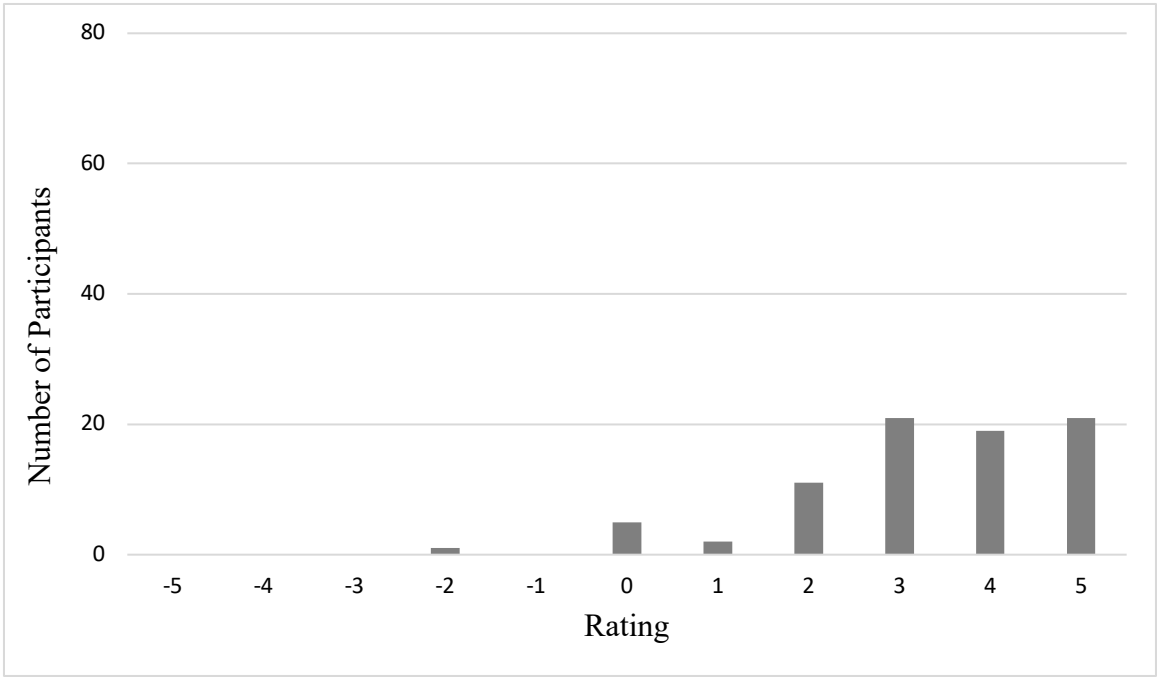


Figure 64. Distribution of Affect Ratings for Positive Image – 4

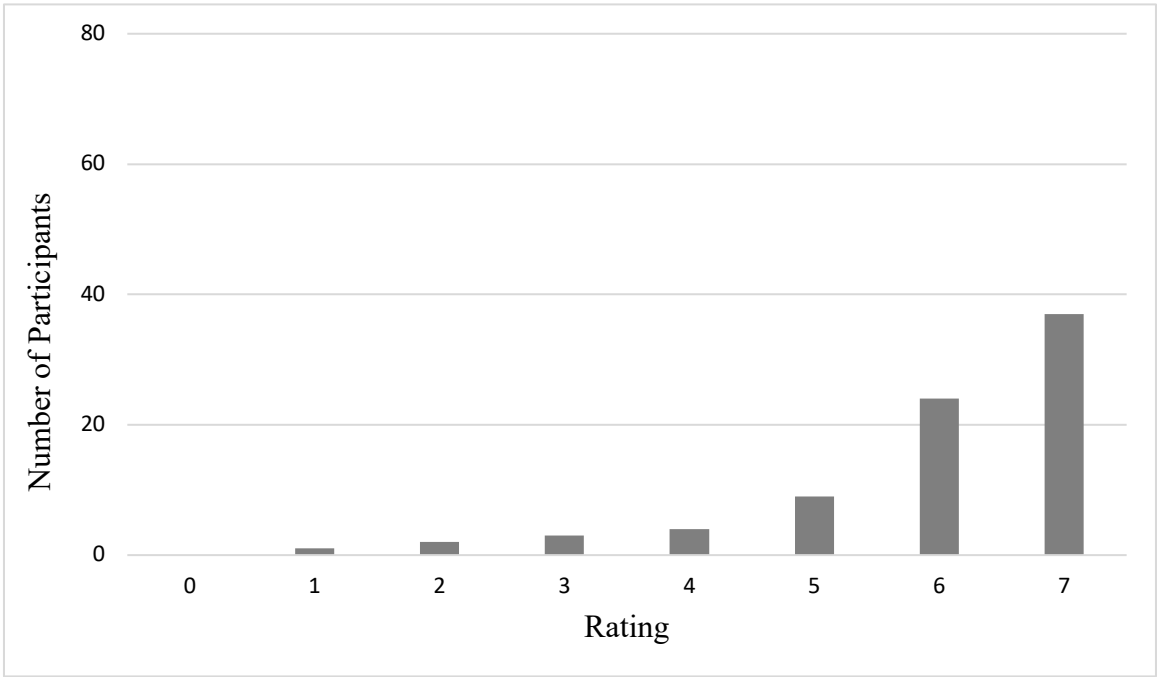


Figure 65. Distribution of Sensory Ratings for Positive Image – 4

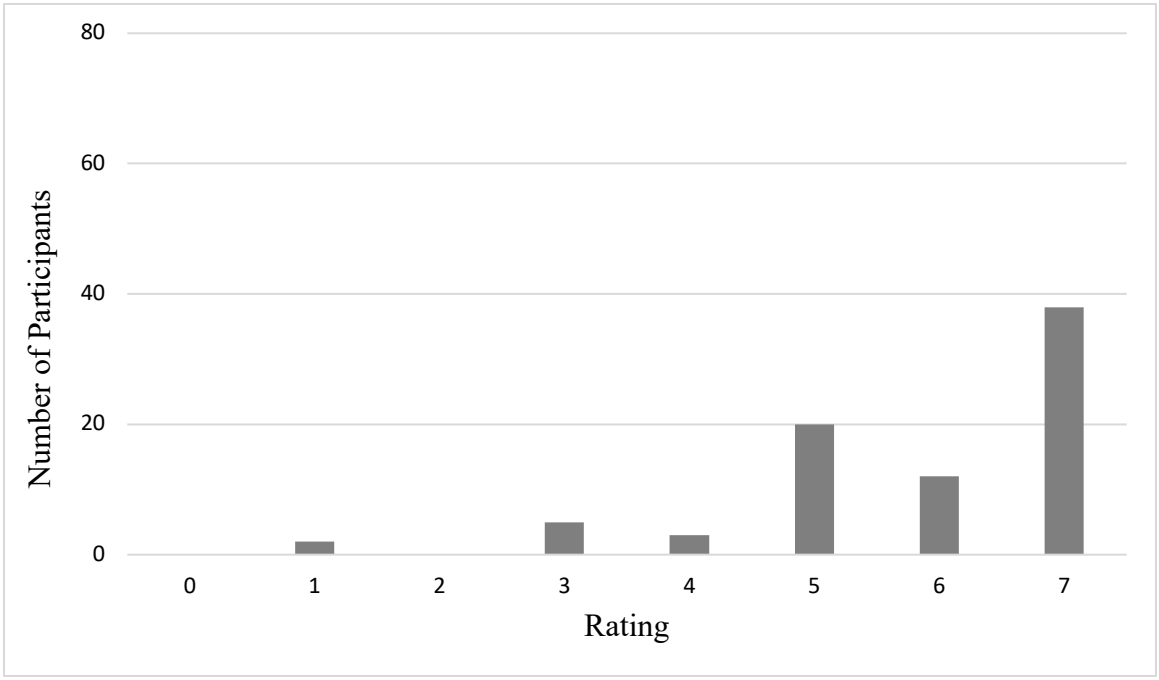


Figure 66. Distribution of Visualize Ratings for Positive Image – 4

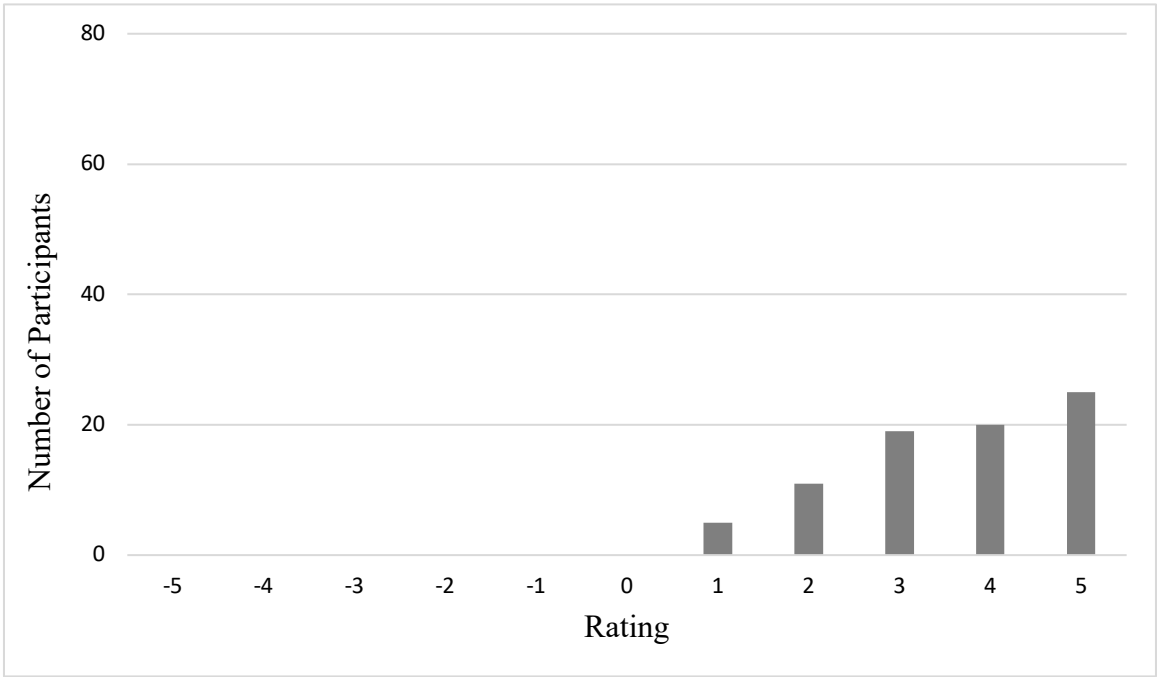


Figure 67. Distribution of Affect Ratings for Positive Image – 5

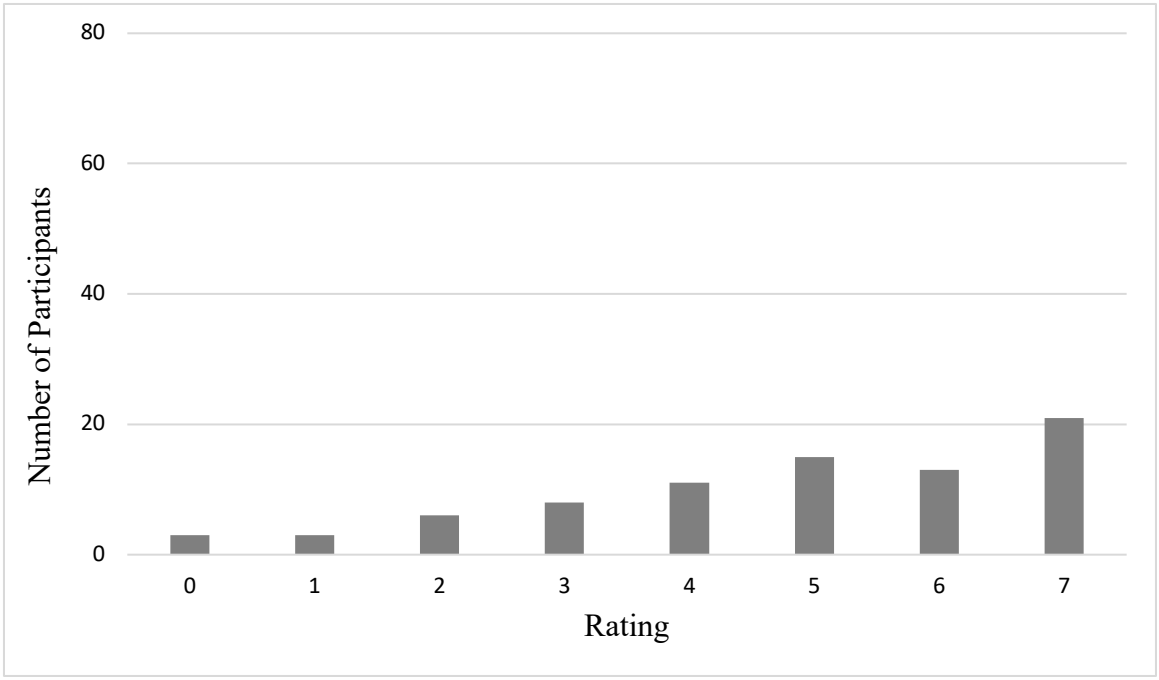


Figure 68. Distribution of Sensory Ratings for Positive Image – 5

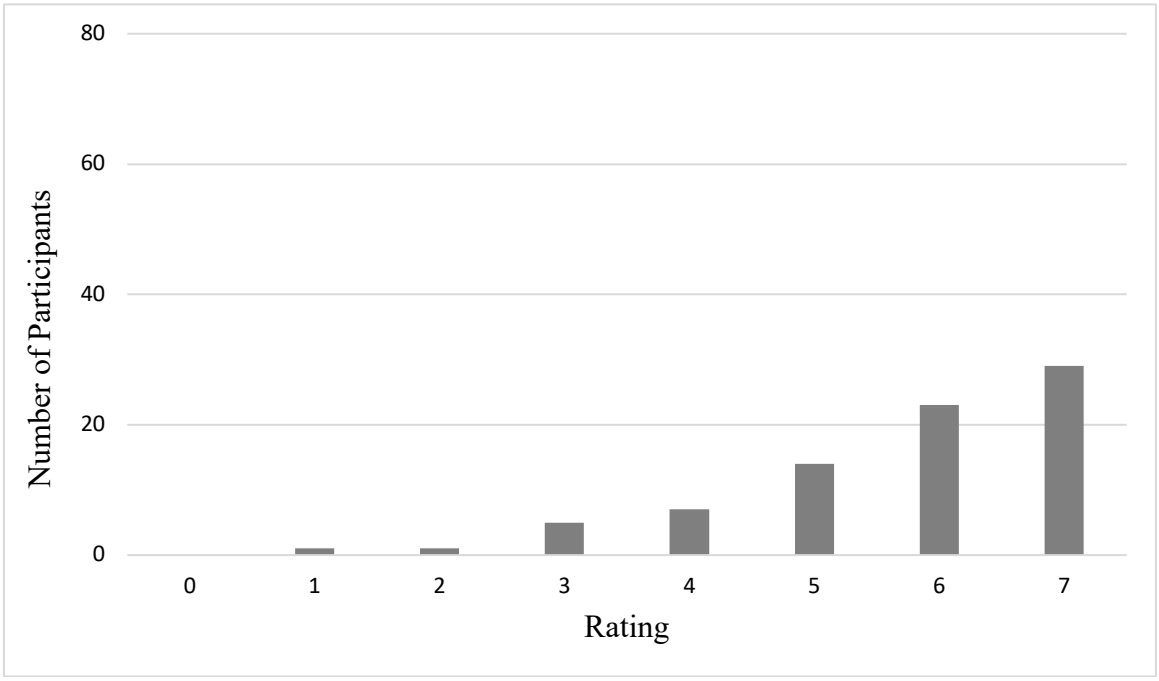


Figure 69. Distribution of Visualize Ratings for Positive Image – 5

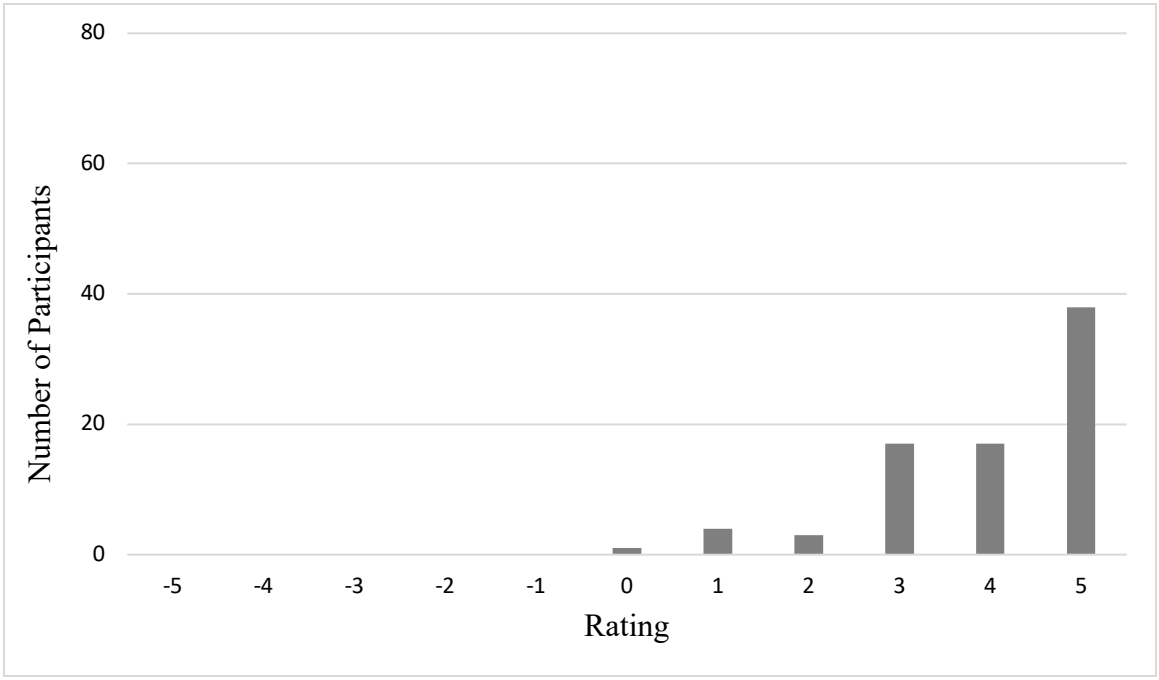


Figure 70. Distribution of Affect Ratings for Positive Image – 6

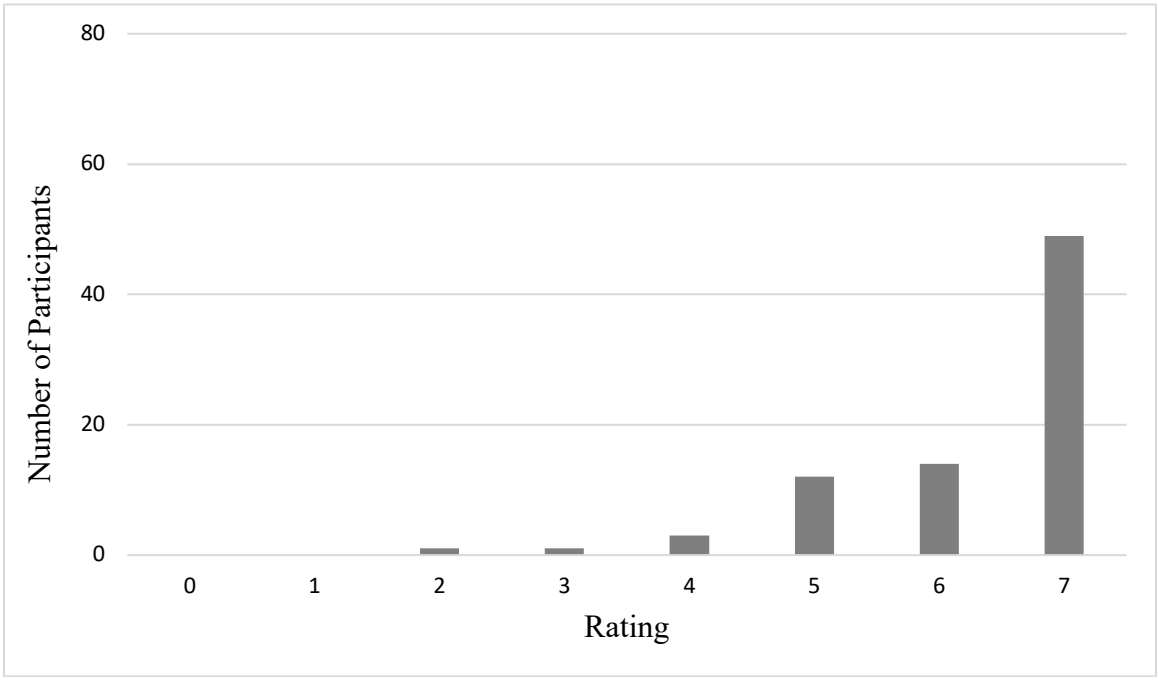


Figure 71. Distribution of Sensory Ratings for Positive Image – 6

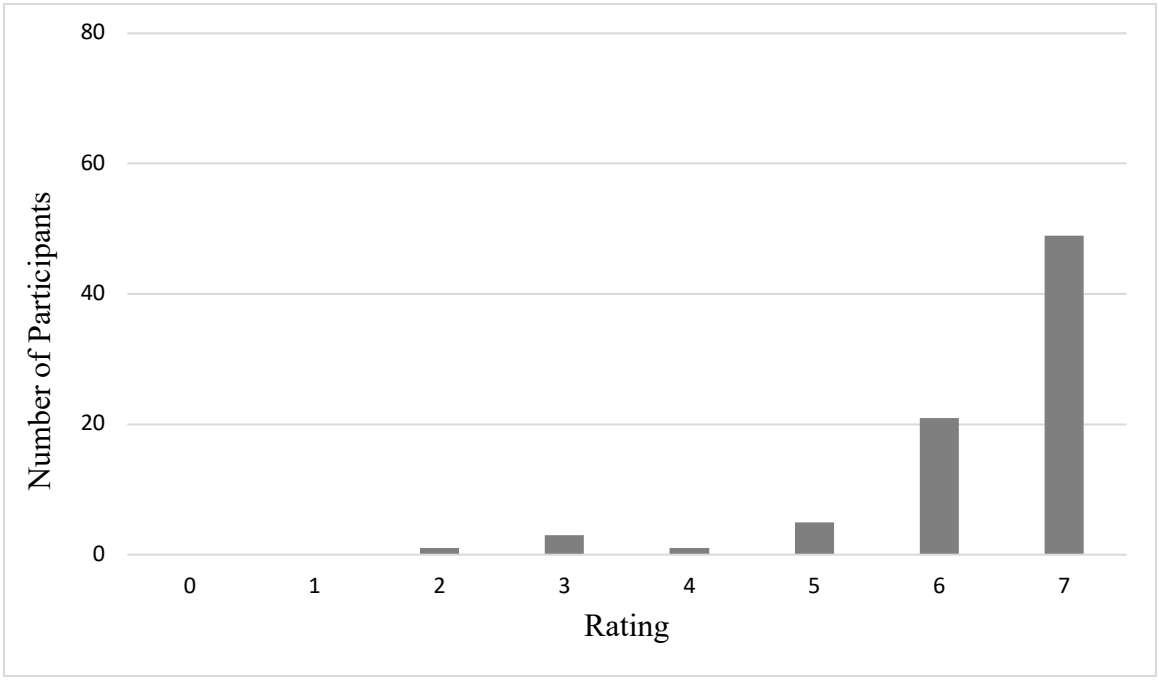


Figure 72. Distribution of Visualize Ratings for Positive Image – 6

