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Distress and Recurrence of Intrusive Thoughts in Younger and Older Adults

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Abstract

The current study incorporated a lifespan perspective into existing theories of intrusive thoughts to examine age-related differences in the difficulty controlling intrusive thoughts, the distress following intrusive thought recurrences, and the meanings assigned to these recurrences. Younger ($N = 51$) and older ($N = 49$) community adults were randomly assigned to suppress (i.e., keep out of mind) or monitor an intrusive thought. Participants rated their positive and negative affect throughout engagement with the intrusive thought, and also rated the meanings they gave to recurrences of their everyday intrusive thoughts. The results demonstrated that older adults tended to perceive greater difficulty with controlling the intrusive thought than younger adults, despite not differing in the actual recurrence of the intrusive thought. With regard to distress, older adults experienced steadier levels of positive affect than younger adults throughout engagement with the intrusive thought. However, older adults also reported greater residual negative affect after engaging with the intrusive thought than younger adults. Finally, older and younger adults appeared to assign meanings to recurrences of intrusive thoughts in line with age-relevant concerns. Specifically, older adults were prone to interpret the recurrence of intrusive thoughts as a sign of cognitive decline, but were less likely than younger adults to see intrusive thoughts as a sign of moral failure. Together, these results highlight a range of potential risk and protective factors in older adults for experiencing emotion dysregulation after intrusive thoughts.

Keywords

Intrusive Thoughts; Older Adults; Thought Suppression; Emotion Regulation; Aging

Introduction

Intrusive thoughts are unpleasant but familiar visitors to the minds of most adults. From nagging worries about one's health to jarring thoughts about a partner being in a car accident, these thoughts encompass a broad range of life concerns. Intrusive thoughts are common for younger and older adults, although there is considerably less research about these thoughts in older adults (Calamari, Janeck, & Deer, 2002). The current study sought to

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map older adults' responding to intrusive thoughts by incorporating a lifespan perspective into existing cognitive theories of intrusive thoughts. We examined age-related differences in three areas that are central to the experience of intrusive thoughts: 1) difficulty controlling intrusive thoughts; 2) the distress following thought recurrences; and 3) the meanings assigned to these recurrences. In addition to a laboratory induction of intrusive thoughts using a thought suppression paradigm, the study also examined reports of everyday intrusive thought experiences in order to capture naturalistic responding to intrusive thoughts over time. Figure 1 shows the proposed model that guided hypotheses for each of these areas.

Age Differences in Difficulty Controlling Intrusive Thoughts

When intrusive thoughts are initially encountered, younger and older adults often engage in strategies designed to control the thoughts. Among these, thought suppression seems to be a common response in both age groups (Krause, 2007; Wegner, 1994). During thought suppression, it is believed that individuals consciously attempt to stop thinking about unwanted thoughts while automatically monitoring for further thought intrusions (Wegner, 1994). As one might expect, persons attempting to suppress thoughts often later end up thinking more about those thoughts (Wegner, 1994).

In thinking about age differences in intrusive thoughts, older adults may initially experience difficulty trying to control thoughts due to impaired inhibition abilities, compared to younger adults (Hasher & Zacks, 1988). Three lines of research from the inhibition literature support the idea that the specific processes involved in thought suppression should be impaired in older adults. First, inhibition tends to be impaired in older adults during more effortful processing (Maylor, Schlaghecken, & Watson, 2005; McDowd, 1997), which is believed to be responsible for successful thought suppression (Wegner, 1994). Second, older adults exhibit greater impairment when inhibiting particularly strong response tendencies (Butler & Zacks, 2006), which regularly occur when people are confronted with negative intrusive thoughts. Third, age-related deficits in inhibitory processes and thought suppression performance show a common neural correlate in the anterior cingulate (Sharp, Scott, Mehta, & Wise, 2006; Wyland, Kelley, Macrae, Gordon, & Heatherton, 2003). Together, these lines of evidence point to the plausibility of older adults having more difficulty than younger adults inhibiting the return of their attention to a negative intrusive thought.

Importantly, older adults' greater difficulty suppressing intrusive thoughts can be reflected in two possible ways: greater actual recurrence of intrusive thoughts, or greater perceived difficulty controlling intrusive thoughts (see middle portion of Figure 1). This distinction follows from evidence that older adults may selectively compensate for executive functioning impairment in tasks they perceive to be particularly relevant (Li, Lindenberger, Freund, & Baltes, 2001). If these compensatory efforts are temporarily effective, impairment should be more evident on secondary tasks or perceptions of difficulty than on a primary task. This distinction is important because greater perceived difficulty controlling intrusive thoughts has been found to predict future rebound of intrusive thoughts (Liberman & Forster, 2000).

One key factor that older adults may use to compensate for executive functioning difficulties is suppression effort. Suppression effort has been predicted to be an ineffective long-term strategy for controlling intrusive thoughts (Wenzlaff & Wegner, 2000), and has been linked to trait anxiety in older adults (Erskine, Kvavilashvili, & Kornbrot, 2007), but may be effective in some cases at reducing actual thought recurrence in the short-term. If older adults are able to use increased effort to reduce actual recurrence, then age differences may be seen with perceived difficulty controlling intrusive thoughts, rather than thought recurrence.

While we have focused on the control attempts occurring immediately *after* encountering intrusive thoughts, it is important to recognize that thought suppression is a cyclical process (see the Figure 1 feedback loop from distress to activation of intrusive thoughts). Although we hypothesize that older adults will *initially* experience greater difficulty controlling intrusive thoughts than younger adults during a lab stressor, we suspect that the fewer negative meanings given to intrusive thoughts and lower distress by older adults will eventually result in lowered activation of intrusive thoughts. Thus, we expect to see greater perceived and/or actual difficulty suppressing intrusive thoughts for older adults during the lab stressor, but lower frequency of intrusive thoughts for older adults in the longer-term, reflected by self-reports of everyday intrusive thoughts.

