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Influence of Age, Thought Content, and Anxiety on Suppression of Intrusive Thoughts

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Abstract

Understanding differences in responses following attempts to suppress versus simply monitor intrusive thoughts is important given the established relationship between intrusive thinking and numerous forms of psychopathology. Moreover, these differences may vary as a function of age. Because of the links between aging and both enhancement in emotion regulation skills and decline in inhibition skills, older and younger adults were expected to differ in their responses (e.g., experience of negative affect and thought recurrence) to attempts at suppressing intrusive thoughts. This study examined whether efforts to suppress thought content that varied in valence and age-relevance differentially affected older (N = 40, aged 66–92) and younger (N = 42, aged 16–25) adults' ability to inhibit intrusive thought recurrence and their resulting negative affect. Interestingly, older adults experienced *less* recurrence for most thoughts than younger adults. Also, for several dependent variables (negative affect and perceived difficulty suppressing intrusive thoughts), older adults showed less decline in their magnitude of response across thinking periods (i.e., from suppression to monitoring) than did younger adults. These age effects were not generally moderated by level of trait anxiety, though higher anxiety did predict intrusive thought responding in expected directions, such as greater negative affect. These findings point to independent influences of age and anxiety, and suggest a complex mix of risk and protective factors for older adults' responses to intrusive thoughts.

Keywords

aging; intrusive thoughts; thought suppression; emotion regulation; older

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Although most everyone experiences intrusive thoughts on occasion (Rachman & de Silva, 1978; Salkovskis & Harrison, 1984), cognitive theories of obsessive compulsive disorder (OCD) suggest that it is the manner in which one interprets and responds to these repetitive, unwanted thoughts that influences both the negative affect associated with the thought and the frequency with which the thought recurs (e.g., Langlois, Freeston, & Ladouceur, 2000; Rachman, 1998; Obsessive-Compulsive Cognitions Working Group, 1997; Salkovskis, 1998). Ongoing attempts to suppress unwanted thoughts, for example, is one response that has been found to promote later thought recurrence[1] and negative affect (Trinder & Salkovskis, 1994; Wegner & Zanakos, 1994). Studies examining responses to intrusive thoughts have primarily focused on younger adults, neglecting the potential impact of developmental changes over the lifespan that could lead to differences in responses to

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intrusive thoughts (Calamari, Janeck, & Deer, 2002). Investigating age differences in responses to intrusive thoughts can lead to an enhanced understanding of both emotional processing in the context of healthy aging, as well as gerontological anxiety, a critical but understudied problem (e.g., Schaub & Linden, 2000; Wolitzky-Taylor, Castriotta, Lenze, Stanley, & Craske, 2010).

Cognitive models of intrusive thoughts in the context of OCD emphasize how interpretations of intrusive thoughts as personally significant lead to increases in negative affect and subsequent recurrence of the thought (Rachman, 1997, 1998); however, thought content can also play a significant role. Rowa and Purdon (2003) found that intrusive thoughts with content that contradicted a person's values or self-concept were rated as more upsetting and were appraised as more negative than thoughts that were less contradictory to self-concept. Additionally, using a thought suppression paradigm similar to the one used in the current study, Corcoran and Woody (2009) asked religious and non-religious participants to suppress (or they were explicitly asked not to suppress) a blasphemous thought. The researchers found that the religious participants experienced greater anxiety during the task and greater thought frequency upon directed thought suppression compared to the non-religious participants. This research points to the likely role of personal and (sub)cultural relevance of the content of intrusive thoughts in determining responses to such thoughts.

Age is another factor that is commonly associated with considerable differences in what goals and values are deemed important (Carstensen, 1993, 2006), and recent evidence suggests emotional reactivity can vary as a function of the age-relevance of the stimuli (Kunzmann & Grühn, 2005; Teachman & Gordon, 2009). Yet, there is a dearth of research examining age-related differences in responding to intrusive thoughts, both in general and specific to intrusive thought content that varies by typical, lifespan development concerns.

Investigating age differences in responding to different types of intrusive thoughts following thought suppression attempts can help determine whether hypothesized differences are due mainly to age variance in the thought suppression process (e.g., because of age-related differences in emotion reactivity and cognitive processing) or to the impact of thought content (e.g., thoughts that vary in age-relevance). We investigated the independent and interactive influences of age and trait anxiety on older and younger adults' thought recurrence and negative affect when attempting to suppress thoughts that are relevant to the common concerns of their respective age group, compared to other types of thoughts, including an age-neutral positive thought and an age-neutral negative thought.

Age and Thought Suppression Ability

Increasing age is associated with a myriad of cognitive changes, including deficits in working memory (Salthouse, 1990) and processing speed (Salthouse, 1996). Some of these cognitive changes are linked to reductions in certain inhibitory abilities (Dempster, 1992; May, Hasher, & Kane, 1999; Zacks & Hasher, 1997), which are highly relevant to thought suppression capability. Specifically, the suppression of intrusive thoughts has been linked to the so-called deletion function of inhibition, which involves suppression of no-longer-relevant information in working memory once a goal or task has changed (Zacks & Hasher, 1997). The deletion function has been found to deteriorate with chronological age (e.g.,

[1]We use the term "recurrence" to reference any occurrence of the thought during a thinking period, regardless of whether it was a suppression or monitoring period. Note, we construe the term "rebound" to have a more specific meaning, reflecting the recurrence of a thought following a period of prior suppression. Given rebound is typically measured as degree of recurrence following suppression relative to degree of recurrence following monitoring, we do not use the term rebound in this study because the current study design did not contrast suppression versus monitoring instructions during the first thinking period.

Ikier, Yang, & Hasher, 2008; Malmstron & LaVoie, 2002; Whitthöft, Sander, Süß, & Whittmann, 2009), potentially making thought suppression more difficult for older adults. Additionally, several aspects of controlled processing deteriorate with age (Hasher, Zacks, & May, 2000), which may hinder thought suppression performance, following from Wegner's (1994) ironic process model. This model proposes that thought suppression involves a controlled process whereby people consciously try to not think about a certain thought (in addition to a relatively more automatic monitoring process). Taken together, these age-related changes suggest that older adults might experience greater recurrence of intrusive thoughts compared to younger adults.

Notwithstanding, Magee and Teachman (2012) did not find age differences in the frequency and duration of intrusive thought recurrences during a directed thought suppression paradigm, and instead found significant age differences in reports of *subjective* difficulty suppressing the thoughts. Thus, it may be perceived difficulty, rather than actual suppression performance, that distinguishes older and younger adults' responses to suppressing intrusive thoughts. Perhaps older adults are able to compensate for their losses in inhibition ability for short bursts of time so performance is not impaired (see model of aging and Selection, Optimization, and Compensation; Baltes & Baltes, 1990; Baltes, 1987), but doing so comes at a cost (hence, they describe the task as more difficult). Indeed, Magee and Teachman found that perceived effort at thought suppression mediated the finding that older adults perceived greater difficulty suppressing thoughts than younger adults. If older adults are able to successfully compensate for losses in inhibition and other controlled processes, there may be no age differences in thought recurrence, frequency and duration, or older adults could even experience less recurrence if compensation was very effective.

Yet an alternative possibility is that suppression difficulties only become exaggerated for older adults if the thought is one that is personally meaningful to them. Suppressing a meaningful intrusive thought, such as one that is age-relevant, may require additional inhibition skills because of the greater processing demands activated. This question is investigated in the current study by assessing suppression ability for multiple thoughts that vary in age-relevance.