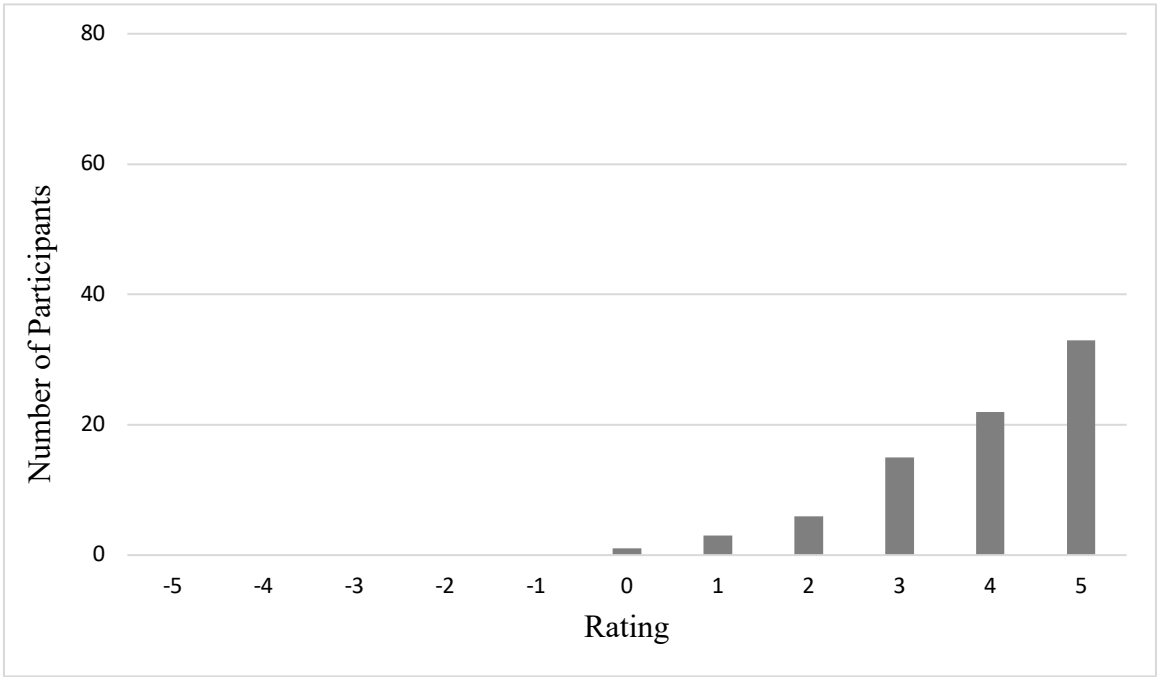


Figure 73. Distribution of Affect Ratings for Positive Image – 7

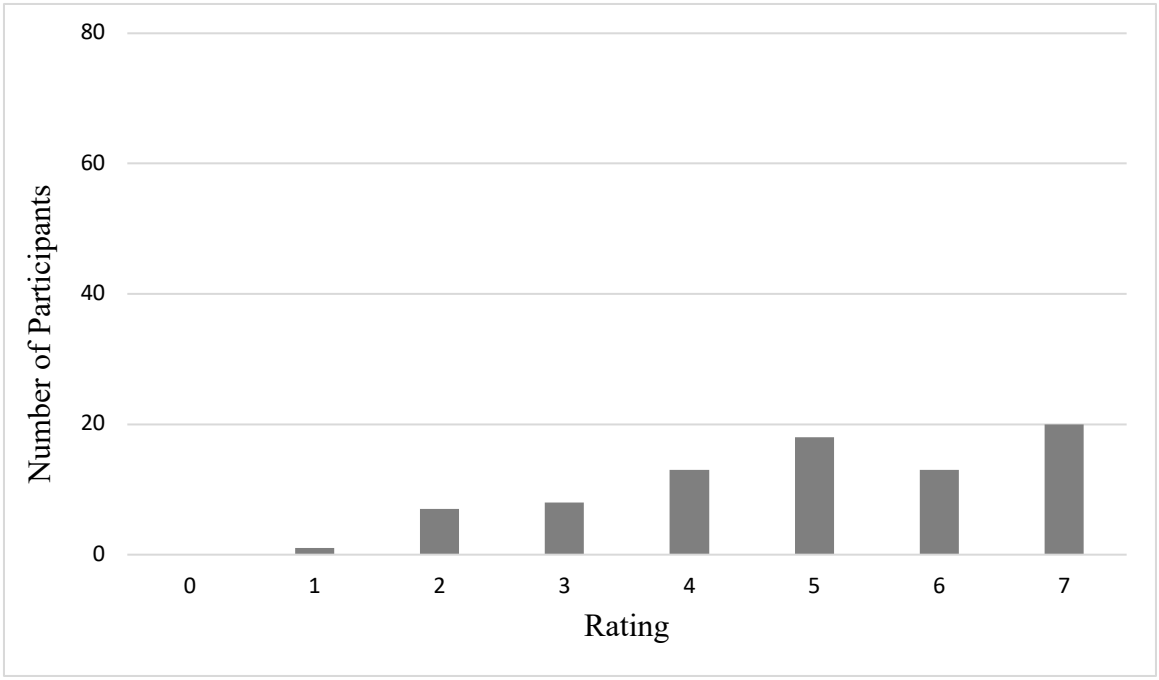


Figure 74. Distribution of Sensory Ratings for Positive Image – 7

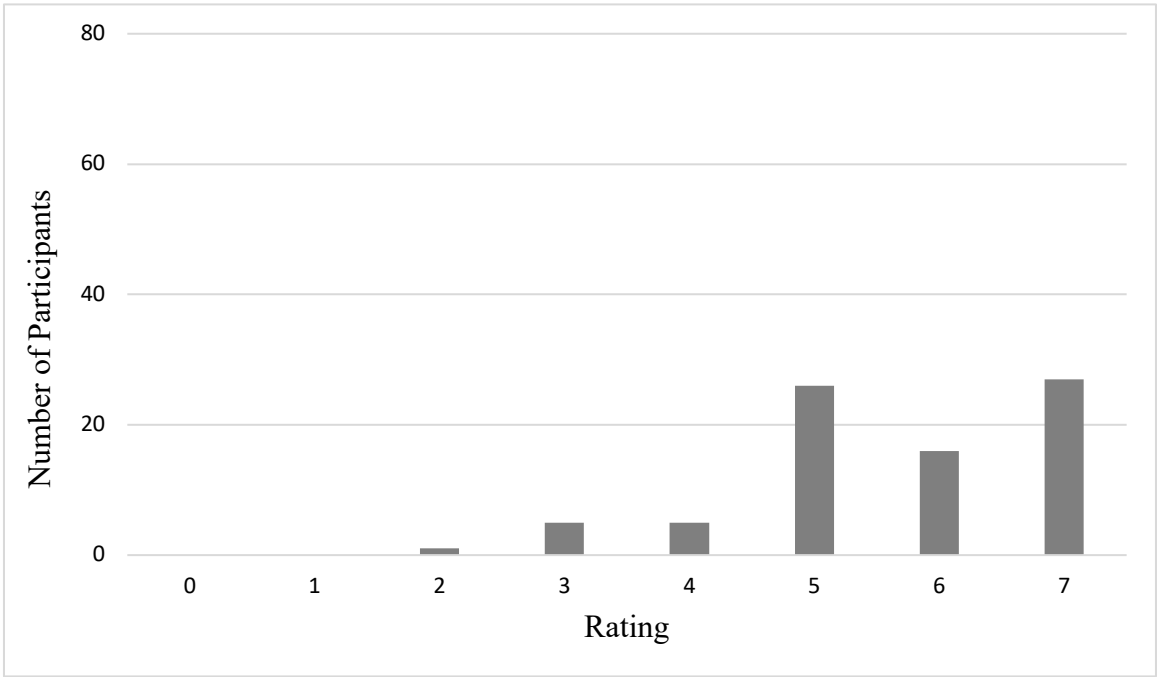


Figure 75. Distribution of Visualize Ratings for Positive Image – 7

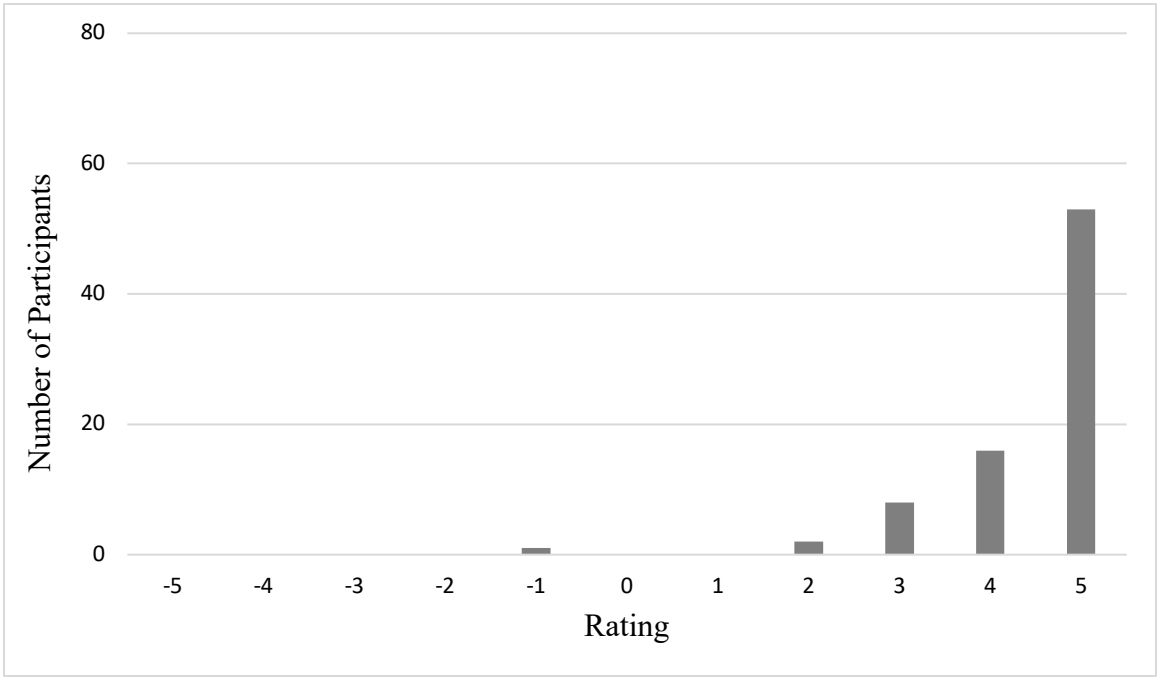


Figure 76. Distribution of Affect Ratings for Positive Image – 8

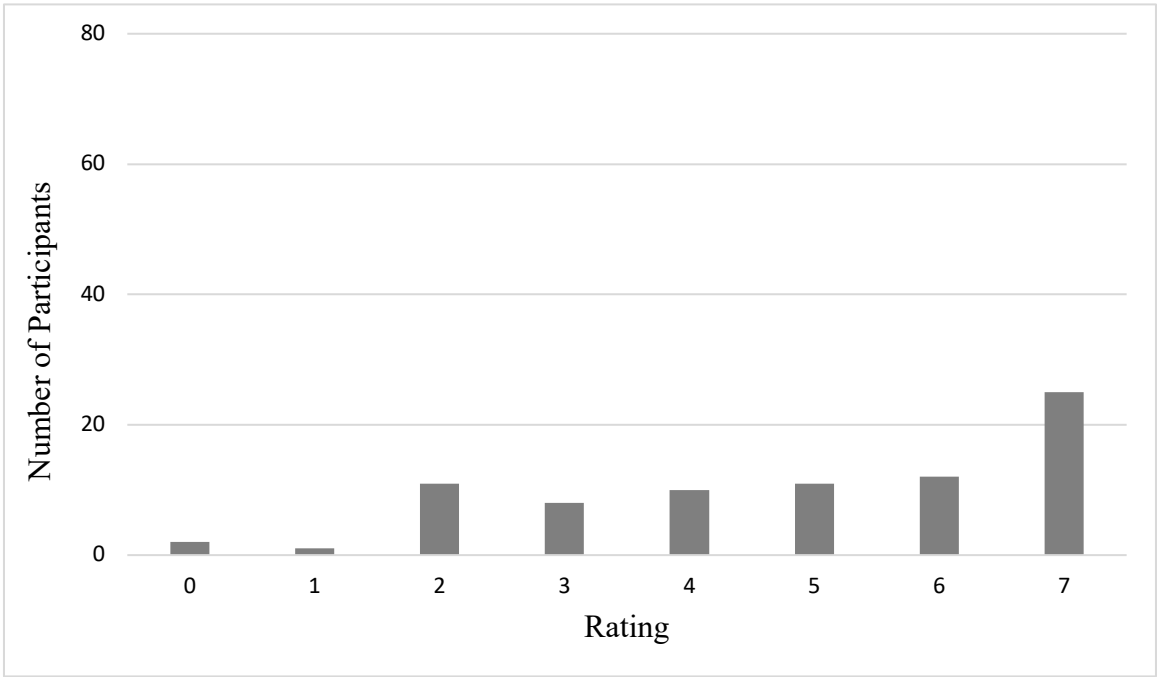


Figure 77. Distribution of Sensory Ratings for Positive Image – 8

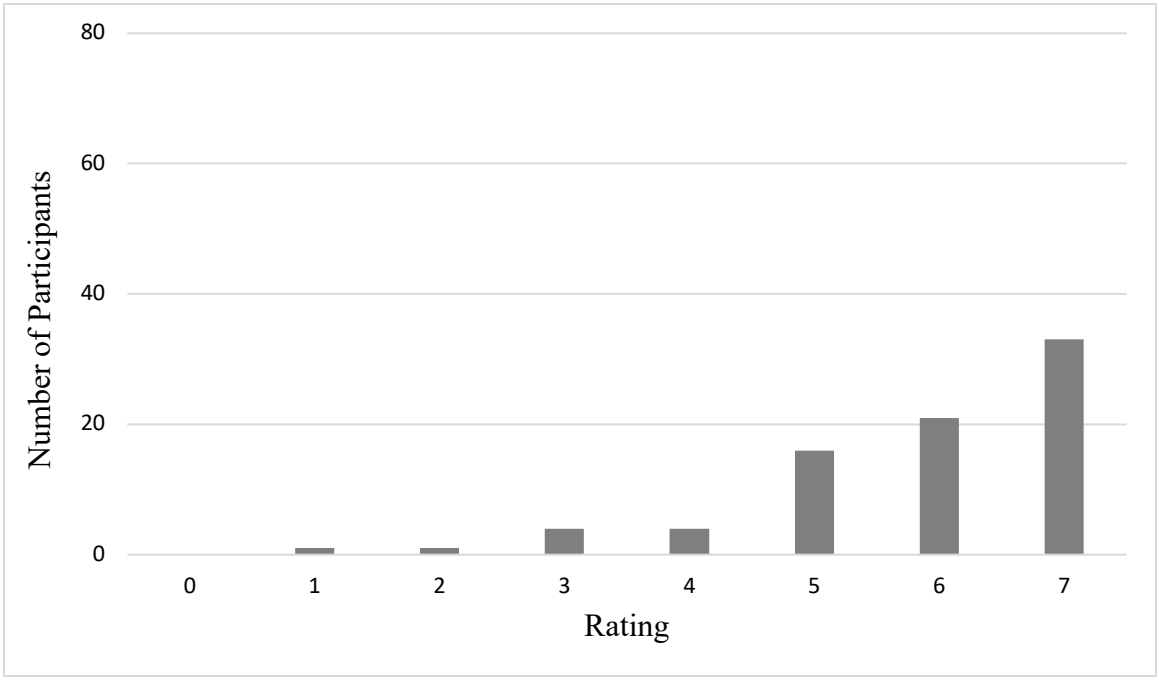


Figure 78. Distribution of Visualize Ratings for Positive Image – 8

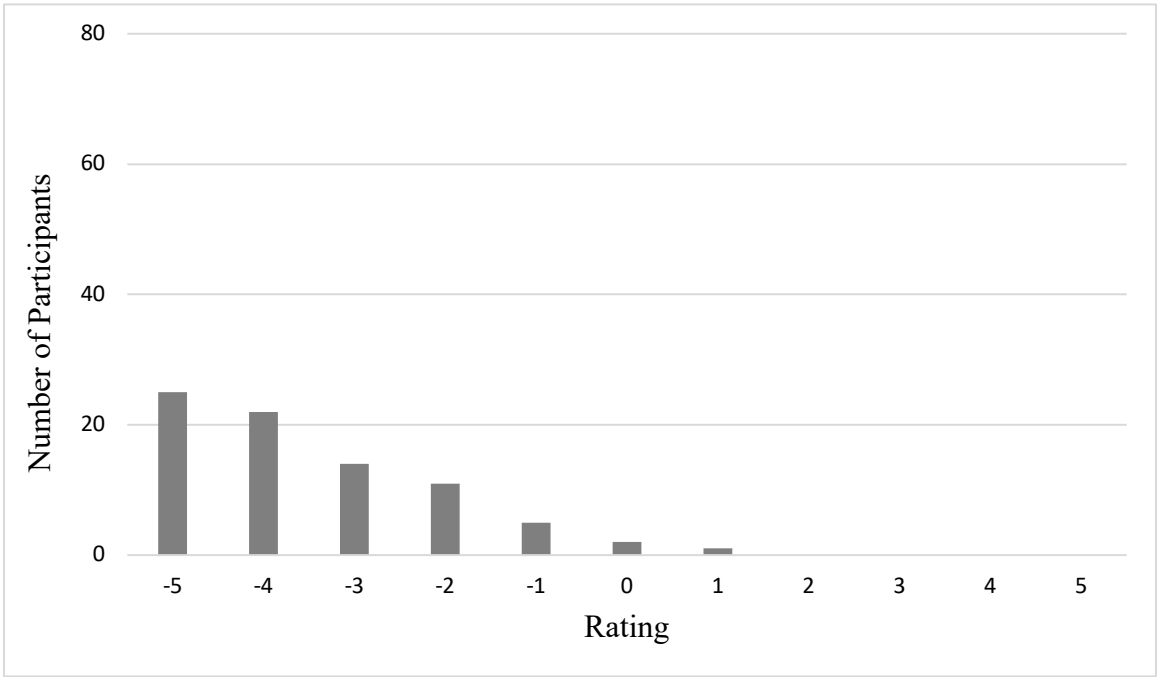


Figure 79. Distribution of Affect Ratings for Negative Image – 1

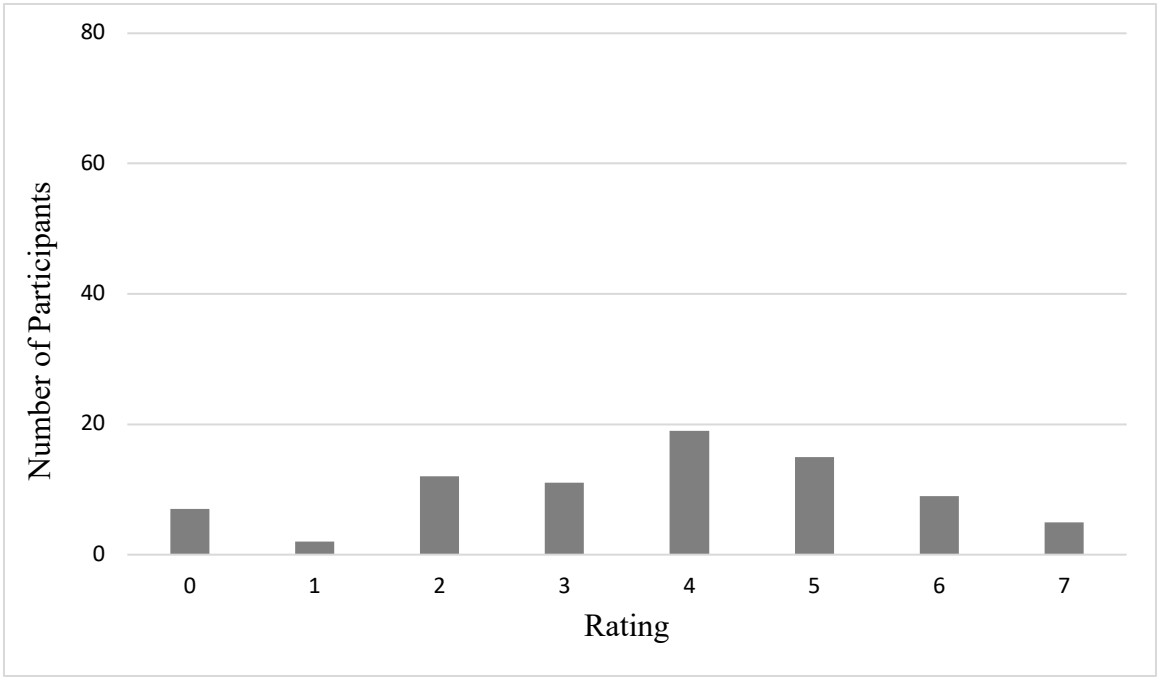


Figure 80. Distribution of Sensory Ratings for Negative Image – 1

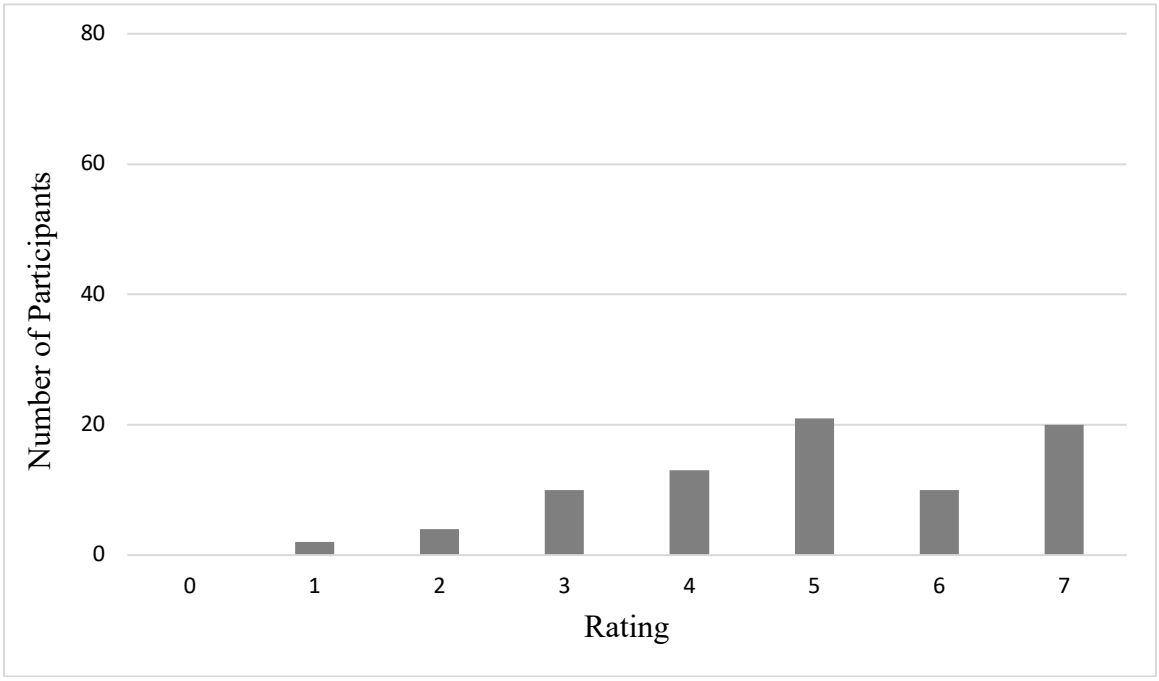


Figure 81. Distribution of Visualize Ratings for Negative Image – 1