Age Differences in the Link between Intrusive Thoughts and Distress

It is tempting to assume that difficulty suppressing intrusive thoughts will invariably cause emotional difficulties. However, intrusive thoughts do not necessarily lead to distress (Rachman, 1997; Salkovskis, 1998). We hypothesize that there will be a dichotomy whereby older adults will experience *more* difficulty suppressing recurrent intrusive thoughts during their initial attempts at thought suppression, but will feel *less* distressed afterwards than younger adults. One important reason for this divergence is that older adults may have the advantage of responding more flexibly to the failure of goals than younger adults (Heckhausen & Schulz, 1995), which is relevant in that thought suppression efforts almost invariably fail to some extent. Additionally, older adults are expected, on average, to attach less negative meanings to recurrences of their intrusive thoughts. According to lifespan theories like socioemotional selectivity theory (Carstensen, 1993, 1995), healthy older adults are thought to show motivated cognitive processing geared toward enhancing positive information while diminishing negative information (Lang & Carstensen, 2002; Mather & Carstensen, 2005). Finally, healthy older adults may experience an inoculation to intrusive thoughts after a long life history of encountering intrusive thoughts without significance consequences.

Age Differences in the Meanings Assigned to Intrusive Thoughts

Theories concerning people's *reactions* to intrusive thoughts highlight the idea that an intrusive thought is not necessarily a problem by itself, but can become harmful due to the meanings individuals ascribe to the thought (Rachman, 1997; Salkovskis, 1998). Recent evidence has supported this notion among younger adults: participants who interpreted intrusive thought recurrences as demonstrating undesirable personal characteristics reported more distress than those who did not report such interpretations (Purdon, 2001; Purdon, Rowa, & Antony, 2005; also, see mediation results by Magee & Teachman, 2007).

While these studies point to the role that meanings ascribed to intrusive thoughts play in the link between intrusive thoughts and distress for younger adults, it is an open question how these meanings differ with age. One key factor that may influence age differences in the meanings given to intrusive thought recurrences is the relative value given to various life goals by younger and older adults. Lifespan theories, such as the Selection, Optimization and Compensation model (SOC; Baltes & Baltes, 1990) and the Optimization in Primary and Secondary control across the lifespan model (OPS; Heckhausen, 1997; Heckhausen & Schulz, 1995), converge in their predictions of goal changes across the lifespan. According to these theories, age-related declines in biological and cognitive resources act as catalysts that change the goals a person will pursue (Baltes, 1987; Heckhausen & Schulz, 1995). In younger adulthood, a time of limited biological and cognitive constraints, adults strive to select and pursue goals that maximize their growth and development. Therefore, it is important for younger adults to perceive their growth as proceeding successfully. For older adults, the number of possible growth paths has been whittled down due to previous

selections and decreased cognitive and biological plasticity. Instead, successful aging entails selecting goals that maintain and compensate for the loss of cognitive and biological functioning, as well as those that enhance emotional functioning (see Carstensen, 1993, 1995, and Heckhausen & Schulz, 1995).

These age differences in goals translate nicely onto the meanings that can be assigned to recurrences of intrusive thoughts. For both younger and older adults, the meanings that we expected to be ‘maladaptive’ were the ones reflecting the failure of valued age-relevant goals (Doron & Kyrios, 2005; Doron, Kyrios, & Moulding, 2007). For younger adults, we expected that the recurrence of an intrusive thought after attempted thought suppression would be perceived by younger adults as indicating a lack of moral development (“This thought about my mom being in a car accident returned; I am becoming a terribly immoral person.”), as is typical in studies among younger adults (Calamari et al., 2002). In contrast, we expected that the dominant negative interpretation made by older adults would concern declining cognitive ability (“I can’t get this thought out of my head; it must be a sign that I’m developing Alzheimer’s.”). Alternatively, a more adaptive meaning for both groups might interpret the recurrence of the thought as having little meaning for their central goals (“This thought keeps returning, but thoughts do this occasionally. It doesn’t have any particular significance.”). Therefore, while we expected that older adults would experience less distress and assign fewer negative meanings than younger adults after intrusive thoughts (see the latter portion of the model in Figure 1), we also expected that they would be at risk for interpreting intrusive thoughts as a sign of cognitive decline.

Thought Suppression and Intrusive Thoughts

The thought suppression paradigm is useful for researchers examining *in-vivo* reactions to intrusive thought recurrences, because participants nearly always experience recurrences (Wenzlaff & Wegner, 2000). In this paradigm, participants are randomly assigned to either suppress (i.e. keep out of mind) or monitor a particular intrusive thought, while recording recurrences of each thought. All participants then participate in a follow-up thinking period during which they are asked to monitor the intrusive thought, while again recording recurrences. A previous meta-analysis of thought suppression studies (Abramowitz, Tolin, & Street, 2001) found that thought suppression instructions are typically associated with *less* recurrence during the initial thinking period compared to monitoring instructions, but greater recurrence during the subsequent thinking period. In the current study, we included suppression and monitoring instructions to allow comparisons to the larger body of work on thought suppression, but did not expect that the two types of thinking instructions would interact with age group.

Hypotheses

Overall, the current study examined responding to intrusive thoughts among older and younger adults. We hypothesized that, compared to younger adults, older adults would report 1) greater perceived and recorded difficulty controlling intrusive thoughts during a laboratory thought suppression paradigm. However, we expected that in everyday life, older adults would report 2) less recurrence and distress associated with intrusive thoughts. We also expected that older adults would report 3) greater positive and less negative affect in response to thought recurrences in the laboratory, and 4) fewer negative meanings when explaining thought recurrences in everyday life. Finally, we anticipated that older adults would report: 5) more negative meanings when explaining thought recurrences in their everyday lives for one particular meaning domain - cognitive decline. This study offers an initial investigation into the unique risk and protective factors among older adults when dealing with intrusive thoughts. To our knowledge, it is the first to use the thought suppression paradigm with older adults (as opposed to questionnaires) to assess intrusive

thought suppression efforts, recurrence and associated distress. While questionnaires assess retrospective estimates of experiences with intrusive thoughts that are aggregated over a longer time period, real-time laboratory assessment offers complementary immediate, contextual reactions to intrusive thoughts.

Method

Participants

Participants were 51 younger and 49 older adults (see Table 1 for sample demographics, including gender and ethnicity). All participants were recruited from the community through newspaper advertisements, flyers, and referrals from other participants. Participants were recruited according to age, with the age groups being 18–30 or 65 and above years of age. To increase the generalizability of the results, participants were not excluded based upon: a) self-reported physical health, b) current/past use of medications, c) educational attainment, or d) current/past psychiatric diagnoses. All participants were evaluated for cognitive impairment with the Mini Mental Status Exam (MMSE; Folstein, Folstein, & McHugh, 1975), and scored above the screening cutoff score of 24, which indicates significant cognitive impairment (as cited in Tombaugh & McIntyre, 1992).

