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Age Differences in Peritraumatic and Posttraumatic Processing

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There is limited research investigating the mechanisms underlying the lower rate of posttraumatic stress disorder (PTSD) in older compared to younger adults. This study examined age differences in peritraumatic and posttraumatic reactions, and the use of two emotion regulation strategies (rumination and positive reappraisal) using a trauma film induction paradigm. Participants (45 older adults and 45 younger adults) watched a trauma film. Eye gaze, Galvanic Skin Response, peritraumatic distress, and emotion regulation were assessed during the film. Participants completed an intrusive memory diary over the next 7 days and follow-up measures of posttraumatic symptoms and emotion regulation. Findings showed no age differences in peritraumatic distress or use of rumination or positive reappraisal during film viewing. Older adults reported lower posttraumatic stress and distress from intrusive memories than younger adults at the 1-week follow-up, despite experiencing a comparable number of intrusions. Rumination was a unique predictor of intrusive and hyperarousal symptoms, after accounting for age. There were no age differences in the use of positive appraisal, and positive reappraisal was not associated with posttraumatic stress. Lower rates of late-life PTSD may relate to decreased use of maladaptive emotion regulation (i.e., rumination), rather than increased use of adaptive emotion regulation strategies (i.e., positive reappraisal).

Public Significance Statement
Results suggest that older and younger adults experience traumatic situations in similar ways during the event (e.g., coping, distress, attentional avoidance), and have similar frequency of posttraumatic intrusive memories afterwards. However there are age differences in the way they cope with these posttraumatic symptoms. This study suggests that lower rates of PTSD in older adults may relate to decreased use of maladaptive emotion regulation strategies (i.e., rumination), rather than increased use of adaptive emotion regulation strategies (i.e., positive reappraisal) after a traumatic event.

Keywords: older, posttraumatic stress, PTSD, rumination, mood induction

Lower prevalence rates of posttraumatic stress disorder (PTSD) in older, compared to younger, adults have been consistently reported in large epidemiological studies for both 12-month (older = 2.3%; younger = 4.3%; Reynolds et al., 2016) and lifetime prevalence (older = 2.5%–2.7%; younger = 6.3%–9.8%; De Vries & Olff, 2009; Kessler et al., 2005). Older adults have also typically reported lower psychological distress and fewer, or less severe, PTSD symptoms than younger adults following traumatic events, including natural disasters and terrorist attacks (Acierno et al., 2006; Day & Jencik, 2011; Norris et al., 2002). Some authors suggest that methodological factors are responsible for the lower prevalence rates among older adults (Böttche et al., 2012; Clapp & Beck, 2012; Dinnen et al., 2015). However, others propose that there are specific aspects of psychological adaptation or emotion regulation that improve with older age, and these protect against the development of posttraumatic symptoms (Acierno et al., 2006; Norris et al., 2002; Reynolds et al., 2016). However, minimal research has investigated the mechanisms underlying these age-related differences in PTSD.

Several large-scale epidemiological studies report that on average, older adults have been exposed to more potentially traumatic experiences than younger adults (De Vries & Olff, 2009; Forman-Hoffman et al., 2016; Monson et al., 2015). Yet, despite being exposed to more traumatic events, older adults are less likely to have been diagnosed with PTSD than younger adults. A recent epidemiological survey reported a past-year prevalence for older adults at 2.3%, compared to 4.3% for younger adults (Reynolds et al., 2016). This trend appears to extend to lifetime prevalence rates. Several epidemiological studies across the world report lifetime prevalence rates of PTSD between 2.3%–4.8% for older adults and 6.1%–9.8% for younger adults (De Vries & Olff, 2009; Frans

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et al., 2005; Jimenez et al., 2010; Kessler et al., 2005; Pietrzak et al., 2012). The limited empirical evidence to date tends to show that older adults report fewer posttraumatic symptoms after experiencing a traumatic event than younger and middle-aged adults. Older adults have reported less psychological distress and fewer PTSD symptoms than younger adults following exposure to natural disasters and terrorist attacks (Acierno et al., 2006; Day & Jencik, 2011). A literature review across 17 distinct samples of disaster victims in multiple countries emphasizes the consistency of this finding, where posttraumatic effects reduced with age in 15 samples (Norris et al., 2002). More recently, a large-scale epidemiology study using a nationally representative sample, found that older adults meeting past-year diagnosis criteria for PTSD reported less severe symptoms than younger and middle-aged adults (Reynolds et al., 2016). Older adults experienced fewer avoidance/numbing and hyperarousal symptoms, fewer distressing dreams of the trauma, and less avoidance of thoughts/conversations about the trauma. No significant differences in the number of re-experiencing symptoms were reported (Reynolds et al., 2016). There is some evidence that shows older adults recover more quickly than younger adults after trauma exposure. For example, in a longitudinal study of exposure to the 9/11 terrorist attack in the United States, older adults reported greater reductions in PTSD symptom severity, anxiety, sleep disturbance, and physical distress, than younger adults, 12 months after the event (Scott et al., 2013). It is interesting that the prevalence rates of PTSD reduce with age.

The reduction in PTSD onset in later life, as well as the reduction in severity of existing PTSD in later life, requires further investigation to understand why the differences from younger adults occur. There are several issues to consider. First, methodological factors may affect the assessment of lifetime prevalence such that the true prevalence of PTSD is underreported. Second, age differences in PTSD prevalence may be the result of cohort effects such as survivor bias, where those who suffer from PTSD are less likely to reach old age (Cook & Simiola, 2017; Reynolds et al., 2016). Mental health literacy about PTSD may be poorer among the current generation of older adults, such that they normalize earlier trauma reactions or do not recognize the negative effects of trauma exposure (Cook et al., 2017). Third, age-related changes may explain the lower rates of PTSD. For example, declines in cognitive or sensory abilities, or the presence of comorbid physical and mental disorders, may result in the misattribution of PTSD symptoms (Cook et al., 2017; Cook & Simiola, 2018). Alternatively, with accumulating evidence suggesting that older adults employ better emotion regulation strategies to manage negative emotions than younger adults, it is possible that older adults are actually better at coping with trauma (Charles, 2010; Urry & Gross, 2010). There is evidence that older adults also have lower rates of depression and anxiety disorders in general compared to younger populations (Kessler et al., 2005), and therefore the reasons for the lower prevalence of PTSD in older adults might not be unique to PTSD.

Intrusive memories are proposed to be at the core of PTSD symptomology (Brewin et al., 1996; Brewin & Holmes, 2003). These repeated, unwanted, and distressing memories of the traumatic event are commonly experienced in the direct aftermath of trauma, but typically subside over time for most people (Iyadurai et al., 2019). Notably, it is the distress associated with early intrusive memories that appear to be more indicative of future PTSD symptoms (Iyadurai et al., 2019; Marks et al., 2018; Michael et al., 2005), rather than how often intrusive memories occur (Iyadurai et al., 2019; Michael et al., 2005). It is possible that there are age-related differences in the number of intrusions experienced, as well as the distress associated with the intrusions that might drive the lower prevalence rates of PTSD in later life. To date, research has not examined this issue or the mechanisms that would underlie age differences in the presence or experience of intrusive memories across ages.

The strength and vulnerability integration (SAVI) model of aging proposes differences in the way older adults process emotional information that might underlie age-related differences in PTSD. SAVI proposes that older adults show age-related strengths in the use of particular emotion regulation strategies (e.g., avoidance) to avoid experiencing negative affect (Charles, 2010). For example, when directed to avoid negative content while viewing a sad film, older adults report less negative affect than younger adults, and less distress compared to viewing a sad film naturally (Lohani & Isaacowitz, 2014). Similar findings have been observed using negative pictures (Wirth & Kunzmann, 2018). During a traumatic situation, older adults may show superior ability to divert their attention to avoid over-activation of their emotional response, and this might account for the reduced rates of traumatic symptoms compared to younger adults. However, SAVI also acknowledges age-related vulnerabilities in emotion regulation. In circumstances of high negative emotional arousal or chronic arousal, older adults may be unable to employ these characteristic emotion regulation strategies (for instance, not be able to avoid). This is then coupled with slowed age-related physiological responsiveness, which means that once overly aroused they have less capacity to downregulate their arousal, resulting in similar, or increased, levels of distress as younger adults (Charles, 2010; Scott et al., 2013). Evidence for this prediction comes from studies showing that older adults have responded with more intense negative emotions than younger adults when viewing highly negative films (Fajula et al., 2013; Fernández-Aguilar et al., 2018; Jenkins & Andrewes, 2012; Lohani & Isaacowitz, 2014), and a similar level of fear when watching fearful films (Brady et al., 2021). Therefore, it is possible that *during* traumatic situations, which would be considered highly arousing, older adults may become similarly distressed to younger adults. If this occurs, then age differences in PTSD may be the result of older adults engaging in better emotion regulation strategies *after* trauma exposure (i.e., posttraumatic processing). This is consistent with a longitudinal study where PTSD symptoms after the 9/11 terrorist attacks were initially similar in younger and older adults, however, older adults showed greater declines in PTSD symptoms over the next 12 months (Scott et al., 2013).

