University of Montana

ScholarWorks at University of Montana

Graduate Student Theses, Dissertations, & Professional Papers

Graduate School

2019

Cognitive Impacts of Age Based Stereotype Threat in Older Adults

Cali Caughie
University of Montana, Missoula

Follow this and additional works at: https://scholarworks.umt.edu/etd

🟡 Part of the Behavioral Neurobiology Commons, Cognitive Neuroscience Commons, Cognitive Psychology Commons, and the Geropsychology Commons

Let us know how access to this document benefits you.

Cognitive Impacts of Age Based Stereotype Threat in Older Adults

Cali A. Caughie

University of Montana

Abstract

The present study examined the effects of age-based stereotype threat (ABST) exposure on cognitive performance in older adults. Forty-nine community volunteers age 65 and older were stratified by age and gender and then randomly assigned to either an ABST group or a Control group. The ABST group read a paragraph describing the expected negative effects of age on cognition and the prevalence of Alzheimer's disease in older adults. Participants in the Control group read a neutral paragraph of similar length and difficulty. It was hypothesized that individuals in the ABST group would perform worse on neuropsychological testing than individuals in the Control group. Specifically, it was hypothesized that participants in the ABST group would score lower on combined neuropsychological measures of memory, attention, executive function, and processing speed which are commonly used to assess cognitive function in older adults in neuropsychological settings.

Results suggest that no significant difference exists between participants in the ABST versus the control group on objective cognitive performance in any of the predicted domains. Implications of these findings as well as limitations and future research directions are discussed.

Keywords: age-based stereotype threat, cognitive performance, neuropsychological assessment

Dedication

This work is dedicated to the many older adults who participated in this study, generously sharing their lives, time, and wisdom. It is further dedicated to all of us who are aging, facing an uncertain future, yet full of expectations in directions of both hope and fear.

Acknowledgements

I am sincerely grateful for the many individuals who have supported me through the many phases of this project. I would like to thank my advisor, Dr. Stuart Hall, for his enduring enthusiasm for this research and his genuine investment in his students. I would like to thank my research assistants, Paul Tiede, Joshua Cobb, and Kaylee Ives, for their dedication to this work. I would also like to thank my Thesis Committee members Craig McFarland and Erin Semmens for their advice and support.

Table of Contents

Purpose

As the population of older adults grows, negative perceptions of aging continue to inundate society, leading to increased ageism and age-based stereotype threat (ABST) exposure in older adults. ABST is the phenomenon wherein exposure to stereotypes regarding age decreases older adult's physical and cognitive performance. Given the role stereotype threat has on cognitive performance, the effects of ABST on neuropsychological assessment are important to understand. The current study aimed to investigate the effects of age-based stereotype threat on neuropsychological assessment outcomes in an older adult population. It further aimed to specifically investigate the effects of age-based stereotype threat on four pertinent cognitive domains affected by aging: memory, executive function, processing speed, and attention. No previous research has investigated how ABST effects specific neuropsychological measures nor which precise cognitive domains are most impacted. To address these gaps, the current study tested the effects of ABST exposure on clinically relevant neuropsychological measures of memory, attention, processing speed, and executive function. Study results provide insight into how commonly held individual and cultural expectations about aging may affect memory, attention, processing speed, and executive function constructs in a vulnerable population. The study further supports future research directed at identifying the downstream effects of ABST and informs potential interventions for increasing older adults' knowledge of normal aging.

Population Statistics in Aging. People are living longer than ever before, and the population of older adults is continuing to grow. Indeed, by 2050, the population of adults age 65 and older is expected to almost double from 48 to 88 million. This dramatic shift in population demographics is heartening in that more and more people will live into old age, yet our understanding of normal and abnormal aging processes continues to lag behind.

As of now, one in ten adults age 65 and older are diagnosed with Alzheimer's disease (AD), the most common form of dementia, and that number increases to one in three for adults age 85 and older. Unfortunately, AD is one of the top ten leading causes of death, and the only one that cannot be prevented, slowed, or cured. Currently, AD alone costs the healthcare system approximated 226 million dollars a year, though this number will likely exceed one trillion as adults continue to live longer, putting them at higher risk of the disease (Alzheimer's Association, 2017).

Dementia Worry. These statistics motivate vital research targeting aging and neurodegenerative disease, yet the attention abnormal aging draws can also create an atmosphere of fear and worry. Indeed, it is thought that dementia is second only to cancer as the most feared disease (Kessler et al., 2012). This phenomenon, known as dementia worry, is widespread and increases older adult's vulnerability to age-based stereotype threat (ABST) (Fresson, Dardenne, Geurten & Meulemans, 2017).

Age-based Stereotype Threat. ABST is thought to occur when negative stereotypes regarding older adult's competence result in their underperformance on physical and cognitive tasks (Lamont, Swift, & Abrams, 2015). Negative aging stereotypes are often culturally ingrained and older adults are consistently exposed to aging bias and age-based stereotype threat in daily living (Abrams et al., 2011; Levy & Banaji, 2002; Nelson, 2002). In addition to decreased physical and cognitive performance, exposure to negative aging stereotypes are shown to have far reaching health implications including increased stress and anxiety, decreased self-efficacy, and the initiation of physiological and biological changes in the brain consistent with the atrophy described in neurodegenerative disease (Levy et al., 2016).

As the aging population continues to grow and media attention of AD and dementia continues to flood society, understanding the impact that negative aging stereotypes have on older adults is essential. Additionally, because common age-based stereotypes include declines in cognitive functioning, understanding the impact ABST has on older adult's performance on cognitive tests used in clinical contexts is important for accurate evaluation, diagnosis, and treatment of neurocognitive disorders.

Neurocognitive Disorder Diagnosis

To begin, it is important to understand the foundations of neurocognitive disorders in order to comprehend the intricacies of the disorder category and the factors moderating its diagnosis in aging populations. In the Diagnostic and Statistical Manual 5, there are twelve diagnosable etiologies subsumed within the diagnostic category of "Neurocognitive Disorders" (DSM-5). The most common of these is Alzheimer's disease. All DSM-5 neurocognitive disorders can be further subdivided into either mild neurocognitive disorder (mNCD) or major neurocognitive disorder (major NCD) forms. According to the DSM-5 criteria, mild neurocognitive disorder is diagnosed on the basis of "evidence of modest cognitive decline from a previous level of performance in one or more cognitive domains" without interference of "the capacity for independence in everyday activities". On the other hand, major neurocognitive disorder results when there are significant deficits in two or more cognitive domains, and these deficits interfere with independence in everyday activities (American Psychological Association [APA], 2013, p. 602).

Mild Neurocognitive Disorder Diagnosis. While not listed in the Diagnostic and Statistical Manual IV, mild neurocognitive disorder was added to the DSM-5 in an effort to increase earlier detection of neurodegenerative processes. The addition of the diagnostic category

was largely influenced by the extensive literature base in mild cognitive impairment (MCI) which suggests mild cognitive changes are potentially indicative of later dementia onset. The diagnosis of mild neurocognitive disorder is beneficial in that it recognizes that the underlying neuropathology of neurodegenerative diseases, such as Alzheimer's disease, emerges prior to the onset of clinical symptoms. Further, identification of the mNCD population is integral to research which aims to slow neurodegenerative progression (Sachs-Ericsson & Blazer, 2015). However, the induction of mild and major neurocognitive disorder diagnoses serves to create distinct categories along a continuous aging spectrum.

Indeed, normal and abnormal aging processes can often overlap. For example, typical age-related changes can include lapses in memory, decreased problem-solving ability, transient confusion surrounding time or place, vision and hearing related declines, word finding difficulty, misplacing items, infrequent poor decision making, general weariness in relation to obligations, and increased irritability and rigidity (Alzheimer's Association). Even the DSM-5 admits that the "distinction between major and minor NCD is inherently arbitrary, and the disorders exist along a continuum" (APA, 2013, p. 608). Yet, arbitrary or not, neuropsychological testing is used to define thresholds of mNCD and major NCD with performance typically "in the 1-2 standard deviation range (between 3rd and 16th percentiles)" for mNCD and performance typically "2 or more standard deviations below appropriate norms (3rd percentile or below)" in major NCD. (APA, 2013, p. 607).

The Role of Neuropsychological Assessment in Diagnosis. Early identification of neurodegenerative processes is beneficial in that it allows for targeted interventions, increases patient time for cogent decision making, and aids dementia research. Diagnosis of early stages of neurodegeneration is aided by both neuroimaging and neuropsychological assessment. However,

while biomarkers such as amyloid plaques and neurofibrillary tangles—molecular hallmarks of AD—are identified in neuroimaging, their diagnostic reliability is uncertain (Busse, Bischkopf, Riedel-Heller, & Angermeyer, 2003). Imaging studies show that levels of amyloid and tau do not consistently predict cognitive impairment or AD. In Snowdon's (1997) groundbreaking study of 678 nuns, one third had neuropathological markers of AD at the time of autopsy but never displayed clinical symptoms of the disease during their lifetimes. Based on data that indicate neuroimaging and biomarker identification are yet capable of reliably predicting mNCD diagnosis, diagnostic reliance of mNCD is thus on neuropsychological assessment (Regner et al., 2016). Indeed, neuropsychological assessment, which picks up on the subtle cognitive deficits which arise in AD prior to the emergence of clinical symptoms, is key in the evaluation of prodromal signs of age-related decline. As stated in the DSM-5, "Neuropsychological testing, with performance compared with norms appropriate to the patient's age, educational attainment, and cultural background, is part of the standard evaluation of NCDs and is particularly critical in the evaluation of mild NCD" (APA, 2013, p. 607). However, conversion estimates from mNCD to AD are still highly variable, with study reports ranging from 5-80% and dependent on varying diagnostic criteria. High rates of misdiagnosis are attributed to inaccuracies and biases in various forms of diagnostic techniques (Busse, Bischkopf, Riedel-Heller, & Angermeyer 2003).