Questionnaires

Affect—The *Positive and Negative Affect Schedule* (PANAS; Watson, Clark, & Tellegen, 1988) is a 20-item scale that was used to assess participants' state affect at baseline and following two thinking periods. The scale has separate 10-item subscales for positive and negative affect, demonstrates good psychometric properties, and has been shown to be valid and reliable in a sample aged 18 to 91 (see Crawford & Henry, 2004). The average Cronbach's alpha across the three administrations of the scale was .90 for negative affect and .90 for positive affect.

Anxiety and Depression Symptom Measures—We included three measures assessing general age differences in obsessive-compulsive symptoms, general anxiety, and depressive symptoms.

The 18-item *Obsessive-Compulsive Inventory-Revised* (OCI-R; Foa et al., 2002) measures overall severity of OCD symptoms, has good psychometric properties and is appropriate for a nonclinical sample. Each item assesses how much participants were distressed or bothered by a symptom over the past month, with ratings ranging from 0 (not at all) to 4 (extremely). Cronbach's alpha was .88 for the current sample.

The *State-Trait Anxiety Inventory-Trait Anxiety* scale (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) is a widely used 20-item scale measuring the tendency to become anxious. The STAI has been investigated in a sample of older adult outpatients with mixed psychiatric disorders, and demonstrated good reliability, although its validity should be interpreted with caution among older adults due to possible differences in factor structure (Kabacoff, Segal, Hersen, & Van Hasselt, 1997). Cronbach's alpha was .79 for the current sample.

The *Center for Epidemiological Studies-Depression scale* (CES-D; Radloff, 1977) is a widely used scale assessing depressive symptoms. The 20-item scale has strong psychometric properties, and has been shown to identify depressive symptoms in older adult samples (Hertzog, Alstine, Usala, Hultsch, & Dixon, 1990). Cronbach's alpha was .88 for the current sample.

Experiences with Intrusive Thoughts—A modified version of the *Unusual Thoughts Checklist* (UTC; Woody, 2007) was used to gather information about general, real-world experiences with intrusive thoughts across age groups. This 16-item checklist assessed the frequency of common types of intrusive thoughts that are high in unpleasantness, perceived immorality, and personal relevance, as well as the distress that participants associate with each type of intrusive thought they have experienced. The original measure was derived from lists of intrusive thoughts that are commonly reported in surveys (Kyrios, 2000; Rachman & de Silva, 1978), and was modified to record more detailed information than whether a person had experienced that type of thought before. Cronbach's alpha was .86 for the frequency subscale and .95 for the distress subscale.

We created the *Age-relevant Meaning of Intrusive Thoughts* (AMIT; Magee, Buck, Viar, Laughinghouse, & Teachman, 2009) scale to assess participants' beliefs about the meaning of their everyday intrusive thoughts. We used the Personal Significance Scale (Rachman, 2001), a scale generally used with younger adults (Teachman & Clerkin, 2007; Teachman, Woody, & Magee, 2006), as a model. The newly developed AMIT scale assesses the personal meaning of intrusive thoughts in three broad categories: cognitive decline, emotional dysfunction, and moral failing meanings. The meanings also encompass two development-related dimensions: a) interpretations signifying limits in one's potential for growth (e.g., "Are these thoughts a sign that your mind will not reach its potential?"), and b) interpretations signifying the *decline/loss* of functioning (e.g., "Are these thoughts a sign that your cognitive functioning is deteriorating?"). Factor analyses indicated that the final 23-item measure was best characterized by the three-factor solution of cognitive decline, emotional dysfunction, and moral failing meanings,¹ so we collapsed across the growth versus loss dimensions for analyses. Cronbach's alpha was .95 for cognitive decline, .93 for emotional dysfunction, and .94 for moral failing meanings. The three subscales had an average inter-correlation of $r = .57$.

Cognitive Functioning—The trail-making subtest of the *Delis-Kaplan Executive Function System* (TM; Delis, Kaplan, & Kramer, 2001) was used to assess an aspect of executive functioning; specifically, the ability to inhibit attention to supraliminally-presented stimuli. In this task, participants were instructed to connect circles on a paper as quickly as they could, without making mistakes. The time taken to connect sequenced number targets was subtracted from the time taken to connect alternating number and letter targets. This test has been validated and standardized using a nationally representative sample and is appropriate for participants between the ages of 8 and 89 (Delis et al., 2001).

The *Mini Mental State Examination* (MMSE; Folstein et al., 1975) was included as a screener for dementia. This brief, standardized method evaluates cognitive status by assessing orientation, attention, recall, and language.

Thought Stimulus and Thinking Instructions—For the thinking periods, the experimenter provided participants with an intrusive thought that paralleled real-life intrusive thoughts by being high in unpleasantness and perceived immorality (Rachman & de Silva, 1978). The thought "I hope my friend is in a car accident" was used, which we have used successfully in past research with younger adults (Magee & Teachman, 2007; Rachman, Shafran, Mitchell, Trant, & Teachman, 1996). Upon initially encountering the thought during the study, older adults rated the thought similarly to younger adults on all

¹We conducted an exploratory factor analysis using principal axis factoring (following Obsessive Compulsive Cognitions Working Group, 2005) with promax rotation. Additionally, confirmatory factor analyses comparing this three-factor solution to alternative models (one-factor, two-factor growth versus decline, and six-factor emotional/cognitive/moral by growth/decline) revealed that the three-factor solution provided the best model according to fit indices and parsimony.

dimensions assessed, including unpleasantness, immorality, imagery, distress associated with the thought, whether they had previously experienced the thought, and how frequently they had experienced the thought (all p 's $> .10$). Thus, prior to the experimental thinking periods, younger and older adults perceived the characteristics of the thought similarly.

