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Rapid Emotion Regulation After Mood Induction: Age and Individual Differences

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Previous research has suggested that emotion regulation improves with age. This study examined both age and individual differences in online emotion regulation after a negative mood induction. We found evidence that older adults were more likely to rapidly regulate their emotions than were younger adults. Moreover, older adults who rapidly regulated had lower trait anxiety and depressive symptoms and higher levels of optimism than their same-age peers who did not rapidly regulate. Measuring mood change over an extended time revealed that older rapid regulators still reported increased levels of positive affect over 20 min later, whereas young adult rapid regulators' moods had declined. These results highlight the importance of considering individual differences when examining age differences in online emotion regulation.

Key Words: Age differences—Emotion regulation—Individual differences.

RESEARCH using both self-report and experimental methods has suggested that emotion regulation and mood management improve with age. For example, in a study that compared the self-reported emotional experience of younger, middle-aged, and older adults, older participants (those aged 60+ years) were more likely to agree with statements, which reflected high levels of emotional control and mood stability (Lawton, Kleban, Rajagopal, & Dean, 1992). Other research also found that older adults report increased emotion regulation capabilities along with experiencing fewer negative emotions compared with their younger counterparts (Gross, Carstensen, Pasupathi, Tsai, Skorpen, & Hsu, 1997). This study drew from diverse populations, yet the results across all samples were strikingly similar: Older adults reported overall better control of their emotions than did younger adults. Sampling emotional experience in daily life has revealed that in addition to declining in frequency, the duration of negative emotional states may decrease with age, further suggesting that older adults might be better emotion regulators compared with younger adults (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000).

Recent experimental research also indicates that older adults may possess superior emotion regulation abilities when compared with their younger counterparts. One study found that instructing older participants to use *positive refocusing* while viewing an upsetting film clip significantly reduced their reported experience of negative affect (Phillips, Henry, Hosie, & Milne, 2008). For younger adults, however, the instructions to reappraise the video in a more positive light did not affect their experience of negative emotions. Research on emotion regulation within the domain of interpersonal problem solving suggests that older adults prioritize managing their emotions during problem solving and that the specific emotion-focused strategies that they use are more effective when dealing with emotionally charged problems compared with those employed by younger individuals (Blanchard-Fields, 2007; Blanchard-Fields, Chen, & Norris, 1997; Blanchard-Fields, Jahnke, & Camp, 1995; Blanchard-Fields, Stein, & Watson, 2004).

One possible explanation as to why older adults appear to be better emotion regulators has to do with an age-related increase in the prioritization of emotion regulatory goals. According to socioemotional selectivity theory (SST), older adults are motivated to regulate their emotions such that positive affective states are maintained and negative affective states are avoided (Carstensen, Isaacowitz, & Charles, 1999). In line with SST, older individuals show preferences for attending to positive emotional information (Isaacowitz, Wadlinger, Goren, & Wilson, 2006a, 2006b; Mather & Carstensen, 2003), which might help them to achieve their emotion regulatory goals. Recent research has found that older adults induced into a negative mood looked longer at happy faces compared with those induced into positive or neutral affective states. Younger adults, on the other hand, displayed mood-congruent attentional patterns, viewing negative faces more when induced into a negative mood (Isaacowitz, Toner, Goren, & Wilson, 2008).

Although research has shown a general age trajectory of changes in emotion regulation and has proposed a possible mechanism by which it is achieved, lingering questions still exist, such as: Are all older adults good emotion regulators or are some better than others? The current research considers the role of individual differences in the online emotion regulation of older adults. Differences between individuals increase with age (Dannefer, 1988), and often, knowing how a general process operates in older adults is not enough to understand it completely. For example, although overall older adults report a decrease in their experience of negative affect, this decrease does not occur in those individuals who report high levels of neuroticism (Charles, Reynolds, &

Gatz, 2001). Therefore, the purposes of the current study were to determine how individual affect-relevant traits such as anxiety, neuroticism, the experience of depressive symptoms, pessimism, and optimism impact online emotion regulation and to see if the pattern and the effect of these factors vary by age. We discuss the rationale for choosing these individual difference variables subsequently.

Individual differences in emotion regulation

Research has shown that high levels of traits such as anxiety and neuroticism—components of the larger construct of negative affectivity (NA; Watson & Clark, 1984)—are associated with ineffective emotion regulation (John & Gross, 2007). According to Watson and Clark, individuals high in NA are more likely to experience emotional distress in response to situations compared with those who are low in that dispositional dimension. In line with this hypothesis, research in a sample of older adult caregivers found a relationship between negative affect and fluctuations in anxiety: Those who had more stability in levels of anxiety reported less negative affect (and more positive affect) compared with individuals whose anxiety levels were more variable (Shifren & Hooker, 1995a).