In addition to misdiagnosis, overdiagnosis may come as an associated risk of early diagnosis as well. While mNCD can set the stage for early identification of neurodegenerative processes, those diagnosed with mNCD do not always, or even often, go on to develop dementia (Mitchell & Shiri-Feshki, 2009). One study reported false diagnosis of Alzheimer's disease as high as 20% in primary care settings (Boustani et al., 2005). The potential misdiagnosis of mNCD and Alzheimer's disease in older adults raises further concerns related to iatrogenic

progression of disease pathology as negative expectations elicited by diagnosis could have detrimental effects on older adults (Regner et al., 2016). In fact, there is evidence that people who are knowingly diagnosed with dementia become worried to an extent that results in low self-esteem, self-stigmatization, and impaired quality of life (Cutler & Hodgson, 2013).

Non-neurological Factors. In order to decrease rates of misdiagnosis, it is important to understand the factors that may contribute to it in the context of mild NCD. Due to the current reliance on neuropsychological data for NCD diagnosis, identifying non-neurological factors involved in the neuropsychological assessment of older adults is central to this investigation. Specifically, because subtle deficits on particular neuropsychological tests are significant in the evaluation of older adult's cognitive functioning, it is essential to investigate what non-neurological factors influence scores on neuropsychological tests.

In the neuropsychological literature, age-based stereotype threat (ABST) has largely been shown to impact discrepancies in clinical cognitive performance. Indeed, Regner et al. (2016) suggest high rates of AD misdiagnosis may be linked to ABST in neuropsychological assessment. Significantly, ABST has been shown to decrease cognitive performance on dementia screening tests, at times causing scores to fall below cutoffs (Barber, 2015; Fresson, 2017, Haslam, 2012; Mazerolle, 2016). Yet while the assessment of fatigue, effort, and comorbid psychiatric disorders are often incorporated in neuropsychological assessment, practitioners do not generally consider the effects ABST may have on older adults in the testing environment.

Stereotype Threat and Age Based Stereotype Threat

Age-based stereotype threat (ABST) is a subcategory of stereotype threat (ST) more generally, wherein exposure to stereotypes reduces the performance of members in the stereotyped group (Steele, 1997). Previous research has found exposure to stereotype threat

reduces academic performance of Hispanics (Gonzales, Blanton, & Williams, 2002; Schmader & Johns, 2003), academic performance of students from low socioeconomic backgrounds (Croizet & Claire, 1998), math performance of females (Good, Aronson, & Harder, 2008; Inzlicht & Ben-Zeev, 2000; Spencer, Steele, & Quinn, 1999), and math performance of white males as compared to Asian males (Aronson, Lustina, Good, Keogh, Steele, & Brown, 1999; Stone, Lynch, Sjomerling, & Darley, 1999). In non-academic domains, stereotype threat has been shown to decrease performance of white men in sports (Stone, Lynch, Sjomerling, & Darley, 1999), women in negotiation (Galinsky & Thompson, 2002), gay men in providing child care (Bosson, Haymovitz, & Pinel, 2004), and women in driving (Yeung & von Hippel, 2008). Strikingly, diverse stereotype threats across multiple groups can significantly affect performance across multiple domains of functioning.

Various theories exist with regards to the mechanism of stereotype threat effects. Across studies, numerous factors have been shown to be involved in moderating stereotype threat effects including stereotype salience, self-relevance of the stereotype (Aronson et al., 1999), emotion regulation ability (Johns, Inzlicht, & Schmader, 2008), working memory capacity (Regner et al., 2010), physiological arousal, and negative cognitions and expectations surrounding performance (Schmader, Johns, & Forbes, 2008; Schmader & Beilock, 2012).

In studies with older adults, stereotype threat has been shown to reduce performance in domains of memory, cognition, and physical tasks. Specifically, older adults have been shown to conform to age-based stereotypes regarding poor driving ability, decreased cognitive performance, and decreased performance on memory tasks (Hess, Hinson, & Hodges, 2009).

The most common negative age-based stereotypes relate to older adults' competence, wherein physical and cognitive abilities are assumed to decrease with age (Fiske, Cuddy, Glick,

& Xu, 2002; Lamont, Swift, & Abrams, 2015). Negative stereotypes of cognitive aging include negative expectations of cognitive decline, especially expectations of poor memory ability. Interestingly, a study evaluating the difference in memory performance scores between elderly adults who did and did not adhere to negative aging beliefs, including the belief that memory deteriorates in old age, showed that those who held negative beliefs about aging underperformed those who did not on tasks of memory. Study analyses showed that the differences in aging beliefs alone accounted for most of the variability in memory task performance between the groups, suggesting a relationship between negative stereotypes of aging and decreases in performance on objective tests (Levy & Langer, 1994).

The relationship between aging stereotypes and cognitive performance on objective measures is startling when considering the reliance of important clinical decisions on such measures. Further, while stereotypes regarding cognitive decline in the domain of memory are most salient, stereotypes regarding decline in cognitive performance more globally have also been shown to affect test performance in older adults (Barber, 2017).

Age-based Stereotype Threat and Cognitive Performance

Despite the far-reaching implications of ABST on older adult's cognitive performance, relatively few studies have looked at the relevance of age-based stereotype threat on older adult's performance on clinically relevant neuropsychological measures. As scores on neuropsychological measures are used to make dementia-related diagnostic decisions, understanding the effects of age-based stereotype on neuropsychological measures relevant to the assessment of older adults is fundamental for the accurate evaluation of cognitive performance in this vulnerable, growing population.

To my knowledge, only four studies to date have looked at the effects of age-based stereotype threat on cognitive performance on clinically relevant measures. All of these studies pointed to the negative effects of age-based stereotype threat on cognitive performance. Three of the studies used screening tests as outcome measures, and of these, two of the studies showed individuals in the age-based stereotype threat condition performed below cut-offs for dementia (Haslam et al., 2012; Mazerolle et al., 2016) while the third showed decreases that were not below normative measures. (Barber, Mather, & Gatz, 2015).

Dementia screening tests are not generally used as the basis of diagnostic conclusions by practicing neuropsychologists however. Cognitive performance on specific clinical cognitive tasks are given great import in neuropsychological assessment related diagnosis. The study by Fresson, Dardenne, Geurten, and Meulemans (2017), is the only published study that has looked at age-based stereotype threat in the context of cognitive performance on specific, clinically relevant, neuropsychological measures. They further looked at whether dementia worry moderated the role of age-based stereotype threat on clinical cognitive performance. Based on the cognitive domains most affected in AD, specific cognitive performance domains measured were memory, attention, and executive function. While they found no effect of stereotype threat on memory, attention, or subjective complaint measures, cognitively intact people with moderate to high dementia worry scored at pathological levels on executive measures.

ABST studies on the cognitive performance of older adults on clinical tests are evidently limited, yet findings are potentially indicative of the significant effects of ABST on clinically relevant outcome measures. The current research study thus stemmed from the paucity of research investigating the role of age based stereotype threat, an established psychosocial factor, on clinically relevant measures used in older adults evaluated for cognitive impairment. The

study specifically investigated how exposure to age based stereotype threat impacted older adult's cognitive performance on neuropsychological tests of memory, attention, executive function and processing speed commonly used in clinical neuropsychology practices (Rabin, Paolillo, & Barr, 2016). The study expanded on and diversified ABST research through its use of different, commonly used neuropsychological tests as outcome measures, through measuring additional cognitive domains, and through exposing participants to a uniquely developed stereotype threat condition.

Effects of Age Based Stereotype Threat on Neuropsychological Measures of Memory, Attention, Executive Function and Processing Speed in Older Adults

Previous ABST research has primarily utilized generalized cognitive performance measures and has focused narrowly on the domain of memory. However, this study targeted ABST effects on neuropsychological measures specifically used in the assessment of older adults and examines multiple cognitive domains. As neuropsychological assessment is important in distinguishing normal from abnormal aging processes, it is essential that clinicians understand the effects psychosocial factors, such as ABST, may have on neuropsychological measures of cognitive performance. Furthermore, given that attention, executive function, processing speed, and memory performance are all indicative of mNCD and Alzheimer's disease disposition, it is essential that the effects of ABST on these domains is understood.

The current study thus examined the effects of ABST on neuropsychological measures of memory, attention, executive function, and processing speed in an older adult population. Not only did the study's approach utilize novel instrumentation in the field of age-based stereotype threat research, it also allowed investigation into the specific cognitive domains affected by ABST. The study provides insight into how ABST, an important non-neurological factor, may

affect neuropsychological performance in an older adult population. Results contrast with previous research in the field and add insight into the extent to which ABST may or may not affect cognition. The current study further informs potential interventions and directions for future studies.

Hypotheses

1) Participants who were exposed to the age-based stereotype threat induction (ABST group) would perform significantly worse on tests of Memory as compared to participants who were given neutral test directions (Control group).

2) Participants who were in the ABST group would perform significantly worse on tests of Executive Function as compared to participants in the Control group.

3) Participants who were in the ABST group would perform significantly worse on tests of Attention as compared to participants in the Control group.

4) Participants who were in the ABST group would perform significantly worse on tests of Processing Speed as compared to participants in the Control group.

Method

Participants

Participants were recruited through a newspaper ad posted in a local Missoula, MT newspaper. Participants were at least 65 years old. Participants were initially screened over the phone using the Telephone Interview for Cognitive Status (TICS) and excluded if they scored below 28, representing possible cognitive impairment. Participants were additionally screened in-person using a Demographic and Health Questionnaire (DHQ) and the Patient Health Questionnaire-8 (PHQ-8). Participants were excluded if they indicated current neurological disorder, scored 3 or higher on anticholinergic medication burden, or scored in the moderate-

severe range of depression (10 or higher on the PHQ-8). Participation in this study was voluntary. All participants received ten dollars for their participation in the study.