When encountering this thought stimulus during an initial thinking period, participants randomly received one of two thinking instructions. In the *thought suppression* condition, participants were instructed: "For this period, I would like you to try not to think about the thought you just focused on. If you do think about that thought, please mark that you did because this is very important information for us, but try your best not to think about that thought." Participants in the *monitoring* condition were told: "For this period, think about whatever you would like - it could be the thought you thought about before, or it could be anything else. If you do think about the thought, please mark that you did because this is very important information for us." In a second thinking period, all participants were given monitoring instructions.

Difficulty with Intrusive Thoughts, and Suppression Effort—During the focusing/practice and thought monitoring/suppression periods, participants recorded the *recurrence of intrusive thoughts* by pressing and holding the space bar on the computer keyboard to record the frequency and duration of each instance of the experimental thought. With this approach, we were able to compute the duration (accuracy to at least a tenth of a second) of every recurrence as reported by the participant. For the primary analyses, we did not include data from the practice/focusing period, typical of the thought suppression literature. Frequency and duration were log transformed due to positive skew, and were analyzed separately.

After each period, participants rated *suppression effort* by answering the question "Rate how hard you tried not to think about this thought during the period." Participants rated effort on a one to five scale, with the scale labels being "I didn't try at all," "I tried, but only a little bit," "I tried a moderate amount," "I tried rather hard," and "I tried as hard as possible." After rating suppression effort, participants rated *perceived difficulty controlling the intrusive thought*. They were asked to "Rate how much difficulty you experienced keeping this thought out of your mind." Participants rated perceived difficulty on a one to five scale, with the scale labels being "No difficulty," "A little difficulty," "Some difficulty," "Significant difficulty," and "Extreme difficulty."

Procedure

Participants were told that the study was about the link between thoughts and emotions; aging was not mentioned. After informed consent, participants completed the PANAS to assess baseline affect. Next, during the focusing/practice period, participants wrote out the thought "I hope my friend is in a car accident" and then focused on that thought for forty seconds while recording the frequency and duration of each thought occurrence using the space bar. Participants lifted their fingers and pressed nothing whenever they thought about anything other than the assigned thought.

Participants were next randomly assigned to receive either thought suppression or monitoring instructions for the four-minute experimental thinking period. During this period, participants once again tracked each thought recurrence using the space bar. Upon completion of the experimental four-minute thinking period, participants rated how much effort they put into suppressing the thought, how much difficulty they experienced at controlling it, and their affect after the first thinking period. Next, participants completed a second four-minute thinking period. In this period, all participants received the monitoring instructions described previously. Participants again recorded thought recurrences, then rated suppression effort, difficulty controlling the thought, and completed a final PANAS

affect measure. Measures of obsessive-compulsive symptoms (OCI-R), trait anxiety (STAI-T), depressive symptoms (CES-D), experiences with everyday intrusive thoughts (UTC), and personal meanings of intrusive thought recurrences (AMIT) were then administered in random order. Participants completed these measures at the end of the experiment to avoid priming particular thinking strategies or revealing the purpose of the study. After these questionnaires, the experimenter administered the executive functioning (TM) measure and MMSE in counterbalanced order. These cognitive functioning measures were administered after the rest of the questionnaires to avoid priming concerns about declines in cognitive functioning. Finally, participants completed a measure of demographic information and were debriefed.

Results

Sample Characteristics

Means and standard deviations for the measures of obsessive-compulsive symptoms (OCI-R), trait anxiety (STAI-T), depressive symptoms (CES-D), executive functioning (TM), and cognitive impairment (MMSE) are listed in Table 1 by age group. T-tests showed that older adults did not differ from younger adults on the total OCI-R ($t_{(98)} = .61, p = .54, d = .12$). In line with previous research, older adults reported less trait anxiety on the STAI-T ($t_{(94)} = 2.19, p = .03, d = .45$), fewer depressive symptoms on the CES-D ($t_{(97)} = 2.30, p = .02, d = .47$), poorer executive functioning on the TM ($t_{(70.8)} = 2.99, p = .004, d = .71$), and more cognitive impairment on the MMSE ($t_{(71.5)} = 3.13, p = .003, d = .74$). Chi-square tests indicated that there were no differences between the age groups for gender ($\chi^2_{(1, N=99)} = 0.07, p = .80$), although older adults were less ethnically diverse than younger adults ($\chi^2_{(1, N=99)} = 25.08, p < .001$), with ethnicity coded as Caucasian versus other. Due to the large percentage of Caucasians in the older adult group, we could not examine ethnicity as a covariate. However, when we excluded non-Caucasians and compared younger and older adults, the pattern of results was similar to the reported results using the full sample, suggesting that ethnic group differences across age groups are unlikely to account for the observed age differences.

The monitoring and suppression instruction groups did not differ on the OCI-R ($t_{(98)} = .44, p = .66, d = .09$), STAI-T ($t_{(94)} = 1.51, p = .14, d = .31$), CES-D ($t_{(94)} = 1.80, p = .08, d = .37$), TM ($t_{(85)} = .26, p = .79, d = .06$), or MMSE ($t_{(86.2)} = 1.82, p = .07, d = .39$), indicating that randomization was successful. There were also no differences between the monitoring and suppression instruction groups for gender ($\chi^2_{(1, N=99)} = 0.24, p = .62$) or ethnicity ($\chi^2_{(1, N=99)} = 0.38, p = .54$). Finally, the thought suppression manipulation was effective across the multi-aged sample, as participants who were assigned to suppression instructions reported greater suppression effort than those assigned to control instructions ($t_{(94)} = 2.77, p < .01, d = .57$).

Age Differences in Difficulty Controlling Intrusive Thoughts

For the primary outcomes, we report all main effects but only the interaction effects involving age group. To examine whether older adults *perceived* greater difficulty controlling the intrusive thought compared to younger adults during the thought suppression task, we conducted a 2 (age group) $\times$ 2 (thinking instructions: suppression, monitoring) $\times$ 2 (time: period one, period two) repeated-measures ANOVA, with age group and thinking instructions as between-subjects variables, and time as the within-subjects variable. The main effect of age group did not reach significance ($F_{(1,92)} = 3.23, p = .08, \eta^2_p = .03$),

²For t-tests, Levine's test for equality of variances was used, and degrees of freedom were corrected when variances significantly differed.

although the means were in the direction of older adults reporting greater overall perceived difficulty than younger adults. There was a significant age group by time interaction ($F_{(1,92)} = 7.85, p = .006, \eta^2_p = .08$). Looking at each time point individually, older adults did not differ in perceived difficulty from younger adults ($t_{(94)} = .25, p = .80, d = .05$) during period one, but reported greater perceived difficulty in period two than younger adults ($t_{(80,3)} = 3.06, p = .003, d = .68$; see Table 2 for means and standard deviations). None of the other main effects, two or three-way interactions were significant (all p 's $> .10$). Thus, as expected, older adults experienced subjectively greater difficulty controlling the intrusive thought during the second thinking period.

