HHS Public Access

Author manuscript

Emotion. Author manuscript; available in PMC 2022 February 01.

Published in final edited form as:

Emotion. 2021 February ; 21(1): 39–51. doi:10.1037/emo0000672.

Age and emotion regulation in daily life: Frequency, strategies, tactics, and effectiveness

Kimberly M. Livingstone, **Derek M. Isaacowitz**

Northeastern University

Abstract

Models of aging and emotion hypothesize age differences in emotion regulation—in frequency, use of strategies, and/or effectiveness—but research to date has been mixed. In the current experience sampling study, younger, middle-aged, and older adults (N=149), were prompted 5 times a day for 10 days to report on both general strategies (e.g., situation selection, cognitive change) and specific tactics. For each of the 5 strategies proposed by Gross's process model, tactics included those that introduced/increased positive aspects, avoided/decreased negative, and engaged with negative. Consistent with socioemotional selectivity theory, older adults reported less contra-hedonic motivation than younger, but this did not necessarily translate into age differences in regulation frequency or strategy use. Across the sample, strong preferences emerged for strategies intervening early in the emotional process and for tactics that introduced/increased positive aspects; a pattern that was even stronger in older adults. Middle-aged people more often avoided and reduced negative situations, whereas younger adults more often (though rarely) sought out or exacerbated negative situations. Effectiveness varied across strategies and tactics, but age differences only emerged for situation selection and reducing negative aspects of the situation (both less effective for older than younger adults). This research highlights the importance of studying how emotion regulation strategies are implemented in real life situations and suggests that age differences in emotion regulation, when they do emerge, may be more a matter of degree than of type.

Keywords

emotion regulation; aging; lifespan development; experience sampling

Older adults report generally high levels of emotional well-being despite normative declines in cognitive and physical functioning (Charles & Carstensen, 2010). Several models of lifespan emotional development suggest emotion regulatory processes shift with age as goals and resources change. Socioemotional selectivity theory (SST) proposes that because older adults perceive future time as more limited, they prioritize short-term emotional well-being over long-term instrumental goals (e.g., Carstensen, 2006), suggesting that pro-hedonic emotion regulation might become more frequent with age. The strength and vulnerability integration model (SAVI) suggests older adults draw upon accumulated knowledge about

Corresponding author: Kimberly M. Livingstone, Department of Psychology, Northeastern University, 125 NI, 360 Huntington Ave., Boston, MA 02115. k.livingstone@northeastern.edu.

emotions to cultivate better emotional outcomes, though age-related vulnerabilities may lead them to alter how they do it (Charles, 2010). For example, older adults may reduce reliance on resource-demanding cognitive strategies and shift toward those that target the situation, intervening before an emotion occurs (Charles, 2010; see also Urry & Gross, 2010). Therefore, we might expect age differences in both strategies people use and how effective they are. Moreover, if emotion regulation helps explain high levels of emotional well-being in older age, we might expect more effective regulation overall in older age, as indicated by change in affect collapsing across all strategies.

Emotion Regulation Strategies and Tactics

The process model of emotion regulation outlines several general strategies people can use to influence their emotions, based on which part of the emotional process they target—the situation, attention, cognition, or response (Gross, 1998). Situation selection involves seeking out or avoiding a situation based on emotion regulation goals; situation modification involves changing aspects of the situation; attentional deployment involves directing attention toward or away from emotional aspects of the situation; cognitive change involves altering the way one thinks about the situation (e.g., via cognitive reappraisal); and response modulation targets the emotional response (e.g., by changing emotional expression). Because of declines in the ability to flexibly down-regulate from intense negative emotions in the moment, older adults may shift regulation efforts away from cognitively and physically demanding strategies, such as cognitive reappraisal and response modulation (Charles, 2010; Urry & Gross, 2010). Instead, they may shift efforts to situational and attentional strategies, which can avoid full-blown emotional responses in the first place.

In an extension of the process model, Gross (2015) outlined a series of decisions within emotion regulation processes: In an episode of regulation, a person (a) identifies the need to regulate, (b) selects a strategy, and (c) implements regulation by translating the general strategy into a particular tactic. When implementing regulation, they also monitor the tactic's effectiveness in achieving their goals, and subsequently maintain, switch, or stop regulation.

Of note in this extended model is the distinction between general strategies—the aspects of the emotion-generative process that regulation targets, such as the situation, attention, or response—and tactics—the specific way(s) a strategy is implemented within a situation. For example, a person could use the strategy of situation selection either by the tactic of avoiding a negative situation or by seeking out a positive one (or both). Whereas most research on emotion regulation targets either the general strategy or one specific tactic representing that strategy (such as detached reappraisal), research has begun to distinguish among multiple tactics, especially in reappraisal (e.g., McRae, Ciesielski, & Gross, 2012; Shiota & Levenson, 2009).

Age differences may occur in each of these stages. First, in line with SST, if older adults prioritize short-term emotional well-being goals (Carstensen, 2006), they may be more likely to identify the need to regulate in a pro-hedonic way (i.e., reduce the likelihood of negative emotions and/or increase the likelihood of positive emotions), and regulate more

frequently overall. In contrast, younger adults are thought to have multiple goals, including long-term goals such as information acquisition, for which current emotional well-being may not be relevant, may not take priority, or may interfere with goal pursuit. Second, if older adults shift away from resource-demanding strategies such as cognitive change and response modulation, and toward earlier intervention via situational and attentional strategies (Charles, 2010; Urry & Gross, 2010), they may select different strategies from younger adults. Third, because of differences in resources or goals, how strategies are implemented may differ with age. As older adults tend to show age-related positivity effects, favoring positive over negative information in attention in memory (Reed & Carstensen, 2012), they may also implement tactics that incorporate positive aspects of the situation, information, and experience, or avoid negative aspects, rather than engage negative ones (Livingstone & Isaacowitz, 2016). Finally, given more experience with emotions (Charles, 2010), older adults may be more effective in monitoring the success of emotion regulation attempts, and experience more positive affective outcomes as a result of regulation. Below, we review whether existing evidence supports these ideas.

Age Differences in Emotion Regulation

Although developmental theories often describe processes as unfolding across the lifespan, empirical research on emotional aging has most often compared extreme age groups (e.g., younger adults vs. older adults). In the current study, we include adults from ages 20–80, but because there is limited research on emotion regulation in middle adulthood, we do not make specific predictions regarding that age group.

Frequency.

In line with theoretical predictions, older adults report more pro-hedonic motivation in daily life (Riediger, Schmiedek, Wagner, & Lindenberger, 2009), and self-report better control of their emotions (Gross, Carstensen, Pasupathi, & Tsai, 1997; Schirda, Valentine, Aldao, & Prakash, 2016). A review of the literature concluded that older age is generally associated with greater emotion regulation knowledge and use of more putatively adaptive emotion regulation strategies, though findings vary by strategy (Doerwald, Scheibe, Zacher, & Yperen, 2016). Although previous research has examined age differences in the extent to which people use different strategies (e.g., Eldesouky & English, 2018), there is little research on whether age groups differ in how often they regulate their emotions overall across strategies.

Strategies.

Some laboratory studies of situation selection have found age differences in valence preferences for positive and/or neutral over negative material (Livingstone & Isaacowitz, 2015; Sands & Isaacowitz, 2017), although a mini meta-analysis of such studies found no overall trends (Sands, Livingstone, & Isaacowitz, 2018). Naturalistic studies suggest that older adults do rely on situation selection, however, for example, by shaping their social networks in ways that promote emotionally fulfilling relationships with close others, rather than seeking to grow a larger network of acquaintances (Lang & Carstensen, 1994). In daily diary research, older adults were more likely to report avoiding situations involving social

conflict (Birditt, Fingerman, & Almeida, 2005), although another daily diary study found no age differences in situation selection or modification (Eldesouky & English, 2018).

Laboratory research has consistently found age-related positivity effects in visual attention, in which older adults attend more to positive than negative information to a greater extent than younger adults (Reed, Chan, & Mikels, 2014). This is thought to reflect motivated cognition related to older adults' more salient well-being goals (Reed & Carstensen, 2012). For example, older adults are more likely to show this positive attention pattern when in a negative mood, whereas younger adults show more mood-congruent behavior, looking more at negative material (Isaacowitz, Toner, Goren, & Wilson, 2008). Evidence suggests that at least in some cases, positive gaze preferences reflect attentional deployment (Isaacowitz, 2012). When given a choice, older adults favor attentional deployment over reappraisal for both low- and high-arousal negative images, compared to younger adults, who prefer reappraisal for low-arousal images (Scheibe, Sheppes, & Staudinger, 2015). This supports the idea that older adults shift toward earlier-intervening strategies within the emotion generative process, in attempts to avoid and disengage from negative experiences.

Although our focus is on directing or redirecting attention to external events or situations, attentional strategies also include shifting internal attention to mental and physical processes, such as in the case of rumination or distraction away from the current situation to an unrelated activity or topic. One laboratory study on self-reported emotion regulation after a film clip found no age differences in distraction or rumination (Hofer, Burkhard, & Allemand, 2015).

