EFFECTS OF ATTENTION ON SUBSEQUENT PREFERENCE JUDGEMENTS IN YOUNG ADULTS AND HEALTHY OLDER ADULTS

by

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LIST OF ABBREVIATIONS

Abbreviation	Description
BIS/BAS	Behavioral Inhibition and Behavioral Activation Scales
BNT	Boston Naming Test
CERAD	Consortium to Establish a Registry for Alzheimer's Disease
DD	Distractor devaluation
DDE	Distractor devaluation effect
ERP	Event-related brain potentials
ME	Mere exposure
MEE	Mere exposure effect
MMSE	Mini Mental State Examination
PANAS	Positive and Negative Affect Scale
STAI	State-Trait Anxiety Inventory
WM	Working memory
A-I	Subtraction of the average liking between attended and ignored words

ABSTRACT

The mere exposure effect, the tendency to like items that have been previously encountered more than new items, has been explored in great detail in many studies. Many effects are known to modulate the mere exposure effect, such as attention, amount and number of exposures, and certain personality traits. Recently, an attentional manipulation called the distractor devaluation effect has been shown to decrease preference for ignored stimuli. We conducted two experiments to investigate how attentional manipulations would affect the subsequent preference for attended, ignored, and new words. Aging often impacts performance on tasks requiring attention so we examined both young adults and healthy older adults. Results from both Experiment 1 and Experiment 2 showed the mere exposure effect, with older words being liked more than new words. When separating out attended versus ignored old words, we observed differences in the mere exposure effect between Experiment 1 and Experiment 2. In Experiment 1, we found attended words were liked significantly more than new and ignored words, whereas, in Experiment 2, there was no significant differences seen when comparing attended, ignored, and new words. In Experiment 1, we also observed an interaction between age and word condition. While both age groups found the attended words most likable, young adults liked the new words the least whereas older adults liked the ignored words the least. These differences show that there are still important questions to be answered regarding preferences and the role of attention.

I. INTRODUCTION

Effects of attention on subsequent preference judgments in young adults and healthy older adults

How people perceive and remember information can be influenced by where, when, and how many times they have been exposed to that information. The mere exposure effect refers to the tendency of individuals to prefer items that they have seen before over new items (Zajonc, 1968). This chapter first discusses and reviews current literature on the mere exposure effect, how certain factors may modulate an individual's evaluation of items, and how the mere exposure effect and attention might be impacted by aging. This literature review describes the important, unanswered questions that the two current experiments examine.

Types of Memory

There are many different types of memory and one of the most important distinctions is between working memory (or short-term memory) and long-term memory. Working memory is a limited capacity memory that is used to manipulate information temporarily, and long-term memory involves the storage and retrieval of information across a delay (Baddeley & Hitch, 1974). Long-term memory can be further broken down into explicit and implicit long-term memory. The primary difference between explicit and implicit memory involves whether memory retrieval involves conscious (explicit) awareness or not (implicit) (Graf & Schacter, 1985). Explicit memory is further subdivided into episodic and semantic memory. Episodic memory is an individual's memory of events, whereas semantic memory is an individual's memory for facts (Tulving, 1972). Implicit memory includes conditioning and procedural memory. Another type of well-studied implicit memory effects is repetition priming, which occurs

when participants show improved accuracy and reduced reaction times on subsequent tasks after prior exposure to a stimulus even without conscious awareness of having encountered the item before (Tulving & Schacter, 1990; Schacter & Buckner, 1998). Another effect that is generally considered to be a type of implicit memory is the mere exposure effect, and it is related to how individuals evaluate items.

The Mere Exposure Effect

In the 1960's Zajonc began investigating a memory phenomenon in which people demonstrate a preference for previously encountered items compared to new, unfamiliar items (Zajonc, 1968). Bornstein (1989) eventually coined the term *the mere exposure effect* in his review of Zajonc's studies. The effect occurs in everyday situations, such as when songs are repeatedly played on the radio, which results in people finding them more enjoyable and catchy (Rothenbuhler, 1985; 1987). The mere exposure effect can also be seen in marketing and advertisements, with the sellers hoping that you will be enticed to purchase their products if you are exposed to them more (Perfect & Askew, 1994).

Bornstein (1989) conducted a meta-analysis covering mere exposure studies from 1968 through 1987. In total, there were 208 experiments included in the meta-analysis. Mere exposure has been elicited using a number of stimuli types (ideographs, auditory, nonsense words, images, etc.) establishing it as a robust effect that is not specific to a certain class of stimulus. Berryman (1984) did a direct comparison of two stimulus types, nonsense words and simple drawings, and found no significant difference between stimulus types on participants' liking ratings. Bornstein (1989) also examined how the number of exposures impacted mere exposure, and it was found that, after so many exposures, a ceiling effect emerged for participants increased preference. This ceiling can

occur at around 10 exposures (Stang & O'Connell, 1974; Zajonc et al., 1972), so it may be optimal to have a range of 1 to 10 exposures for a mere exposure study (Bornstein, 1989). Length of exposure also can have an effect on the mere exposure effect, with ratings of the stimuli creating an inverted U shape as exposure increases (Bornstein, 1989; Hamid, 1973). At first, as exposure length increases, the rating of the stimuli will also increase. However, this effect will plateau and even begin to show a decrease in ratings as the exposure length becomes too long (Bornstein, 1989; Hamid, 1973). Several studies have shown that individuals will still show an increased preference for items they have been exposed to before, even if these items were presented subliminally (Bornstein, 1989). Kunst-Wilson and Zajonc (1980) showed that participants who were subliminally presented stimuli still displayed the mere exposure effect by liking old items at greater than a chance rate in a forced-choice test. Participants did not correctly identify which items were old or new at a greater than chance rate, however, when testing for their recognition. Studies like these have demonstrated that the mere exposure effect can occur subliminally, and without conscious recognition of the stimuli.

Initial theories for the mere exposure effect involved the affective processing theory. Zajonc (1968) proposed that affective processing was the mechanism underlying the mere exposure effect. The affective processing theory suggests that exposure to novel stimuli will result in a fear response, but, in the absence of any negative results or danger, this fear will be reduced when exposed to the stimulus again. This reduction in fear, in turn, results in an increase in affect towards the stimulus (e.g. the mere exposure effect). Next, the two-factor model theory was introduced because researchers believed the level of complexity or arousal the stimulus invoked could affect the mere exposure effect

(Berlyne, 1970). The two-factor model proposes an inverted U-shaped pattern will occur when evaluating stimuli of varying processing difficulty (Berlyne, 1970; Stang, 1974). Stimuli that provide little arousal and few processing requirements, and also stimuli that are too arousing and require too much processing, will not be positively evaluated. Stimuli in the middle (intermediate levels of processing and arousal) will be evaluated positively.

Another prominent theory used to describe the processes involved in the mere exposure effect is the perceptual fluency/attributional theory (Borstein, 1992; Bornstein & D'Agostino, 1994; Seamon et al., 1995). Stimuli that have been previously seen will be easier to process, and this ease of processing results in an increase in the preference for those items because they misattribute the ease of processing as positive affect for the items (Bornstein, 1992; Jacoby, 1983; Jacoby & Kelly, 1987; Jacoby & Whitehouse, 1989). New stimuli do not receive an increase in evaluation because they require initial processing to recognize and evaluate them.

Although the mere exposure effect has been replicated in many studies (Bornstein, 1992; Butler, Berry, & Helman, 2004; de Zilva, Vu, Newell, & Pearson, 2013; Hicks & King, 2011; Jacoby & Whitehouse, 1989; Willems, Dedonder, & Van der Linden, 2010; Winograd et al., 1999; Zajonc, 1968), researchers are still investigating how this effect is related to other types of memory. The mere exposure effect appears similar to repetition priming effects because both result in a change in performance after exposure without the need for conscious awareness. Butler and Berry (2004) compared the mere exposure effect to repetition priming in a meta-analysis and found that their analysis was mixed as to whether mere exposure was another type of repetition priming.

There appeared to be a common underlying mechanism between mere exposure and repetition priming, but there were still many differences found, such as stimulus novelty. Butler, Berry, and Helman (2004) directly compared mere exposure to repetition priming effects using words and nonwords. In their first experiment, they examined repetition priming for words and nonwords using a perceptual identification test. They found a significant repetition priming effect as participants were more accurate at identifying studied words and nonwords than the unstudied words and nonwords. In their second experiment, they examined the mere exposure effect by having participants make preference judgments for studied words and nonwords as well as new words and nonwords. The results of their second experiment showed that participants showed the mere exposure effect for nonword stimuli because they rated the studied nonwords as more preferential than the unstudied nonwords. However, participants showed no mere exposure effect for real words. The results of this second experiment further weakened the argument that the mere exposure effect is simply another type of repetition priming, since participants did not prefer real words they had been exposed to over words that they had not, while participants in the priming condition were primed regardless of the meaningfulness of the stimuli.