Age and Negative Affect

Despite significant reductions in certain cognitive abilities, studies suggest that older adults are better able to regulate many facets of emotional experience and expression compared to younger adults (Gross et al., 1997). Notably, researchers found that although the intensity of self-reported emotions did not vary as a function of age, suggesting intact emotion sensitivity, age was associated with increases in emotional stability (as indicated by less lability across time; Carstensen et al., 2010). Similarly, research from our laboratory revealed that older adults started with and maintained steadier positive affect during a directed thought suppression paradigm than did younger adults (Magee & Teachman, 2012). With respect to negative affect, older adults reported lower initial levels of negative affect at baseline than younger adults, but similar intensity of negative reactivity to the intrusive thought. In line with prior findings of less change in emotions over time, Magee and Teachman found that older adults' negative affect decreased less steeply across thinking periods than did younger adults'. These findings suggest a pattern of comparable negative reactivity to intrusive thoughts across age groups, but reduced affective change across time among older adults.

Influence of Trait Anxiety

Older adults often score lower than younger adults on measures of trait anxiety (Teachman, 2006), but there has been little prior literature examining the role of anxiety in influencing

age differences in responses to intrusive thoughts. Independent of age, higher levels of trait anxiety have been associated with greater suppression effort (Erskine, Kvavilashvili, & Kornbrot, 2007), and greater negative affect following directed thought suppression attempts (Magee, 2010; though see Tolin, Abramowitz, Hamlin, Foa, & Synodi, 2002). However, this does not mean actual thought recurrence will be greater. In fact, in a meta-analysis examining the link between psychopathology and thought recurrence following thought suppression, Magee, Harden, and Teachman (2012) found a small effect indicating higher trait anxiety was actually associated with less recurrence. There are many open questions about how age and trait anxiety might interact to influence thought suppression outcomes. Interestingly, Steinman, Smyth, Bucks, MacLeod, and Teachman (in press) found the effects of age and anxiety were independent in a study of expectancy biases. Similarly, Magee did not find that age interacted with trait anxiety to predict thought suppression outcomes, though this study did not include an aging-relevant thought, leaving open the possibility that a more personally significant thought might lead to more interactive effects.

Overview and Hypotheses

In this study, older and younger adults were asked to suppress and then monitor four thoughts of varying content: older-age-relevant negative thought, younger-age-relevant negative thought, age-neutral negative thought, and age-neutral positive thought. Age differences in thought suppression/monitoring outcomes were examined for perceived and actual difficulty controlling the return of intrusive thoughts, and the experience of negative affect. Self-reported effort at suppressing intrusive thoughts was also measured after each thought period to check that greater suppression effort was reported after the suppression period than the monitoring period, indicating adherence to task instructions. Further, the influence of trait anxiety on thought suppression/monitoring outcomes, and its interaction with age, was examined. For all outcomes, it was expected that older adults would indicate stronger responses (more thought recurrence and negative affect) to the older-age-relevant thought, while younger adults would indicate stronger responses to the younger-age-relevant thought, because of the increased personal relevance of those thoughts within the age groups.

Control over the return of intrusive thoughts was operationalized in two ways: perceived difficulty with suppression, and duration and frequency of actual thought recurrence. Based in part on the findings of Magee and Teachman (2012), it was predicted that older adults would report greater perceived difficulty suppressing thoughts than younger adults, as evidenced by higher self-reports of the difficulty experienced trying to suppress intrusive thoughts. There were competing predictions for age differences in actual thought recurrence given prior contradictory theory and findings; the inhibition and controlled processing literatures suggest older adults will show greater recurrence, as evidenced by higher frequency and longer duration of intrusive thoughts, while the cognitive compensation literature and Magee and Teachman's earlier findings suggest that older adults will show less recurrence or no difference, compared to younger adults.

Self-reported negative affect was measured at baseline and after each thinking period using the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). Based on prior findings of less affective change across time but comparable intensity of negative reactivity (Carstensen et al., 2010; Magee & Teachman, 2012), it was hypothesized that older adults would experience less change in negative affect across the thinking periods than younger adults in response to the thoughts, but no age differences in intensity of negative affect.

Finally, trait anxiety measured via a questionnaire was expected to be associated with greater negative affect and suppression effort, but less thought recurrence. Following Magee

(2010) and Steinman et al. (in press), the effects of age and anxiety were expected to be independent rather than interactive, but given the limited prior theory and literature, this was an exploratory question.

Methods

Participants

Participants were 42 younger adults (mean age = 18.9, *SD* = 1.5, range = 16–25[2], 57.1% female) and 40 older adults (mean age = 76.0, *SD* = 7.9, range = 66–92, 65% female). Across age groups, ethnicity was reported as 81.7% European American, 11.0% Asian, 3.7% African American, 2.4% Bi-racial, and 1.2% other. The younger adults were recruited from the psychology department's undergraduate participant pool, and the older adults were recruited from the community via flyers and newspaper advertisements listing a study on "linking thoughts and feelings." Participants were selected based on their age. Individuals aged 18–30 were eligible for inclusion in the younger age group, and those 65 years and above were eligible for inclusion in the older age group.

Materials[3]

Thought stimuli and piloting

In each thinking sequence, participants were asked to focus on a given thought for a 30-second thought induction period, and then were asked to try to suppress the thought and, finally, to monitor its occurrence without trying to suppress it. This sequence was performed for four different thoughts in random order. The thoughts included one relevant to the concerns and goals of younger adults ("I will not succeed in my career"), one relevant to the concerns and goals of older adults ("I will lose my memory and forget my friends and family"), an age-neutral negative thought ("I hope my friend gets into a car accident"), and an age-neutral positive thought ("I hope I win the lottery"). These thoughts were selected from a group of thoughts that were pilot tested for valence and age-relevance on a group of older and younger adults (who did not then participate in the main study). See Appendix for more information on the pilot testing.

Responses to intrusive thoughts

Thought prior experience ratings—Upon first encountering each thought, participants rated it on a variety of dimensions, including the frequency with which they had experienced it in the past six months.

Intrusive thought recurrence, suppression effort and difficulty—Frequency and duration data were recorded using a JAVA-based computer program written for the current study. All thought stimuli were presented on a computer monitor, and participants recorded their thought recurrences during a suppression period and a subsequent monitoring period, each lasting 1 minute 45 seconds, for each of the four thoughts. During the suppression and monitoring periods, participants recorded their thought recurrence by holding down the spacebar on the computer keyboard whenever the given thought came to mind. Participants were instructed to hold down the spacebar for as long as they were thinking about the thought and to press nothing if they were thinking about anything else. This method provided a measure of total thought duration (as measured in milliseconds) and frequency per thinking period. The duration and frequency data were log transformed due to positive

[2]Due to experimenter error, one 16-year-old participant was run. All other participants were at least 18 years old.
[3]Participants also completed the Age-relevant Meaning of Intrusive Thoughts (AMIT; Magee & Teachman, 2012), though this measure was not included in the current analyses.

skew, and to simplify analyses, were combined due to their high correlations with one another at each assessment point (mean $r = .74$). For each thinking period, we converted the log-transformed frequency and duration data into z-scores and then examined the average of the z-scores. Notably, when examining the frequency and duration outcomes separately, the pattern of results was similar. After each thought suppression and thought monitoring period, participants used a 5-point Likert scale to rate their degree of effort in trying to suppress the given thought and the degree of difficulty they had experienced suppressing the thought during the thought period. The scale anchors for suppression effort ranged from one to five (1= "I didn't try at all," 2= "I tried, but only a little bit," 3= "I tried a moderate amount," 4="I tried rather hard," 5= "I tried as hard as possible"). Similarly, the scale anchors for perceived difficulty with suppression ranged from one to five (1= "No difficulty," 2= "A little difficulty," 3= "Some difficulty," 4= "Significant difficulty," 5= "Extreme difficulty").

Negative affect—The Negative Affect subscale of the *Positive and Negative Affect Schedule* was used to measure participants' state negative affect at baseline and immediately following each thought suppression and thought monitoring period. Using a 5-point Likert scale, participants rated the degree to which they were currently experiencing certain negative feelings (e.g., upset). This 10-item subscale has been shown to be both valid and reliable in a sample ranging from 18 to 91 years (see Crawford & Henry, 2004). In the current study, the average Cronbach's alpha across the nine administrations of the subscale was .76 for the younger adults and .81 for the older adults.