Looking at individual differences in emotion regulation from the perspective of regulation strategies, research has shown that individuals' greater use of suppression—a strategy that downregulates the expression of negative emotions, but does not necessarily reduce the experience of it—was related to a greater experience of negative emotions and depressive symptoms and lower levels of optimism. The use of cognitive reappraisal (viewing negative situations in a more positive light) was associated with less experience of negative emotions and depressive symptoms and higher levels of optimism (Gross & John, 2003). Because this study was correlational, we cannot conclude that low levels of depression and high levels of optimism resulted in those individuals being better emotion regulators; however, these results still propose a possible profile of someone who would be successful during online emotion regulation.

Although aspects of NA are associated with ineffective alleviation of negative emotions and moods, researchers have suggested that optimism might be related to the successful regulation of negative affective states (Gross & John, 2003; John & Gross, 2007). Optimists tend to be happier, less depressed, and have better coping strategies than more pessimistic individuals (Scheier & Carver, 1992, 1993). Research in an older caregiver sample found that those with higher reports of optimism had lower levels of negative affect. Additionally, individuals high in dispositional optimism also reported greater variability in state optimism, which suggested that the influence of individual differences might play a role in the ability to modulate optimism in response to situations (Shifren & Hooker, 1995b). As in emotion regulation in older adults, gaze preferences are one proposed mechanism for optimists' positive outlook. One study found that optimistic individuals looked less at skin cancer images than their more pessimistic counterparts (Isaacowitz, 2005).

Current study

The current study used a mood induction technique to arouse negative emotions in older and younger adults in order to investigate age and individual differences in online emotion regulation. The first research question that we addressed was: Are some individuals better than others at emotion regulation in that they are able to regulate their emotions in a very short period of time, and does the likelihood of being one of these "rapid regulators" vary by age? We hypothesized that age would indeed affect the likelihood of being a rapid regulator and that more older adults would report quick regulation of mood compared with younger ones. As a follow-up to our first research question, we wanted to determine if those who rapidly regulated their emotions and those who did not differed with regard to affect-relevant traits such as anxiety, frequency of depressive symptoms, neuroticism, and levels of pessimism and optimism. Again, we looked at the pattern and the effect of these traits within the context of age-related differences. Although the differential *effects* of these traits on emotion regulation have not often been examined in the context of aging, findings of age-related decreases in negative affect (e.g., Carstensen et al., 2000; Charles et al., 2001; Mroczek & Kolarz, 1998) might suggest that older adults who were able to rapidly regulate their emotions would have the lowest levels of affective traits related to the experience of negative emotions. In other words, older adults who are able to rapidly end negative moods may be unique from their age peers as well as from younger adults in having especially low levels of trait anxiety, depressive symptoms, neuroticism, and pessimism and higher levels of optimism. Our final research question involved determining what effects rapid emotion regulation had on mood as it was measured over time. Based on past findings that older adults endorse statements of mood stability (e.g., Lawton et al., 1992), we expected that those older individuals who rapidly regulated their mood would maintain that positive affective state as time progressed. For younger adults, however, we predicted that any initial regulation from a negative to a positive mood would not last over time (Carstensen et al.; Gross et al., 1997; Lawton et al.). We believe that the assessment of affect across a longer time span was critical because *successful* emotion regulation is indicated not only by a rapid change in mood but also by a sustained well-regulated affective state.

Methods

Participants

Thirty-six older adults (8 men and 28 women) aged 58–82 years ($M = 72.08$ years, $SD = 7.18$) and 27 younger adults

(12 men and 15 women) aged 18–25 years (M = 19.93 years, SD = 2.02) participated in the current study. Older adults were recruited from a lifelong learning program and received a monetary stipend for their participation. Younger adults were recruited through an introductory psychology course and received class credit for their participation. The data for the current research come from a larger eye-tracking study that looked at the effect of mood on age differences in gaze preferences (see Isaacowitz et al., 2008). As the percentage of successfully tracked older adults is lower in comparison to younger participants, older individuals were oversampled in order to have similar numbers of trackable participants in both age groups.

In terms of sample demographics, older and younger participants reported similar levels of current health (M = 3.89 out of a range from 1 [*poor*] to 5 [*excellent*], SD = .89 and M = 3.85, SD = .77, respectively), $t(61) = -.17$, $p = .86$. Older adults completed significantly more years of education (M = 16.72, SD = 1.86) compared with younger adults (M = 12.70, SD = 1.94), $t(61) = -8.33$, $p < .001$.

Measures of Affect-Relevant Traits

Trait anxiety.—The Form Y version of the State–Trait Anxiety Inventory (STAI; Spielberger, 1983; Spielberger, Gorsuch, & Luschene, 1970) was used to assess participants' trait levels of anxiety. The trait component of the STAI is commonly used to measure the intensity of and frequency with which individuals experience feelings of worry and nervousness in their daily lives (Barnes, Harp, & Jung, 2002). This measure was found to have a mean alpha coefficient of .90 and test–retest reliability coefficients ranging from .73 to .86 (Spielberger). For our older and younger adult subsamples, we found internal consistencies ($\alpha_{\text{OlderAdults}}$ [α_{OA}] = .92 and $\alpha_{\text{YoungerAdults}}$ [α_{YA}] = .94) that were in line with those reported by Spielberger.