There have also been examinations of the relationship between the mere exposure effect and familiarity. Willems, Dedonder, and Van der Linden (2010) compared the mere exposure effect to explicit recollection as they believed potentially familiarity process might underlie the mere exposure effect rather than perceptual fluency. In the dual-process theory of recognition memory (Yonelinas, 2002), there are two processes that can be used for successful recognition memory. First, there is recollection, which

requires retrieval of specific context and details or by familiarity, the acontextual feeling of having encountered an item previously, which can be argued as similar to how the mere exposure effect works. Their study suggested that the mere exposure effect, despite not being explicit recognition, also may not be a clear-cut implicit type of memory.

Although the mere exposure effect has been studied extensively and is a robust effect, there are still many questions to be investigated. It is still not clear whether the two-factor theory, perceptual fluency theory, or potentially a combination of the two theories explain the mere exposure effect. Further examination is necessary to fully understand what factors can affect or change the mere exposure effect.

Factors that Modulate the Mere Exposure Effect

Along with exposure duration, different stimuli types, and varying repetitions, several studies have investigated further other factors that modulate the mere exposure effect. Although there are many different ways that the mere exposure effect could be modulated, we have chosen to focus on a select few: stimuli meaning, individual differences, awareness, and attention.

Meaningfulness of Stimuli

Voss, Lucas, and Paller (2010) conducted a study where participants viewed very low frequency words and were asked to make meaningfulness ratings about these words. The subsequent test asked them to make liking judgements on both the words they had seen previously and new words. Their findings showed that the mere exposure effect was only found for words participants had rated as more meaningful, not for words rated low in meaning. Their findings are surprising as it might have been predicted that the mere exposure effect would occur for all words previously viewed, as seen in the subliminal

mere exposure experiments, regardless of their meaningfulness to the participants. Additionally, these findings seem to be the opposite of the findings of Butler, Berry, and Helman (2004) who found that participants displayed the mere exposure effect only for nonwords, which could be viewed as low in meaning.

Individual Differences

If affective processing is responsible for the mere exposure effect, then individual differences in emotional responses could affect the mere exposure effect. Modulation of the mere exposure effect due to state or trait anxiety was observed by Ladd and Gabrieli (2015). In two studies, they were able to observe that both higher chronic anxiety (trait anxiety) and higher fluctuating anxiety (state anxiety), as evaluated by the State-Trait Anxiety Inventory (STAI), reduced the mere exposure effect. This finding is an interesting exception to the general findings that the mere exposure effect increases positive feelings about a stimulus. These findings are supported by the affective processing theory because increased anxiety would result in a decrease in the fear reduction that is normally seen with the mere exposure effect after initial exposure to the stimuli.

Attention and Awareness

Studies have also explored the effect of conscious attention modulation on the mere exposure effect. Yagi, Ikoma, and Kikuchi (2009) found that attentional selection can alter the mere exposure effect. Using unfamiliar polygon shaped stimuli, they conducted a study to examine the effects of attention on the mere exposure effect. In their study, they indicated a target (i.e. telling the participant to attend only to the green polygon, though they were presented an overlapping image of a red and green polygon)

and have the unattended polygon be the distractor. Following the exposure section, they had the affective judgement section. Participants were instructed to indicate which of two polygons (one old, one new) they preferred. Their study concluded that objects not attended to would not show the effect, even when participants showed recognition of the unattended objects. The findings of this study contradict what would be expected from studies demonstrating that the mere exposure effect can occur subliminally.

Huang and Hsieh (2013) investigated the mere exposure effect and selective attention using unfamiliar faces. A binocular rivalry paradigm was used to present faces to participants in their study. During the first block, both faces would be visible to each eye, and participants were asked to memorize them both. After four seconds, the binocular rivalry phase would begin. During binocular rivalry, one of the faces would be presented only to the left eye, while the other face would be presented to only the right eye. This results in binocular rivalry because the eyes are receiving two completely different images, and therefore conscious perception of the two images will shift between the two. Participants would indicate which face was the dominant precept by pressing a button, during this phase. The second block of the study was the evaluative and recognition task. Participants were first asked to rate the trustworthiness of new and old faces, and then asked if they remembered attending to it during block one. Results from their study showed that an overall mere exposure effect was found because previously exposed faces were more positively evaluated than novel ones. When looking at attended faces separately, they also were significantly evaluated as more positive than new faces. Unattended faces, however, were not significantly different from new faces. They concluded that evaluations were improved by selective attention (determined by which

image the participant indicated was the dominant precept) and evaluations were not improved by mere visual awareness.

Conscious awareness has further been shown necessary for the mere exposure effect by de Zilva, Vu, Newell, and Pearson (2013). They used conscious flash suppression (a method used to mask the presentation of stimuli) to present stimuli to participants with and without awareness. Results from their study showed that consciously presenting stimuli to their participants increased the mere exposure effect and recognition, but unconsciously presenting stimuli did not result in the mere exposure effect. The findings of these studies contradict the findings of studies that previously have established that the mere exposure effect can occur subliminally (Bornstein, 1989; Bornstein & D'Agostino, 1992; Monahan, Murphy, & Zajonc, 2000; Murphy, Monahan, & Zajonc, 1995; Hicks & King, 2011). These contradictory findings about how attention or awareness modulates the mere exposure effect suggests that more investigation is necessary.

The Distractor Devaluation Effect

The distractor devaluation effect is another type of attentional manipulation that has been shown to affect people's preference for items. The first examination of the distractor devaluation effect was presented by Raymond, Fenske, and Westoby (2005). Their study involved participants focusing on a target object while ignoring the other objects displayed at the same time. The participants were then instructed to perform immediate emotional evaluation ratings either for the distractors or targets. Results of their study found that the distractors were rated significantly more negatively than targets. Additionally, they found that proximity to the target also affected the

participants' ratings with the distracters closest to the target receiving the lower evaluations than distractors farther away. Their explanation for why this may have occurred is that there were attentional inhibitory processes involved that resulted in subsequent lower ratings for the distractor objects. This is contrary to what the mere exposure effect would have predicted. Distractor devaluation also negatively affects reaction times, as seen in a negative priming paradigm where distractor stimuli were responded to much slower as well as more negatively (Griffiths & Mitchell, 2008). Devaluation of ignored stimuli also appears to be feature-based; new stimuli that share a particular feature (i.e., color) with the distractor stimuli were also negatively evaluated (Goolsby, Shapiro & Raymond, 2009). Furthermore, similar to the mere exposure effect, the distractor devaluation effect can still be found when the participants display no recognition memory for the distractor stimuli (Martiny-Huenger, Gollwitzer, & Oettingen, 2014).

In an event-related potential (ERP) study by Kiss et al (2007), participants rated target and distractor faces in a working memory task. Behavioral results from their study showed replication of the distractor devaluation effect as participants rated distractor faces a less trustworthy than target faces. ERP results showed an increase in amplitude (in the N2pc component associated with attention) was appearing earlier for trials where distractors were negatively rated (rated as less trustworthy). In those trials, participants were able to direct their attention towards the target, and they were able to inhibit the distractor faces. In trials where distractors were rated as more trustworthy, this N2pc amplitude had a delayed onset. This delay potentially reflected a decrease in attention during those trials. Therefore, the distractors were not properly inhibited for those trials,

which would explain the increased rating for those faces. The researchers concluded that attentional selection was vital to the distractor devaluation effect.

Researchers have examined the effects of different instructions regarding the relevancy of items during encoding. Vivas et al. (2016) found that they could manipulate the mere exposure effect by instructing participants to forget the target items (faces and words) during the encoding phase. This instruction to forget resulted in a negative evaluation of these targets later. This target devaluation is contrary to what the mere exposure effect would anticipate because, despite being told to forget the targets, participants were still exposed to them. The mere exposure effect would suggest the participants should have still rated those targets more positively. The results of this study demonstrated that stimulus relevancy can result in a different pattern of evaluation than the mere exposure effect. Dittrich and Klauer (2012) have demonstrated a similar effect with distractor devaluation. In their study, they were able to counteract negative ratings for distractors by informing participants that they would be task-relevant later in the study. Although these items were still distractors, making the participants believe they would be important at a later time suppressed the anticipated decrease in evaluation, as expected by the distractor devaluation effect. These studies display that both the mere exposure effect and distractor devaluation effect can be negated or reversed by manipulating the perceived importance of targets or distractors at encoding.

The Effects of Age on Cognition

Cognitive aging, or the gradual decline of certain cognitive abilities as people age, has been an area of interest in current research. Researchers have been working to determine what areas of cognition (i.e. memory, attention, executive function) decline as

people age, and what areas seem to remain relatively intact with aging. In a meta-analysis of over 39 studies observing aging and memory (25 over healthy aging, 9 in amnestic Mild Cognitive Impairment, and 5 in Alzheimer's disease), Koen and Yonelinas (2014) found a marked decline in explicit memory, particularly in the area of episodic recollection. They concluded that the data are mixed for familiarity-based episodic memory, with some studies providing evidence that there is a noticeable decline in familiarity as people age, (Belleville et al. 2011; Duarte et al. 2006; Düzel et al. 2011; Friedman et al. 2010; Parks 2007; Peters & Daum 2008; Prull et al. 2006; Wang et al. 2012), while others provide evidence that there is not a decline in familiarity as people age (Cohn et al. 2008; Jennings and Jacoby 1993; 1997; McCabe et al. 2009; Parkin and Walter 1992; Wolk et al. 2013; Yonelinas 2002). Working memory is also known to be affected in healthy normal aging, and this results in older adults performing worse on working memory tasks (Salthouse & Babcock, 1991). In studies focusing on attention and aging, older adults are often impaired at orienting their attention compared to younger adults (Dempster, 1992). Unlike explicit memory, implicit memory is typically unaffected by healthy aging (Anderson & Craik, 2000).

