Emotion

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Anger Regulation Choice—The Role of Age and Habitual Reappraisal

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The ability to choose emotion regulation strategies in accordance to contextual demands, known as emotion regulation flexibility, is key to healthy adaptation. While recent investigations on spontaneous emotion regulation choice tested the effects of emotional intensity and age using standardized negative pictures with no particular emotional quality, we elicited the discrete emotion of anger with personally relevant autobiographical memories in a sample of 52 younger and 41 older adults. In addition, we included habitual reappraisal as a predictor of emotion regulation choice. Our main hypothesis was that, compared with younger adults, older adults prefer less resource-demanding emotion regulation strategies (i.e., distraction) over more resource-demanding strategies (i.e., reappraisal), particularly if older adults' habitual reappraisal is low and the to-be-regulated anger is of high intensity. Surprisingly, our findings suggest that only older adults' emotion regulation choices depend on the emotional intensity of the autobiographical memory and habitual reappraisal. Only older adults with high habitual reappraisal preferred to reappraise their anger in situations of low anger intensity but switched to the less demanding strategy of distraction in high anger memories, indicating emotion regulation flexibility. This study extends previous research by testing emotion regulation choices in natural contexts and considering regulation habits. Although we replicate previous findings of emotion regulation flexibility according to emotional intensity in anger memories for older adults with high habitual reappraisal only, our findings illustrate the relevance of reappraisal habits to emotion regulation choice in age-comparative research.

Keywords: emotion regulation choice, anger, emotional aging, habitual reappraisal

Supplemental materials: https://doi.org/10.1037/emo0000915.supp

Although aging is associated with loss in many life domains, emotional well-being remains stable or even increases with age (e.g., Carstensen et al., 2011; Charles et al., 2001). Older adults' stable and relatively high levels of emotional well-being have been attributed to age-related gains in emotion regulation (e.g., Carstensen, 2006; Charles, 2010). Emotion regulation, defined as processes by which we influence which emotions we have, when we have them and how we experience and express these emotions (Gross, 1998) can be achieved by a variety of regulatory strategies that differ in multiple aspects, including the degree to which they

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demand cognitive or physiological resources (Gross, 2015). The goal of the present work was to investigate age differences in one aspect of emotion regulation that has received relatively little attention in past work, that is, emotion regulation choice. We predicted that older, as compared with younger, adults' emotion regulation choices will reflect greater flexibility, particularly if they habitually use cognitive demanding emotion regulation strategies such as cognitive reappraisal. Though this might seem counterintuitive considering age-related cognitive decline (for a review, see Hedden & Gabrieli, 2004), older adults benefit from lifelong emotional experience and the gained knowledge about the most efficient way to alter their affective responses (Blanchard-Fields, 2007; English & Carstensen, 2013). Moreover, habitual reappraisal might compensate age-related loss in cognitive resources, as it has been shown to decrease the related cognitive costs of reappraisal implementation (Ortner et al., 2016), thereby preserving a repertoire of emotion regulation strategies to choose from. We tested this prediction in a laboratory study, that is, under standardized conditions and in vivo. Extending past relevant work (Martins et al., 2016; Scheibe et al., 2015), which has been based on external stimuli of emotional pictures with questionable relevance to the participants, we used internal stimuli, that is, autobiographical memories as elicitors. The advantage of such internal stimuli is that they are similarly and highly relevant and meaningful to individuals of different ages (Kunzmann & Isaacowitz, 2017), allowing researchers to enhance both the internal and external validity of their studies. Here, we focus on the sample case of anger, often provoked by interpersonal conflicts (Avrill, 1983; Kashdan et al., 2016) which constitute the main source of psychological stress in daily life (Almeida, 2005; Bolger & Zuckerman, 1995). As such, effective anger regulation is of pivotal importance across the life span for social functioning and mental health (e.g., Rook et al., 2012; for a review, see Rook & Charles, 2017). Furthermore, due to the anger related physiological arousal, which is more damaging to the older than to the younger cardiovascular system (Barlow et al., 2019; Charles, 2010; Wrzus et al., 2014), its regulation is vital to maintain physical health (for a review see: Buckley et al., 2015; Kraynak et al., 2018; Mostofsky et al., 2014; Suls, 2013).

Emotion Regulation Choice

The process model of Gross (1998) defined different strategies of emotion regulation according to their primary impact along the emotion generation cycle. Based on the places we go (i.e., situation selection), the way we direct our attention (i.e., attentional deployment like distraction) or how we interpret certain aspects of an event (i.e., cognitive change like cognitive reappraisal) we alter our emotions constantly. Since emotion regulation strategies vary in terms of cognitive effort and regulation effectiveness (e.g., Webb et al., 2012) which are modulated by context (e.g., Sheppes & Levin, 2013; Troy et al., 2013), the ability to choose strategies that align with contextual demands is key to healthy adaptation. Emotion regulation flexibility refers to the ability to implement emotion regulation strategies that are synchronized with contextual demands (Aldao et al., 2015) and is considered adaptive, if it facilitates goal pursuit, for example, the prohedonic goal to down-regulate a negative emotional experience. As an extension of Gross' process model, the process-specific timing hypothesis conceptualizes three main determinants of such regulatory choices: emotional intensity, cognitive factors, and motivational aspects (Sheppes et al., 2014; Sheppes & Gross, 2011; Sheppes & Levin, 2013). Emotion regulation strategies are assumed to vary in terms of cognitive effort necessary to implement them, depending on the depth of emotional processing, that is, emotional engagement (early selection vs. semantic processing), and therefore should be differentially affected by the cognitive load of varying emotional intensity (Sheppes & Gross, 2011). Consequently, individuals should show a regulation preference for cognitively undemanding strategies in high intense emotional contexts, disengaging from processing the emotional content, while in situations of low emotional intensity, cognitively demanding strategies that allow for emotional processing while regulating it should be preferred. Past work has focused on two cognitive emotion regulation strategies that differ in terms of cognitive effort and emotional engagement: cognitive distraction and cognitive reappraisal. While distraction blocks cognitive processing of the emotional stimulus early on, providing effective down-regulation of even potent emotional stimuli, cognitive reappraisal attempts to overwrite the initial representation of the stimulus with an alternative, neutral or positive, stimulus interpretation which causes cognitive conflict that is harder to resolve with increasing emotional intensity (Sheppes & Meiran, 2007). Using a paradigm with standardized negative pictures, a recent study provided initial empirical support for the expected preferential shift from reappraisal in low intensity to distraction in high intensity stimuli (Sheppes et al., 2011), which has been replicated in several studies (Scheibe et al., 2015; Shafir et al., 2016; Sheppes et al., 2014).

In addition to emotional intensity, cognitive costs of emotion regulation strategies influence regulatory choices. Using the aforementioned paradigm, but providing participants with alternative interpretations and thoughts in the reappraisal condition (thereby reducing the cognitive costs of this strategy), reappraisal was chosen more often, although the main effect of intensity remained (Sheppes et al., 2014). Because regulation strategies differ in their regulatory outcome, motivational aspects like emotional goals should additionally influence emotion regulation choice. While distraction offers quick relief, even in high-intense emotional contexts, cognitive reappraisal allows for emotional processing, modulates the initial interpretation of an emotional stimulus and thus provides the benefit of long-term adaptation (Sheppes & Meiran, 2007). By manipulating the regulatory goal of quick-relief versus long-term adaptation in healthy young adults, an increase of reappraisal preference in the long-term adaptation condition for low and high intensity stimuli has been found, although the main effect of intensity remained for both regulatory goal conditions (Sheppes et al., 2014).

Age Differences in Emotion Regulation Choice

Prominent theories of emotional aging would suggest that emotion regulation increases with age. To begin, according to the socioemotional selectivity theory (Carstensen, 2006; Carstensen et al., 1999), as individuals age and perceive their future life time as more and more limited, they increasingly value emotional goals and, thus, are increasingly motivated to regulate their emotions. The strength and vulnerability integration model (SAVI; Charles, 2010) adds that aging individuals may not only become more

motivated to regulate their emotions, but also more experienced at doing so, given their continued practice. Notably, however, according to SAVI, older adults may not be able to play out their strengths in certain situations and contexts, namely, in those that are characterized by high emotional arousal, as such states, once elicited, are harder to regulate and lead to prolonged physiological arousal due to the vulnerability of a less flexible cardiovascular system in old age (Wrzus et al., 2014).

According to these theories, older, as compared with younger, adults' regulatory goals should be driven by the motivation to increase immediate affective well-being and to disengage quickly from negative contexts to avoid high emotional arousal. More specifically, on the one hand, older adults have been considered to be particularly motivated to not experience negative emotions (Carstensen, 2006). On the other hand, older adults have a greater need to quickly down-regulate their negative emotions, given that age-related physiological vulnerabilities make negative emotions increasingly costly (Charles, 2010). These two factors should result in an increased preference for cognitive undemanding emotion regulation strategies with quick results such as cognitive distraction.

To best of our knowledge, only two studies tested this idea so far. In one study, both younger and older adults preferred distraction over cognitive reappraisal under high emotional arousal. More critical, older adults indeed showed an overall higher preference for distraction compared with young adults (Scheibe et al., 2015). However, a second study with younger and older men could only replicate an age effect in the regulation preference of positive, but not negative, emotions (Martins et al., 2016). Given this inconsistency, additional factors may serve as moderators of the effects of age group on emotion regulation choice. One may be the personal relevance of emotional stimuli, arguably modulating the intensity of emotional reactions (e.g., Katzorreck & Kunzmann, 2018; Kunzmann & Grühn, 2005; Kunzmann & Isaacowitz, 2017; Streubel & Kunzmann, 2011). A second factor may be individual differences in the habitual use of cognitively demanding emotion regulation strategies, particularly cognitive reappraisal, as high habitual reappraisal decreases the cognitive costs of this resource-demanding strategy (Ortner et al., 2016).