Depressive symptoms.—The frequency of the experience of depressive symptoms was evaluated by the original version of the Center for Epidemiological Studies-Depression scale (CES-D; Radloff, 1977). The CES-D is widely used in psychological and psychiatric research (see Eaton, Smith, Ybarra, Muntaner, & Tien, 2004 for a comprehensive history and review of this measure). Like the STAI trait, the CES-D is a reliable assessment with alpha coefficients of internal consistency ranging from .80 to .90 and a 2-week to 1-year test–retest reliability ranging from .40 to .70 (Eaton et al.). The internal consistencies found in the current study, α_{OA} = .86 and α_{YA} = .91, were similar to those previously reported.

Neuroticism.—Neuroticism was assessed with the Neuroticism Questionnaire (N-Questionnaire) as used in the research of Bolger and Schilling (1991). The N-Questionnaire is a shortened form of the Neuroticism Scale from the Eysenck Personality Inventory (Eysenck & Eysenck, 1964). Two examples of the 11 items on the N-Questionnaire are (a) "In general are your feelings easily hurt?" and (b) "Would you call yourself tense or 'high strung'." Scores on this measure can range from 11 to 22, depending on whether a participant responded "no" or "yes" to each item. In their research, Bolger and Schilling found that the questionnaire had an internal consistency of .78. The short version of the Eysenck Personality Questionnaire-Revised (EPQS-R; Eysenck & Eysenck, 1992) contains 12 items that assess neuroticism—11 of these identical to those of the N-Questionnaire. Using the neuroticism scale of the EPQS-R in order to examine the psychometric properties of the extremely similar N-Questionnaire revealed internal consistencies ranging from .71 to .87 (Alexopoulos & Kalaitzidis, 2004; Aluja, García, & García, 2003; Hosokawa & Ohyama, 1993) and a 6-month test–retest reliability of .79 (Hosokawa & Ohyama). The alpha coefficients found for the N-Questionnaire in the current study were on the lower end of the range reported in previous literature for those of the EPQS-R, α_{OA} = .72 and α_{YA} = .67; however, they are still satisfactory (see Aiken, 1999). The neuroticism scale of the EPQS-R also has good concurrent validity as it correlates significantly with the neuroticism scales of the Revised NEO Personality Inventory, r = .77, and the Zuckerman–Kuhlman Personality Questionnaire, r = .80 (Aluja, García, & García, 2002).

Optimism and pessimism.—Dispositional optimism and pessimism were assessed separately using the original version of the Life Orientation Test (LOT; Scheier & Carver, 1985). Scheier and Carver found that this measure has a mean Cronbach's alpha coefficient of .76 and a test–retest correlation of .79 for a period of 4 weeks. The items measuring optimism and pessimism had adequate internal consistencies in both our older and younger samples, α_{OA} = .86 and α_{YA} = .80 (LOT optimism) and α_{OA} = .70 and α_{YA} = .84 (LOT pessimism).

Procedure

Upon arrival at the laboratory and after giving their informed consent, participants completed the affective questionnaires in randomized orders. After this, participants were induced into a negative mood using the Eich Continuous Music mood induction technique (Eich & Metcalfe, 1989). In this procedure, participants listened to music that has been shown to reliably induce a negative mood while thinking of mood-congruent thoughts. Before beginning the mood induction procedure, participants were instructed on how to chart their mood using an *affect grid*. The affect grid is a 9 × 9 matrix of squares that measures valence on the *x*-axis (ranging from very negative on the far left to very positive on the far right) and arousal on the *y*-axis (ranging from very low arousal at the bottom to very high arousal at the

top of the grid). The grid was displayed on a computer screen, and participants were instructed to make mouse clicks on the grid every time their mood changed. Using Virtual Network Computing, an experimenter in another room was able to watch participants charting the changes in their moods on the grid. The induction was considered successful when participants' mouse clicks were in the area of the grid that represented negative mood (left quadrants) for at least 30 s. The induction was successful for 94% of older participants ($n = 34$) and 96% of younger participants ($n = 26$). Only those participants who were successfully induced into a negative mood were included in the final data analysis.