After completing the DHQ, PHQ-8, and reading the experimental or control condition paragraph, all participants were administered a series of neuropsychological measures and self-report questionnaires.

A total of 49 subjects participated in the research. Six participants were excluded from study analyses after failing to meet inclusion criteria on the anticholinergic burden scale or depression measure.

Materials

Demographic and Health Questionnaire.

The demographic and health questionnaire was used to obtain participant information including age, gender, ethnicity, years of education, psychiatric and neurological history, and behavioral health habits (Appendix A).

Patient Health Questionnaire-8

The Patient Health Questionnaire- 8 was used as a measure of depression. It is deemed a valid indicator of depressive symptoms. Participants with scores of 10 or higher, which is indicative of moderate or high levels of depressive symptoms, were excluded from this study. The PHQ-9 has a specificity of 88% and a sensitivity of 88% for major depression (Kroenke, Spitzer, & Williams, 2001). The PHQ-8 includes all PHQ-9 items with the exception of an item regarding suicidal ideation (Kroenke et al., 2009). The PHQ-8 was administered to participants during the in-person screening evaluation (Appendix B).

Telephone Interview for Cognitive Status

The Telephone Interview for Cognitive Status (TICS) is one of the most widely used cognitive screening measures in medium-large scale epidemiological studies and is believed to reliably distinguish between normal cognition, mild cognitive impairment, and dementia (Knopman et al., 2010). The TICS took less than 10 minutes to complete and was administered over the phone prior to participant scheduling. Those who scored under 28 were excluded from the study. The TICS is highly correlated with the Mini-mental Status Exam (r=.94, p<.001) and has been found to have excellent sensitivity (94%) and specificity (100%) in differentiating normal elderly and those with Alzheimer's disease (Fong et al., 2009) (Appendix C).

Anticholinergic Burden Scale

Medications with anticholinergic properties have been found to impact cognition in non-demented older adults (Risacher et al., 2016). The anticholinergic burden (ACB) scale was developed to assess the additive effects of specific drugs implicated in decreasing cognitive ability in older adults. Drugs listed on the scale are given a number between 1 and 3 depending on their cognitive impact with 1 being low and 3 being high. A total ACB score of 3 or more is considered clinically relevant. Participants who had an ACB score of 3 or higher were excluded from study analyses (Appendix D).

Experimental and Control Conditions

The age-based stereotype threat exposure used in the current study was designed to realistically represent common, culturally relevant aging stereotypes while also providing a poignant and robust stereotype threat induction. The age-based stereotype threat condition for cognitive performance was developed in relation to meta-analytic data indicating the most robust forms of stereotype threat exposure (Lamont, Swift, & Abrams, 2015). The experimental condition was presented as an excerpt from a pseudo-journal on aging and incorporated fact-

based and ambiguous stereotypes as well as implicit aging stereotypes. It was adapted from

information provided on the National Institute of Aging website. The experimental condition

further required participants to answer True/False questions about what they had read in order to

enhance their attendance to the stereotypes presented. The control condition was presented as an

excerpt from a pseudo-journal article on ornithology and similarly required participants to

answer True/False questions about what they had read (Appendices E & F).

Neuropsychological Measures

Neuropsychological measures were determined based upon their common use in

neuropsychological practice and their validity in assessing for memory, executive function,

processing speed, and attention performance. According to a study evaluating test usage

practices among clinical neuropsychologists, the Weschler Adult Intelligence Scale (WAIS), the

Trail Making Test (TMT), and the California Verbal Learning Test (CVLT) are three of the five

most commonly used tests in neuropsychology. Further, in older adults specifically, the study

determined that commonly used and well normed tests of executive function, attention,

processing speed, and memory included the DKEFS Stroop, Trail Making Test, WAIS-IV Digit

Span and Coding subtests, and the California Verbal Learning Test (Rabin, Paolillo, & Barr,

2016).

Neuropsychological Measures of Memory

California Verbal Learning Test II

The California Verbal Learning Test II (CVLT-II) measures immediate and delayed

recall of a list of 16 words read out loud a total of five times (CVLT-II, r=.94). Total words on

immediate (0-80) and delayed recall (0-16) measures were used to assess general memory

function. Total scores on immediate and delayed recall have been shown to have 87.6% and

86.5% respective accuracy in predicting the presence of mild cognitive impairment (CVLT-II; Delis, Kramer, Kaplan, & Ober, 2000; Lezak, Howieson, Bigler, & Tranel, 2012).

Neuropsychological Measures of Executive Function

DKEFS Stroop

The DKEFS Stroop test was used as an outcome measure of executive function (r=.93). DKEFS Stroop appears specifically relevant to the executive function ability to resist or resolve interference from irrelevant information in the external environment. The DKEFS Stroop task assesses one's ability to inhibit an automatic response over a controlled response (Kane & Engle, 2003). DKEFS Stroop is timed and participants are given 45 seconds to read as many words, as fast as they can, in each of four different tasks. Each task varies in terms of demand with the first set pure word reading, the second pure color, the third color-word reading, and the fourth alternating color-word and word reading. Scores on color-word/word reading (trial 3) were used in the analysis of executive function (Stroop, 1935).

Trails B

Trail Making Test (TMT) Part B tests executive function by requiring subjects to plan and execute a drawing task while utilizing working memory to maintain appropriate task instructions (r=.55). Participants are given instructions to draw a line connecting alternating, sequential numbers and letters, as fast as they can. TMT B raw times, in seconds, were used for analysis of executive function (TMT; Reitan, 1992).

Neuropsychological Measures of Attention

Trails A

The Trail Making Test (TMT) A test asks participants to draw a line connecting a page of mixed-up numbers in sequential order from 1 to 25. TMT A raw times, in seconds, were used for

analysis of attention (r=.74). Given the foundational importance of attention in other cognitive systems, understanding the effects of age-related expectations on attention has significant potential to shape targeted interventions aimed at reducing the consequences of stereotype threat. Both TMT A and TMT B are shown to be sensitive to the progressive decline of dementia (TMT; Reitan, 1992; Lezak, Howieson, Bigler, & Tranel, 2012)

Weschler Adult Intelligence Scale IV, Digit Span

The entire Weschler Adult Intelligence Scale IV is a test of intelligence. Digit span (DS) is a subtest of the WAIS-IV which measures attention. DS has three trials wherein participants are asked to repeat a list of numbers read aloud to them by the examiner verbatim, backwards, and in sequential order. Total raw scores from all trials (0-27) were used for analysis of attention (WAIS-IV; Weschler, 2008a, 2008b).

Neuropsychological Measures of Processing Speed

Weschler Adult Intelligence Scale IV, Coding

Coding is a subtest of the WAIS-IV which measures processing speed. Coding requires participants to translate numbers to symbols using a key and to complete as many translations as possible within two minutes. The total number of correct translations were used in the analysis of processing speed (WAIS-IV; Weschler, 2008a, 2008b).

Weschler Adult Intelligence Scale IV, Symbol Search

Symbol Search is a subtest of the WAIS-IV which additionally measures processing speed. It requires subjects to scan multiple series' of symbols and identify whether or not each series has a symbol which does or does not match a given target symbol. Participants are given two minutes to complete as many symbol searches as they can. The total number of correct

symbol searches was used in the analysis of processing speed (WAIS-IV; Weschler, 2008a, 2008b).

Manipulation Check Questionnaire

A manipulation check questionnaire was used to check participant understanding of the age-based stereotype threat exposure instructions. The manipulation check asked participants a dichotomous yes or no question about whether they understood the statements they read prior to testing. Participants were also be asked to rank how much effort they put into the tasks, the perceived difficulty of the tasks, how much pressure they felt during the testing, and their perception of their performance on the tasks using a 9-point Likert scale adapted from Suhr and Gunstad, 2002 (Appendix G).

Procedure

Study approval was obtained from the Montana Institutional Review Board prior to participant recruitment. Following recruitment, participants were screened over the phone using the TICS (a cognitive screening tool) and then scheduled for the in-person portion of the study. In-person, participants completed an additional screening evaluation that asked them to list their medications (for later scoring using the ACB scale, an assessment of potential medication-based reductions in cognition) and to complete the PHQ-8 (a measure of depression). Participants were excluded if they had a TICS score under 28, a PHQ-8 score greater than 10, or an ACB score of 3 or higher.

Prior to participants entering the clinic, the primary researcher created packets which contained the informed consent, demographic and health questionnaire, and either the control or experimental tasks. Packets were labeled according to age and gender and randomly mixed. Each new participant scheduled received a packet according to their associated age and gender label.

In this way the primary researcher and the trained research assistants who administered the study were blind to participant condition.

Participants completed the study in a designated assessment room within the Clinical Psychology Center on the University of Montana campus. At the onset of the study, participants were provided with the introductory packet which included the informed consent form, indicating the nature and potential risks of the study. Participants were informed that they could voluntarily withdraw from the study at any time, without penalty. Assessment was conducted by the researcher and by trained research assistants. Scoring was performed by trained research assistants who had no involvement in instruction packaging nor who had administered the tests they scored. Following control or experimental task completion, cognitive tests were administered in semi-randomized order to each participant. All participants began testing with the CVLT-II immediate recall task. All other tests were administered in randomized order within the 20 minute CVLT-II delay period. If participants did not complete all other tests within the 20 minute delay they were administered following the CVLT-II delayed recall task. At the conclusion of testing, participants completed a manipulation check. Administration of these measures was followed by debriefing.