Emotion regulation is a key mechanism underlying PTSD. Research with younger and middle-aged adults suggests that individuals who develop PTSD tend to overutilize maladaptive emotion regulation strategies (e.g., rumination, thought suppression, and experiential avoidance), and underutilize adaptive emotion regulation strategies (e.g., cognitive reappraisal, positive reappraisal; Boden et al., 2013; Seligowski et al., 2015). Rumination (repetitive negative thinking about the event and its consequences) has a moderate to strong relationship with each PTSD symptom cluster (Seligowski et al., 2016; Szabo et al., 2017). Interestingly, older adults have been found to engage in less rumination than younger adults in general (Erskine et al., 2007; Ricarte et al., 2016; Sütterlin et al., 2012), but also in response to trauma (Markham & Mason, 2016) which may be relevant to age differences in PTSD, and in particular intrusive memories. That is, less rumination

about intrusive memories when they occur might relate to lower PTSD symptoms. In contrast, positive reappraisal (focus on the positive meaning of a negative event) has been found to be effective in reducing distress in adults with PTSD (Charlton & Thompson, 1996), and may be a particularly beneficial general emotion regulation skill for older adults (Nowlan et al., 2015). This adaptive emotion regulation skill may be particularly beneficial for older adults when faced with traumatic situations. It is unclear whether older adults use positive reappraisal *more often* than younger adults in general (Folkman et al., 1987; Garnefski & Kraaij, 2006; Nolen-Hoeksema & Aldao, 2011) although when directed to utilize this emotion regulation strategy, older adults appear more successful than younger adults in downregulating distress (Lohani & Isaacowitz, 2014; Shiota & Levenson, 2009).

Theoretically, older adults would be predicted to regulate emotional responses to traumatic scenarios differently than younger adults. To date, there are no studies that have examined age differences in emotional responses *during*, as well as *after* exposure to trauma, and whether utilization of particular emotion regulation strategies may underpin age differences in trauma responses. This study aims to examine: (a) age differences in peritraumatic and posttraumatic distress using a trauma film induction paradigm, and (b) the effect of rumination and positive reappraisal in explaining or moderating age differences in emotional responses to trauma. We expected no age differences in subjective distress during film viewing, although older adults would demonstrate reduced physiological arousal (Galvanic Skin Response [GSR]) consistent with other GSR studies (Brady et al., 2021; Kemp et al., 2014). Given the SAVI prediction that older adults are unable to employ emotion regulation strategies to minimize distress in highly negative situations, we expected no age differences in the use of positive reappraisal, however, we expected older adults to use less rumination. In the week following trauma film exposure, we expected no age differences in the number of intrusive memories, but lower PTSD symptoms, less distress, less use of rumination, and more use of positive reappraisal in older compared to younger adults. We hypothesized greater use of positive reappraisal and less use of rumination would be associated with lower PTSD symptoms and these effects would be moderated by age.

Method

Participants

Participants ($N = 90$), reporting their gender as either female or male, were 45 older adults (62% female, 38% male) aged 66–85 years ($M = 74.9$, $SD = 4.4$) and 45 younger adults (64% female, 36% male) aged 18–40 years ($M = 24.8$, $SD = 5.8$). Participants selected which country they were born in (Australia, England, New Zealand, Scotland, Italy, Greece, Vietnam, or Other), their education level and income bracket (see Table 1), and whether they received social security benefits (yes, no). Demographic information is summarized in Table 1. Older adults were recruited from a research volunteer database and community advertising. Younger adults were recruited from undergraduate psychology courses and community advertising. Participants were screened prior to enrollment and excluded if they reported current PTSD symptoms or likely cognitive impairment based on ≥3 errors on the Six-Item Screener (Callahan et al., 2001).

Materials

Trauma Film Paradigm

A trauma film paradigm was used to model exposure to traumatic material and subsequent responses (Holmes & Bourne, 2008). A 14-min trauma film previously used by Belcher and Kangas (2015) was used, that comprised seven clips of traumatic events, including motor vehicle accidents, drowning, and terrorist attacks. Participants were informed that the footage depicted real-life events and were instructed to watch the film as though they were a bystander at the scene. The film was presented to each participant individually on a TX300 Tobii eye tracker screen (23 in.). Sound was delivered through Sennheiser headphones.

Baseline Measures

The Six-Item Screener (Callahan et al., 2001) is a clinician-administered measure of general cognitive functioning and was administered to assess for potential cognitive impairment. Items are scored (0 = *correct* and 1 = *incorrect*) and summed to give a total score ranging from 0 to 6. Scores of ≥3 are indicative of likely cognitive impairment (Callahan et al., 2001).

Traumatic Events Questionnaire (TEQ; Vrana & Lauterbach, 1994) assesses lifetime history of exposure to 12 potentially traumatic events (*yes/no;* e.g., sexual assault, natural disasters). Items were summed to give a total score ranging from 0 to 12.

Center for Epidemiology Studies Depression Scale—Revised (CESD-R; Eaton et al., 2004) is a 20-item measure of depressive symptom severity over the past week. Items are rated on a 5-point Likert scale, with higher scores representing a greater depressive symptom severity. Internal consistency was excellent in the present study ($\alpha = .93$).

State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983) is a measure of state anxiety (STAI-S) and trait anxiety (STAI-T) using 20 items for each subscale. Items are rated on a 4-point Likert scale (1 = *not at all* to 4 = *very much*), with higher scores representing greater state and trait anxiety, respectively. Internal consistency was excellent for STAI-T ($\alpha = .92$) and STAI-S ($\alpha = .91$) in this study.

Psychophysiological Measurement

Eye Tracking. To verify visual attention (objective attention) to the trauma film, a TX300 Tobii eye tracker recorded eye gaze patterns with data sampled at a rate of 60 Hz. Participants were seated approximately 65 cm away from the monitor. Eye gaze was calibrated using a 5-point procedure. Tobii Studio Professional was used to present stimuli and analyze data. Fixations were defined as a stable gaze for at least 100 ms. A single area of interest comprising the full area of video stimuli was used to assess the total amount of gaze time on the trauma film.

Galvanic Skin Response. Continuous GSR was recorded using a PowerLab 8/35 Data Acquisition System and analyzed in LabChart Pro Version 8.0. GSR is a measure of conductivity of human skin and is indicative of sympathetic nervous system arousal (Boucsein et al., 2012; Neumann & Blanton, 1970). GSR was sampled at a rate of 1,000 Hz and amplified using an external PowerLab GSR amplifier. Ag–AgCl electrodes were connected to the distal phalanges of the index and middle fingers of the nondominant

Table 1
Demographic and Baseline Information for Younger and Older Adults

Characteristic	Younger ($N = 45$) *n* (%)	Older ($N = 45$) *n* (%)	χ^2/Fisher's exact test	*p*
Gender				
Female	29 (64.4)	28 (62.2)	0.05	.827
Male	16 (35.6%)	17 (37.8%)		
Born outside Australia	17 (37.8)	9 (20)	3.46	.063
Education				<.001**
High school or below	0 (0)	7 (15.6)		
Trade/Certificate/Diploma	2 (4.4)	11 (24.4)		
Bachelor's degree	32 (71.1)	11 (24.4)		
Postgraduate degree	11 (24.4)	16 (35.6)		
Income (per week)			—	.001**
$0–$499	19 (42.2)	5 (11.4)		
$500–$999	17 (37.8)	18 (40.1)		
$1,000+	5 (11.1)	17 (38.6)		
Missing	4	5		
Social Security Benefits	6 (13.3)	18 (40)	8.18	.004*
	M (*SD*)	*M* (*SD*)	*F*	*p*
Age	24.8 (5.8)	74.9 (4.4)	2,099.39	<.001**
Six-Item Screener Score	0.04 (0.2)	0.02 (0.2)	2.05	.16
TEQ	1.2 (1.4)	1.8 (4.4)	3.99	.049*
CESD-R	10.4 (12.9)	8.6 (8.9)	0.56	.455
STAI-S	33.6 (10.7)	32.6 (8.4)	0.23	.632
STAI-T	37.4 (10.9)	34.1 (9.2)	2.46	.121
CERQ-PR	14.3 (4.1)	14.9 (4.1)	0.42	.521
CERQ-R	11.0 (4.3)	9.5 (3.7)	3.49	.065