The Role of Personal Relevance of the Immediate Context

Even though previous age-comparative studies on emotion regulation choice selected pictures that elicit negative emotions to a comparable extent in the age groups investigated according to normative arousal ratings (Martins et al., 2016; Scheibe et al., 2015), the ecological validity of standardized negative pictures may be limited and their personal relevance might vary systematically across age groups (Kunzmann & Wrosch, 2017). Especially, as different negative emotions vary in functionality across the life span (Kunzmann & Thomas, 2014). For instance, the study by Martins et al. (2016) states that negative pictures primarily represented scenes of sadness and fear. One possible explanation for the conflicting findings of the two previous age-comparative studies might be a systematic age-difference in personal relevance of the applied emotion elicitors, as sadness is a particularly relevant and adaptive emotion in late adulthood (Kunzmann & Thomas, 2014) which might motivate older adults to engage with the emotional content instead of showing the expected overall distraction tendency. Therefore, we apply an ecological approach (Kunzmann & Isaacowitz, 2017) and use autobiographical memories as negative emotional stimuli in order to maximize personal relevance and resemblance with natural occurring regulatory choices within and across age groups. Moreover, we account for the immediate context by investigating a discrete emotion instead of general negative affect.

The Role of Habitual Reappraisal

Cognitive reappraisal is generally considered an adaptive emotion regulation strategy, as frequent use of cognitive reappraisal is associated with higher levels of life satisfaction, self-esteem, optimism, environmental mastery as well as greater positive affect, lower negative affect, and less stress reactivity (Brewer et al., 2016; D'Avanzato et al., 2013; Gross & John, 2003; Moore et al., 2008). In addition, cognitive reappraisal has been considered a protective factor for mental health, as the use of reappraisal is reduced in many psychopathologies (Cludius et al., 2020) such as anxiety disorders and depression (Dryman & Heimberg, 2018). Perhaps more critical for present purposes, cognitive reappraisal has been shown to be related to greater regulation success (McRae et al., 2012; Ortner et al., 2016) and less negative emotional reactions to daily negative events (Gunaydin et al., 2016; Heiy & Cheavens, 2014). Although habitual reappraisal did not impact the frequency of anger experiences in a diary study (Kashdan et al., 2016), in response to an anger provocation in the lab, high habitual reappraisal was related to less negative affect as well as lower cardiovascular reactivity accompanied by faster recovery (Mauss et al., 2007; Memedovic et al., 2010).

Although cognitive reappraisal use is generally adaptive, the cognitive costs of reappraisal implementation are relatively high (Sheppes & Gross, 2011), which may be a problem especially in late adulthood when cognitive resources are lower than in young adulthood (Hedden & Gabrieli, 2004). Notably, however, Ortner et al. (2016) reported that the cognitive costs of reappraisal implementation do not only vary by stimulus intensity, but also by the individual frequency of reappraisal use in everyday life. Individuals reporting frequent reappraisal use showed lower cognitive costs for reappraisal implementation compared with individuals with lower habitual reappraisal. This regulation habit might have the similar cognitive facilitation effect that increases reappraisal choices as it has been shown for providing participants with alternative interpretations (Sheppes et al., 2014). Seen in this light, although older adults may have fewer cognitive resources than young adults, they may still be motivated and able to successfully engage in cognitive reappraisal if they have used this regulation strategy habitually, thereby limiting its costs (cf. Charles, 2010). This increasing automatization may be one reason for older adults' continued use of cognitive reappraisal as suggested by a recent review that concluded that there is much age similarity in the frequency of reappraisal use (Allen & Windsor, 2019).

Thus, future research that tests the main and interactive effects of age and habitual reappraisal on emotion regulation choice would be desirable. Proceeding from past work, we predict that individuals who habitually use reappraisal would prioritize this form in a concrete situation and that this prioritization would be evident in both younger and older adults. In addition, as older adults are assumed to benefit from lifelong emotional experience, older adults might compensate age-normative declines in cognitive resources through high habitual reappraisal, as their automatized use of this strategy leads to cognitive facilitation of reappraisal implementation. Our central

prediction was that age differences on emotion regulation choice would be moderated by habitual reappraisal in that such effects may be attenuated if older adults score high on this disposition.

The Current Study

We investigated emotion regulation choice in natural contexts using personally relevant emotional memories. Specifically, we examined the influence of age and habitual reappraisal which have important implications for both, the motivational factors (i.e., regulatory goals) and cognitive factors (i.e., cognitive resources) which bias regulatory choices next to the predictor of emotional intensity. To test the impact of these factors on regulatory choices in personally relevant contexts, we asked participants to recall autobiographical anger episodes of low and high anger intensity, seeking for an increase of ecological validity compared with previous study designs. Moreover, as regulatory goals change with age, we test this in a comparison of young and older adults. The contributory factor of cognitive resources is tested directly and indirectly. It is tested indirectly by examining individual differences in habitual reappraisal, following the observation that habitual reappraisal use in daily life facilitates the cognitive efforts related with the implementation of reappraisal. A direct measure of executive functions is included to control for a potential moderating effect of cognitive resources. In addition, two other prominent emotion regulation habits, habitual distraction and habitual suppression, have been assessed to control for potential moderation and as alternative predictors of emotion regulation choice in an exploratory fashion.

The central purpose of this study was to examine the effects of age on emotion regulation choice in real-life contexts. We hypothesized a shift in emotion regulation choice from engaging reappraisal to disengaging distraction in high as compared with low anger intensity. Further, we predicted a higher distraction preference in general for older as compared with young adults. A second aim was to study the influence of reappraisal habits on spontaneous emotion regulation choices. We expected a positive association between habitual reappraisal and the frequency of reappraisal choices in both age groups. Following the assumption that habits become more influential with lifetime, we expected this association to be stronger in older as compared with young adults. High habitual reappraisal in older adults was expected to result in higher frequency of reappraisal choices, especially in low anger intensity stimuli.

Method

Participants

Participants were 103 healthy volunteers comprising 57 young adults between 20 and 35 years (M = 24.60, SD = 3.05) and 46 older adults between 59 and 77 years (M = 67.26, SD = 5.15) who took part in a large study on healthy aging called *Leipzig Study for Mind–Body–Emotion Interactions* (see Babayan et al., 2019). Participants were screened for the following exclusion criteria via self-reports: psychology student, positive drug anamnesis, diagnosis of cardiovascular disease or untreated hypertension, history of psychiatric disease, neurological disorder, or malignant disease. We excluded 10 participants, due to missing data in the anger regulation choice paradigm. This left a sample of 52 young adults (M = 24.63, SD = 3.016; 44.2% women, 96.2% university-entrance diploma) and 41 older adults (M = 66.61, SD = 4.99; 36.6% women; 56.1% university-entrance diploma). Young and older adults did not differ in self-reported habitual reappraisal, habitual distraction, trait anger, trait affect, emotional well-being and the anger during recall averaged across four episodes (see Table 1 for details). Older adults scored lower on an executive control test and higher on habitual suppression as young adults. The study was approved by the local ethics committee (154/13-ff), all participants gave written consent before the experiment and received monetary compensation for volunteering.

Materials and Procedure

Questionnaires about demographic characteristics, personality and emotion have been assessed 1 week before the emotion regulation choice task. Cognitive functioning has been tested 2 weeks prior to the experiment. Because this task involved the induction

Table 1
Sample Characteristics

Variable	Young adults (n = 52)	Older adults (n = 41)	Age difference
Habitual reappraisal	4.67 ± .95	4.77 ± 1.05	p = .61
Habitual distraction	5.37 ± 2.70	4.59 ± 2.77	p = .18
Habitual suppression	3.12 ± 1.11	3.88 ± 1.21	p = .002
Trait anger	18.44 ± 4.25	17.88 ± 3.16	p = .48
Emotional well-being	5.75 ± .97	5.46 ± 1.02	p = .17
Trait affect			
Positive affect	2.56 ± 1.14	2.87 ± 1.27	p = .22
Negative affect	.54 ± .52	.47 ± .45	p = .53
TMT difference	24.34 ± 11.95	49.29 ± 25.59	p < .001
TMT ratio	2.02 ± .59	2.27 ± .60	p < .05
Anger across episodes			
Retrospect	3.67 ± .73	3.65 ± 1.14	p = .90
After recall	2.62 ± .91	2.75 ± 1.21	p = .55

Note. Age groups do not vary among self-reported habitual reappraisal, habitual distraction, habitual anger experience, emotional well-being, trait affect, and mean anger across episodes. However, as expected, older adults had lower executive control, which was measured using the trail making test (TMT), indicated by a higher TMT difference and TMT ratio score in contrast to young adults. Furthermore, young and older adults differed in their self-reported habitual suppression use.

of negative mood through recall of negative memories which could have influenced performance in the other tasks, it was presented at the end of the session and was preceded by a learning, a habituation and a positivity task, which will be reported elsewhere.

Emotion-Regulation Choice Task

The paradigm started with a 5-min resting-period, in which participants were told to relax, leave their eyes open, and sit quietly. To standardize the content of thoughts during the baseline measurement, we asked participants to think of their daily morning routine. After a first baseline assessment of affective experiences, participants were asked to select four recent anger-inducing autobiographical events of either low intensity or high intensity. Participants were subsequently asked to think about each anger situation and relive the target emotion as vividly as possible for maximally three minutes. After each episode, participants reported the intensity of their anger feelings during recall and then selected either distraction or reappraisal as an emotion regulation strategy. The instruction on the screen read "If you would like to think of something different from the angry event now, please press button 1 on the keyboard. If you would like to find a positive meaning to the situation, then please press button 8 on the keyboard." According to their chosen strategy, they followed a set of four acoustic instructions in fixed order during a 2-minute regulation phase. To avoid boredom and customization to the distraction instructions, we provided two parallel sets that changed from choice to choice. A first introductory acoustic instruction, which was the same for the two strategies, asked the participants to close their eyes, think back to the reported event as vividly as possible and follow the subsequent acoustic emotion regulation instructions according to their selected strategy (see the online supplemental material for detailed instructions). At the end of the task, participants reported on their affective experiences.

