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Impact of Retirement Worry on Information Processing

Helen C. Gutierrez and Douglas A. Hershey
Oklahoma State University

Clinically anxious individuals have been shown to process psychologically threatening words (e.g., *worry*) more slowly than words that are unrelated to their disorder (e.g., *hammer*). In the present investigation, working adults (N = 87) with different levels of financially linked retirement anxiety were investigated using the Emotional Stroop Task (EST). The EST involves presenting financially relevant retirement threat words (e.g., *poverty*) on a computer screen in addition to nonretirement neutral words (e.g., *sailboat*). Words were presented individually in 1 of 4 different colors of ink. Respondents' task was to identify the ink color for each word as rapidly as possible. It was hypothesized that individuals with high levels of retirement anxiety would generate slower response latencies when naming the color of retirement threat words relative to neutral words. No such processing delay was predicted for nonanxious participants. ANOVA findings revealed a 2-way interaction that was consistent with a priori predictions. The data suggest working adults with retirement anxiety experienced information processing disruptions that stem from the negative emotional content linked to retirement concepts in long-term memory. From an applied perspective, these processing disruptions may represent a significant obstacle that needs to be surmounted when encouraging individuals with retirement anxiety to plan and save for the future.

Keywords: retirement, anxiety, financial, Stroop, worry

Imagine a 45-year-old male working a typical nine to five job. He goes through the same routine 5 days a week. This individual has thought about retirement in passing, but he has not had the desire or motivation to plan much for the future. Each month he squirrels away a little into his workplace retirement savings account, but he is unsure as to exactly how much he will need to live on after he leaves the workforce. The mere thought of retiring makes the palms of his hands sweat. In terms of getting a comprehensive financial plan in place, he is not quite sure where to begin. He often worries that he should have begun saving in earnest a number of years ago, but he secretly hopes everything will work out in the long run. Unfortunately, the plight of this nervous worker is not uncommon. The overarching goal of the present investigation is to explore the nature of individuals' retirement-related fears and worries, and how those concerns affect the way individuals cognitively process retirement planning information.

In designing this investigation we draw upon two separate lines of empirical work. The first explores the affective basis of financial planning for retirement. Specifically, studies have shown that individual differences exist when it comes to fears and worries surrounding the prospect of having insufficient resources for old age (Neukam & Hershey, 2003; Owen & Wu, 2007). The second line of work we draw upon involves a variant of the Stroop task (Stroop, 1935)—which is a well-known cognitive information processing paradigm used to assess the speed with which individuals access concepts in long-term memory (LTM). In a typical version of the Stroop task, participants are presented with individual words one at a time (usually on a computer screen) and they are required to name the color of ink in which each word is written. The dependent measure is typically the amount of time it takes to name the color of the word or

Helen C. Gutierrez and Douglas A. Hershey, Department of Psychology, Oklahoma State University.

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Correspondence concerning this article should be addressed to Helen C. Gutierrez, 116 North Murray Hall, Department of Psychology, Oklahoma State University, Stillwater, OK 74078. E-mail: helencg@okstate.edu

press a key to indicate the color. In the present experiment, these two lines of research are combined by having individuals—some of whom have retirement worries and others who do not—complete a variant of the Stroop task in which both retirement and nonretirement words are presented. The working hypothesis is that individuals with retirement-linked fears and worries will take longer to name retirement concepts than nonretirement concepts. No such delay in information processing is predicted for individuals without financially linked retirement concerns. This combination of findings, should they be observed, might suggest a subconscious barrier to the planning process among individuals predisposed to having financial concerns.

In an attempt to frame the present investigation in the context of existing cognitive psychological research, it is useful to think of classifying empirical work as residing at one of three different levels of analysis. According to Hunt (1995a, 1995b) cognitive research exists at the representational, computational, and biological levels. Work at the representational level focuses on individuals' conscious attitudes and beliefs about retirement, such as the way felt social forces shape retirement decisions (e.g., Croy, Gerrans, & Speelman, 2010; Henkens, 1999). Work at the biological level, in contrast, focuses on the way basic concepts are stored and represented in the brain. Recent neuroeconomic investigations of saving and investment decisions, which seek to identify regions of activation in the brain as individuals make economic decisions (e.g., Holden, 2010; Hsu, Krajbich, Zhao, & Camerer, 2009; James, 2012), are good examples of work at this level of analysis. Studies at the computational level of analysis seek to describe subconscious cognitive processes that allow individuals to transition from biological representations of concepts (at the most basic level of analysis) to the types of conscious cognitive representations that make up our attitudes and beliefs (at the highest level of analysis). Relative to studies at the representational and biological levels, existing research at the computational level is quite limited. This investigation, which has as its goal to explore how retirement information is processed at the level of semantic LTM representations, clearly resides at Hunt's computational level. Work such as this is needed to establish a conceptual bridge between retirement research at the representational and biological levels of analysis. Thus, the unique contribution of the present study to the retirement literature lies in the attempt to shed light on psychological processes that take place at this understudied level of cognition.