Note. TEQ = Traumatic Events Questionnaire; CESD-R = The Center for Epidemiology Studies Depression Scale—Revised; STAI-S = State-Trait Anxiety Inventory—State; STAI-T = State-Trait Anxiety Inventory—Trait; CERQ-PR = Cognitive Emotion Regulation Questionnaire—Positive Reappraisal; CERQ-R = Cognitive Emotion Regulation Questionnaire—Rumination.
* $p < .05$. ** $p < .01$.

hand with a nonsaline electrode paste. The average GSR level across a 5-min baseline period and during the trauma film was calculated.

Mood, Emotion Regulation, and Attention

Visual Analogue Mood Rating Scale. Participants rated their experience of seven mood states (happiness, sadness, anger, anxiety, fear, disgust, and horror) on an 11-point Likert scale (0 = *not at all* to 10 = *extremely*) prior to viewing the trauma film. After film viewing, they rated the highest level of each emotion they experienced during the trauma film.

Post-Film Questionnaire. Participants rated their level of distress during film viewing (0 = *not at all* to 100 = *extremely*) and self-reported attention to the film (0 = *none at all* to 100 = *complete attention*). Participants also indicated whether they had looked away at any point during the film (yes/no) and whether they had seen any of the film clips before (yes/no).

Cognitive Emotion Regulation Questionnaire. The Cognitive Emotion Regulation Questionnaire (CERQ; Garnefski et al., 2001) measures cognitive emotion regulation strategies used in response to negative events or situations. Only the positive reappraisal (CERQ-PR) and rumination (CERQ-R) subscales (four items each) were rated using a 5-point Likert scale (1 = *almost never* to 5 = *almost always*), with higher scores representing a greater use of each strategy. At baseline, items were rated to assess trait use of positive reappraisal and rumination. Participants also reported their state use of positive reappraisal and rumination immediately following the film and in response to intrusive memories that occurred during the following week at the follow-up assessment. Internal consistency for was adequate for positive reappraisal ($\alpha = .89$, .82, and .84, respectively) and rumination ($\alpha = .84$, .85, and .76, respectively).

Intrusion Diary

The number of intrusive memories and associated distress were recorded in an intrusion diary (via SMS or paper) three times a day (morning, afternoon, and evening) for 7 days following the trauma induction. For each diary entry, participants reported the number of intrusive memories and their level of distress from each intrusion on an 11-point scale (0 = *not at all* to 100 = *extremely*). Participants were told that if they missed a rating, to record all intrusive memories at their next rating.

Posttraumatic Distress

Impact of Events Scale—Revised (IES-R; Weiss & Marmar, 1997) is a 22-item scale that measures distress in relation to traumatic events over the last week in three subscales: intrusion (eight items), avoidance (eight items), and hyperarousal (six items). Items are rated on a 5-point Likert scale (0 = *not at all* to 4 = *extremely*), with higher scores reflecting greater symptom severity. The current study demonstrated adequate internal consistency for: IES-R Total ($\alpha = .88$), IES-R Intrusions ($\alpha = .80$), IES-R Avoidance ($\alpha = .84$), and IES-R Hyperarousal ($\alpha = .65$).

Posttraumatic Cognitions Inventory (PTCI; Foa et al., 1999) assesses trauma-related thoughts and beliefs in 33 items comprised of three subscales: self (21 items), the world (seven items), and self-blame (five items). Items are rated on a 7-point Likert scale (1 = *totally disagree* to 7 = *totally agree*), with scores summed (ranging from 33 to 231), with higher scores indicating greater levels of negative cognitions (Foa et al., 1999). Internal consistency was excellent in the present study ($\alpha = .94$).

Procedure

All procedures were approved by the Macquarie University Human Research Ethics Committee. Interested participants completed the online screening questionnaire to determine eligibility. At the testing session, participants provided informed consent, were administered the Six-Item Screener and completed baseline questionnaires via Qualtrics. Participants were fitted with psychophysiological equipment and a baseline recording of GSR was sampled for 5 min, followed by calibration to the Tobii eye tracker. Participants were fitted with headphones, and continuous eye gaze and GSR were recorded during the trauma film presentation. After viewing the film, participants were disconnected from the psychophysiological equipment and completed the Post-Film Questionnaire, CERQ-PR, CERQ-R, and Mood Rating Scale.

Participants rated their intrusive memories three times daily for 7 days via SMS or paper. Follow-up questionnaires (CERQ-PR, CERQ-R, IES-R, and PTCI) were completed online or via paper. Students were awarded course credit on completion and all nonstudent participants were offered AUD $20 reimbursement for their time.

Data Analysis

Data analysis was conducted using IBM SPSS Statistics for Windows, Version 26.0. Preliminary analyses compared younger and older samples on demographic and baseline measures, using chi-squared test for categorical variables (or Fisher's exact tests where cell sizes <5), and a one-way analysis of variance (ANOVA) for continuous variables. A prior power analysis suggested that 82 participants (41 in each age group) would provide 80% power to detect an age difference assuming a medium effect size of 0.3 and a two-tailed alpha of 0.05. Given the 1-week follow-up, we anticipated a 10% attrition rate, thus aimed to recruit a sample of 90 participants. To assess age differences in peritraumatic responses, a 2 × 2 mixed ANOVA was performed on each mood rating and GSR, with time (baseline and peritraumatic) as the within-subjects variable and age group (older and younger) as the between-subjects variable. Statistical significance was set at $\alpha = .05$, with follow-up tests corrected using a Sidak alpha adjustment where significant interactions were present. Age differences in the remaining peritraumatic responses were assessed using chi-squared for categorical variables, and one-way ANOVA for continuous variables. Analysis of covariance (ANCOVA) was used to assess age differences in emotion regulation strategies while controlling for baseline differences, and in subjective distress during the film while additionally controlling for objective attention (measured by gaze duration).

To assess age differences in posttraumatic responses, and whether emotion regulation strategies moderated the relationship, hierarchical regression analyses were conducted on five measures of posttraumatic distress (IES-R, IES-R-intrusions, IES-R-avoidance, IES-R-hyperarousal, and PTCI) for each emotion regulation strategy. Age group and baseline control variables were entered in the first step, emotion regulation strategy (rumination or positive reappraisal) was entered in the second step, and the interaction term was entered in the third step. A Bonferroni adjustment of $\alpha = .01$ was used, given the five measures of posttraumatic distress analyzed. A one-way ANCOVA assessed age differences in each emotion regulation strategy (i.e., positive reappraisal and rumination) at 7 days post-film and the number of intrusive memories recorded in the diary, while controlling for baseline differences. Similarly, an ANCOVA was conducted on distress associated with intrusive memories, while additionally controlling for the number of intrusive memories.

Results

Missing Data

Data were missing at baseline for three older adults: income ($n = 1$), depressive symptoms and six mood variables ($n = 1$), traumatic events ($n = 1$), and at follow-up for one older adult: positive reappraisal ($n = 1$). Due to technical issues and one participant needing to take a break, eye tracking data were missing for one younger and four older adults, and GSR data were missing for one younger and two older adults. One participant failed to complete at least one diary rating per day. Intrusion data were excluded for three participants ($n = 2$ older; $n = 1$ younger) who reported the number of intrusions at >3 *SD*s from the mean. Missing data were excluded pairwise.

Preliminary Analyses

Older participants had significantly higher lifetime exposure to traumatic events (TEQ) than younger adults and younger adults had a higher education level. Older adults' income was significantly higher, but more older adults received social security benefits than younger adults. There were no other significant group differences (see Table 1).