Interestingly, when examining actual recorded thought recurrence as tracked by participants' key presses during the thinking periods, the results did not match the perceptions of younger and older adults. For thought recurrence, we conducted separate 2 (age group) $\times$ 2 (thinking instructions: suppression, monitoring) $\times$ 2 (time: period one, period two) repeated-measures ANOVAs for the frequency and duration of intrusive thoughts. See Table 2.

For frequency, there were no main effects for age group ($F_{(1,92)} = .15, p = .70, \eta^2_p = .002$) or thinking instructions ($F_{(1,92)} = .05, p = .83, \eta^2_p < .001$), and none of the two or three way interactions with age group were significant (all p 's $\geq .10$). There was a significant effect of time ($F_{(1,92)} = 29.75, p < .001, \eta^2_p = .24$), such that frequency decreased from the first to the second period. Therefore, it appeared that while older adults perceived greater difficulty controlling the intrusive thought than younger adults during the second thinking period, the age groups did not perform significantly differently according to the frequency of thoughts they recorded during the thinking periods. For duration, there was a largely similar pattern, with no main effects for age group ($F_{(1,92)} = .33, p = .57, \eta^2_p = .004$) or thinking instructions ($F_{(1,92)} = .68, p = .41, \eta^2_p = .007$). There was a significant age group by thinking instructions interaction ($F_{(1,92)} = 4.22, p = .04, \eta^2_p = .04$). Within each age-group, follow-up tests revealed that for older adults there was a significant effect of thinking instructions ($F_{(1,44)} = 4.59, p < .04, \eta^2_p = .09$), such that suppression instructions were associated with shorter duration than monitoring instructions (when collapsing across the two thinking periods). However, for younger adults, there was no difference between the two types of thinking instructions ($F_{(1,48)} = .70, p = .41, \eta^2_p = .01$). None of the other two or three way interactions with age group were significant (all p 's $> .10$). There was a significant effect of time ($F_{(1,92)} = 15.30, p < .001, \eta^2_p = .14$), such that duration decreased from the first to the second period. Therefore, it appeared that neither frequency nor duration matched older adults' perceptions of greater difficulty during the second thinking period.

Suppression Effort in Relation to Difficulty with Controlling Intrusive Thoughts

In a follow-up analysis, we used regression analysis to examine whether the use of greater suppression effort by older adults would account for their greater perceptions of difficulty during the second period, despite no actual measured differences in intrusive thought recurrence. First, we found that older adults indeed reported greater suppression effort than younger adults during the second thinking period ($\beta = .40, p < .001$). Further, we found that greater suppression effort significantly predicted greater perceived difficulty for the second period ($\beta = .62, p < .001$). Critically, the relationship between age group and perceived difficulty was reduced from $\beta = .31, p = .003$ to $\beta = .06, p = .48$ once suppression effort was entered into a regression with age group predicting perceived difficulty. Sobel's test statistic was 3.74 ($p < .001$), indicating that the greater suppression effort reported by older adults for the second period appeared to account for their greater perceived difficulty controlling the thought compared to younger adults. Note, we also checked whether perceived difficulty would account for age differences in suppression effort, but found that this reversed model did not show significant mediation.

Age Differences in Distress Following Induction of an Intrusive Thought

To test whether older adults would show less emotional reactivity after being induced to experience an intrusive thought, we examined positive and negative affect. As is common in aging research (Charles, Reynolds, & Gatz, 2001), the two types of affect were negligibly correlated (r 's = $-.07$, $.06$, and $.05$, respectively at baseline and following periods one and two) and were examined separately. To evaluate positive affect, we conducted a 2 (age group) $\times$ 2 (thinking instructions: suppression, monitoring) $\times$ 3 (time: baseline, period one, period two) repeated-measures ANOVA in which age group and thinking instructions were between-subjects variables while time was within-subjects. There was an expected main effect of age ($F_{(1,96)} = 18.36$, $p < .001$, $\eta^2_p = .16$), with older adults showing greater positive affect throughout the study than younger adults. There was no main effect of thinking instructions ($F_{(1,96)} = .65$, $p = .42$, $\eta^2_p = .007$). The main effect of age group was qualified by an age group by time interaction ($F_{(2,95)} = 3.41$, $p = .04$, $\eta^2_p = .07$). To follow up this interaction, we examined t -tests comparing the age groups at each time point. We then examined the effect of time within each age group to see if positive affect significantly varied across time using Least Significant Difference (LSD) comparisons. See Figure 2 for results.

T -tests revealed that older adults reported greater positive affect at baseline ($t_{(98)} = 3.19$, $p = .002$, $d = .64$), and for periods one ($t_{(98)} = 4.18$, $p < .001$, $d = .84$) and two ($t_{(98)} = 4.40$, $p < .001$, $d = .89$) compared to younger adults. Within-age-group follow-up tests revealed that for older adults, there was no effect of time ($F_{(2,47)} = 2.46$, $p = .10$, $\eta^2_p = .10$), indicating that positive affect remained relatively stable throughout the study. However, for younger adults, there was an effect of time ($F_{(2,49)} = 14.08$, $p < .001$, $\eta^2_p = .37$), with younger adults endorsing greater positive affect at baseline than at periods one or two (p 's $< .001$). Positive affect for thinking periods one and two did not differ ($p = .23$) for younger adults, indicating that positive affect dropped after initially engaging with an intrusive thought and did not return to baseline levels. These results suggest that older adults began the study with greater positive affect and, in line with predictions, experienced steadier positive affect than younger adults after encountering an intrusive thought. Finally, no other interaction with age group was significant (all p 's $\geq .10$).