Attention has been shown to have an effect on implicit memory, particularly for older adults (Rowe, Valderrama, Hasher, & Lenatowicz, 2006). In Rowe et al.'s (2006) study, the stimuli used were line drawings superimposed with irrelevant letter strings. Rowe et al. (2006) found that older adults had better implicit memory for the distractor letter strings than the younger adults did. From these findings, they inferred that older adults showed better memory for the distractors due to their inability to ignore them as well as younger adults. Amer and Hasher (2014) recently demonstrated this difference by

examining priming differences between older and younger adults. Older adults in their study showed a priming effect for distractors, but this priming effect was not observed with young adults. Priming for distractors was measured by better performance on a subsequent, general knowledge task where the distractors served as potential answers. Since older adults have difficulty orienting their attention compared to young adults, it is likely that the older participants were unable to successfully inhibit their attention from focusing on the distractors, leading to better memory for distractors when tested later.

The mere exposure effect has been previously examined in healthy older adults and in patients with Alzheimer's disease, a neurodegenerative disease that results in memory impairments and eventual disruption of cognitive abilities. One study investigated this by presenting unfamiliar faces to participants and asking them to judge physical characteristics in an encoding phase (Winograd, Goldstein, Monarch, Peluso, & Goldman, 1999). In the test phase, they examined the mere exposure effect (asking which faces were liked better) by presenting both new and old faces. Additionally, they also tested explicit recognition (making an old/new response). In the mere exposure test, they found that the mere exposure effect was intact in the patients with Alzheimer's disease as they showed an increased preference for "old" faces similar to the healthy older adults. These findings suggested that the implicit preference was not due entirely to explicit recognition as the patients with Alzheimer's disease performed much worse on explicit recognition, compared to the healthy older adults, in the recognition task.

Current Study

At face value, it seems the mere exposure effect and the distractor devaluation effect could be two sides of the same coin: attending to a stimulus invokes positive

evaluations and inhibition of attention towards a stimulus results in negative evaluations. Both the mere exposure effect and distractor devaluation effect can be affected by the relevancy of the item to the participant (i.e., the word is meaningful; there is an expectation that the stimulus will be useful later), which can either positively or negatively affect evaluations (Dittrich & Klauer, 2012; Vivas et al., 2016 Voss et al., 2010). It is still not entirely clear if the two memory effects are related, so there is much more research necessary to clarify the relationship between the two effects.

It may not be the case that these two effects result from the same mechanisms, however. Most distractor devaluation studies are examining working memory, while the mere exposure effect is seemingly more of a long-term memory effect. When comparing distractors, targets, and new items, some distractor devaluation effect studies reported no differences between target and new items, which is contrary to what would be expected due to the mere exposure effect (Veling, 2007). Other studies did note more positive evaluations for targets over novel stimuli, so it may just be more difficult to elicit the mere exposure effect in a working memory task, but not impossible (Goolsby, Shapiro & Raymond, 2009; Martiny-Huenger, Gollwitzer, & Oettingen, 2014). Because older adults show decreased ability to ignore irrelevant information, it is of particular interest to examine differences in the preferences that they may have for distractor items compared to young adults (Rowe, Valderrama, Hasher, & Lenatowicz, 2006; Amer & Hasher, 2014). Examining the preferential evaluations of distractors in an older adult sample has not been explored. Memory and priming for distractor items is different in older adults compared to young adults, thus it is likely that older adults may show a different pattern of preferences when they are evaluating distractor items. Older adults could show a

different preference for ignored words, perhaps by liking them more than young adults due to increased exposure (since they may have trouble ignoring them). Young adults and older adults perform differently in many areas of cognition, so there is reason to believe that young and older adults might perform differently in tasks that examine the role of attention in the mere exposure effect.

In the current set of experiments, we will be examining the degree to which participants preference for words is based on the level of attention. Participants will be presented with two words and instructed to rate one word (the target) but not the other (the distractor). Following this encoding phase, participants will then rate how much they like all targets, distractors, and a set of new words. In addition to the measure of anxiety used by Ladd and Gabrieli (2015), we will also have participants fill out assessments of approach and inhibition, assessments of mood, and the Beck Depression Inventory. We will be examining differences in the preference for words based on their attention condition, and also investigating whether older adults and young adults show differences in their evaluations of the words. We will also test whether participants' scores on anxiety measures and the other assessments correlate with the mere exposure and distractor devaluation effects.

II. EXPERIMENT 1

Experiment 1A

Method

Participants

For this study, 36 young adults (28 female; age range: 18-27; average age: 21.03) were recruited using the Texas State participant recruiting pool and classroom announcements. Participants were compensated for their participation with course credit or extra credit. All participants were required to have normal or corrected-to-normal vision to ensure that they could optimally see the stimuli. Procedures were approved by the Institutional Review Board at Texas State University.

Materials

For stimuli, a subset of the low frequency words utilized by Voss et al. (2010) were chosen. There were 200 words total, divided into eight lists of 25 words each. Each list of 25 words was counterbalanced for word length and frequency, as reported by both the Kucera-Francis Word Frequency List (Kucera & Francis, 1967). These lists were rotated so that each word appears an equal number of times in each condition across subjects.

Procedure

Each participant completed four experimental sections followed by a series of questionnaires. The first section of the study was the encoding phase, where participants were asked to rate the meaningfulness of attended words. The second section consisted of the mere exposure test in which participants were asked how much they liked the words. In section three, participants made meaningfulness judgements of words that had not

previously been rated. Then, in the last section, participants indicated whether or not they had seen a mix of old and new words before in a recognition test. Following all four sections, participants completed questionnaires.

Encoding

In the first section of the experiment, participants were told that they would be making meaningfulness ratings of uncommon and fake/pseudowords (actually all words were real but very low frequency). At the beginning of each trial, a fixation cross appeared for 1000 ms as a warning the words were about to appear. Following the fixation cross, participants were shown two words at a time, with an arrow between them. The arrow served as an indicator of which word the participant was to rate. Each set of words were on the screen for 2000 ms, and there was an inter-trial interval (ITI) of 500 ms. Participants could rate the words while the words were on the screen or they could respond after the words disappeared, when the rating scale was on the screen until they made a response. The words remained on the screen for the entire 2000 ms, regardless of when the participant made their response. Participants rated the meaningfulness of the word indicated by the arrow on a scale from 1 to 5 (see Figure 1). They were instructed to rate word as negligible (5) if the stimulus invoked no meaning, rate the word as having low meaning (4) if it was possible to attribute minimal meaning to the stimulus with effort, rate the word as medium (3) if it immediately invoked an intangible meaning or connotation, rate the word as high (2) if it immediately invoked a concrete meaning, and rate the word as real (1) if it was thought to be a real word regardless of whether the definition of the word was known. There were 50 trials total, with two words presented in each trial, one target and one distractor. Trials were presented pseudo-randomly so that

no more than three trials in a row had the arrow pointing in the same direction. Words and the direction of the arrow were counterbalanced so that an equal number of targets and distractors were presented on each side of the screen.

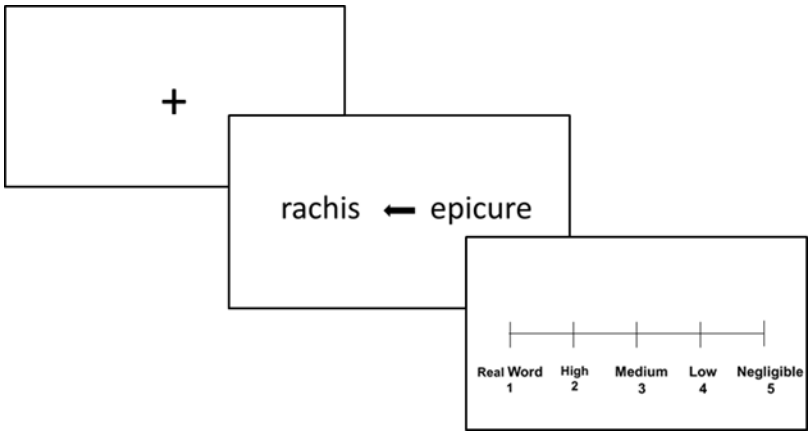


Figure 1. An example of what a single trial would consist of during the encoding section.