Peritraumatic Symptoms

Attention and Familiarity

Significantly fewer older ($n = 6$, 13%) compared to younger adults ($n = 18$, 40%) self-reported looking away from the trauma film, $\chi^2(90) = 8.18$, $p = .004$. This was confirmed by eye tracking data, with significantly greater gaze duration for older ($M_{seconds} = 621.6$, $SD = 113.3$) compared to younger adults ($M_{seconds} = 528.5$, $SD = 183.1$), $F(1, 83) = 7.81$, $p = .006$. There were no significant age differences in subjective reports of attention (Younger: $M = 9.5$, $SD = 1.1$; Older: $M = 9.6$, $SD = 0.9$), $F(1, 88) = 0.39$, $p = .533$, or familiarity with the film clips (Younger: $n = 3$, 6.7%; Older: $n = 5$, 11.1%, Fisher's exact test $p = .714$).

Mood and Distress

Older adults reported significantly lower baseline levels of fear prior to film viewing (see Table 2), $F(1, 88) = 3.98$, $p = .049$, with no other baseline state mood differences (all $ps > .05$). There was a significant Group × Time interaction for happiness, $F(1, 88) = 4.56$, $p = .036$, $\eta_p^2 = .05$, with older adults reporting a significantly greater decrease in happiness pre- to post-film viewing compared to younger adults (see Figure 1). There were no other significant Group × Time interactions for other mood ratings (all $ps > .05$).

Table 2
Change in State Mood Before (Baseline) and During Trauma Induction (Film) for Younger and Older Samples

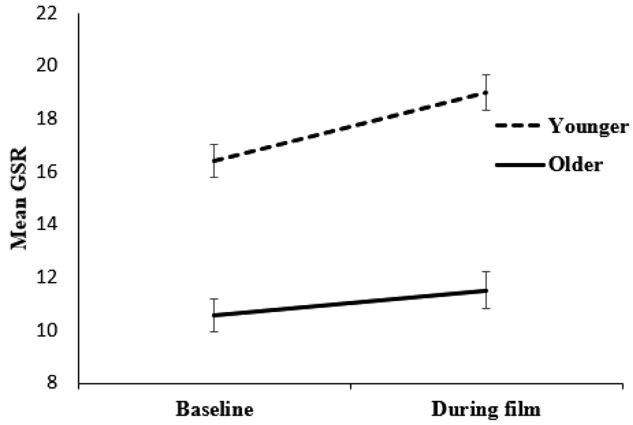
Mood	Younger *M* (*SD*)	Older *M* (*SD*)	Main effects for time			Group × Time interaction		
			F	*p*	η_p^2	*F*	*p*	η_p^2
Happiness			1,105.72	<.001**	.926	4.56	.036*	.049
Baseline	6.8 (1.8)	7.2 (1.4)						
Film	0.7 (1.8)	0.2 (0.7)						
Sadness			282.28	<.001**	.764	0.40	.527	.005
Baseline	1.6 (1.9)	1.6 (2.1)						
Film	7.2 (2.7)	7.8 (2.6)						
Anger			116.41	<.001**	.572	2.10	.151	.024
Baseline	0.6 (1.5)	0.7 (1.6)						
Film	5.2 (3.7)	4.3 (3.2)						
Anxiety			51.99	<.001**	.374	1.32	.254	.015
Baseline	2.6 (2.4)	1.8 (2.2)						
Film	5.7 (3.0)	4.3 (3.2)						
Fear			91.76	<.001**	.513	3.14	.080	.035
Baseline	1.0 (1.6)	0.3 (1.3)						
Film	4.7 (3.1)	2.9 (3.1)						
Disgust			183.88	<.001**	.679	1.75	.190	.020
Baseline	0.2 (0.6)	0.4 (1.7)						
Film	4.7 (3.1)	2.9 (3.1)						
Horror			364.82	<.001**	.807	0.1	.320	.011
Baseline	0.1 (0.3)	0.0 (0.0)						
Film	6.6 (2.7)	5.9 (3.3)						
GSR			77.51	<.001**	.477	19.24	<.001**	.185
Baseline	16.4 (4.9)	10.6 (3.0)						
Film	19.3 (5.5)	11.5 (3.4)						

Note. GSR = Galvanic Skin Response.
* $p < .05$. ** $p < .001$.

There was a significant main effect of time for all moods, see Table 2. There was a significant main effect of age group for anxiety, $F(1, 87) = 8.06$, $p = .006$, $\eta_p^2 = .085$, and fear, $F(1, 87) = 9.31$, $p = .003$, $\eta_p^2 = .035$, with older adults reporting lower levels of anxiety and fear than younger adults across phases. The main effect for age group was not significant for the other moods (all $ps > .05$).

When controlling for baseline differences in education, fear, and TEQ, there were no significant age differences in subjective distress during film viewing (Younger: range 10–100, $M = 6.8$, $SD = 2.1$; Older: range 10–100, $M = 6.0$, $SD = 2.2$), $F(1, 88) = 2.12$, $p = .149$, $\eta_p^2 = .025$. This was consistent when additionally controlling for attention, measured by gaze duration (Younger range 10–100, $M = 6.8$, $SD = 2.1$; Older: range 10–100, $M = 6.0$, $SD = 2.3$), $F(1, 82) = 1.03$, $p = .314$, $\eta_p^2 = .013$.

Figure 1
Mean Galvanic Skin Response During Baseline and Film Viewing for Older and Younger Adults



GSR

There was a significant Age Group × Time interaction for GSR, $F(1, 85) = 19.24$, $p < .001$, $\eta_p^2 = .185$, with older adults experiencing a significantly smaller increase in GSR from baseline compared to during the film ($p = .003$) than younger adults ($p < .001$; see Figure 1). Older adults also had a significantly lower GSR than younger adults during baseline, see Table 2. There was a significant main effect of age group, $F(1, 85) = 57.08$, $p = <.001$, $\eta_p^2 = .402$, with older adults experiencing a lower GSR than younger adults across phases, and a significant main effect of time, $F(1, 85) = 77.51$, $p < .001$, $\eta_p^2 = .477$, where GSR during film viewing was significantly higher than baseline for both age groups.

Peritraumatic Rumination and Positive Reappraisal

When controlling for baseline differences in education, fear, and TEQ, there were no significant age differences during film viewing in the use of rumination (CERQ-R), $F(1, 88) = 2.58$, $p = .112$, and positive reappraisal (CERQ-PR), $F(1, 88) = 0.56$, $p = .455$.

Posttraumatic Response

Posttraumatic Distress and Rumination

A one-way ANCOVA, controlling for baseline differences in education, fear, and TEQ, revealed that 7 days after film viewing, use of rumination (CERQ-R) was significantly lower among older adults

than younger adults, $F(1, 88) = 5.00$, $p = .028$. Table 3 summarizes the results for hierarchical regression analyses conducted for each measure of posttraumatic distress (IES-R Total, IES-R Intrusions, IES-R Avoidance, IES-R Hyperarousal, and PTCI) and controlling for education, fear, and TEQ. Age was a significant predictor on Step 1 in all models. In Step 2 when rumination was added, age remained a significant predictor for IES-R total, IES-Avoidance, and PTCI, while rumination was a significant predictor for IES-R total, IES-R intrusions, and IES-R hyperarousal. In Step 3, the Age × Rumination interaction was not a significant predictor for any outcome.

Posttraumatic Distress and Positive Reappraisal

At 7 days after viewing the film, there were no age differences in positive reappraisal (CERQ-PR; Younger $M = 8.4$, $SD = 3.6$; Older: $M = 8.3$, $SD = 3.1$), $F(1, 87) = 0.94$, $p = .336$, when controlling for baseline differences in education, fear, and TEQ. Hierarchical regressions controlling for education, fear, and TEQ revealed that on Step 2 when positive reappraisal was added with age, age remained a significant predictor of all posttraumatic symptom measures, while positive reappraisal was not a significant predictor in any model. In Step 3, the Age × Positive Reappraisal interaction was not a significant predictor for any outcome.

Intrusive Memories

A one-way ANCOVA, controlling for baseline differences in education, fear, and TEQ, revealed no significant age differences in the number of intrusive memories over the week following film viewing (Younger: range 0–15, $M = 3.7$, $SD = 3.2$; Older: range 0–10, $M = 3.0$, $SD = 2.7$), $F(1, 85) = 0.41$, $p = .524$. When examining those who reported experiencing at least one intrusive memory (38 younger adults and 35 older adults), and also controlling for the number of intrusive memories, older adults reported significantly lower distress from their intrusive memories ($M = 2.7$, $SD = 1.9$) compared to younger adults ($M = 3.9$, $SD = 2.2$), $F(2, 70) = 6.00$, $p = .017$.