After indicating being in a negative mood on the affect grid, participants were instructed on how to rate their current mood using an analog slider (Empirisoft Corporation, New York, NY); approximately 3 min elapsed between participants' last mood rating on the affect grid and their first rating on the slider. The slider measured mood on a scale of 0–100 (0 = *extremely negative*; 100 = *extremely positive*). Dividing the range of these initial slider ratings (10–100) from the grand *N* of the study (106 older adults and 85 younger adults; see Isaacowitz et al., 2008) into tertiles created the categories of "negative" (ratings of 10–49), "neutral" (ratings of 50–67), and "positive" (ratings of 68–100) slider ratings. We then divided individuals into "rapid" and "nonregulation" groups, with rapid regulators being those whose initial slider ratings were >50 (positive and neutral groups) and nonregulators as those whose slider ratings were <50 (negative group). For their first slider rating, 17 older and 8 younger participants indicated that they were in a neutral or positive mood and accordingly were classified as rapid regulators, whereas 17 older and 17 younger adults still reported experiencing a negative affective state—they were classified as nonregulators. We should note that the term "nonregulator" does not imply that these individuals did not make any attempts to regulate their emotions; however, we gave them this label because we did not find evidence of rapid emotion regulation attempts on their part, using the measures available to us in this study.

In order to compare pre- and postinduction mood rated on the affect grid with later mood rated on the slider, we gave values to the valence-measuring *x*-axis of the grid based on those of the slider; similar to the slider, the assigned values for the grid ranged from 10 (*extremely negative*) to 100 (*extremely positive*). Older rapid regulators' preinduction mood was significantly better than that of older nonregulators ($M = 71.53$, $SD = 16.11$ and $M = 52.56$, $SD = 22.16$, respectively), $t(32) = -2.91$, $p < .01$. For younger adults, no preinduction differences in mood were found between rapid ($M = 48.63$, $SD = 19.63$) and nonregulators ($M = 52.71$, $SD = 19.60$), $t(23) = .49$, $p = .63$. Most importantly, however, we did not find any differences in postinduction negative mood between both older and younger rapid regulators and nonregulators, $t(32) = .44$, $p = .66$ and $t(32) = 1.03$, $p = .32$, respectively. This suggests that the induction was equally effective in producing negative moods across age groups.

One younger adult participant was excluded from analysis because of missing slider ratings, which resulted in us being unable to place this person in a regulation category. After the initial rating, we continued to measure changes in mood in 2-min intervals using the slider for approximately 24 min as participants completed another task. Throughout this time, participants were frequently reminded to make slider ratings allowing us to determine their current mood every 2 min.

Results

Age Differences in Affect-Relevant Traits

Before testing our three main hypotheses, we conducted preliminary analyses to explore the age differences with regard to the measured affect-relevant traits. On the STAI, we found a nonsignificant trend for older adults to report lower levels of trait anxiety ($M = 34.76$, $SD = 9.63$) in comparison to younger adults ($M = 39.27$, $SD = 10.49$), $t(57) = 1.71$, $p = .09$. A significant difference between older and younger adults, however, was found for levels of depressive symptoms as measured by the CES-D. Older participants' scores on the CES-D reflected that they experienced depressive symptoms significantly less often compared with their younger counterparts ($M = 8.16$, $SD = 7.26$ and $M = 14.63$, $SD = 9.67$, respectively), $t(61) = 3.05$, $p < .01$. Following the pattern of age differences on the other measures of affect-relevant traits, older adults scored significantly lower on the N-Questionnaire ($M = 13.87$, $SD = 3.06$) than younger adults ($M = 15.07$, $SD = 3.05$), $t(59) = 2.15$, $p < .05$. Finally, our analyses revealed that levels of dispositional pessimism were significantly lower in older adults ($M = 3.36$, $SD = 3.44$) than in younger adults ($M = 5.89$, $SD = 3.25$), $t(61) = 3.53$, $p = .001$; however, there was no difference between the two groups in their levels of optimism, $t(61) = -.26$, $p = .80$.

Likelihood of Rapid Regulation or Nonregulation Among Older and Young Adults

In testing our first hypothesis, we conducted *t*-tests on older and younger participants' first slider ratings as higher ratings among these participants who had previously been induced into a negative mood indicated rapid regulation. Overall, older adults had significantly higher initial slider ratings ($M = 56.31$, $SD = 26.26$) compared with younger participants ($M = 41.68$, $SD = 21.54$), $t(57) = -2.29$, $p < .05$. Considering the categorization of participants into groups of rapid regulators and nonregulators, a goodness-of-fit chi-square test (χ^2) revealed that older adults were just as likely to be rapid regulators as nonregulators, χ^2 (1, $N = 34$) = .00, $p = 1.00$; however, for younger adults a trend was found in which they were more likely to be nonregulators than rapid regulators, χ^2 (1, $N = 25$) = 3.24, $p = .07$.