Retirement Saving and Retirement Worry

Many American working adults are not saving enough to ensure a financially worry-free retirement (Employee Benefits Research Institute, 2010). Financial planning professionals suggest that for most individuals, saving for retirement is a task that should ideally begin shortly after entering the workforce (Jones, 2006). Yet in reality, many only begin to save as they draw close to retirement age (Helman, Copeland, & VanDerhei, 2012). According to Skinner (2007), baby boomers are only saving at a rate that is one third the amount they should be saving in order to maintain their preretirement standard of living. Consistent with this finding, a recent industry report concluded that 28% of working American adults are on track when it comes to retirement savings, 52% lag behind, and 20% have either not yet begun to save, or they have no intention of saving whatsoever (MetLife, 2010). From a primary prevention perspective, these are indeed troubling statistics. This retirement savings "challenge" is one that extends to many Westernized countries in which individuals are expected to shoulder a portion of the burden in providing for their own late-life financial well-being (AXA, 2008).

A variety of reasons have been advanced to explain why it is that individuals fail to save adequately for retirement when it would clearly be prudent to do so. Lusardi and Mitchell (2007) suggest many working adults are not aware of the essential economic issues involved in planning for retirement, and for that reason, they postpone saving activities. Bosworth (2004) suggests that the problem is microeconomic in nature, having to do with inadequate incentives associated with employer retirement saving programs. Others suggest that the root of the problem lies in cultural or societal values that promote hedonic consumption at the expense of establishing a suitable nest egg (Yao, Wang, Weagley, & Liao, 2011). Still others fault educational systems that fail to teach chil-

dren how to think sensibly about life span financial planning (Bernheim, Garrett, & Maki, 2001; Olsen & Whitman, 2007). Despite the many reasons that have been put forth to explain the lack of savings among American workers, relatively little attention has focused on the role of negative affect and worry as a determinant of saving.

Over the past two decades, a small body of research has accumulated to suggest a link between worry and (a lack of) retirement savings. Owen and Wu (2007) found that working adults worry about their future retirement income when they encounter negative financial shocks, and Hershey, Henkens, and van Dalen (2010) point to the fact that many individuals worry because they possess insufficient levels of general financial knowledge. In one investigation, Neukam and Hershey (2003) developed a "financial inhibition" scale that demonstrated individuals experience not only fears and concerns about accumulating sufficient resources for retirement, but also fears about planning and investing competently for the postemployment period. By comparing cohorts of different ages (preretirees and retired adults), Skarborn and Nicki (2000) found that financial worry is more commonly seen among preretirees, perhaps due to the uncertainty associated with not knowing how much they can expect to receive in the way of retirement income. It has even been suggested that the seemingly adaptive act of seeking advice from a financial professional could lead to the onset of anxiety and concern, as doing so might result in embarrassment on the part of the client for not having been a more proactive and timely saver (Gutierrez, Hershey, & Gerrans, 2011).

In the present experiment, the financial inhibition scale (FIS) developed by Neukam and Hershey (2003) is used to assess respondents' degree of retirement-linked financial fears and worries. In fact, individuals' FIS scores serve as one of the two independent variables in this investigation. These financial fears and worries are then examined in relation to individuals' ability to access concepts in semantic long-term memory using an established cognitive response time task. More information about this task is provided in the following section of the article.

Emotional Stroop Task

The Stroop Task, which was developed by J. Ridley Stroop, is designed to measure response latencies using an interference paradigm (Stroop, 1935). Although the Stroop task has been used in a variety of different ways, the most common approach involves presenting words to an individual on a computer screen and having them identify the color by pressing the appropriate designated key on the computer keyboard. The types of words presented are typically either neutral words (e.g., *fish*, *table*) or color words (e.g., *red*, *blue*). For example, the word "red" might be presented to the participant using a green font. The participant's task is to inhibit the tendency to say the word "red," and instead, say the name of the color of the font (i.e., green). The dependent measure in the Stroop paradigm is the amount of time (in ms) it takes for the respondent to correctly identify the font color of the word presented. Previous investigations have revealed that it takes individuals longer to say the font color of color words (e.g., *red*) as compared with noncolor words (e.g., *bicycle*), due to the interference caused by simultaneously processing the (color) word and the name of the font color.

One variation of the Stroop Task is the emotional Stroop task (EST) (Williams, Mathews, & MacLeod, 1996). Rather than presenting individuals words that are the name of colors, the EST uses *threat words* and *neutral words* that are presented in different colored fonts. Threat words are words that the participant should find emotionally intimidating, because they are linked to preexisting fears or worries in the individual's semantic LTM network. Thus, threat words could be said to have a negative emotional valence for those with domain-related worry. Neutral words, in contrast, are not presumed to be associated with a particular emotional valence.