Discussion

This study examined age differences in peritraumatic and posttraumatic processing, and the effect of emotion regulation strategies (positive reappraisal and rumination) in regulating responses to a trauma film. In regard to peritraumatic processing, the trauma film paradigm was associated with similar increases in subjective distress across age groups, and similar visual attention to the film (as indicated by the eye-tracking data). This finding is consistent with SAVI model predictions (Charles, 2010), namely, in circumstances where older adults do not avoid highly negative emotional information, they have a similar emotional reaction to younger adults. Our results contrast with previous studies that found negative film clips induced *higher* levels of subjective distress among older compared to younger adults (Fajula et al., 2013; Fernández-Aguilar et al., 2018; Jenkins & Andrewes, 2012). Previous studies used commercial films featuring moral transgressions (e.g., murder, sexual assault, and body mutilation; Fajula et al., 2013; Fernández-Aguilar et al., 2018) and previous results might have been confounded by age group differences in visual attention. A strength of the current study is that it used footage from real-life events that did not focus on moral transgression, and controlled for attention.

One key difference in peritraumatic responses between age groups is related to GSR response. At baseline and during the film, GSR response was smaller in older versus younger adults, replicating previous results when watching fearful films (Brady et al., 2021) and consistent with dampened physiological responsiveness in later life (Kemp et al., 2014). These findings are also consistent with research showing a discrepancy between GSR and self-reported distress (Burriss et al., 2007; Gavazzeni et al., 2008; Neiss et al., 2009), and research showing that despite experiencing a smaller increase in GSR than younger adults, older adults respond with greater levels of subjective distress (Gavazzeni et al., 2008; Gomez et al., 2016; Lohani & Isaacowitz, 2014). The impact of these age-related differences in psychophysiological reactivity on trauma processing is unknown; however, older adults still experienced an increase in physiological reactivity, and that self-reported distress did not differ between age groups, suggesting the subjective experience between age groups was more similar than different and the trauma induction was effective in both age groups.

There were no age differences in the use of rumination and positive reappraisal during film viewing. This was consistent with predictions for positive reappraisal, but not predictions for rumination. This may be related to the lack of age differences in trait rumination at baseline, which also contrasts with previous research that suggests older adults have a tendency to ruminate less than younger adults (Erskine et al., 2007; Ricarte et al., 2016; Sütterlin et al., 2012). This inconsistency may be related to the use of depressive rumination measures in previous studies, whereas this study assessed rumination as an emotion regulation strategy in response to stressful events, consistent with previous PTSD studies (Chesney & Gordon, 2017; Hussain & Bhushan, 2011). The current findings suggest that older adults may not ruminate less than younger adults at the time of the stressor. Given the absence of age differences in subjective distress and utilization of emotion regulation strategies during film viewing, this suggests that post-event processing may be the key to understanding lower PTSD symptoms among older adults, rather than differential experiences of a traumatic event. Age-based differences in posttraumatic responses indicated that older adults had less posttraumatic symptoms and distress on all PTSD indices at follow-up, consistent with studies following real-life traumatic events (Acierno et al., 2006; Norris et al., 2002). One exception was the lack of age-based differences in the *frequency* of intrusions following the trauma induction, only the distress associated with these intrusions, with older adults reporting significantly less distress. Given there were no age differences in emotional distress during the film, the lack of age differences in the number of intrusive memories reported is consistent with previous research conducted with younger adults showing that emotional distress during film viewing is related to the number of intrusive memories (Regambal & Alden, 2009). This is also consistent with past research in younger adults, where lower distress associated with intrusive memories predicted less severe PTSD symptoms subsequently (Michael et al., 2005; Schooler et al., 1999). Taken together, these age-related differences are aligned with epidemiological findings that older adults have a lower past-year PTSD prevalence than younger adults and lower severity of PTSD symptoms (Reynolds et al., 2016), and suggest that the age-related differences in prevalence rates are related to differences in posttraumatic processing of traumatic events, rather than the absence of, or avoidance of traumatic events.

Table 3

Results of Hierarchical Regression Models for Posttraumatic Symptoms, Age Group, Rumination, and Positive Reappraisal

	IES-R Total			IES-R Intrusions			IES-R Avoidance			IES-R Hyperarousal			PTCI		
Predictor	β	*F*/*t*	R^2	β	*F*/*t*	R^2	β	*F*/*t*	R^2	β	*F*/*t*	R^2	β	*F*/*t*	R^2
Age and rumination $F(1, 88)$															
Step 1:		6.86	.25**		2.92	.12		6.70	.24**		2.60	.11		4.90	.19*
Age group	−.47	−4.72**		−.32	−2.98*		−.47	−4.64**		−.33	−2.98*		−.32	−3.10*	
Education	−.14	−1.39		−.12	−1.15		−.11	−1.06		−.15	−1.35		−.06	−0.60	
TEQ	−.13	−1.27		−.12	−1.12		−.11	−1.13		−.06	−0.53		.14	1.35	
Fear	.01	0.10		−.01	−0.12		.04	0.41		−.07	−0.62		.25	2.47	
			ΔR^2			ΔR^2			ΔR^2			ΔR^2			ΔR^2
Step 2:		8.87	.10**		5.59	.13**		6.63	.04		4.24	.09*		4.40	.02
Age group	−.39	−4.04**		−.23	−2.21		−.41	−4.08**		−.25	−2.30		−.29	−2.68*	
Education	−.14	−1.55		−.13	−1.30		−.11	−1.12		−.15	−1.47		−.07	−0.63	
TEQ	−.15	−1.61		−.15	−1.47		−.13	−1.32		−.08	−0.77		.13	1.25	
Fear	−.01	−0.12		−.04	−0.37		.03	0.27		−.09	−0.85		.24	2.39	
CERQ-R	.33	3.60**		.38	3.79**		.22	2.25		.32	3.12*		.15	1.46	
Step 3:		7.33	<.01		4.61	<.01		5.46	<.01		4.05	.03		4.04	.02
Age group	−.31	−1.05		−.17	−0.55		−.44	−1.43		.25	0.77		.14	0.43	
Education	−.14	−1.53		−.13	−1.29		−.11	−1.12		−.15	−1.44		−.06	−0.60	
TEQ	−.15	−1.61		−.15	−1.46		−.13	−1.31		−.08	−0.79		.13	1.26	
Fear	−.01	−0.11		−.04	−0.37		−.03	0.27		−.08	−0.82		.24	2.44	
CERQ-R	.35	3.33*		.38	3.44**		.21	1.95		.40	3.55**		.22	1.95	
Age × CERQ-R	−.09	−0.30		−.06	−0.18		.03	0.10		−.50	−1.63		−.43	−1.40	
Age and positive reappraisal $F(1, 87)$															
Step 1:		6.7	.25**		2.84	.12		6.58	.24**		2.52	.11		5.77	.22**
Age group	−.47	−4.67**		−.32	−2.93*		−.47	−4.60**		−.32	−2.94*		−.35	−3.45**	
Education	−.14	−1.38		−.12	−1.14		−.11	−1.06		−.15	−1.34		−.07	0.69	
TEQ	−.13	−1.27		−.12	−1.11		−.11	−1.13		−.06	−0.52		.14	1.35	
Fear	.01	0.10		−.01	−0.12		.04	0.41		−.07	−0.62		.26	2.62*	
			ΔR^2			ΔR^2			ΔR^2			ΔR^2			ΔR^2
Step 2:		5.83	.02		2.83	.03		5.34	<.01		2.59	.03		4.59	<.01
Age group	−.46	−4.52**		−.30	−2.77*		−.46	−4.48**		−.30	−2.78*		−.35	−3.38**	
Education	−.11	−1.05		−.09	−0.77		−.09	−.87		−.11	−0.96		−.06	−0.60	
TEQ	−.15	−1.50		−.15	−1.38		−.13	−1.24		−.09	−0.80		.13	1.27	
Fear	.01	.128		−.01	−0.09		.04	0.42		−.06	−0.60		.26	2.61	
CERQ-PR	.14	1.42		.17	1.60		.08	0.74		.18	1.63		.03	0.31	
Step 3:		5.51	.03		3.30	.05		4.71	.01		2.19	<.01		3.84	<.01
Age group	−.03	−0.10		.28	0.99		−.16	−0.60		−.16	−0.55		−.21	−0.76	
Education	−.13	−1.28		−.12	−1.08		−.11	−1.02		−.11	−1.02		−.07	−0.67	
TEQ	−.18	−1.82		−.19	−1.80		−.15	−1.44		−.10	−0.88		.12	1.14	
Fear	.01	0.07		−.02	−0.17		.04	0.38		−.07	−0.61		.26	2.58	
CERQ-PR	.29	2.24		.37	2.44*		.17	1.33		.23	1.60		.08	0.59	
Age × CERQ-PR	−.48	−1.77		−.65	−2.24		−.33	−1.19		−.16	−0.54		−.16	−0.56	