Next, we looked at whether the earlier findings might simply be a side effect of differences in how we categorized rapid regulators and nonregulators. We evaluated this in two ways. First, we recategorized participants based on the magnitude of change from the affect grid to the slider. Change scores were calculated by subtracting the final grid rating from the first slider rating. Participants whose change scores were above the median, a score of 23, were classified as rapid regulators. Those whose change scores were less than 23 were classified as nonregulators. When the groups were recategorized in this manner, we found a significant age difference in the likelihood of being a rapid regulator. As expected, older adults were more likely to be classified as rapid regulators than younger individuals, χ^2 (1, N = 59) = 3.83, p = .05.

We then returned to our original categorization and evaluated the change scores for the regulators and nonregulators in both age groups, $t(23) = -.80$, $p = .44$ and $t(32) = -.66$, $p = .52$, respectively. Together, these findings suggest that our categorization is not simply an artifact of how we defined what it means to regulate; instead, there were clear groups of subjects who regulated into better mood states and those who stayed in worse ones, and older adults were overrepresented in the regulation group.

We did not find a significant difference in the likelihood of males or females being rapid regulators within either the older adult, χ^2 (1, N = 34) = .00, p = 1.00, or the younger adult age group, χ^2 (1, N = 25) = 1.78, p = .18.

Effects of Rapid Regulation and Age on Affect-Relevant Traits

To test our second hypothesis, we first conducted 2 × 2 (regulation category: rapid regulators vs. nonregulators [We continued with our original categorization given the earlier findings.] × age: older vs. young adults) analyses of variance (ANOVAs) to determine if those participants who rapidly regulated their mood differed in terms of their affect-relevant traits from those who did not and if this difference varied by age. For trait anxiety, there was a nonsignificant trend toward a main effect of age, $F(1, 51) = 3.29$, $p = .08$, partial $\eta^2 = .06$; however, there was not a significant main effect of regulation category nor a significant interaction effect between the two variables. For depressive symptoms, there was a significant main effect of age, $F(1, 55) = 7.75$, $p < .01$, partial $\eta^2 = .12$, and a nonsignificant trend for regulation category, $F(1, 55) = 2.84$, $p = .10$, partial $\eta^2 = .05$. Again, a significant interaction effect did not emerge. For neuroticism, there was a significant main effect of age, $F(1, 57) = 4.80$, $p < .05$, partial $\eta^2 = .08$, a nonsignificant trend for regulation category, $F(1, 57) = 3.02$, $p = .09$, partial $\eta^2 = .05$, but no significant interaction. For LOT optimism scores, a significant main effect of regulation category was found, $F(1, 55) = 6.75$, $p < .05$, partial $\eta^2 = .11$, such that rapid regulators reported higher levels of optimism (M = 11.24, SD = 2.28) compared with nonregulators (M = 9.15, SD = 3.02). No main effect of age or significant interaction emerged. Finally, for LOT dispositional pessimism, there was a main effect of age, $F(1, 55) = 14.50$, $p < .001$, partial $\eta^2 = .21$, no effect of regulation category, and a nonsignificant trend for the interaction effect, $F(1, 55) = 3.06$, $p = .09$, partial $\eta^2 = .05$.

ANOVAs are not optimal in cases such as the current study, in which cell sizes are extremely unequal (Keppel, 1991). In such cases, ANOVA can fail to detect even large effects that are significant with equal sample sizes (Rosenthal & Rosnow, 1984). In the current study, the unequal cell sizes were a key finding, not a limitation. We therefore conducted two other analyses to better capture possible differences between the groups. First, contrast analyses were conducted in order to test our specific hypothesis that older rapid regulators would show the best affective profile in comparison to the other groups. We found that in comparison to nonregulating older adults, regulating and nonregulating younger adults, older rapid regulators had significantly lower levels of trait anxiety, $F(1, 51) = 6.19$, $p < .05$, partial $\eta^2 = .11$, depressive symptoms, $F(1, 51) = 8.09$, $p < .01$, partial $\eta^2 = .13$, neuroticism, $F(1, 53) = 6.18$, $p < .05$, partial $\eta^2 = .10$, and pessimism, F (1, 55) = 9.63, $p < .01$, partial $\eta^2 = .15$. Additionally, we found a trend for older rapid regulators to have higher levels of optimism compared with the other groups, $F(1, 55) = 3.73$, $p = .06$, partial $\eta^2 = .06$.

In addition, we examined rapid regulators' and nonregulators' scores on the measures separately by age group. As shown in Figure 1, we found that older adults who quickly regulated their mood reported significantly less trait anxiety compared with those who did not, $t(18.43) = 2.13$, $p < .05$ (A Levene's test revealed that the variances were not equal. The reported degrees of freedom and t and p values are those for which equal variances were not assumed.). In addition, older rapid regulators reported experiencing fewer depressive symptoms than nonregulators, $t(32) = 2.20$, $p < .05$, along with significantly higher levels of optimism, $t(32) = -3.53$, $p < .01$. A trend for rapid regulators to have lower levels of neuroticism was also found, $t(18.77) = 1.78$, $p = .09$ (A Levene's test revealed that the variances were not equal. The reported degrees of freedom and t and p values are those for which equal variances were not assumed.). The two groups did not differ, however, with regard to their self-reports of pessimism, $t(32) = 1.68$, $p = .11$. When examining the pattern of affect-relevant traits in younger adults, we found that it did not match those of older participants: Rapid and nonregulator young adults did not differ significantly with regard to any of the measured affect-relevant traits.