Affect Ratings

Emotional self-reports were given on an 18-item mood scale based on the model of basic emotion systems (Stemmler, 2002). The scale contains ten negative (anxious, irritated, angry, frustrated, rejected, negative, tired, nervous, sad, bashful) and eight positive items (happy, comfortable, pleasant anticipation, proud, accepted, positive, active, relaxed). The full-scale had been used for the rest and regulation measurements. For the ratings after anger-recall, the short subscale of the five anger-items (irritated, angry, frustrated, nervous, bashful) had been used. Ratings were made using unipolar 9-point Likert scales, ranging from 0 (*not at all*) to 8 (*extremely*), and bipolar scales (accepted–rejected; negative–positive; tired–active; relaxed–nervous) ranging from –4 (*extremely*) to 0 (*not at all*) to 4 (*extremely*) each being transferred to two unipolar ratings ranging from 0 (*not at all*) to 4 (*extremely*).

Habitual Emotion Regulation

The habitual use of cognitive reappraisal and habitual suppression was measured using the 6-item reappraisal scale (e.g., "When I'm faced with a stressful situation, I make myself think about it in a way that helps me to stay calm.") and the 4-item suppression scale (e.g., "I control my emotions by not expressing them.") of the German adaptation of the Emotion Regulation Questionnaire (ERQ; Abler & Kessler, 2009). Answers are given on a 7-point Likert-scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The reappraisal scale has demonstrated good reliability in our sample ($\alpha_{overall}$ = .816; α_{young} = .796, α_{old} = .840), as well as the suppression scale ($\alpha_{overall}$ = .769; α_{young} = .765, α_{old} = .772) which is comparable to the internal consistency of the German validation study (α = .739 for reappraisal and α =.760 for suppression). The habitual use of attentional deployment, that is, distraction, was measured using the three-item positive refocusing scale of the German adaptation of the Cognitive Emotion Regulation Questionnaire (CERQ; Loch et al., 2011; e.g., "I think of pleasant things that have nothing to do with it"). Answers are given on a 5-point Likert scale ranging from 0 (*almost never*) to 4 (*almost always*). The positive refocusing scale has demonstrated good reliability in our sample ($\alpha_{overall}$ = .818; α_{young} = .830, α_{old} = .803) which is comparable to the internal consistency of the German validation study (α = .86).

State–Trait Anger Expression

The habitual experience, expression, and control of anger was assessed using the 44-item German version of the State–Trait Anger Expression Inventory (STAXI; Schwenkmezger et al., 1992). We applied the following four trait scales: Trait-Anger, that is, the individual anger-disposition; Anger In, that is, the tendency to suppress and nonverbalization of angry feelings; Anger Out, that is, the verbal or physical expression of anger toward others or self; and Anger Control, which measures the attempt to control anger-expressions. All items were rated on a 4-point Likert-scale ranging from 1 (*not at all or hardly ever*) to 4 (*very much or nearly always*). The subscales reached good internal consistency (Trait Anger: $\alpha_{overall}$ = .752; α_{young} = .780, α_{old} = .697; Anger In: $\alpha_{overall}$ = .733; α_{young} = .774, α_{old} = .654; Anger Out: $\alpha_{overall}$ = .812; α_{young} = .806, α_{old} = .820; Anger Control: $\alpha_{overall}$ = .825; α_{young} = .816, α_{old} = .840, which is comparable to the German validation (Trait Anger α = .88, Anger In α = .79, Anger Out α = .86, Anger Control α = .88).

Emotional Well-Being

To measure a general feeling of well-being as an emotion-related disposition we applied the subscale "well-being" of the 30-item short version of the German Trait Emotional Intelligence Questionnaire (TEIQue-SF; Freudenthaler et al., 2008). Answers are rated on a 7-point Likert scale, ranging from 1 (*do not agree at all*) to 7 (*agree completely*). The scale shows good reliability in the German validation study (α = .94), which is comparable with the reliability measures in our sample (TEIQue-SF Well-being: $\alpha_{overall}$ = .797; α_{young} = .856, α_{old} = .728).

Executive Control

The Trail Making Test (TMT; Reitan, 1992) assesses cognitive flexibility, and consists of Subtest A (TMT-A) and Subtest B (TMT-B). Participants are instructed to connect circles as accurate and quickly as possible, which are randomly distributed on a piece of paper. In TMT-A, these circles contain numbers from 1 to 25. In TMT-B, numbers and letters must be connected in alternating and consecutive order (i.e., 1A–2B–3C). We applied the difference between reaction times in TMT-A and TMT-B (TMT-B–TMT-A)

as a measure of executive functioning and mental flexibility (Tombaugh, 2004).

Data Analysis

To examine the success of the anger-recall and -regulation manipulation we applied an analysis of variance (ANOVA) in a 3 (manipulation conditions: rest, recall, regulation) × 2 (intensity: low, high) × 2 (repeated measures) × 2 (age group) design with self-reported anger experience as the dependent variable (SPSS V. 25.0; IBM Corp, 2017).[1] If not explicitly noted, assumptions for ANOVAs were not violated. Greenhouse-Geisser corrections for heteroskedasticity were applied when necessary (Kesselman et al., 2001). Effect sizes are reported as partial eta squared (η^2). To predict emotion regulation choice, we used generalized estimating equations (GEE), a procedure introduced by Liang and Zeger (1986) for handling correlated discrete and continuous outcome variables. We applied the SPSS procedure GENLIN with an unstructured covariance matrix, logit link, a binomial distribution and a robust estimator using SPSS 25.0. The model was fitted on emotion regulation choice, coded as 1 = reappraisal, 0 = distraction, with distraction as the reference category, with anger intensity (low, high), age group (young, old) and habitual reappraisal (continuous) and their interactions as explanatory variables (see Table 2). To test for moderating effects of executive functions, we fitted a second model on emotion regulation choice, with anger intensity, age group, habitual reappraisal and the TMT-difference score (continuous) and their interactions as explanatory variables (see Table 3). Another model was fitted on emotion regulation choice with anger intensity, age group and habitual distraction (continuous), and their interactions as explanatory variables (see Table 4). Furthermore, we fitted a cumulative model on emotion regulation choice with anger intensity, age group, habitual reappraisal, habitual distraction, habitual suppression and TMT-difference and their interactions as explanatory variables (see Table 5). The corrected quasi-likelihood under the independence model criterion (QICC), was used as an indication of model goodness of fit, with unstructured working correlation structure generating the lowest QICC in the models.

Results

Effects of the Anger Recall and Anger Regulation Manipulation

As expected, there was a main effect of anger manipulation, that is, self-reported anger changed over the three phases of the paradigm[2] (F (1.46, 132.69) = 258.885, $p < .001$, $\eta^2 = .740$). Follow-up paired t-tests revealed significant changes in self-reported anger from rest to recall (anger increases) and recall to regulation (anger decreases; all $p < .001$) suggesting an effective anger induction and –regulation. There was a main effect of intensity ($F(1, 91) = 28.222$, $p < .001$, $\eta^2 = .237$), meaning that the low and high anger episodes varied in intensity to a statistically significant extent (see Figure 1). There was no main effect of episode ($F(1, 91) = .345$, $p = .558$, $\eta^2 = .004$), that is the two measurements of low and high anger intensity, respectively, did not vary in anger intensity. There was no main effect of age group ($F(1, 91) = .084$, $p = .773$, $\eta^2 = .001$). Furthermore, there were no significant interaction effects neither between anger manipulation and age group (F (1.46, 132.69) = 1.080, $p = .342$, $\eta^2 = .012$), nor intensity and age group ($F(1, 91) = 1.624$, $p = .206$, $\eta^2 = .018$), nor episode and age group ($F(1, 91) = .001$, $p = .976$, $\eta^2 = .000$). Thus, the changes in self-reported anger along the paradigm and the intensity ratings did not differ between age groups.[3] These results suggest an effective anger manipulation, independent of age that grant validity for further emotion regulation choice analyses.

Emotion Regulation Choice

We ran four GEE models in a binary logistic session. In our main prediction model, we included anger intensity, age group, and habitual reappraisal as predictors of the likelihood that participants chose reappraisal over distraction. There was a nonsignificant trend for a main effect of age group, Wald $\chi^2(1) = 3.77$, $p = .052$, suggesting a higher distraction preference for older as compared with younger adults. Furthermore, we found a significant age by habitual reappraisal interaction, Wald $\chi^2(1) = 4.36$, $p = .037$, suggesting that older adults high in habitual reappraisal were more likely to select reappraisal (see Table 2). As shown in Figure 2, this interaction was qualified by the significant triple interaction of age, habitual reappraisal, and anger intensity, Wald $\chi^2(1) = 3.96$, $p = .047$, suggesting a higher likelihood of distraction choice for older adults high in habitual reappraisal in episodes of high anger intensity. To clarify the nature of the interactions we fitted two separate models for each age group on emotion regulation choice with anger intensity, habitual reappraisal score, and their interaction as explanatory variables.

Results of the follow-up analyses revealed that the significant effects in the main model were driven by the older subsample. In the younger age group, the effects of the predictor variables were all nonsignificant. In the older age group, however, there was a significant main effect of anger intensity, Wald $\chi^2(1) = 7.25$, $p = .007$, suggesting that episodes of high anger intensity were more likely to be regulated with reappraisal than the episodes of low anger intensity. In addition, there was a significant main effect of habitual reappraisal, Wald $\chi^2(1) = 4.47$, $p = .034$, suggesting that individuals with high habitual reappraisal were more likely to choose reappraisal to regulate the recalled anger. Both main effects were qualified by a significant interaction of anger intensity and habitual reappraisal, Wald $\chi^2(1) = 8.29$, $p = .004$, suggesting that individuals with high habitual reappraisal were more likely to choose distraction over reappraisal in the high anger episodes. In low anger episodes, older adults who report high habitual reappraisal showed a reappraisal preference.