Mere Exposure Test

In the second section, participants were instructed to indicate how much they liked each word presented to them on a scale from 1 to 4 (see Figure 2). At the beginning of each trial, a fixation cross appeared for 1000 ms as a warning the word was about to appear. Following the fixation cross, participants were presented with a word and asked to make their liking rating. Each word was on the screen for 1500 ms, and there was an ITI of 500 ms. Participants could rate the word while it was on the screen, or they could respond after the word disappeared, when the rating scale remained on the screen until they made a response. The words were presented for the entire 1500 ms, regardless of when the participant made their response. To respond, participants indicated the words they dislike the most by pressing 1, words they liked the least by pressing 2, words they liked a little more by pressing 3, and words they liked the most by pressing 4. The

response scales for the Encoding and Mere Exposure sections were reversed in order to prevent any response learning. Participants rated 150 words (50 previously target words, 50 previously distractor words, and 50 new words), which were randomly intermixed.

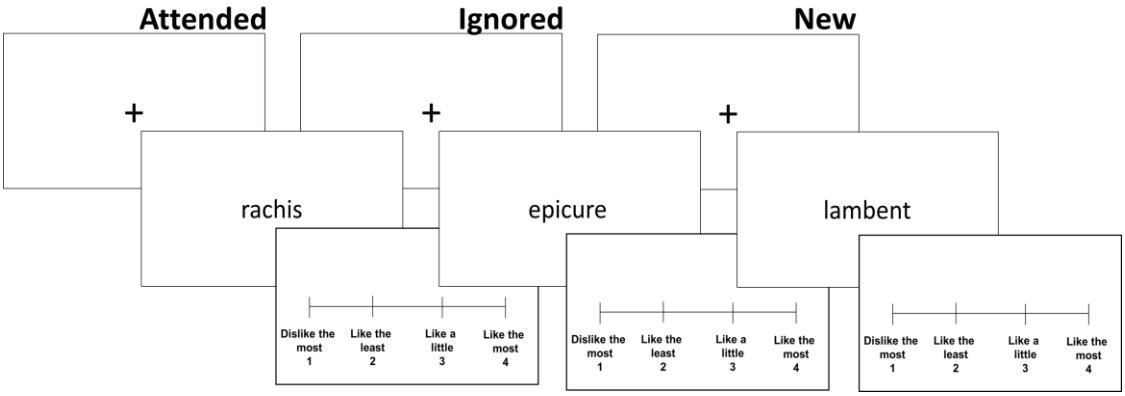


Figure 2. An example of an attended word trial, ignored word trial, and new word trial for the mere exposure test.

Meaningfulness Ratings

The third section was a meaningfulness ratings task similar to the second section, but words were presented individually. Prior to each trial, a fixation cross appeared for 1000 ms as a warning the word was about to appear. Following the fixation cross, participants would make their rating. Each word was on the screen for 2000 ms, and there was an ITI of 500 ms. Participants could rate the words while the words were on the screen, or they could respond after the words disappeared when the rating scale remain on the screen until they made a response. The words were presented for the entire 2000 ms, regardless of when the participant made their response. The words rated during this section consisted of words ignored during the encoding section and new words used in the mere exposure test. There was a total of 100 trials (with 50 previously ignored words, 50 new words).

Recognition Test

The final section of the experiment was a recognition test. Participants were instructed to report if they recalled seeing a word previously in the study or not. Prior to each trial, a fixation cross appeared for 1000 ms as a warning the word was about to appear. Following the fixation cross, participants were presented with a word on the screen and would be asked to make their response. Participants were instructed to press 1 if they had seen the word and 2 if they had not seen the word in the study. Each word remained on the screen until the participant made a response, and there was an inter-trial interval (ITI) of 500 ms. There were 25 targets (words attended and rated in the encoding section), 25 distractors (words ignored in the encoding section), and 50 new words (not the same new words used in the mere exposure test), which were randomly intermixed.

Questionnaires

Following the study, participants completed the Behavioral Inhibition System and Behavioral Activation System (BIS/BAS; Carver & White, 1994), Positive Affect/Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988), the Beck Depression Inventory (Beck et al., 1961), and the State-Trait Anxiety Inventory (STAI; Spielberger et al, 1983). The BIS/BAS was used to measure participants' tendencies to approach or avoid new situations (see Appendix A). Within the BIS/BAS, there are 4 subscales: BIS, BAS Drive, BAS Fun Seeking, and BAS Reward Responsiveness. The BIS subscale measures punishment sensitivity. The BAS Drive subscale measures the pursuit of desired goals. The BAS Fun Seeking subscale measures the desire for rewards and openness to approach rewarding event spontaneously. The BAS Reward

Responsiveness subscale measures responses to the anticipation of rewards. The PANAS was used to assess the mood of the participants (see Appendix B). The Beck Depression Inventory was used to measure the level of depression of the participants (see Appendix C). The STAI was used to assess participant's state and trait anxiety levels (see Appendix D).

Experiment 1B

Method

Participants

For this study, 14 healthy older adults (11 female; age range: 63-82; average age = 70.71; average education = 17.04) were recruited from the surrounding communities through outreach programs (e.g. "Aging and Memory" talks given to the public). One participant was removed from analysis due to poor performance on the neuropsychological battery. All participants were screened for neurological problems and for normal or corrected-to-normal vision to ensure that they could optimally see the stimuli. Procedures were approved by the Institutional Review Board at Texas State University.

Materials and Procedure

Materials and procedure for the healthy older adults were identical to those completed by the young adults in Experiment 1A. Additionally, the older adults completed a neuropsychological battery to ensure they were cognitively healthy older adults (see Table 1). First, participants completed the Mini Mental State Examination, which assesses cognitive impairment on a 30-point scale and is often used in screening for dementia (MMSE; Folstein, Folstein, & McHugh, 1975). Then they completed the

Consortium to Establish a Registry for Alzheimer's Disease (CERAD) Word List Memory Test, which tested participants' ability to recall word lists (Morris et al., 1989). Next, they performed verbal fluency and category fluency tasks to test their fluency for letters and categories (Monsch et al., 1992). Lastly, they were tested with the short form Boston Naming Test to examine their object naming abilities (Mack, Freed, Williams, & Henderson, 1992).

Table 1

Table of Means and Standard Deviations for Education and Neuropsychological Battery Scores

	Mean Score	Standard Deviation
Age	69.85	1.29
Education	17.04	2.73
MMSE	29.46	.97
CERAD Encoding	20.67	3.7
CERAD Delayed Recall	8.08	1.38
CERAD Recognition	9.45	.38
Verbal Fluency	41.15	8.73
Category Fluency	45.54	7.72
Boston Naming Test	14.62	.65

Results

A mixed measures ANOVA was conducted using a between-subjects factor of group (young adults vs. older adults) and within-subjects factor of word condition (attended, ignored, and new) to examine differences in the average liking rating given during the mere exposure test (see Table 2). There was a main effect of words condition ($F(1.568, 73.688) = 11.526$, $p < .001$), with attended words ($M = 2.63$) being evaluated as

more likable than both ignored (M = 2.50; $t(48) = 3.65$, $p = .001$) and new words (M = 2.47; $t(48) = 3.38$, $p = .001$). There was no significant difference between ignored and new words, $t(48) = 1.39$, $p > .05$. There was also a main effect of age, with older adults evaluating all conditions of words as more likeable than young adults, $F(1, 47) = 10.591$, $p = .002$. There was no interaction between age and condition, $F(1.568, 73.688) = 2.013$, $p = .15$.

Table 2

Means and Standard Deviations for Average Like Ratings

	Young Adults		Older Adults		Both Groups	
	Mean	SD	Mean	SD	Mean	SD
Attended	2.41	.35	2.85	.24	2.52	.37
Ignored	2.35	.40	2.66	.23	2.43	.39
New	2.31	.42	2.63	.32	2.39	.41

A mixed measures ANOVA was conducted using a between-subjects factor of age group (young adults vs. older adults) and within-subjects factor of word condition (attended, ignored, new) to examine differences in the average reaction time during the mere exposure test. There was no main effect of condition, $F(2, 94) = 1.468$, $p = .236$. There was a main effect of age group, with young adults (M = 2259.28) responding faster on average than older adults (M = 3175.6), $F(1, 47) = 9.147$, $p = .236$. There was no interaction between age and reaction time, $F(2, 94) = 1.986$, $p = .143$. Table 3 shows the means and standard deviations for the average reaction time for older adults, young adults, and both groups combined.

Table 3

Means and Standard Deviations for Average Reaction Time (ms)

	Young Adults		Older Adults		Both Groups	
	Mean	SD	Mean	SD	Mean	SD
Attended	2258.55	858.15	3091.69	1148.20	2479.58	1002.34
Ignored	2271.70	824.47	3157.43	1075.83	2506.69	970.11
New	2247.59	985.37	3277.58	1119.68	2520.85	1110.18

Real Words Removed

We conducted additional analyses examining the results when words which participants rated as real words were removed. If participants identified the words as real, we could not control for their prior exposure to these words and this potential familiarity might lead to different effects. It is typical for stimuli to be unfamiliar in tests of the mere exposure effect (Bornstein, 1989; Butler, Berry, & Helman, 2004). A mixed measures ANOVA was conducted using a between-subjects factor of age group (young adults vs. older adults) and within-subjects factor of word condition (attended, ignored, and new) to examine differences in the average liking rating given during the mere exposure test. There was a main effect of condition, with attended words being evaluated as more likable than both ignored and new words, $F(1.639, 77.017) = 8.907$, $p = .001$. Participants rated attended words significantly more likeable than ignored words, $t(48) = 3.12$, $p = .003$. Attended words were rated significantly higher than new words, $t(48) = 2.50$, $p = .016$. There was no significant difference between ignored and new words, $t(48) = .28$, $p > .05$. There was also a main effect of age group, with older adults ($M = 2.56$)

evaluating all words as more likeable than young adults (M = 2.31), $F(1, 47) = 4.324$, p = .043.

