Published in final edited form as:

J Exp Psychol Gen. 2019 November ; 148(11): 1972–1992. doi:10.1037/xge0000556.

Age Similarities and Differences in Spontaneous Use of Emotion Regulation Tactics Across Five Laboratory Tasks

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

Northeastern University

Abstract

Theories of emotional aging have proposed that age differences in emotion regulation may partly explain why older adults report high levels of emotional well-being despite declines in other domains. The current research examined age differences and similarities in emotion regulatory tactic preferences across five laboratory tasks designed to measure the strategies within the process model of emotion regulation (situation selection, situation modification, attentional deployment, cognitive change, and response modulation). An adult lifespan sample (ages 20–78, N=225) completed tasks offering opportunities to use tactics that decrease negative, increase positive, or engage with negative aspects of the situation. Overall, age similarity in tactic preferences (supported by Bayes factors) was much more common than age differences. Across the sample, participants favored avoiding negative aspects in situation selection and modification, and seeking or introducing positive aspects in attentional deployment and cognitive change. Self-reports of affect suggest that older adults were more responsive to positive aspects of the situation, although they did not seek them out more than other age groups. These results cast some doubt on the assumption that spontaneous emotion regulation is more likely in older age, but rather show that both younger and older adults show similar preferences in the absence of other strong goals. This novel approach of examining strategies across the process model highlights benefits of comparing multiple tactics within strategies not only when examining possible age differences, but also when studying patterns of emotion regulation in general.

Keywords

aging; emotion regulation; positivity effects

Despite age-related cognitive and physical declines, older adults generally report high levels of emotional well-being and life satisfaction (for a review, see Charles & Carstensen, 2010). Several models of emotional aging have made compelling arguments for why emotion regulation—the processes by which people influence emotions and their expression (Gross, 1998)—may explain these findings. Older adults are theorized to prioritize momentary wellbeing over long-term instrumental goals (e.g., Carstensen, 2006). Their lifetime of experience with emotional situations also puts them in a better position to influence their emotional lives, barring certain situational or personal constraints (Charles, 2010). Age-related advantages in emotion regulation can be found in self-reports (Gross et al., 1997; Schirda, Valentine, Aldao, & Prakash, 2016), daily diaries of interpersonal situations (Birditt, Fingerman, & Almeida, 2005), and studies of problem-solving and coping (Blanchard-Fields, 2007).

The current research investigates whether there are age differences in the ways that people implement emotion regulation within a controlled laboratory setting. Laboratory research on emotion regulation has traditionally examined one strategy (e.g., Rovenpor, Skogsberg, & Isaacowitz, 2013) or compared a small number (e.g., Scheibe, Sheppes, & Staudinger, 2015). As there is great variety in strategies people can use to manage their emotions, however, several recent self-report studies have shown the usefulness of simultaneously examining larger numbers of strategies (e.g., Eldesouky & English, 2018; Heiy & Cheavens, 2014; Schirda et al., 2016). Here, we apply this approach to the lab, with a series of five standardized situations offering opportunities to engage with emotional situations and information in ways that might vary by age. Specifically, we test whether older adults would be (a) more likely to seek out positive aspects, (b) more likely to avoid negative aspects, and (c) less likely to engage with negative aspects of the situation, compared to younger adults.

Emotion Regulation Strategies and Tactics

We use as a framework the process model of emotion regulation (Gross, 1998), which outlines opportunities for people to shape how they engage with emotional situations, information, and experiences. The model proposes that people use five broad *strategies* to manage their emotional experience, based on when in the emotion-eliciting process they target. In situation selection, people choose to avoid or enter situations based on emotions they anticipate experiencing in the situation. In situation modification, people change aspects of the situation to alter their feelings; it is similar to problem-solving and active coping, which target situational sources of stress rather than emotion. In attentional deployment, people direct attention toward or away from emotion-eliciting aspects of the environment. In cognitive change, people change the way they think to change their feelings; reappraisal—changing one's appraisal of a situation—is one example. In response modulation, people target subjective, behavioral, or physiological changes that are part of the emotional response. Response modulation, a response-focused strategy, is employed after the emotional experience is underway; in contrast, the four antecedent-focused strategies can influence the emotional experience before it is fully underway (Gross, 1998), although there is variability in the onset of regulation within antecedent strategies (Sheppes & Gross, 2011).

Emotion regulation *tactics* refer to how a strategy is implemented within a given situation (Gross, 2015). For example, attentional deployment can take the form of directing attention away from a negative news article, directing it toward the negative content to process it more thoroughly, or searching for a more positive article to read instead. Cognitive change can take the form of trying to remain objective and impassive (detached reappraisal) or trying to focus on the positive aspects or consequences of a negative situation (positive reappraisal). The current research seeks to distinguish, within each strategy in the process model, tactics that focus on (a) *introducing or increasing* positive aspects, (b) *avoiding or decreasing* negative aspects, and (c) *engaging* with negative aspects of the situation and experience.