Note. CERQ-R = Cognitive Emotion Regulation Questionnaire—Rumination; CERQ-PR = Cognitive Emotion Regulation Questionnaire—Positive Reappraisal; IES-R = Impact of Events Scale-Revised; PTCI = Posttraumatic Cognitions Inventory; TEQ = Traumatic Events Questionnaire.

* $p < .01$. ** $p < .001$.

Some age-based differences were found in the use of emotion regulation strategies that appear to be important in understanding lower distress in older adults after trauma. Older adults reported using rumination less frequently than younger adults, and this explained part of the variance in PTSD symptoms. After accounting for rumination, age continued to be a significant unique predictor of avoidance symptoms and posttraumatic cognitions, but not hyperarousal or intrusions. The reason for this is unclear, however, older adults might have interpreted the trauma film less negatively than younger adults. In our sample, the older adults reported significantly more lifetime traumatic events than the younger adults, which might have enabled them to accommodate the negative experiences without a shattering worldview or draw on their individual resources to cope, consistent with cognitive models of PTSD (Ehlers & Clark, 2000). In contrast, age was no longer a unique predictor of intrusions and hyperarousal after accounting for the effect of rumination. These results are consistent with meta-analytic findings in the general population showing rumination has moderate to strong associations with intrusion and hyperarousal symptoms (Szabo et al., 2017), and previous trauma film studies in younger adults where film-related rumination was associated with increased intrusive symptoms and intrusion-related distress (Ball & Brewin, 2012; Holz et al., 2017; Kubota & Nixon, 2017). Both age and rumination explained unique variance in posttraumatic stress symptoms (IES-R Total scores), which likely reflects the differential relationship between rumination and different IES symptom clusters.

Given the mixed research on age differences in the use of positive reappraisal in general life (Folkman et al., 1987; Garnefski & Kraaij, 2006; Nolen-Hoeksema & Aldao, 2011), it was not altogether surprising that there were no age differences in the use of positive reappraisal on posttraumatic processing. Although past research found positive reappraisal was associated with reduced posttraumatic symptoms after a trauma film induction (Woud et al., 2012, 2013) and more so in older than younger adults in response to disgust and sad films (Lohani & Isaacowitz, 2014; Shiota & Levenson, 2009), in those studies participants were *directed* to use positive reappraisal, in contrast to the current study, which assessed spontaneous use. Alternatively, positive reappraisal may be more beneficial with more time post-trauma so individuals have time to reflect on the positives that arise from the event. Distal benefits of positive reappraisal have been demonstrated in previous studies by increased positive emotion at various time points, for example, 3, 6, and/or 12 months after an adverse life event in older adults (Nowlan et al., 2016) and in younger adults (Sears et al., 2003). Therefore, assessing positive reappraisal at longer durations after trauma exposure would be beneficial in future research.

Study limitations include that the results may not be generalized to real-life trauma exposure. Although rumination was found to explain unique variance in intrusions and hyperarousal symptoms, over and above the effect of age, a causal mediation relationship could not be established from this study design and should be examined in future longitudinal studies. Although attentional avoidance was measured during the film, it would have been beneficial to measure any age differences in experiential avoidance at baseline, during the film, and at follow-up. Another limitation is the baseline measures of income and social security benefits differed between groups but were not controlled for in analyses as both are poor proxy measures of socioeconomic status and yielded contradictory results. Younger adults were predominantly students (over 90%) studying full-time and living at home with their families. This means that while their personal income is low, they are not paying living expenses, and are often not eligible for social benefits due to their family household income level. Alternative assessment of socioeconomic status should be considered in future studies.

This study highlights potential mechanisms responsible for reduced posttraumatic symptoms and distress found in older adults. Results suggest that older adults downregulated their distress more effectively than younger adults during the week after viewing the trauma film, despite experiencing a similar peritraumatic distress, and the number of intrusive memories. These age-related advantages in downregulating distress were at least partially attributable to the decreased use of maladaptive emotion regulation (i.e., rumination), rather than the increased use of adaptive emotion regulation (i.e., positive reappraisal). Findings from this study have important implications for the developmental theories of aging in relation to trauma processing.

References

Acierno, R., Ruggiero, K. J., Kilpatrick, D. G., Resnick, H. S., & Galea, S. (2006). Risk and protective factors for psychopathology among older versus younger adults after the 2004 Florida hurricanes. *American Journal of Geriatric Psychiatry*, *14*(12), 1051–1059. https://doi.org/10.1097/01.JGP.0000221327.97904.b0

Ball, S. C., & Brewin, C. R. (2012). The effect of rumination on intrusive images and mood: An experimental investigation using the Trauma Film Paradigm. *Journal of Experimental Psychopathology*, *3*(2), 297–309. https://doi.org/10.5127/jep.019511

Belcher, J., & Kangas, M. (2015). Autobiographical memory and imagining future personal events: Event specificity and symptoms of depression and stress following exposure to an analogue trauma. *Stress and Health*, *31*(5), 419–431. https://doi.org/10.1002/smi.v31.5

Boden, M. T., Westermann, S., McRae, K., Kuo, J., Alvarez, J., Kulkarni, M. R., Gross, J. J., & Bonn-Miller, M. O. (2013). Emotion regulation and posttraumatic stress disorder: A prospective investigation. *Journal of Social and Clinical Psychology*, *32*(3), 296–314. https://doi.org/10.1521/jscp.2013.32.3.296

Böttche, M., Kuwert, P., & Knaevelsrud, C. (2012). Posttraumatic stress disorder in older adults: An overview of characteristics and treatment approaches. *International Journal of Geriatric Psychiatry*, *27*(3), 230–239. https://doi.org/10.1002/gps.2725

Boucsein, W., Fowles, D., Grimnes, S., Ben-Shakhar, G., Roth, W. T., Dawson, M. E., & Filion, D. L. (2012). Publication recommendations for electrodermal measurements. *Psychophysiology*, *49*(8), 1017–1034. https://doi.org/10.1111/j.1469-8986.2012.01384.x

Brady, B., Gonsalvez, C., Kneebone, I. I., Wufong, E., & Bailey, P. E. (2021). Age-related differences in instructed positive reappraisal and mindful attention. *Mindfulness*, *12*(3), 646–658. https://doi.org/10.1007/s12671-020-01523-2

Brewin, C. R., Dalgleish, T., & Joseph, S. (1996). A dual representation theory of posttraumatic stress disorder. *Psychological Review*, *103*(4), 670–686. https://doi.org/10.1037/0033-295X.103.4.670

Brewin, C. R., & Holmes, E. A. (2003). Psychological theories of posttraumatic stress disorder. *Clinical Psychology Review*, *23*(3), 339–376. https://doi.org/10.1016/S0272-7358(03)00033-3

Burriss, L., Powell, D. A., & White, J. (2007). Psychophysiological and subjective indices of emotion as a function of age and gender a function of age and gender. *Cognition and Emotion*, *21*(1), 182–210. https://doi.org/10.1080/02699930600562235

Callahan, C. M., Unverzagt, F. W., Hui, S. L., & Anthony, J. (2001). Six-item screener to identify cognitive impairment among potential subjects for clinical research. *Medical Care*, *40*(9), 771–781. https://doi.org/10.1097/00005650-200209000-00007

Charles, S. T. (2010). Strength and vulnerability integration: A model of emotional well-being across adulthood. *Psychological Bulletin*, *136*(6), 1068–1091. https://doi.org/10.1037/a0021232