Studies of age differences in use of reappraisal and expressive suppression (a commonly studied form of response modulation in which people hide expression of emotion) have generally relied on global self-report. In some studies, older people report using reappraisal more than younger adults (John & Gross, 2004; Masumoto, Taishi, & Shiozaki, 2016), whereas in others they report less (Nolen-Hoeksema & Aldao, 2011); in still others there are no differences (Brummer, Stopa, & Bucks, 2014). Some studies of expressive suppression find that older adults report using it more (Brummer et al., 2014; Nolen-Hoeksema & Aldao, 2011) or less (John & Gross, 2004) than younger adults; others find no difference (Masumoto et al., 2016). In the laboratory, at least one study found that that older adults used more expressive suppression and mediality (a form of reappraisal emphasizing the video's fictional nature) after viewing a film clip (Hofer et al., 2015).

In sum, research on age differences in emotion regulation strategy use has been mixed (see also Allen & Windsor, 2017). Because strategies have typically been examined in isolation or contrasted with one or two others, it is difficult to draw conclusions across the strategies within the process model. A recent laboratory study, however, provided opportunities to engage in regulatory behaviors representing each of the five strategies, and found that younger and older adults behaved similarly in standardized situations, avoiding and modifying negative situations and using positive attentional deployment and positive reappraisal (Livingstone & Isaacowitz, in press). A recent daily diary study also found no age differences in the use of any of the five strategies (Eldesouky & English, 2018). In contrast to age differences found in studies examining one or two strategies, the only two

studies to date that have investigated all five strategies within the same sample, therefore, have found more age similarity than differences.

Tactics.

Most emotion regulation research to date has examined emotion regulation at the strategy level. There is emerging evidence that shifting to the tactic level—that is, the specific way that a strategy is implemented within a situation—may provide more nuanced information (e.g., McRae et al., 2012; Ochsner, Silvers, & Buhle, 2012). Outside of comparing positive and detached reappraisal, however, research has only begun to examine age differences at the tactic level. So far, research has suggested that in the lab, overall tactics that avoid or decrease negative aspects of the situation are common in situation- and attention-focused strategies, whereas introducing positive aspects in attention and cognition are more common once negative stimuli are present (Livingstone & Isaacowitz, in press). Although these patterns were present in both younger and older adults, middle-aged adults in that study showed less pro-hedonic behavior, showing no valence preference in situation selection, and deploying attention toward both positive and negative content. Preliminary evidence, then, suggests that examining specific valence-focused tactics may reveal important information about emotion regulation patterns across age groups.

We note that tactics are likely related to the goals that a person has in the situation, but that they are nonethless conceptually distinguishable: A goal is a desired end state that a person is motivated to pursue; a tactic is the emotion regulatory behavior undertaken in pursuit of that goal. For example, if someone has a goal of increasing positive emotions, they are likely to use tactics that aim to increase positive aspects of the situation or experience. They may also, however, employ tactics that are likely to avoid or diminish negative aspects. Similarly, a person with the goal of reducing negative feelings may do so by reducing negative aspects *and/or* increasing positive ones. Therefore, we treat goals and tactics as related but separate constructs.

Effectiveness.

Laboratory studies typically manipulate strategy instructions and measure online or subsequent affect. Studies have found that older adults are less effective at implementing cognitive reappraisal (Opitz, Rauch, Terry, & Urry, 2012), although this may vary by tactic. Two studies found that older adults were more effective at using positive reappraisal (focusing on positive aspects), whereas younger adults were more effective at using detached reappraisal (remaining objective; Lohani & Isaacowitz, 2014; Shiota & Levenson, 2009); another study found no age differences in the effectiveness of either tactic (Livingstone & Isaacowitz, 2018). Studies have generally found no age differences in ability to suppress (Lohani & Isaacowitz, 2014; Phillips, Henry, Hosie, & Milne, 2008; Shiota & Levenson, 2009) or amplify (Kunzmann, Kupperbusch, & Levenson, 2005) emotional expression, though the latter study suggested that amplification may be more difficult for older adults.

Lab studies of spontaneous emotion regulation behavior find that pro-hedonic situation selection is effective for both younger and older adults (e.g., Isaacowitz, Livingstone, Harris, & Marcotte, 2015; Livingstone & Isaacowitz, 2015). In contrast, more pro-hedonic

attentional deployment has been effective only for those older adults with stronger attentional control abilities (Isaacowitz, 2012). Although one lab study found that situation modification by skipping negative content was not effective in reducing negative affect (Livingstone & Isaacowitz, 2015), a daily diary showed that avoiding social conflict was related to lower negative affect for older, but not younger, adults (Charles, Piazza, Luong, & Almeida, 2009).

Emotion regulation in daily life

Because older adults' strengths in the emotional domain rely on knowledge and experience, some theorists argue that in daily life, older adults regulate emotions by actively and selectively engaging with situations, information, and experiences to support their emotional goals in ways that most laboratory tasks do not afford (Sims, Hogan, & Carstensen, 2015). However, asking people to report on global tendencies may obscure variability in situations and tactics. The purpose of this research, therefore, is to investigate emotion regulation in the daily lives of younger, middle-aged, and older adults.

Although it has its limitations, experience sampling methodology (ESM) provides more ecological validity than laboratory studies and is less susceptible to retrospective bias than global self-reports. Importantly, it also allows parallel assessment of multiple strategies, in contrast to previous research on age differences in emotion regulation that has typically examined one or a few strategies at a time. Laboratory research investigating multiple strategies shows that people often use multiple strategies during regulation (Aldao & Nolen-Hoeksema, 2012). One ESM study assessing 40 strategies in undergraduates found that people averaged seven strategies for regulating negative emotions, and eight for positive emotions (Heiy & Cheavens, 2014).

Previous ESM studies show that older age is associated with more positive emotional experience (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000) and more pro-hedonic motivation (Rieidger et al., 2009). A daily diary study found that young-old adults (up to age 64) used more adaptive and less maladaptive strategies (Scheibe et al., 2016); another found no age differences in daily use of situation selection, situation modification, distraction, detached reappraisal, positive reappraisal, or expressive suppression (Eldesouky & English, 2018). To date, however, there have been few experience sampling studies examining age differences in emotion regulation multiple times a day, and none examining tactics within each strategy. As previous aging research has produced mixed results on strategy use and effectiveness, examining how the strategies are implemented may clarify emotion regulatory processes across the adult lifespan. Although tactics may be defined in a number of ways, previous research has distinguished between tactics that reduce negative aspects of the situation or experience from those that introduce or increase positive aspects, and those that engage with negative aspects (Livingstone & Isaacowitz, in press), providing a framework with which to begin to identify differences in emotion regulation implementation.

The Current Research

The current study examined emotion regulation in everyday daily lives of younger, middle-aged, and older adults, who reported on emotion regulation strategy and tactic use and effectiveness five times a day across 10 days. This allowed us to examine four main questions.

First, are older adults more likely to report regulating their emotions than younger adults? For each of the five surveys throughout each day, participants indicated whether they had tried to influence their emotions since the last survey. If older adults have more salient emotional well-being goals, we would expect them to report regulating more often than younger adults overall.

Second, do older adults use strategies that intervene earlier in the emotion-generative process compared to later, to a greater extent than younger adults? For each instance of regulation, participants reported on which strategies they used. If older adults do shift more toward situation and attention-focused regulation, we would expect them to use situation selection, situation modification, and attentional deployment more often, and cognitive change and response modulation less, than younger adults.

Third, do older adults use more positivity-increasing and/or negativity-decreasing tactics, compared to younger adults? For each strategy participants reported using, participants indicated the specific tactics they employed, with tactics focused on reducing negative aspects (avoiding negative situations, reducing negative aspects of the situation, attending away from negative aspects, using detached reappraisal, and hiding emotional expression), introducing or increasing positive aspects (seeking out positive situations, increasing positive aspects of the situation, attending toward positive aspects, using positive reappraisal, masking emotional experiences with positive expressions, and engaging or increasing negative aspects (seeking out negative situations, increasing negative aspects, attending toward negative aspects, thinking about the negative aspects, and expressing their negative emotions). If older adults have more salient prohedonic goals and younger adults also have other longer-term instrumental goals, we might expect older adults to report more frequently introducing positive aspects and decreasing negative aspects, and less frequent engagement with negative aspects, compared to younger adults (see also Scheibe et al., 2015).

Fourth, are older adults more effective in their emotion regulation than younger adults? For each instance of emotion regulation, participants reported their affect before and after regulation as a measure of regulation effectiveness. If older adults are more effective at regulating their emotions, we would expect more positive affect change from before to after, as well as more positive affect overall, compared to younger adults.

We also examined a number of exploratory questions for which we did not have specific hypotheses. Whereas most global self-report and lab studies of emotion regulation have used extreme age-group designs, comparing younger to older adults, we included a middle-aged group as well. In middle age, people have more experience with emotional situations, but may not yet face cognitive and physical decline, making this period a pivotal one (Lachman, Teshale, & Agrigoroaei, 2015). Middle-aged people could show regulation use and

effectiveness that falls between younger and older adults', or they could show an inverse U-shaped pattern, in which effectiveness is highest due to a convergence of skills and resources.