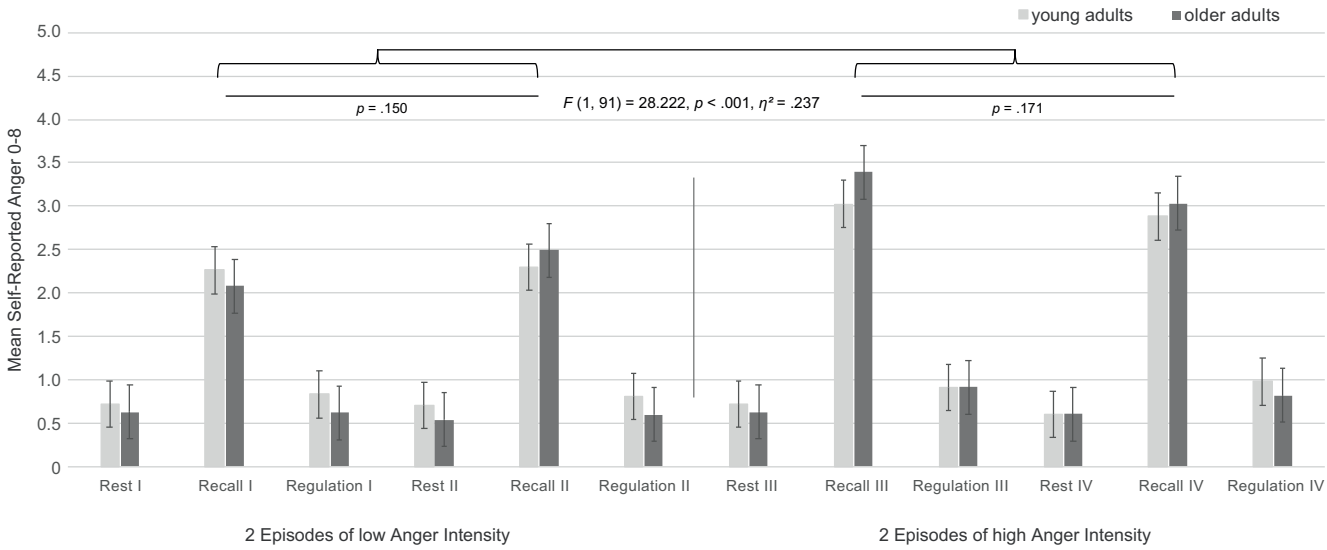
[1] In addition, we conducted a torso-based 3-electrode electrocardiogram and ran an ANOVA for the dependent variable "heart rate", as a second measure of emotional arousal. Due to an extensive data-loss for technical reasons, i.e. failed recording, we provide the results of the remaining $N = 50$ subjects as online supplemental materials.

[2] Anger intensity has been measured twice for each episode, before and after the report. Emotion regulation choice predictions are based on the initial rating of retrospective anger intensity.

[3] Furthermore, heart rate changed significantly during the paradigm (F (5.69, 273.07) = 31.980, $p = .000$, $\eta^2 = .400$; see online supplemental material).

Figure 1

Changes in Self-Reported Anger, Separated for Young and Older Adults During Rest, Anger Recall, and Anger Regulation Phases Along the Emotion Regulation Choice Paradigm



Note. This graph shows the four episodes in sorted, not randomized order, with I and II representing the measurements of the two episodes of low anger intensity and III and IV representing the measurements of the two episodes of high anger intensity. Self-reported anger during recall varied to a statistically significant extent between low and high anger episodes, whereas anger within the two low intensity and the two high anger intensity episodes did not.

In Model 2, we additionally included the TMT difference score as a measure of cognitive resources to our main prediction Model 1, which did not contribute to the prediction model to a statistically significant extend. By controlling for the moderating effect of cognitive resources, the interaction effects of age and habitual reappraisal, Wald $\chi^2(1) = 5.69$, $p = .017$, and of age, anger intensity and habitual reappraisal remained, Wald $\chi^2(1) = 7.62$, $p = .006$, like in the model without the covariate of TMT difference. Older adults with high habitual reappraisal chose more reappraisal overall. However, in high anger intensity memories, older adults with high habitual reappraisal chose less reappraisal (see Table 3). In Model 3, with anger intensity, age group and habitual distraction and their interactions predicting emotion regulation choice, there was a main effect of intensity, Wald $\chi^2(1) = 5.00$, $p = .025$, which was qualified by an anger intensity by habitual distraction interaction, Wald $\chi^2(1) = 7.04$, $p = .008$. Individuals with high habitual distraction chose more distraction in high anger intensity (see Table 4).

To control for all potential moderators in a cumulative GEE model, Model 4 contained anger intensity, age group, and habitual reappraisal, habitual distraction, habitual suppression and TMT differences and their interactions as predictors of emotion regulation choice. There was a main effect of habitual reappraisal, Wald $\chi^2(1) = 4.99$, $p = .025$, suggesting less reappraisal preference for the regulation of anger in individuals with high habitual reappraisal. In addition, there was a main effect of habitual suppression, Wald $\chi^2(1) = 4.37$, $p = .037$, also suggesting less reappraisal preference for the regulation of anger in individuals with high habitual suppression. The main effect of habitual reappraisal was qualified by an interaction effect of age and habitual reappraisal, Wald $\chi^2(1) = 5.81$, $p = .016$, which suggests a higher reappraisal preference for older individuals with high habitual reappraisal. This replicates the age by habitual reappraisal interaction of Model 1 and Model 3. In addition, there was triple interaction of age group, anger intensity and habitual reappraisal, Wald $\chi^2(1) = 5.99$, $p = .014$, which suggests a higher likelihood of distraction choice for older adults high in habitual reappraisal in episodes of high anger intensity, again replicating the triple interaction of Model 1 and Model 3 (see Table 5).

Discussion

This study, to the best of our knowledge, is the first to test emotion regulation choice using personally relevant autobiographical memories, thereby increasing ecological validity of emotion regulation choices. In support of the primary hypothesis of an age-dependent motivational shift in spontaneous anger regulation, we found a nonsignificant trend for a main effect of age ($p = .052$). In contrast to young adults, older adults preferred regulation with emotionally disengaging distraction over the engaging strategy of reappraisal. This finding supports the socioemotional selectivity theory (Carstensen et al., 1999) and the strength and vulnerability model (Charles, 2010), which states that as people get older the relative importance of the goal to increase affective well-being is attained by emotion regulation strategies that help to disengage quickly from negative stimuli and that keep emotional arousal to a manageable level. In addition, this finding replicates the previous overall distraction preference in older as compared with young adults in negative pictures (Scheibe et al., 2015).

Table 2
Emotion Regulation Choice—Estimates From GEE Models in a Logistics Regression Setting

Model	*B*	*SE*	Wald $\chi^2(1)$	*p*	Odds ratio	[95% CI]
			Full sample (full-factorial QICC = 521.027)			
Anger intensity						
Low	1					
High	−0.377	1.288	0.086	.770	0.686	[0.055, 8.571]
Age group						
Young adults	1					
Older adults	−2.720	1.401	3.768	.052	0.066	[0.004, 1.027]
Habitual reappraisal	−0.107	0.159	0.455	.500	0.899	[0.658, 1.226]
Age × Anger Intensity	3.373	1.765	3.650	.056	29.156	[0.916, 927.688]
Age × Habitual Reappraisal	0.597	0.286	4.363	.037	1.816	[1.037, 3.180]
Anger Intensity × Habitual Reappraisal	0.085	0.262	0.105	.746	1.089	[0.652, 1.819]
Age × Anger Intensity × Habitual Reappraisal	−0.697	0.350	3.961	.047	0.498	[0.251, 0.989]
Intercept	0.180	0.737	0.060	.807	1.197	[0.283, 5.073]
			Young adults (full-factorial QICC = 291.09)			
Anger intensity						
Low	1					
High	−0.470	1.299	0.131	.718	0.625	[0.049, 7.977]
Habitual reappraisal	−0.084	0.170	0.245	.620	0.919	[0.659, 1.283]
Anger Intensity × Habitual Reappraisal	0.092	0.264	0.122	.727	1.097	[0.653, 1.842]
Intercept	0.091	0.785	.013	.908	1.095	[0.235, 5.098]
			Older adults (full-factorial QICC = 230.01)			
Anger intensity						
Low	1					
High	3.324	1.235	7.248	.007	27.782	[2.470, 312.470]
Habitual reappraisal	0.516	0.244	4.471	.034	1.675	[1.038, 2.703]
Anger Intensity × Habitual Reappraisal	−0.677	0.235	8.294	.004	0.508	[0.321, 0.806]
Intercept	−2.714	1.228	4.887	.027	0.066	[0.006, 0.735]

Note. Reference groups are as follows (in parentheses): emotion regulation choice (distraction), anger intensity (low intensity), age (young adults). GEE = generalized estimating equations; QICC = quasi-likelihood under the independence model criterion.

However, this finding was qualified by the factors of habitual reappraisal and anger intensity. Although we did not find the predicted main effect for habitual reappraisal, our hypothesized increase in reappraisal preference with higher habitual reappraisal has been found in older adults. Since habitual reappraisal has been found to decrease the cognitive costs related to its implementation (Ortner et al., 2016), this result is in line with the previous finding that regulation strategies are chosen according to available cognitive resources (Scheibe et al., 2015) and the postulate of the selection, optimization and compensation with emotion regulation framework (SOC-ER; Urry & Gross, 2010), meaning that older adults' age-associated lower cognitive resources can be compensated by regulation experience. In contrast, older adults who cannot rely on much reappraisal experience, since they do not report on habitually using reappraisal, show the adaptive capacity to preferably distract from the high arousing negative emotion of anger. In the same manner, though neither the main effect of anger intensity in regulatory choices nor its interaction with age were significant in our main prediction Model 1, but a main effect of anger intensity when controlling for all covariates, we found a triple interaction of the three predictors intensity, age, and habitual reappraisal. Follow-up analyses of this interaction effects suggested that older adults who reported a frequent reappraisal use indeed showed a reappraisal preference in low anger intensity, but flexibly switched to less cognitively demanding disengagement in situations of high anger intensity. The follow-up analysis also revealed a main effect of intensity, suggesting older adults to regulate high anger intensity more frequently with reappraisal, in contradiction to our hypothesis and previous findings. This main effect of intensity was qualified by habitual reappraisal, thus should be interpreted deliberately. Although close social ties become increasingly important for well-being as we age (Carstensen, 2006), they also constitute the main source of interpersonal conflicts in later life (Sorkin & Rook, 2004). Considering the detrimental effects of anger on social relationships, and the related aggregated physical costs through enduring conflicts (for a review see Rook & Charles, 2017), it may be that older adults show a general tendency to reappraise high intensity anger in order to gain long-term adaptation thereby avoiding persistent conflicts and protecting important social ties. The reported triple interaction of anger intensity, age group and habitual reappraisal was consistently found not only in our main prediction Model 1 but also when controlling for executive functions and other regulation habits. Older adults who can rely on reappraisal experience, which they gained through habitually using reappraisal, probably benefit from cognitive facilitation in reappraisal implementation (Ortner et al., 2016) in low anger intensity. Hence, they engage with the emotional content, gaining long-term adaptation to the initial anger provocation. But in high anger intensity, those older individuals prefer to quickly disengage from emotional processing. This can be seen as an indication that "cognitive facilitation through experience" is not independent from cognitive effort, in fact moderated by emotional intensity, similarly as it has been seen in the age-related positivity effect in emotional processing, that disappeared under conditions of high cognitive load (Mather & Knight, 2005). However, considering the adaptivity of such flexible regulatory choices, that is, the