Data Analysis

Cognitive performance was evaluated using raw scores on each measure within each cognitive domain. Each cognitive domain was constructed of two dependent variable measures. Data was analyzed using separate between groups MANOVAs on each cognitive domain with the group status (experimental or control) as the between groups measure. The construct of Memory was measured using total word scores on immediate and delayed CVLT II recall, Attention was constructed using total seconds scores of TMT A and total number scores of

WAIS-IV Digit Span, Processing Speed was constructed using total correct scores from WAIS-IV Coding and Symbol Search, and Executive Function was constructed using Trial 3 scores from DKEFS Stroop and total seconds scores from TMT B. A separate One-way ANOVA was used to assess whether significant differences existed between groups education.

Overall, the following sample means and sample mean vectors were compared:

1. Control and experimental sample mean vectors of scores on Memory measures (Immediate and Delayed CVLT-II raw word scores).

2. Control and experimental sample mean vectors of scores on Attention measures (TMT A and WAIS-IV Digit Span time and total raw scores).

3. Control and experimental sample mean vectors of scores on Executive Function measures (TMT B and DKEFS Stroop time and interference score).

4. Control and experimental sample means of scores on Processing Speed measures (WAIS-IV Coding and Symbol Search total correct scores).

Results

Power

An a priori power MANOVA analysis using G Power statistical software indicated a sample size of 42 total participants would be needed for sufficient power (1-beta=.95) to detect an expected moderate effect size (d=.3). Forty-three participants were included in the analyses.

Demographic Information

Demographic information is provided in Table 1. A total of forty-nine subjects completed the neuropsychological measures and questionnaires. Of these, five were excluded on the basis of depression, as measured by the PHQ-8 cutoff of 10 or higher, and one was excluded on the

basis of anticholinergic burden, as measured by an ACB scale score of 3 or higher. Forty-three

participants were therefore included in the analyses.

Of these participants 14 (33%) were male and 29 (67%) were female. Forty-two

participants identified as Caucasian (97.7%) while 1 (2.3%) identified as Asian. Participants

ranged in age from 67-89. Nine (20.9%) participants were 65-70, 11 (25.6%) were 71-75, 12

(27.9%) were 76-80, 10 (23.3%) were 81-85, and 1 (0.02%) was 89. The mean number of

completed years of education was 17.65 with a standard deviation of 2.47. Chi-square analysis

for gender revealed no significant differences between the two groups, $\chi2$ (1, $N = 43$) = 0.011,

$p>.05$. Group differences for Age and Education were analyzed using two separate one-way

ANOVAs. There was no significant different found for Age, $F(1, 41) = 0.329$, $p>.05$ or

Education, $F(1, 41) = 1.655$, $p>.05$. No participants included in the analyses reported a current

psychiatric illness, neurological illness, or substance use issue.

Table 1. *Demographic Characteristics of the Study Groups.*

Variable	Control Group (N=21)	ABST Group (N=22)	Significance
Age	M=75.38 (SD=5.54)	M=76.41 (SD=6.18)	p=.569
Raw Education	M=18.14 (SD=2.15)	M=17.18 (SD=2.70)	p=.918
Male	Percent= 33.3%	Percent= 31.8%	p=.206

Performance on Neuropsychological Measures

Memory. Performance on the cognitive domain of Memory was analyzed using total

scores on the CVLTII immediate and delayed recall. Table 2 shows the means and standard

deviations for immediate and delayed recall scores in ABST and Control groups. MANOVA was

used to analyze group differences in Memory using CVLTII immediate and delayed recall scores

as dependent variables and group condition as the between groups measure. Individuals in the

ABST condition did not perform significantly differently than individuals in the Control condition on Memory, $F(1, 41) = .109$, $p>.05$ (*Partial Eta Squared = .005*) (Table 3).

Attention. Performance on the cognitive domain of Attention was analyzed using total score on WAIS-IV Digit Span and total seconds on Trail Making Test Part A. Table 2 shows means and standard deviations for total DS and TMTA seconds scores in ABST and Control groups. MANOVA was used to analyze group differences in Attention using total DS and total TMTA seconds scores as dependent variables and group condition as the between groups measure. Individuals in the ABST condition did not perform significantly differently than individuals in the Control condition on Attention, $F(1, 41) = .973$, $p>.05$ (*Partial Eta Squared = .046*) (Table 3).

Executive Function. Performance on the cognitive domain of Executive Function was analyzed using total seconds on TMTB and total seconds on the inhibition trial (trial 3) of DKEFS Stroop. Table 2 shows the means and standard deviations for total TMTB and DKEFS Stroop Trial 3 seconds scores in ABST and Control groups. MANOVA was used to analyze group differences in Executive Function using TMTB and DKEFS Stroop Trial 3 seconds scores as dependent variables and group condition as the between groups measure. Individuals in the ABST condition did not perform significantly differently than individuals in the Control condition on Executive Function, $F(1, 41) = .274$, $p>.05$ (*Partial Eta Squared = .014*) (Table 3).

Processing Speed. Performance on the cognitive domain of Processing Speed was analyzed using total seconds on WAIS-IV Coding and Symbol Search subtests. Table 2 shows the means and standard deviations for total WAIS-IV Coding and Symbol Search seconds scores in ABST and Control groups. MANOVA was used to analyze group differences in Processing Speed using Coding and Symbol Search seconds scores as dependent variables and group

condition as the between groups measure. Individuals in the ABST condition did not perform

significantly differently than individuals in the Control condition on Processing Speed, $F(1, 41)$

= 2.055, $p>.05$ (*Partial Eta Squared = .093*) (Table 3).

Table 2. *Means and Standard Deviations of Neuropsychological Measures by Condition*

Neuropsychological Domain	Control Group (N=21)	ABST Group (N=22)	p value
Memory	M (SD)	M (SD)	
CVLT II Immediate Recall	47.00 (10.36)	46.86 (12.80)	0.910
CVLT II Delayed Recall	9.70 (3.11)	9.41 (3.46)	0.879
Attention			
Trails A	29.60 (6.69)	34.55 (12.86)	0.217
Digit Span Total	28.25 (5.89)	26.18 (5.48)	0.285
Executive Function			
Trails B	83.05 (36.06)	86.05 (29.20)	0.755
DKEFS Trial 3	63.45 (19.33)	67.95 (14.05)	0.471
Processing Speed			
WAIS IV Coding	62.95 (12.61)	54.50 (14.11)	0.054
WAIS IV Symbol Search	27.00 (6.18)	25.27 (8.62)	0.418

CVLT II= California Verbal Learning Test II, WAIS IV= Weschler Adult Intelligence Scale-IV.

Table 3. *MANOVA Results*

Neuropsychological Domain	*df1*	*df2*	*F*	η^2	*p*
Memory	1	41	0.109	0.005	0.897
Attention	1	41	0.973	0.046	0.387
Executive Function	1	41	0.274	0.014	0.761
Processing Speed	1	41	2.055	0.093	0.141

Ratings on the Manipulation Check Questionnaire

Independent samples t-tests were used to analyze whether or not group conditions

differed on self-report measures of how hard participants tried during testing, how difficult they

found the tests, how much pressure they felt during the testing, and how confident they were in

their testing performance. Participants in the ABST group did not differ significantly from

participants in the Control group with regards to how much self-rated effort they put into taking

the tests, $t(43) = 1.606$, $p > .05$, how difficult they found the tests, $t(43) = -0.09$, $p > .05$, how much

more pressure they felt during the testing, $t(43) = -0.901$, $p > .05$, or how confident they were in

their performance, $t(43) = 1.202$, $p > .05$ (Table 4). All participants indicated they understood the

instructions given at the beginning of the study.

Table 4. *Posttest Ratings on the Manipulation Check Questionnaire by Group Condition*

Self-Report Ratings	Control Group (N=21) M (SD)	ABST Group (N=22) M (SD)	p value
Effort	12.10 (2.49)	10.95 (1.94)	0.116
Difficulty	6.31 (1.86)	6.36 (2.08)	0.929
Pressure	4.38 (2.54)	5.14 (2.93)	0.373
Confidence	6.17 (1.20)	5.64 (1.65)	0.236

*all ratings are scaled with higher values representative of higher levels of effort put forth on testing, higher levels of perceived test difficulty, higher pressure felt during testing, and higher confidence in testing performance

Discussion

In the current study, results showed that exposure to age-based stereotypes did not

significantly reduce cognitive performance on neuropsychological tests used to assess memory,

attention, processing speed and executive function. These results were in opposition to the

central hypotheses of the study which were that exposure to ABST would decrease cognitive

performance on neuropsychological measures of memory, attention, processing speed and

executive function. Additionally, analyses revealed no significant differences between groups

with regards to self-reported perceptions of effort, test difficulty, pressure felt during testing, and

confidence in testing performance. These results provide an advancement in understanding the neuropsychological impact of ABST, given the limited previous research that exists in this subject area. Results are inconsistent with previous study findings in the ABST literature by Barber et al., 2015; Haslam et al., 2012, and Mazerolle et al., 2016, all of which showed reductions in cognitive performance on dementia screening tests after various ABST inductions.

Of note, each of the previous studies examining the effects of ABST on cognitive performance used different ABST inductions. Haslam et al. informed participants that they were either in a study group ranging from 40 to 70 or 60 to 90, indicating that participants themselves were either "older" or "younger" relative to the others. Barber et al. had participants in the ABST condition read a pseudo article on memory decline in old age and stated that the purpose of the study was to show that memory inevitably declined in aging. In contrast, participants in their control group were told the purpose of the study was to show that verbal memory was preserved in old age. Mazerolle et al. induced ABST by telling participants in the threat group that their performance was being compared to that of younger adults.