There was an interaction between age group and condition, $F(1.639, 77.017)$ = 3.578, p = .041. Numerically, young adults rated the attended words the highest (M = 2.34), the new words the lowest (M = 2.28), and the ignored words in the middle (M = 2.30), but there was no significant difference between any of these conditions in our post-hoc, paired t-test analyses (Attended and Ignored: $t(35) = 1.32$, $p > .05$; Attended and New: t(35) = 1.41, p > .05; Ignored and New: $t(35) = .78$, $p > .05$;). Older adults rated the attended words as the highest (M = 2.68), ignored words the lowest (M = 2.47), and the new words were in the middle (M = 2.51), and there was a significant difference seen between attended and new words ($t(12) = 2.83$, p = .015) as well as attended and ignored words ($t(12) = 4.21$, p = .001). There was no significant difference between ignored and new words for our older adult sample ($t(12) = -1.09$, $p > .05$). Figure 3 shows a graph of the mean like rating for older adults, young adults, and both groups combined.

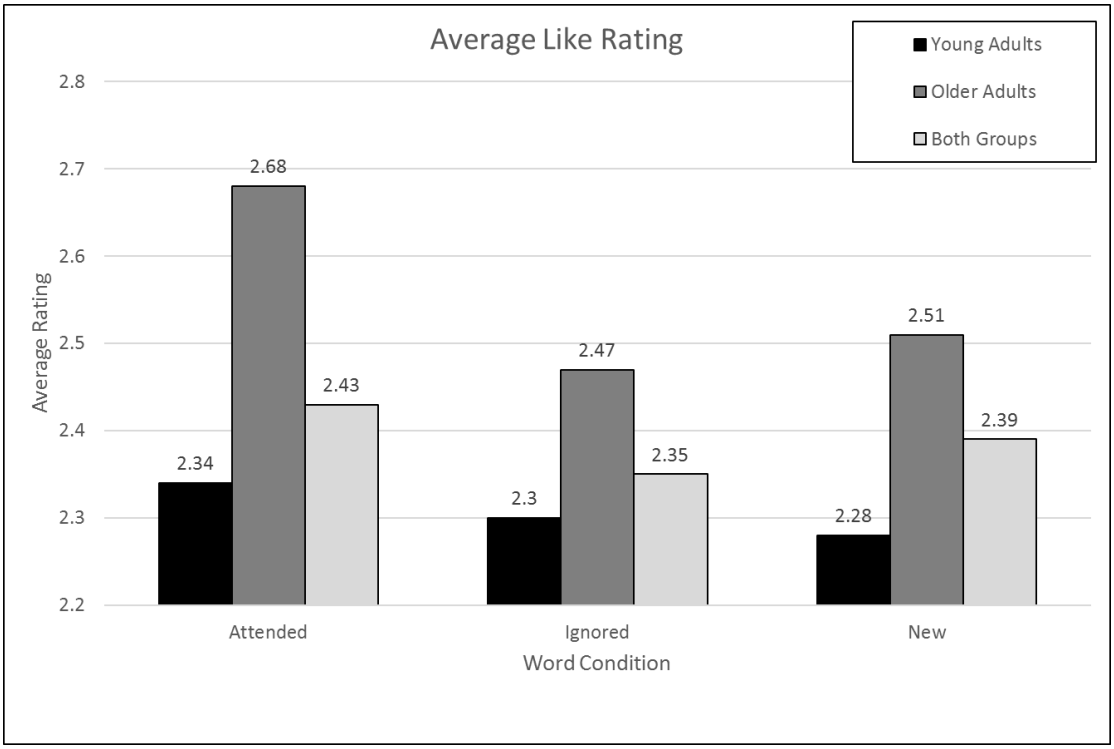


Figure 3. Graph of mean like ratings between word conditions (attended, ignored, new) and age group.

A mixed measures ANOVA was conducted using a between-subjects factor of group (young adults vs. older adults) and within-subjects factor word condition (attended, ignored, new) to examine differences in the average reaction times during the mere exposure test. There was a no main effect of condition, $F(2, 94) = 2.204$, $p = .116$. There was a main effect of age, with young adults ($M = 2263.65$) responding faster on average than older adults ($M = 3208.75$), $F(1, 47) = 9.964$, $p = .171$. There was no interaction between age and reaction time, $F(2, 94) = 565$, $p = .57$. Table 4 shows the means and standard deviations for the average reaction time for older adults, young adults, and both groups combined.

Table 4

Means and Standard Deviations for Average Reaction Time (ms)

	Young Adults		Older Adults		Both Groups	
	Mean	SD	Mean	SD	Mean	SD
Attended	2249.68	860.00	3165.73	1242.75	2492.72	1045.16
Ignored	2252.54	829.61	3175.31	1075.86	2497.36	980.13
New	2288.72	927.36	3285.19	1108.66	2553.09	1063.93

Correlations

Correlations were conducted using all participants (young adults and older adults) and included all trials, regardless of meaningfulness rating. Pearson correlations were examined to determine the relationship between the preference rating for words in each condition (attended, ignored, and new) and their scores on the questionnaires. To calculate a measure of the mere exposure effect, we subtracted each participant's average rating for new words from their average rating for attended words (called ME). We also subtracted each participant's average rating for new words from their average rating for ignored words to create a value for the difference between ignored and new words (called DD). Then we subtracted each participant's average rating for ignored words from their average rating for attended words to create a value to represent the difference in their evaluations of attended and ignored words (called A-I). We then correlated these three values with the participants' scores on the BIS/BAS (BIS, BAS Drive, BAS Fun Seeking, and BAS Reward Responsiveness subscales), PANAS, Beck Depression Inventory, and the STAI.

We used a Bonferroni correction to adjust the significance levels for the number of correlations. There were no significant correlations seen with the ME, DD, or A-I score and participants' scores on any of the questionnaires given.

Recognition

We also examined participants' ability to discriminate between old and new words by calculating Pr (% Hit Rate - % False Alarm Rate; Snodgrass & Corwin, 1988). An independent samples t-test was conducted to see if there were differences in Pr between the age groups (older adults vs. younger adults) in Experiment 1. There was no significant difference in average Pr between older adults (M = .62) and younger adults (M = .63), $t(47) = .089$, $p > .05$.

III. EXPERIMENT 2

Experiment 2 was designed to more closely replicate the paradigm of Ladd and Gabrieli (2015), who found that participants' state and trait anxiety scores (measured by the STAI) could predict the mere exposure effect. Experiment 1 used a 5-point Likert scale for the mere exposure test, while Ladd and Gabrieli used an alternative forced-choice (2FAC) method of testing the mere exposure effect. The 2FAC method of testing for mere exposure is considered to be a more sensitive measure than a Likert scale because it just requires indicating the preferred stimulus, rather than requiring a deeper understanding of the scale (Willems, Adam, & Van der Linden, 2002).

Method

Participants

For Experiment 2, 20 young adults (12 female; age range: 18-24; average age: 19.45) were recruited using the Texas State participant recruiting pool and classroom announcements. Participants were compensated for their participation with course credit or extra credit. All participants were required to have normal or corrected-to-normal vision to ensure that they could optimally see the stimuli. Procedures were approved by the Institutional Review Board at Texas State University.

Materials and Procedure

Materials and procedure for experiment were identical to Experiment 1, except for the structure of the mere exposure test. In Experiment 2, participants were presented with two words on each trial in the mere exposure test. Participants completed a two alternative force-choice task, deciding if they preferred the word on the left or the right of the screen. The pairs of words presented were either pairs of a previously attended word

with a new word, or a previously ignored word with a new word. Words were counterbalanced for side of the screen to ensure that old and new words were equally presented on both sides of the screen and that the old words did not always appear on the same side of the screen where they had appeared during the encoding section. At the beginning of each trial, a fixation cross appeared for 1000 ms as a warning the words were about to appear. Following the fixation cross, participants viewed two words on the screen and were asked to choose which word they liked the best. Each pair of words were on the screen until the participant made their response, and there was an ITI of 500 ms. The mere exposure test in Experiment 2 had 100 trials, 50 of which were attended-new pairs, and the other 50 were ignored-new pairs, and trials were randomly intermixed.