Table 3

Emotion Regulation Choice—Estimates From GEE Models in a Logistics Regression Setting, Including Habitual Reappraisal and Cognitive Resources

Model	*B*	*SE*	Wald $\chi^2(1)$	*p*	*OR*	[95% CI]
			Full-factorial QICC = 530.474			
Anger intensity						
Low	1					
High	0.057	0.404	0.020	.887	1.059	[0.480, 2.339]
Age group						
Young	1					
Older	−0.101	0.410	0.060	.806	0.904	[0.405. 2.019]
Habitual reappraisal	−0.263	0.187	1.986	.159	0.768	[0.533, 1.108]
TMT difference	0.173	0.324	0.285	.593	1.189	[0.630, 2.246]
Age × Anger Intensity	0.105	0.494	0.045	.831	1.111	[0.422, 2.922]
Anger Intensity × Habitual Reappraisal	0.266	0.279	0.908	.341	1.304	[0.755, 2.252]
Anger Intensity × TMT Difference	−0.004	0.494	0.000	.993	0.996	[0.378, 2.621]
Age × Habitual Reappraisal	1.211	0.508	5.694	.017	3.358	[1.242, 9.084]
Age × TMT Difference	−0.051	0.397	0.016	.899	0.951	[0.437, 2.068]
Habitual Reappraisal × TMT Difference	−0.361	0.306	1.390	.238	0.697	[0.382, 1.270]
Anger Intensity × Age × Habitual Reappraisal	−1.197	0.433	7.626	.006	0.302	[0.129, 0.706]
Anger Intensity × Age × TMT Difference	−0.062	0.527	0.014	.906	0.940	[0.335, 2.641]
Anger Intensity × Habitual Reappraisal × TMT Difference	0.417	0.437	0.909	.340	1.517	[0.644, 3.573]
Age × Habitual Reappraisal × TMT Difference	−0.147	0.459	0.102	.749	0.863	[0.351, 2.123]
Anger Intensity × Age × Habitual Reappraisal × TMT Difference	−0.052	0.500	0.011	.917	0.949	[0.356, 2.530]
Intercept	−0.257	0.243	1.115	.291	0.773	[0.480, 1.246]

Note. Reference groups are as follows (in parentheses): emotion regulation choice (distraction), anger intensity (low intensity), age (young adults). Habitual reappraisal and trail making test (TMT) difference scores have been *z* transformed. GEE = generalized estimating equations; QICC = quasi-likelihood under the independence model criterion. *OR* = odds ratio.

regulatory consequences, give rise to an alternative interpretation. Older adults with high habitual reappraisal might have chosen distraction more frequently in high anger intensity as it is more effective to control high intensity stimuli (Sheppes & Meiran, 2007), thus they chose what is most adaptive. In the standardized emotion regulation choice task with negative pictures, distraction lead to a stronger attenuation of the neural measure and self-reported arousal, whereas cognitive reappraisal lead to a stronger decrease in self-reported unpleasantness in response to the negative pictures (Shafir et al., 2016). In other words, while distraction is a good choice to prevent a less flexible cardiovascular system from high emotional arousal, which would result in prolonged recovery (Charles, 2010; Wrzus et al., 2014), reappraisal holds the benefit to even enhance current emotional well-being. Interestingly, the interaction of age group by habitual reappraisal and the triple interaction of anger intensity by age group by habitual reappraisal remained even when controlling for cognitive resources and other regulation habits, that is, habitual distraction and habitual suppression. This replication emphasizes the specificity of reappraisal experience for emotion regulation flexibility and emotional adaptivity, thus highlights the explanation in favor of adaptivity rather than mere cognitive resources. Our measure of executive functioning did not contribute to the prediction of emotion regulation choice to a statistically significant extent. Although most of the literature assumes high cognitive resources to be a requirement for cognitive reappraisal (e.g., Scheibe et al., 2015), which are age-normatively declined, our results did not change when controlling for executive functions, most interestingly, across age groups. For older individuals, emotion regulation

Table 4

Emotion Regulation Choice—Estimates From GEE Models in a Logistics Regression Setting, Including Habitual Distraction

Model	*B*	*SE*	Wald $\chi^2(1)$	*p*	*OR*	[95% CI]
			Full-factorial QICC = 520.712			
Anger intensity						
Low	1					
High	1.254	0.561	5.002	.025	3.503	[1.168, 10.511]
Age group						
Young	1					
Older	−0.017	0.547	0.001	.974	0.983	[0.337, 2.870]
Habitual distraction	0.044	0.056	0.626	.429	1.045	[0.936, 1.167]
Age × Anger Intensity	−0.787	0.748	1.109	.292	0.455	[0.105, 1.969]
Age × Habitual Distraction	0.037	0.102	0.134	.714	1.038	[0.850, 1.268]
Anger Intensity × Habitual Distraction	−0.235	0.885	7.041	.008	0.791	[0.665, 0.940]
Age × Anger Intensity × Habitual Distraction	0.146	0.123	1.396	.237	1.157	[0.908, 1.474]
Intercept	−0.551	0.353	2.432	.119	0.576	[0.288, 1.152]

Note. Reference groups are as follows (in parentheses): emotion regulation choice (distraction), anger intensity (low intensity), age (young adults). GEE = generalized estimating equations. *OR* = odds ratio.

Table 5

Emotion Regulation Choice—Estimates From a Cumulative GEE Model in a Logistics Regression Setting, Including Habitual Reappraisal, Habitual Distraction, Habitual Suppression, and Cognitive Resources

Model	*B*	*SE*	Wald χ^2	*p*	*OR*	[95% CI]
			Full-factorial QICC = 551.873			
Anger intensity						
Low	1					
High	0.504	0.504	1.001	.317	1.656	[0.617, 4.448]
Age group						
Young	1					
Older	−0.021	0.460	0.002	.963	0.979	[0.398, 2.412]
Habitual reappraisal	−0.453	0.203	4.993	.025	0.636	[0.427, 0.946]
Habitual distraction	0.157	0.386	0.165	.685	1.170	[0.549, 2.493]
Habitual suppression	−0.703	0.336	4.367	.037	0.495	[0.256, 0.957]
TMT difference	0.287	0.308	0.868	.352	1.333	[0.728, 2.439]
Anger Intensity × Age	−0.424	0.609	0.485	.486	0.654	[0.198, 2.158]
Anger Intensity × Habitual Reappraisal	0.780	0.521	2.244	.134	2.182	[0.786, 6.053]
Anger Intensity × Habitual Distraction	−1.033	0.596	3.003	.083	0.356	[0.111, 1.145]
Anger Intensity × Habitual Suppression	0.698	0.656	1.130	.288	2.009	[0.555, 7.273]
Anger Intensity × TMT Difference	0.472	0.586	0.650	.420	1.604	[0.509, 5.055]
Age × Habitual Reappraisal	1.565	0.650	5.806	.016	4.784	[1.339, 17.091]
Age × Habitual Distraction	−0.234	0.504	0.217	.642	0.791	[0.295, 2.123]
Age × Habitual Suppression	0.454	0.479	0.899	.343	1.575	[0.616, 4.028]
Age × TMT Difference	0.003	0.468	0.000	.996	1.003	[0.401, 2.506]
Intensity × Age × Habitual Reappraisal	−1.779	0.727	5.992	.014	0.169	[0.041, 0.701]
Intensity × Age × Habitual Distraction	1.040	0.648	2.577	.108	2.829	[0.795, 10.067]
Intensity × Age × Habitual Suppression	−0.482	0.723	0.444	.505	0.618	[0.150, 2.549]
Intensity × Age × TMT Difference	−0.540	0.654	0.683	.409	0.583	[0.162, 2.097]
Age (older) × Habitual Reappraisal × TMT Difference	−0.518	0.432	1.434	.231	0.596	[0.255, 1.390]
Age (young) × Habitual Reappraisal × TMT Difference	−0.704	0.376	3.502	.061	0.494	[0.236, 1.034]
Age (older) × Habitual Distraction × TMT Difference	−0.051	0.293	0.030	.861	0.950	[0.535, 1.688]
Age (young) × Habitual Distraction × TMT Difference	−0.014	0.493	0.001	.977	0.986	[0.375, 2.592]
Age (older) × Habitual Suppression × TMT Difference	−0.118	0.246	0.231	.631	0.888	[0.548, 1.440]
Age (young) × Habitual Suppression × TMT Difference	−0.499	0.467	1.144	.285	0.607	[0.243, 1.515]
Anger Intensity × Habitual Reappraisal × TMT Difference	0.835	0.859	0.944	.331	2.304	[0.428, 12.410]
Anger Intensity × Habitual Distraction × TMT Difference	−0.247	0.813	0.092	.762	0.781	[0.159, 3.843]
Anger Intensity × Habitual Suppression × TMT Difference	1.094	0.749	2.132	.144	2.987	[0.688, 12.976]
Anger Intensity × Age × Habitual Reappraisal × TMT Difference	−0.532	0.936	0.323	.570	0.588	[0.094, 3.679]
Anger Intensity × Age × Habitual Distraction × TMT Difference	0.362	0.875	0.171	.679	1.436	[0.258, 7.980]
Anger Intensity × Age × Habitual Suppression × TMT Difference	−1.121	0.783	2.050	.152	0.326	[0.070, 1.512]
Intercept	−0.321	0.267	1.445	.229	0.726	[0.430, 1.224]

Note. Reference groups are as follows (in parentheses): emotion regulation choice (distraction), anger intensity (low intensity), age (young adults). Habitual reappraisal, -distraction, -suppression and trail making test (TMT) difference scores have been *z* transformed. GEE = generalized estimating equations; QICC = quasi-likelihood under the independence model criterion. *OR* = odds ratio.