We also assessed two forms of acceptance strategies: of the situation and of emotions. Although not outlined in the original process model (Gross, 1998), acceptance is a commonly studied cognitive emotion regulation strategy, with evidence suggesting that older adults show higher trait-level acceptance of negative emotions than younger adults (Shallcross, Ford, Floerke, & Mauss, 2013). We also included acceptance of the situation, as older adults have also been shown to use more passive coping strategies when it is adaptive (Blanchard-Fields, 2007).

Finally, for each instance of regulation, we asked participants what their goals were for regulation (increase vs. decrease positive vs. negative emotions). Although we expected older adults to report more pro-hedonic goals consistent with past research (Riediger et al., 2009), we did not have specific hypotheses about increasing positive vs. decreasing negative emotions.

Method

Participants

The target sample size was 50 participants per age group, based on past ESM research comparing group differences (Gruber, Kogan, Mennin, & Murray, 2013). Participants were 170 members of the greater Boston community recruited through online and print advertisements. The final sample consisted of 149 participants (52.7% female, 7.1% Hispanic, 49% White, 34% Black, 20.3% Asian): 49 younger adults (YAs; ages 20–39, M=26.22, SD=5.62), 50 middle-aged adults (MAs; ages 40–59, M=50.68, SD=5.94), and 50 older adults (OAs; ages 60–79, M=66.56, SD=4.81). Exclusion reasons and sample characteristics can be found in supplemental materials.

Participants received $50 for completing both lab sessions plus a survey completion bonus (a total of $75 for completing at least 50% of the surveys, and $100 for completing at least 80%). Payment occurred at the conclusion of their participation. One YA participant dropped out due to infeasibility of taking surveys throughout their day.

Measures

Individual difference measures.—In the intake session, participants completed a series of questionnaires, including demographic information, trait-level emotional well-being, and emotion regulation styles. In the debriefing session, participants completed tests of cognitive functioning as well as additional questionnaires, including personality traits, optimism, personal control, and health. Details about all measures can be found in supplemental materials.

Experience sampling surveys.—Surveys consisted of a series of branching questions. Complete text of the survey questions and answer options can be found in supplemental materials. All participants first rated their current mood on a scale from 1 (very negative) to

7 (very positive). They were then asked, “Since the last survey, have you done anything to try to influence your emotions?” Participants indicated “Yes” or “No.”

Non-regulation episodes.: If participants indicated they had not influenced their emotions, they were asked “You indicated that you DID NOT try to influence your feelings. Did you experience any strong positive or negative emotions?” and could choose from “No”, “Yes, and I accepted them or let them play out,” or “Yes, and I actually did try to influence my emotions.” If they chose the latter, they were redirected to start of the “Yes” branch. In the “No” branch, they were asked a series of filler questions, including current activities and whether they were interacting with anyone (if yes, with whom); these questions were designed to take up time so people would not choose the “no” branch merely because it was shorter. They were also asked whether they had sought out or avoided people or activities based on how they would make them feel. These questions were designed to catch instances of situation selection, which in piloting people did not always consider to be trying to influence their emotions. Results for these questions can be found in supplemental materials.

Regulation episodes.: If participants indicated that they had tried to influence their emotions, they were asked to think of ONE event, and indicate their goal(s) and the context(s) that the incident involved. To assess strategy-level emotion regulation, they were then asked whether they had (a) selected to enter or avoid a situation, (b) taken action to change a situation, (c) shifted their attention, (d) changed their thinking, and (e) changed their emotional expression, indicating yes or no for each. If they selected “no,” they were directed to the next strategy item. If they selected “yes,” they saw a follow-up question asking them about specific tactics. For each of the five strategies, options included one focusing on decreasing negative elements, one focusing on increasing positive elements, and one focusing on engaging with negative elements. Additionally, situation modification and cognitive change/focus included options for acceptance of the situation and emotions, respectively. Participants could choose as many strategies and tactics as applied. Afterwards, they were asked whether they did anything else to influence their feelings (in a textbox), and then rated how they felt both before and after trying to change their emotions, on the same 1 (very negative) to 7 (very positive) scale. They were offered a chance to enter in any additional information in a textbox, and then completed the survey.

Procedure

Intake session.—Participants completed a 2-hour intake session in which they provided informed consent, received information on emotion regulation strategies and tactics, installed the application on their device, completed practice surveys, and filled out questionnaires. The informational session included an 11-minute video defining emotions, emotion regulation, and the strategy and tactic items they would see in the surveys. This video, a narrated PowerPoint slideshow created for the purpose of this study, followed the process model of emotion regulation (Gross, 1998), and described how emotions unfold (situation, attention, thinking, and expression), as well as how people can intervene at any stage to change their emotions. It included an example involving traveling on crowded public transportation, which provided opportunities to increase positive, decrease negative, or engage with negative elements of the situation and experience.

The researcher remained in the room while the video played and answered any questions the participants had. After the video, the researcher asked participants to think of a recent time when they tried to influence their emotions, and went through the episode, asking about the context, the goal, the strategies, and the tactics that the participant had used to try to change their emotions. Participants were given a pamphlet with an overview of all of the options, and were asked to indicate whether they had used each or not, in a way that paralleled the app's survey flow. Participants reported on 2–3 recent episodes until they indicated understanding the options.

The researcher then installed the app, created for this project, on the participants' device, adjusted permission and notification settings, and set the 12-hour time window during which the participant would receive notifications. Participants completed two practice surveys, one for each branch, to familiarize themselves with the app and the content of the questions. They then completed a series of questionnaires and were asked to keep the pamphlet, which contained contact information should any issues or questions arise.

Survey period.—Participants received notifications starting the day after their intake session, and received 5 notifications per day for 10 days. Notifications were scheduled semi-randomly within the 12 hours, with the restriction that they were at least 30 minutes apart. Participants could also complete a survey at any time, even outside of their 12-hour window, but were told that surveys would only count if they were at least 30 minutes apart. Because of this, some participants completed more than 50 surveys. A research assistant called each participant 2–4 days into the survey period to ask if they had any questions or problems with the app. After the 10 days, participants could continue to answer surveys, but were told that they could stop.

Participants completed surveys on their smartphone (N=138) or tablet (N=10); 4 were not recorded). The majority of participants used Android (N=101, 66%), the rest used iOS (N=47, 30.9%); 4 were not recorded. Surveys were completed on average 2 hours and 37 minutes apart (SD=1 hour 32 minutes; range 30 minutes to 12 hours 50 minutes). Two versions of the app were developed because the first had significant data loss for certain participants. Because of how timestamps were recorded, survey duration was only available for one version of the app.

Based on this data, participants completed surveys on average in 61 seconds (SD=75 sec; range 1–1425 sec; this included partial surveys). Complete surveys with no regulation were completed in an average of 27 sec (SD=22, range 5–279); those with regulation were completed in an average of 100 sec (SD=98, range 12–1425).

Debriefing session.—Participants came back to the lab 11–14 days after the beginning of the survey period and uninstalled the app. The researchers provided participants with descriptive statistics regarding their average reported affect each day of the survey period and the frequencies of using each emotion regulation strategy. This served as an incentive for participants to complete surveys in addition to the payment. Participants completed additional questionnaires, then were fully debriefed and paid for their participation. This study was approved by the Northeastern University IRB (protocol #1608-16).

Results

Data Cleaning

Due to a recording problem with the first version of the app that emerged mid-data collection, 17 participants had 10 or fewer valid surveys (5 YAs, 9 MAs, 3 OAs). 1 OA was outside of targeted age range (88 years old). In addition, 1 YA and 1 OA were extreme outliers in number of surveys submitted (N=218, 178); 1 YA and 1 MA were outliers in number of valid surveys (N=109, 94). These participants were excluded from analyses.

Of the 7938 surveys submitted by the remaining participants, 875 were excluded because they were duplicate responses, mistakes, or submitted within 30 minutes of the previous report. Complete data screening processes are reported in supplemental materials. Because results can be sensitive to data screening procedures, we conducted a multiverse analysis (Steegen, Tuerlinckx, Gelman, & Vanpaemel, 2016) to examine the robustness of effects to different inclusion criteria (see supplemental materials). All results reported below were generally robust to such variations (exceptions are noted in the text below).

The final data set included 7106 surveys from 148 participants (M=47.94, SD=12.63, range 14–81). YAs completed fewer surveys (M=43.42, SD=11.85) than MAs (M=50.82, SD=12.86) and OAs (M=49.40, SD=12.15), $F(2,145)=4.97$, p=.008. Number of valid responses did not differ by gender, $t(146)=-.46$, p=.647, d=.07; race (white vs. person of color), $t(146)=.13$, p=..898, d=.02; college degree, $t(143)=-.47$, p=.639, d=.08; or employment status (employed vs. not), $t(141)=-.20$, p=.844, d=.03. Number of surveys completed correlated with age (r=.28, p=.001), but did not correlate above .20 for any other individual difference measure.