Trait anxiety—Participants' trait anxiety was measured using the *State Trait Anxiety Inventory – Trait Form* (STAI-T; Spielberger, Gorusch, Luchene, Vagg, & Jacobs, 1983). This 20-item measure assesses the presence of somatic and cognitive symptoms of anxiety and has been shown to have strong psychometric properties in a college-aged population (Metzger, 1976). Cronbach's alpha in the current sample was .88 for the younger adults and. 87 for the older adults.

State anxiety—Participants used the 0–100 verbal analogue Subjective Units of Distress Scale (SUDS: Wolpe, 1990) to rate their state anxiety at baseline and at the conclusion of each of the four thought sequences. On the scale, 0 represents no anxiety and 100 signifies the most anxious one can imagine being. This measure was included to monitor residual anxiety after each thought suppression sequence.

Cognitive functioning

Executive functioning—Two tests from the *Trailmaking* subtest of the Delis-Kaplan Executive Function System (TM; Delis, Kaplan, & Kramer, 2001) were used to assess executive functioning. This capacity was assessed because it is thought to be a critical component of controlling thought recurrence during suppression periods (Zacks & Hasher, 1997). The tests were timed and administered in a set order. On Test A, participants were asked to draw a line sequentially connecting jumbled number targets, and on Test B, participants were asked to draw a line connecting jumbled letter and number targets in alternating sequential order (e.g., 1-A-2-B…). Participants' scores were calculated by subtracting the amount of time taken on Test A from that taken on Test B. The Trailmaking subtest has been well validated and shown to be appropriate for individuals aged 8 to 89 (Delis et al.).

Dementia screener—All participants completed the *Mini-Mental Status Exam* (MMSE; Folstein, Folstein, & McHugh, 1975), a structured interview that measures general cognitive functioning and screens for dementia by assessing orientation, attention, memory, and

language. No participants scored below the recommended cutoff of 24 (see Tombaugh & McIntyre, 1992); therefore, all were included in the analyses.

Procedure

Participants were informed that they would be participating in "a study about the way people react to certain thoughts." Following informed consent, participants provided a measure of their baseline anxiety level using the SUDS scale and of negative affect level using the PANAS-NA. Next, participants began the first of four thought sequences (one per thought). Each thought sequence began with a thought induction period during which a computer monitor displayed one of the four thoughts (selected at random). Before the thought induction, they were asked to copy the given thought onto a slip of paper and to rate the degree to which they found it distressing, the frequency with which they had experienced it, and how often they had attempted to suppress it in the past. Following this, participants focused on the thought for 30 seconds, during which they were instructed to record their thought recurrence by pressing the keyboard spacebar. Immediately following the induction period, participants began the thought suppression period for which they were told, "Try not to think about the thought. If you do think about the thought, it's very important that you hold down [the spacebar], but try your best not to think about the thought at all." The suppression period lasted 1 minute 45 seconds. After the thought suppression period, participants provided a measure of their negative affect during the thought suppression period using the PANAS-NA. Finally, participants completed the thought monitoring period for which they were told, "Think about whatever you would like. It could be the thought you thought about before, or it could be anything else. Hold down [the spacebar] any time you think about the given thought." Similar to the suppression period, the thought monitoring period lasted 1 minute 45 seconds, after which participants completed the PANAS-NA in relation to their negative affect during the thought monitoring period.

Following completion of each thought sequence, participants provided a measure of their state anxiety using the SUDS. If they reported that their anxiety level was more than 20 points higher than it was at baseline, the experimenter conducted relaxation exercises (diaphragmatic breathing) until their anxiety level had returned to a score within 20 points of their baseline rating. This process was designed to reduce anxiety from one thought sequence being carried over to the next sequence.

Participants next completed a demographics form and the STAI. Finally, participants completed the MMSE and the Trailmaking tasks as measures of their cognitive functioning before being debriefed. These measures were placed at the end of the study so as not to prime participants' concerns about cognitive abilities during the study.

Results

Sample Characteristics

A series of tests were conducted to characterize the younger and older adult samples. There was a non-significant trend for older adults to perform slightly worse than younger adults on the cognitive screener, the MMSE ($t(80) = 1.74$, $p = .09$, Cohen's d[4] = .38). However, there was no significant age difference on the Delis-Kaplan Trail Making Task, a measure of executive functioning, ($t(74) = -1.21$, $p > .10$, $d = -.28$), though there was a small to moderate effect size in the expected direction (lower scores for older adults). There was a significant difference in trait anxiety, with older adults reporting less trait anxiety than younger adults ($t(79) = 4.77$, $p < .001$, $d = 1.06$), consistent with prior literature.

[4]All d scores represent Cohen's d effect sizes.

Additionally, although a chi-square test revealed that there were no significant gender differences across groups ($\chi^2(1, N = 82) = .532$, $p > .10$), the test examining age differences in ethnicity (comparing the number of Caucasian participants to non-Caucasian participants) revealed that the younger adult sample was significantly more ethnically diverse than the older adult sample ($\chi^2(1, N = 82) = 9.23$, $p < .01$). As a result of the small number of non–Caucasian participants in the older adult sample, we were unable to examine ethnicity as a separate factor in subsequent analyses. Instead, a re-analysis of the data excluding non-Caucasian participants was conducted. Findings were similar to those found when using the full sample, suggesting that the ethnic disparity across the younger and older adult samples is unlikely to account for any observed age-related differences. See Table 1 for age group means and standard deviations for demographic variables and measures of cognitive functioning.

Prior Experience with the Thoughts

Consistent with results from pilot testing (see Appendix), both age groups reported more frequent experience with their age-relevant thought relative to the other age group (more older adult experience with the memory thought: $t(78) = -3.84$, $p = .001$, $d = -.84$; more younger adult experience with the career thought: $t(78) = 5.25$, $p < .001$, $d = .1.19$), and there were no reported age differences for prior frequency of the age-neutral thoughts ($p > .10$ for the car accident and lottery thoughts). These results support the classification of the thoughts in their respective age-relevant categories.

Manipulation Check: Suppression Effort

To verify the effectiveness of the thought suppression instructions, suppression effort was compared across the suppression and monitoring periods. As expected, there was a significant difference for thinking instruction ($t(79) = 7.84$, $p < .001$, $d = .88$), with participants reporting significantly more effort to suppress the target thoughts during the suppression compared to monitoring periods, supporting the validity of the suppression paradigm.

Responses to intrusive thoughts

All main effects are reported in the subsequent analyses, but only those interactions involving age are reported, given that these were the primary questions of interest.

Age Differences in Thought Suppression Ability

Prior to analyzing the variables reflecting difficulty controlling intrusive thoughts (i.e., self-reported perceived difficulty, and the combined thought recurrence frequency and duration indicator), their mean correlation across thinking periods was examined. Results indicated a moderate relationship ($r = .56$), suggesting that they are significantly related constructs, but also sufficiently independent to warrant examination in separate analyses.

Perceived difficulty

To examine perceived difficulty in controlling intrusive thoughts, a 2 (Age Group) × 2 (Thinking Instruction: period 1 suppress, period 2 monitor) × 4 (Thought Content: career, memory loss, car accident, lottery) repeated measures analysis of variance (ANOVA) was conducted with age as the between subjects factor and thinking instruction and thought content as within subjects factors. See Table 2 for means and standard deviations for the key dependent variables. While there was not a significant main effect of age ($F(1, 78) = .10$, $p > .10$, $\eta^2_p = .00$), a main effect for thought type was detected ($F(3, 76) = 7.18$, $p < .001$, $\eta^2_p = .22$). Follow-up comparisons showed that the car accident thought was more difficult to suppress than the memory thought at the level of a trend ($p = .09$), and significantly more

difficult than the lottery and career thoughts (p's < .01). Further, the memory thought was perceived as significantly more difficult to suppress than the career thought (p = .003), but there was no significant difference between the lottery and career thought (p > .10). There was also a main effect of thinking instruction (F(1, 78) = 56.17, p < .001, η^2_p = .42), with greater perceived difficulty reported during period 1 suppression versus period 2 monitoring, as would be expected.