For negative affect, a different pattern emerged (see Figure 2). Neither the main effects of age group ($F_{(1,96)} = 2.80$, $p = .10$, $\eta^2_p = .03$) nor thinking instructions ($F_{(1,96)} = 1.67$, $p = .20$, $\eta^2_p = .02$) were significant. As with positive affect, there was a significant time by age interaction ($F_{(2,95)} = 3.82$, $p = .03$, $\eta^2_p = .08$). T -tests revealed that older adults reported less negative affect than younger adults at baseline ($t_{(98)} = 2.25$, $p = .03$, $d = .45$), but the two age groups did not differ at periods one ($t_{(98)} = 1.74$, $p = .09$, $d = .35$) or two ($t_{(98)} = .56$, $p = .58$, $d = .11$).

Follow-up tests within each age group showed that time had a significant effect for older ($F_{(2,47)} = 6.52$, $p = .003$, $\eta^2_p = .22$) and younger ($F_{(2,49)} = 18.92$, $p < .001$, $\eta^2_p = .44$) adults. LSD tests showed that both older and younger adults reported increased negative affect from baseline to period one ($p = .01$ and $p = .003$, respectively), and decreased negative affect from period one to period two ($p = .001$ and $p < .001$, respectively). However, younger adults reported negative affect for period two *below* their baseline level ($p = .02$), whereas older adults' negative affect did not differ between baseline and period two ($p = .51$). These results suggest that, contrary to expectations, both groups showed similar initial reactivity in negative affect to an intrusive thought, followed by similar dissipation of negative affect during the second (monitoring) period. However, younger adults' negative affect was reduced below baseline levels, unlike older adults. Finally, the age group by thinking instructions interaction ($F_{(1,96)} = 1.62$, $p = .21$, $\eta^2_p = .02$), and the three-way interaction ($F_{(2,95)} = .85$, $p = .43$, $\eta^2_p = .02$) were non-significant.

Overall, the results indicated dissociation between the two types of affect: older adults experienced steadier positive affect than younger adults throughout the study, but both age groups showed largely similar reactivity for negative affect, followed by greater residual negative affect for older adults³.

Age Differences in Meanings Assigned to Intrusive Thought Recurrence

Next, we tested the hypothesis that older adults would report more meanings about intrusive thought recurrences concerning cognitive decline compared to younger adults, but would report fewer negative meanings outside of this older adult-relevant domain. Using the AMIT, we conducted a 2 (age group) $\times$ 3 (type of meaning: cognitive decline, moral failure, emotion dysregulation) repeated-measures ANOVA in which age group was a between-subjects factor and type of meaning was a within-subjects factor. There was no main effect of age group ($F_{(1,91)} = .00, p = 1.00, \eta^2_p < .001$), indicating that the age groups did not differ in overall negative meanings endorsed across domains. However, as seen in Figure 3, the age group by type of meaning interaction was significant ($F_{(2,90)} = 15.19, p < .001, \eta^2_p = .25$), in line with hypotheses. Follow-up t-tests indicated that, as expected, older (versus younger) adults reported more cognitive decline meanings ($t_{(69)} = 2.78, p = .007, d = .67$), and fewer moral failure meanings ($t_{(82)} = 2.09, p = .04, d = .46$). Unexpectedly, the age groups did not differ in emotion dysregulation meanings ($t_{(91)} = 1.16, p = .25, d = .24$).

We then conducted within-subjects tests for the type of meaning within each age group and used LSD comparisons of two types of meanings to isolate the source of any significant effect. Within age-groups, both older ($F_{(2,42)} = 15.64, p < .001, \eta^2_p = .43$) and younger ($F_{(2,47)} = 9.62, p < .001, \eta^2_p = .29$) adults showed significant differences across the types of meanings given to intrusive thoughts. Follow-up tests revealed that older adults endorsed significantly more cognitive decline meanings than emotional dysfunction ($p = .03$) or moral failure ($p < .001$) ones, and endorsed more emotional dysfunction meanings than moral failure ones ($p < .001$). Younger adults reported more emotion dysregulation meanings than cognitive decline ($p < .001$) or moral failure ($p = .004$) ones, and did not show different endorsement of cognitive decline and moral failure meanings ($p = .10$). Together, these results support the idea that younger and older adults interpret their intrusive thoughts in line with age-relevant concerns, particularly within cognitive decline and moral failure domains.

Age Differences in Everyday Intrusive Thoughts

Next we tested the hypothesis that older adults would report less frequent and distressing everyday intrusive thoughts than younger adults. This hypothesis reflected the expected impact of enhanced emotion regulation skills for older adults in the long-term, and differed from our hypotheses about recurrence of intrusive thoughts during a short-term laboratory exposure to intrusive thoughts. Because with intrusive thought difficulties often center on one or a few specific intrusive thoughts, we examined participants' single most frequent and single most distressing intrusive thoughts, as well as averages across all intrusive thoughts.

For the average across intrusive thoughts, as expected, older adults ($M = 1.84, SD = .87$) reported less frequency than younger adults ($M = 2.76, SD = 1.33; t_{(86.6)} = 4.12, p < .001, d = .89$). (Note, a rating of one corresponds to having never experienced that intrusive thought, a rating of two refers to less than once per six months, and a rating of three refers to once per three to six months.) Also, for the single most frequent thought, older adults ($M = 4.73, SD = 2.52$) reported a lower frequency for this thought than younger adults ($M = 6.61, SD = 2.36; t_{(98)} = 3.84, p < .001, d = .78$). The older adult mean rating was near five, "between once per

³The age differences in affect were not mediated by suppression effort, meanings given to everyday intrusive thoughts (AMIT), or executive functioning (TM).

week and once per month,” while the younger adult rating was near seven, “at least between once per day and once per several days.”

For the average rating of distress associated with previously experienced intrusive thoughts for the UTC overall, the difference between older ($M = 3.72$, $SD = 1.72$) and younger adults ($M = 4.44$, $SD = 1.80$) was in the expected direction ($t_{(90)} = 1.96$, $p < .06$, $d = .41$), although it did not reach significance. Both groups were closer to the scale label “moderately distressing” (a rating of five) than the label “no problem” (a rating of one). For the single most distressing thought, older adults ($M = 5.26$, $SD = 2.57$) reported less distress for this thought than younger adults ($M = 6.82$, $SD = 2.27$; $t_{(90)} = 3.09$, $p = .003$, $d = .65$). Together, the results suggest that older adults report less frequent intrusive thoughts across a range of thoughts, and that when examining individuals’ most troublesome thoughts, older adults experience these thoughts less frequently and with less distress. These results largely support the idea of adaptive long-term emotional processing of intrusive thoughts by older adults.