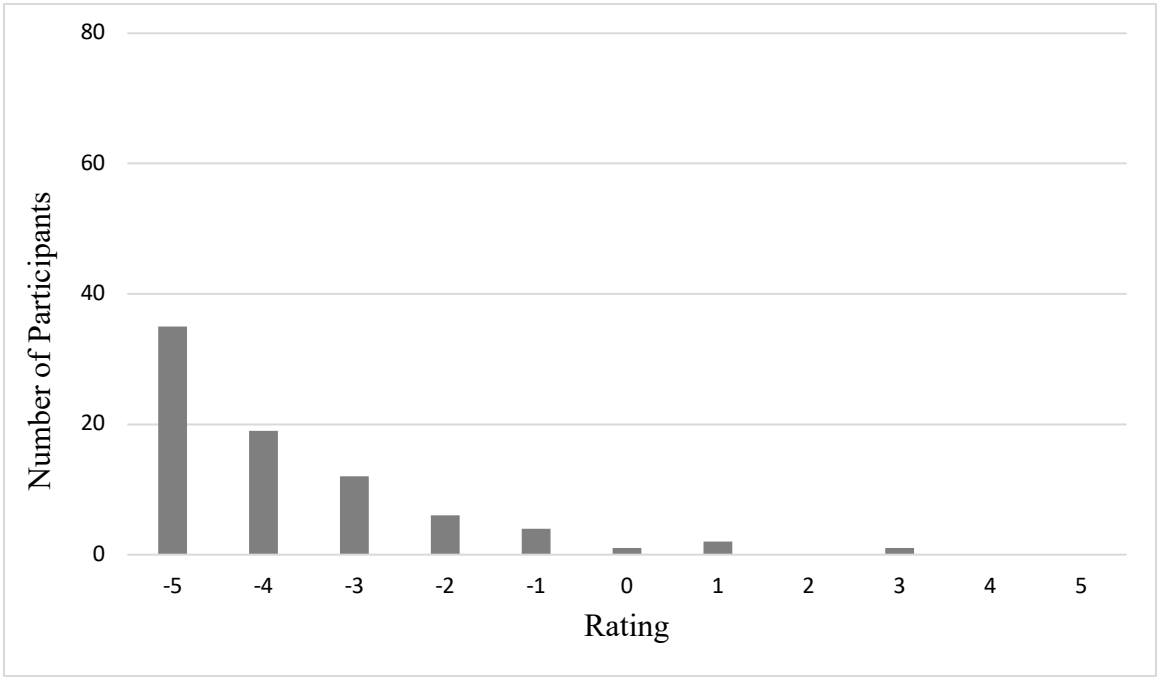


Figure 82. Distribution of Affect Ratings for Negative Image – 2

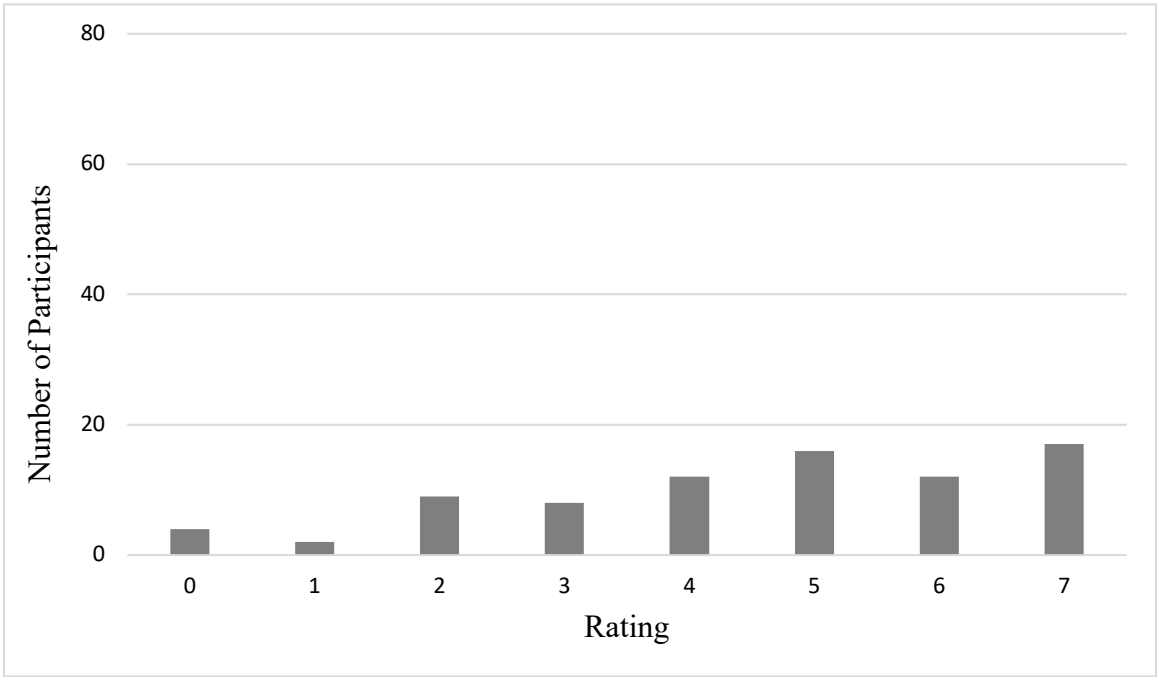


Figure 83. Distribution of Sensory Ratings for Negative Image – 2

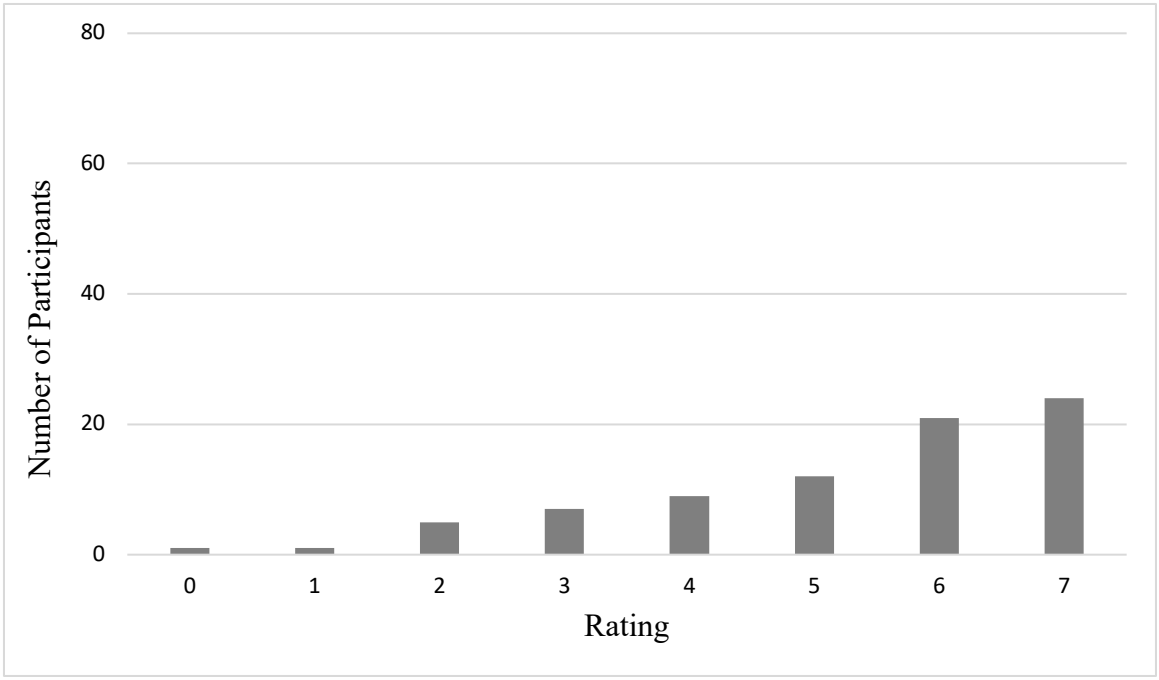


Figure 84. Distribution of Visualize Ratings for Negative Image – 2

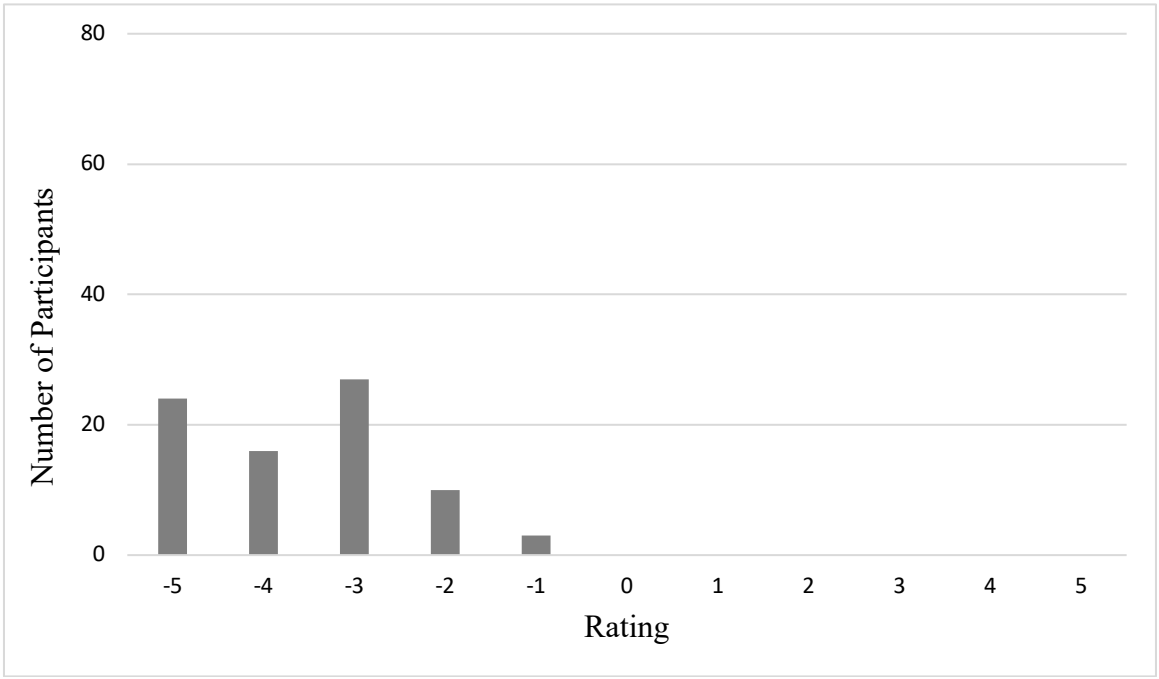


Figure 85. Distribution of Affect Ratings for Negative Image – 3

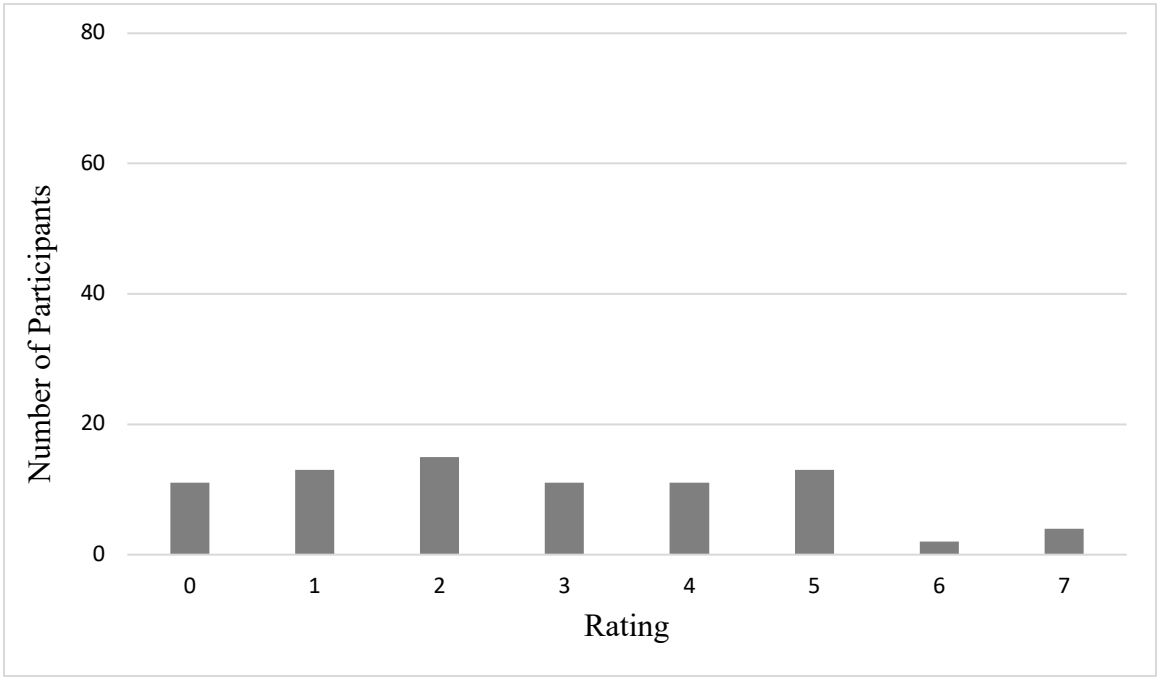


Figure 86. Distribution of Sensory Ratings for Negative Image – 3

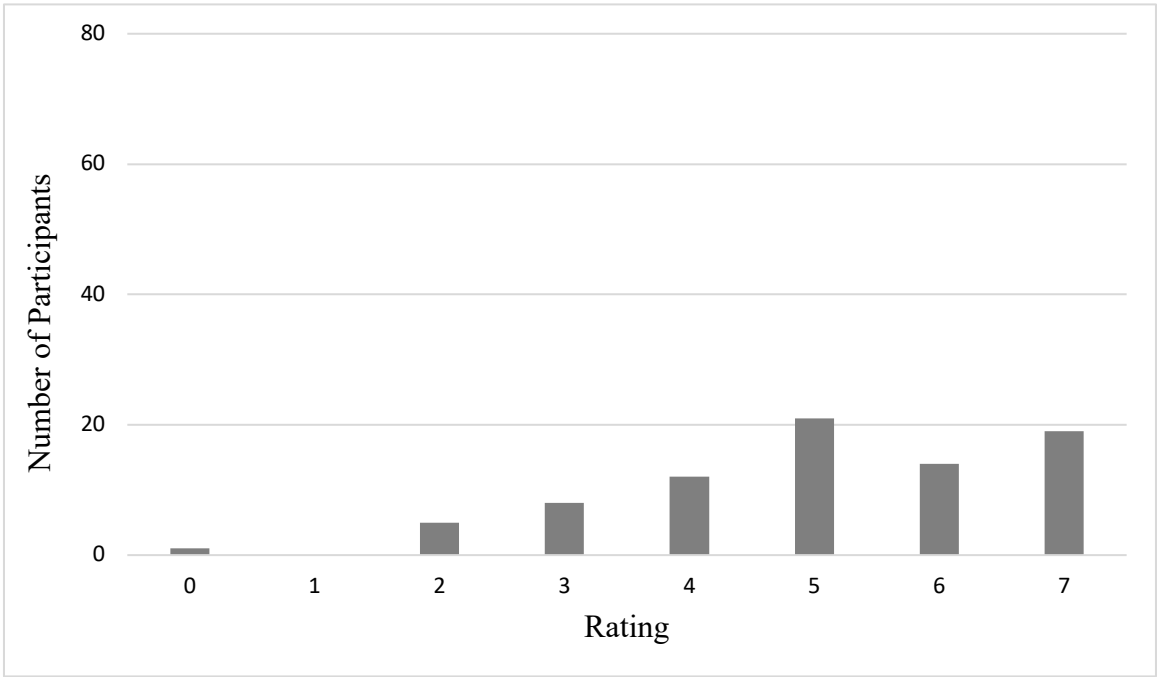


Figure 87. Distribution of Visualize Ratings for Negative Image – 3

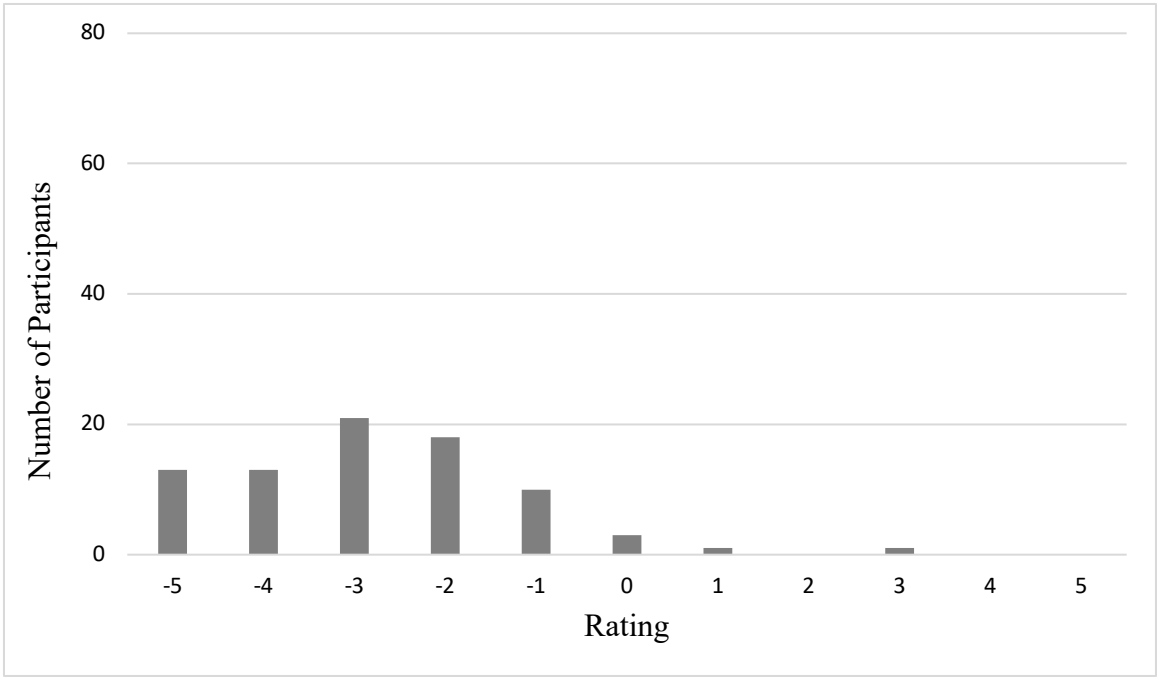


Figure 88. Distribution of Affect Ratings for Negative Image – 4

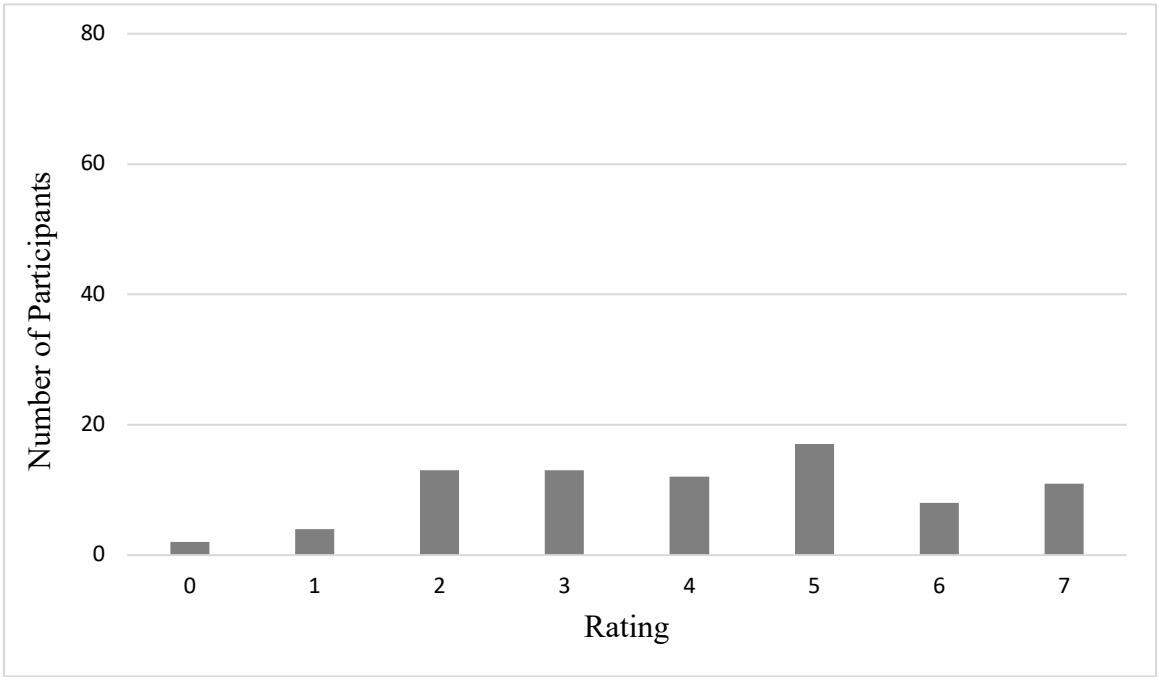


Figure 89. Distribution of Sensory Ratings for Negative Image – 4

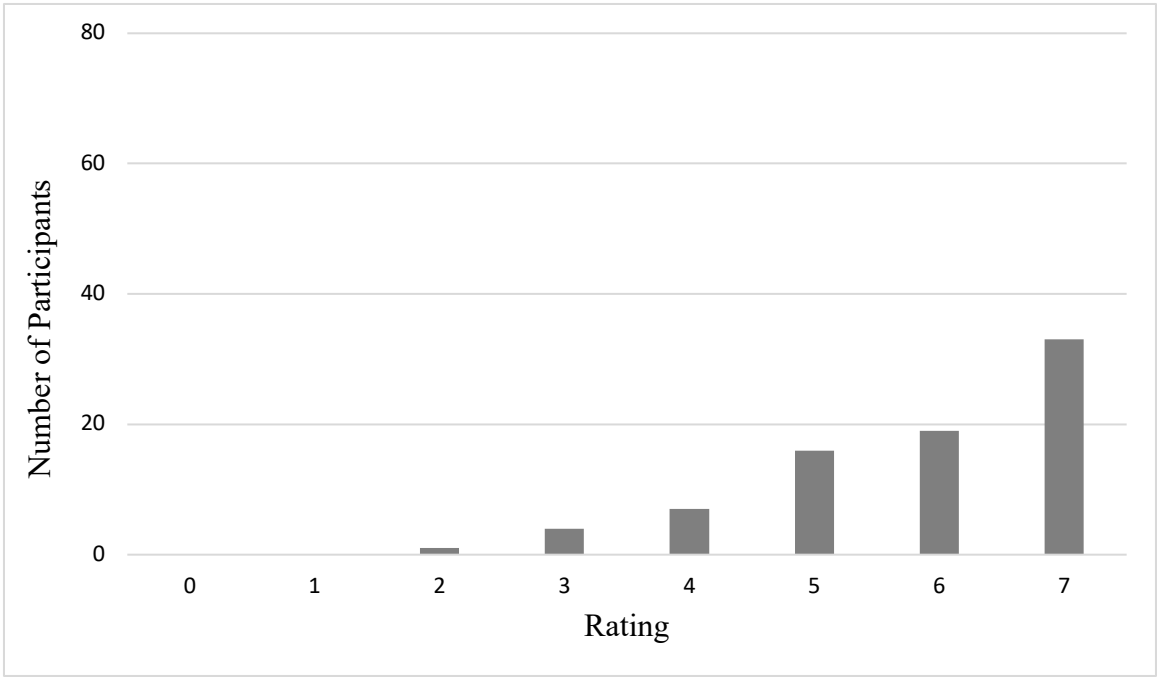


Figure 90. Distribution of Visualize Ratings for Negative Image – 4