Overview of analysis

When examining age differences in regulation, strategy use, and tactic use, responses were aggregated across valid surveys for each participant. Experience sampling studies have typically used multilevel modeling (e.g., Gruber et al., 2013), to test strategies individually without comparing strategies and tactics with each other. Rather than examine survey-level variability in emotion regulation, analysis of variance on aggregated scores provided a more straightforward approach to compare across specific strategies and tactics. We note, however, that testing each strategy and tactic separately provided nearly identical results for age comparisons. For ANOVA, planned contrasts compared both middle-aged and older adults to younger adults. Additional exploratory questions examined frequency of regulatory goals. Descriptive statistics can be found in Table 1. Where Mauchly's test of sphericity was significant, Greenhouse-Geisser corrected degrees of freedom were used. For analyses of affect, we used multilevel modeling to examine the relationships between strategies and tactics and affect change for regulatory episodes. Strategies and tactics were each tested separately. Exploratory analysis using age as a continuous predictor can be found in supplemental materials.

Frequency of Regulation

Participants regulated emotions in less than half of episodes (M=.45, SD=.26). A one-way ANOVA showed that neither MAs (M=.43, SD=.27) nor OAs (M=.46, SD=.28) differed from YAs (M=.46, SD=.23) in overall frequency of regulation, $F(2,145)=.14$, $p=.870$, $\eta^2=.002$.

Strategy Use

To examine age differences in use of general strategies, we analyzed the proportion of surveys in which participants endorsed strategy-level items. A 5 (strategy: situation selection, situation modification, attentional deployment, cognitive change, response modulation) × 3 (age group: YA, MA, OA) ANOVA showed that people used strategies at different rates, $F(3.39, 453.81)=78.58$, $p<.001$, $\eta_p^2=.355$, but neither the overall age difference, $F(2,143)=2.85$, $p=.061$, $\eta_p^2=.038$, nor the strategy x age interaction, $F(6.35, 453.81)=1.79$, $p=.095$, $\eta_p^2=.024$, were significant. Repeated contrasts showed that across the age groups, participants did not differ in use of situation selection and modification ($p=.166$, $\eta_p^2=.013$), but used those more than attentional deployment ($p<.001$, $\eta_p^2=.103$), which was used more than cognitive change ($p=.021$, $\eta_p^2=.037$); response modulation was used the least ($p<.001$, $\eta_p^2=.452$).

Tactic Use

To examine age differences in use of specific tactics, a 5 (strategy family) × 3 (tactic type: introduce/increase positive, avoid/decrease negative, or engage with negative aspects) × 3 (age group) ANOVA examined the proportion of episodes in which tactics were used. We note that strategy here as aggregated across tactics, rather than responses to strategy-level items, as in the previous analysis. Results are presented in Figure 1. Age groups did not significantly differ in overall tactic use, $F(2, 144)=.87$, $p=.422$, $\eta_p^2=.012$. There were main effects of strategy, $F(3.40,488.93)=46.44$, $p<.001$, $\eta_p^2= .244$, and tactic type, $F(1.58, 228.01)=202.75$, $p<.001$, $\eta_p^2=.585$, as well as a strategy x tactic type interaction, $F(5.81, 836.06)=44.99$, $p<.001$, $\eta_p^2=.238$, and a significant three-way interaction, $F(11.61, 836.06)=4.38$, $p<.001$, $\eta_p^2=.057$. When aggregated across tactics with strategies, repeated contrasts showed that participants did not differ in using situation selection, situation modification, and attentional deployment tactics (p's > .15), but used these more than cognitive change ($p<.001$), and used response modulation the least ($p<.001$). When aggregated across tactics within tactic type, simple contrasts showed that participants used tactics that increased positive aspects the most, followed by those that reduced negative aspects ($p<.001$), and those that engaged with negative aspects the least ($p<.001$). The age x strategy interaction was not significant, $F(6.79, 488.93)=0.85$, $p=.542$, $\eta_p^2=.012$, though the age x tactic interaction was, $F(3.17, 228.01)=3.47$, $p=.015$, $\eta_p^2=.046$.

To investigate the three-way interaction, we analyzed tactic types separately (for strategies and age groups separately, see supplemental materials). There was a significant age difference across tactics that increased positive aspects, $F(2,144)=3.77$, $p=.025$, $\eta_p^2=.050$: OAs ($p=.016$), but not MAs ($p=.862$), used tactics that increased positive aspects more than YAs. This pattern held for making situations more positive, $F(2,143)=3.37$, $p=.037$; and attending to positive information, $F(2,143)=4.20$, $p=.017$; but not positive reappraisal,

$F(2,143)=1.60$, $p=.204$; or masking, $F(2,142)=.65$, $p=.525$. Age differences also emerged in seeking positive situations, $F(2,144)=6.07$, $p=.003$, but these results did not occur across all multiverse analyses (see supplemental materials).

There were no age differences in tactics that decreased negative aspects, $F(2,144)=1.83$, $p=.164$, $\eta_p^2=.025$, but there was an age x strategy interaction, $F(7.45, 528.82)=3.38$, $p=.001$, $\eta_p^2=.045$. Age groups differed in avoiding negative situations, $F(2,144)=4.85$, $p=.009$; and making situations less negative, $F(2,143)=4.05$, $\eta_p^2=.020$; but not for attending away from negative information, detached reappraisal, or expressive suppression. MAs, but not OAs, were more likely than YAs to avoid negative situations and make situations less negative.

There was no overall age difference in engaging with negative aspects, $F(2, 142)=.35$, $p=.707$, $\eta_p^2=.005$, and the interaction between strategy and age was not significant, $F(5.31, 376.76)=1.65$, $p=.141$, $\eta_p^2=.023$. There were significant age differences in seeking negative situations, $F(2,144)=5.16$, $p=.007$; and in making situations more negative, $F(2,143)=4.99$, $p=.008$; but not in attending to negative information, negative cognitive focus, or expressing negative emotions. YAs were more likely than both MAs and OAs to seek negative situations and make them more negative.

Momentary Affect

Twenty-nine percent of the variance in momentary affect was between people. On average, people reported being in a slightly to moderately positive mood ($\gamma=5.35$, SE=.060). OAs ($\gamma=5.52$, $SE=.11$) reported more positive affect than YAs ($\gamma=5.21$, $SE=.09$), $p=.025$; MAs ($\gamma=5.31$, $SE=.10$) and YAs did not differ, $p>.500$.

Emotion Regulation Effectiveness

To test effectiveness of emotion regulation strategies and tactics, we examined reported affect change at the episode level rather than aggregated. Multilevel models were tested in HLM 7.01 (Raudenbush, Bryk, & Congdon, 2013). Random effects were initially included but removed if the variance component was not significant at $p<.10$ (Nezlek, 2011). For models testing age differences, dummy codes for middle-aged and older adults were entered to compare both to the reference group of younger adults. For clarity, effectiveness analyses included only episodes in which the goal was reported as increasing positive affect or decreasing negative (or both, $n=2855$). The dependent variable was the change in affect from before regulation to after.

Overall effectiveness.—Collapsing across all strategies and tactics, YAs reported more negative affect than MAs and OAs before regulation, but there were no differences after. MAs reported less of an increase in positive affect compared to YAs; YAs and OAs did not differ.

Strategy and tactic effectiveness.—Strategies and tactics were entered individually at Level 1, with dummy coded age variables at Level 2; predictors were dichotomous and were not centered. Results of multilevel models are presented in Table 2. All five general strategies were associated with changes in the form of more positive/less negative affect.

Tactics of making situations less negative, making situations more positive, detached reappraisal, positive reappraisal, and masking with a positive expression were associated with changes to more positive/less negative affect.

There were significant interactions with age (the OA dummy variable) for the strategy of situation selection and the tactic of making a situation less negative. Follow-up analyses examined YAs and OAs separately. Use of situation selection was significantly and positively associated with affect change for YAs, γ=.19, *SE*=.09, t(763)=2.03, p=.042; but not for OAs, γ=−.13, *SE*=.13, t(49)=−1.01, p=.317. Similarly, use of the situation modification tactic of making the situation less negative was associated with affect change for YAs, γ=0.33, *SE*=.10, t(755)=−3.22, p=.001; but not OAs, γ<.001, *SE*=.12, t(49)= −0.004, p=.997.

In sum, middle-aged adults reported less affect change during regulation episodes than younger adults, whereas younger and older adults did not differ. Use of all five strategies was associated with positive changes in affect from before to after regulation, as well as tactics of situation modification tactics that increased positive aspects and decreased positive aspects of the situation, positive and detached reappraisal, and expressing positive emotion.

Exploratory Analyses

Non-regulation episodes.—Complete descriptive and inferential statistics for all exploratory analyses can be found in supplemental materials. A one-way ANOVA showed that on average in non-regulation episodes, participants reported not having emotions in the majority of episodes (*M*=.69, *SD*=.26); this did not vary by age, F(2,144)=1.57, p=.212. Multilevel modeling showed that current affect ratings did not differ between episodes in which regulation was reported and those that did not (γ=.023, *SE*=.053, t(146)=.44, p=.663).