As an exploratory analysis, we compared the affect-relevant traits of older and younger rapid regulators. Independent sample t-tests revealed that older rapid regulators had significantly lower levels of trait anxiety, $t(22) = 3.22$, $p < .01$, and neuroticism, $t(23) = 2.39$, $p < .05$, and reported experiencing depressive symptoms significantly less often

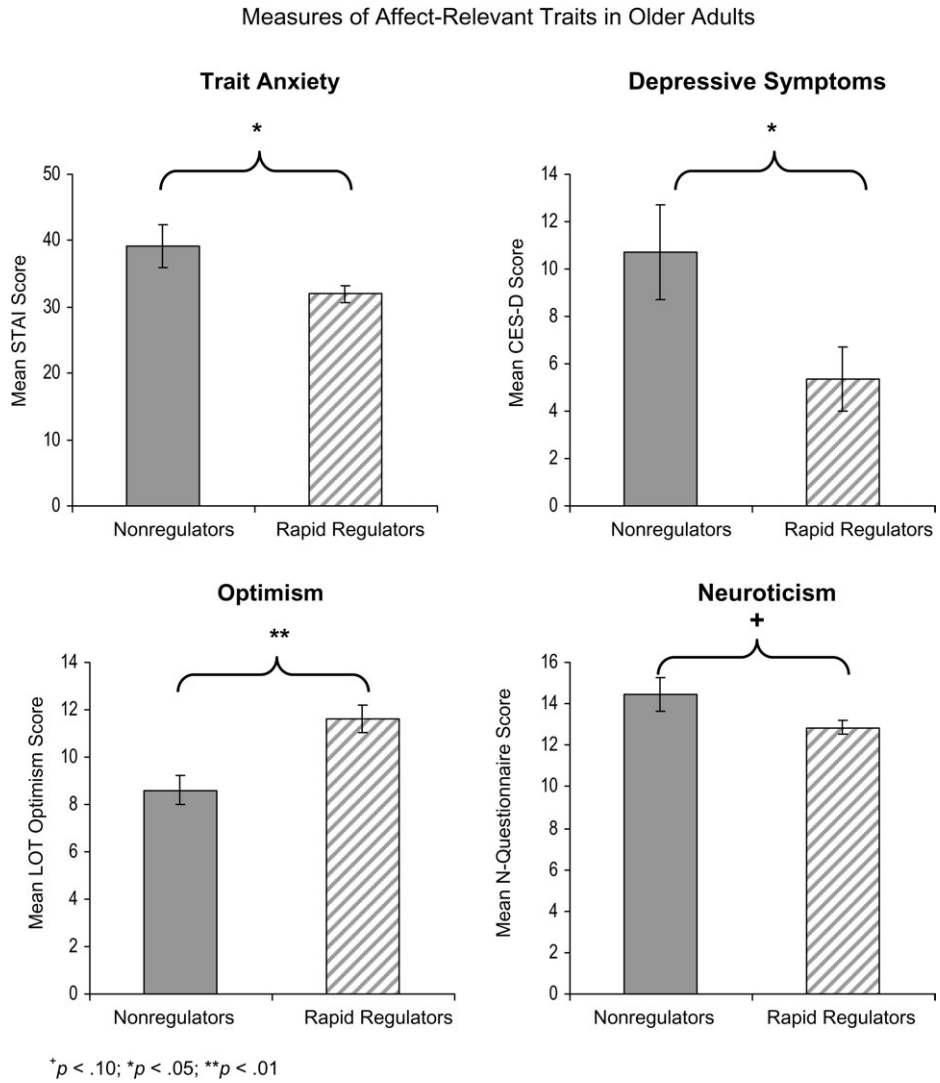

Figure 1. Mean scores on measures of trait anxiety, frequency of the experience of depressive symptoms, optimism, and neuroticism for rapid regulating ($N = 17$) and nonregulating ($N = 17$) older adults.

than their younger counterparts, $t(22) = 3.16$, $p < .01$. In addition, older participants who rapidly regulated their mood scored significantly lower on LOT items measuring pessimism compared with younger rapid regulators, $t(23) = 3.45$, $p < .01$; however, a significant difference in levels of optimism was not found, $t(23) = -.73$, $p = .47$.