While the current study used an ABST induction thought to elicit multiple salient stereotype threats, it may have been more fact-based than previous studies which utilized a more ambiguous threat condition. Literature supports that ambiguous threats are often more effective at decreasing performance than fact-based stereotypes (Lamont, Swift, & Abrams, 2015). Thus, the current study may have used a less salient form of ABST induction. Another way to explain the lack of significant findings may be that the fact-based, cultural exposure participants already experience may have been salient enough that the ABST condition itself did not elicit significant additional effects on performance.

In addition to the ABST induction itself, it is important to examine other differences between the current study and previous studies in the ABST literature in order to better understand the incongruency between the current study and previous research. Importantly, in each of the four known previous studies of ABST effects on cognitive performance, researchers used different outcome measures. Further, many of the studies tested potential moderating variables in the relationship between ABST and cognitive performance. Indeed, certain authors found that the effects of ABST on cognitive performance were dependent on other related factors; factors which were not evaluated in the current study (Haslam et al., 2012; Fresson, Dardenne, Geurten, & Meulmanns, 2017). Let us look more in depth at each of the relevant, comparable studies below.

In the first related study, Haslam et al. showed that 70% of older adults who expected declines in memory and self-categorized as "older" performed below predementia cutoffs on the Addenbrookes Cognitive Examination-Revised (ACE-R). A key difference between the current study and the Haslam et al. study; however, is that experimenters assessed participant expectations regarding cognitive decline in addition to exposing them to self-categorization based ABST. Thus, those that performed worse were expecting to do so.

Literature suggests that negative expectations in and of themselves may decrease performance and increase threat salience (Suhr & Gunstad, 2002). Thus, it may be conjectured that, while ABST may increase negative expectations, the expectations themselves may be what impact cognitive performance. In future studies, assessing participant's expectations of performance prior to test administration and ABST induction, as well as after ABST induction, is recommended to determine whether a negative change in performance expectations moderates the effect of ABST on cognitive performance.

In the second related study, Barber et al. showed that participants in their ABST condition performed significantly lower on the ACE-R than participants in their positive control group. However, this effect did not change the proportion of participants who met diagnostic criteria for predementia. In contrast to the current study, Barber et al. used a threat condition and a reduced threat condition but did not include a true control condition. This may have increased the difference in performance scores between threat and reduced threat conditions more so than in the current study.

Future studies using the current study paradigm should include an additional threat reduction group in addition to an ABST and control group. This may allow for a better examination of whether there is a linear increase in performance scores from threat to control to reduced threat conditions. If this were so, it would make sense that Barber et al. found a greater difference between ABST and reduced threat group performance scores than the current study found between ABST and control group performance scores. In general, how reduced threat conditions affect performance deserves more clarity in the broader stereotype threat research literature, as there are indeterminate results showing that reduced threat conditions can at times increase or decrease cognitive performance scores, depending on various research designs (Shih, Pittinsky, & Ho, 2012).

In the third relevant study, Mazerolle et al. looked at how ABST affects the Mini-Mental Status Exam (MMSE) and Montreal Cognitive Assessment (MoCA) screening measures for dementia. Results from their study showed that ABST significantly lowered performance on both measures, resulting in 40% of ABST group participants meeting screening criteria for predementia in comparison to 10% of control participants. This difference in findings from the current study may indicate that neuropsychological tests, which aim to measure precise cognitive

constructs, are more robust to ABST than global screening measures. Such inconsistent results may also be related to the difference in education level between the Mazerolle et al. study population and the current study population.

Indeed, the current study population had an average education level of 17 years while the average education level of participants in the Mazerolle et al. study was 8 years. While higher education is thought to increase stereotype threat saliency, it may be that more highly educated people experience greater chronic ABST relative to those with lower levels of education (Hess, Hinson, & Hodges, 2009).

While not studied, chronic ABST could be described as the long-term exposure of older adults to culturally embedded stereotypes of aging. Those with higher education would likely have greater chronic ABST exposure due to their potentially higher levels of media consumption on topics related to aging and dementia. Additionally, more highly educated individuals may experience more susceptibility to ABST due to their higher presumed use of cognition in occupational and other settings. Indeed, if more highly educated individuals rely on cognition in work settings more than less educated individuals, a minor decrease in cognitive ability may be of greater actual and perceived threat to their livelihood. In this way, sociocultural ABSTs, elicited both externally and internally, may have desensitized the current study population to the brief, experimental ABST exposure. Relatedly, current study results could suggest that chronic, cultural ABST is salient enough that brief exposure to ABST in a laboratory setting is insignificant as an experimental condition in this population.

Taking all of this in account, if certain older adults are, as we suggest, highly exposed to ABST within the American culture, it may be pertinent to investigate how long-term ABST exposure impacts cognition longitudinally. Further, it may be especially interesting to know how

long-term ABST exposure specifically impacts other non-neurological variables such as worry, anxiety, distractibility, and confidence; as these variables may have significant downstream effects on cognition and performance in the context of neuropsychological assessment.

Interestingly, it is not far-fetched to imagine that psychological variables, such as anxiety and worry serve, to mechanize ABST effects. In fact, one theory of stereotype threat mechanisms suggests thought suppression, physiological arousal, and cognitive monitoring—all features of worry—work to decrease cognitive performance in individuals exposed to such threats (Johns, Inzlicht, & Schmader, 2008). In the literature, this mechanism is specifically referred to as the "executive interference" model of stereotype threat.

In the executive interference model, these worry related factors are thought to decrease working memory capacity, thereby decreasing executive control and performance on executive function measures. Many general ST studies have supported this model and a couple studies of ABST support this model as well. For instance, Mazerolle et al. showed that the executive function subtests on the Mini-mental Status Exam (MMSE) and the Montreal Cognitive Assessment (MoCA) were the most significantly affected by ABST. Additionally, Fresson, Dardenne, Geurten, and Meulemans, showed that ABST specifically reduced performance on the DKEFS Stroop executive function measure.

However, in the Fresson, Dardenne, Geurten, and Meulemans study, decreases in executive function performance in participants exposed to ABST was moderated by the level of self-reported dementia worry. This would make sense given that more worry may decrease executive control below a threshold at which performance scores are significantly impacted. It may then be that, in older adults, there exists a particularly relevant worry variable which can

impact cognitive performance—dementia worry. Further this type of worry may be increased in the context of ABST. In fact, certain studies support this very conclusion (Kinzer & Suhr, 2016).

So, given that ABST increases dementia worry, the lack of significant findings in the current study may simply suggest that the analyses did not account for pertinent moderating variables when investigating the effects of ABST on cognitive performance. As the sample size in the current study limits the ability to look at such effects, it is recommended that future studies increase power to allow for the examination of moderation effects.

Of note, unpublished data collected by the current author suggest that dementia worry, apart from true cognitive impairment, significantly decreases neuropsychological performance on measures of executive function and processing speed in older adults (See Appendix I). While conclusions about how ABST affects dementia worry prior to its effect on cognitive performance are not possible to draw, these data provide evidence that dementia worry is a laudable cultural concern. Given previously cited research which suggests that ABST increases dementia worry, the long-term effect of ABST may result in increased dementia worry and thus, decreased cognitive ability. Future studies should certainly work to determine the interrelatedness of ABST and dementia worry effects, as well as aim to clarify how these non-neurological factors impact neuropsychological performance.

In summary, given that neuropsychological assessment is imperative in the evaluation of older adults with cognitive difficulty, understanding the relationship between ABST and other complex non-neurological factors is important to understand. Already, there is evidence that ABST increases a specific non-neurological factor relevant to older adults, which operates to decrease cognitive performance. Indeed, a known effect of ABST exposure in older adults is that

it increases individual's level of worry about getting dementia, a phenomenon known as "dementia worry".

In the context of models of ST which posit that ST decreases executive control through increasing physiological, cognitive, and behavioral aspects of anxiety; it is possible that ABST and dementia worry work in combination to decrease cognitive performance (Johns, Inzlicht, & Schmader, 2008). Alternatively, dementia worry may impact cognitive performance above and beyond ABST.

In light of this overall discussion, the current study supports an interesting and important question: How might ingrained cultural aging stereotypes impact downstream psychological variables? Further, how might older adults worries about getting dementia impact their cognitive performance in the context neuropsychological assessment?

Limitations

Limitations of this study include selection bias, confounding, and condition salience. Due to the voluntary nature of this study and the use of newspaper recruitment, selection bias may have occurred. Though study participants were equally represented in age, gender, and education across groups, the sample overall included more women, more Caucasians, and more highly educated individuals than the national average.

This study also had a great potential for confounding in that participation in the study required older adults to engage in neuropsychological assessment which may have exposed control participants to inherent, self-imposed age-based stereotype threat. Often, older adults coming in for testing are worried about their cognition and have negative expectations pertaining to their performance already. Indeed, observations noted during the course of the study indicated that many individuals who participated expressed concern about their memory during testing,

independent of group condition (e.g., "I am not good with memory", "I'm not going to be able to remember, I'm too old").

Another potential limitation in this study was exposure saliency. While balancing the realistic nature of the ABST exposure so as to allow culturally relevant research results, the exposure needed to be of a high enough dose that effects could be measured. For this reason, the study used direct, fact-based language which is shown to be the most poignant in stereotype threat studies. However, given the prevalence of media attention on Alzheimer's disease and cognitive aging, as well as the high average education level of study participants, this exposure may not have been salient above and beyond what participants are exposed to in daily life.