Results: Experiment 2

The mere exposure effect was tested using a one sample t-test to see if participants preferred old words over new words at more than a 50% chance. There was a statistically significant difference, showing that the mere exposure effect was elicited, and participants did prefer the old words (M = .53) at more than a chance over the new words (M = .47), $t(19) = 2.253$, $p = .036$. Additional one sample t-tests were conducted to see if attended words and ignored words were selected at more than chance than new words. The attended words were not selected at more than chance over new words, $t(19) = 1.477$, $p = .156$, and ignored words were also not selected at more than chance over new words, $t(19) = 1.838$, $p = .082$. A paired samples t-test was conducted to determine if there was a significant difference between the rate at which attended words and ignored words were selected over new words. There was no significant difference between the attended words and ignored words being selected, $t(19) = .046$, $p = .964$.

Two linear regressions were run in an attempt to replicate the findings of Ladd and Gabrieli (2015). First, we conducted a linear regression to predict the preference for old words over new words from the average score on the State Anxiety Inventory. Mean State Anxiety scores were not significant predictors of participants' preferences for old words, *Beta* = .000, p = .621. Next, we conducted a simple linear regression to predict the preference for old words over new words from the average score on the Trait Anxiety Inventory. Mean Trait Anxiety scores were not significant predictors of participants' preferences for old words, *Beta* = -.001, p = .38.

Recognition

Additionally, an independent samples t-test was conducted to see if there were any differences in young adults' average discrimination, as measured by Pr, between Experiment 1 and Experiment 2. Young adult participants in Experiment 1 (M = .63) performed significantly better on the recognition task than the participants in Experiment 2 (M = .38), $t(54) = 4.391$, $p < .001$.

IV. DISCUSSION

Results from both Experiment 1 and Experiment 2 replicated the mere exposure effect. Overall, participants liked old words more than they liked new words. In Experiment 1, the mere exposure effect was still present when looking at only attended words because they were preferred to new words. Experiment 2, however, did not show any significant difference between attended words and new words, when separated. One potential reason for this lack of significant difference could be that there were fewer trials when comparing attended and ignored words separately. The difference in findings between Experiments 1 and 2 is interesting as the two experiments used identical procedures and stimuli, except for the structure of the mere exposure test (Likert scale vs. forced choice). The different test format resulted in different roles of attention when testing for the mere exposure effect.

In Experiment 1, there was no significant difference found between ignored and new words, but there was a significant interaction between word condition and age group. Young adults showed a numerical pattern of liking attended words the most, new words the least, and evaluating ignored words in the middle. Older adults, however, showed a significantly higher liking for attended words than both new and ignored words, and ignored words actually had the lowest average of the three word groups. For reaction times, older adults took a significantly longer time to respond to the words during the mere exposure test than the young adults.

We did not find a significant distractor devaluation effect in either experiment. If the effect had been elicited, we would have expected to see a significantly lower average like rating for ignored words when comparing them to new words. This was not the case,

however, and there was no significant difference found in either of our studies between ignored words and new words.

There are multiple possibilities as to why we did not find a significant distractor devaluation effect. One possible reason could be that the distractor devaluation effect can only be achieved in a working memory task, and, therefore, will not be seen in a long-term memory study. In the current literature on distractor devaluation, all of the experiments involve working memory as participants are making their preference evaluations immediately after their first exposure to the stimuli (Goolsby et al. 2009; Kiss et al, 2007; Raymond, Fenske, and Westoby, 2005).

We examined recognition memory for older adults and younger adults in both experiments. In Experiment 1, we found that young adults and older adults showed no significant differences in performance on the recognition test. This is interesting because generally older adults show decreased performance on tasks of explicit recognition compared with young adults (Koen & Yonelinas, 2014). When comparing the performance of young adults in our two experiments, we found that participants in Experiment 1 had significantly better recognition of the words than participants in Experiment 2. It is important to reiterate that Experiment 1 and Experiment 2 were exactly the same, except for the mere exposure test structure. Perhaps participants were processing the words on a deeper level by rating them on a scale of 1 to 4 in Experiment 1, while participants in Experiment 2 only selected which of two presented words was liked more. These results show that different methods of testing for mere exposure can affect subsequent recognition memory as well as the mere exposure effect itself.

According to the perceptual fluency theory, we should have seen participants rate ignored words just as likeable as attended words. While this was not the case, participants also did not outright dislike the words significantly when compared to new words. It could be that exposure to the ignored words during encoding was enough to decrease the processing requirements of these words, just not to the degree that the attended words were (Borstein, 1992; Bornstein & D'Agostino, 1994; Jacoby, 1983; Jacoby & Kelly, 1987; Jacoby & Whitehouse, 1989). In regard to the affective processing theory, mere exposure for ignored items could also be elicited because, while the item is a distractor, nothing dangerous occurred during the exposure. This could have resulted in a reduction of fear, which then resulted in an increase in positive affect towards the ignored words, (Zajonc, 1968).

While not significant, older adults did evaluate the ignored words as less liked than new words, which is in the direction that distractor devaluation would suggest. Older adults have been shown to display attentional deficits (Dempster, 1992; Rowe et al. 2006; Amer and Hasher, 2014), so it is possible that they evaluated the ignored words as the least liked because they simply were unable to pay attention to them during the first meaningfulness task for encoding. Young adults, who have greater attentional resources, could have been able to process both the attended and ignored words during the encoding phase, which resulted in an increase in the liking evaluation for ignored words. The results from our recognition test, however, would argue against this because our older adults remembered old words (attended and ignored) just as well as the young adults. This means that our older adult sample was still able to attend to both word conditions

effectively enough to have recognized them, and thus it was probably not a factor of not paying attention to the ignored words.

One purpose of this set of experiments was to replicate the findings of Ladd and Gabrieli (2015) and examine how attention might interact with the relationship between the mere exposure effect and anxiety. We were unable to successfully replicate the regression results of Ladd and Gabrieli (2015), and did not find that participants' scores on the STAI predicted their performance on the mere exposure effect. While we had more trials than Ladd when asking preference (100 vs. 48), we did not achieve a large enough sample size for a strong replication statistically, so potentially we might find a replication with an increased sample size.

We ran multiple correlations on participants scores for the assessments (BIS/BAS, PANAS, Beck Depression Inventory, and STAI) and the differences in their preferences for the different words categories (ME, DD, and A-I). We did not find any significant correlations when running these analysis. Our study failed to find that performance on the different assessments of individual differences showed a relationship with preference judgments.

Future directions include correlating the neuropsychological battery information collected from healthy older adults with task performance. Additionally, we intend to run the study on a larger sample of older adults. Increasing our sample and including the neuropsychological battery would improve our research by giving us more power and the ability to determine any possible moderators within the neuropsychological battery. Furthermore, in the future, collecting more data for Experiment 2 will be done, in order to determine if there continues to be no difference in preference between attended and

ignored words. This would also help with comparing Experiment 1 and Experiment 2, by making the two sample sizes more equivalent.

Conclusions

In summary, we were able to replicate the mere exposure effect for both experiments when comparing old and new words. When separating the old words into attended and ignored groups, however, Experiment 2 did not show significant effects of attention at encoding. Experiment 1, on the other hand, showed that attended words were liked significantly more than both ignored and attended words, in our analysis looking at young adults and older adults together. The differences between our experiments show that attention could possibly manipulate the mere exposure effect differently, based on how you decide to test it during the evaluative section for the mere exposure effect.

Research on the mere exposure effect in older adult samples is relatively sparse, so there are still many areas in which researchers can explore how this effect works in the older adult population. It is important to discover what areas of memory that healthy older adults still show promising strengths. As people age, certain areas of memory do decline, so it is vital to pinpoint what types of memory are preserved in order to generate strategies that can be used use to compensate for declining processes.

APPENDIX SECTION

Appendix A

Subject #: _____ 1

Date: _____

BIS/BAS

Below are a series of statements concerning certain behaviors or feelings about certain situations. Please indicate the degree to which you agree or disagree with each statement using the scale below:

1	2	3	4
agree strongly	agree somewhat	disagree somewhat	disagree strongly

_____ I feel worried when I think I have done poorly at something.

_____ I will often do things for no other reason than that they might be fun.

_____ I worry about making mistakes.

_____ I go out of my way to get things I want.

_____ When I get something I want, I feel excited and energized.

_____ I crave excitement and new sensations.

_____ Criticism or scolding hurts me quite a bit.

_____ I often act on the spur of the moment.

_____ If I see a chance to get something I want, I move on it right away.

_____ When good things happen to me, it affects me strongly.

_____ If I think something unpleasant is going to happen, I usually get pretty "worked up."

_____ When I see an opportunity for something I like, I get excited right away.

_____ I feel pretty worried or upset when I think or know somebody is angry at me.

_____ It would excite me to win a contest.

_____ When I go after something I use a "no holds barred" approach. 2

_____ I'm always willing to try something new if I think it will be fun.

_____ I have very few fears compared to my friends.

_____ When I want something, I usually go all-out to get it.

_____ When I'm doing well at something, I love to keep at it.

_____ Even if something bad is about to happen to me, I rarely expoerience fear or nervousness.

Appendix B

Study #: _____
Date: _____

The PANAS

INSTRUCTIONS: This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. **Indicate to what extent you generally feel this way, that is, how you feel on the average.** Use the following scale to record your answers:

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____ interested
_____ distressed
_____ excited
_____ upset
_____ strong
_____ guilty
_____ scared
_____ hostile
_____ enthusiastic
_____ proud

_____ irritable
_____ alert
_____ ashamed
_____ inspired
_____ nervous
_____ determined
_____ attentive
_____ jittery
_____ active
_____ afraid

Appendix C

Beck's Depression Inventory

This depression inventory can be self-scored. The scoring scale is at the end of the questionnaire.