Effects of Mood Regulation Over Time

To test our final hypothesis that older rapid regulations would be more able to maintain their positive mood over time than their younger counterparts, current affect was measured throughout an approximately 24-min time span. We conducted a 2 × 2 between groups ANOVA on change scores that were created by subtracting participants' initial slider rating from their last slider rating. This analysis showed a significant emotion regulation category by age interaction, $F(1, 53) = 4.80$, $p < .05$, $\eta^2 = .08$. This interaction was driven primarily by the younger adult rapid regulators, who reported a 31-point drop in mood. As shown in Figure 2, younger adults who initially regulated their mood began to report more negative affect as time progressed. Initially, significant differences between the young adults who did and did not rapidly regulate, $t(23) = -8.53$, $p < .001$, no longer remained significant by the final slider rating, $t(23) = .39$, $p = .71$. For older rapid regulators, however, their mood remained significantly more positive compared with the older nonregulators from the first, $t(32) = -6.82$, $p < .001$, until the final slider rating, $t(32) = -3.21$, $p < .01$. Importantly, there was no significant difference between older rapid regulators and younger rapid regulators in their first slider rating, $t(23) = -1.05$, $p = .31$.

Discussion

The current study examined how age and individual differences affect online emotion regulation. Past research

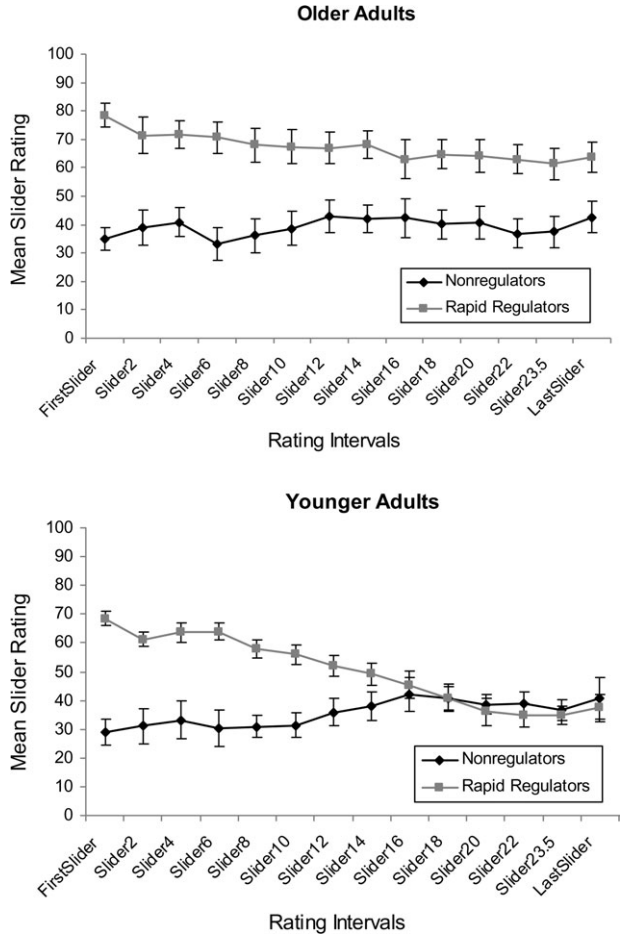

Figure 2. Change in mood over approximately 24 min while performing a concurrent task, depicted separately by age group (older adults: top graph; young adults: bottom graph). Rapid regulators are represented by gray, nonregulators are represented by black. Mood ratings were captured before the concurrent task began (*FirstSlider*), every 2 min thereafter until the final presentation of the task (*Slider23.5*), and then immediately after completing the task (*LastSlider*).

has shown that older adults report having better control over their emotions compared with younger individuals (Carstensen et al., 2000; Gross et al., 1997; Lawton et al., 1992). The current research revealed that they might be better in regulating their emotions in real time as well but that it depends to some degree on individual differences. As indicated by high first slider ratings, older adults seemed to be rapidly regulating their mood more than younger adults. With regard to individual differences in affect-relevant traits, we found that older adults who rapidly regulated their negative mood had lower levels of trait anxiety, neuroticism, and depressive symptoms, and higher levels of optimism than those who did not regulate their negative affective state. In older adults, the effect of these traits on emotion regulation ability is consistent with what the literature would predict. For example, John and Gross (2007) speculated that optimistic individuals would be better at regulating their emotions as they would have an easier time reappraising negative situations in a more positive light. They also predicted, based on Scheier and Carver's (1992) work, that optimists would have less anxiety about experiencing situations where negative emotions might arise because they feel that they have more control over those situations and their responses to them. Indeed, we found that older participants who quickly regulated their mood reported less trait anxiety compared with those who did not regulate their negative mood.

Younger participants did not display the same patterns of affective-relevant variables as their older counterparts. Moreover, rapid young regulators who initially reported being in a positive mood started to feel more negative as time passed. Older adults who quickly regulated their mood, however, maintained that positive affective state over time. From these results, two questions emerge: (a) Why did individual differences play a role in the rapid mood regulation of older adults but not younger adults and (b) What do the later effects of older adults' rapid regulation tell us about their emotion regulation abilities?