Conclusions

The current study examined how exposure to age related stereotypes impacts cognitive performance on neuropsychological measures in an older adult population. The findings of this study suggest that brief ABST exposure on its own does not significantly reduce cognitive performance on measures of memory, attention, executive function, or processing speed. However, authors suspect the lack of significant findings may reflect the high level of cultural exposure to ABST and age-related information in the study population overall. Further, authors posit that downstream effects of chronic ABST exposure, such as increased dementia worry, may significantly impact older adult's cognitive performance abilities.

Future Directions

The current study supports many future research directions. To start, it is recommended that future studies include a positive control group which may serve to mitigate the culturally embedded stereotypes people may arrive with. Further, it is advised that future research assess older adults' preconceived negative expectations regarding cognitive aging, as well as their level

of dementia worry, prior to neuropsychological test performance. It is further recommended that future studies identify potential moderating factors of ABST in order to fully understand the effects ABST may have on cognitive performance.

Future studies should specifically expand on how ABST affects dementia worry, and how both factors influence neuropsychological performance and cognition overall. It is also recommended that future research examines how ABST and dementia worry may affect neuropsychological assessment in people with different socioeconomic backgrounds, ethnicities, and lower levels of education. It may be especially intriguing to examine how people from different cultures are differentially affected by ABST and dementia worry. Curiously, research by Kinzer and Suhr suggests worrying about dementia may be a very American anxiety. This is in part because, in America, acquiring dementia represents a threat to our culturally valued individual, autonomous selves.

All in all, as we age into an unknown future, it is exciting to consider future research which identifies the cultural relevance of aging expectations, stereotypes, and worries. Indeed, such a future holds potential answers to fundamental human questions: What do we face as we grow old? How does this impact who we are? And what can we do about it?

References

Abrams D., Russell P. S., Vauclair M., & Swift H. (2011). Ageism in Europe: Findings from the European social survey. London, UK: AgeUK.

Alzheimer's Association. (2017). 2017 Alzheimer's disease facts and figures. Alzheimer's and Dementia: *The Journal of the Alzheimer's Association, 13*(4), 325 - 373.

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). Arlington, VA: Author.

Aronson, J., Fried, C. B., & Good, C. (2002). Reducing the effects of stereotype threat on african american college students by shaping theories of intelligence. *Journal of Experimental Social Psychology, 38*(2), 113-125. doi:http://dx.doi.org/10.1006/jesp.2001.1491

Aronson, J., Lustina, M.J., Good, C., Keough, K., Steele, C.M., & Brown, J. (1999). When white men can't do math: Necessary and sufficient factors in stereotype threat. Journal of Experimental Social Psychology, 35, 29-46

Barber, S. J., Mather, M., & Gatz, M. (2015). How stereotype threat affects healthy older adults' performance on clinical assessments of cognitive decline: The key role of regulatory fit. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 70*, 891–900. doi:10.1093/geronb/gbv009

Barber, S. J. (2017). An examination of age-based stereotype threat about cognitive decline: Implications for stereotype-threat research and theory development. *Perspectives on Psychological Science, 12*(1), 62-90. doi:http://dx.doi.org/10.1177/1745691616656345

Bosson, J. K., Haymovitz, E. L., & Pinel, E. C. (2004). When saying and doing diverge: The effects of stereotype threat on selfreported versus non-verbal anxiety. Journal of Experimental Social Psychology, 40, 247–255.

Boustani M., Callahan C.M., Unverzagt F.W., Austrom M.G., Perkins A.J., Fultz B.A. Implementing a screening and diagnosis program for dementia in primary care. J Gen Intern Med. 2005;20:572–577. [PubMed] [Ref list]

Busse, A., Bischkopf, J., Riedel-Heller, S.G., & Angermeyer, M.C. (2003). Mild cognitive impairment: Prevalence and incidence according to different diagnostic criteria. Results of the Leipzig longitudinal study of the aged (LEILA75+). *The British Journal of Psychiatry*, *182(*5), 449–454. doi:10.1192/bjp.02.296

Croizet, J.C. et al. (2004). Stereotype threat undermines intellectual performance by triggering a disruptive mental load. Personality Social Psychology Bulletin, 30, 721-31.

Cutler, S. J., & Hodgson, L. G. (2013). Concerns about cognitive functioning, dementia worries, and psychological well-being. Revista de Asistenţă Socială, 12, 77–86.

Delis, D.C., Kramer, J.H., Kaplan, E., & Ober, B.A. (2000). California Verbal Learning Test: Second Edition. San Antonio, TX: Psychological Corporation.

Fiske, S. T., Cuddy, A. J. C., Glick, P., & Xu, J. (2002). A model of (often mixed) stereotype content: Competence and warmth respectively follow from perceived status and competition. *Journal of Personality and Social Psychology, 82*(6), 878-902. doi:http://dx.doi.org.weblib.lib.umt.edu:8080/10.1037/0022-3514.82.6.878

Fong, T. G., Fearing, M. A., Jones, R. N., Shi, P., Marcantonio, E. R., Rudolph, J. L., Yang, F. M., Kiely, D. K., … Inouye, S. K. (2009). Telephone interview for cognitive status: Creating a crosswalk with the Mini-Mental State Examination. *Alzheimer's & dementia : the journal of the Alzheimer's Association*, *5*(6), 492-7.

Fresson, M., Dardenne, B., Geurten, M., & Meulemans, T. (2017). The effect of stereotype threat on older people's clinical cognitive outcomes: Investigating the moderating role

of dementia worry. *The Clinical Neuropsychologist, 31*(8), 1306-1328. doi:10.1080/13854046.2017.1307456

Good, C., Aronson, J., & Harder, J. A. (2008). Problems in the pipeline: Stereotype threat and women's achievement in high-level math courses. Journal of Applied Developmental Psychology, 29, 17-28.

Gonzales, P. M., Blanton, H., & Williams, K. J. (2002). The effects of stereotype threat and double-minority status on the test performance of Latino women. Personality and Social Psychology Bulletin, 28, 659-670.

Haslam, C., Morton, T. A., Haslam, S. A., Varnes, L., Graham, R., & Gamaz, L. (2012). "When the age is in, the wit is out": Age-related self-categorization and deficit expectations reduce performance on clinical tests used in dementia assessment. *Psychology and Aging, 27*, 778–784. doi:10.1037/a0027754

Hess, T. M., Hinson, J. T., & Hodges, E. A. (2009). Moderators of and mechanisms underlying stereotype threat effects on older adults' memory performance. Experimental Aging Research, 35, 153–177. doi:10.1080/03610730802716413

Inzlicht, M., & Ben-Zeev, T. (2000). A Threatening Intellectual Environment: Why Females Are Susceptible to Experiencing Problem-Solving Deficits in the Presence of Males. *Psychological Science, 11*(5), 365-371.

Johns, M., Inzlicht, M., & Schmader, T. (2008). Stereotype threat and executive resource depletion: Examining the influence of emotion regulation. *Journal of Experimental Psychology: General, 137*(4), 691-705. doi:10.1037/a0013834

Kane, M. J., & Engle, R. W. (2003). Working-memory capacity and the control of attention: The contributions of goal neglect, response competition, and task set to stroop

interference. *Journal of Experimental Psychology: General, 132*(1), 47-70. doi:http://dx.doi.org/10.1037/0096-3445.132.1.47

Kessler, E.-M., Bowen, C. E., Baer, M., Froelich, L., & Wahl, H.-W. (2012). Dementia worry: A psychological examination of an unexplored phenomenon. European Journal of Ageing, 9, 275–284. doi:10.1007/ s10433-012-0242-8

Kinzer A. & Suhr J. (2016) Dementia worry and its relationship to dementia exposure, psychological factors, and subjective memory concerns, Applied Neuropsychology: Adult, 23:3, 196-204, DOI: 10.1080/23279095.2015.1030669

Kray, L. J., Galinsky, A. D., & Thompson, L. (2002). Reversing the gender gap in negotiations: An exploration of stereotype regeneration. *Organizational Behavior and Human Decision Processes, 87*(2), 386-409. doi:http://dx.doi.org.weblib.lib.umt.edu:8080/10.1006/obhd.2001.2979

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*(9), 606-613. doi:http://dx.doi.org.weblib.lib.umt.edu:8080/10.1046/j.1525-1497.2001.016009606.x

Kroenke, K., Strine, T. W., Spitzer, R. L., Williams, J. B. W., Berry, J. T., & Mokdad, A. H. (2009). The PHQ-8 as a measure of current depression in the general population. *Journal of Affective Disorders, 114*(1-3), 163-173. doi:http://dx.doi.org.weblib.lib.umt.edu:8080/10.1016/j.jad.2008.06.026

Knopman DS, Roberts RO, Geda YE, Pankratz VS, Christianson THJ, Petersen RC, Rocca WA: Validation of the Telephone Interview for Cognitive Status-modified in subjects with normal cognition, mild cognitive impairment, or dementia. Neuroepidemiology 2010;34:34– 42.

Lamont, R. A., Swift, H. J., & Abrams, D. (2015). A review and meta-analysis of age-based stereotype threat: Negative stereotypes, not facts, do the damage. Psychology and Aging, 30, 180–193. (Levy et al., 2016).

Levy, B. (1996). Improving memory in old age through implicit self stereotyping. Journal of Personality and Social Psychology, 71, 1092-1107.

Levy B., & Banaji M. R. (2002). Implicit ageism In Nelson T. D., editor. (Ed.), Ageism, stereotyping and prejudice against older persons (pp. 163–199). Cambridge, MA: MIT Press.

Levy, B. R., Ferrucci, L., Zonderman, A. B., Slade, M. D., Troncoso, J., & Resnick, S. M. (2016). A culture–brain link: Negative age stereotypes predict Alzheimer's disease biomarkers. *Psychology and Aging, 31*(1), 82-88.

Levy, B. & Langer, E. (1994). Aging free from negative stereotypes: Successful memory in China and among the American deaf. Journal of Personality and Social Psychology, 66, 989-987.