Regulatory goals.—Separate one-way ANOVAs tested each of the four regulation goals (see supplemental materials for descriptive information). MAs did not differ from YAs in any of their regulatory goals (p's > .40). OAs, however, were less likely to report a goal of decreasing positive (p=.007) and increasing negative (p=.025) emotions; the difference in decreasing negative emotion (p=.064) and increasing positive emotion goals (p=.051) were not significant.

Use and effectiveness of acceptance strategies.—A 2 (acceptance of situation vs. emotion) × 3 (age group) ANOVA showed no significant age difference overall, F(2,145)=2.21, p=.114, η_p^2=.030; no difference between situational and emotional acceptance, F(1,145)=.59, p=.443, η_p^2=.004; and no interaction, F(2,145)=.73, p=.483, η_p^2=.010. In sum, age groups did not significantly differ in their acceptance of situations or emotions.

Discussion

Older adults often report high levels of emotional well-being despite normative declines in cognition and physical functioning, and this is often attributed to age differences in emotion regulation. SST suggests that older adults prioritize emotional well-being goals (Carstensen,

2006); other models propose that older adults may shift how they regulate in order to maintain effectiveness (Charles, 2010; Urry & Gross, 2010). The current study aimed to test these models by examining everyday emotion regulation of younger, middle-aged, and older adults in order to test whether age differences in emotion regulation frequency, strategy and tactic use, and/or effectiveness might clarify how older adults might achieve high levels of well-being

Across the sample, regulation occurred in less than half of episodes (45%); 69% of the time participants reported having no strong emotions, and 31% of the time participants reported letting emotions play out unregulated. When regulation occurred, there was a clear preference across all groups for earlier intervention in the emotional process, with situation-focused strategies being the most commonly used, and decreasing preference for attention, cognitive change, and response modulation. Tactics that introduced or increased positive aspects were favored over those that reduced negative. This was especially the case for older adults, who favored positive situation selection and modification and attention to positive. Middle-aged adults were more likely to avoid negative situations and make them less negative, whereas younger adults showed more willingness to seek negative situations and make them more negative, although this was quite rare. Older adults also reported less frequent contra-hedonic goals than younger adults, though pro-hedonic goals did not differ across age groups. Thus, although they did not differ strongly on the frequency of pro-hedonic goals, older adults used more positive tactics on average to achieve them.

Consistent with previous experience sampling studies (Carstensen et al., 2000), older adults reported more momentary positive affect than younger adults, but they were no more likely to regulate their emotions in general, or to use any of the general strategies, than younger adults (see also Eldesouky & English, 2018). Contrary to hypotheses, younger and older adults did not differ in their emotion regulation effectiveness; rather, it was middle-aged adults who reported less affect change from before to after regulation. Two differences in strategy effectiveness emerged, however. First, in contrast to laboratory studies, where situation selection has been linked to more positive affect for both younger and older adults (e.g., Livingstone & Isaacowitz, 2015), situation selection was associated with more positive affect for younger, but not older, adults. Second, situation modification, in the form of making situations less negative, was associated with more positive/less negative affect for younger, but not older adults. For older adults, only making situations more positive was linked to better emotional outcomes.

Implications for Aging Theory and Research

The current study was consistent with SST in that older adults reported both higher levels of overall momentary well-being and less frequent contra-hedonic goals than younger adults. In addition, older adults reported being more likely to use certain emotion regulation tactics. Specifically, age differences in emotion regulation were focused on introducing or increasing positive aspects to situations and experiences, rather than avoiding or decreasing negative ones. Research on positivity effects in cognition has emphasized contrast between positive and negative; the current findings suggest that it may be fruitful to more explicitly

disentangle positivity-seeking from negativity-avoidance (see also Livingstone & Isaacowitz, in press).

Models of emotional aging highlight resources that diminish with age (cognitive and physiological flexibility) as well as those that increase (knowledge, experience; Charles, 2010; Urry & Gross, 2010). Theorists have specifically predicted that regulation shifts away from coping with negative emotions as or after they arise via cognitive and response-focused strategies, and toward antecedent strategies that target the situation or attention. The current findings are consistent in that older adults showed greater positive situation selection, modification, and attentional deployment compared to younger adults, although older adults were no more likely to minimize exposure to negative situations or information.

Although SST emphasizes motivation and motivated cognition, emotion regulation is often cited within this framework as a likely explanation for older adults' high levels of well-being. Along with the inconsistent findings in past research, the current study suggests that age differences in emotion regulation may not be captured by examining emotion regulation broadly, but rather by investigating specific goals and tactics within situations. The current findings also emphasize the importance of examining emotion regulation tendencies in everyday life, where participants have more control over their environment (see also Sims et al., 2015). Laboratory studies high in experimental control have found that when facing standardized situations, people of different ages often behave quite similarly (e.g., Livingstone & Isaacowitz, in press; Sands et al., 2018). Lab studies reveal what people of different ages *would do* when facing similar situations; experience sampling reveals what people *actually do* in their daily lives. As the current findings suggest, regulating situations —whether seeking out, avoiding, or changing them in ways that have emotional consequences—is a large part of daily emotion regulation. This highlights the active roles that people play in selecting their experiences, which may contribute in important ways to emotional well-being (see also Sims et al., 2015).

Implications for emotion regulation research

In addition to age differences in regulation, we were also interested in examining normative patterns of emotion regulation within a community sample diverse in age, race, and educational background. To our knowledge, this is the first experience sampling study to directly compare the five strategies proposed by the process model, and the first to distinguish between tactics designed to increase positive aspects, decrease negative ones, and engage with negative. Similar to past laboratory research, one notable finding was the strong preference for strategies and tactics that intervene early in the emotional process: Situation-focused strategies were reported the most frequently, followed by attention, then cognition, with response-focused strategies being the least frequent. Although examinations of earlier strategies are becoming more common (e.g., Sands et al., 2018; Eldesouky & English, 2018), it has so far been outpaced by research on cognitive and response-focused strategies (Webb, Miles, & Sheeran, 2012).

As shown in Figure 1, there was a strong preference for tactics that introduced or increased positive aspects of the situation, which was even stronger in older adults. These tactics could be used within negative situations, to "undo" the subjective and physiological effects of

negative experiences (Folkman, 2008; Fredrickson, 2001), but can also be introduced in the absence of negativity, to build social, cognitive, and physiological resources (Fredrickson, 2001). A previous experience sampling in younger adults also found more regulation attempts involved positive emotions than negative, even in a sample high on neuroticism (Heiy & Cheavens, 2014). The current finding that positive regulation tactics, especially those early in the emotion-eliciting process, are among the most often used and most effective, highlights the need to investigate the role of positive emotion regulation—in addition to the down-regulation of negative emotions—in the context of emotional well-being in general, and especially with regard to aging.

The current study, in line with other recent research examining wider ranges of strategies (e.g., Eldesouky & English, 2018; Livingstone & Isaacowitz, in press), finds fewer age differences than prior studies that examined one or two in isolation. Researchers are acknowledging that emotion regulation strategies are not used in isolation (e.g., see "polyregulation," Ford, Gross, & Gruber, 2019), and as more studies include more strategies, participants may be able to better distinguish among them and less likely to group them into more general, less clearly defined categories (e.g., general cognitive change). These findings may also reflect a difference between lab and experience sampling approaches: Highly structured lab environments may call for different emotion regulation behavior than everyday life. Moving forward, therefore, it will be important to consider the context of the observations. Finally, recent trends in psychological science have placed less emphasis on finding statistically significant findings. With greater inclination toward transparency and objective science, researchers are more open to hearing about lack of differences when they may occur. In this spirit, the findings of this study should considered in the larger context of research on emotion regulation, which sometimes finds age differences and sometimes does not.

Limitations and Future Directions

By assessing specific tactics within all five strategies outlined in the process model, we were able to examine both age differences and normative trends in everyday emotion regulation. We note, however, some specific design considerations. First, we focused on emotion regulation strategies and tactics that are conscious and intrapersonal. Participants self-reported on their use of emotion regulation, although emotion regulation may occur outside of consciousness (e.g., Mauss, Bunge, & Gross, 2007). This may especially be the case for older adults, who have more experience with dealing with emotional events (Charles, 2010). In addition, we did not explicitly include interpersonal regulation (e.g., Zaki & Williams, 2013), although situation selection could include seeking out other people.

Second, to reduce demand on participants, surveys assessed only general affect rather than specific emotions. Past research has suggested that regulation use may vary by emotion (Heiy & Cheavens, 2014), and that age may influence different emotions in different ways, depending on relevance (e.g., Kunzmann & Thomas, 2014). The use of a bipolar negative-positive scale also did not allow separate assessment of positive and negative affect, and so we could not assess decreases in negative affect as separate from increases in positive affect. As there was such a clear distinction between tactics that introduced or increased positive

aspects of the situation or experience and those that avoided or reduced negative aspects, it will be important for future research to disentangle the downstream effects on positive and negative affect separately. We also did not assess level of arousal, which also appears to play a role in age differences in emotion regulation (Sands & Isaacowitz, 2017). In addition, effectiveness was assessed via self-report. Although the index was derived from two separate items, the back-to-back placement of affect ratings before and after regulation could have introduced demand characteristics.