1.
- 0 I do not feel sad.
- 1 I feel sad
- 2 I am sad all the time and I can't snap out of it.
- 3 I am so sad and unhappy that I can't stand it.

2.
- 0 I am not particularly discouraged about the future.
- 1 I feel discouraged about the future.
- 2 I feel I have nothing to look forward to.
- 3 I feel the future is hopeless and that things cannot improve.

3.
- 0 I do not feel like a failure.
- 1 I feel I have failed more than the average person.
- 2 As I look back on my life, all I can see is a lot of failures.
- 3 I feel I am a complete failure as a person.

4.
- 0 I get as much satisfaction out of things as I used to.
- 1 I don't enjoy things the way I used to.
- 2 I don't get real satisfaction out of anything anymore.
- 3 I am dissatisfied or bored with everything.

5.
- 0 I don't feel particularly guilty
- 1 I feel guilty a good part of the time.
- 2 I feel quite guilty most of the time.
- 3 I feel guilty all of the time.

6.
- 0 I don't feel I am being punished.
- 1 I feel I may be punished.
- 2 I expect to be punished.
- 3 I feel I am being punished.

7.
- 0 I don't feel disappointed in myself.
- 1 I am disappointed in myself.
- 2 I am disgusted with myself.
- 3 I hate myself.

8.
- 0 I don't feel I am any worse than anybody else.
- 1 I am critical of myself for my weaknesses or mistakes.
- 2 I blame myself all the time for my faults.
- 3 I blame myself for everything bad that happens.

9.
- 0 I don't have any thoughts of killing myself.
- 1 I have thoughts of killing myself, but I would not carry them out.
- 2 I would like to kill myself.
- 3 I would kill myself if I had the chance.

10.
- 0 I don't cry any more than usual.
- 1 I cry more now than I used to.
- 2 I cry all the time now.
- 3 I used to be able to cry, but now I can't cry even though I want to.

11.

0 I am no more irritated by things than I ever was.
1 I am slightly more irritated now than usual.
2 I am quite annoyed or irritated a good deal of the time.
3 I feel irritated all the time.

12.

0 I have not lost interest in other people.
1 I am less interested in other people than I used to be.
2 I have lost most of my interest in other people.
3 I have lost all of my interest in other people.

13.

0 I make decisions about as well as I ever could.
1 I put off making decisions more than I used to.
2 I have greater difficulty in making decisions more than I used to.
3 I can't make decisions at all anymore.

14.

0 I don't feel that I look any worse than I used to.
1 I am worried that I am looking old or unattractive.
2 I feel there are permanent changes in my appearance that make me look unattractive
3 I believe that I look ugly.

15.

0 I can work about as well as before.
1 It takes an extra effort to get started at doing something.
2 I have to push myself very hard to do anything.
3 I can't do any work at all.

16.

0 I can sleep as well as usual.
1 I don't sleep as well as I used to.
2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
3 I wake up several hours earlier than I used to and cannot get back to sleep.

17.

0 I don't get more tired than usual.
1 I get tired more easily than I used to.
2 I get tired from doing almost anything.
3 I am too tired to do anything.

18.

0 My appetite is no worse than usual.
1 My appetite is not as good as it used to be.
2 My appetite is much worse now.
3 I have no appetite at all anymore.

19.

0 I haven't lost much weight, if any, lately.
1 I have lost more than five pounds.
2 I have lost more than ten pounds.
3 I have lost more than fifteen pounds.

20.

0 I am no more worried about my health than usual.
1 I am worried about physical problems like aches, pains, upset stomach, or constipation.
2 I am very worried about physical problems and it's hard to think of much else.
3 I am so worried about my physical problems that I cannot think of anything else.

21.

0 I have not noticed any recent change in my interest in sex.
1 I am less interested in sex than I used to be.
2 I have almost no interest in sex.
3 I have lost interest in sex completely.

INTERPRETING THE BECK DEPRESSION INVENTORY

Now that you have completed the questionnaire, add up the score for each of the twenty-one questions by counting the number to the right of each question you marked. The highest possible total for the whole test would be sixty-three. This would mean you circled number three on all twenty-one questions. Since the lowest possible score for each question is zero, the lowest possible score for the test would be zero. This would mean you circles zero on each question. You can evaluate your depression according to the Table below.

Total Score	Levels of Depression
1-10	These ups and downs are considered normal
11-16	Mild mood disturbance
17-20	Borderline clinical depression
21-30	Moderate depression
31-40	Severe depression
over 40	Extreme depression

Appendix D

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-1

Name _____ Date _____
Age _____ Sex: M ____ F ____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you feel *right* now, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	Not at all	Somewhat	Moderately So	Very Much So
1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense	1	2	3	4
4. I feel strained	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. 1 am presently worrying over possible misfortunes	1	2	3	4
8. I feel satisfied	1	2	3	4
9. I feel frightened	1	2	3	4
10. I feel comfortable	1	2	3	4
11. 1 feel self-confident	1	2	3	4
12: I feel nervous	1	2	3	4
13. I am jittery	1	2	3	4
14. I feel indecisive	1	2	3	4
15 I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. 1 am worried	1	2	3	4
18. 1 feel confused	1	2	3	4
19. I feel steady	1	2	3	4
20. 1 feel pleasant	1	2	3	4

Official Use Only:
Administrator _____ Entered by _____ Checked by _____

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-2

Name _____ **Date**_____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers.

Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	Not at all	Somewhat	Moderately So	Very Much So
21. I feel pleasant	1	2	3	4
22. I feel nervous and restless	1	2	3	4
723. I feel satisfied with myself	1	2	3	4
24. I wish I could be as happy as others seem to be	1	2	3	4
25. I feel like a failure	1	2	3	4
26. I feel rested	1	2	3	4
27. I am "calm, cool, and collected"	1	2	3	4
28. I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
29. I worry too much over something that really doesn't matter	1	2	3	4
30. I am happy	1	2	3	4
31. I have disturbing thoughts	1	2	3	4
32. I lack self-confidence	1	2	3	4
33. I feel secure	1	2	3	4
34. I make decisions easily	1	2	3	4
35. I feel inadequate	1	2	3	4
36. I am content	1	2	3	4
37. Some unimportant thought runs through my mind and bothers me	1	2	3	4
38. I take disappointments so keenly that I can't put them out of my mind	1	2	3	4
39. I am a steady person	1	2	3	4
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4

Appendix E

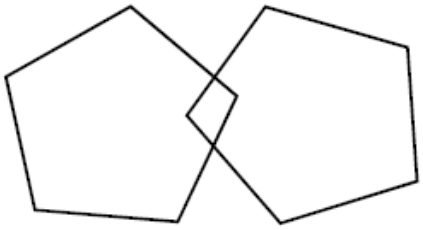
Name_____ Date_____

Administered by_____ Time _____

MMSE

Circle Number of Correct Answers	
0 1	*Year___
0 1	*Season___
0 1	*Month___
0 1	*Date___
0 1	*Day___
0 1	*Country___
0 1	*State___
0 1	*City/Town___
0 1	Place: Name___
0 1	*Floor___
	REGISTRATION
0 1 2 3	Apple___ Table___ Penny___
	Take 1s to say each, ask pt to repeat all 3; 1pt each correct answer.
	Then repeat until pt learns all 3.
	ATTENTION AND CACULATION
0 1 2 3 4 5	Serial 7's ___ ___ ___ ___ ___
0 1 2 3 4 5	World Backwards ___ ___ ___ ___ ___
only larger one of these two scores	RECALL
	Ask for above objects repeated above (cannot be
	tested if all 3 subjects were not remembered during Registration)
0 1 2 3	Apple___ Table___ Penny___
	LANGUAGE
0 1 2	Show: Pencil___ Watch___
	Repeat the following: "No ifs, ands, or buts"
0 1	No ifs___ ands___ or buts___
0 1	"Take a paper in your right hand"___
0 1	"Fold it in half"___
0 1	"And put it on the floor"___
0 1	Read and obey the following: "Close your eyes."___
0 1	"Write a sentence."___
0 1	"Copy Intersecting Pentagons"___

Close your eyes.