An Age Group × Thinking Instruction interaction was also found (F(1, 78) = 15.70, p < .001, η^2_p = .17). See Figure 1a. Follow-up t-tests examining the difference in difficulty ratings between the suppression and monitoring period within each age group indicated that, though both older and younger adults each showed a significant decrease in perceived difficulty across the thinking periods (both p's < .01), older adults experienced significantly less of a decline in perceived difficulty from the suppression to monitoring periods than did younger adults (t(78) = 3.96, p < .001, d = .90). None of the other two- or three-way interactions with age were significant (p's > .10).

Frequency/duration of thought recurrence

To test whether thought recurrence (operationalized as the combination of thought frequency and duration) differed by age, a 2 (Age Group) × 2 (Thinking Instruction) × 4 (Thought Content) repeated measures ANOVA was conducted. There were no main effects of thought type (F(3, 76) = .01, p > .10, η^2_p = .00), or thinking instruction (F(1, 78) = .00, p > .10, η^2_p = .00). However, there was a non-significant trend for a main effect of age (F(1, 78) = 3.29, p = .07, η^2_p = .04), with older adults indicating less thought recurrence than younger adults. Additionally, there was a significant Age Group × Thought Type interaction (F(3, 76) = 3.04, p = .03, η^2_p = .11). See Figure 1b. Specifically, for younger adults, there was no significant difference in recurrence across the four thoughts (F(3, 39) = 1.11, p > .10, η^2_p = .08); however, for older adults, there was a trend for differences across thought type, (F(3, 35) = 2.27, p = .098, η^2_p = .16), with more recurrence in response to the car accident thought than to the lottery thought (p = .03) or to the career thought (p = .05). The memory thought resulted in the second highest level of recurrence for older adults, though there was no significant difference in recurrence between this thought and any of the other thoughts (p's > .10). Next, examination of age differences for each thought showed that older adults experienced significantly less thought recurrence than younger adults for the lottery thought (t(78) = 2.48, p = .02, d = .54), and a non-significant trend for less recurrence for the memory (t(78) = 1.74, p = .09, d = .39) and career thought (t(78) = 1.97, p = .05, d = .44). There was no age difference in the recurrence of the car accident thought (t(78) = .17, p > .10, d = 04). Additionally, none of the other two- or three-way interactions with age were significant (p's > .10). These results suggest that, counter to the inhibition literature, older adults tended to report less overall thought recurrence than younger adults, except during the car accident thought. However, given some effects were at the level of a trend, they should be interpreted with caution and warrant replication.

Age Differences in Negative Affect in Response to Intrusive Thoughts

To examine age differences in negative affect in response to intrusive thoughts, a 2 (Age Group) × 2 (Thinking Instruction) × 4 (Thought Content) repeated measures analysis of covariance (covarying baseline negative affect) was conducted. Results indicated no main effect of age (F(1, 77) = .12, p > .10, η^2_p = .002), thinking instruction (F(1, 77) = .01, p > .10, η^2_p < .001), or thought content (F(3, 75) = .34, p > .10, η^2_p = .01).

There was a significant Age Group × Thought Type interaction (F(3, 75) = 3.88, p = .01, η^2_p = .13), which was subsumed within a trend for a three-way interaction between Age Group, Thought Type, and Thinking Instruction (F(3, 75) = 2.63, p = .06, η^2_p = .10). See Figure 2a.

To understand the three-way interaction, independent samples t-tests were conducted comparing the age groups' negative affect ratings separately for suppression and monitoring for each thought. The only significant age differences were that younger adults experienced significantly more negative affect during the suppression ($t(80) = 3.98$, $p < .001$, $d = .88$) and monitoring periods ($t(80) = 2.18$, $p = .03$, $d = .48$) for the career thought. To further understand the three-way interaction, we also conducted the parallel analyses used to examine the analogous age by instruction interaction for perceived difficulty. Specifically, independent samples t-tests were used to test age group differences in the magnitude of change in negative affect from suppression to monitoring. There was a significant age difference in the magnitude of change across thinking periods for the career thought ($t(80) = 3.00$, $p < .01$, $d = .67$) and a non-significant trend for the memory thought ($t(78) = 1.71$, $p = .09$, $d = .38$), both indicating that older adults reported less decline in negative affect from suppression to monitoring compared to younger adults. The age differences in change across thinking periods for the lottery and car accident thoughts were not significant (both p's > .10).

Taken together, the results indicate that the younger-age-relevant career thought led to greater negative affect in younger (vs. older) adults, as expected, and there was some suggestion that older adults experienced less decline in negative affect from suppression to monitoring compared to the younger adults, though results varied by thought content.

Independent and Interactive Effects of Trait Anxiety

The primary repeated measures analyses testing for age differences in difficulty controlling intrusive thoughts and in negative affect were rerun with trait anxiety entered as a predictor of thought suppression outcomes and moderator of age-related effects. As expected, there was a significant main effect of trait anxiety on negative affect ($F(1, 75) = 6.10$, $p = .02$, $\eta^2_p = .08$), such that higher trait anxiety predicted more negative affect in response to the thinking periods. Also, there was a non-significant trend for higher trait anxiety to be associated with higher perceived difficulty suppressing thoughts ($F(1, 75) = 3.31$, $p = .07$, $\eta^2_p = .04$). There was no effect of trait anxiety on thought recurrence ($F(1, 75) = 2.48$, $p = .12$, $\eta^2_p = .03$). All interactions between age and trait anxiety were not significant (all $p > .10$), with the exception of a non-significant trend for a four-way interaction between age, thought content, instruction period, and trait anxiety for thought recurrence ($F(3, 73) = 2.26$, $p = .09$, $\eta^2_p = .09$). Follow-up tests examining the correlation between trait anxiety and recurrence for each of the four thoughts separately during the suppression and monitoring thought periods yielded only two significant associations. Specifically, for younger adults, there was a significant positive correlation between trait anxiety and the recurrence of the lottery thought during the suppression period ($r = .35$, $p = .02$), and for the memory thought during the monitoring period ($r = .43$, $p < .01$). Thus, while there was evidence for trait anxiety to independently predict certain thought suppression outcomes, anxiety did not moderate the age-related effects for the most part.

Discussion

The primary goal of the present thought suppression study was to examine age differences in thought recurrence and negative affect in response to intrusive thoughts, as well as the impact of age-relevant thought content and trait anxiety on the age effects. Results for thought recurrence indicated that older adults experienced less recurrence, as measured by frequency/duration, than younger adults across all of the thoughts (though mostly at the level of non-significant trends, so results should be interpreted with caution), with the exception of the car accident thought. Additionally, while there were no age differences in overall level of perceived difficulty suppressing thoughts, older adults exhibited less decline in perceived difficulty from the suppression to monitoring instruction periods (within each

thought sequence) than younger adults. This finding of less steep decline across instruction periods for older adults was also evident for negative affect, as anticipated. Also as expected, older adults reported feeling less negative affect than younger adults following exposure to the younger-relevant career thought, but, surprisingly, there was no age difference in response to the older-relevant memory thought. These results point to the importance of considering thought content when examining age differences in response to intrusive thoughts, and suggest important interactions with age-related differences in processing style (e.g., reduced change across time) and the age-relevant content of the thoughts being processed. Finally, while trait anxiety was associated with greater negative affect following the thinking periods, and trended toward predicting greater perceived difficulty suppressing thoughts, there was little evidence that trait anxiety moderated the age effects, suggesting mostly independent effects for anxiety and age on thought suppression outcomes.