Discussion

The current study examines the complex nature of older adults’ experiences with intrusive thoughts by identifying age-related risk and protective factors for experiencing distress and thought recurrence following intrusive thoughts. In line with lifespan theories that suggest emotion regulation advantages for older adults (e.g., socioemotional selectivity theory; Carstensen, 1993, 1995), older adults experienced steadier and higher levels of positive affect when experiencing an intrusive thought. Older adults reported less frequent and distressing everyday intrusive thoughts, and also were less likely than younger adults to view recurrences of these intrusive thoughts as a sign of moral failure. However, older (compared to younger) adults also more readily interpreted their intrusive thoughts recurrences as a sign of declining cognitive functioning, and perceived greater difficulty suppressing an intrusive thought during the second thinking period, despite no age differences in actual recorded recurrence. Both older and younger adults reported a largely similar rise and fall of negative affect after an intrusive thought, with younger adults’ negative affect eventually declining below baseline levels. Finally, the deployment of suppression effort may be key for understanding age differences in perceptions of difficulty suppressing intrusive thoughts, because greater suppression effort mediated older (versus younger) adults’ greater perceived difficulty keeping the intrusive thought out of mind during the second thinking period.

These results offer initial support for the model proposed in Figure 1, although several revisions to the model are necessary. In particular, the portions of the model involving age differences in difficulty suppressing intrusive thoughts and distress after the recurrence of intrusive thoughts need refinement to incorporate the more complex pattern of results. The initial evidence from this study sets the stage for more intensive testing of each proposed component of the model.

Meanings Assigned to Intrusive Thoughts

Much of the current study built upon cognitive models of intrusive thoughts, which predict that the meanings individuals assign to intrusive thoughts play a large role in determining the emotional consequences of the thought (Rachman, 1997; Salkovskis, 1998). We expanded upon the types of meanings previous researchers have considered by including meanings that are related to important age-relevant goals. Older adults showed less endorsement than younger adults of moral failure meanings, which have been a common focus of the literature (Calamari et al., 2002). Instead, meanings about declining cognitive functioning were the most highly endorsed type of meanings for older adults, indicating that much of the current work on intrusive thoughts has overlooked what is possibly the greatest

concern for older adults about recurrences of their intrusive thoughts. While lifespan theories have long noted the primary focus on age-related decline during goal selection for older adults (Heckhausen & Schulz, 1995), these results highlight the need for researchers to more fully consider adult development in models of psychopathology and emotion regulation. For example, increased efforts could be made to incorporate assessments of fears about age-related decline into treatment studies and clinical work.

Emotional Responding to Intrusive Thoughts

In general, older adulthood may be a time of relatively adaptive responding to intrusive thoughts in their usual context. Older adults reported lower rates of everyday intrusive thoughts, and lower distress and frequency for their single most frequent or distressing intrusive thought, compared to younger adults. These findings are consistent with epidemiological studies showing lower rates of OCD among older adults (Regier et al., 1988), and likely stem from a healthier long-term approach to intrusive thoughts compared to younger adults. Lifespan theories, such as socioemotional selectivity theory (Carstensen, 1993, 1995), that emphasize some increased emotion regulation abilities in older adulthood may translate well, on average, to the experiences of intrusive thoughts in older adults. Specifically, these theories predict that older adults tend to emphasize motivated processing of positive information, while diminishing negative information. As we expected, this processing style extended to meanings given to intrusive thought recurrences based on the lower endorsement of moral failure meanings by older adults.

However, when examining immediate emotional reactivity after engaging with an intrusive thought in the lab, a different pattern emerged with results diverging by type of affect. Following the lab stressor, older adults reported steadier levels of positive affect than younger adults in line with models predicting optimization of positive affect by older adults (Labouvie-Vief & Medler, 2002). However, for negative affect, both age groups showed similar increases in negative affect after initially encountering an intrusive thought. Older adults then showed a subsequent lack of volatility compared to younger adults, as younger adults' negative affect eventually declined beyond baseline levels.

It should be noted that lifespan researchers frequently find divergences between positive and negative affect (Charles et al., 2001) and have tied these divergences directly to styles of emotion processing. Specifically, some recent research has suggested that by experiencing and processing both positive and negative information, older adults could be setting the stage for emotional benefits after later stressors (Ong, Bergeman, Bisconti, & Wallace, 2006).

On the other hand, these results parallel findings by Charles and Carstensen (2008) in which both older and younger adults experienced initial increases in sadness when encountering aversive stimuli, but older adults showed greater residual sadness with continued exposure compared to younger adults. In this case, older adults may adaptively attempt to head off distressing experiences by selectively avoiding them, but sometimes apply this strategy in unsuitable situations. Intrusive thoughts appear to be one such situation, as avoidance attempts frequently have the paradoxical effect of *increasing* the recurrence of those same intrusive thoughts (Wenzlaff & Wegner, 2000). In the current study, the greater suppression effort by older adults suggests that they attempted to avoid the intrusive thought (and presumably the associated negative affect) when it was encountered, but this strategy did not mitigate their negative affect, similar to the Charles and Carstensen (2008) finding.

Difficulties Controlling Intrusive Thoughts

One unanticipated finding was the equivalence of the age groups in recorded thought recurrence despite older adults' poorer executive functioning. There are several plausible explanations for this finding. First, it may be that among this relatively healthy sample of older adults, participants attempted to compensate for deficits in executive functioning with greater suppression effort, leading to greater perceived difficulty for older adults. In other words, there would have been differences in recurrence that were not evident due to greater suppression effort by older adults.

While this explanation fits with strategic compensation efforts used by older adults for age-relevant tasks (Li et al., 2001), it is not the only possibility. An alternative explanation for the discrepancy between perceived difficulty and actual thought recurrence is that older adults may perceive deficits in their control of intrusive thoughts despite no actual age differences in suppression ability. This interpretation follows from analogous research noting that there exists an inconsistent relationship between objective and subjective evaluations of cognitive functioning (Jorm et al., 1994), but a meaningful relationship between subjective cognitive functioning and anxiety symptoms (e.g., Teachman, 2007). Along the same lines, older adults' perceived difficulty was not strongly related to recorded recurrence (average of $r = .18$) but was correlated with negative affect (average of $r = .41$). Thus, older adults' perceptions of difficulty during suppression may be tied more to emotion dysfunction rather than actual cognitive performance.