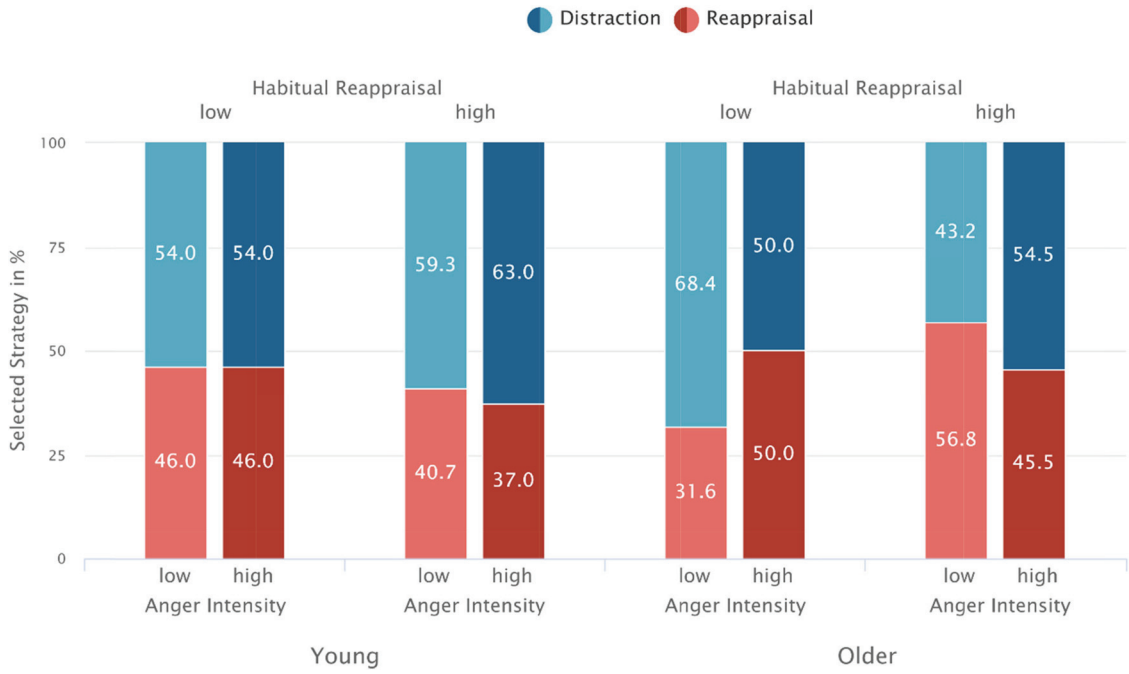
choices depend on their regulation habits and anger intensity, which have been found to influence cognitive effort of reappraisal implementation, but not on their general cognitive resources. In line with the finding of Ortner et al. (2016), this could be interpreted as an indication of a cognitive facilitation through habitual use of cognitively demanding strategies which might preserve a repertoire of emotion regulation strategies, thereby improving emotion regulation flexibility with age, in line with postulates of SOC-ER (Urry & Gross, 2010).

Taken together, the fact that we found highest emotion regulation flexibility in older adults with high habitual reappraisal supports the assumption of frequent reappraisal use being related to psychological adjustment, especially in late adulthood (Nowlan et al., 2015) which might even compensate decreasing cognitive resources. Moreover, our results are in line with theories on emotional aging assuming that older adults enjoy emotion regulation benefits due to a motivational shift toward affective well-being and increased social and emotional experience, which, however, are diminished in situations of high emotional arousal.

Furthermore, in Model 3 we found a main effect of anger intensity, which was qualified by habitual distraction, suggesting a reduced reappraisal choice in high anger intensity in individuals with high habitual distraction. In addition, our cumulative Model 4 with all possible predictors showed a main effect of habitual suppression, suggesting less reappraisal preference in individuals with high habitual suppression. Though habitual reappraisal and habitual suppression have been conceptualized and found to be independent constructs in evaluations with the ERQ (e.g., John & Gross, 2004), the negative association between habitual suppression and reappraisal preference in spontaneous anger regulation might be explained by their oppositional link to health outcomes (Moore et al., 2008). Because the habitual use of suppression has been associated with increased stress reactivity, it might also be related to limited emotion regulation flexibility, in contrast to habitual reappraisal being related to increased anger regulation flexibility, at least in older adults. Future research should further elaborate on this by taking habitual suppression and suppression

Figure 2

Emotion Regulation Preference by Anger Intensity, Age Group, and Habitual Reappraisal



Note. Blue [light gray] indicates the proportion of distraction preference, in either low (light blue [light gray]) or high anger intensity (dark blue [shaded light gray]). Red [dark gray] indicates the proportion of reappraisal preference in either low (light red [dark gray]) or high anger intensity (dark red [shaded dark gray]). See the online article for the color version of this figure.

as an alternative regulation strategy in emotion regulation choice paradigms into account.

We did not find a significant prediction of anger regulation choices in young adults based on the factors of anger intensity, habitual emotion regulation with reappraisal, distraction and suppression, as well as executive functions. This is surprising given the well-established shift in regulatory preference from engagement reappraisal to disengagement distraction with increasing emotional intensity in negative pictures (Scheibe et al., 2015; Shafir at al., 2016; Sheppes et al., 2011; 2014). There are two possible explanations for this finding, which refer to our operationalization of emotion regulation choices in real-life stimuli: personal relevance and the discrete emotion of anger.

The Role of Personal Relevance

One explanation for our findings in young adults could be the use of autobiographical memories instead of standardized negative pictures. Because we could not replicate an emotion regulation preference driven by emotional intensity in a relived emotions' setting, that is, testing spontaneous emotion regulation in emotionally difficult situations out of each participants' life, one must consider limited generalizability from previous findings based on the emotion regulation choice paradigm with negative affective pictures. This could mean limited generalizability from findings with general negative affect on discrete emotions, as well as limited generalizability from findings with standardized negative pictures on ecologically valid autobiographical memories. A first indication for the latter is given by a recent study on emotion regulation choice in young to middle-aged adults using angry and disgusting vignettes (Suri et al., 2018). While those stimuli provide higher ecological validity than negative pictures, researchers could not predict regulation choices by their emotional intensity. Future studies, therefore, should assess emotion regulation choice in more complex and personally relevant contexts rather than general negative affect using negative pictures to draw inferences for the real world, as it has been argued especially in the context of emotional aging (Kunzmann & Isaacowitz, 2017).

The Role of the Discrete Emotion of Anger

An alternative explanation emerges, arguing from a functionalists' perspective. The discrete emotion approach in emotional aging (Kunzmann & Thomas, 2014) postulates anger to be particularly salient and adaptive in young adulthood, whereas sadness is assumed to more adaptive for older adults. The experience of anger arises by the feeling of one's goal being intentionally blocked by others, promoting the defense of one's resources (Frijda, 1986) and the perception of high situational control (Lazarus, 1991). Anger thereby facilitates the fulfillment of age-normative tasks in young adulthood to optimize the future regardless of immediate affective consequences, whereas older adults are assumed to primarily promote their affective well-being (Carstensen, 2006). Accordingly, regulatory goals in young adults should differ substantially from those in older adults and might not even follow the intention to down regulate anger (i.e., prohedonic motivation). In

line with this notion, there is evidence for an age-related increase in prohedonic motivation to down-regulate negative affect together with a decrease of contra-hedonic motivations to maintain or enhance negative affect (Riediger et al., 2009). In fact, young adults prefer activities that increase their anger when anticipating a confrontational task in contrast to a cooperational task (Kim et al., 2015; Tamir et al., 2008), thereby even improving performance in that task (Tamir et al., 2008). Similarly, young in contrast to older adults are more likely to engage in interpersonal confrontation (Luong et al., 2011). In contrast, older adults most likely pursue nonconfrontational, prohedonic regulatory goals, in line with their higher need of close social ties (Rook & Charles, 2017) and their overarching goal of emotional well-being (Carstensen, 2006). While one experience sampling study found distraction and reappraisal to be implemented especially for prohedonic regulatory goals (English et al., 2017), another found that young adults showed a general tendency to apply rumination in the face of negative emotions, a strategy that maintains or even increases negative affective experience (Heiy & Cheavens, 2014). The main purpose of flexible, adaptive regulatory choices is the promotion of goal pursuits. Therefore, it is reasonable to assume that young adults' regulatory choices are primarily driven by instrumental motivations, whereas older adults' regulatory choice are rather following prohedonic motivations in personally relevant negative emotional experiences. Future studies should take this inference into account by considering a third "no-regulation" control condition in the standard emotion regulation choice paradigm and an investigation of choices of other emotion regulation strategies, that serve rather instrumental than prohedonic goals like suppression or rumination. Furthermore, an investigation of different negative emotions, for example, directly comparing anger and sadness in young and older adults would be desirable to further address motivational factors in emotion regulation choices.