Third, strategy use was measured as a binary variable, rather than continuous, so we cannot determine the extent to which each strategy was implemented, the perceived quality of implementation, or the effort put into the strategy or tactic. In many episodes, people reported multiple strategies and tactics, but we do not know whether they were used sequentially or simultaneously. Further research is needed to elucidate how strategies may work together within contexts.

Fourth, though we tried to distinguish among the five strategies and the specific tactics within each of those strategies as much as possible, there is often overlap conceptually and empirically. For example, we focused attentional deployment on shifting attention to aspects of the external environment, although attentional strategies can also include directing attention toward or away from internal processes such as physiology and thoughts. On the other hand, by distinguishing among strategies and tactics, it seems possible that participants were better able to articulate the specific strategies they used, which provides a clearer picture of how people regulate in daily life. We provide information regarding the use of multiple strategies and tactics in the supplemental materials.

Conclusion

This investigation of everyday emotion regulation across the lifespan suggests strong general normative tendencies to intervene early in the emotional process, and to do so by introducing or increasing positive aspects of situations, a pattern that appears to be even stronger in older age. Younger adults may more frequently (but rarely) choose to enter or exacerbate negative situations, perhaps in pursuit of instrumental goals, while middle-aged adults may focus more on avoiding negativity. Older adults seek out positivity in situations and attention, and continue to use the strategies and tactics that are effective across the lifespan. Overall, it was not that age groups used different strategies or tactics; rather, there were clear general tendencies, some of which were stronger in certain age groups. Age differences in everyday emotion regulation, when they do exist, may therefore be more a matter of degree than of type.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This research was supported by the National Institute on Aging Grant R01 AG048731 to D.M.I.

References

Allen VC, & Windsor TD (2017). Age differences in the use of emotion regulation strategies derived from the process model of emotion regulation: A systematic review. Aging and Mental Health. 10.1080/13607863.2017.1396575

Birditt KS, Fingerman KL, & Almeida DM (2005). Age differences in exposure and reactions to interpersonal tensions: A daily diary study. Psychology and Aging, 20, 330–340. 10.1037/0882-7974.20.2.330 [PubMed: 16029096]

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

Brummer L, Stopa L, & Bucks R (2014). The influence of age on emotion regulation strategies and psychological distress. Behavioural and Cognitive Psychotherapy, 42, 668–681. 10.1017/S1352465813000453 [PubMed: 23823314]

Bryant F (2003). Savoring Beliefs Inventory (SBI): A scale for measuring beliefs about savouring. Journal of Mental Health, 12, 175–196. 10.1080/0963823031000103489

Carstensen LL (2006). The influence of a sense of time on human development. Science, 312, 1913–1915. 10.1126/science.1127488 [PubMed: 16809530]

Carstensen LL, Pasupathi M, Mayr U, & Nesselroade JR (2000). Emotional experience in everyday life across the adult lifespan. Journal of Personality and Social Psychology, 79, 644–655. 10.1037//0022-3514.79.4.644 [PubMed: 11045744]

Charles ST (2010). Strength and vulnerability integration: A model of emotional well-being across adulthood. Psychological Bulletin, 136, 1068–1091. 10.1037/a0021232 [PubMed: 21038939]

Charles ST, & Carstensen LL (2010). Social and emotional aging. Annual Review of Psychology, 61, 383–409. 10.1146/annurev.psych.093008.100448

Charles ST, Piazza JR, Luong G, & Almeida DM (2009). Now you see it, now you don't: Age differences in affective reactivity to social tensions. Psychology and Aging, 24, 645–653. 10.1037/a0016673 [PubMed: 19739920]

Cohen P, Cohen J, Aiken LS, & West SG (1999). The problem of units and the circumstance for POMP. Multivariate behavioral research, 34, 315–346. 10.1207/S15327906MBR3403_2

Diener ED, Emmons RA, Larsen RJ, & Griffin S (1985). The satisfaction with life scale. Journal of Personality Assessment, 49, 71–75. 10.1207/s15327752jpa4901_13 [PubMed: 16367493]

Doerwald F, Scheibe S, Zacher H, & van Yperen NW (2016). Emotional competencies across adulthood: State of knowledge and implications for the work context. Work, Aging, & Retirement, 2, 159–216. 10.1093/workar/waw013

Eldesouky L, & English T (2018). Another year older, another year wiser? Emotion regulation strategy selection and flexibility across adulthood. Psychology and Aging, 33, 572–585. 10.1037/pag0000251 [PubMed: 29745687]

Folkman S (2008). The case for positive emotions in the stress process. Anxiety, Stress, and Coping, 21, 3–14. 10.1080/10615800701740457

Folstein MF, Folstein SE, & McHugh PR (1975). "Mini-mental state": A practical method for grading the cognitive state of patients for the clinician. Journal of Psychiatric Research, 12, 189–198. [PubMed: 1202204]

Ford BQ, Gross JJ, & Gruber J (2019). Broadening our field of view: The role of emotion polyregulation. Emotion Review, 11, 197–208. 10.1177/1754073919850314

Fredrickson BF (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. American Psychologist, 56, 218–226. 10.1037/0003-066x.56.3.218

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

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

Gross JJ, Carstensen LL, Pasupathi M, Tsai J, Götestam Skorpen K, & Hsu AYC (1997). Emotion and aging: Experience, expression, and control. Psychology and Aging, 12, 590–599. 10.1037//0882-7974.12.4.590 [PubMed: 9416628]

Gruber J, Kogan A, Mennin D, & Murray G (2013). Real-world emotion? An experience sampling approach to emotional experience and regulation in bipolar I disorder. Journal of Abnormal Psychology, 122, 971–983. 10.1037/a0034425 [PubMed: 24364600]

Heiy JE, & Cheavens JS (2014). Back to basics: A naturalistic assessment of the experience and regulation of emotion. Emotion, 14, 878–891. 10.1037/a0037231 [PubMed: 24999913]

Hofer M, Burkhard L, & Allemand M (2015). Age differences in emotion regulation during a distressing film scene. Journal of Media Psychology, 27, 47–52. 10.1027/1864-1105/a000134

Isaacowitz DM (2012). Mood regulation in real time: Age differences in the role of looking. Current Directions in Psychological Science, 21, 237–242. 10.1177/0963721412448651 [PubMed: 23139458]

Isaacowitz DM, Livingstone KM, Harris JA, & Marcotte SL (2015). Mobile eye tracking reveals little evidence for age differences in attentional selection for mood regulation. Emotion, 15, 151–161. 10.1037/emo0000037 [PubMed: 25527965]

Isaacowitz DM, Toner K, Goren D, & Wilson HR (2008). Looking while unhappy: Mood-congruent gaze in young adults, positive gaze in older adults. Psychological Science, 19, 848–853. 10.1037/a0026666 [PubMed: 18947348]

John OP, & Gross JJ (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 [PubMed: 15509284]

Kirk BA, Schutte NS, & Hine DW (2008). Development and preliminary validation of an emotional self-efficacy scale. Personality and Individual Differences, 45, 432–436. 10.1016/j.paid.2008.06.010

Kunzmann U, Kupperbusch CS, & Levenson RW (2005). Behavioral inhibition and amplification during emotional arousal: A comparison of two age groups. Psychology and Aging, 20, 144–158. 10.1037/0882-7974.20.1.144 [PubMed: 15769220]

Kunzmann U, & Thomas S (2014). Multidirectional age differences in anger and sadness. Psychology and Aging, 29, 16–27. 10.1037/a0035751 [PubMed: 24660793]

Lachman ME, Teshale S, & Agrigoroaei S (2015). Midlife as a pivotal period in the life course: Balancing growth and decline at the crossroads of youth and old age. International Journal of Behavioral Development, 39, 20–31. 10.1177/0175025414533223 [PubMed: 25580043]

Lachman ME, & Weaver SL (1998). The sense of control as a moderator of social class differences in health and well-being. Journal of Personality and Social Psychology, 74, 763–773. 10.1037/0022-3514.74.3.763 [PubMed: 9523418]

Lang FR, & Carstensen LL (1994). Close emotional relationships later in life: Further support for proactive aging in the social domain. Psychology and Aging, 9, 315–324. 10.1037//0882-7974.9.2.315 [PubMed: 8054179]

Livingstone KM (2012). The effects of implicit theories of emotion regulation and experience (Doctoral dissertation). University of Oregon, Eugene, OR.