The answers to these two questions may be related. Rapidly regulating older adults were able to maintain their regulated mood over time, whereas rapidly regulating young adults showed only transient, and not sustained, regulation. This suggests that the older rapid regulators were actually better at regulation even than the younger rapid regulators. The affect-relevant trait results revealed that older adult rapid regulators showed a profile of traits thought to facilitate emotion regulation ability, whereas young adult rapid regulators did not show any particular profile of affect-relevant traits. Together, these findings paint a picture of a subgroup of older individuals deploying expertise in emotion regulation, rooted in their affectively resilient personalities. In contrast, the (fewer) younger adults who rapidly regulated were not drawing on resilient affect profiles and could not sustain their better mood over time. One possibility is that the younger adult rapid regulators were using a strategy of suppression and that attempts to suppress the negative feelings dissipated as time passed (see Gross & John, 2003 for evidence of suppression being a less effective emotion regulation strategy). Older adult rapid regulators did not show this susceptibility.

We should note, however, that the previously posed questions can also be answered from another perspective. Skilled emotion regulation abilities, which older rapid regulators were displaying, may develop over time. In turn, this superior emotion regulation ability could influence and alter affect-relevant traits such as the ones examined in the current study in a way that continues to promote successful emotion regulation. Additionally, with more years of emotion regulation experience, young rapidly regulating individuals may come to resemble their older counterparts both in affective profile and in their ability to sustain a regulated positive mood over a prolonged period of time. Finally, there is one more possible explanation for our findings that should be

acknowledged: The older sample might have been more highly motivated to maintain their regulated emotional state because they were paid for their participation and were in a relatively novel environment, whereas the younger sample consisted of college students fulfilling a course requirement who may have more easily become bored by the experiment. Although we cannot rule out this explanation for our results, we believe it unlikely that all our findings are simply side effects of differential compensation.

Limitations and Conclusions

In addition to the low *N* of younger adults, a limitation of the current study is that we do not know if the affective profile of older rapid regulators—low trait anxiety, depressive symptoms, levels of neuroticism, and high levels of optimism—caused them to rapidly regulate their mood or if rapid mood regulation promotes this particular pattern of affect-relevant traits. Future research will need to be conducted in order to address this directionality issue.

Another limitation is that while we have reason to believe that younger rapid regulators were using suppression as an emotion regulation strategy because of their inability to maintain a regulated positive mood state, we do not know this for certain. A measure such as Gross and John's (2003) Emotion Regulation Questionnaire would have been useful in the current study as we could have observed what specific strategies—suppression or reappraisal—older and younger rapid regulators and nonregulators prefer to use. It will remain for future research to make this link more explicitly.

Related to this issue, we do not know exactly *how* older rapid regulators repaired their mood. Specifically, from our measures, we could not infer whether they used deliberate effortful processing to regulate their emotions or if they relied on more automatic processes. The field of emotion and aging research is still determining how much cognitive effort older individuals exert when regulating their emotions (for examples of this literature, see Allard & Isaacowitz, 2008; Carstensen & Mikels, 2005; Isaacowitz, Allard, Murphy, & Schangel, 2009; Knight et al., 2007; Labouvie-Vief, Diehl, Jain, & Zhang, 2007). The design of the current study did not allow us to answer this question; however, whether using effortful or automatic processing, older rapid regulators seem to be a unique group of individuals who had superior emotion regulation ability along with an affective profile that promotes well-being.

One unexpected but critical finding of the current study is that mood induction techniques do not affect everyone in the same way. This research used a mood induction technique that encouraged participants to think mood-congruent thoughts while listening to music intended to elicit a negative affective state. Music is commonly used in mood inductions (see Eich, Ng, Macaulay, Percy, & Grebneva, 2007; Gerrards-Hesse, Spies, & Hesse, 1994); however, the current study shows that researchers need to be aware that once the music stops or the mood induction procedure ends—the negative (or positive) stimuli is removed—some participants can quickly regulate themselves out of that induced affective state, and this will depend on age and individual difference factors. Simple manipulation checks, such as asking participants to rate their mood, should be done throughout the experiment to determine changes in mood that occur after the induction technique. Also, these frequent manipulation checks are essential when determining in which experimental groups participants should be placed.

Although this research supports previous self-report (e.g., Carstensen et al., 2000; Gross et al., 1997; Lawton et al., 1992) and experimental evidence (e.g., Blanchard-Fields et al., 1995, 1997, 2004; Isaacowitz et al., 2008; Phillips et al., 2008) suggesting that overall older adults are better at emotion regulation than younger ones, it also adds to this literature in one important way: Even among older adults, some may be better than others at regulating their affective states. The current study shows that a comprehensive picture of the effects of aging on emotion regulation must consider not only age differences but individual differences as well.

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