Charlton, P. F. C., & Thompson, J. A. (1996). Ways of coping with psychological distress after trauma. *British Journal of Clinical Psychology*, *35*(4), 517–530. https://doi.org/10.1111/j.2044-8260.1996.tb01208.x

Chesney, S. A., & Gordon, N. S. (2017). Profiles of emotion regulation: Understanding regulatory patterns and the implications for posttraumatic stress. *Cognition and Emotion*, *31*(3), 598–606. https://doi.org/10.1080/02699931.2015.1126555

Clapp, J. D., & Beck, J. G. (2012). Treatment of PTSD in older adults: Do cognitive-behavioral interventions remain viable? *Cognitive and Behavioral Practice*, *19*(1), 126–135. https://doi.org/10.1016/j.cbpra.2010.10.002

Cook, J. M., McCarthy, E., & Thorp, S. R. (2017). Older adults with PTSD: Brief state of research and evidence-based psychotherapy case illustration. *American Journal of Geriatric Psychiatry*, *25*(5), 522–530. https://doi.org/10.1016/j.jagp.2016.12.016

Cook, J. M., & Simiola, V. (2017). Trauma and PTSD in older adults: Prevalence, course, concomitants and clinical considerations. *Current Opinion in Psychology*, *14*, 1–4. https://doi.org/10.1016/j.copsyc.2016.08.003

Cook, J. M., & Simiola, V. (2018). Trauma and aging. *Current Psychiatry Reports*, *20*(10), Article 93. https://doi.org/10.1007/s11920-018-0943-6

Day, C. L., & Jencik, A. N. (2011). Aging and disaster: Coping in the wake of Hurricane Katrina. *Journal of Emergency Management*, *9*(3), 23–36. https://doi.org/10.5055/jem.2011.0058

De Vries, G., & Olff, M. (2009). The lifetime prevalence of traumatic events and posttraumatic stress disorder in the Netherlands. *Journal of Traumatic Stress*, *22*(4), 259–267. https://doi.org/10.1002/jts.20429

Dinnen, S., Simiola, V., & Cook, J. M. (2015). Post-traumatic stress disorder in older adults: A systematic review of the psychotherapy treatment literature. *Aging and Mental Health*, *19*(2), 144–150. https://doi.org/10.1080/13607863.2014.920299

Eaton, W. W., Smith, C., Ybarra, M., Muntaner, C., & Tien, A. (2004). Center for Epidemiologic Studies Depression Scale: Review and revision (CESD and CESD-R). In M. E. Maruish (Ed.), *The use of psychological testing for treatment planning and outcomes assessment: Instruments for adults* (pp. 363–377). Lawrence Erlbaum Associates.

Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy*, *38*(4), 319–345. https://doi.org/10.1016/S0005-7967(99)00123-0

Erskine, J. A. K., Kvavilashvili, L., Conway, M. A., & Myers, L. (2007). The effects of age on psychopathology, well-being and repressive coping. *Aging and Mental Health*, *11*(4), 394–404. https://doi.org/10.1080/13607860600963737

Fajula, C., Bonin-guillaume, S., Jouve, E., Blin, O., Fajula, C., Bonin-guillaume, S., Jouve, E., & Blin, O. (2013). Emotional reactivity assessment of healthy elderly with an emotion-induction procedure. *Experimental Aging Research*, *39*(1), 109–124. https://doi.org/10.1080/0361073X.2013.741961

Fernández-Aguilar, L., Ricarte, J., Ros, L., & Latorre, J. M. (2018). Emotional differences in young and older adults: Films as mood induction procedure. *Frontiers in Psychology*, *9*, Article 1110. https://doi.org/10.3389/fpsyg.2018.01110

Foa, E. B., Ehlers, A., Clark, D. M., Tolin, D. F., & Orsillo, S. M. (1999). The post-traumatic cognitions inventory (PTCI): Development and validation. *Psychological Assessment*, *11*(3), 303–314. https://doi.org/10.1037/1040-3590.11.3.303

Folkman, S., Lazarus, R. S., Pimley, S., & Novacek, J. (1987). Age differences in stress and coping processes. *Psychology and Aging*, *2*(2), 171–184. https://doi.org/10.1037/0882-7974.2.2.171

Forman-Hoffman, V. L., Bose, J., Batts, K. R., Glasheen, C., Hirsch, E., Karg, R. S., Huang, L. N., & Hedden, S. (2016). *Correlates of lifetime exposure to one or more potentially traumatic events and subsequent posttraumatic stress among adults in the United States: Results from the mental health surveillance study, 2008–2012* (Data review). Center for Behavioral Health Statistics and Quality. https://www.samhsa.gov/data/sites/default/files/CBHSQ-DR-PTSDtrauma-2016/CBHSQ-DR-PTSDtrauma-2016.htm

Frans, O., Rimmö, P. A., Åber, L., & Fredrikson, M. (2005). Trauma exposure and post-traumatic stress disorder in the general population. *Acta Psychiatrica Scandinavica*, *111*(4), 291–299. https://doi.org/10.1111/j.1600-0447.2004.00463.x

Garnefski, N., & Kraaij, V. (2006). Relationships between cognitive emotion regulation strategies and depressive symptoms: A comparative study of five specific samples. *Personality and Individual Differences*, *40*(8), 1659–1669. https://doi.org/10.1016/j.paid.2005.12.009

Garnefski, N., Kraaij, V., & Spinhoven, P. (2001). Negative life events, cognitive emotion regulation and emotional problems. *Personality and Individual Differences*, *30*(8), 1311–1327. https://doi.org/10.1016/S0191-8869(00)00113-6

Gavazzeni, J., Wiens, S., & Fischer, H. (2008). Age effects to negative arousal differ for self-report and electrodermal activity. *Psychophysiology*, *45*(1), 148–151. https://doi.org/10.1111/j.1469-8986.2007.00596.x

Gomez, P., von Gunten, A., & Danuser, B. (2016). Autonomic nervous system reactivity within the valence–arousal affective space: Modulation by sex and age. *International Journal of Psychophysiology*, *109*, 51–62. https://doi.org/10.1016/j.ijpsycho.2016.10.002

Holmes, E. A., & Bourne, C. (2008). Inducing and modulating intrusive emotional memories: A review of the trauma film paradigm. *Acta Psychologica*, *127*(3), 553–566. https://doi.org/10.1016/j.actpsy.2007.11.002

Holz, E., Lass-Hennemann, J., & Michael, T. (2017). Analogue PTSD symptoms are best predicted by state rumination. *Journal of Experimental Psychopathology*, *8*(2), 192–213. https://doi.org/10.5127/jep.050915

Hussain, D., & Bhushan, B. (2011). Posttraumatic stress and growth among Tibetan refugees: The mediating role of cognitive-emotional regulation strategies. *Journal of Clinical Psychology*, *67*(7), 720–735. https://doi.org/10.1002/jclp.20801

Iyadurai, L., Visser, R. M., Lau-Zhu, A., Porcheret, K., Horsch, A., Holmes, E. A., & James, E. L. (2019). Intrusive memories of trauma: A target for research bridging cognitive science and its clinical application. *Clinical Psychology Review*, *69*, 67–82. https://doi.org/10.1016/j.cpr.2018.08.005

Jenkins, L. M., & Andrewes, D. G. (2012). A new set of standardised verbal and non-verbal contemporary film stimuli for the elicitation of emotions. *Brain Impairment*, *13*(2), 212–227. https://doi.org/10.1017/BrImp.2012.18

Jimenez, D. E., Alegrı, Ã. M., Chen, C.-N., Chan, D., & Laderman, M. (2010). Prevalence of psychiatric illnesses in older ethnic minority adults. *Journal of the American Geriatrics Society*, *58*(2), 256–264. https://doi.org/10.1111/j.1532-5415.2009.02685.x

Kemp, J., Després, O., Pebayle, T., & Dufour, A. (2014). Clinical neurophysiology age-related decrease in sensitivity to electrical stimulation is unrelated to skin conductance: An evoked potentials study. *Clinical Neurophysiology*, *125*(3), 602–607. https://doi.org/10.1016/j.clinph.2013.08.020

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, *62*(6), 593–602. https://doi.org/10.1001/archpsyc.62.6.593