Therefore, for example, individuals with an anxiety disorder would be expected to take longer to respond to threat words (such as *worry* and *nervous*), because these words are directly (and negatively) related to their psychological condition (Peach, Jovev, Foster, & Jackson, 2012). Neutral words (such as *dog* and *desk*) would not be expected to affect depressed individuals on an emotional level and, therefore, would not differentially affect (i.e., delay) their

color identification response times. Interestingly, the threat word delay effect described above has been observed among individuals who have anxiety-based and nonanxiety based clinical psychopathologies including: generalized anxiety disorder (GAD; e.g., Dresler, Mériau, Heekeren, & van der Meer, 2009), obsessive–compulsive disorder (e.g., Foa, Ilai, McCarthy, Shoyer & Murdock, 1993), social phobias and panic disorders (e.g., Hope, Rapee, Heimberg, & Dombeck, 1990), posttraumatic stress disorder (PTSD; e.g., Kaspi, McNally & Amir, 1995), depression (e.g., Peckham, McHugh, & Otto, 2010), and comorbid psychopathologies (e.g., Grant & Beck, 2006), among others (see Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007; Williams et al., 1996). Relative to studies carried out with individuals that have specific pathological conditions, fewer EST investigations have been published using samples drawn from the general population (Yiend, 2010). According to Williams, Mathews, and MacLeod (1996), individuals with PTSD have been shown to produce the most pronounced threat word interference delays (on the order of 200 ms–300 ms per word), those with social phobias produce moderate delays (on the order of 75 ms), and those with specific phobias tend to produce modest interference effects (in the area of 40 ms–50 ms).

Of the literature reviewed on the EST, we were only able to identify one investigation that examined a task-specific attentional response bias as a function of financial anxiety level. Shapiro and Burchell (2012; Study 1, Conditions 2 and 3) had 38 full-time undergraduate students complete a card-based version of the EST in which respondents had to name the font color of: (a) a list of eight general financial words (*overdraft, credit, bank, loan, cost, account, debt, finances*); or (b) a list of neutral words (*navigates, apron, shoe, chair, frog, mantle, port, cinemas*). Intraindividual differences in response times for the two conditions were then correlated with scores on a measure of general financial anxiety. Researchers found a negative correlation ($r = -0.31$) between the two sets of scores, which reflected the fact that more anxious individuals had larger difference scores in word reading times. The investigators took this negative correlation as evidence that general financial anxiety results in an attentional bias effect on the EST. The present investigation will be conceptually similar to the Shapiro and Burchell (2012) study. However, in this experiment: (a) working middle-aged adults (as opposed to college students) will serve as participants; (b) a computerized version of the EST will be used (as opposed to a manual card-based presentation) that allows for millisecond-level timing; and (c) the critical stimulus set will focus on financial planning for retirement (as opposed to finances in general).

Theoretical accounts have appeared in the literature designed to explain the mechanisms that underlie the delay in color identification response times that occur when anxious respondents encounter threat words on the EST. One avoidance-based explanation suggests negative emotional concepts linked to threat words in long-term memory are more difficult to suppress (or filter) than nonemotional concepts, which in turn, slows processing on the primary color-naming task. A different explanation suggests that emotionally laden stimuli affect cognitive processing in some nonattentional manner (i.e., through a different processing mechanism or pathway), thereby causing a general disruption to the processes otherwise associated with the color identification task (see Yiend, 2010 for a discussion of these two explanations). A third explanation posits that as part and parcel of the stimulus word recognition process, individuals differentially focus attention on the negative emotional content linked to threat words in semantic LTM. This vigilant focus on emotional content—a form of attentional capture—draws down limited processing resources that reside in the executive control system of working memory, leaving insufficient resources available for processing of the primary executive task (Dawkins & Furnham, 1989). Unfortunately, theorists recognize it is difficult to tease apart the mechanisms that underlie the delay in color naming, leaving only speculative explanations (see Williams et al., 1996 for a discussion of artifactual theoretical explanations).

In the present experiment, a version of the EST will be used in which financial and retirement concepts (i.e., threat words) will be presented alongside neutral concepts (i.e., nonthreat words). For individuals with moderate to high levels of retirement anxiety, financial words and retirement words are both considered

threat words because both types of words are related to the more general concept of financial planning for retirement. In the following section, more will be said about the word type manipulation used, and the extent to which it is expected to interact with the other independent variable (i.e., FIS levels).

Present Investigation

No known studies have appeared in the literature that have used the EST to examine words related to retirement and financial planning. In addition to completing the EST, all participants will complete the Neukam and Hershey (2003) FIS measure. Scores on this scale will be recoded so as to create high and low levels of a blocking variable that will be used in a subsequent extreme groups analysis (cf., Preacher, Rucker, MacCallum, & Nicewander, 2005). In other words, financial inhibition will be dichotomized to serve as a between-subjects independent variable that represents high-worry and low-worry groups. Our selection approach sought to include 60% of participants in the study (the top and bottom 30% of respondents on the FIS dimension), setting aside data from the 40% of respondents who scored in the middle of the distribution.[1] The rationale for using an extreme groups approach (as opposed to, say, a median split approach or using all FIS scores in the form of a continuous variable) comes from studies of clinically anxious individuals, in which stringent participation selection procedures are used in order to form maximally homogeneous groups (Yiend, 2010).