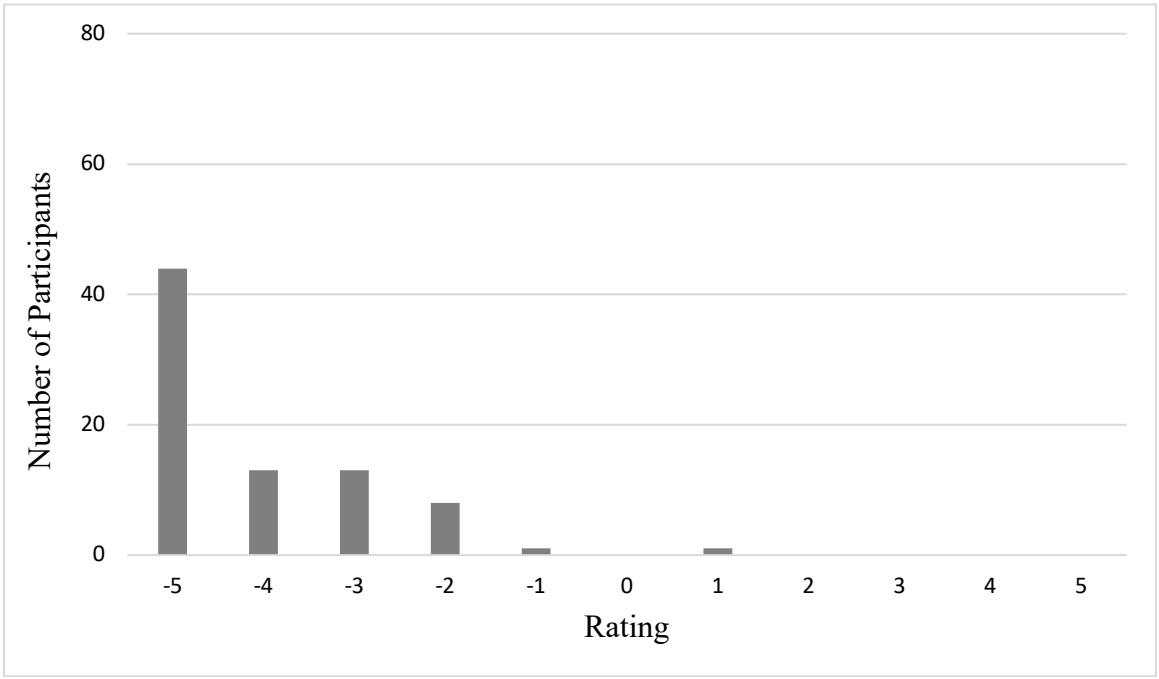


Figure 91. Distribution of Affect Ratings for Negative Image – 5

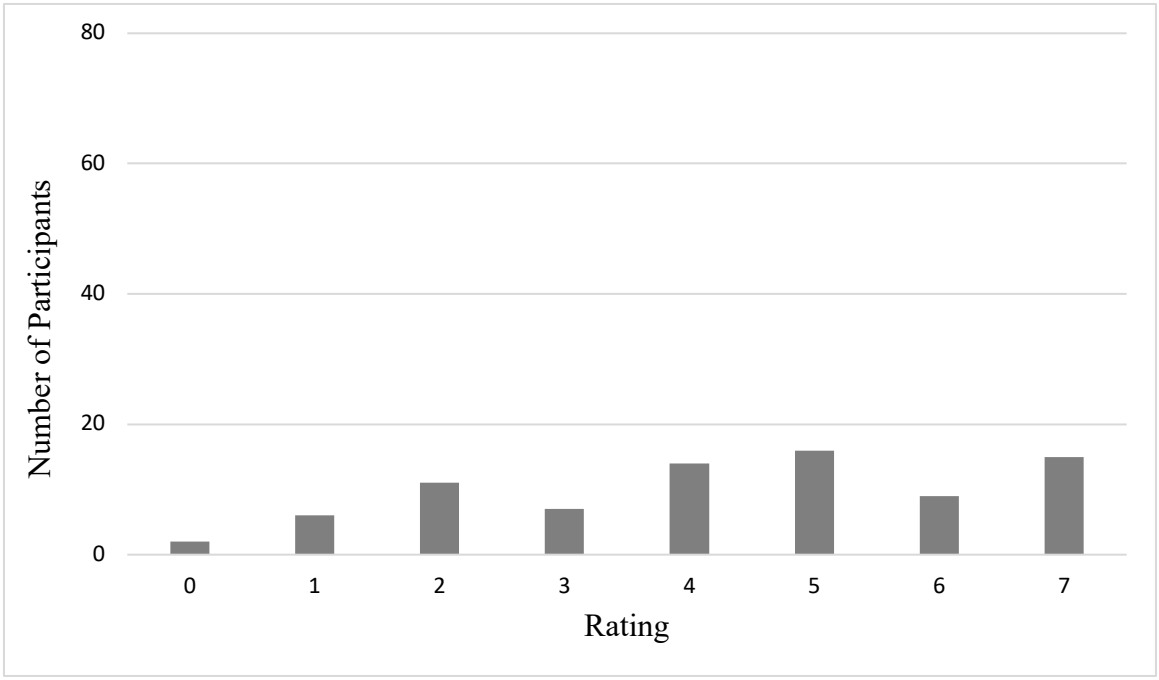


Figure 92. Distribution of Sensory Ratings for Negative Image – 5

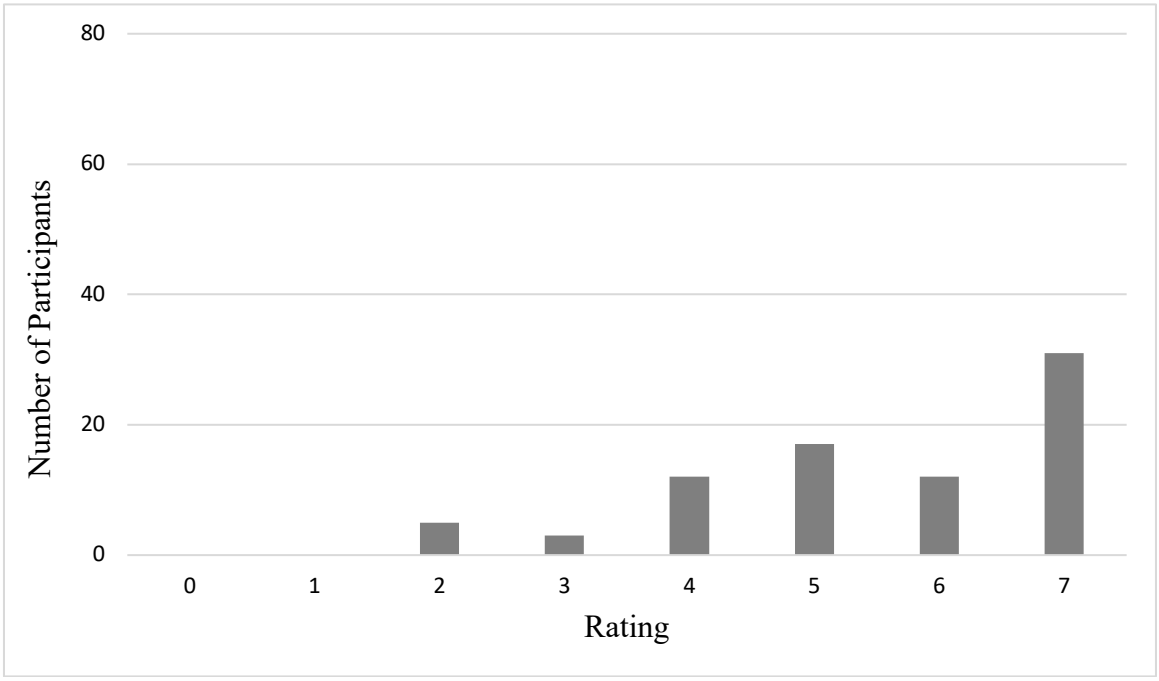


Figure 93. Distribution of Visualize Ratings for Negative Image – 5

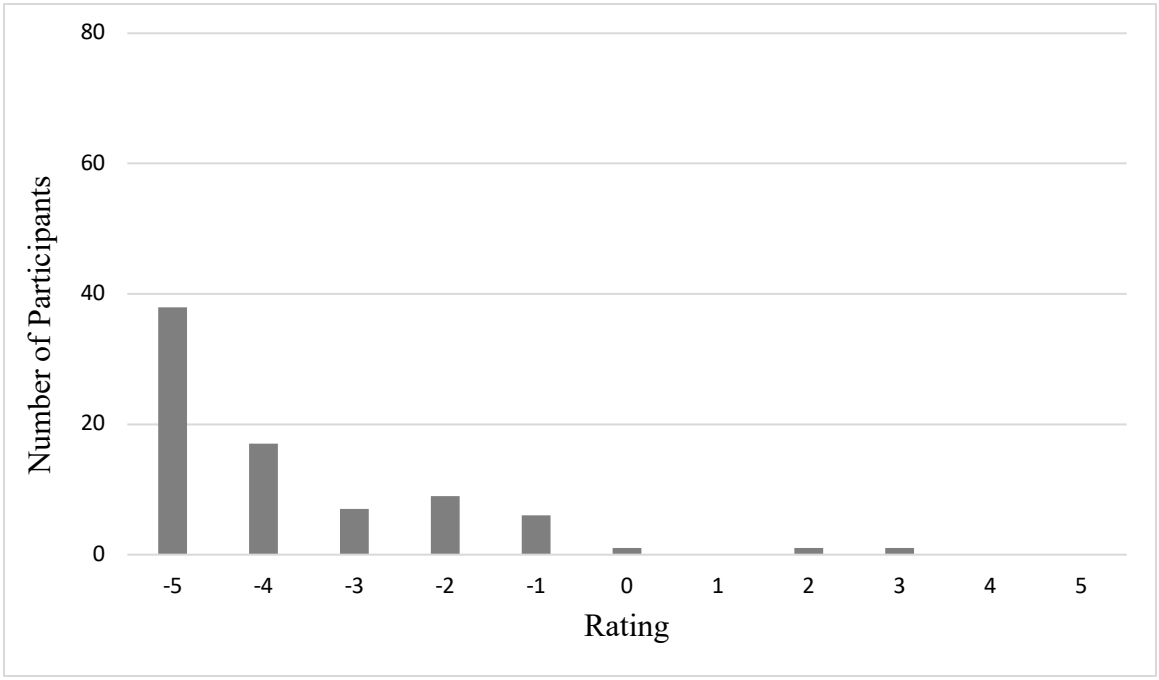


Figure 94. Distribution of Affect Ratings for Negative Image – 6

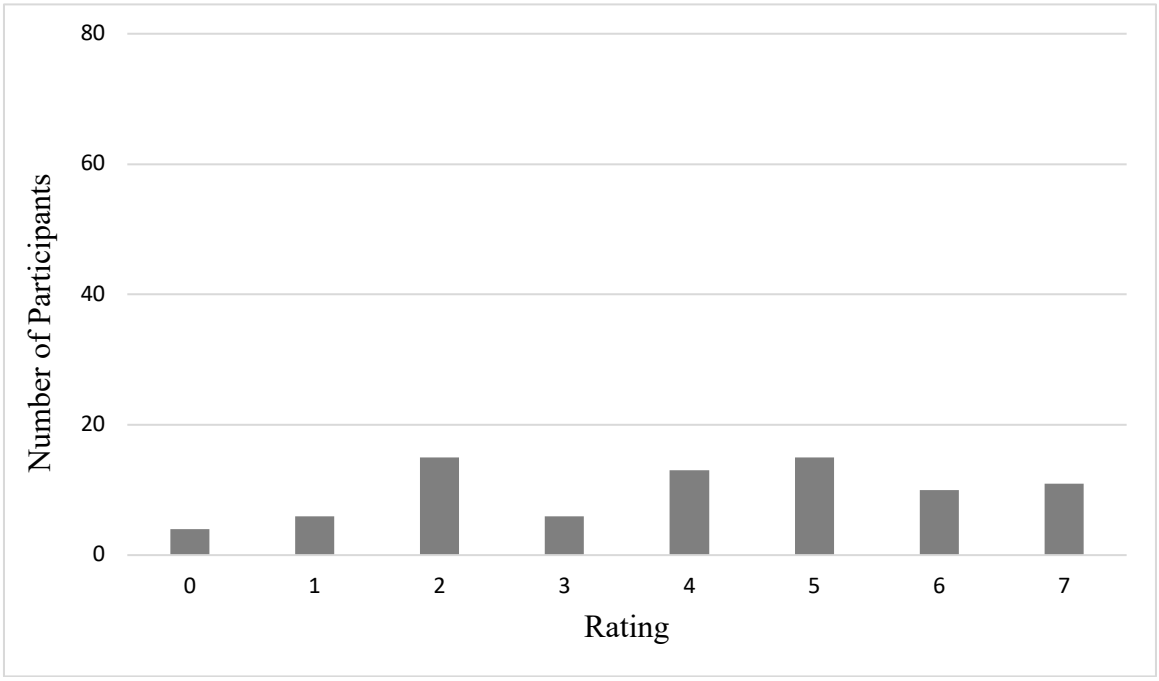


Figure 95. Distribution of Sensory Ratings for Negative Image – 6

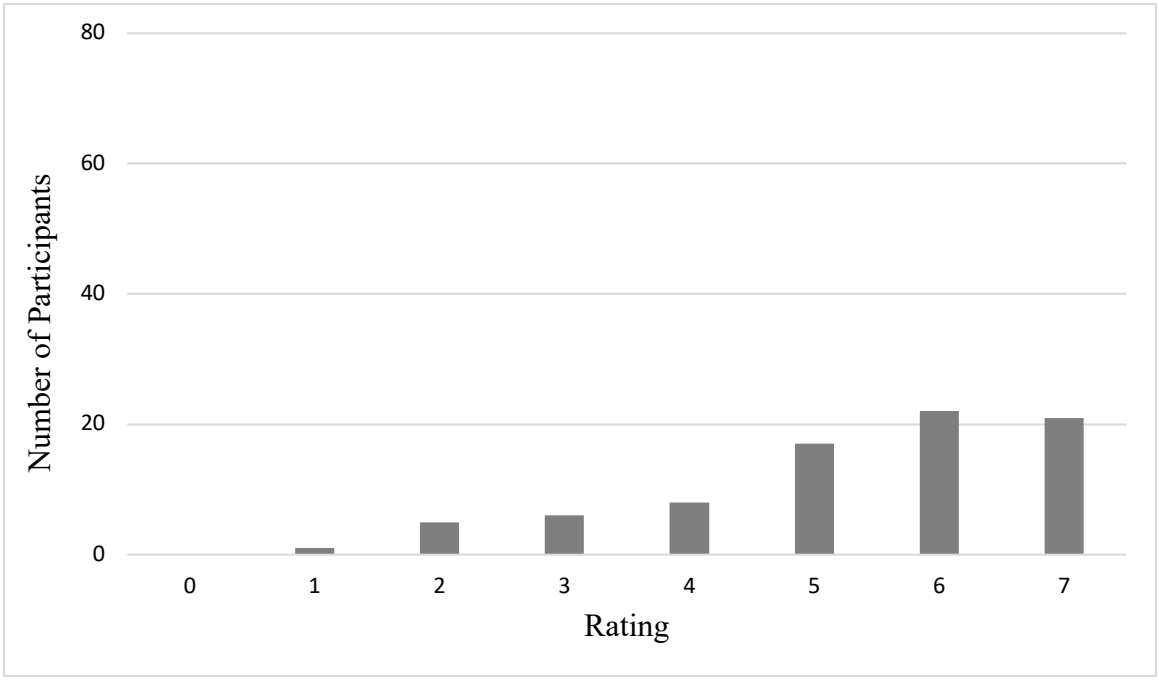


Figure 96. Distribution of Visualize Ratings for Negative Image – 6

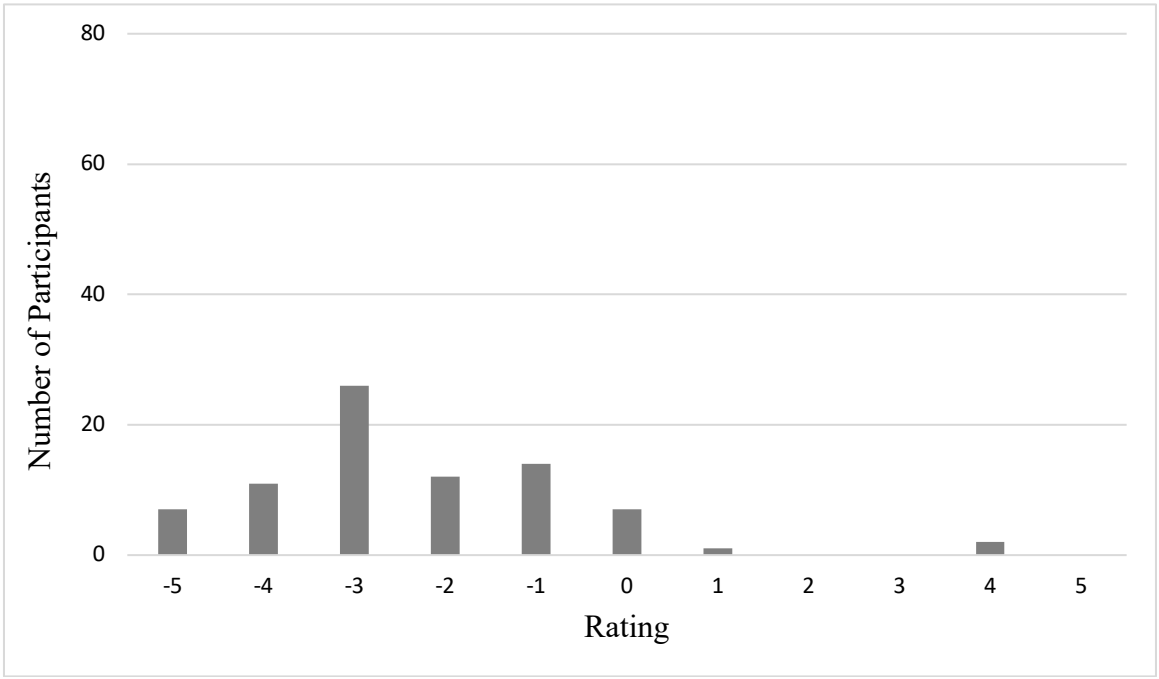


Figure 97. Distribution of Affect Ratings for Negative Image – 7

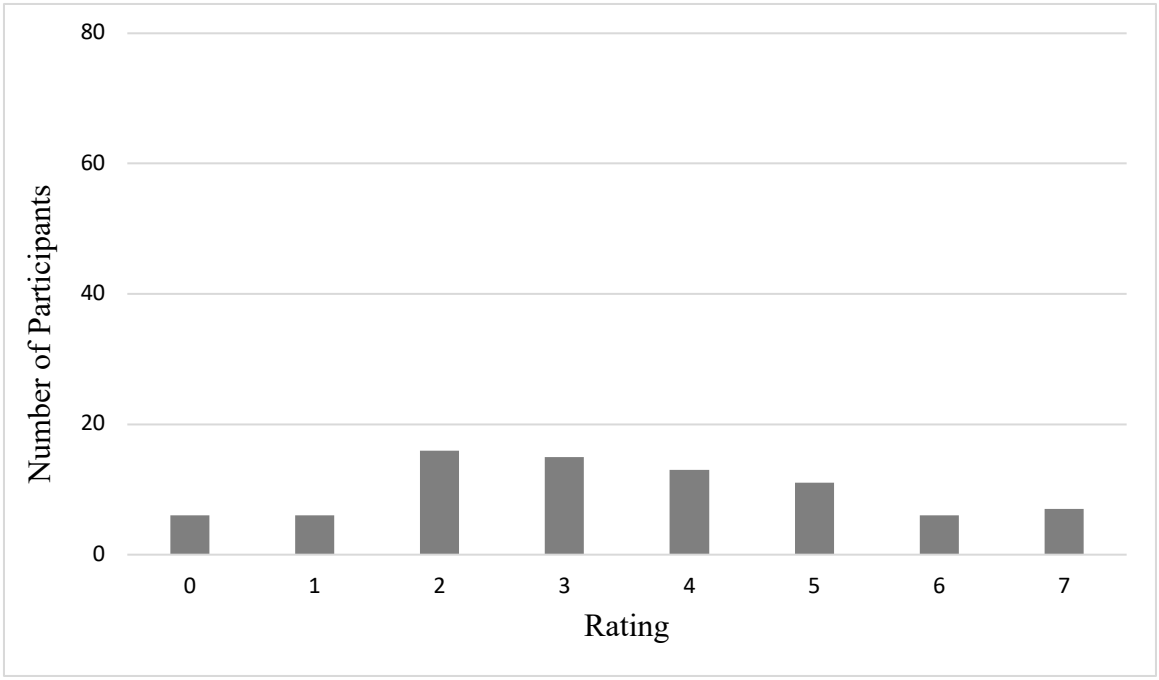


Figure 98. Distribution of Sensory Ratings for Negative Image – 7

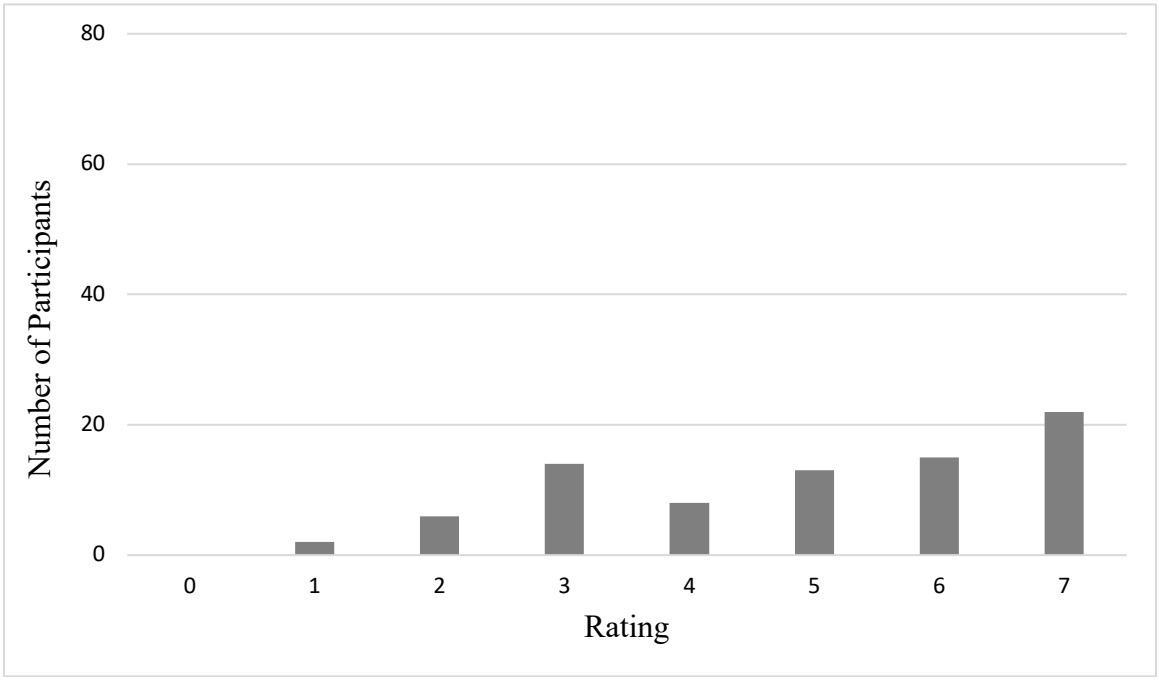


Figure 99. Distribution of Visualize Ratings for Negative Image – 7