Strengths and Limitations

With this study, we provide first evidence for the complexity of emotion regulation choices in real-life contexts and with high personal relevance through the application of autobiographical anger memories. However, such stimuli involve other limitations, such as the fact that one does not assess "original" emotional responses, in the heat of the moment, but the memory of it, which might be affected by the time elapsed (Scott et al., 2017; Wrzus et al., 2014), older adults' positivity bias in memory (e.g., Isaacowitz et al., 2006) and previous reappraisal attempts (Levine et al., 2012). Furthermore, as preferences in regulatory choices have been found to be influenced by manipulations of regulatory goals (i.e., immediate well-being vs. long-term adaptation) in young adults (Sheppes et al., 2014), in this study we assumed regulatory goals to differ globally between age groups but we did not directly assess them for each anger event. To conclude whether the presented age differences in emotion regulation choice are specific to anger and an age-dependent motivational shift in anger regulation, upcoming studies should investigate age effects in emotion regulation choice in other real-life negative emotional events, especially sadness. Last, in an exemplary case of anger we investigated an additional contributory factor, that is personal relevance and thereby increased ecological validity. To test the complexity of emotion regulation flexibility including the adaptivity of regulatory choices, future research might focus on outcome measures, investigate on other forms of cognitive emotion regulation and consider further relevant moderators in and outside the individual.

Conclusion

We investigated spontaneous regulatory choices across the life span in personally relevant anger experiences taking habitual reappraisal into account. Although we could not predict regulatory choices in young adults, we replicated the established shift from engaging reappraisal in low intensity to disengaging distraction in high intensity anger for older adults with more reappraisal experience. This work advances our understanding concerning the role of regulation experience in flexible emotion regulation, insofar that our results support the notion of habitual reappraisal being associated to good psychological adjustment. Older adults with frequent reappraisal use showed the highest flexibility in emotion regulation which is supposed to contribute to psychological and cardiovascular adaptation. As a recent intervention study showed that regulatory flexibility can be increased (Alkoby et al., 2019), the training of reappraisal habits might be a promising approach for older adults to promote affective well-being and healthy aging, especially as our finding about an age-related benefit of emotion regulation flexibility in older adults with high habitual reappraisal was still present after controlling for cognitive resources. Our study extends previous knowledge on the determinants of emotion regulation choice by the relevance of the internal and external contextual factors, that is, the role of emotion regulation experience as well as the complexity in emotion regulation choice in real-life anger experience in young and older healthy adults.

References

Abler, B., & Kessler, H. (2009). Emotion regulation questionnaire—Eine deutschsprachige Fassung des ERQ von Gross und John. *Diagnostica*, *55*(3), 144–152. 10.1026/0012-1924.55.3.144

Aldao, A., Sheppes, G., & Gross, J. J. (2015). Emotion regulation flexibility. *Cognitive Therapy and Research*, *39*(3), 263–278. 10.1007/s10608-014-9662-4

Alkoby, A., Pliskin, R., Halperin, E., & Levit-Binnun, N. (2019). An eight-week mindfulness-based stress reduction (MBSR) workshop increases regulatory choice flexibility. *Emotion*, *19*(4), 593–604. 10.1037/emo0000461

Allen, V. C., & Windsor, T. D. (2019). Age differences in the use of emotion regulation strategies derived from the process model of emotion regulation: A systematic review. *Aging & Mental Health*, *23*(1), 1–14. 10.1080/13607863.2017.1396575

Almeida, D. M. (2005). Resilience and vulnerability to daily stressors assessed via diary methods. *Current Directions in Psychological Science*, *14*(2), 64–68. 10.1111/j.0963-7214.2005.00336.x

Avrill, J. R. (1983). Studies on anger and aggression: Implications for theories of emotion. *American Psychologist*, *38*(11), 1145–1160. 10.1037/0003-066X.38.11.1145

Babayan, A., Erbey, M., Kumral, D., Reinelt, J. D., Reiter, A. M. F., Röbbig, J., Schaare, H. L., Uhlig, M., Anwander, A., Bazin, P.-L., Horstmann, A., Lampe, L., Nikulin, V. V., Okon-Singer, H., Preusser, S., Pampel, A., Rohr, C. S., Sacher, J., Thöne-Otto, A., . . . Villringer, A. (2019). A mind–brain–body dataset of MRI, EEG, cognition, emotion, and peripheral physiology in young and old adults. *Scientific Data*, *6*, 180308. 10.1038/sdata.2018.308

Barlow, M. A., Wrosch, C., Gouin, J. P., & Kunzmann, U. (2019). Is anger, but not sadness, associated with chronic inflammation and illness in older adulthood? *Psychology and Aging*, *34*(3), 330–340. 10.1037/pag0000348

Blanchard-Fields, F. (2007). Everyday problem solving and emotion: An adult developmental perspective. *Current Directions in Psychological Science*, *16*(1), 26–31. 10.1111/j.1467-8721.2007.00469.x

Bolger, N., & Zuckerman, A. (1995). A framework for studying personality in the stress process. *Journal of Personality and Social Psychology*, *69*(5), 890–902. 10.1037/0022-3514.69.5.890

Brewer, S. K., Zahniser, E., & Conley, C. S. (2016). Longitudinal impacts of emotion regulation on emerging adults: Variable-and person-centered approaches. *Journal of Applied Developmental Psychology*, *47*, 1–12. 10.1016/j.appdev.2016.09.002

Buckley, T., Hoo, S. Y. S., Fethney, J., Shaw, E., Hanson, P. S., & Tofler, G. H. (2015). Triggering of acute coronary occlusion by episodes of anger. *European Heart Journal. Acute Cardiovascular Care*, *4*(6), 493–498. 10.1177/2048872615568969

Carstensen, L. L. (2006). The influence of a sense of time on human development. *Science*, *312*(5782), 1913–1915. 10.1126/science.1127488

Carstensen, L. L., Isaacowitz, D. M., & Charles, S. T. (1999). Taking time seriously: A theory of socioemotional selectivity. *American Psychologist*, *54*(3), 165–181. 10.1037/0003-066X.54.3.165

Carstensen, L. L., Turan, B., Scheibe, S., Ram, N., Ersner-Hershfield, H., Samanez-Larkin, G. R., Brooks, K. P., & Nesselroade, J. R. (2011). Emotional experience improves with age: evidence based on over 10 years of experience sampling. *Psychology and Aging*, *26*(1), 21–33. 10.1037/a0021285

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

Charles, S. T., Reynolds, C. A., & Gatz, M. (2001). Age-related differences and change in positive and negative affect over 23 years. *Journal of Personality and Social Psychology*, *80*(1), 136–151. 10.1037/0022-3514.80.1.136

Cludius, B., Mennin, D., & Ehring, T. (2020). Emotion regulation as a transdiagnostic process. *Emotion*, *20*(1), 37–42. 10.1037/emo0000646

D'Avanzato, C., Joormann, J., Siemer, M., & Gotlib, I. H. (2013). Emotion regulation in depression and anxiety: Examining diagnostic specificity and stability of strategy use. *Cognitive Therapy and Research*, *37*, 968–980. 10.1007/s10608-013-9537-0

Dryman, M. T., & Heimberg, R. G. (2018). Emotion regulation in social anxiety and depression: A systematic review of expressive suppression and cognitive reappraisal. *Clinical Psychology Review*, *65*, 17–42. 10.1016/j.cpr.2018.07.004

English, T., & Carstensen, L. L. (2013). Shifts in emotional experience and regulation across adulthood. In B. Mesquita & L. Campbell (Eds.), *Changing emotions* (pp. 31–36). Psychology Press.

English, T., Lee, I. A., John, O. P., & Gross, J. J. (2017). Emotion regulation strategy selection in daily life: The role of social context and goals. *Motivation and emotion*, *41*(2), 230–242. 10.1007/s11031-016-9597-z

Freudenthaler, H. H., Neubauer, A. C., Gabler, P., Scherl, W. G., & Rindermann, H. (2008). Testing and validating the trait emotional intelligence questionnaire (TEIQue) in a German-speaking sample. *Personality and Individual Differences*, *45*(7), 673–678. 10.1016/j.paid.2008.07.014

Frijda, N. H. (1986). *The emotions*. Cambridge University Press.

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, *2*(3), 271–299. 10.1037/1089-2680.2.3.271

Gross, J. J. (2015). Emotion regulation: Current status and future prospects. *Psychological Inquiry*, *26*(1), 1–26. 10.1080/1047840X.2014.940781

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, *85*(2), 348–362. 10.1037/0022-3514.85.2.348

Gunaydin, G., Selcuk, E., & Ong, A. D. (2016). Trait reappraisal predicts affective reactivity to daily positive and negative events. *Frontiers in Psychology*, *7*, 1000. 10.3389/fpsyg.2016.01000

Hedden, T., & Gabrieli, J. D. (2004). Insights into the ageing mind: A view from cognitive neuroscience. *Nature Reviews Neuroscience*, *5*(2), 87–96. 10.1038/nrn1323

Heiy, J. E., & Cheavens, J. S. (2014). Back to basics: A naturalistic assessment of the experience and regulation of emotion. *Emotion*, *14*(5), 878–891. 10.1037/a0037231

IBM Corp. (2017). *IBM SPSS Statistics for Linux* (Version 25.0).