Lezak, M. D., Howieson, D. B., Bigler, E. D., & Tranel, D. (2012). *Neuropsychological assessment* (5th ed. ed.) Oxford University Press, New York, NY. Retrieved from https://search-proquest-com.weblib.lib.umt.edu:2443/docview/1122596593?accountid=14593

Mazerolle, M., Régner, I., Barber, S., Paccalin, M., Miazola, A.-C., Huguet, P., & Rigalleau, F. (2016). Negative aging stereotypes impair performance on brief cognitive tests used to screen for predementia. *Journal of Gerontology Series B: Psychological Sciences. 72*(6), 932-936. doi:10.1093/geronb/gbw083

Mitchell, A. J., & Shiri-Feshki, M. (2009). Rate of progression of mild cognitive impairment to dementia—meta-analysis of 41 robust inception cohort studies. *Acta Psychiatrica Scandinavica, 119*(4), 252–265. doi:10.1111/j.1600-0447.2008.01326.x

Molden, J., & Maxfield, M. (2017). The impact of aging stereotypes on dementia worry. *European Journal of Ageing, 14*(1), 29-37. doi:http://dx.doi.org/10.1007/s10433-016-0378-z

Nelson T. D. (2002). Ageism: Stereotyping and prejudice against older persons. Cambridge, MA: MIT Press.

Ory, M., Hoffman, M. K., Hawkins, M., Sanner, B., & Mockenhaupt, R. (2003). Challenging aging stereotypes: Strategies for creating a more active society. .*American Journal of Preventive Medicine, 25*(3), 164-171. doi:http://dx.doi.org/10.1016/S0749-3797(03)00181-8.

Rabin, L. A., Paolillo, E., & Barr, W. B. (2016). Stability in test-usage practices of clinical neuropsychologists in the united states and canada over a 10-year period: A follow-up survey of INS and NAN members. *Archives of Clinical Neuropsychology, 31*(3), 206-doi:http://dx.doi.org/10.1093/arclin/acw007

Régner, I., Smeding, A., Gimmig, D., Thinus-Blanc, C., Monteil, J., & Huguet, P. (2010). Individual differences in working memory moderate stereotype-threat effects. *Psychological Science, 21*(11), 1646-1648. http://dx.doi.org/10.1177/0956797610386619 Retrieved from https://search.proquest.com/docview/819632877?accountid=14593

Régner, I., Mazerolle, M., Alescio-Lautier, B., Clarys, D., Michel, B., Paccalin, M., … Huguet, P. (2016). Aging stereotypes must be taken into account for the diagnosis of prodromal and early Alzheimer disease. *Alzheimer Disease and Associated Disorders, 30*, 77–79. http://dx.doi.org.weblib.lib.umt.edu:8080/10.1097/WAD.0000000000000129

Reitan RM. Trail Making Test: Manual for administration and scoring. South Tuscon, AZ: Reitan Neuropsychology Laboratory.; 1992.

Risacher SL, McDonald BC, Tallman EF, et al. Association Between Anticholinergic Medication Use and Cognition, Brain Metabolism, and Brain Atrophy in Cognitively Normal Older Adults. *JAMA Neurol.*2016;73(6):721–732. doi:10.1001/jamaneurol.2016.0580

Sachs-Ericsson, N., & Blazer, D. G. (2015). The new DSM-5 diagnosis of mild neurocognitive disorder and its relation to research in mild cognitive impairment. *Aging & Mental Health, 19*(1), 2-12. http://dx.doi.org/10.1080/13607863.2014.920303

Schmader, T., & Johns, M. (2003). Converging evidence that stereotype threat reduces working memory capacity. Journal of Personality and Social Psychology, 85, 440-452.

Schmader, T., & Beilock, S. L. (2012). Mechanisms: An integration of processes that underlie stereotype threat. In T. Schmader & M. Inzlicht (Eds.), Stereotype threat: Theory, process, and application (pp. 34-50). New York, NY: Oxford University Press.

Schmader, T., Johns, M., & Forbes, C. (2008). An integrated process model of stereotype threat on performance. Psychological Review, 115, 336-356.

Shih, M. J., Pittinsky, T. L., & Ho, G. C. (2012). Stereotype boost: Positive outcomes from the activation of positive stereotypes. In M. Inzlicht & T. Schmader (Eds.), *Stereotype threat: Theory, process, and application* (pp. 141-156). New York, NY, US: Oxford University Press.

Snowdon, D. A. (1997). Aging and alzheimer's disease: Lessons from the nun study. *The Gerontologist, 37*(2), 150-156. doi:http://dx.doi.org/10.1093/geront/37.2.150

Spencer, S.J., Steele, C.M., & Quinn, D.M. (1999). Stereotype threat and women's math performance. Journal of Experimental Social Psychology, 35, 4-28.

Steele, C.M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. American Psychologist, 52, 613-29.

Steele, C.M. & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. Journal of Personality and Social Psychology, 69, 797-811.

Stone, J. (2002). Battling doubt by avoiding practice: The effects of stereotype threat on self handicapping in white athletes. Personality and Social Psychology Bulletin, 80, 942-58.

Stroop, J. R. Journal of Experimental Psychology Vol. 18, Iss. 6, (Dec 1935): 643-662

Spreen & Strauss (1991). A compendium of neuropsychological tests—Administration, norms, and commentary, Oxford University Press, New York (1991)

Suhr, J. A., & Gunstad, J. (2002). "Diagnosis threat": The effect of negative expectations on cognitive performance in head injury. Journal of Clinical and Experimental Neuropsychology, 24, 448–457. doi:10.1076/jcen.24.4.448.103912187458

Wechsler, D. (2008a). Wechsler Adult Intelligence Scale–Fourth Edition. San Antonio, TX: Pearson.

Wechsler, D. (2008b). Wechsler Adult Intelligence Scale–Fourth Edition: Technical and interpretive manual. San Antonio, TX: Pearson.

Yeung, N. C. J., & von Hippel, C. (2008). Stereotype threat increases the likelihood that female drivers in a simulator run over jaywalkers. *Accident Analysis and Prevention, 40*(2), 667 674. doi:http://dx.doi.org.weblib.lib

APPENDIX A

<u>Demographic and Health Questionnaire</u>

Participant #: _____   Date:_____

Sex: M   F

Handedness: R   L

Date of Birth: _____ Age: _____ Ethnicity: _____

Marital Status: Single   Married   Widowed   Divorced   Separated

Is English your first language? Y   N

If No, what was your 1st language? _____

When did you first learn English? _____

Educational History

How much education have you completed?

High School/ GED?   Y   N If no, what was the last grade you

completed: _____

Vocational School*? Y N Specify (area of study):

_____

Undergraduate College**? Y   N

Graduate College**? Y   N

*Vocational School does NOT count toward total years of education.

**Please answer questions below:

Did you receive a degree? Y   N

If Yes, what degree, from where, and in what area of study?

_____

_____

If you did not receive a degree, how many years of FULL-TIME education did you complete? _____

Raw Years of Education: _____ (Round down when less than a year completed)

What is your current or most recent occupation: _____

What is your estimated total household income: _____

Have you ever been diagnosed with a learning disability? Y   N

If yes, please describe:

_____

_____

Medical History

Are you seeing a health care practitioner for any current medical problems? Y N

Illness	Duration	Meds
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Psychiatric and Neurological History

Have you ever been treated by a psychiatrist? Y   N

Have you ever seen a neurologist? Y   N

If Yes to either question, note when, what for, and current status:

_____

_____
_____
_____
_____

Are you experiencing changes or have you ever noticed changes in headaches? Y N

Note changes:
_____

Do you have any vision or hearing problems? Y   N

Please explain:_____

_____
_____

Do you wear a hearing aid? Y   N

Do you wear eyeglasses? Y   N

Bifocals? Y   N

Trifocals? Y N

Contacts? Y N

Do you have cataracts? Y N

Cataract surgery? Y   N   When?_____

Are you colorblind? Y   N

Notes:
_____
_____

Have you noticed a recent decline in vision, hearing, memory, or anything else relevant? Y   N

Please Explain:
_____

_____
_____

Have you ever had seizures? Y   N   Currently? Y   N

Blackouts or Dizzy Spells? Y   N   Currently? Y   N

Numbness or Tingling? Y   N   Currently? Y   N

Have you ever lost consciousness? Y   N

Have you ever had a head injury? Y   N

If yes, did you fracture your skull? Y   N

If yes to any of the above, please describe the problem, when it occurred, its duration (e.g., how long did you lose consciousness for?), whether you experienced any problems like headaches or memory loss afterwards, and its current status:

_____
_____
_____
_____

How much alcohol, beer and wine do you drink now? (include what you drink, how often and how many drinks)
_____
_____

Have you ever been treated for alcohol dependence? Y N

Details:
_____

_____

Do you currently use any recreational drugs (including cannabis)? Y N

Details:

_____

_____

How often do you exercise?

Less than once per week   2-4 times/week   more than 5 times/week

What do you do for exercise?

_____

How many days a week do you wake up feeling rested?

Do you have difficulty falling asleep? Y N   Staying asleep? Y N   Waking up? Y   N

Details:

_____

_____

How often do you engage in social activities?

Less than once per week   2-4 times/week   more than 5 times/week

What social activities do you engage in?