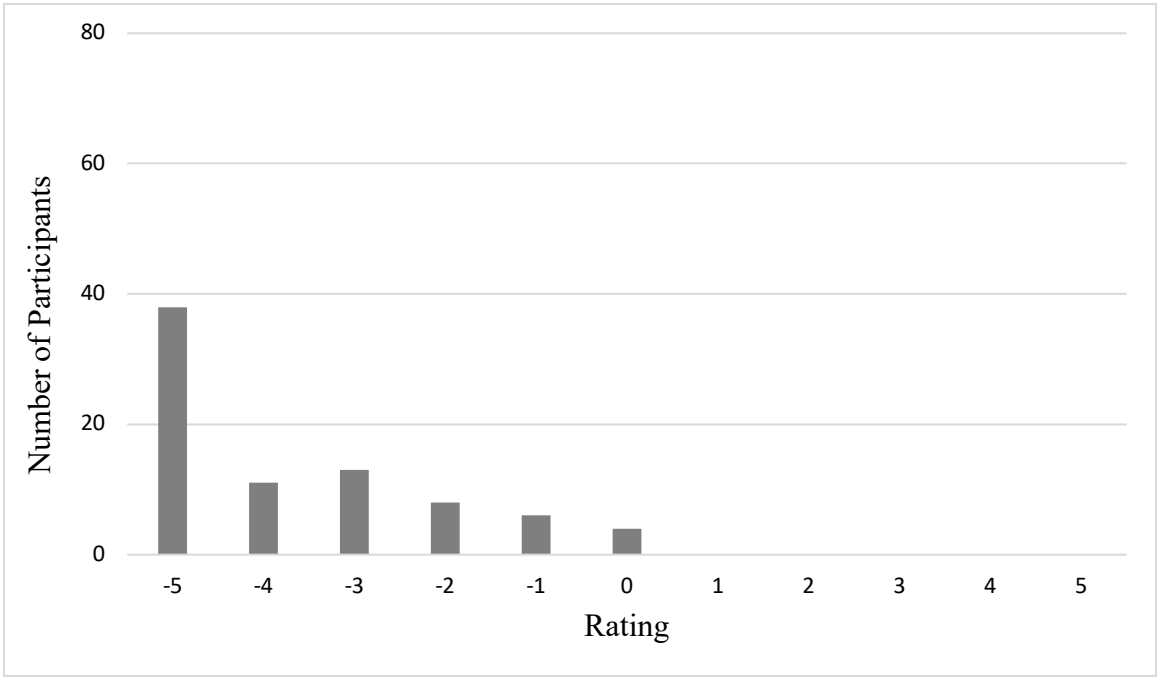


Figure 100. Distribution of Affect Ratings for Negative Image – 8

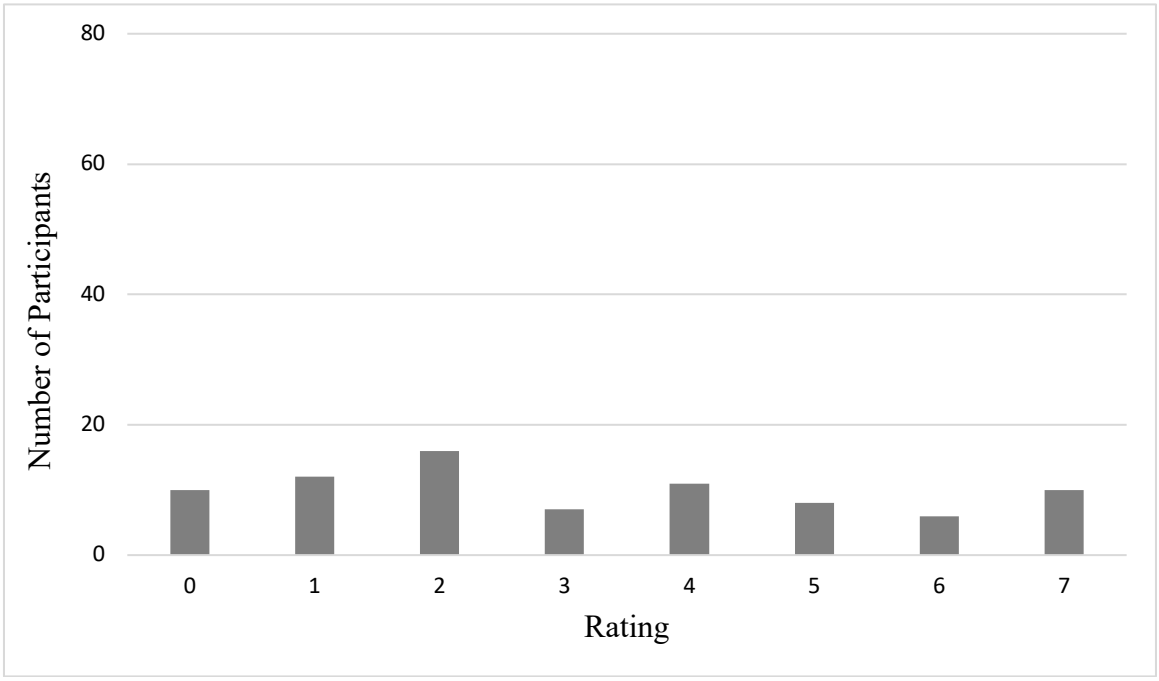


Figure 101. Distribution of Sensory Ratings for Negative Image – 8

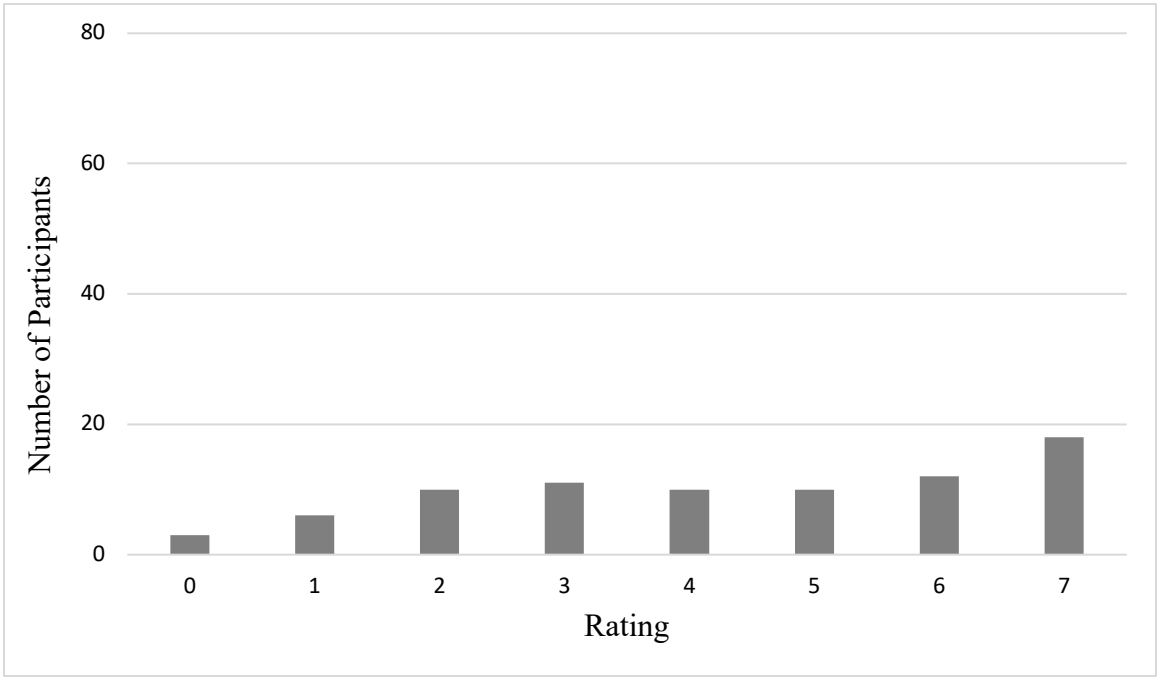


Figure 102. Distribution of Visualize Ratings for Negative Image – 8

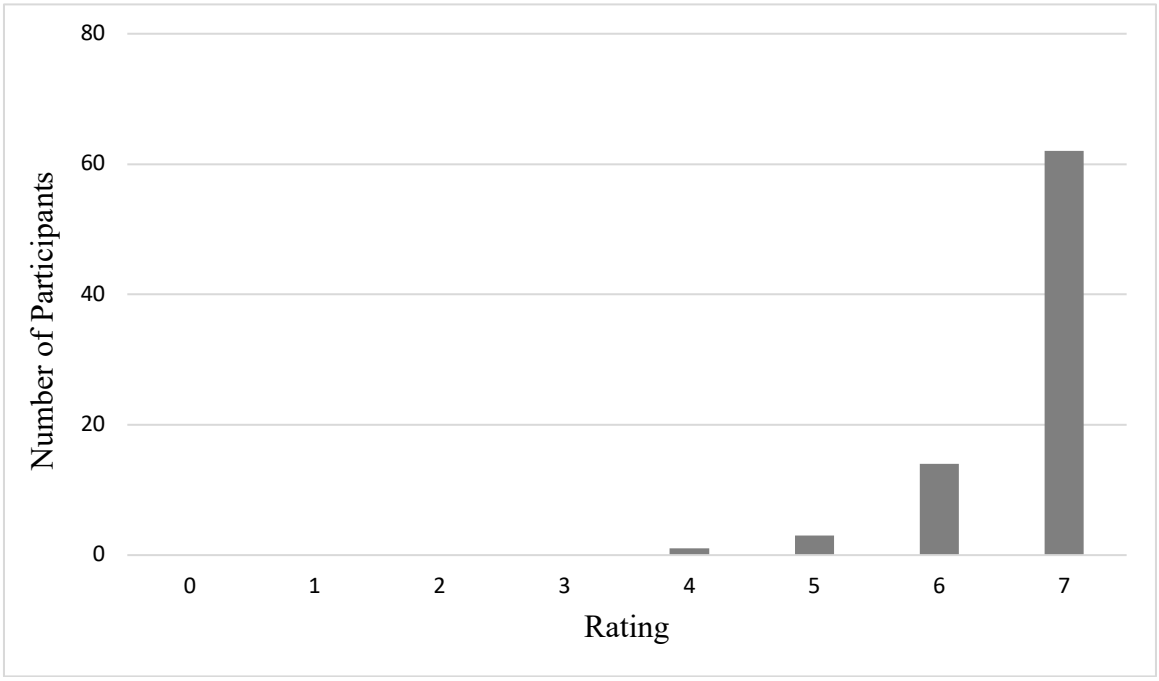


Figure 103. Distribution of Correspondence Ratings for Positive Cues – Pair 1

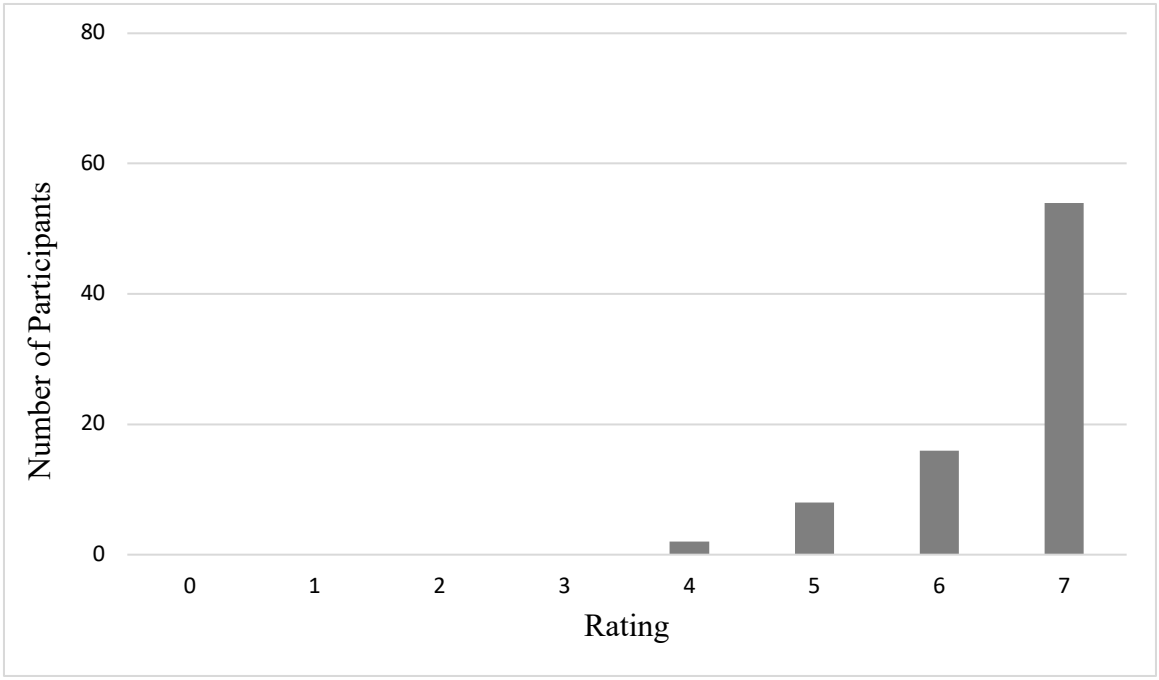


Figure 104. Distribution of Correspondence Ratings for Positive Cues – Pair 2

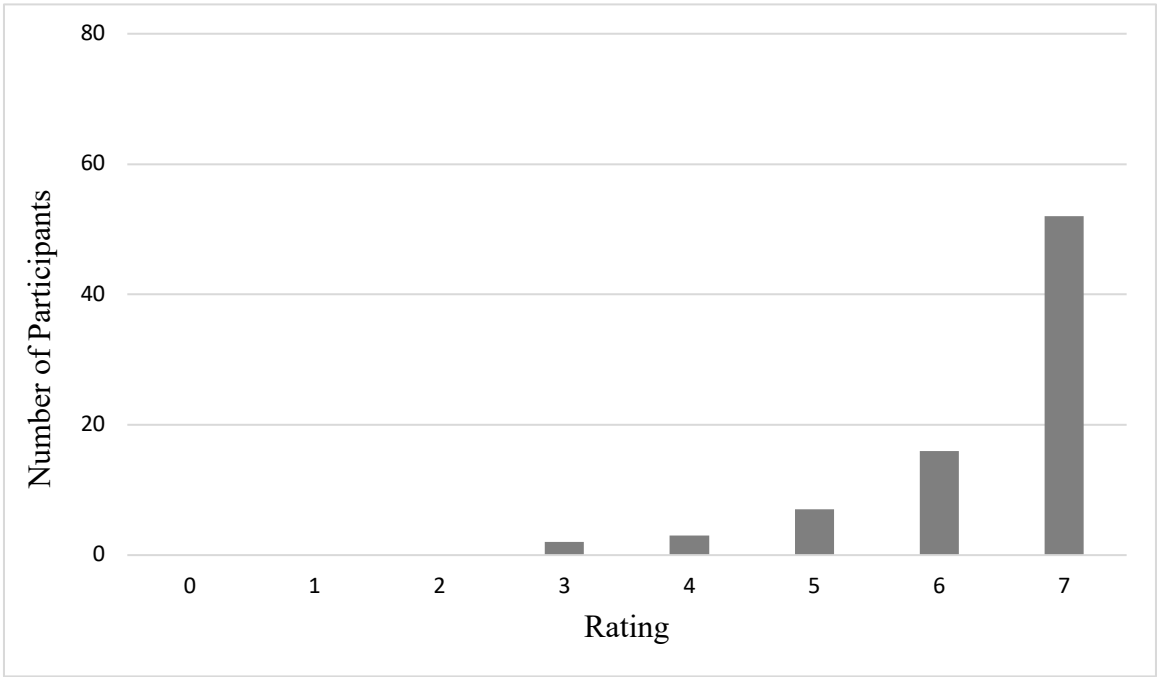


Figure 105. Distribution of Correspondence Ratings for Positive Cues – Pair 3

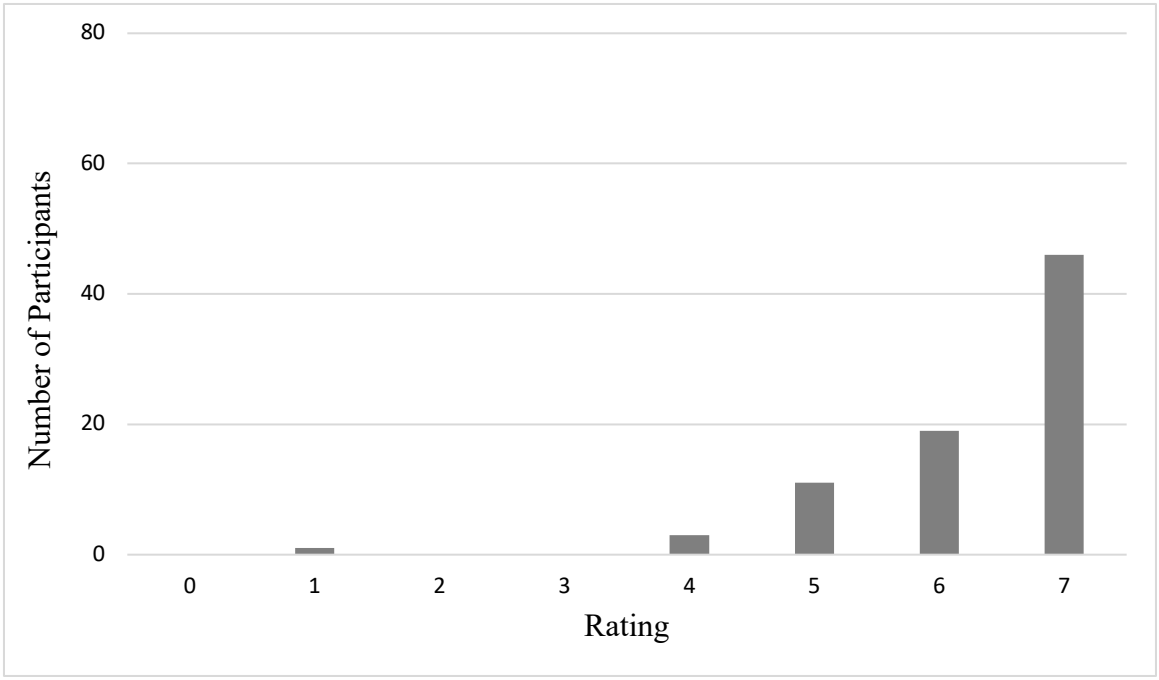


Figure 106. Distribution of Correspondence Ratings for Positive Cues – Pair 4

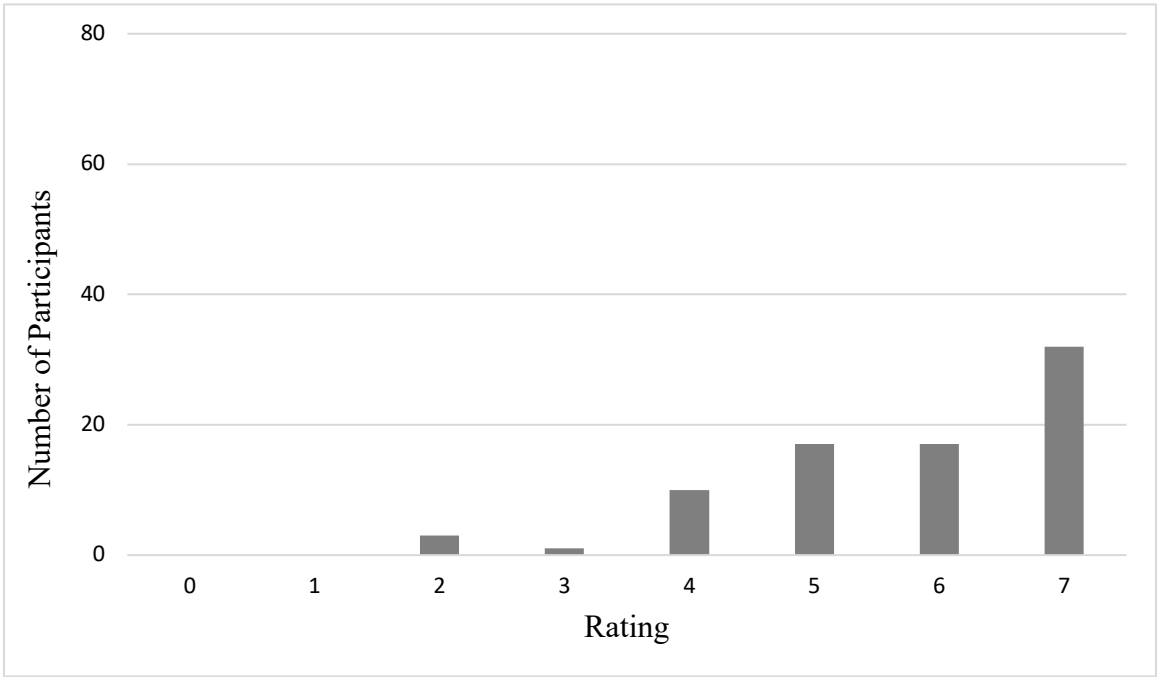


Figure 107. Distribution of Correspondence Ratings for Positive Cues – Pair 5

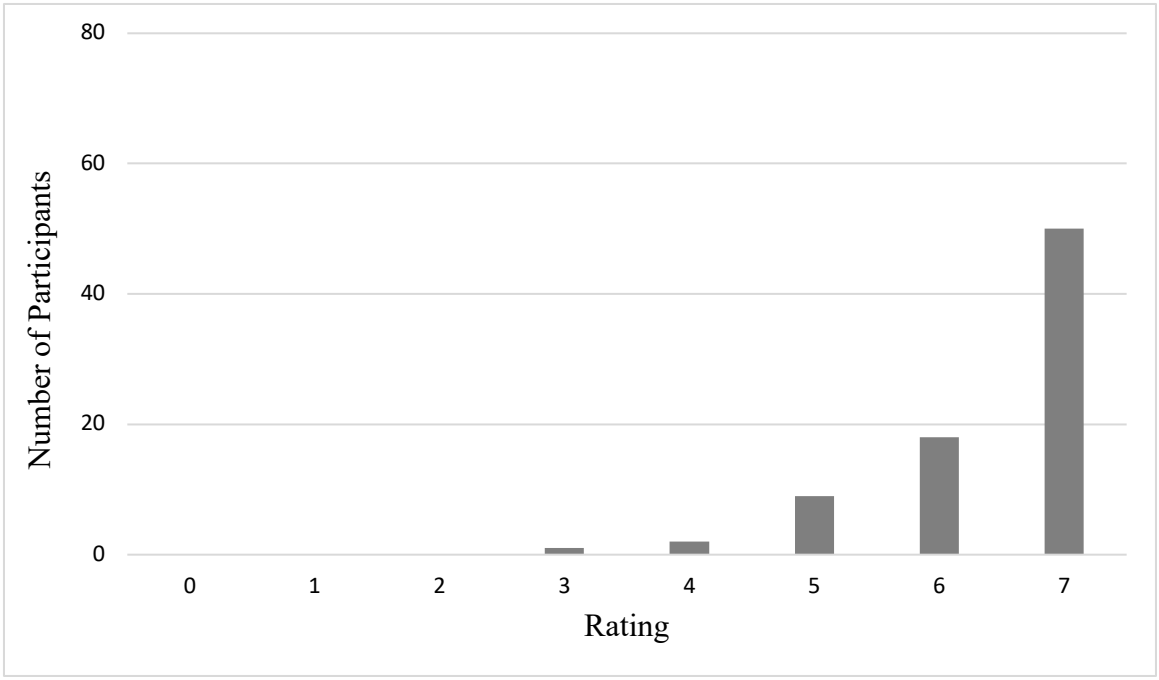