Aging and Change in Responding Across Thinking Periods

An intriguing pattern that emerged across two out of the three outcome measures was that older adults showed less change in responding across the instruction periods. Specifically, older adults reported less steep decline in perceived difficulty and negative affect from suppression to monitoring periods. These findings are in line with research showing that older adults report more mood stability compared to middle-aged and younger adults (Carstensen et al., 2010; Lawton, Kleban, Rajagopal, & Dean, 1992), and less fluctuation in both positive and negative affect compared to younger adults (Rocke, Li, & Smith, 2009). A novel contribution of this study is to show that the reduced change in responses across time in older adults also occurs for non-affective responses to intrusive thoughts, like perceived difficulty. It is interesting that the reduced change occurred on the relatively more subjective measures of responding to intrusive thoughts, rather than on the more objective indicator of thought recurrence frequency and duration. Further research will be important to determine whether this pattern holds in other clinical domains beyond intrusive thinking, and across more time points.

Thought Recurrence

Based on contradictory findings and theories in the aging literature, there were competing predictions for age differences in thought recurrence. The current finding that older adults generally experienced less intrusive thought recurrence than younger adults does not match predictions following from past research on normative age-related decline in inhibition skills (e.g., Ikier et al., 2008), which imply that older adults should experience greater thought recurrence than younger adults. Notwithstanding, other studies have also not found more thought recurrence in older adults (Magee & Teachman, 2012). It is possible that this lower older adult recurrence finding occurred because older adults expended fewer cognitive resources than younger adults on emotion regulation, leaving more resources available for inhibition of unwanted thoughts. Indeed, Scheibe and Blanchard-Fields (2009) found that older adults experienced less of a decline in cognitive performance (on an N-back task) than younger adults when attempting to down-regulate their emotions in response to disturbing emotional stimuli. They concluded that emotion regulation was significantly less cognitively costly for older adults, which may explain why older adults in the current study were more successful at inhibiting intrusive thoughts. It is also possible that the intrusive thoughts were simply not activated as frequently for the older adults. Future research using paradigms that can tease apart age differences in degree of intrusive thought activation versus suppression will be helpful to distinguish these different explanations.

Interestingly, results for the relatively more subjective indicator of thought recurrence (perceived difficulty with suppression) revealed few differences based on age, with the

exception that older adults experienced less of a reduction in perceived difficulty across thinking periods compared to younger adults. The discrepant findings for the subjective vs. more objective markers of recurrence has parallels with past research showing that older adults routinely perceive their memory and cognitive functioning as declining (e.g., Jorm et al., 1994), but these perceptions are often better predictors of emotional distress than of objective measures of cognitive functioning (Sinoff & Werner, 2003). Understanding how perceived versus actual difficulty in thought suppression differentially affects subsequent negative affect and strategies used to manage intrusive thoughts will be important to ultimately determine when and why age differences in managing intrusive thoughts occur. Additionally, despite the fact that there were significant age differences in perceived difficulty, it should be noted that both age groups indicated, on average, no more than minimal difficulty with suppression across thoughts. A thought suppression paradigm or thought stimuli that increase perceived difficulty (e.g., use of ideographic thought selection so stimuli are highly personally relevant, or suppression attempts under cognitive load) may enhance detection of age differences in suppression outcomes based on age-related changes in cognitive functioning. Specifically, more difficult suppression requirements presumably demand greater resources and effortful cognitive control, which may be preferentially taxed for older adults given normative age-related declines in executive functioning (Salthouse, Atkinson, & Berish, 2003).

Impact of Thought Content on Negative Affect

Thought content varied in terms of both valence (positive and negative) and age-relevance (younger adult and older adult). While older adults reported significantly less negative affect in response to the younger-age-relevant career thought than did younger adults, as expected, the groups reported equal amounts of negative affect in response to the older-age-relevant memory thought. One possible explanation for this finding is that younger adults may also perceive memory loss as a personally meaningful, threatening outcome despite the probability that this outcome would be more temporally distant for them compared to older adults. Consistent with this idea, younger adults experience more generalized worry than older adults (Hunt, Wisocki, & Yanko, 2003), so they may worry about events that are likely not imminent.

The results for negative affect in the current study closely replicated those of Magee and Teachman (2012), pointing to the reliability of the effects and adding support to the idea that initial affective intensity in response to a stressor may not differ across age groups. Instead, older adults tend to show less extreme change in affect across thinking periods, depending on the thought, similar to findings of greater stability of affect among older adults in Carstensen et al. (2010).

Role of Trait Anxiety and Clinical Implications

In the current study, trait anxiety significantly predicted greater negative affect following the thinking periods, and trended toward predicting greater perceived difficulty suppressing thoughts. Despite these main effects for trait anxiety, there was little evidence that trait anxiety moderated the age effects, suggesting that trait anxiety may independently influence responses to thought suppression, rather than interacting with age. This finding is consistent with other recent work examining the impact of age and anxiety on expectancy biases, which found separate effects for anxiety and age, but no interaction between the two (Steinman et al., in press). These independent effects suggest that older adults are as vulnerable to the potentially pernicious effects of trait anxiety on thought suppression outcomes, like enhanced negative affect (Magee, 2010), as well as the potentially protective effects, like reduced rates of thought recurrence (Magee et al., 2012), as younger adults.

More generally, the anxiety- and age-related findings suggest that older adults are equally at risk for experiencing negative affect following thought suppression attempts as younger adults. While there is an impressive body of research showing that older adults have some enhanced emotion regulation skills (Mather & Carstensen, 2005) and report more control of their emotions (Gross et al., 1997), older adults in the present study showed less decline in negative affect across time/thinking periods compared to younger adults. This result is especially notable given the older adults had lower rates of intrusive thought recurrence for most thoughts (at the level of a trend). The finding that negative affect levels were not any lower among the older adults, and did not decline across thinking periods as steeply as they did for younger adults, suggests that negative affect following the thought periods is influenced by factors beyond intrusive thought recurrence alone. This is in agreement with theory and research on intrusive thoughts, suggesting that it is not simply the occurrence of an intrusive thought, but the interpretation of the thought and attributions made about its recurrence that can lead to negative affect and psychopathology (Purdon, 2001; Purdon & Clark, 1999). For older adults, it may be especially important to examine attributions and interpretations tied to exaggerated beliefs about cognitive decline (e.g., the idea that a thought suppression failure is a sign of declining cognitive functioning), given the prominence of subjective cognitive decline concerns for older adults (Jorm et al., 1994). At a more general level, the findings suggest that the normative age-related changes in emotion regulation skills will not necessarily protect older adults from the sometimes difficult affective consequences of thought suppression attempts and failures.

These findings suggest several implications for the assessment and treatment of anxiety in older adults, though work with a diagnosed anxious older adult sample is needed to make any strong arguments about clinical implications. As noted, the present results point to the need to look beyond just the frequency of recurrence of intrusive thoughts; in addition to assessing for aging-relevant content of the thoughts, it may also be important to assess how responses to the thoughts do or do not change over time and context, and when reduced change over time serves a helpful versus harmful function. For instance, emotion regulation theorists have proposed that emotion maintenance can be equally as important as down-regulation of negative affect for enhancing overall emotional wellbeing (Thompson, 1994), though Carstensen et al. (2010) found that emotional stability was not linked to increased survival in older adults, and a substantial lack of variability in affect (termed emotional inertia) has been found to predict onset of depression in adolescents (Kuppens et al., 2012). Examining change or variability in responses to intrusive thoughts is not part of most standard intrusive thinking assessments, but the current findings suggest this factor may be tied to the unique experience of intrusive thinking among older adults.