Livingstone KM, & Isaacowitz DM (2015). Situation selection and modification for emotion regulation in younger and older adults. Social Psychological and Personality Science, 6, 904–910. 10.1177/1948550615593148 [PubMed: 26998196]

Livingstone KM, & Isaacowitz DM (in press). Age similarities and differences in spontaneous use of emotion regulation tactics across five laboratory tasks. Journal of Experimental Psychology: General. 10.1037/xge0000556

Lohani M, & Isaacowitz DM (2014). Age differences in managing response to sadness elicitors using attentional deployment, positive reappraisal, and suppression. Cognition and Emotion, 28, 678–697. 10.1080/02699931.2013.853648 [PubMed: 24206128]

Masumoto K, Taishi N, & Shiozaki M (2016). Age and gender differences in relationships among emotion regulation, mood, and mental health. Gerontology and Geriatric Medicine, 2, 1–8. 10.1177/2333721416637022

Mauss IB, Bunge SA, & Gross JJ (2007). Automatic emotion regulation. Social and Personality Compass, 1, 146–167. 10.1111/j.1751-9004.2007.00005x

McRae K, Ciesielski B, & Gross JJ (2012). Unpacking cognitive reappraisal: Goals, tactics, and outcomes. Emotion, 12(2), 250–255. 10.1037/a0026351 [PubMed: 22148990]

Nezlek JB (2011). Multilevel modeling for social and personality psychology. London: Sage.

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

Ochsner KN, Silvers JA, & Buhle JT (2012). Functional imaging studies of emotion regulation: A synthetic review and evolving model of the cognitive control of emotion. Annals of the New York Academy of Sciences, 1251, 1–24. 10.1111/j.1749-6632.2012.06751.x [PubMed: 22329960]

Opitz PC, Rauch LC, Terry DP, & Urry HL (2012). Prefrontal mediation of age differences in cognitive reappraisal. Neurobiology of aging, 33, 645–655. 10.1016/j.neurobiolaging.2010.06.004 [PubMed: 20674090]

Phillips L, Henry J, Hoise J, & Milne A (2008). Effective regulation of the experience and expression of negative affect in old age. Journal of Gerontology: Psychological Sciences, 63, 138–145. 10.1093/geronb/63.3.p138

Radloff LS (1977). The CES-D Scale: A self-report depression scale for research in the general population. Journal of Applied Psychological Measures, 1, 385–401. 10.1177/014662167700100306

Raudenbush SW, Bryk AS, & Congdon R (2013). HLM 7.01 for Windows [Computer software]. Skokie, IL: Scientific Software International, Inc.

Reed AE, & Carstensen LL (2012). The theory behind the age-related positivity effect. Frontiers in Emotion Science, 3, 1–9. 10.3389/fpsyg.2012.00339

Reed AE, Chan L, & Mikels JA (2014). Meta-analysis of the age-related positivity effect: age differences in preferences for positive over negative information. Psychology and Aging, 29, 1–15. 10.1037/a0035194 [PubMed: 24660792]

Riediger M, Schmiedek F, Wagner GG, & Lindenberger U (2009). Seeking pleasure and seeking pain: Differences in prohedonic and contra-hedonic motivation from adolescence to old age. Psychological Science, 20, 1529–1535. http://dx.doi.org/10.1111.j.1467-9280.2009.02473.x [PubMed: 19891749]

Salovey P, Mayer JD, Goldman SL, Turvey C, & Palfai TP (1995). Emotional attention, clarity, and repair: Exploring emotional intelligence using the Trait Meta-Mood Scale In Pennebaker JW (Ed.), Emotion, Disclosure, and Health (pp. 125–154). Washington, DC: American Psychological Association 10.1037/10182-006

Sands M, & Isaacowitz DM (2017). Situation selection across adulthood: The role of arousal. Cognition and Emotion, 31, 791–798. 10.1080/02699931.2016.1152954 [PubMed: 26983792]

Sands M, Livingstone KM, & Isaacowitz DM (2018). Characterizing age-related positivity effects in situation selection. International Journal of Behavioral Development, 42, 396–404. 10.1177/0165025417723086 [PubMed: 30393413]

Scheibe S, Sheppes G, & Staudinger UM (2015). Distract or reappraise? Age-related differences in emotion-regulation choice. Emotion, 15, 677–681. 10.1037/a0039246 [PubMed: 25961143]

Scheier MF, Carver CS, & Bridges MW (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A re-evaluation of the Life Orientation Test. Journal of Personality and Social Psychology, 67, 1063–1078. 10.1037//0022-3514.67.6.1063 [PubMed: 7815302]

Schirda B, Valentines TR, Aldao A, & Prakash RS (2016). Age-related differences in emotion regulation strategies: Examining the role of contextual factors. Developmental Psychology, 52, 1370–1380. 10.1037/dev0000194 [PubMed: 27570980]

Shallcross AJ, Ford BQ, Florke VA, & Mauss IB (2013). Getting better with age: The relationship between age, acceptance, and negative affect. Journal of Personality and Social Psychology, 104, 734–749. 10.1037/a0031180 [PubMed: 23276266]

Shiota MN, & Levenson RW (2009). Effects of aging on experimentally instructed detached reappraisal, positive reappraisal, and emotional behavior suppression. Psychology and Aging, 24, 890–900. 10.1037/a0017896 [PubMed: 20025404]

Sims T, Hogan CL, & Carstensen LL (2015). Selectivity as an emotion regulation strategy: Lessons from older adults. Current Opinion in Psychology, 3, 80–84. 10.1016/j.copsyc.2015.02.012 [PubMed: 25914897]

Soto CJ, & John OP (2017). The next Big Five Inventory (BFI-2): Developing and assessing a hierarchical model with 15 facets to enhance bandwidth, fidelity, and predictive power. Journal of Personality and Social Psychology, 113, 117–143. 10.1037/pspp0000155 [PubMed: 27055049]

Steegen S, Tuerlinckx F, Gelman A, & Vanpaemel W (2016). Increasing transparency through a multiverse analysis. Perspectives in Psychological Science, 11, 702–712. 10.1177/1745691616658637

Urry HL, & Gross JJ (2010). Emotion regulation in older age. Current Directions in Psychological Science, 19, 352–357. 10.1037/14857-004

Watson D, Clark LA, & Tellegen A (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. Journal of Personality and Social Psychology, 54, 1063–1070. 10.1037//0022-3514.54.6.1063 [PubMed: 3397865]

Webb TL, 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, 775–808. 10.1037/a0027600 [PubMed: 22582737]

Weschler D, Coalson DL, & Raiford SE (1997). WAIS-III: Wechsler adult intelligence scale. San Antonio, TX: Psychological Corporation.

Zachary RA (1991). Shipley institute of living scale: Revised manual. Los Angeles, CA: Western Psychological Services.

Zaki J, & Williams WC (2013). Interpersonal emotion regulation. Emotion, 13, 308–310. 10.1037/a0033839

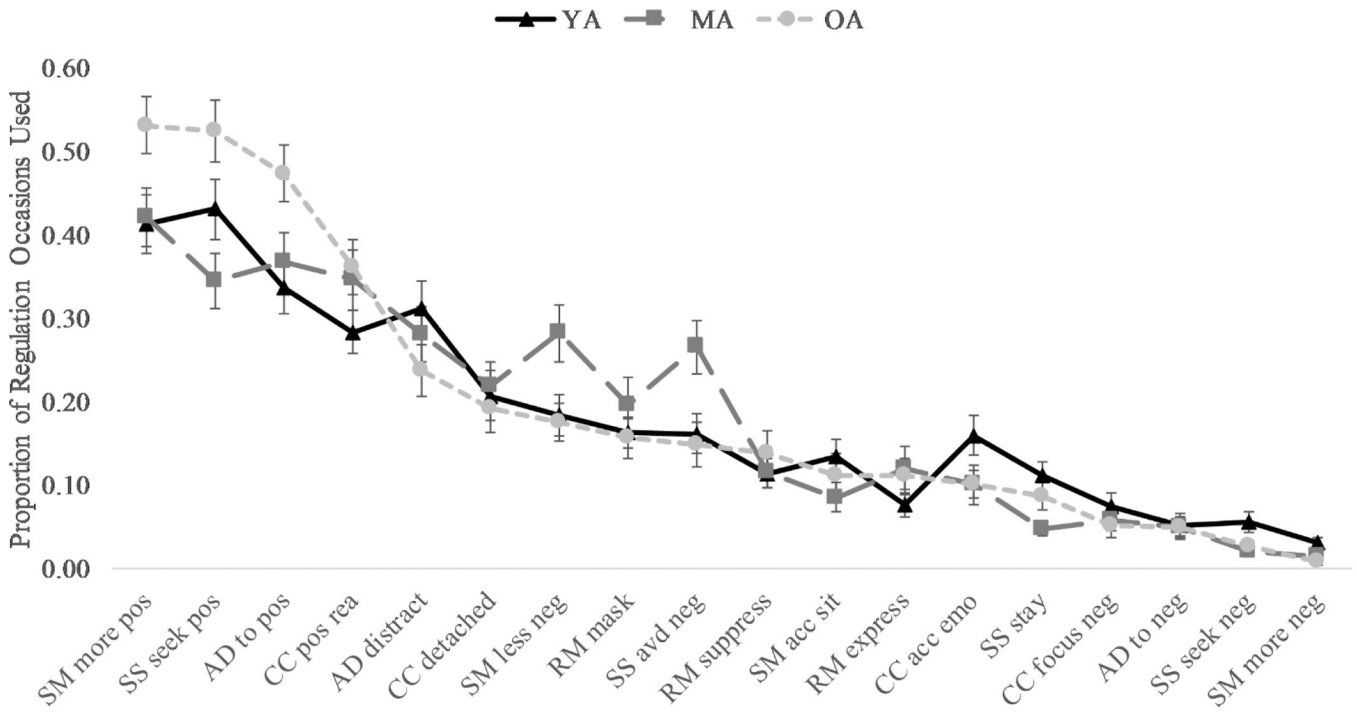

Figure 1.