Figure 108. Distribution of Correspondence Ratings for Positive Cues – Pair 6

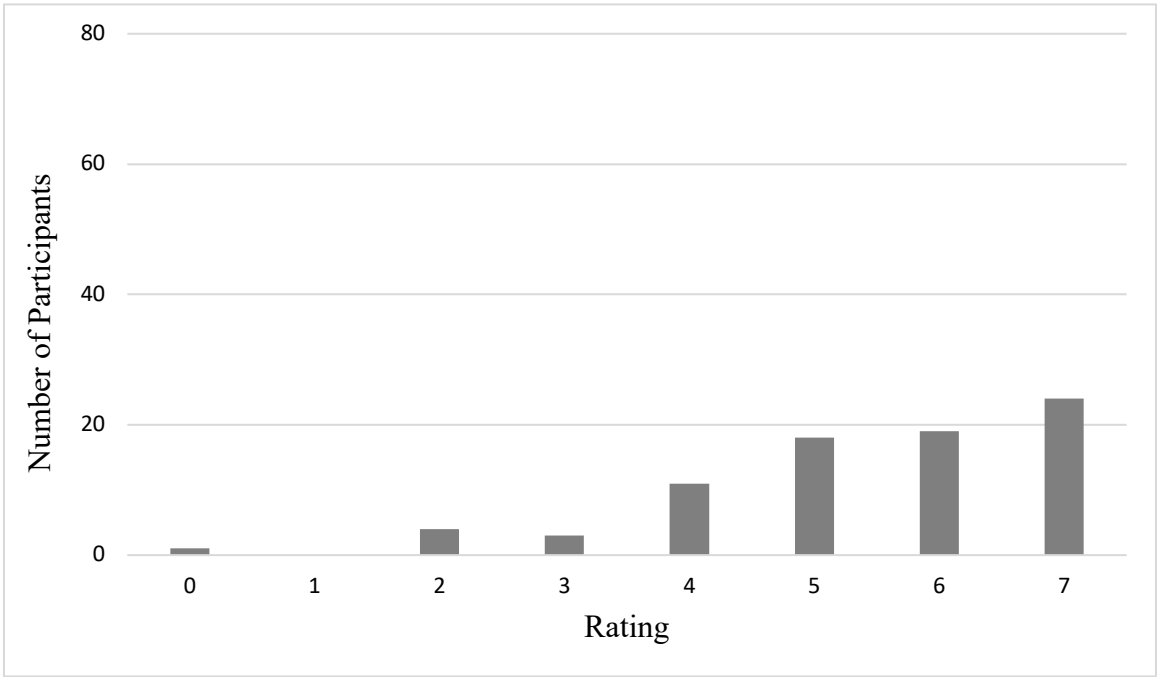


Figure 109. Distribution of Correspondence Ratings for Positive Cues – Pair 7

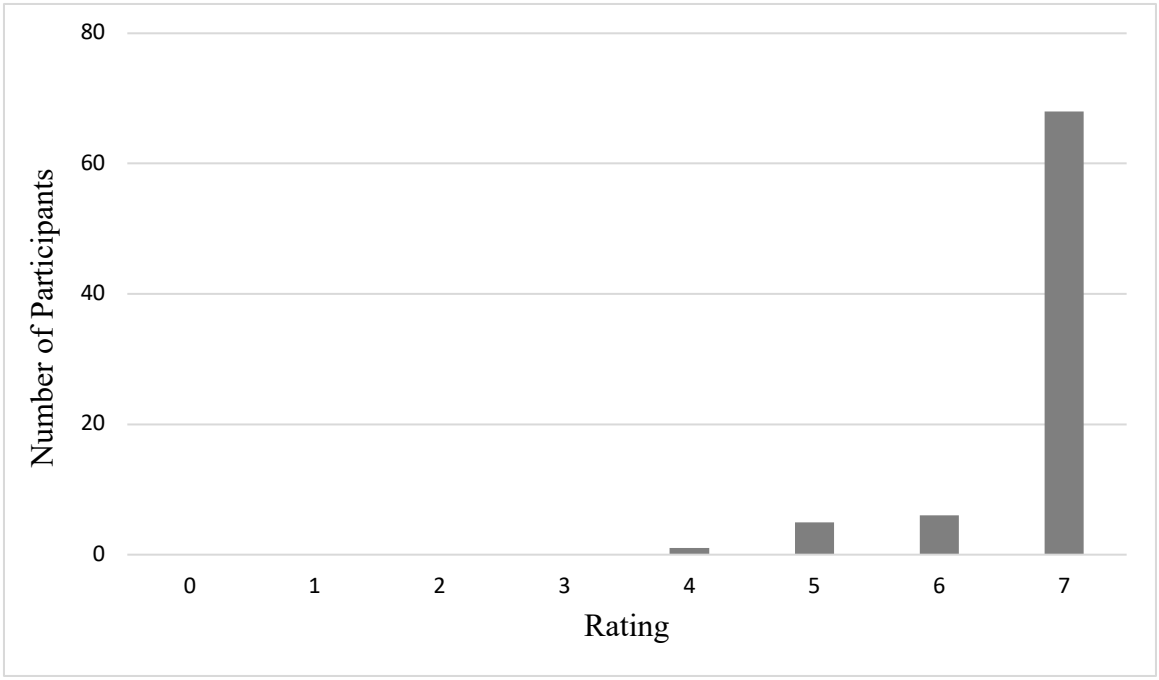


Figure 110. Distribution of Correspondence Ratings for Positive Cues – Pair 8

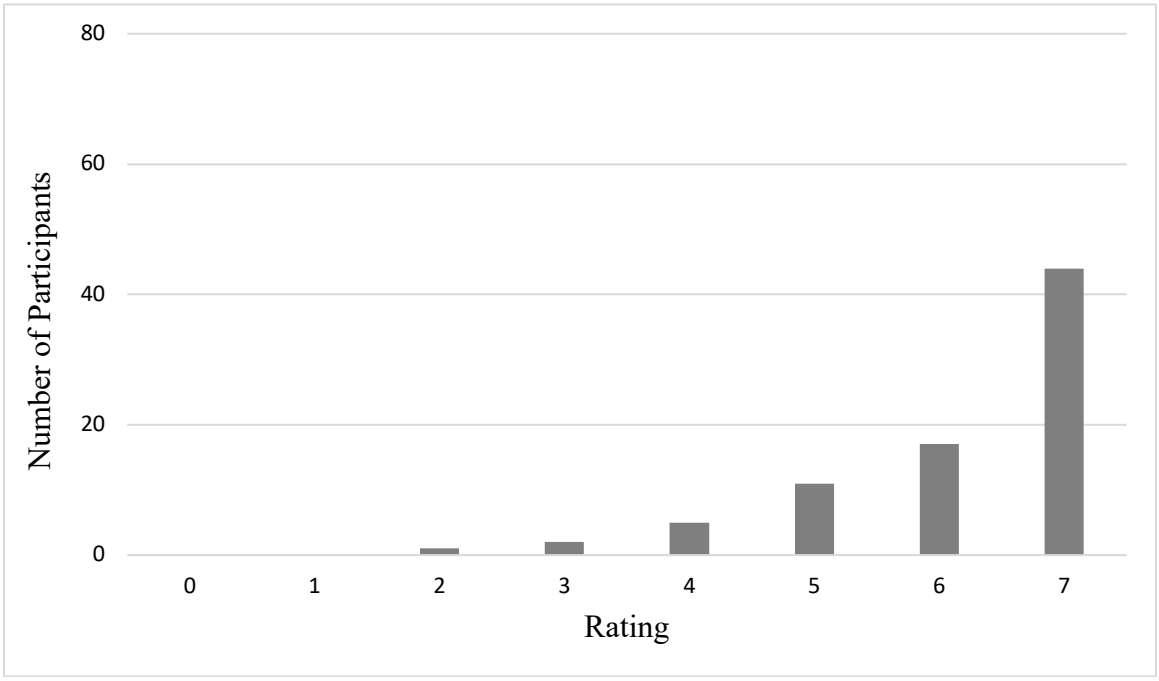


Figure 111. Distribution of Correspondence Ratings for Negative Cues – Pair 1

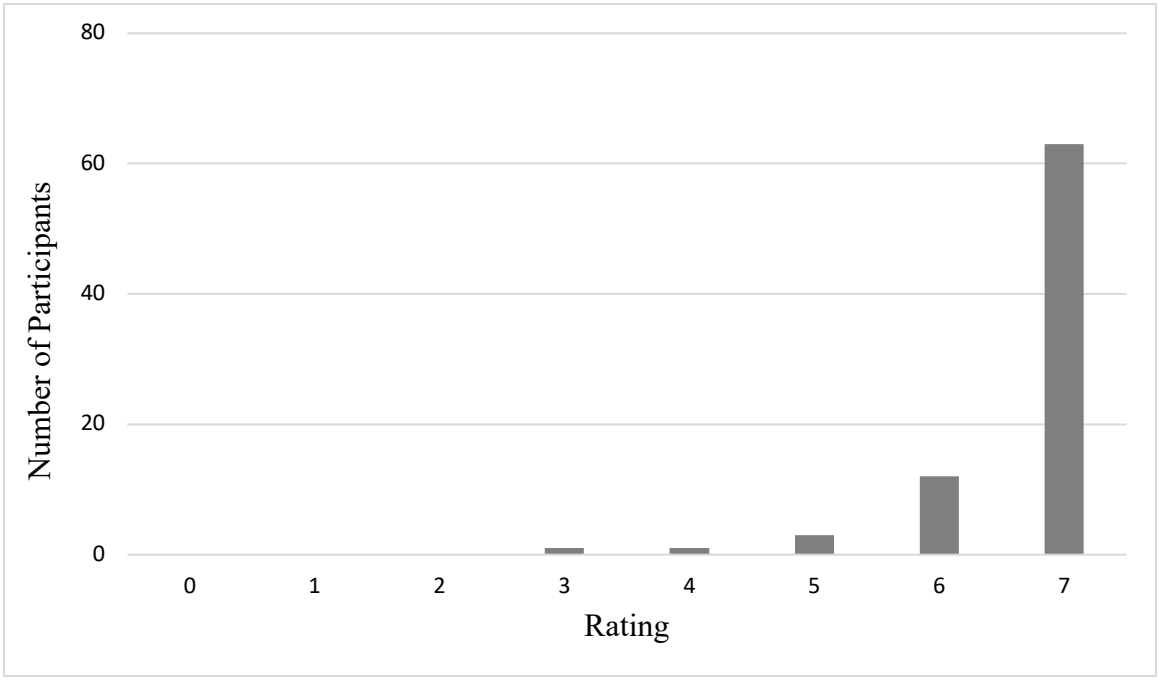


Figure 112. Distribution of Correspondence Ratings for Negative Cues – Pair 2

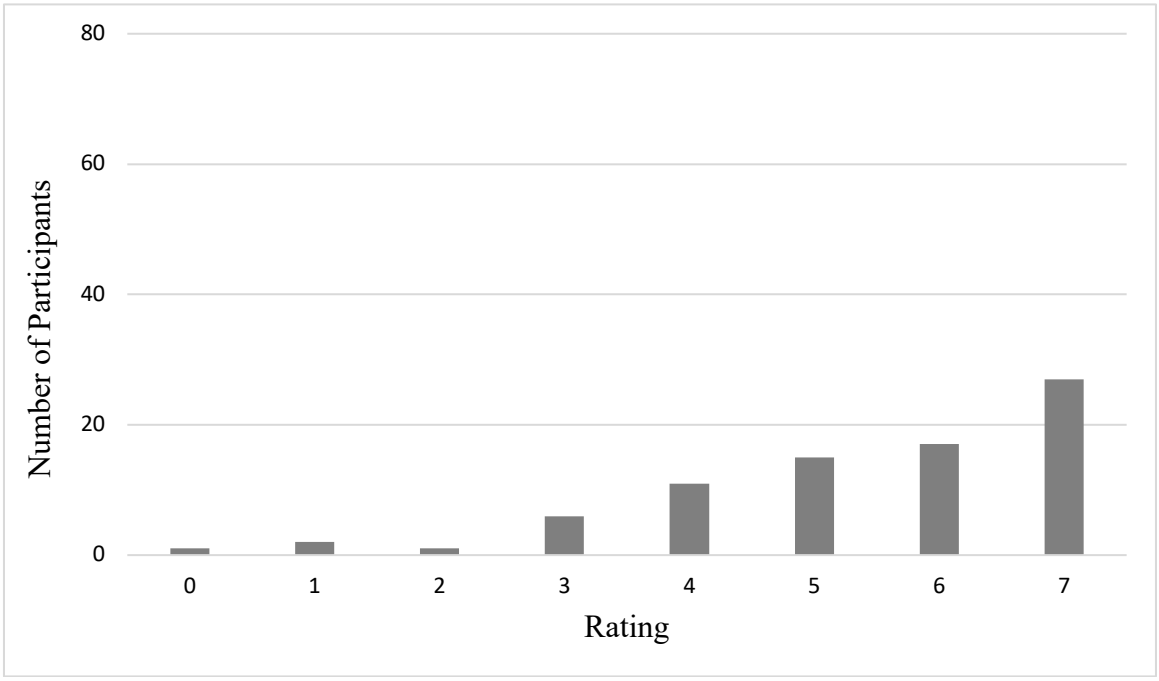


Figure 113. Distribution of Correspondence Ratings for Negative Cues – Pair 3

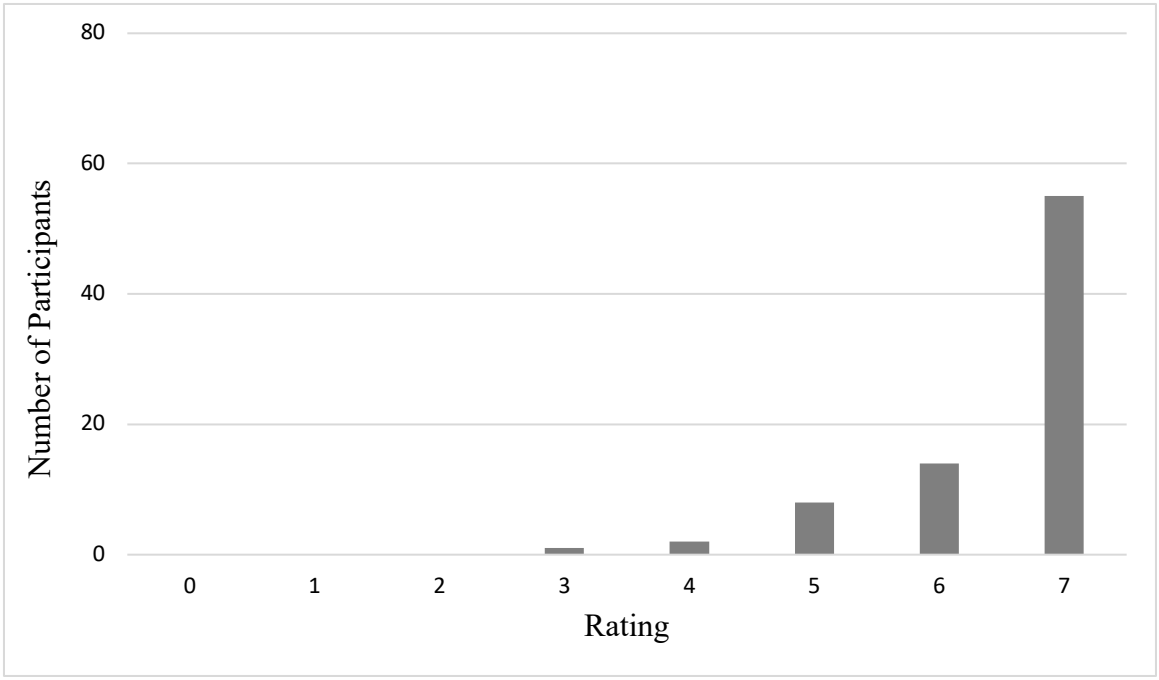


Figure 114. Distribution of Correspondence Ratings for Negative Cues – Pair 4

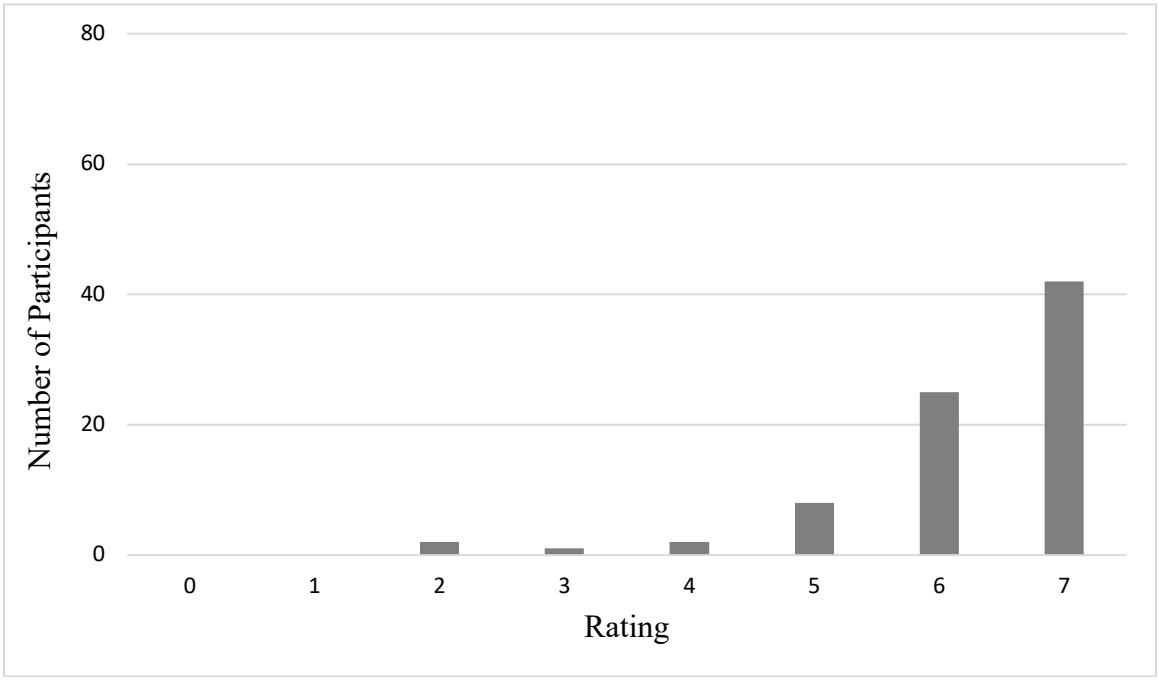


Figure 115. Distribution of Correspondence Ratings for Negative Cues – Pair 5

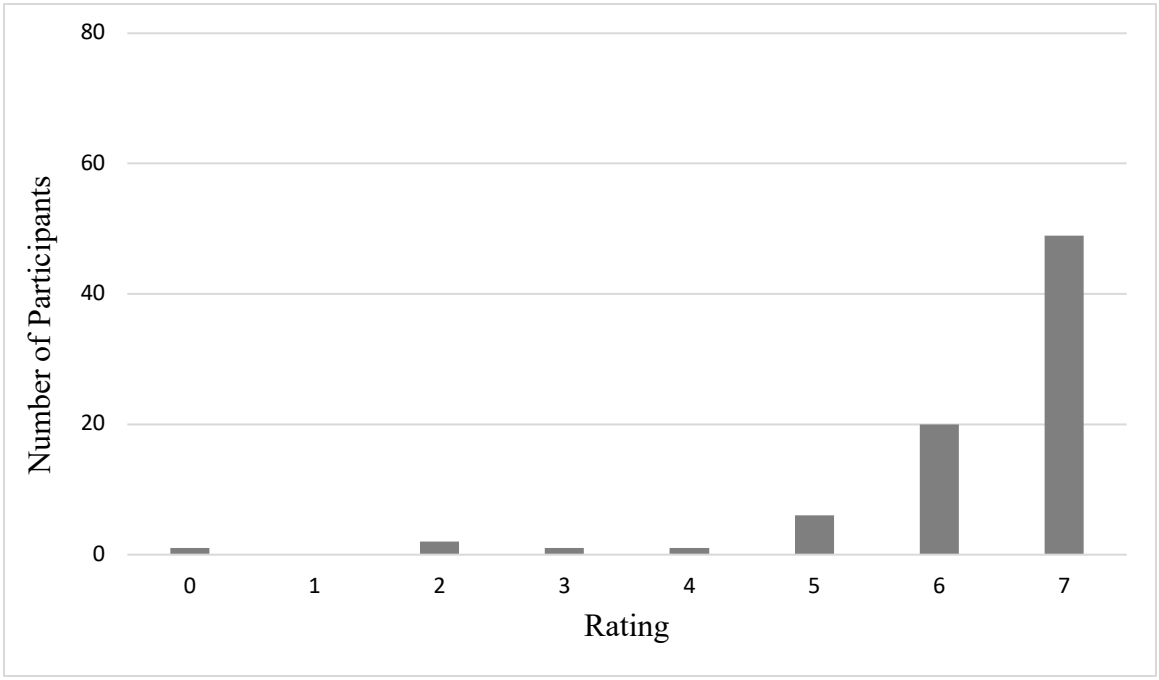