Limitations and Conclusion

There were several limitations in this study. The sample of older adults was ethnically homogeneous (primarily Caucasian), limiting generalizability to diverse populations, and was fairly cognitively healthy (though this should be interpreted with caution given our relatively circumscribed assessment), limiting opportunities to see effects based on age differences in inhibition abilities. Also, all participants completed a directed suppression thought period followed by monitoring thought period for each thought sequence, rather than being initially randomized to suppression versus monitoring instructions as is typical in the thought suppression literature (Abramowitz, Tolin, & Street, 2001). This was done to reduce the number of conditions, given the length and complexity of the design with the four thought sequences. However, as a result of this design decision, we cannot disentangle the impact of time from suppression/monitor instructions when comparing across instruction periods. Also, while we conducted considerable pilot work to select the four thoughts used in the current study, these thoughts may have varied on dimensions other than age-relevance

and valence, such as the expression of expectation ("I will") versus desire ("I hope"). Moreover, including an older-age-relevant thought that is unrelated to cognitive impairment will be helpful in future work to minimize the possibility that the thought content might have influenced older adults' reports of suppression effort and perceived difficulty. Additionally, while we did not collect the employment status of the older adult participants, it would be useful for future research to examine whether retirement status alters responding to the career thought.

Finally, it is difficult to fully rule out the potential impact of demand characteristics in this type of research, though we think it is unlikely to have played a large role in the observed effects. First, to reduce the likelihood of demand effects, the experimenter's role was highly standardized and participants were provided with privacy during all response periods, except for the first thinking period, which was a practice induction period and not included in the main analyses. Second, to the extent demand effects nonetheless occurred, the effects would likely be comparable for the younger and older adults given they received identical thought suppression instructions, making it unlikely these effects would alter the opportunity to observe age differences in our sample. Third, the observed variability on the various self-report variables suggests that individual differences can still readily emerge with this design.

Despite these limitations, the current study provides new insights into age differences in responding to intrusive thoughts and the impact that trait anxiety and age-relevant thought content has on the ability to respond to such thoughts. Older adults show less steep decline in negative affect and perceived difficulty suppressing thoughts across thinking periods than younger adults, despite a trend indicating less actual thought recurrence. At the same time, age differences in responses to intrusive thoughts vary as a function of the content of the thought, especially for the negative affect elicited by the thoughts. Thus, evaluation of intrusive thinking in older adults needs to consider both age differences in the thought suppression process (e.g., age-related changes in emotion reactivity and cognitive processing) and the impact of age-relevant thought content.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

Abramowitz JS, Tolin DF, Street GP. Paradoxical effects of thought suppression: a meta-analysis of controlled studies. Clinical Psychology Review. 2001; 21:683–703. [PubMed: 11434226]

Baltes PB. Theoretical propositions of life-span developmental psychology: On the dynamics between growth and decline. Developmental Psychology. 1987; 23:611–626.

Baltes, PB.; Baltes, MM. Psychological perspectives on successful aging: The model of selective optimization with compensation. In: Baltes, PB.; Baltes, MM., editors. Successful aging: perspectives from the behavioral sciences. New York: Cambridge University Press; 1990. p. 1-34.

Calamari, JE.; Janeck, AS.; Deer, TM. Cognitive processes and obsessive compulsive disorder in older adults. In: Frost, RO.; Steketee, G., editors. Cognitive approaches to obsessions and compulsions: Theory, assessment, and treatment. New York, NY: Pergamon; 2002. p. 315-336.

Carstensen, LL. Motivation for social contact across the life span: A theory of socioemotional selectivity. In: Jacobs, J., editor. Nebraska symposium on motivation: Developmental perspectives on motivation. Vol. Vol. 40. Lincoln: University of Nebraska Press; 1993. p. 209-254.

Carstensen LL. Evidence for a life span theory of socioemotional selectivity. Current Directions in Psychological Science. 1995; 4:151–156.

Carstensen LL. The influence of a sense of time on human development. Science. 2006; 312(5782): 1913–1915. [PubMed: 16809530]

Carstensen LL, Turan B, Scheibe S, Ram N, Ersner-Hershfield H, Samanez-Larkin GR, Nesselroade JR. Emotional experience improves with age: Evidence based on over 10 years of experience sampling. Psychology and Aging. 2010; 26:21–33. [PubMed: 20973600]

Corcoran KM, Woody SR. Effects of suppression and appraisals on thought frequency and distress. Behaviour Research and Therapy. 2009; 47:1024–1031. [PubMed: 19765684]

Crawford JR, Henry JD. The Positive and Negative Affect Schedule (PANAS): Construct validity, measurement properties and normative data in a large nonclinical sample. British Journal of Clinical Psychology. 2004; 43:245–265. [PubMed: 15333231]

Dark-Freudeman A, West R, Viverito K. Future selves and aging: Older adults' memory fears. Educational Gerontology. 2006; 32(2):85–109.

Delis, DC.; Kaplan, E.; Kramer, J. Delis Kaplan Executive Function System. San Antonio, TX: The Psychological Corporation; 2001.

Dempster FN. The rise and fall of the inhibitory mechanism: Toward a unified theory of cognitive development and aging. Developmental Review. 1992; 12(1):45–75.

Erskine JAK, Kvavilashvili L, Kornbrot DE. The predictors of thought suppression in young and old adults: Effects of anxiety, rumination and other variables. Personality and Individual Differences. 2007; 42:1047–1057.

Folstein MF, Folstein SE, McHugh PR. Mini-Mental State: A practical method for grading the state of patients for the clinician. Journal of Psychiatric Research. 1975; 12:189–198. [PubMed: 1202204]

Gross JJ, Carstensen LL, Pasupathi M, Tsai J, Skorpen CG, Hsu AYC. Emotion and aging: Experience, expression, and control. Psychology and Aging. 1997; 12(4):590–599. [PubMed: 9416628]

Hasher, L.; Zacks, RT.; May, CP. Inhibitory control, circadian arousal, and age. In: Gopher, D.; Koriat, A., editors. Attention & Performance, XVII, Cognitive Regulation of Performance: Interaction of Theory and Application. Cambridge, MA: MIT Press; 2000. p. 653-675.

Hunt SL, Wisocki PA, Yanko J. Worry and use of coping strategies among older and younger adults. Journal of Anxiety Disorders. 2003; 17:547–560. [PubMed: 12941365]

Ikier S, Yang L, Hasher L. Implicit proactive interference, age, automatic versus controlled retrieval strategies. Psychological Science. 2008; 19(5):456–461. [PubMed: 18466406]

Jorm AF, Christensen H, Henderson AS, Korten AE, MacKinnon AJ, Scott A. Complaints of cognitive decline in the elderly: A comparison of reports by subjects and informants in a community survey. Psychological Medicine. 1994; 24:365–374. [PubMed: 8084932]

Kunzmann U, Grühn D. Age differences in emotional reactivity: The sample case of sadness. Psychology and Aging. 2005; 20(1):47–59. [PubMed: 15769213]

Kuppens P, Sheeber LB, Yap MBH, Whittle S, Simmons JG, Allen NB. Emotional inertia prospectively predicts the onset of depressive disorder in adolescence. Emotion. 2012; 12:283–289. [PubMed: 21988744]

Langlois F, Freeston MH, Ladouceur R. Differences and similarities between obsessive intrusive thoughts and worry in a non-clinical population: Study 1. Behaviour Research and Therapy. 2000; 38:157–173. [PubMed: 10661001]

Lawton MP, Kleban MH, Rajagopal D, Dean J. Dimensions of affective experience in three age groups. Psychology and Aging. 1992; 7:171–184. [PubMed: 1610505]

Magee, JC. Doctoral Dissertation. 2010. Experiences with Intrusive Thoughts in Younger and Older Adults. Retreived from ProQuest Dissertation and Theses Database. (AAT 3467466).