The second independent variable (hereafter referred to as word type) will be a within-subjects dimension, specifically, whether the type of stimulus words presented represent financial or retirement planning words (e.g., *poverty*, *saving*; hereafter referred to as threat words) or neutral words (e.g., *canyon*, *baseball*). It is important to note that each of the threat words need not have an inherently negative emotional valence (as does the word *poverty*, for instance) in order for them to be perceived as threatening to someone who has retirement-linked worries. That is because whether or not a word is perceived to have a negative valence will depend on the extent to which there is negative emotional content linked to that word. Therefore, for instance, the word *saving* could be perceived as a positive or neutral concept to those who are conscientious active savers, but as a negative concept to individuals who have yet to begin saving for retirement and who worry their efforts will fall short of meeting their long-term financial needs. Support for the contention of individual differences in word valence perceptions in the EST context can be found in the work of Mathews and Klug (1993). On this point Yiend (2010) notes ". . . any stimuli that are sufficiently related to the individuals' current concerns will produce attention-bias effects" (p. 17).

Together, the impact of these two independent variables (IVs) (financial inhibition level and word type) will be evaluated using a two-way mixed model analysis of variance (ANOVA), in which the dependent variable will be response times associated with stimulus color identification. If it is found that the high and low FIS groups differ in terms of subject variables that in previous studies have been linked to retirement planning practices (e.g., age, income, gender, education), then these subject variables will also be tested as covariates in an analysis of covariance (ANCOVA) model.

Given the nature of findings from previous EST studies carried out with clinically anxious individuals (Dresler et al., 2009; Grant & Beck, 2006; Hope et al., 1990), it is hypothesized that individuals who have concerns about financial adequacy in retirement (i.e., high-FIS respondents) will process threat words more slowly than neutral words due to an attentional or processing bias described in the preceding section. Because financially linked retirement threat words are posited to be emotionally charged for high-FIS individuals, it is theoretically expected that a focus on that negative affective content will either: (a) lead to word filtering or suppression difficulties, (b) disrupt cognitive processing, or (c) draw down attentional resources that

[1] It was believed that including individuals who scored in the middle of the FIS distribution would increase overall error variance, which in turn, would hinder the ability to identify the proposed attentional bias. In this regard, we took our cue from many studies of the EST and psychopathology that were carried out using an extreme groups approach. According to the basic principles of sampling theory, moderate-FIS individuals would be the *least likely* to process retirement concepts in a particularly positive or negative manner, relative to low-FIS and high-FIS individuals, respectively.

would otherwise be needed to rapidly carry out the color naming task. Individuals without financial concerns (i.e., low-FIS respondents), in contrast, are not expected to show a response time differential when processing threat and neutral stimuli, due to the presumed absence of negative emotional content linked to retirement words in the semantic LTM network.

In overarching terms, the analytic focus will be on whether a two-way interaction will emerge as statistically significant. If a main effect is found to emerge for FIS group, then it would be anticipated that high-FIS individuals would take longer to identify the stimulus colors relative to low-FIS individuals. Furthermore, in terms of a main effect for word type, threat words would be expected to take longer to process than neutral words. Main effects for FIS group and word type, if observed, would likely be due to the (slowing) influence of response times associated with the high-FIS threat word condition. However, if the two-way interaction is found to emerge, then it would serve to overshadow any significant main effects.

Method

Participants

Ninety working adults (25 males; 65 females) served as participants in the study. Individuals were recruited through public service announcements placed in local media outlets and via snowball sampling. The mean age of participants was 49.1 years (SD = 7.91), their average income was \$60,188 (SD = \$35,900), and they had completed an average of 15.5 years of formal education (SD = 2.33). Moreover, respondents were predominantly Caucasian, which reflects the racial representation of the Midwestern region where the data were collected.

Procedure

Participants were tested either at a university research laboratory or at a location that was convenient (e.g., office, home), as long as it was deemed to be free from distractions. Each data collection session consisted of two parts and took a total of 10–15 min to complete. After providing informed consent, participants were administered the computerized EST. Once completed, they were asked to fill out a paper and pencil version of the FIS. The experimental session was then concluded with a thorough debriefing.