Aging and Emotion Regulation

Socioemotional selectivity theory (SST; Carstensen, 2006) suggests that perceived time limitations lead older adults to prioritize momentary emotional well-being goals over other,

longer-term goals such as information acquisition. Specifically, whereas people of all ages have goals involving happiness and well-being, these goals are most salient in older age. In contrast, younger adults with fewer time limitations may have a wider range of long-term goals that may bring them into contact with negative experiences (e.g., competing for a position, developing skills, meeting new people). In support of SST, one experience sampling study found that prohedonic motives—to increase positive or decrease negative emotions—were more common in older age, whereas contrahedonic motives—to decrease positive or increase negative emotions— though rare, were most common in adolescence (Riediger, Schmiedek, Wagner, & Lindenberger, 2009).

Although SST does not propose age differences in emotion regulation per se, if there are age differences in motivations, we may predict age differences in the ways that people engage with emotional situations and experiences. Studies of age differences in attentional patterns and memory tend to find that older adults prioritize positive over negative information, whereas younger adults show the opposite pattern, a phenomenon known as age-related positivity effects (Reed, Chan, & Mikels, 2014), which are thought to reflect more salient emotional well-being goals in older age (Reed & Carstensen, 2012). Here, we raise the possibility that these patterns found in information processing are also evident in a larger pattern of how people interact with emotional situations and materials. That is, we pose the question of whether across situations and choices, older adults seek out and engage with more positive than negative aspects of their environments, in line with greater prioritization of momentary well-being, compared to younger adults. Younger adults, on the other hand, may be more likely to engage with negative aspects of their environments because other long-term goals such as personal growth or information acquisition, may also be operating. Past research has examined age differences in motivation (Riediger et al., 2009), whereas our interest is on the behaviors people demonstrate and the choices they make within emotion-eliciting situations.

Below, we review evidence for age differences in emotion regulation that could inform this possibility. With some exceptions, noted below, studies have typically examined emotion regulation at the strategy level (e.g., cognitive reappraisal), rather than the tactic level (e.g., how cognitive reappraisal was implemented). Within each strategy, we therefore also provide examples of tactics that focus on increasing positive, decreasing negative, and engaging with negative aspects might look like, and where past research addresses them.

Situation selection and modification.

Older adults do appear to use situation selection and modification to promote well-being goals. For example, older adults seem to selectively shape their social networks, preferring a small number of close, emotionally fulfilling relationships over a larger number of acquaintances (Lang & Carstensen, 1994). They are also more likely to avoid situations involving social conflict (Birditt et al., 2005).

Lab studies have investigated situation selection using the affective environment, in which participants select from among negative, neutral, and positive stimuli for 10–15 minutes (e.g., Rovenpor et al, 2013). In such an environment, tactics may take the form of avoiding negative content (choosing fewer negative stimuli), seeking positive content (choosing more

positive stimuli), or engaging negative content (choosing more negative stimuli). A mini meta-analysis of studies using the affective environment (Sands, Livingstone, & Isaacowitz, 2018) found no age differences in preferring positive stimuli or avoiding negative stimuli. Individual studies have found differences under certain conditions, however. For example, older adults with stronger emotion regulation self-efficacy beliefs chose fewer negative stimuli to engage with, whereas younger adults with stronger emotional control beliefs chose more negative stimuli (Rovenpor et al., 2013). Another study found that younger adults chose more negative stimuli when instructed to choose what was interesting to them than when instructed to minimize negative emotions, whereas older adults engaged less with negative content regardless of instructions (Livingstone & Isaacowitz, 2015). In a separate situation modification task within the same study, older adults skipped more negative content than younger adults, regardless of instructions.

Attentional deployment.

Attentional deployment tactics may take the form of looking away from negative material, toward positive material, or toward negative material. Eye-tracking research has shown that compared to younger adults, older adults attend away from angry and afraid faces (Isaacowitz, Wadlinger, Goren, & Wilson, 2006), negative video content (Isaacowitz & Choi, 2012), and the most negative parts of images (Noh, Lohani, & Isaacowitz, 2011), suggesting robust preference to attend away from negative information, also found using a dotprobe task (Mather & Carstensen, 2003). Evidence for preferences for attending toward positive content is less robust, but trends in the expected direction (Isaacowitz et al., 2006; Nitikin & Freund, 2011).

Although positivity effects may not always reflect conscious emotion regulation, age differences in looking patterns are consistent with attentional deployment behavior (Isaacowitz, 2012). They are more likely to emerge when participants are motivated to regulate their emotions: For example, when induced into a negative mood, younger adults looked more at negative parts of the images (engaged with negative content), whereas older adults looked even less (Isaacowitz, Toner, Goren, & Wilson, 2008).

We note that although attentional strategies can also include first-person cognitive processing of experiences (e.g., rumination, distraction by thinking about something unrelated), our examination of attentional deployment in this study is focused on overt visual engagement with and disengagement from emotional content, in contrast to meaning-focused cognitive strategies discussed below.

Cognitive change/focus.