Magee JC, Harden KP, Teachman BA. Thought suppression and psychopathology: A quantitative review. Clinical Psychology Review. 2012; 32:189–201. [PubMed: 22388007]

Magee JC, Teachman BA. Why did the white bear return? Attributions for unsuccessful thought suppression and obsessive-compulsive symptoms. Behaviour Research and Therapy. 2007; 45:2884–2898. [PubMed: 17825786]

Magee JC, Teachman BA. Distress and recurrence of intrusive thoughts in younger and older adults. Psychology and Aging. 2012; 27:199–210. [PubMed: 21707184]

Malstrom T, LaVoie DJ. Age differences in inhibition of schema-activated distracters. Experimental Aging Research. 2002; 28(3):281–298. [PubMed: 12079579]

Mather M, Carstensen LL. Aging and motivated cognition: The positivity effect in attention and memory. Trends in Cognitive Sciences. 2005; 9:496–502. [PubMed: 16154382]

May CP, Hasher L, Kane MJ. The role of interference in memory span. Memory & Cognition. 1999; 27:759–767. [PubMed: 10540805]

Metzger RL. A reliability and validity study of the State-Trait Anxiety Inventory. Journal of Clinical Psychology. 1976; 32(2):276–278.

Obsessive Compulsive Cognitions Working Group. Cognitive assessment of obsessive-compulsive disorder. Behaviour Research and Therapy. 1997; 35:667–682. Rachman, S. (1997). A cognitive theory of obsessions. *Behaviour Research and Therapy, 35*, 793–802. [PubMed: 9193129]

Purdon C. Appraisal of obsessional thought recurrences: Impact on anxiety and mood state. Behavior Therapy. 2001; 32:47–64.

Purdon CL, Clark DA. Metacognition and obsessions. Clinical Psychology and Psychotherapy. 1999; 6:102–110.

Rachman S. A cognitive theory of obsessions. Behaviour Research and Therapy. 1997; 35(9):793–802. [PubMed: 9299799]

Rachman S. A cognitive theory of obsessions: Elaborations. Behaviour Research and Therapy. 1998; 36(4):385–401. [PubMed: 9670600]

Rachman S, de Silva P. Abnormal and normal obsessions. Behaviour Research and Therapy. 1978; 16:233–248. [PubMed: 718588]

Rachman S, Shafran R, Mitchell D, Trant J, Teachman B. How to remain neutral: An experimental analysis of neutralization. Behaviour Research and Therapy. 1996; 34:889–898. [PubMed: 8990540]

Reese CM, Cherry KE, Norris LE. Practical memory concerns of older adults. Journal of Clinical Geropsychology. 1999; 5(4):231–244.

Rocke C, Li SC, Smith J. Intraindividual variability in positive and negative affect over 45 days: Do older adults fluctuate less than young adults? Psychology and Aging. 2009; 24:863–878. [PubMed: 20025402]

Rowa K, Purdon C. Why are certain intrusive thoughts more upsetting than others? Behavioral and Cognitive Psychotherapy. 2003; 31:1–11.

Salkovskis, PM. Psychological approaches to the understanding of obsessional problems. In: Swinson, RP.; Antony; Rachman, S.; Richter, MA., editors. Obsessive-compulsive disorder: Theory, research and treatment. New York: Guilford; 1998. p. 33-50.

Salkovskis PM, Harrison J. Abnormal and normal obsessions – A replication. Behaviour Research and Therapy. 1984; 22(5):549–552. [PubMed: 6508704]

Salthouse TA. Working memory as a processing resource in cognitive aging. Developmental Review. 1990; 10(1):101–124.

Salthouse TA. The processing-speed theory of adult age differences in cognition. Psychological Review. 1996; 103(3):403–428. [PubMed: 8759042]

Salthouse TA, Atkinson TM, Berish DE. Executive functioning as a potential mediator of age-related cognitive decline in normal adults. Journal of Experimental Psychology: General. 2003; 132:566–594. [PubMed: 14640849]

Schaub RT, Linden M. Anxiety and anxiety disorders in the old and very old – Results from the Berlin Aging Study (BASE). Comprehensive Psychiatry. 2000; 41:48–54. [PubMed: 10746904]

Scheibe S, Blanchard-Fields F. Effects of regulating emotions on cognitive performance: What is costly for young adults is not so costly for older adults. Psychology and Aging. 2009; 24:217–223. [PubMed: 19290754]

Sinoff G, Werner P. Anxiety disorder and accompanying subjective memory loss in the elderly as a predictor of future cognitive decline. International Journal of Geriatric Psychiatry. 2003; 18(10): 951–959. [PubMed: 14533128]

Spielberger, CD.; Gorsuch, RL.; Lushene, R.; Vagg, PR.; Jacobs, GA. Manual for the State-Trait Anxiety Inventory (Form Y). Palo Alto, CA: Mind Garden; 1983.

Steinman SA, Smyth F, Bucks R, MacLeod C, Teachman BA. Anxiety-linked expectancy bias across the adult lifespan. Cognition and Emotion. (in press).

Teachman BA. Aging and negative affect: The rise and fall and rise of anxiety and depression symptoms. Psychology and Aging. 2006; 21:201–207. [PubMed: 16594806]

Teachman BA, Gordon TL. Age differences in anxious responding: Older and calmer, unless the trigger is physical. Psychology and Aging. 2009; 24:703–714. [PubMed: 19739926]

Tolin DF, Abramowitz JS, Hamlin C, Foa EB, Synodi DS. Attributions for thought suppression failure in obsessive-compulsive disorder. Cognitive Therapy and Research. 2002; 26:505–517.

Tombaugh TN, McIntyre NJ. The Mini-Mental State Examination: A comprehensive review. Journal of the American Geriatrics Society. 1992; 40:922–935. [PubMed: 1512391]

Thompson RA. Fox NA. Emotion regulation: A theme in search of a definition. The development of emotion regulation: Biological and behavioral considerations. Monographs of the Society for Research in Child Development. 1994; 59(2–3, Serial No. 240):25–52.

Trinder H, Salkovskis PM. Personally relevant intrusions outside the laboratory: Long-term suppression increases intrusion. Behaviour Research and Therapy. 1994; 38(8):833–842. [PubMed: 7993327]

Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: The PANAS scales. Journal of Personality and Social Psychology. 1988; 54:1063–1070. [PubMed: 3397865]

Wegner DM. Ironic processes of mental control. Psychological Review. 1994; 101(1):34–52. [PubMed: 8121959]

Wegner DM, Schneider DJ, Carter S, White T. Paradoxical effects of thought suppression. Journal of Personality and Social Psychology. 1987; 53:5–13. [PubMed: 3612492]

Wegner D, Zanakos S. Chronic thought suppression. Journal of Personality. 1994; 62:615–640.

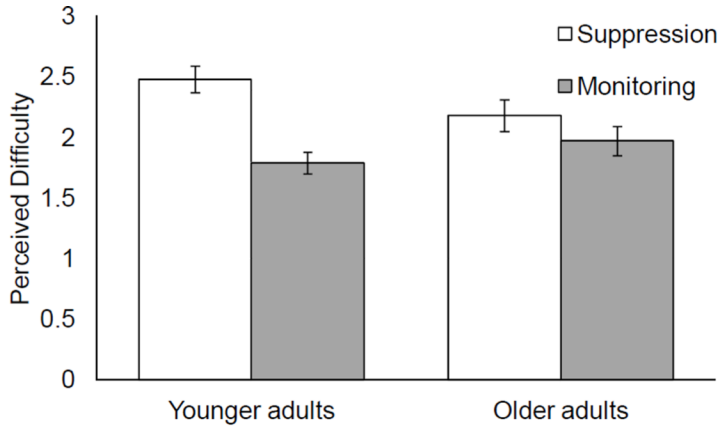
Wenzlaff RM, Wegner DM. Thought suppression. Annual Review of Psychology. 2000; 51:59–91.

Witthöft M, Sander N, Süß H-M, Wittmann W. Adult age differences in inhibitory processes and their predictive validity for fluid intelligence. Aging, Neuropsychology, and Cognition. 2009; 16(2): 133–163.