The EST was administered to participants on a 17 in. (43 cm) color computer monitor using DirectRT software (Jarvis, 2008), which is designed to record response times with millisecond-level accuracy. Stimulus words (Arial font, 1.5 in. tall) appeared in the middle of the screen one at a time against a black background. Participants were instructed to indicate the color of the ink in which each word was written (red, yellow, green, or blue) by pressing the appropriate key on the keyboard. To reduce participants' working memory load associated with this manual response, different colored stickers were placed on each of four keys (T, Y, G, and H). These four keys were selected due to their close proximity and in order to reduce the possibility of a left–right spatial bias associated with using response keys on opposite sides of the keyboard. The entire task involved 72 trials that were organized into four 18-trial blocks; the interstimulus interval was set to 500 ms. Sixty of the 72 trials involved the presentation of neutral words (e.g., *canyon*, *train*, and *wrench*). The other 12 trials presented retirement-linked threat words (e.g., *saving*, *planning*, and *poverty*). More will be said about the precise nature of the stimulus items, below. All participants were given the opportunity to complete five practice trials prior to beginning the actual experimental task.

Dependent and Independent Variables

This study included two independent variables and one dependent variable. The dependent measure for each trial was response time latency, which was recorded in milliseconds. Overall means for neutral and threat words were calculated separately for each individual to obtain mean stimulus response times as a function of word type.

The first of the two IVs was participants' level of financial inhibition, which is a construct designed to tap one's degree of retirement-linked financial fears and worries. Scores on this dimension were based on responses to the 9-item FIS measure (Neukam & Hershey, 2003), which taps specific fears related to retirement planning competence and late life financial insufficiency (sample items: *"I am hes-*

itant about making retirement investment decisions because I worry about making a mistake" and *"I often find myself concerned about not having enough money in retirement"*). All responses were made using a 7-point Likert-type format (1 = *Strongly Disagree*; 7 = *Strongly Agree*) and the total score for the measure was calculated as the aggregate mean of the nine items (M = 4.07; min. = 1.00; max. = 6.44). Higher scores on the FIS are associated with higher levels of financial and retirement worry. In terms of internal consistency, the coefficient alpha value for the scale was .93.

As described above, the top 30% and bottom 30% of FIS scores were coded to form high-FIS (n = 28) and low-FIS (n = 25) groups, respectively. Those in the high-FIS group had scores of 4.90 or higher; those in the low-FIS group had scores of 3.12 or lower. The resulting groups did not differ in terms of mean age, educational level, or gender distribution; however, self-reported income was significantly larger for members of the high-FIS group relative to their low-FIS counterparts.

The second independent variable in the study was EST word type. As mentioned above, participants were individually presented with 72 trials that included 12 threat words and 60 neutral words. The set of words included in the threat category included: *401K, aged, elderly, finances, future, investing, nest egg, pension, planning, poverty, retirement,* and *saving*. Examples of words included in the neutral category included: *aluminum, canyon, corduroy, elevator, lemonade, maroon, nephew, rose, sailboat, spatula, trumpet,* and *waltz*.

In developing the list of threat and neutral words, every effort was made to ensure word length and frequency of usage were equivalent, based on the Battig and Montague (1969) word norms. The 72 words were presented in the form of four 18 word blocks, with one quarter of the threat words included in each of the four blocks (i.e., three threat words per block). The placement of threat words within blocks was randomly determined. Word lengths for the two types of stimulus items were not found to differ—threat words had a mean length of 6.92 letters and neutral words had a mean length of 6.50 letters, $t(70) = 1.28$, *ns*. Furthermore, when selecting neutral words, an effort was made to avoid choosing more than two words from any one conceptual category (e.g., transportation words) so as not to inadvertently create a subcategory that might result in some other form of (positive or negative) response bias.

Results

Preliminary Analyses

Prior to testing the proposed hypotheses, a check was carried out to ensure that the means for the response time distributions were not unduly distorted by outliers. Moreover, error rates were checked for individuals to ensure that all respondents were attending to the task. Finally, error rates were examined as a function of stimulus color and word type.

Outlier analysis. Consistent with many chronometric investigations of cognitive processing (Lachaud & Renaud, 2011), response time scores greater than 3 standard deviations from the trial mean were replaced with the mean of the remaining scores (i.e., threat word outliers replaced with mean threat response times; neutral word outliers replaced with mean neutral response times). These replacements accounted for 1.7% of all response times.

Stimulus color analysis. To ensure participants perceived each of the four stimulus colors appropriately, response errors (i.e., pressing the incorrect key) was examined as a function of font color. A one-way repeated measures ANOVA identified a significant difference in error rates, $F(1, 89) = 25.87$, $p < .01$, with the prevalence of green errors (24%) being statistically higher than error rates for the other three colors (red, 2%; yellow, 3%; and blue, 3%). This finding suggests participants had trouble discriminating the particular hue of green that was used. It was therefore concluded the 12 green trials should be eliminated from consideration. This resulted in a stimulus pool of 60 items—11 threat words and 49 neutral words.[2]

Response error analysis. The percentage of response errors for stimulus items was then calculated for each participant to ensure individual respondents were appropriately attending

[2] To ensure equivalency of stimulus sets, word length as a function of word type was again checked using the 11 threat and 49 neutral items. This analysis failed to reveal a difference across word sets, $t(58) = 0.77$, *ns*, thereby demonstrating length equivalence for the threat and neutral words.

to the task. Three of the 90 respondents were found to produce unacceptable error rates of greater than 15%; therefore, these individuals were eliminated from the study. This reduced the sample to 87 persons. Furthermore, consistent with mainstream cognitive response time investigations, prior to analysis response errors were identified and replaced with the group mean for that particular word type. This analysis revealed that the overall error rate was quite low at 1.64% (i.e., 86 errors out of 5,220 total trials).