Suppression Effort

Greater suppression effort by older adults was an important characteristic of older adults' responding to intrusive thoughts, as it accounted for perceptions of increased difficulty suppressing thoughts. Given evidence for increased flexibility by older adults in responding to goal failures (like unsuccessful thought suppression; Heckhausen & Schultz, 1995), a logical question is why older adults would expend sustained suppression effort, which is often linked to negative outcomes (Wenzlaff & Wegner, 2000).

One hint may lie in the cognitive resources needed to avoid distressing experiences versus regulate resulting negative affect. If used successfully, emotion regulation strategies that operate at an early stage of emotional processing tend to consume less cognitive resources than those that require sustained effort (Gross & John, 2003). It may be that older adults attempted to head off intrusive thoughts by suppressing them, but were not fully successful. More research is needed to explore the tradeoffs in cognitive resources between expending effort suppressing thoughts versus regulating negative affect after recurrence of the thoughts, especially given past research linking suppression effort to trait anxiety in older adults (Erskine et al., 2007).

Limitations and Conclusion

The sample of older adults in the current study was largely Caucasian and cognitively healthy. Reactions to intrusive thoughts by people with more pronounced cognitive decline could differ in terms of affective consequences (see Petrican, Moscovitch, & Schimmack, 2008) or difficulty suppressing intrusive thoughts. Additionally, our measure of executive functioning was brief, and did not allow us to discriminate among a variety of executive functioning constructs. In the current cross-sectional study, age was confounded with cohort for age comparisons, leaving untested the assumption that these findings reflect developmental changes rather than cohort differences. It would also be informative in future research to examine age differences in responding to a wide variety of intrusive thought content. While the current study followed past research (e.g., Purdon et al., 2005) in using intrusive thoughts that were negative and perceived to be immoral, other thoughts may

evoke different meanings, control attempts, and affect. An additional limitation was the use of self-report measures, which can be prone to response biases. However, the consistency of some of the findings (i.e., the initial increase in negative affect for both age groups) with past research using multiple methods of measurement after age-relevant stressors (Teachman & Gordon, 2009) makes it unlikely that such a bias can account for the observed age differences.

Notwithstanding these limitations, the current study highlights the importance of integrating a lifespan perspective into theories of intrusive thoughts. Older adults experienced a range of risk and protective factors when encountering intrusive thoughts, including differences in meanings assigned to intrusive thought recurrences and the tendency to employ thought suppression effort. The evidence from this study demonstrates that an individual's reactions to intrusive thoughts must be considered within an 'age context' that takes into account the age-relevant concerns of the individual.

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Figure 1.
Model of Age-Relevant Predictors of Distress Following Recurrent, Intrusive Thoughts

Figure 2.
Positive and Negative Affect by Age Group across Thinking Periods
Note: Positive and negative affect was measured using the Positive and Negative Affect Schedule.

Figure 3.

Meanings Assigned to Intrusive Thoughts by Age Group

Note: * refers to $p < .05$. Meanings were measured using the Age-relevant Meaning of Intrusive Thoughts (AMIT) scale.

Table 1

Descriptive Statistics for Sample Demographics, Symptom and Cognitive Functioning Measures, and Meanings Given to Recurrences of Intrusive Thoughts by Age Group

	Age Group			
	Younger Adult		Older Adult	
	<i>M or n</i>	<i>SD or %</i>	<i>M or n</i>	<i>SD or %</i>
Age	22.02 ^a	3.40	73.33 ^b	6.07
Gender (Female)	30	59%	27	56%
Ethnicity				
Caucasian	26 ^a	51%	46 ^b	96%
African-American	12	24%	0	0%
Asian	6	12%	0	0%
Other	7	14%	2	4%
OCI-R	16.93	11.51	15.62	9.84
STAI-T	41.06 ^a	9.53	36.22 ^b	12.13
CES-D	15.67 ^a	8.21	11.86 ^b	8.23
TM	31.43 ^a	19.48	49.63 ^b	38.15
MMSE	29.43 ^a	.70	28.76 ^b	1.35

Note: Group differences are noted by unique letter superscripts (i.e., 'a' versus 'b') and are all significant at $p < .05$. OCI-R = Obsessive-Compulsive Inventory – Revised; STAI-T = State-Trait Anxiety Inventory – Trait Version; CES-D = Center for Epidemiological Studies-Depression scale; TM = Trailmaking subtest; MMSE = Mini-Mental Status Exam. The superscripts for ethnicity refer to a significant age group difference on the omnibus test testing the percentage of 'Caucasian' versus all other ethnicities. The percentages for ethnicity among younger adults sum to 101% due to rounding.

Table 2
Suppression Effort, Perceived Difficulty, and Recorded Difficulty Controlling Intrusive Thoughts by Age Group

	Age Group					
	Younger Adult			Older Adult		
	Period One		Period Two	Period One		Period Two
	<i>M</i>	<i>SD</i>		<i>M</i>	<i>SD</i>	
Suppression Effort	3.18 ^a	1.27	2.44 ^b	1.22	3.54 ^a	1.21
Perceived Difficulty	2.68 ^a	1.10	1.82 ^b	.83	2.74 ^a	1.20
Frequency	9.96 ^a	8.30	6.30 ^b	5.42	8.02 ^a	5.31
Duration	57.33 ^a	77.65	41.64 ^b	75.10	57.56 ^a	75.35
Average Duration	12.87 ^a	36.37	19.17 ^b	53.02	13.11 ^a	27.97
						7.38 ^{ab}
						15.26

Note: Group differences are noted by unique letter superscripts (i.e., ‘a’ versus ‘b’) and are all significant at $p < .05$. Average duration refers to the average duration of each intrusive thought recurrence experienced by a participant during a thinking period. Frequency, duration, and average duration refer to the thought recurrence data. These variables are presented in raw units to ease interpretability, but were analyzed using log transformed units due to high skew.