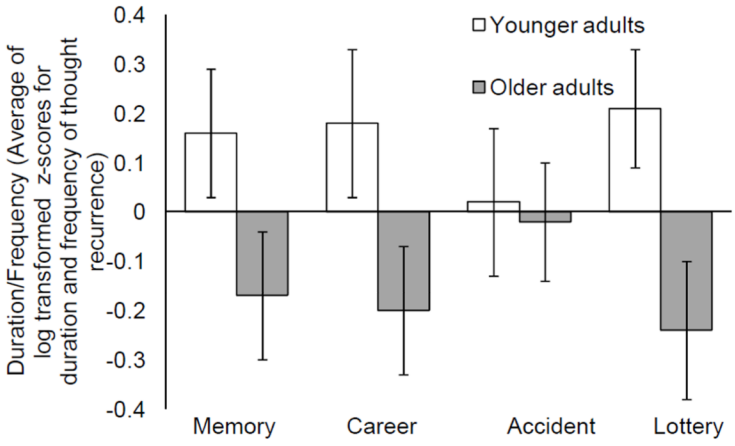
Wolitzky-Taylor KB, Castriotta N, Lenze EJ, Stanley MA, Craske MG. Anxiety disorders in older adults: A comprehensive review. Depression and Anxiety. 2010; 27:190–211. [PubMed: 20099273]

Wolpe, J. The practice of behavior therapy. 4th ed.. New York: Pergamon Press; 1990.

Zacks R, Hasher L. Cognitive gerontology and attentional inhibition: A reply to Burke and McDowd. Journal of Gerontology Series B: Psychological Sciences and Social Sciences. 1997; 52B(6):274–283.



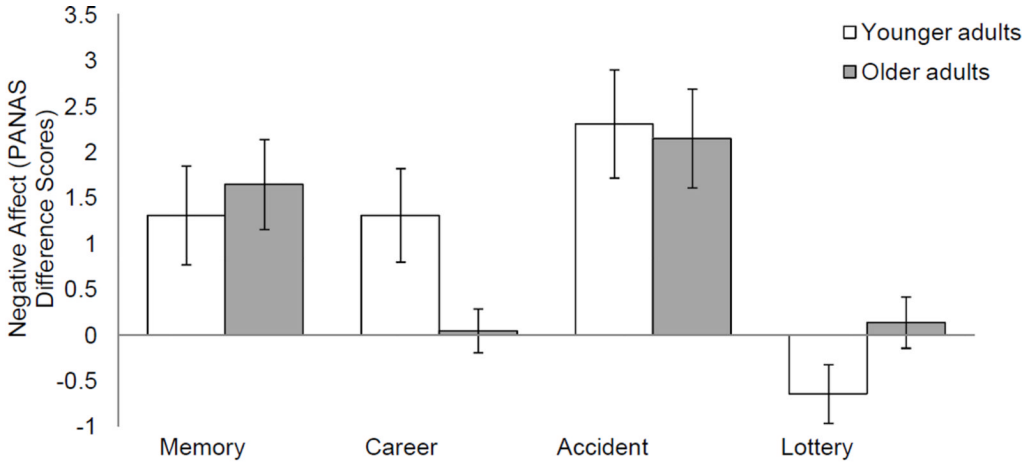
a. Age by instruction period interaction for perceived difficulty.



b. Age by thought type interaction for thought recurrence (combined duration and frequency).

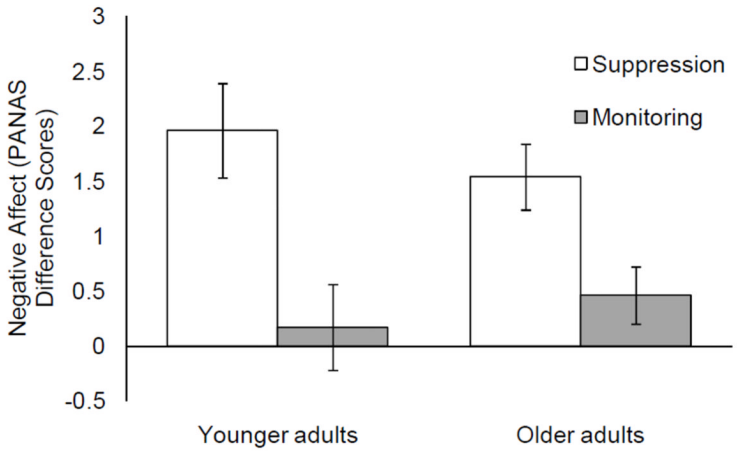
Note: Thought recurrence was measured by separately log transforming thought frequency and duration, and then computing z-scores to standardize the metrics of the two variables. Finally, the average of the z-scored frequency and duration variables was taken to create a mean recurrence score for each thinking period. Higher scores indicate greater recurrence.

Figure 1.



a. Age by thought type interaction for negative affect.

Note: Negative affect was measured by subtracting baseline PANAS-NA scores from scores during thought suppression and monitoring. Higher scores indicate greater negative affect during suppression or monitoring compared to baseline.



b. Age by instruction period interaction for negative affect.

Note: Negative affect was measured by subtracting baseline PANAS-NA scores from scores during thought suppression and monitoring. Higher scores indicate greater negative affect during suppression or monitoring compared to baseline.

Figure 2.

Table 1

Descriptive Statistics for Age and Cognitive Functioning Measures

	Age group			
	Younger adult		Older adult	
	M	*SD*	*M*	*SD*
Age*	18.93	1.47	75.95	7.86
STAI-trait*	42.38	8.68	33.56	7.90
TM	47.37	35.09	56.94	33.72
MMSE†	29.15	0.94	28.70	1.40

Note.

* indicates an age-group difference of at least $p < .05$, and

† indicates a statistical trend for a difference at $p < .10$.

STAI-trait = State-Trait Anxiety Inventory – Trait Subscale, TM = Delis-Kaplan Trailmaking (difference score between time to complete the numbers only sequencing task and time to complete the letter-number sequencing task), MMSE = Mini-Mental Status Exam.

Table 2

Descriptive Statistics for Dependent Variables as a Function of Age, Thought Period, and Thought Type

		Younger adults								Older adults							
		Suppression				Monitoring				Suppression				Monitoring			
		M	***C***	***A***	***L***	***M***	***C***	***A***	***L***	***M***	***C***	***A***	***L***	***M***	***C***	***A***	***L***
Negative Affect	*M*	2.45	2.31	3.60	−0.52	0.15	0.31	1.02	−0.76	2.21	0.18	3.56	0.23	1.10	−0.08	0.74	0.05
	SD	4.09	4.38	4.25	2.18	3.49	2.95	4.09	2.38	4.21	1.65	5.24	1.86	2.87	1.69	2.66	2.29
Duration/Frequency	*M*	0.16	0.19	0.02	0.26	0.15	0.17	0.01	0.17	−0.18	−0.21	−0.02	0.29	−0.17	−0.19	−0.02	−0.18
	SD	0.83	0.97	1.03	0.75	1.01	1.02	1.03	0.97	0.98	0.91	0.82	0.99	0.86	0.81	0.85	0.86
Perceived Difficulty	*M*	2.45	2.31	2.62	2.43	1.90	1.71	1.90	1.64	2.26	1.76	2.61	2.08	2.03	1.61	2.34	1.92
	SD	0.89	1.05	1.29	1.06	0.91	0.89	0.98	0.91	1.08	1.00	1.26	0.97	1.00	0.89	1.02	0.97

Note. *M* = mean, *SD* = standard deviation. M = Memory thought (“I could lose my memory and forget my friends and family”), C = Career thought (“I will never succeed in my career”), A = Car accident thought (“I hope my friend gets in a car accident”), L = Lottery thought (“I hope I win the lottery”). Perceived difficulty was assessed on a scale of one to five (1 = “No difficulty,” 2 = “A little difficulty,”3 = “Some difficulty,” 4 = “Significant difficulty,” and 5 =“Extreme difficulty”).”