_____

_____

Are you involved in any other studies at this time? Y N

Details:
_____

APPENDIX B

Patient Health Questionnaire (PHQ-8)

Over the **last 2 weeks**, how often have you been bothered by any of the following problems?
*(circle **one** number on each line)*

How often during the past 2 weeks were you bothered by...	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself, or that you are a failure, or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3

APPENDIX C

Telephone Interview for Cognitive Status (TICS)

Page 12	**C2. TELEPHONE INTERVIEW FOR COGNITIVE STATUS**	DIGS 3.0 03-Nov-1999

INTERVIEWER: Directions: 1) Explain exam to subject. 2) Get address. 3) Be sure distractions are minimal (e.g., no T.V. or radio on, remove pens and pencils from reach.) 4) Be sure sources of orientation (e.g., newspapers, calendars) are not in subject's view. 5) Care-givers may offer reassurance, but not assistance. 6) Single repetitions permitted, except for items 5 and 8.

		Maximum Score	Subject Score
1.	*Please tell me your name.* Score one point for first name, and one point for last name.	2	☐
2.	*What is today's date?* Score one point for month, date, year, day of week, and season. If incomplete ask specifics (e.g., "What is the month?" "What season are we in?")	5	☐
3.	*Where are you right now?* Score one point each for house number, street, city state and zip. If incomplete ask specifics (e.g., "What street are you on right now?")	5	☐
4.	*Count backwards from 20 to 1.* Score two points if completely correct on the first trial; one point if the completely correct on second trial; no points for anything else.	2	☐
5.	*I am going to read you a list of ten words. Please listen carefully and try to remember them. When I am done, tell me as many words as you can, in any order. Ready? The words are cabin, pipe, elephant, chest, silk, theater, watch, whip, pillow, giant. Now tell me all the words you remember.* Score one point for each correct response. No penalty for repetitions or intrusions.	10	☐ ☐
6.	*100 minus 7 equals what? And 7 from that? Etc.* Stop at 5 serial subtractions. Score one point for each correct subtraction. Do not inform the subject of incorrect responses, but allow subtractions to be made from his/her last response (e.g., 93-85-78-71-65 would get 3 points.)	5	☐
7.	*What do people use to cut paper?* Score one point for scissors or shears only.	1	☐
	How many things in a dozen? Score one point for 12.	1	☐
	What do you call the prickly green plant that lives in the desert? Score one point for cactus only.	1	☐
	What animal does wool come from? Score one point for sheep or lamb only.	1	☐

DIGS 3.0 03-Nov-1999	C2. TELEPHONE INTERVIEW FOR COGNITIVE STATUS	Page 13

		Maximum Score	Subject Score
8.	*Say this: "No ifs ands or buts."* *Say this: "Methodist Episcopal."* Score one point for each complete repetition on the first trial. Repeat only if poorly presented.	2	☐
9.	*Who is the President of the United States right now?* *Who is the Vice-President?* Score one point each for correct first and last name.	2	☐
10.	*With your finger, tap 5 times on the part of the phone you speak into.* Score two points if 5 taps are heard; one point if subject taps more or less than 5 times.	2	☐
11.	*I am going to give you a word and I want you to give me the opposite. For example, the opposite of hot is cold. What is the opposite of "west"?* Score one point for "east".	1	☐
	What is the opposite of "generous"? Score one point for "selfish", "greedy", "stingy", "tight", "cheap", "mean", "meager", "skimpy", or other good antonym.	1	☐
12.	**Record Total Score**	41	☐☐

> **INTERVIEWER:** If Total Score is **20 or less**, discontinue interview at this time. If total score is between **20 and 28**, interviewer may need to consider whether proceeding through the interview will yield reliable information.
>
> **Otherwise, continue with D. Somatization (page 14)**

APPENDIX D

Anticholinergic Burden Scale

Drugs on the Anticholinergic Burden (ACB) scale
(A total ACB scale score of three or more is considered clinically relevant)

ACB Score 1 (mild)	ACB Score 2 (moderate)	ACB Score 3 (severe)
Alimemazine	Amantadine	Amitriptyline
Alprazolam	Belladonna alkaloids	Amoxapine
Alverine	Carbamazepine	Atropine
Atenolol	Cyclobenzaprine	Benztropine
Beclometasone dipropionate	Cyproheptadine	Chlorpheniramine
Bupropion hydrochloride	Loxapine	Chlorpromazine
Captopril	Meperidine	Clemastine
Chlorthalidone	Methotrimeprazine	Clomipramine
Cimetidine hydrochloride	Molindone	Clozapine
Clorazepate	Oxcarbazepine	Darifenacin
Codeine	Pethidine hydrochloride	Desipramine
Colchicine	Pimozide	Dicyclomine
Dextropropoxyphene		Diphenhydramine
Diazepam		Doxepin
Digoxin		Flavoxate
Dipyridamole		Hydroxyzine
Disopyramide phosphate		Hyoscyamine
Fentanyl		Imipramine
Fluvoxamine		Meclizine
Furosemide		Nortriptyline
Haloperidol		Orphenadrine
Hydralazine		Oxybutynin
Hydrocortisone		Paroxetine
Isosorbide preparations		Perphenazine
Loperamide		Procyclidine
Metoprolol		Promazine
Morphine		Promethazine
Nifedipine		Propentheline
Prednisone/Prednisolone		Pyrilamine
Quinidine		Scopolamine
Ranitidine		Thioridazine (withdrawn)
Theophylline		Tolterodine
Timolol maleate		Trifluoperazine
Trazodone		Trihexyphenidyl
Triamterene		Trimipramine
Warfarin		

Notes:
1. Certain medicines eg Risperidone (mild ACB), Quetiapine (severe ACB) and Olanzapine (severe ACB) were licensed after 1990 and therefore not prescribed to the original CFAS cohort.
2. Brand names may conceal generic drug names.
3. Some combination medicines contain anticholinergic drugs.
4. This list is indicative and some related medicines were taken by patients in the CFAS study; if appropriate these related medicines were given an ACB score based on the ACB of the related medicine in the Aging Health publication (see below).

References:
1. Boustani MA, Campbell NL, Munger S, Maidment I, Fox GC. Impact of anticholinergics on the aging brain: a review and practical application. Aging Health. 2008;4(3):311-20.
2. Campbell N, Boustani M, Limbil T, Ott C, et al. The cognitive impact of anticholinergics: a clinical review. Clinical Interventions in Aging. 2009;4(1):225-33

APPENDIX E

Experimental Condition Instructions

Stereotype Threat Instructions (Experimental)

Please read the following excerpt from the *Journal of Aging and Science* and answer the questions that follow:

People in the U.S. are living longer than ever before, but there's no getting around one thing: as we age, our bodies and minds change. Research indicates that aging inevitably leads to cognitive decline. Older adults commonly forget things, misplace items, and find themselves confused more often than younger adults. Many older adults will go on to develop Alzheimer's disease or other forms of dementia. Memory problems are typically one of the first signs of cognitive impairment related to Alzheimer's disease but decline in non-memory aspects of cognition such as word-finding, thinking quickly, and impaired reasoning or judgement, may also signal the early stages of Alzheimer's disease.

According to the excerpt, which of the following statements are true?

Aging inevitably leads to cognitive decline	True	False
Many older adults develop dementia	True	False
Impaired cognition is a sign of Alzheimer's disease	True	False
As we age, our bodies and minds change	True	False

APPENDIX F

Control Condition Instructions

Neutral Instructions (Control)

Please read the following excerpt from the *Journal of American Ornithology* and answer the questions that follow:

The "eerie" call of the Common Loon is distinct to individuals and can be heard at great distances. A fascinating bird, the loon swims underwater to catch fish, propelling itself with its feet. It swallows most of its prey underwater. The loon has sharp, rearward-pointing projections on the roof of its mouth and tongue that help it keep a firm hold on slippery fish. While loons are agile swimmers, they move pretty fast in the air, too. Migrating loons have been clocked flying at speeds of more than 70 mph.

According to the excerpt, which of the following statements are true?

Loons swallow most of their prey under water	True	False
Loons can fly more than 70 mph	True	False
The call of the loon can be heard at great distances	True	False
Loons are able to hold slippery fish in their mouths	True	False

APPENDIX G

<u>Manipulation Check Questionnaire</u>

Did you understand the instructions you read at the beginning of the study?   Y   N

How hard did you try on the tests?

1   2   3   4   5   6   7   8   9

 Not at all   Very hard

How difficult did you find these tests?

1   2   3   4   5   6   7   8   9

 Not at all difficult   Very difficult

How much pressure did you feel during testing?

1   2   3   4   5   6   7   8   9

 No pressure at all   Very pressured

How well did you do on the tests?

1   2   3   4   5   6   7   8   9

 Very poorly   Very well

APPENDIX H

Debriefing Statement

Thank you for participating in this study. Throughout the course of this experiment, you may have had questions regarding the nature or purpose of this study. If you still have these questions, the experimenter will be glad to answer them for you at this time.

The purpose of this study was to investigate the influence of negative stereotypes about aging on neuropsychological test performance. Previous research suggests that even individuals who do not have neuropsychological impairment may perform more poorly on neuropsychological tests simply due to exposure to aging biases.

It is important to note, while many older adults worry about dementia, only a small percentage go on to develop the disease. Additionally, research has clearly demonstrated that losing some cognitive efficiency is a normal effect of reaching old age. With regards to this study, you were selected to participate only after being screened to be cognitively normal for your age.

If you would like to learn more about aging processes, you can find further information at the National Institute of Aging Website: https://www.nia.nih.gov/health

IMPORTANT: We request that you not discuss the details of this experiment with anyone who may be a future participant in the study. Thank you for your cooperation.

APPENDIX I

Table 5. *Significant Univariate Effects of Dementia Worry on Executive Function and Processing Speed Measures*

Dependent Variable	df1	df2	F	p
DKEFS Trial 3	1	41	4.765	p<.01
DKEFS Trial 4	1	41	2.274	p<.05
WAIS-IV Coding	1	41	2.642	p<.05
WAIS-IV Symbol Search	1	41	3.938	P<.01