Also examined as part of the preliminary analyses was whether there was a difference in error rates as a function of word type. Toward this end, the mean error rates for neutral and threat stimuli were compared. The percentage of errors for threat words ($M = 0.01$; $SD = 0.03$) was not statistically different from errors for neutral words ($M = 0.02$; $SD = 0.03$), $t(86) = 1.49$, *ns*, which suggests the word sets were comparable in terms of their level of difficulty.

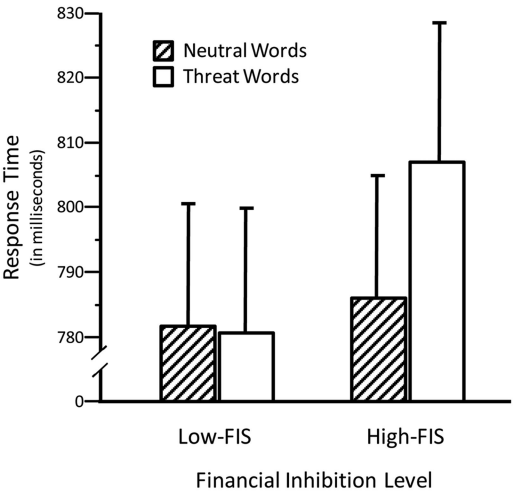

Figure 1. Mean response times and standard errors as a function of word type and financial inhibition level. Note: Low-FIS = low financial inhibition group; High-FIS = high financial inhibition group.

Analysis of Response Times

The first analysis was carried out to assess whether retirement worry level and word type had an impact on color identification performance. Toward that end, a 2 FIS (high vs. low) × 2 word type (neutral vs. threat) mixed model ANOVA was calculated. In this analysis, neither the main effect of FIS group nor word type was found to emerge, $F(1, 51) = 0.27$, *ns*, and $F(1, 51) = 3.68$, *ns,* respectively. However, the hypothesized two-way interaction was found to exceed the significance threshold, $F(1, 51) = 4.72$, $p = .04$, $\eta^2 = .07$ (see Figure 1). A simple effects analysis revealed that, consistent with predictions, there was no difference in the response times of low-FIS individuals, $F(1, 24) = 0.04$, *ns*; $M_{neutral} = 783$ ms, $M_{threat} = 781$ ms. However, response times for the word type factor did differ for high-FIS respondents, $F(1, 27) = 7.21$, $p = .01$; $\eta^2 = 0.21$; $M_{neutral} = 786$ ms, $M_{threat} = 807$ ms.[3]

It is worth noting that high-FIS respondents had a significantly smaller mean income than low-FIS individuals. To rule out the rival hypothesis that differential income levels (and not retirement-linked worries) were driving the observed two-way interaction, an ANCOVA was carried out in which income was used as the covariate. In this analysis, the covariate failed to emerge as significant, $F(1, 50) = 1.36$, *ns*, as did the main effects of FIS and word type, $F(1, 50) = 0.00$, *ns*; and $F(1, 50) = 0.39$, *ns*, respectively. However, the two-way interaction did reveal a reliable effect, $F(1, 50) = 4.37$, $p < .05$; $\eta^2 = 0.08$. Thus, the results of this ANCOVA analysis serve to rule out the rival hypothesis that income was responsible for the significant two-way interaction in the initial ANOVA.

Two additional (ANCOVA) response time analyses were carried out that were identical to the ANCOVA described immediately above, only in these analyses age and gender were used as covariates. The rationale for this test was that even though age and gender distributions were not found to differ across levels of the FIS dimension, it was felt that including them as covariates in the multivariate model could help reduce overall error variance, thereby strengthening the magnitude of the interaction. These

[3] In other analyses (not shown), different approaches were used to create the extreme groups blocking variable (e.g., top and bottom quartiles of the FIS distribution; top and bottom thirds). However, the pattern of mean response times in these other analyses was essentially the same as the pattern observed in the approach reported (i.e., top and bottom 30% of respondents). This latter approach was selected for presentation purposes because it most clearly illustrates the hypothesized pattern of effects.

speculative effects are based on well-established findings regarding the link between advancing age and behavioral slowing (Swearer & Kane, 1996), and gender-linked perspectives and retirement planning practices (Grace, Weaven, & Ross, 2010). In this analysis, age emerged as a significant covariate ($p < .05$), but gender did not. Importantly, neither of the main effects emerged as significant, and the magnitude of the significant two-way interaction was found to be essentially identical to the interaction effects reported above, $F(1, 49) = 4.70$, $p = .04$, $\eta^2 = 0.09$.