Isaacowitz, D. M., Wadlinger, H. A., Goren, D., & Wilson, H. R. (2006). Is there an age-related positivity effect in visual attention? A comparison of two methodologies. *Emotion*, *6*(3), 511–516. 10.1037/1528-3542.6.3.511

John, O. P., & Gross, J. J. (2004). Healthy and unhealthy emotion regulation: Personality processes, individual differences, and life span development. *Journal of Personality*, *72*(6), 1301–1334. 10.1111/j.1467-6494.2004.00298.x

Kashdan, T. B., Goodman, F. R., Mallard, T. T., & DeWall, C. N. (2016). What triggers anger in everyday life? Links to the intensity, control, and regulation of these emotions, and personality traits. *Journal of Personality*, *84*(6), 737–749. 10.1111/jopy.12214

Katzorreck, M., & Kunzmann, U. (2018). Greater empathic accuracy and emotional reactivity in old age: The sample case of death and dying. *Psychology and Aging*, *33*(8), 1202–1214. 10.1037/pag0000313

Kesselman, H. J., Algina, J., & Kowalchuk, R. K. (2001). The analysis of repeated measures designs: A review. *British Journal of Mathematical & Statistical Psychology*, *54*(1), 1–20. 10.1348/000711001159357

Kim, M. Y., Ford, B. Q., Mauss, I., & Tamir, M. (2015). Knowing when to seek anger: Psychological health and context-sensitive emotional preferences. *Cognition and Emotion*, *29*(6), 1126–1136. 10.1080/02699931.2014.970519

Kraynak, T. E., Marsland, A. L., & Gianaros, P. J. (2018). Neural mechanisms linking emotion with cardiovascular disease. *Current Cardiology Reports*, *20*(12), 128–138. 10.1007/s11886-018-1071-y

Kunzmann, U., & Grühn, D. (2005). Age differences in emotional reactivity: The sample case of sadness. *Psychology and Aging*, *20*(1), 47–59. 10.1037/0882-7974.20.1.47

Kunzmann, U., & Isaacowitz, D. (2017). Emotional aging: Taking the immediate context seriously. *Research in Human Development*, *14*(3), 182–199. 10.1080/15427609.2017.1340048

Kunzmann, U., & Thomas, S. (2014). Multidirectional age differences in anger and sadness. *Psychology and Aging*, *29*(1), 16–27. 10.1037/a0035751

Kunzmann, U., & Wrosch, C. (2017). Emotional development in old age. In N. Pachana (Ed.), *Encyclopedia of geropsychology*. Springer. 10.1007/978-981-287-082-7_112

Lazarus, R. S. (1991). *Emotion and adaptation*. Oxford University Press.

Levine, L. J., Schmidt, S., Kang, H. S., & Tinti, C. (2012). Remembering the silver lining: Reappraisal and positive bias in memory for emotion. *Cognition and Emotion*, *26*(5), 871–884. 10.1080/02699931.2011.625403

Liang, K. Y., & Zeger, S. L. (1986). Longitudinal data analysis using generalized linear models. *Biometrika*, *73*(1), 13–22. 10.1093/biomet/73.1.13

Loch, N., Hiller, W., & Witthöft, M. (2011). Der cognitive emotion regulation questionnaire (CERQ). *Zeitschrift für Klinische Psychologie und Psychotherapie*, *40*, 94–106. 10.1026/1616-3443/a000079

Luong, G., Charles, S. T., & Fingerman, K. L. (2011). Better with age: Social relationships across adulthood. *Journal of Social and Personal Relationships*, *28*(1), 9–23. 10.1177/0265407510391362

Martins, B., Sheppes, G., Gross, J. J., & Mather, M. (2016). Age differences in emotion regulation choice: Older adults use distraction less than younger adults in high-intensity positive contexts. *The Journals of*

Gerontology. Series B, Psychological Sciences and Social Sciences, *73*, 603–611. 10.1093/geronb/gbw028

Mather, M., & Knight, M. (2005). Goal-directed memory: The role of cognitive control in older adults' emotional memory. *Psychology and Aging*, *20*(4), 554–570. 10.1037/0882-7974.20.4.554

Mauss, I. B., Cook, C. L., Cheng, J. Y., & Gross, J. J. (2007). Individual differences in cognitive reappraisal: Experiential and physiological responses to an anger provocation. *International Journal of Psychophysiology*, *66*(2), 116–124. 10.1016/j.ijpsycho.2007.03.017

McRae, K., Jacobs, S. E., Ray, R. D., John, O. P., & Gross, J. J. (2012). Individual differences in reappraisal ability: Links to reappraisal frequency, well-being, and cognitive control. *Journal of Research in Personality*, *46*(1), 2–7. 10.1016/j.jrp.2011.10.003

Memedovic, S., Grisham, J. R., Denson, T. F., & Moulds, M. L. (2010). The effects of trait reappraisal and suppression on anger and blood pressure in response to provocation. *Journal of Research in Personality*, *44*(4), 540–543. 10.1016/j.jrp.2010.05.002

Moore, S. A., Zoellner, L. A., & Mollenholt, N. (2008). Are expressive suppression and cognitive reappraisal associated with stress-related symptoms? *Behaviour Research and Therapy*, *46*(9), 993–1000. 10.1016/j.brat.2008.05.001

Mostofsky, E., Penner, E. A., & Mittleman, M. A. (2014). Outbursts of anger as a trigger of acute cardiovascular events: A systematic review and meta-analysis. *European Heart Journal*, *35*(21), 1404–1410. 10.1093/eurheartj/ehu033

Nowlan, J. S., Wuthrich, V. M., & Rapee, R. M. (2015). Self-report measures of positive reappraisal with a focus on older adults: A systematic review. *Clinical Gerontologist*, *38*(4), 302–324. 10.1080/07317115.2015.1032468

Ortner, C. N. M., Marie, M. S., & Corno, D. (2016). Cognitive costs of reappraisal depend on both emotional stimulus intensity and individual differences in habitual reappraisal. *PLoS One*, *11*(12), e0167253–18. 10.1371/journal.pone.0167253

Reitan, R. M. (1992). *Trail making test*. Reitan Neuropsychology Laboratory.

Riediger, M., Schmiedek, F., Wagner, G. G., & Lindenberger, U. (2009). Seeking pleasure and seeking pain: Differences in prohedonic and contrahedonic motivation from adolescence to old age. *Psychological Science*, *20*(12), 1529–1535. 10.1111/j.1467-9280.2009.02473.x

Rook, K. S., & Charles, S. T. (2017). Close social ties and health in later life: Strengths and vulnerabilities. *American Psychologist*, *72*(6), 567–577. 10.1037/amp0000104

Rook, K. S., Luong, G., Sorkin, D. H., Newsom, J. T., & Krause, N. (2012). Ambivalent versus problematic social ties: Implications for psychological health, functional health, and interpersonal coping. *Psychology and Aging*, *27*(4), 912–923. 10.1037/a0029246

Scheibe, S., Sheppes, G., & Staudinger, U. M. (2015). Distract or reappraise? Age-related differences in emotion-regulation choice. *Emotion*, *15*(6), 677–681. 10.1037/a0039246

Schwenkmezger, P., Hodapp, V., & Spielberger, C. (1992). *Das State-Trait-Ärgerausdrucks-Inventar (STAXI)* [The State-Trait-Angerexpression-Inventory (STAXI)]. Huber.

Scott, S. B., Ram, N., Smyth, J. M., Almeida, D. M., & Sliwinski, M. J. (2017). Age differences in negative emotional responses to daily stressors depend on time since event. *Developmental Psychology*, *53*(1), 177–190. 10.1037/dev0000257

Shafir, R., Thiruchselvam, R., Suri, G., Gross, J. J., & Sheppes, G. (2016). Neural processing of emotional-intensity predicts emotion regulation choice. *Social Cognitive and Affective Neuroscience*, *11*(12), 1863–1871. 10.1093/scan/nsw114

Sheppes, G., & Gross, J. J. (2011). Is timing everything? Temporal considerations in emotion regulation. *Personality and Social Psychology Review*, *15*(4), 319–331. 10.1177/1088868310395778

Sheppes, G., & Meiran, N. (2007). Better late than never? On the dynamics of online regulation of sadness using distraction and cognitive reappraisal. *Personality and Social Psychology Bulletin*, *33*(11), 1518–1532. 10.1177/0146167207305537

Sheppes, G., Scheibe, S., Suri, G., & Gross, J. J. (2011). Emotion-regulation choice. *Psychological Science*, *22*(11), 1391–1396. 10.1177/0956797611418350

Sheppes, G., Scheibe, S., Suri, G., Radu, P., Blechert, J., & Gross, J. J. (2014). Emotion regulation choice: A conceptual framework and supporting evidence. *Journal of Experimental Psychology: General*, *143*(1), 163–181. 10.1037/a0030831

Sheppes, G., & Levin, Z. (2013). Emotion regulation choice: Selecting between cognitive regulation strategies to control emotion. *Frontiers in Human Neuroscience*, *7*, 179. 10.3389/fnhum.2013.00179

Sorkin, D. H., & Rook, K. S. (2004). Interpersonal control strivings and vulnerability to negative social exchanges in later life. *Psychology and Aging*, *19*(4), 555–564. 10.1037/0882-7974.19.4.555

Stemmler, G. (2002). Persönlichkeit und Emotion: Bausteine einer biobehavioralen Theorie [Personality and emotion: Bricks of a biobehavioral theory]. In M. Myrtek (Ed.), *Die Personen im biologischen und sozialen Kontext* (pp. 115–141). Hogrefe.

Streubel, B., & Kunzmann, U. (2011). Age differences in emotional reactions: Arousal and age-relevance count. *Psychology and Aging*, *26*(4), 966–978. 10.1037/a0023424

Suls, J. (2013). Anger and the heart: Perspectives on cardiac risk, mechanisms and interventions. *Progress in Cardiovascular Diseases*, *55*(6), 538–547. 10.1016/j.pcad.2013.03.002

Suri, G., Sheppes, G., Young, G., Abraham, D., McRae, K., & Gross, J. J. (2018). Emotion regulation choice: The role of environmental affordances. *Cognition and Emotion*, *32*(5), 963–971. 10.1080/02699931.2017.1371003

Tamir, M., Mitchell, C., & Gross, J. J. (2008). Hedonic and instrumental motives in anger regulation. *Psychological Science*, *19*(4), 324–328. 10.1111/j.1467-9280.2008.02088.x

Tombaugh, T. N. (2004). Trail making test A and B: Normative data stratified by age and education. *Archives of Clinical Neuropsychology*, *19*(2), 203–214.

Troy, A. S., Shallcross, A. J., & Mauss, I. B. (2013). A person-by-situation approach to emotion regulation: Cognitive reappraisal can either help or hurt, depending on the context. *Psychological Science*, *24*(12), 2505–2514. 10.1177/0956797613496434

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

Webb, T. L., Miles, E., & Sheeran, P. (2012). Dealing with feeling: A meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. *Psychological Bulletin*, *138*(4), 775–808. 10.1037/a0027600

Wrzus, C., Müller, V., Wagner, G. G., Lindenberger, U., & Riediger, M. (2014). Affect dynamics across the lifespan: With age, heart rate reacts less strongly, but recovers more slowly from unpleasant emotional situations. *Psychology and Aging*, *29*(3), 563–576. 10.1037/a0037451

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