Figure 116. Distribution of Correspondence Ratings for Negative Cues – Pair 6

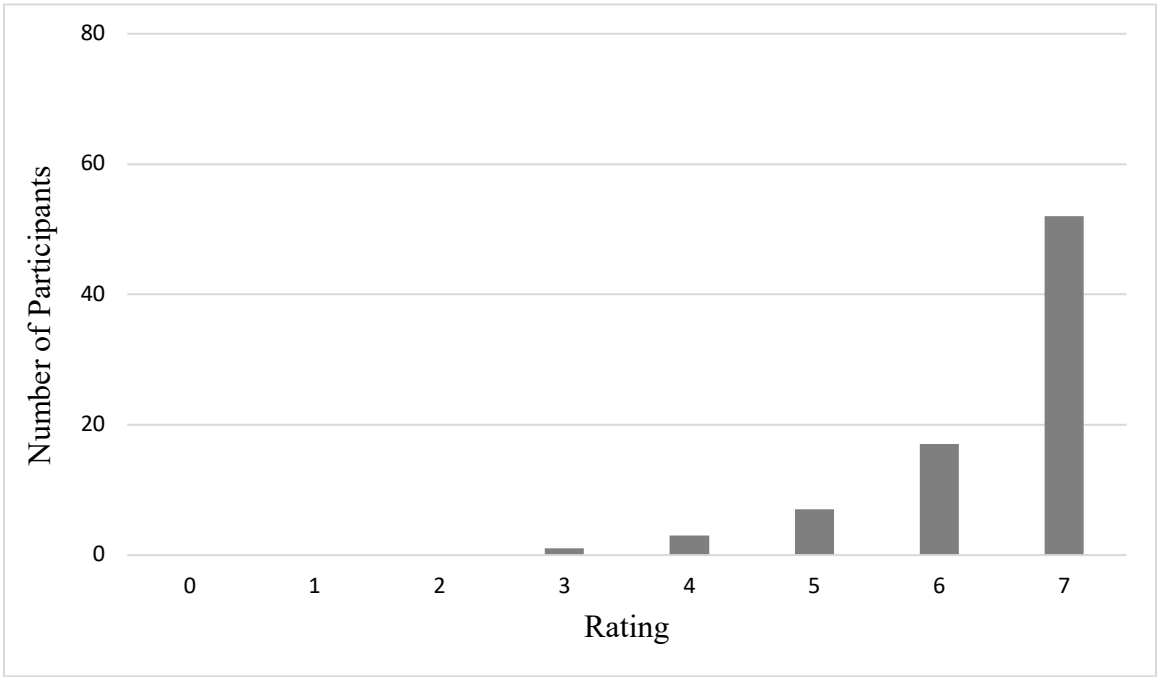


Figure 117. Distribution of Correspondence Ratings for Negative Cues – Pair 7

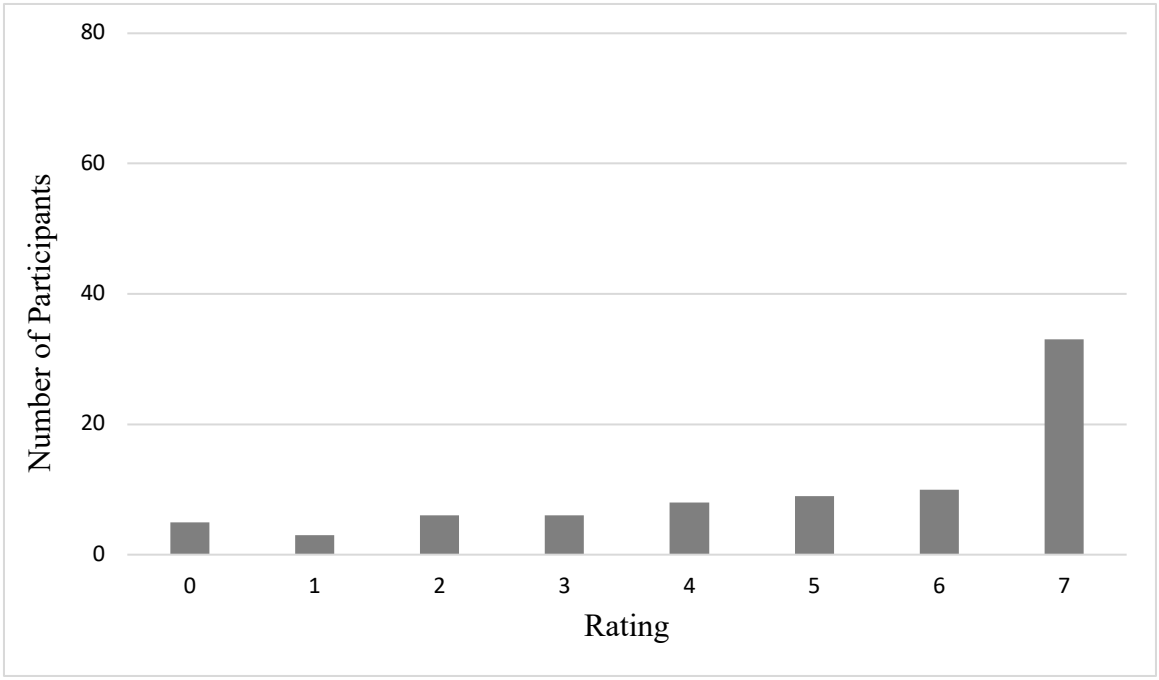


Figure 118. Distribution of Correspondence Ratings for Negative Cues – Pair 8

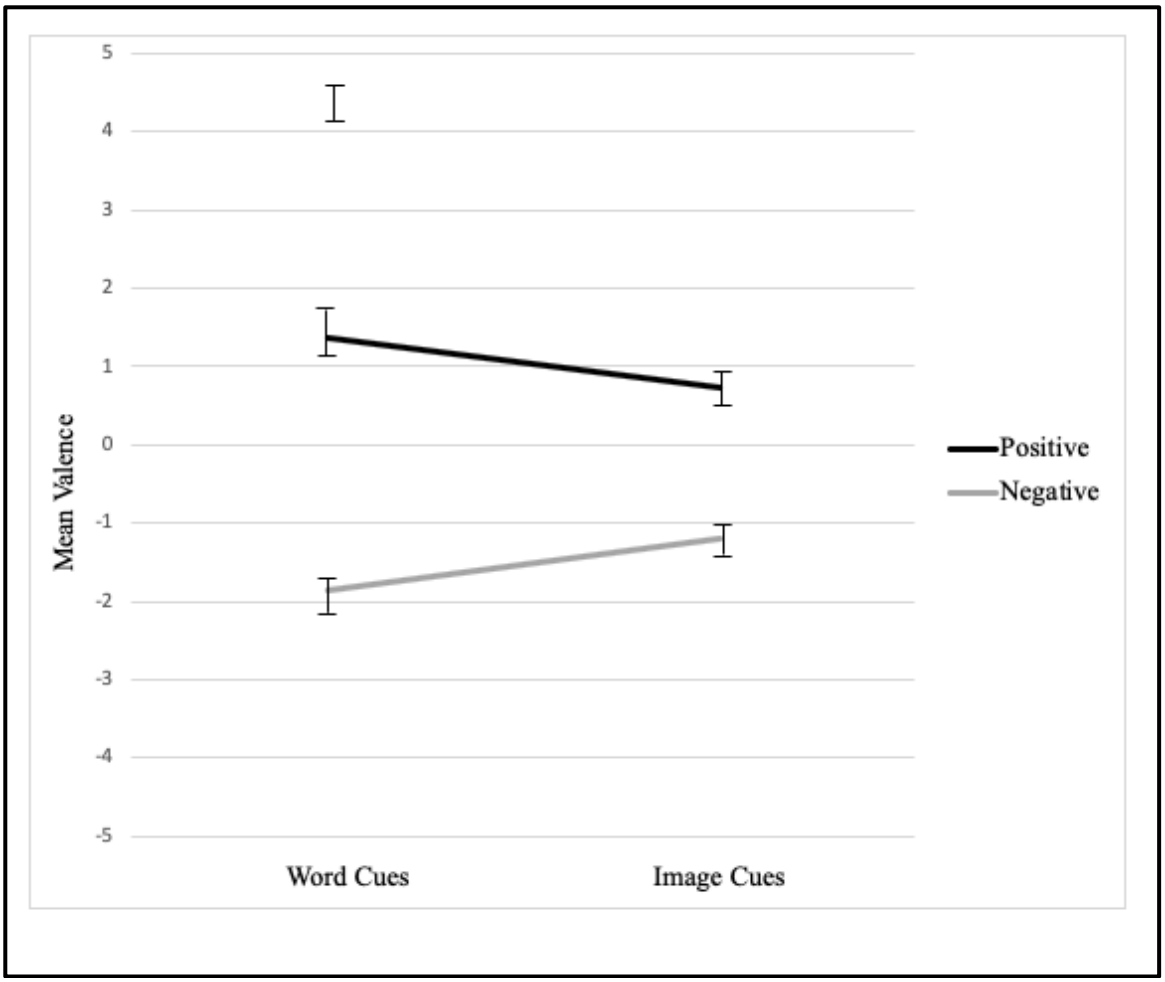


Figure 119. Interaction Effect of Cue Type x Cue Valence on AM Valence (error bars: 95% CI)

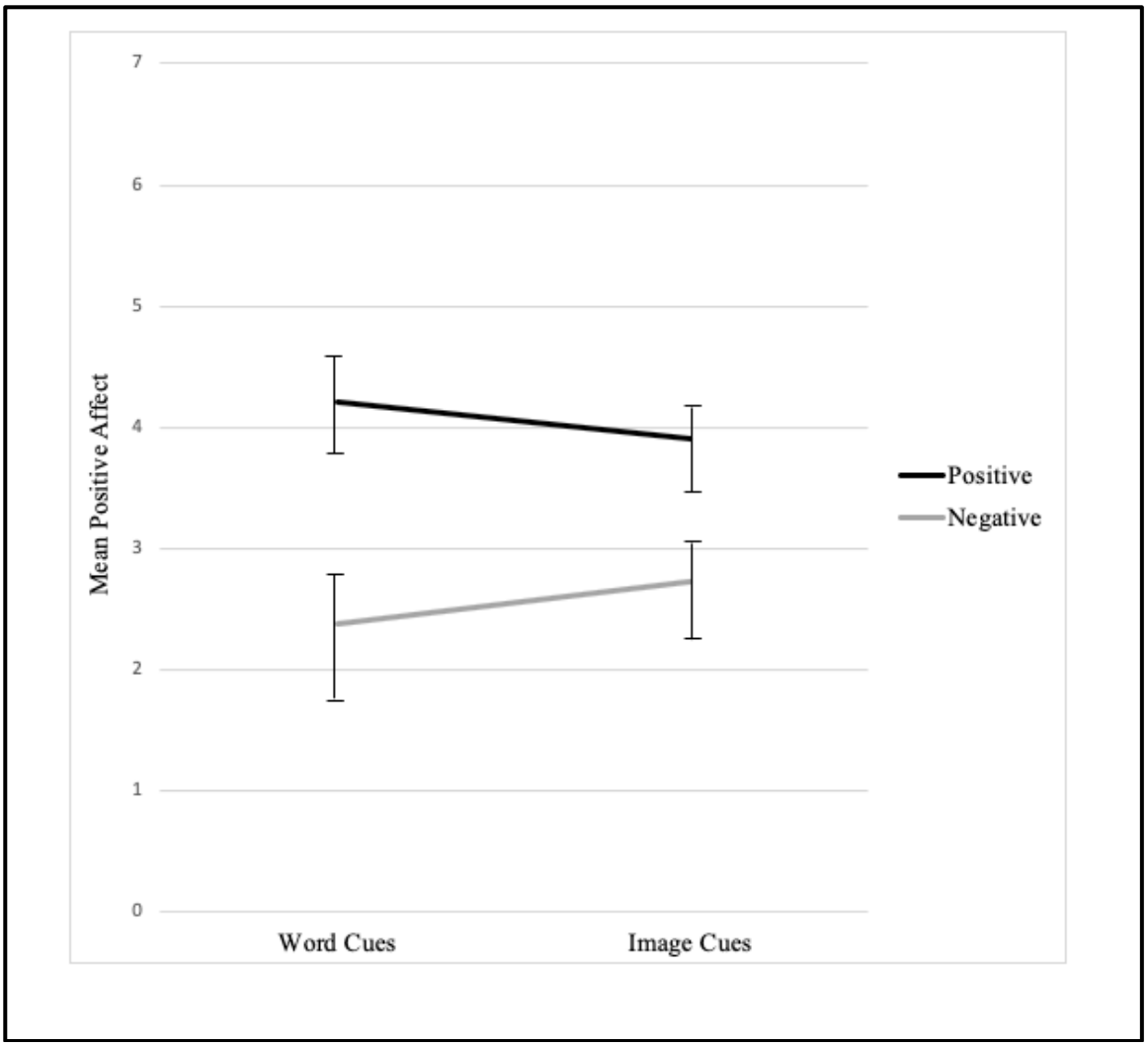


Figure 120. Interaction Effect of Cue Type x Cue Valence on Self-Reported Positive Affect in in Currently Depressed Participants (error bars: 95% CI)

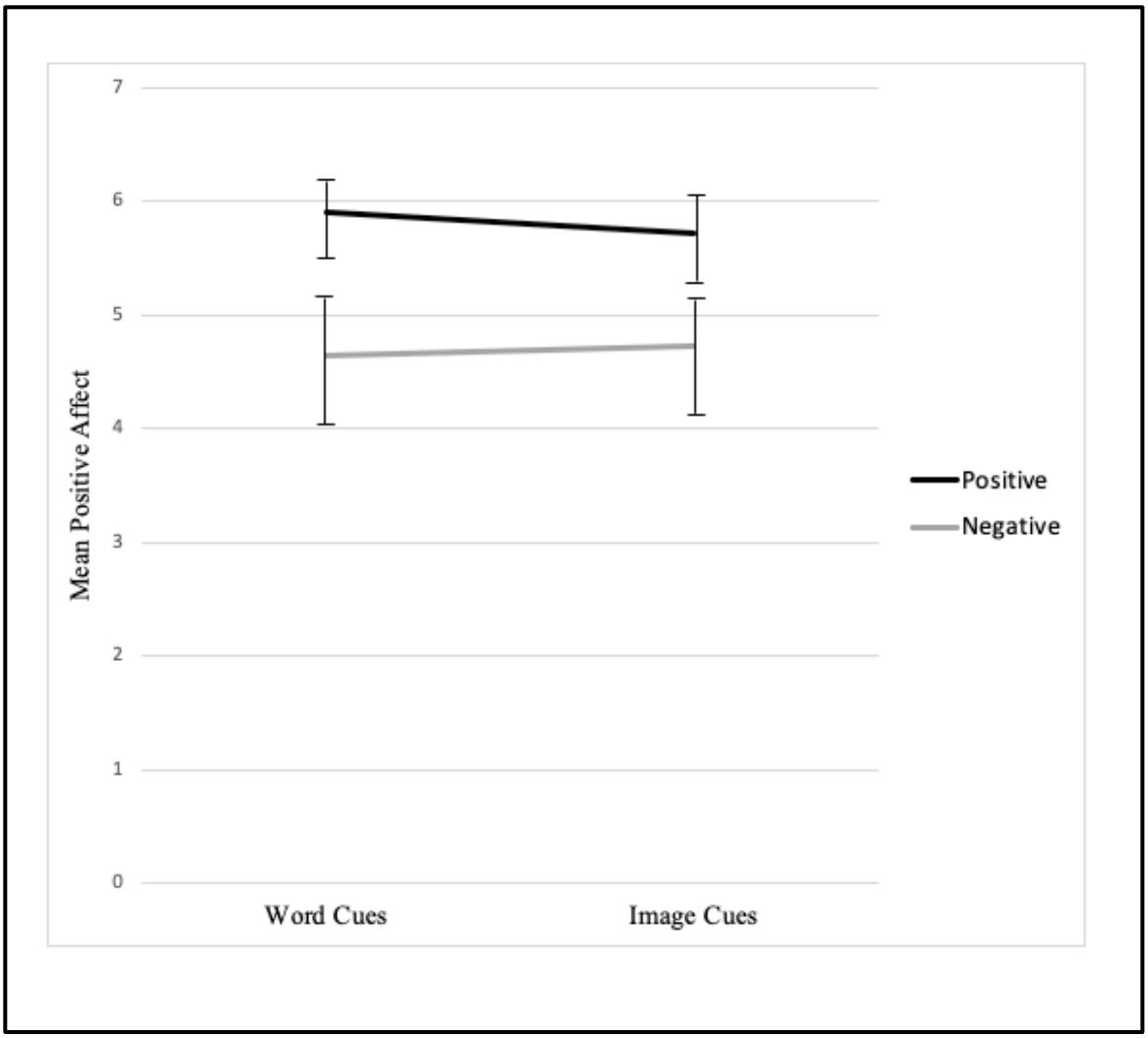


Figure 121. Effect of Cue Type x Cue Valence on Self-Reported Positive Affect in in Never-Depressed Participants (error bars: 95% CI)

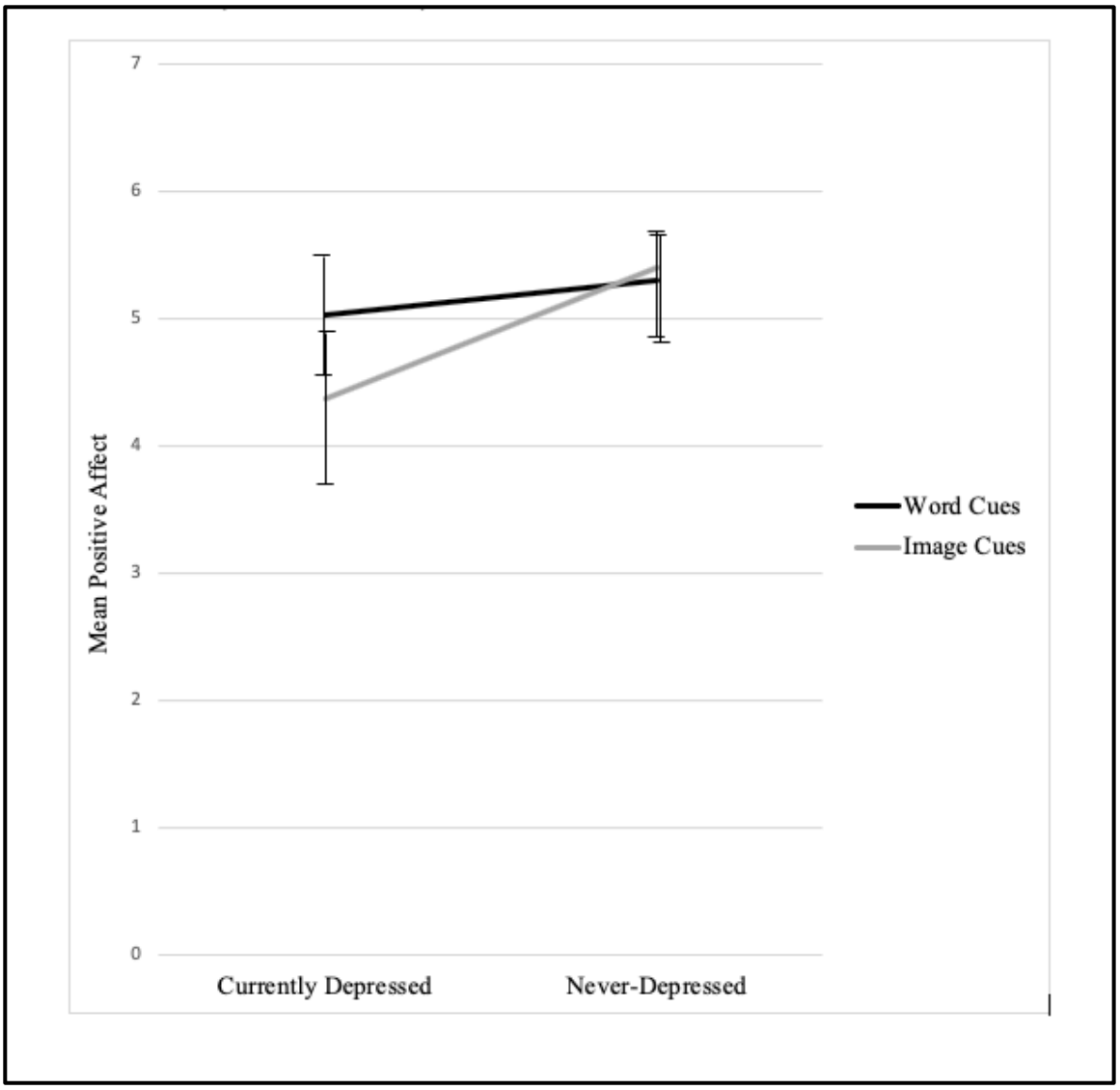


Figure 122. Interaction Effect of Group x Cue Type on Self-Reported Positive Affect for Positive Cues (error bars: 95% CI)