Kubota, R., & Nixon, R. D. V. (2017). An analogue investigation into the effect of trauma-related rumination on trauma intrusions and the moderating role of trait rumination and depression. *Journal of Experimental Psychopathology*, *8*(4), 413–442. https://doi.org/10.5127/jep.058516

Lohani, M., & Isaacowitz, D. M. (2014). Age differences in managing response to sadness elicitors using attentional deployment, positive reappraisal, and suppression. *Cognition and Emotion*, *28*(4), 678–697. https://doi.org/10.1080/02699931.2013.853648

Markham, A., & Mason, S. (2016). The relationship between rumination, gender, age, and posttraumatic stress. *Modern Psychological Studies*, *21*(2), Article 11. https://doi.org/10.1371/journal.pone.0278328

Marks, E. H., Franklin, A. R., & Zoellner, L. A. (2018). Can't get it out of my mind: A systematic review of predictors of intrusive memories of distressing events. *Psychological Bulletin*, *144*(6), 584–640. https://doi.org/10.1037/bul0000132

Michael, T., Ehlers, A., Halligan, S. L., & Clark, D. M. (2005). Unwanted memories of assault: What intrusion characteristics are associated with PTSD? *Behaviour Research and Therapy*, *43*(5), 613–628. https://doi.org/10.1016/j.brat.2004.04.006

Monson, E., Lonergan, M., Caron, J., Brunet, A., Monson, E., Lonergan, M., Caron, J., & Brunet, A. (2015). Assessing trauma and posttraumatic stress disorder: Single, open-ended question versus list-based inventory. *Psychological Assessment*, *28*(8), 1001–1008. https://doi.org/10.1037/pas0000223

wNeiss, M. B., Leigland, L. A., Carlson, N. E., & Janowsky, J. S. (2009). Age differences in perception and awareness of emotion. *Neurobiology of Aging*, *30*(8), 1305–1313. https://doi.org/10.1016/j.neurobiolaging.2007.11.007

Neumann, E., & Blanton, R. (1970). The early history of electrodermal research. *Psychophysiology*, *6*(4), 453–475. https://doi.org/10.1111/j.1469-8986.1970.tb01755.x

Nolen-Hoeksema, S., & Aldao, A. (2011). Gender and age differences in emotion regulation strategies and their relationship to depressive symptoms. *Personality and Individual Differences*, *51*(6), 704–708. https://doi.org/10.1016/j.paid.2011.06.012

Norris, F. H., Friedman, M. J., Watson, P. A., Byrne, C. M., Diaz, E., & Kaniasty, K. (2002). 60,000 Disaster victims speak: Part I. An empirical review of the empirical literature, 1981–2001. *Psychiatry*, *65*(3), 207–239. https://doi.org/10.1521/psyc.65.3.207.20173

Nowlan, J. S., Wuthrich, V. M., & Rapee, R. M. (2015). Positive reappraisal in older adults: A systematic literature review. *Aging and Mental Health*, *19*(6), 475–484. https://doi.org/10.1080/13607863.2014.954528

Nowlan, J. S., Wuthrich, V. M., & Rapee, R. M. (2016). The impact of positive reappraisal on positive (and negative) emotion among older adults. *International Psychogeriatrics*, *28*(4), 681–693. https://doi.org/10.1017/S1041610215002057

Pietrzak, R. H., Goldstein, R. B., Southwick, S. M., & Grant, B. F. (2012). Psychiatric comorbidity of full and partial posttraumatic stress disorder among older adults in the United States: Results from wave 2 of the national epidemiologic survey on alcohol and related conditions. *American Journal of Geriatric Psychiatry*, *20*(5), 380–390. https://doi.org/10.1097/JGP.0b013e31820d92e7

Regambal, M. J., & Alden, L. E. (2009). Pathways to intrusive memories in a trauma analogue paradigm: A structural equation model. *Depression and Anxiety*, *26*(2), 155–166. https://doi.org/10.1002/da.20483

Reynolds, K., Pietrzak, R. H., Mackenzie, C. S., Chou, K. L., & Sareen, J. (2016). Post-traumatic stress disorder across the adult lifespan: Findings from a nationally representative survey. *American Journal of Geriatric Psychiatry*, *24*(1), 81–93. https://doi.org/10.1016/j.jagp.2015.11.001

Ricarte, J., Ros, L., Serrano, J. P., Martínez-Lorca, M., & Latorre, J. M. (2016). Age differences in rumination and autobiographical retrieval. *Aging and Mental Health*, *20*(10), 1063–1069. https://doi.org/10.1080/13607863.2015.1060944

Schooler, T. Y., Dougall, A. L., & Baum, A. (1999). Cues, frequency, and the disturbing nature of intrusive thoughts: Patterns seen in rescue workers after the crash of flight 427. *Journal of Traumatic Stress*, *12*(4), 571–585. https://doi.org/10.1023/A:1024756832073

Scott, S. B., Poulin, M. J., & Silver, R. C. (2013). A lifespan perspective on terrorism: Age differences in trajectories of response to 9/11. *Developmental Psychology*, *49*(5), 986–998. https://doi.org/10.1037/a0028916

Sears, S. R., Stanton, A. L., Danoff-burg, S., & Armstrong, L. (2003). The yellow brick road and the emerald city: Benefit finding, positive reappraisal coping, and posttraumatic growth in women with early-stage breast cancer. *Health Psychology*, *22*(5), 487–497. https://doi.org/10.1037/0278-6133.22.5.487

Seligowski, A. V., Lee, D. J., Bardeen, J. R., & Orcutt, H. K. (2015). Emotion regulation and posttraumatic stress symptoms: A meta-analysis. *Cognitive Behaviour Therapy*, *44*(2), 87–102. https://doi.org/10.1080/16506073.2014.980753

Seligowski, A. V., Rogers, A. P., & Orcutt, H. K. (2016). Relations among emotion regulation and DSM-5 symptom clusters of PTSD. *Personality and Individual Differences*, *92*, 104–108. https://doi.org/10.1016/j.paid.2015.12.032

Shiota, M. N., & Levenson, R. W. (2009). Effects of aging on experimentally instructed detached reappraisal, positive reappraisal, and emotional behavior suppression. *Psychology and Aging*, *24*(4), 890–900. https://doi.org/10.1037/a0017896

Spielberger, C. D., Gorsuch, R. L., Lushene, R., Vagg, P., & Jacobs, G. (1983). *Manual of the state-trait anxiety inventory*. Consulting Psychologists Press.

Sütterlin, S., Paap, M. C. S., Babic, S., Kübler, A., & Vögele, C. (2012). Rumination and age: Some things get better. *Journal of Aging Research*, *2012*, Article 267327. https://doi.org/10.1155/2012/267327

Szabo, Y. Z., Warnecke, A. J., Newton, T. L., & Valentine, J. C. (2017). Rumination and posttraumatic stress symptoms in trauma-exposed adults: A systematic review and meta-analysis. *Anxiety, Stress and Coping*, *30*(4), 396–414. https://doi.org/10.1080/10615806.2017.1313835

Urry, H. L., & Gross, J. J. (2010). Emotion regulation in older age. *Current Directions in Psychological Science*, *19*(6), 352–357. https://doi.org/10.1177/0963721410388395

Vrana, S., & Lauterbach, D. (1994). Prevalence of traumatic events and peritraumatic predictors of posttraumatic stress symptoms in a nonclinical sample of college students. *Journal of Traumatic Stress*, *7*(2), 289–302. https://doi.org/10.1002/jts.2490070209

Weiss, D. S., & Marmar, C. R. (1997). *The impact of event scale-revised*. Guilford Press.

Wirth, M., & Kunzmann, U. (2018). Age differences in regulating negative emotions via attentional deployment. *Psychology and Aging*, *33*(3), 384–398. https://doi.org/10.1037/pag0000254

Woud, M. L., Holmes, E. A., Postma, P., Dalgleish, T., & Mackintosh, B. (2012). Ameliorating intrusive memories of distressing experiences using computerized reappraisal training. *Emotion*, *12*(4), 778–784. https://doi.org/10.1037/a0024992

Woud, M. L., Postma, P., Holmes, E. A., & MacKintosh, B. (2013). Reducing analogue trauma symptoms by computerized reappraisal training—Considering a cognitive prophylaxis? *Journal of Behavior Therapy and Experimental Psychiatry*, *44*(3), 312–315. https://doi.org/10.1016/j.jbtep.2013.01.003

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