Discussion

The present study was designed to examine the way in which individuals' emotions impact their cognitive processing of financial planning and retirement concepts in semantic LTM. This was accomplished by looking at the ability of respondents to rapidly access retirement and nonretirement concepts using a computerized EST. Participants who had retirement-linked worries were found to take longer to process retirement and financial concepts compared with nonretirement concepts. By way of contrast, those not shown to have retirement-linked worries revealed no appreciable difference in the speed with which they processed threat and neutral words. This set of outcomes supports the critical two-way interaction hypothesis outlined in the introduction, and the results are not inconsistent with the three theoretical models of EST slowing presented above. In sum, in the domain of financial planning for retirement, emotionally based fears affect the processing of concepts in semantic LTM, which in turn, have a negative impact on performance on the color identification task.

Theoretical Implications

One theoretical implication of this investigation involves the extension of cognitively based retirement research to a new and relatively unexplored level of analysis (cf., Hunt, 1995a, 1995b). As pointed out in the beginning of the article, the large majority of work on the topic of retirement focuses on attitudes, knowledge, goals, and social influences as determinants of planning practices (i.e., work at the representational level of analysis). Also mentioned earlier is the fact that foundation-level cognitive studies—that is, what would be considered biological cognitive work in the Hunt tripartite theoretical framework—are limited in scope and have only recently begun to appear in the literature (see Hsu et al., 2009; Lehrer, 2009 for examples). The present investigation effectively bridges the gap between representational and biological research, by examining how concepts are organized and processed at the computational level of analysis. By doing so, it was possible to fashion a window through which to view the way in which individuals process retirement information.

A second theoretical implication is that it was possible to extend the EST paradigm to a relatively understudied group—that is, members of the general population (Yiend, 2010). Most previous investigations using the EST have been carried out with individuals who have clinically significant levels of anxiety and depression. The present study was able to successfully examine the relationship between emotions and information processing among members of a nonclinical population, some of whom are experiencing a degree of anxiety related to financial planning for retirement. It was found that mildly anxious individuals (i.e., those with a form of trait anxiety that would be considered to be at the subclinical level) revealed delayed word activation processes compared with individuals with little or no retirement anxiety. To that extent, the findings from this study conceptually replicate the results of the Shapiro and Burchell (2012) investigation. It is worth noting that in this study, the magnitude of the processing delay observed among those with retirement anxiety (i.e., 21 ms) was essentially identical to the response delay observed in the Shapiro and Burchell investigation (i.e., 22 ms). In turn, the response delays for both studies are smaller than the magnitude of slowing typically observed among individuals who have been clinically diagnosed as having an anxiety disorder. Emotional Stroop findings based on nonclinical populations (such as the present study) should help to extend our understanding of the role of emotions in other real-world decision-making contexts, such as when individuals face potentially stressful career decisions, family planning decisions, or child rearing decisions, to name but a few.

A third implication has to do with EST performance and lessons learned about attentional processes and executive functioning. The data suggest that among those who were anxious about retirement, automatic word recognition processes involving threat stimuli created a processing bias that was sufficient to slow performance on the primary executive task. A comparable effect failed to be observed for neutral words, or for words processed by nonanxious respondents. Taken together, these findings not only support memory theorists' contentions that concepts in LTM are linked to emotional content (Bower, 1981), but that affective content has an impact on how related cognitive processing takes place (Forgas, 2001, 2008). This suggests that in the retirement context, it could be beneficial to explore different paradigms (e.g., the dot-probe paradigm; Shapiro & Burchell, 2012) to assess the role of attention in relation to financial planning, and in turn, the possible decision biases that might emerge when threat-based cues arise. Unfortunately, as pointed out by others who have studied the EST, it is difficult to theoretically disentangle the reasons why delays in processing to the color naming task occur. That is, whether executive processing delays are the direct result of attentional vigilance or avoidance to emotionally threatening stimuli (Fox, 1993, 2004; MacLeod, Mathews, & Tata, 1986), or whether delays happen for a different reason altogether, such as slowing that results from cognitive disruptions that stem from processing stimulus words via emotion-specific pathways. Whatever the explanation may be, we see value in conducting future investigations that explore the mechanisms that underlie EST slowing.