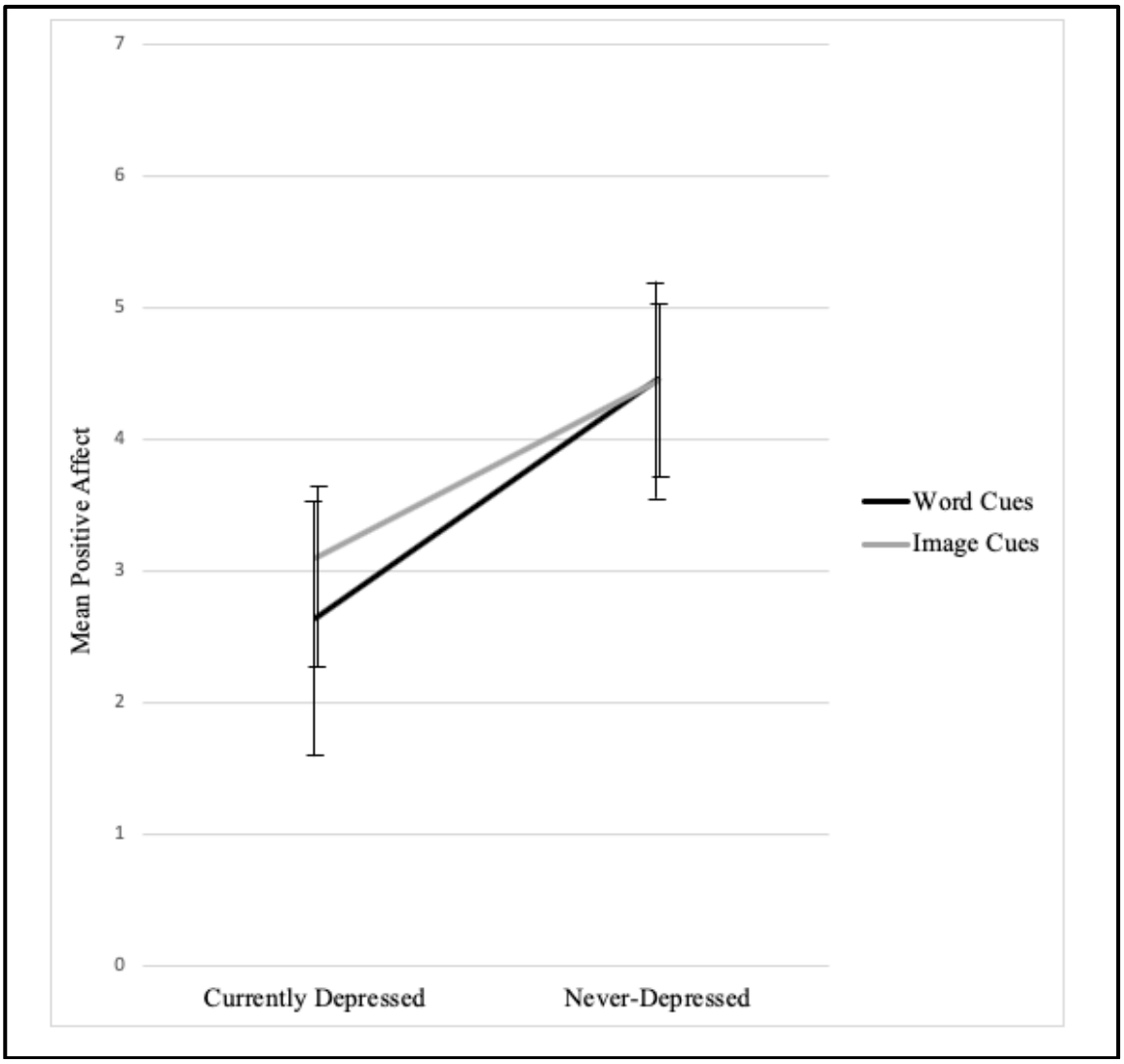


Figure 123. Effect of Group x Cue Type on Self-Reported Positive Affect for Negative Cues (error bars: 95% CI)

APPENDIX C: FINAL SET OF WORD - IMAGE PAIRS

Positive Cues

Pair #1 Laughter

(Positive Image -1)

Pair #2 Relaxed

(Positive Image - 2)

Pair #3 Happy

(Positive Image - 3)

Pair #4 Cheer

(Positive Image - 4)

Pair #5 Love

(Positive Image - 5)

Pair #6 Celebrate

(Positive Image - 6)

Pair #7 Surprise

(Positive Image - 7)

Pair #8 Success

(Positive Image - 8)

Negative Cues

Pair #1 Sad

(Negative Image - 1)

Pair #2 Damage

(Negative Image - 2)

Pair #3 Overwhelmed

(Negative Image - 3)

Pair #4 Stress

(Negative Image - 4)

Pair #5 Humiliate

(Negative Image - 5)

Pair #6 Grief

(Negative Image - 6)

Pair #7 Punishment

(Negative Image - 7)

Pair #8 Reject

(Negative Image - 8)

APPENDIX D: FINAL CUES FOR PRACTICE TRIALS

Practice Word Cue

Keyboard

Practice Image Cue

(Neutral Image – 1)

APPENDIX E: CODING MANUAL

Specificity

DEFINITION(S)

Specific autobiographical memory = a memory of an event that occurred in one's personal past. The event lasted a day or less, and occurred at a certain place and time, even if the subject does not remember when.

Non-specific autobiographical memory/overgeneral autobiographical memory = a memory of an event that occurred in one's personal past. The event lasted *longer* than a day and/or reflects a repeated situation.

CODING/ANCHORS

0 = Specific autobiographical memory

1 = Non-specific autobiographical memory/general

2 = Other (autobiographical fact; non-autobiographical memory; etc.)

IMPORTANT CONSIDERATIONS

- If the memory is coded 0 (specific) or 1 (general), code the other memory characteristics as well. If the memory is coded as a 2 (other), do NOT code the remaining characteristics.

- Pay attention to the language used and contextual details provided to help determine if the response is a specific or non-specific/overgeneral autobiographical memory (ex: "On this particular day…."; "this one time…."; "during my high school graduation".) However, also keep in mind that a subject may use this language, but the response may not truly reflect a specific memory.

- If the subject's response is mostly a non-specific/overgeneral event, but at some point the subject makes a sufficient reference to a specific event, code the response as "0 – specific autobiographical memory"

- If a memory is unclear regarding whether the subject was there at the event (if it could go either way – present at the event or heard about it), give the subject the benefit of the doubt and assume that the subject was there.

- If the subject's response included recalling something like a tv show or youtube video, in order to count as an autobiographical memory, the subject would also need to describe their subjective experience at some point.

EXAMPLES

Response coded as "**specific/ 0**"
• "I'm originally from a rural part of (state), but I moved to (city) for college, so it was a huge culture shock. I distinctly remember the first day of school because I decided to walk to school that day. I remember walking on the sidewalks in the city and looking all around me and just being mesmerized because the buildings were so tall and everything looked so industrial. I'd never seen anything like that in my hometown. There were so many people too, most were dressed in suits and business clothes and they were going into the different tall buildings. The sidewalks were pretty crowded too and I accidentally ended up bumping into people a few times because I was looking up at the building and wasn't watching were I was going".

Response coded as "**non-specific/overgeneral/ 1**"
• "So, I lived in (city) for a year, and just like walking to school every day, I'd see the city and the tall buildings and the narrow streets. Everything was so industrial and there was always so many people on the sidewalks. This picture reminds me of that."

Response coded as "**other/ 2**"
• "This looks like (city) where my sister goes to school now. She moved to (city) last year." • "This reminds me of my keyboard cover on my laptop. It's really dingy, so I'm planning to get to Office Depot or Staples this weekend to buy a new one."

Valence

DEFINITION(S)

Valence = emotional tone AND emotional intensity of the event at the time.

CODING

- Ratings range from -5 to +5.

ANCHORS

-5 = extremely negative tone of the event PLUS high emotional intensity

0 = neutral OR both mildly negative/mildly positive with low emotional intensity

5 = extremely positive tone of the event PLUS high emotional intensity

IMPORTANT CONSIDERATIONS

- Your rating for this characteristic should factor in emotional tone of the event AND the level of intensity/arousal of emotions at the time of the event.
- Consider OVERALL tone, even if it not happen directly to the subject.
- Pay attention to the subject's description of behaviors, thoughts, and emotions present at the time of the event.
- DO NOT factor in the emotional response present at recall (i.e., in the study session). For example: if the person is discussing a negative event, but at recall is giggling, do not factor in the giggling in the rating for this memory characteristic.
- Pay attention to the words and detailed used by the subject to describe the event and/or their emotional state/emotional reaction during the event. Example: annoyed → angry→ enraged reflect increasing degree of emotional intensity.
- You can think of emotional intensity/arousal as ranging from calm/soothing to exciting/agitating.
- When coding this characteristic, consider the overall tone of the memory, the experience described, and feelings at the time. If both negative and positive aspects are present, consider the degree to which is present. If both negative (high-moderate) and positive (mild) aspects are present, ratings should be in the lower end of the scale. On the other hand, if both negative (mild) and positive (high-moderate) aspects are present, ratings should be in the higher end of the scale.

- Taking into account all the emotions mentioned and the intensity. If both positive and negative emotions are present, adjust the rating to reflect this.

Response coded as "-4 to -5" for Valence
P: um:: So: I toured (school) ah: f - for like initiate ah: what is it ? ah I forgot what is it called but like basically you know you just see the campus and they explain things to you ((sigh)) , ah:: an:d my mom showed up a couple of hours early before I got to go and she started yelling at me like what are you wearing: um you look ((sigh)) you look like a slut and then um: , that my dog was dying because she left him on: the:: um ((laugh)) on the balcony for two days or n- not two days it was probably like a day .. and ((laugh)) she did all of this in front of my friend and then started yelling at me that I can't ah plan things well enough ? ah: and: then: ((sigh)) I: (wanted to go) back to the hotel I didn't want to talk to her at all: , we got into a physical fight because she couldn't understand that .. ((sigh)) it was just .. – It was humiliating ((wept)) ((Alarm Beeping)) E: okay .

Response coded as "-2" for Valence
P: uh:.. so (theme park) .. (inhales) i think it was like new year's ev:e maybe? im not quite sure what day it was but there supposed to be .. fir:eworks an:d uh my stepfather and my mom .. and me . i didn't want to be there all day long and i was there at night waiting for fireworks that .. didn't- i don't think they ever happened ? i think there was like technical difficulties and we just waited there and uh .. at (theme park) and (just) very unhappy that day ((ahem)) my mom got mad at me because she was paying so: much money for me to go to this amusement parks ((inhales)) and uh::: oh i kept having to look after my sister while they went on fun rides E: okay. Do you remember anything else about this event P: nh:: peng:u:in ride she was so excited for me to go: and i just- i really didn't want to go so- and i don't know if it was cold ((Alarm Beeping))

Response coded as "-1" for Valence
P: um .. last yea:r .. i:n actually eleventh grade um .. we were in English: class , and we weren't allowed to eat in high school , like in class ? um .. this girl started eating an apple in the back of the classroom , and our teacher .. made: her throw the apple away so she just walked into the hallway , and stood behind the door till she finished the apple , and she was out there for like ten minutes and they were like arguing through the doorway back and forth with the teacher [((laughs))

E: [((chuckles)) do you remember anything else from the event ?

P: u:m.. no: , that was pretty much it . ((laughs))

Response coded as "+1" for Valence

P: um:: .. in: two-thousand-eight when I first came to (country) .. uh:: we::- me and my siblings stayed with my aunt , over the summer

E: uhum .

P: and then I can remember . one day we were in the house , in her apartment .. which um: .. is located in a building similar to those .

E: uhum .

P: and then I can remember one day we were in the apartment around like , one p m just playing video games with my cousins .

E: uhum

P: so her sons .. and we were playing video games together having fun , an:d yes: . and … we were playing Fifa .. its:- it was in two-thousand:- two-thousand-eight , so Fifa oh eight .. back then . and then we were just taking turns playing together an:d just having fun !

Response coded as "+2" for Valence

P: um back in high school, there was a uh- uh a concert. and I was playing the keyboard, it was for an exam. um, but it was to an audience. a:nd I played one of the Alicia Key's songs, a:nd in that moment, I was nervous! very, very nervous cause of the crowd but um: after getting into the song, I: felt great and at the end, when everyone was clapping, it felt like I was on top of things! um.. that's: all I can remember? [now

E: [okay, any other details?

P: everyone congratulated! me after the whole concert! and that we wen- we went out! that-that's it.

Sensory Detail

DEFINITION(S)

Sensory details = the degree to which the subjects recalls what they sensed (sight, sound, smell, touch, taste) during the event, and the quality/detail of the description.

CODING

- Ratings range from 1 to 10.

ANCHORS

1 = low sensory detail (1 sense with very little or no detail)

3-4 = referencing ~2 senses but with little detail

5 = moderate sensory detail (references 2+ senses, with moderate detail OR 1 sense with high detail)

10 =high sensory detail (references 2+ senses, with high detail)

IMPORTANT CONSIDERATIONS

- To count for sensory detail, the sense needs to include a descriptor/adjective
- SIGHT – seeing overt sights, behaviors, etc.
- SOUND – speech or words with an auditory element
    - A reference to talking in and of itself would NOT count. It would only count if they add a descriptor/adjective (ex: loud talking")
- SMELL – subject needs to make a specific reference to a smell
- TOUCH – to count, the subject needs to refer to the experience of the touch
    - "I picked up the pen" – this would NOT count
    - "I picked up the pen and it was heavy" – this WOULD count.
- TASTE – subject needs to make a specific reference to a taste
    - " I eat a cheesecake" - this would NOT count

- "I eat the cheesecake and it was so sweet" – this WOULD count.

Response coded as "+1 to +2" for Sensory Detail
P: um:: .. in: two-thousand-eight when I first came to (country) .. uh:: we::- me and my siblings stayed with my aunt , over the summer E: uhum . P: and then I can remember . one day we were in the house , in her apartment .. which um: .. is located in a building similar to those . E: uhum . P: and then I can remember one day we were in the apartment around like , one p m just playing video games with my cousins . E: uhum P: so her sons .. and we were playing video games together having fun , an:d yes: . and … we were playing Fifa .. its:- it was in two-thousand:- two-thousand-eight , so Fifa oh eight .. back then . and then we were just taking turns playing together an:d just having fun !

Response coded as "+3" for Sensory Detail
P: um:: So: I toured (school) ah: f - for like initiate ah: what is it ? ah I forgot what is it called but like basically you know you just see the campus and they explain things to you ((sigh)) , ah:: an:d my mom showed up a couple of hours early before I got to go and she started yelling at me like what are you wearing: um you look ((sigh)) you look like a slut and then um: , that my dog was dying because she left him on: the:: um ((laugh)) on the balcony for two days or n- not two days it was probably like a day .. and ((laugh)) she did all of this in front of my friend and then started yelling at me that I can't ah plan things well enough ? ah: and: then: ((sigh)) I: (wanted to go) back to the hotel I didn't want to talk to her at all: , we got into a physical fight because she couldn't understand that .. ((sigh)) it was just .. – It was humiliating ((wept)) ((Alarm Beeping)) E: okay .

Response coded as "+5" for Sensory Detail
P: um I was riding bikes down the street to my grandma's house with my friend and my uncle. I was li:ke probably like ten: or younger and um .. I hit a rock and .. like slid on it was like gravel or like dirt road so it was like rocks and I slid and like scraped up

my elbows and my chin and had to like run back to my grandma's house and get patched up and I was like crying and screaming .. ((laughs))

E: do you remember any other details from that event?

P: umm .. well my mom was: already at my grandma's house for some reason which was so weird to me that she was already there ? .. before I even got back , and umm .. it was like just down the stree:t ! from..- but I didn't know - like how to get back so they had to … like carry me back . to my grandma's house and my bike .. that's all I remember . ((chuckles))

((alarm beeping))

Response coded as "6" for Sensory Detail

P: um so in July of twenty sixteen , um my um brother , sister, and dad , we all went to (city) for one day as part of one of our fit- like our vacation in (state) 'cause I was born in (state) and uh we had a lo- we have a lot of family obviously still there so we went to (city) for the day um we rode the subway in really early in the morning , (popular attraction site in the city) , I was wearing a Breaking Bad T-shirt , and uh the first thing we did was walk around we went to like walked past (popular attraction site in the city), walked past (popular attraction site in the city), then we went to this national- the national science museum , and it was k- it's kinda a free thing ahm: like you don't have to pay to get in 'cause it's a national museum but my friend's dad still like offered them money for us to go in , um I remember I was like really interested because they had like all these cool metals and stuff because I'm a chemical engineer, and um after that , we ate at this diner like right outside of (popular attraction site in the city), but not in (popular attraction site in the city) because (popular attraction site in the city) was too expensive , and then [we ended up going to my brother's (xxx)

[((Alarm Beeping))

Coherence

DEFINITION(S)

Coherence = the degree to which the recalled memory involves a contextualized, logical story line.

CODING

- Ratings range from 1 to 10

ANCHORS

1 = low coherence (no time-marker, unclear chain of events/no logical storyline)

4 = missing 1 of the 3 stages of story (beginning, middle, or end), but has some time marker, context

5 = moderate coherence (provides a broad, logical understanding of beginning, middle, and end of story with some detail.)

5-10 = amount of detail (nature of the time marker) would dictate where in this range it would fall.

10 =high coherence (specific date – month/day/year PLUS clearly articulated and very detailed beginning, middle, and end of event

IMPORTANT CONSIDERATIONS

- When coding this characteristic, pay attention to the degree to which the order of events in the memory is logical and clear. A response should receive a lower rating if it reflects the blending of similar events/themes or if the memory of the event is presented in bits and pieces.

- Time marker is not requirement, but can be taken into account for rating.

- If the experimenter prompts for additional detail and the subject *provides minor detail that is not significant to the story line*, don't factor it into the rating.

- If the experimenter prompts for additional detail and the subject *provides information that is significant to the story line*, factor this into the rating for coherence.

Response coded as "+2" for Coherence
P: um:: So: I toured (city) ah: f - for like initiate ah: what is it ? ah I forgot what is it called but like basically you know you just see the campus and they explain things to you ((sigh)) , ah:: an:d my mom showed up a couple of hours early before I got to go and she started yelling at me like what are you wearing: um you look ((sigh)) you look like a slut and then um: , that my dog was dying because she left him on: the:: um ((laugh)) on the balcony for two days or n- not two days it was probably like a day .. and ((laugh)) she did all of this in front of my friend and then started yelling at me that I can't ah plan things well enough ? ah: and: then: ((sigh)) I: (wanted to go) back to the hotel I didn't want to talk to her at all: , we got into a physical fight because she couldn't understand that .. ((sigh)) it was just .. – It was humiliating ((wept)) ((Alarm Beeping)) E: okay .

Response coded as "+4" for Coherence
P: um:: .. in: two-thousand-eight when I first came to (country) .. uh:: we::- me and my siblings stayed with my aunt , over the summer E: uhum . P: and then I can remember . one day we were in the house , in her apartment .. which um: .. is located in a building similar to those . E: uhum . P: and then I can remember one day we were in the apartment around like , one p m just playing video games with my cousins . E: uhum P: so her sons .. and we were playing video games together having fun , an:d yes: . and … we were playing Fifa .. its:- it was in two-thousand:- two-thousand-eight , so Fifa oh eight .. back then . and then we were just taking turns playing together an:d just having fun !

Response coded as "+5" for Coherence
P: It was in Business Keyboarding class on a specific day when we had a project to do with the Power Point, and this one kid goes- I can't remember his name, but he does- he gives a terrible Power Point. It was bland, it had no animations, nothing. But he plays Luther Vandross in the background and barely gets by all the information he needs, and the teacher gives him an A plus.. because she's super bias and loves Luther Vandross and he took advantage of that. But I had a bomb Power Point with everything anybody could

ask for and more information than what it was required, but I get a C minus. And she did this specifically because she didn't like me and she justified it out right with saying You didn't play Luther Vandross and he did. And that just got under my skin for the entire day

((alarm beeping))

Response coded as "7" for Coherence

P: um so in July of twenty sixteen , um my um brother , sister, and dad , we all went to (city) for one day as part of one of our fit- like our vacation in (state) 'cause I was born in (state) and uh we had a lo- we have a lot of family obviously still there so we went to (city) for the day um we rode the subway in really early in the morning , (popular attraction site in the city) , I was wearing a Breaking Bad T-shirt , and uh the first thing we did was walk around we went to like walked past (popular attraction site in the city), walked past (popular attraction site in the city), then we went to this national- the national science museum , and it was k- it's kinda a free thing ahm: like you don't have to pay to get in 'cause it's a national museum but my friend's dad still like offered them money for us to go in , um I remember I was like really interested because they had like all these cool metals and stuff because I'm a chemical engineer, and um after that , we ate at this diner like right outside of (popular attraction site in the city), but not in (popular attraction site in the city) because (popular attraction site in the city) was too expensive , and then [we ended up going to my brother's (xxx)

[((Alarm Beeping))

APPENDIX F: IRB APPROVAL LETTER - STUDY #1

USF
UNIVERSITY OF SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX (813) 974-7091

10/31/2018

Ena Begovic, M.A.
Psychology

RE: **Expedited Approval for Initial Review**
IRB#: Pro00037484
Title: Validation of Word and Picture Cues

Study Approval Period: 10/24/2018 to 10/24/2019

Dear Ms. Begovic:

On 10/24/2018, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Begovic_Pilot Study_IRB Protocol Guidelines_v1 .docx

Consent/Assent Document(s)*:
Pilot_Consent Form_v3.docx.pdf

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved.

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review category:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural

beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) business days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

Kristen Salomon, Ph.D., Chairperson
USF Institutional Review Board

APPENDIX G: IRB APPROVAL LETTER - STUDY #2

USF
UNIVERSITY OF SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX(813)974-7091

10/26/2018

Ena Begovic
Psychology

RE: **Expedited Approval for Initial Review**
IRB#: Pro00037162
Title: The Impact of Cues on Autobiographical Memory Recall in Depression

Study Approval Period: 10/26/2018 to 10/26/2019

Dear E. Begovic:

On 10/26/2018, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Begovic_Dissertation_IRB Protocol Guidelines_v1.docx

Consent/Assent Document(s)*:
Dissertation_Consent Form_v3.docx.pdf

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved.

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review category:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) business days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

Kristen Salomon, Ph.D., Chairperson
USF Institutional Review Board