Appendix F

CERAD (Form 1)

Name_____ Subj #_____ Date_____

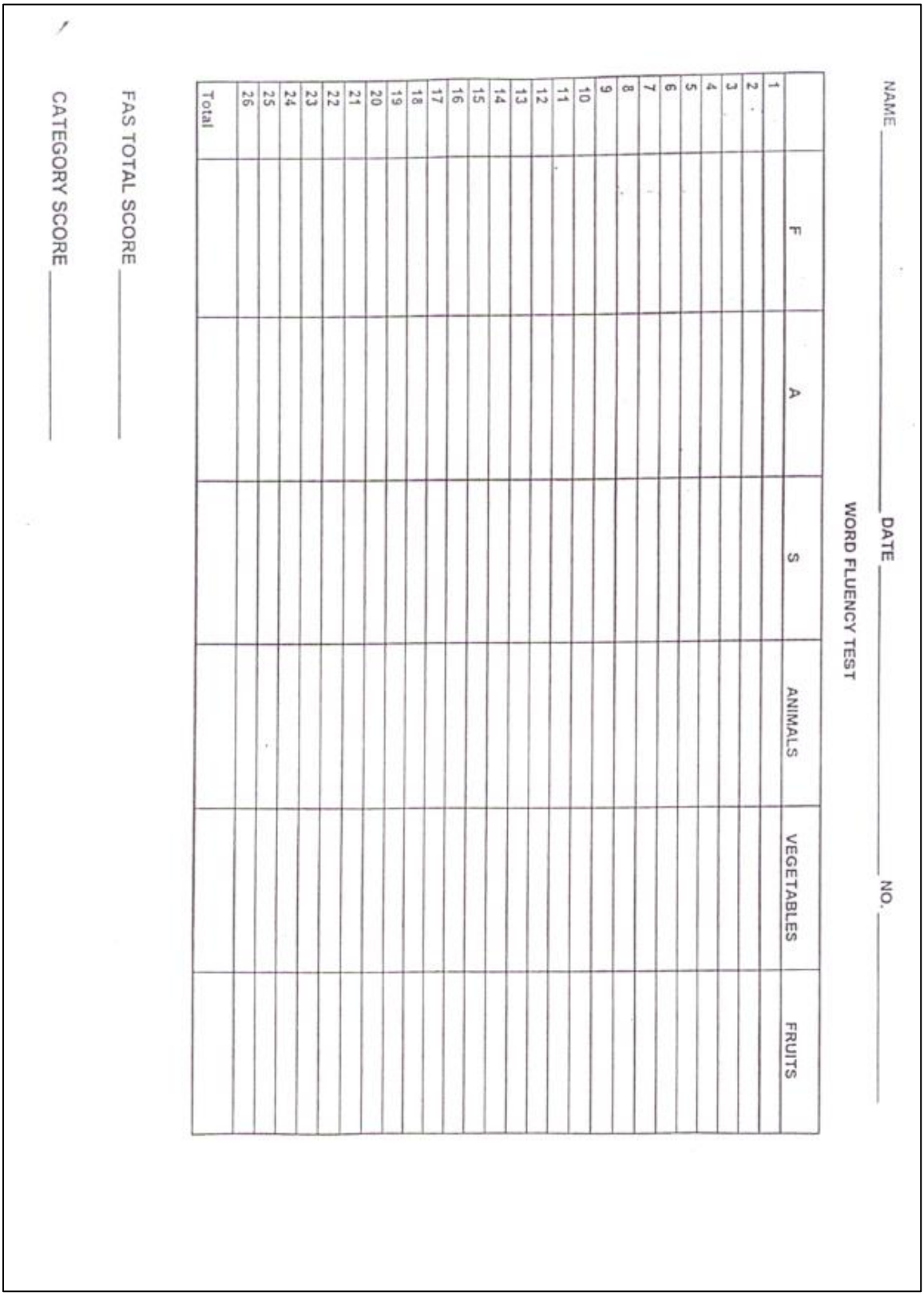
Time at end of trial 3:_____

WORDS	TRIAL 1	TRIAL 2	TRIAL 3	Delayed Rcl
Butter				
Arm				
Shore				
Letter				
Queen				
Cabin				
Pole				
Ticket				
Grass				
Engine				
TOTALS				

Word List Total: _____
(sum of trials 1,2,3)

Recognition		
Words	Correct	Encoded?
Church		
Coffee		
Butter*		
Dollar		
Arm*		
Shore*		
Five		
Letter*		
Hotel		
Mountain		
Queen*		
Cabin*		
Slipper		
Pole*		
Village		
String		
Ticket*		
Troops		
Grass*		
Engine*		
RECOG (out of 10)		
# False Positives		
Recog - FP		

Appendix G



NAME _____ DATE _____ NO. _____

WORD FLUENCY TEST

	F	A	S	ANIMALS	VEGETABLES	FRUITS
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
Total						

FAS TOTAL SCORE _____

CATEGORY SCORE _____

Appendix H

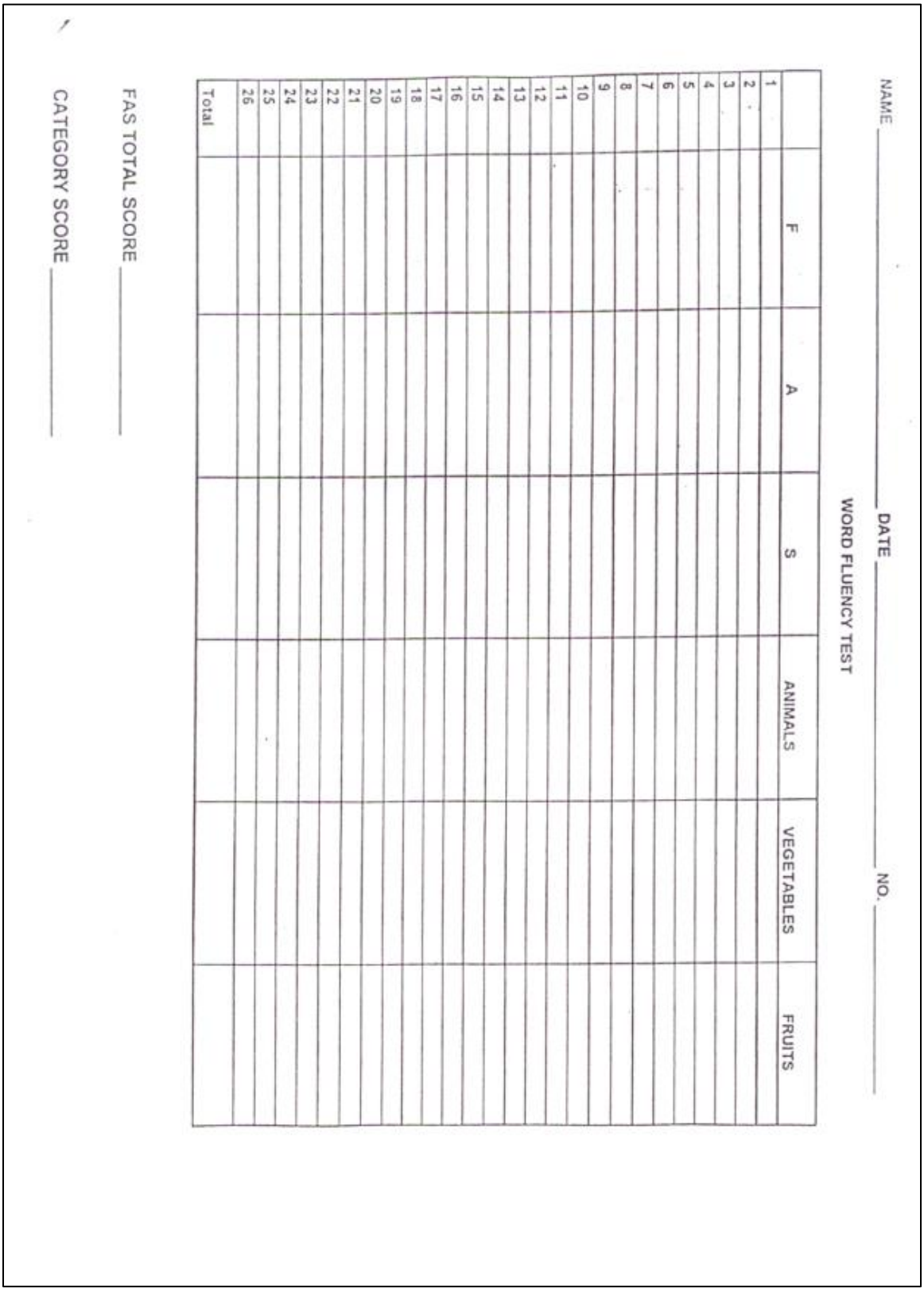
Boston Naming Test: Short Form-15

Name:_____ Date:_____

Administered by: _____

#	Picture	Correct	Missed	semantic cue	phonemic cue
1	House (a kind of building)				
2	Comb (used for fixing hair)				
3	Toothbrush (used in the mouth)				
4	Octopus (an ocean animal)				
5	Bench (used for sitting)				
6	Volcano (a kind of mountain)				
7	Canoe (used in the water)				
8	Beaver (an animal)				
9	Cactus (something that grows)				
10	Hammock (you lie on it)				
11	Stethoscope (used by doctors and nurses)				
12	Unicorn (a mythical animal)				
13	Tripod (photographers and surveyors use it)				
14	Sphynx (it's found in Egypt)				
15	Palette (artists use it)				
TOTALS:					

Appendix I



NAME _____ DATE _____ NO. _____

WORD FLUENCY TEST

	F	A	S	ANIMALS	VEGETABLES	FRUITS
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
Total						

FAS TOTAL SCORE _____

CATEGORY SCORE _____

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