Applied Implications

In thinking through the applied implications of this investigation, it is worth considering the message financial planners, retirement counselors, and intervention specialists would most benefit from receiving. Certainly, one important take-away message is that a poor pattern of saving for a nonplanner does not simply reflect a poor attitude toward retirement preparation or a lack of motivation. The difficulties some individuals experience in becoming engaged in the planning process might perhaps stem from a more fundamental challenge having to do with the way in which retirement concepts are semantically stored and cognitively processed. It is not unlikely that for high-fear individuals, simple intervention solutions aimed at encouraging workers to "plan more and save more" may miss their mark. It may otherwise be necessary to devise intervention approaches that address the structural basis of individuals' financial LTM networks as a way of stimulating saving motives. Perhaps it would be possible to take cues from research on cognitive restructuring (Calero-Elvira, Froján-Parga, Montaño-Fidalgo, & Alpañés-Freitag, 2012; Davis, Newman, & Pruiksma, 2009), neuro-linguistic programming (Angell, 2011; Bandler & Grinder, 1979; Tosey & Mathison, 2010), or cognitive–behavioral therapy (Shapiro & Burchell, 2012) to find ways to effectively reshape the affective content of these LTM networks.

Also in the realm of intervention, it would seem that this study has implications for ways to develop veridical mental representations of financial planning and retirement starting at a relatively young age. A number of retirement research scholars have made the argument that retirement planning education should begin with children (Danes, 1994; Hershey, Jacobs-Lawson, & Austin, 2012; Shobe & Sturm, 2007). If parents and society can find ways to work together to effectively cultivate positive mental representations of saving among children and adolescents, then that might help reduce their likelihood of experiencing financially linked fears surrounding the planning process. It could also, decades down the road, reduce financially related concerns about the decision to withdraw from the workforce (Gouskova, Chiteji, & Stafford, 2010). Toward this end, the identification of best practices for youth-based retirement and pension planning education programs is essential (Doyle, 2007; Organisation for Economic and Co-Operation Development, 2005).

Limitations and Future Directions

Although the findings from this study are illuminating, they need to be interpreted with caution as the investigation is not without its limitations. One limitation involves the fact that the characteristics of the EST computer program required a consistent mapping of colors to

stimulus items, as well as a static stimulus presentation order. This combination of design characteristics, however, could have resulted in some unspecified form of order effects. To eliminate the possibility of order effects, in future studies we see the value of using a variable mapping of colors to stimuli and a fully randomized word presentation order.

A second limitation involves the fact that in terms of participant selection, there was a narrow focus on individuals who were (and were not) experiencing trait anxiety linked to financial planning for retirement. Future investigations would be warranted that examine: (a) the impact generalized trait anxiety has on EST performance, and (b) the impact momentarily induced state anxiety has on performance. The first type of investigation could potentially explore the extent to which preexisting nonspecific trait anxiety might have contributed to the effects witnessed in this study (see Bar-Haim et al., 2007 and Phaf & Kan, 2007 for meta-analytic reviews of the role of trait anxiety and EST). The second (state anxiety) investigation mentioned could profitably explore the malleability of retirement anxiety in the experimental setting for those who do (and do not) have preexisting degrees of retirement-linked trait anxiety. Both types of studies would stand to contribute to our understanding of the dynamics between retirement worry and information processing (Yiend, 2010).

A different investigative direction might involve exploring the types of "messages" that motivate individuals to adaptively plan and save for the future. Investigators working in the fields of consumer behavior and health promotion recognize the benefits of using "loss-frame" messages and "gain-frame" messages to encourage individuals to change (Rothman & Salovey, 1997). In the retirement context, a loss-frame message might involve communicating that: *"unless you begin saving for retirement by the time you're 50, the chances of encountering poverty in old age are quite high."* A gain-framed message, in contrast, would suggest that *"even saving small amounts of money over an extended period of time could result in a substantial nest egg by the time you retire."* Loss-framed messages tend to work well to motivate individuals when the goal is prevention (as is the case when one tries to prevent cancer through prostate screenings and mammograms), and gain-framed messages tend to work well to motivate individuals when the goal is promotion (such as when one's objective is to promote daily exercise as a way of maintaining good health; Keren, 2011). One would normally think of the retirement savings arena as one in which promotion is the key (thereby suggesting the use of messages using a gain frame); but it is unclear which of the two frames would be most effective for individuals who are predisposed to a degree of retirement trait anxiety. Future studies are warranted that are designed to address this issue. Recent work in the area of framing suggests that an individual's perception of risk (Bartels, Kelly, & Rothman, 2010) and orientation to time (Zhao, Villagran, Kreps, & McHorney, 2012) could both be important individual difference factors that determine the type of frame (i.e., gain or loss) that is most effective.

Conclusion

This study stands to make a significant contribution to the retirement literature, because it focuses on an understudied aspect of retirement cognition—concept activation in semantic LTM. As mentioned above, most existing research on the topic has ignored the computational dimension of the retirement planning process, focusing instead on cognitive processes at the representational level of analysis. That said, the findings from this investigation clearly indicate that individuals with high levels of worry about retirement planning face greater difficulties processing financial and retirement concepts than those without affective barriers. Perhaps future studies could use this novel finding as a springboard to explore in greater detail the role of affective processes in the retirement planning process. We tacitly acknowledge the profound role affect plays in other aspects of our daily lives; there is no reason to assume we can leave emotions at the doorstep when it comes to establishing a sound financial plan for old age.

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