Frequency of emotion regulation tactic use by age group. Error bars represent standard errors. Older adults were significantly more likely to seek out positive situations, make situations more positive, and attend to positive aspects more than younger adults. Middle-aged adults were more likely to make situations less negative and avoid negative situations. Younger adults were more likely to seek negative situations and make situations more negative than older adults.

Table 1

Means and Standard Deviations for Frequency of Regulation, Strategy Use, and Tactic Use

Variable	YA	MA	OA	All
Episodes Regulated	.46 (.23)	.43 (.27)	.46 (.28)	.45 (.26)
Situation Selection[a]	.70 (.26)	.62 (.28)	.78 (.24)	.70 (.27)
Avoid negative[b]	.16 (.16)	.25 (.20)	.15 (.19)	.19 (.19)
Seek positive[b]	.44 (.25)	.35 (.23)	.52 (.26)	.44 (.25)
Seek negative[b]	.05 (.08)	.02 (.04)	.03 (.05)	.03 (.06)
Stay in situation[b]	.11 (.13)	.05 (.06)	.09 (.11)	.08 (.11)
Situation Modification[a]	.67 (.23)	.71 (.26)	.79 (.21)	.73 (.24)
Less negative[b]	.17 (.16)	.28 (.23)	.18 (.16)	.21 (.19)
More positive[b]	.42 (.24)	.42 (.24)	.53 (.24)	.46 (.24)
More negative[b]	.03 (.05)	.02 (.04)	.01 (.02)	.02 (.04)
Accept situation[b]	.13 (.15)	.09 (.12)	.11 (.19)	.11 (.16)
Attentional Deploy.[a]	.60 (.24)	.63 (.30)	.72 (.26)	.65 (.27)
Distract from neg[b]	.31 (.24)	.28 (.23)	.24 (.22)	.27 (.23)
Attend toward pos.[b]	.33 (.22)	.37 (.24)	.47 (.24)	.39 (.24)
Attend toward neg[b]	.05 (.10)	.05 (.09)	.05 (.09)	.05 (.09)
Cognitive Change[a]	.58 (.24)	.61 (.28)	.66 (.30)	.62 (.27)
Detached reappraisal[b]	.19 (.18)	.22 (.20)	.19 (.21)	.20 (.20)
Positive reappraisal[b]	.29 (.18)	.35 (.25)	.36 (.24)	.33 (.23)
Negative Focus[b]	.08 (.12)	.06 (.09)	.05 (.09)	.06 (.10)
Accept emotions[b]	.16 (.17)	.10 (.16)	.10 (.12)	.12 (.15)
Response Modulation[a]	.34 (.22)	.41 (.29)	.40 (.29)	.38 (.27)
Suppress expression[b]	.11 (.12)	.12 (.14)	.14 (.18)	.12 (.15)
Mask with positive[b]	.16 (.12)	.20 (.22)	.16 (.18)	.17 (.18)
Exaggerate/Express[b]	.08 (.10)	.12 (.18)	.11 (.15)	.10 (.15)
Other[a]	.11 (.22)	.14 (.17)	.19 (.23)	.15 (.21)

Note. Proportions are a function of the number of valid surveys (excluding missing data).

[a]Strategy-level items were forced choice questions in which participants could choose only yes or no.

[b]Tactic-level items were checkbox questions in which participants could choose as many answers as applied.

[c]Participants only saw the regulation subtypes if they indicated “yes” to using the main strategy; they could choose as many as applied. Neg = negative; pos = positive.

Table 2.

Results of Multilevel Models with Age and Regulation Strategy/Tactic Predicting Change in Affect

Predictor	Affect Change Without Tactic			Tactic Effects on Affect Change		
	Intercept[a]	MA[b]	OA[b]	Strategy/Tactic[c]	MA[d]	OA[d]
Situation Selection	0.98 (.12)***	−0.29 (.17)	0.06 (.18)	0.19 (.09)*	−0.17 (.12)	−0.34 (.15)*
Avoid Negative	1.12 (.10)***	−0.37 (.15)*	−0.20 (.14)	0.05 (.11)	−0.22 (.15)	−0.05 (.17)
Seek Out Positive	1.05 (.11)***	−0.44 (.16)**	−0.16 (.15)	0.16 (.11)	0.09 (.14)	−0.11 (.14)
Seek Out Negative	1.12 (.10)***	−0.40 (.15)**	−0.20 (.14)	−0.07 (.29)	−0.03 (.53)	−0.13 (.46)
Stay in Situation	1.13 (.10)***	−0.41 (.15)**	−0.17 (.14)	−0.00 (.25)	−0.23 (.31)	−0.47 (.31)
Situation Modification	0.81 (.13)***	−0.36 (.19)	−0.21 (.18)	0.46 (.12)***	−0.09 (.17)	−0.08 (.17)
Make Less Negative	1.06 (.10)***	−0.39 (.15)*	−0.15 (.13)	0.33 (.11)**	−0.19 (.13)	−0.31 (.16)*
Make More Positive	0.95 (.11)***	−0.36 (.16)*	−0.13 (.15)	0.50 (.13)**	−0.11 (.16)	−0.20 (.16)
Make More Negative	1.13 (.10)***	−0.41 (.15)**	−0.21 (.14)	−0.61 (.35)	0.24 (.56)	0.09 (.66)
Accept Situation	1.12 (.10)***	−0.40 (.15)**	−0.22 (.14)	0.02 (.15)	−0.14 (.21)	0.11 (.20)
Attentional Deploy.	0.96 (.10)***	−0.48 (.16)**	−0.45 (.16)**	0.25 (.11)*	0.05 (.17)	0.26 (.17)
Distract from Neg.	1.06 (.10)***	−0.36 (.15)*	−0.17 (.14)	0.20 (.11)	−0.20 (.14)	−0.12 (.15)
Attend to Positive	1.06 (.10)***	−0.45 (.16)**	−0.30 (.15)*	0.15 (.09)	0.13 (.15)	0.12 (.14)
Attend to Negative	1.13 (.10)***	−0.41 (.14)**	−0.22 (.14)	−0.33 (.27)	−0.24 (.38)	0.15 (.37)
Cognitive Change	0.93 (.09)***	−0.49 (.15)**	−0.31 (.14)*	0.32 (.10)**	0.10 (.14)	0.11 (.13)
Detached Reappraisal	1.07 (.10)***	−0.39 (.15)**	−0.17 (.14)	0.30 (.13)*	−0.11 (.13)	−0.18 (.17)
Positive Reappraisal	1.06 (.09)***	−0.46 (.15)**	−0.24 (.13)	0.22 (.09)*	0.10 (.14)	0.05 (.12)
Negative Focus	1.13 (.09)***	−0.41 (.15)**	−0.21 (.14)	−0.12 (.25)	−0.10 (.32)	−0.00 (.30)
Accept Emotions	1.12 (.10)***	−0.41 (.15)**	−0.21 (.13)	−0.06 (.11)	−0.00 (.17)	0.02 (.18)
Response Modulation	1.04 (.10)***	−0.40 (.15)**	−0.19 (.15)	0.22 (.10)*	−0.06 (.13)	−0.08 (.14)
Expressive Suppr.	1.13 (.10)***	−0.41 (.15)**	−0.22 (.14)	−0.07 (.17)	0.01 (.20)	0.18 (.20)
Mask with Positive	1.05 (.10)***	−0.39 (.15)*	−0.16 (.14)	0.33 (.15)*	−0.11 (.21)	−0.10 (.18)
Express/Exaggerate	1.11 (.10)***	−0.40 (.15)**	−0.18 (.14)	0.14 (.14)	−0.12 (.23)	−0.32 (.21)
Other	1.07 (.10)***	−0.40 (.14)**	−0.22 (.14)	0.44 (.20)*	−0.17 (.24)	−0.08 (.24)
Affect Before	4.23 (.14)	0.42 (.22)	0.45 (.21)*			
Affect After	5.33 (.10)	0.02 (.15)	0.24 (.16)			
Affect Change	1.12 (.10)	−0.41 (.15)**	−0.20 (.14)			

Note.

[a] A significant effect indicates YAs reported a significant change in affect from before to after attempting to regulate in the absence of this tactic.

[b] A significant effect indicates that the affect change reported by MAs or OAs was significantly different from that of YAs.

[c] A significant positive effect indicates that affect change was greater for episodes when this tactic was used, compared to when it was not, for YAs (i.e., effectiveness for younger adults).

[d] A significant effect indicates that MAs or OAs differed in affect change when using this tactic from YAs (i.e., age differences in effectiveness).