Because it involves active engagement with appraisals of emotional situations, cognitive change is considered more resource-demanding than more antecedent strategies, and thought to be used less in older age for this reason (e.g., Scheibe et al., 2015; Urry & Gross, 2010). Self-report research on cognitive reappraisal has produced mixed results, with some studies finding older adults use it less (Nolen-Hoeksema & Aldao, 2011) or more (John & Gross, 2004; Masumoto, Taishi, & Shiozaki, 2016) than younger adults, and others finding no differences (Brummer, Stopa, & Bucks, 2014; Eldesouky & English, 2018). The specific

tactic may matter, however: Laboratory research suggests that older adults are more effective at using positive reappraisal (thinking about the positive aspects of a negative situation) than detached reappraisal (thinking about content in an objective, detached way; Lohani & Isaacowitz, 2014; Shiota & Levenson, 2009; cf. Livingstone & Isaacowitz, 2018).

Shiota and Levenson (2009) suggested that older adults may draw on habitual positive cognitive processing tendencies to successfully reappraise in a positive way. There is also some evidence that older adults' appraisals tend to be more positive on average: Charles (2010) reviews research showing that compared to younger adults, older adults make more favorable social comparisons, evaluate goal discrepancies in a more favorable way, and recall stressors as less severe. To date, however, there has been little research on whether older adults are more likely to use positive than detached reappraisal; one daily diary study found both were used to similar extents (Eldesouky & English, 2018).

Response modulation.

This broad category of emotion regulation includes steps taken to influence behavioral and physiological responses to, and nonverbal expression of, emotion. Here, we focus on tactics that influence the facial expressivity of emotion, which, although they do not target the subjective experience of emotion, play an important role in how emotions unfold; they are also among the most commonly studied forms of response modulation (Webb, Miles, & Sheeran, 2012). Moreover, as with the strategies above, tactics can focus on decreasing negative expression, as in expressive suppression (i.e., hiding the expression of emotions); increasing positive expression, as in masking (i.e., introducing positive expressions to cover negative ones); and engaging negative, as when one intentionally displays or exaggerates negative expressions.

As with cognitive change, research on expressive suppression is mixed, with some self-report studies finding older adults use it less (John & Gross, 2004) or more (Brummer & Stopa, 2014; Nolen-Hoeksema & Aldao, 2011), and others finding no differences (Eldesouky & English, 2018; Masumoto et al., 2016). Laboratory studies have generally found no age differences in the ability to implement expressive suppression (e.g., Lohani & Isaacowitz, 2014; Shiota & Levenson, 2009), but have not examined preferences for implementing it.

Rather than hiding expression of negative emotions, people may choose instead to mask them with positive ones. For example, children are often taught to express pleasure upon receiving a gift, even if it is disappointing (Saarni, 1984). If older adults are more likely to have a goal of maintaining social harmony (e.g., Sorkin & Rook, 2006), they may be more likely to mask their negative feelings with positive expressions to express good will. Moreover, although changing expression may not influence the actual experience of emotion (Webb et al., 2012), positive facial expressions at least allow for the possibility of introducing positive feelings, more than hiding negative expressions. To our knowledge, however, there are no studies of adult age differences in this tactic.

Summary.

In sum, the research on age differences in emotion regulation use is mixed, with results varying across strategies and studies. Some theorists have proposed that in daily life, older people are more likely to use selectivity to proactively shape their environments and process information in a way that supports their emotional goals (Sims, Hogan, & Carstensen, 2015). Laboratory research, the authors suggest, does not typically allow older adults to utilize such selectivity. One exception is a study in which younger and older adults chose between distraction and reappraisal when viewing emotion-eliciting images; older adults choose to distract more than younger adults in low-arousal trials (Scheibe et al., 2015). Expanding on this approach, the current study assessed age differences in choices within a series of standardized situations that nonetheless offered participants various ways of engaging with the situations and information. Notably, the options provided within the current study provided opportunities for employing each strategy via a range of tactics. In this way, we can observe participants' natural preferences in selecting how to engage with emotional situations, whether by seeking out or increasing positive aspects of the situation or experience, reducing negative aspects, or engaging with negative aspects.

Current Study

In the current research, younger, middle-aged, and older adults completed five tasks representing the strategies of the process model. The goal of this study was not to activate emotion regulation goals per se, but to see how people would spontaneously engage with emotional situations, information, and experiences. In this study, we did not explicitly instruct participants to influence their emotions in any way; they could make decisions and engage with stimuli based on personal preferences. Each task provided an opportunity to engage a particular strategy, and participants had discretion as to which tactic to use to implement it. Specifically, participants could (a) introduce or engage with positive aspects, (b) avoid or reduce negative aspects, and/or (c) engage with negative aspects of the situation and experience. If, as SST suggests, older adults have more salient momentary well-being goals, we might expect them to avoid or diminish negative aspects of the situation or experience and/or introduce or engage with positive aspects, more than younger adults, who might have alternative goals such as information acquisition, leading them to engage with situations or experiences, even if they are negative. That is, they may or may not have the goal of experiencing negative emotion, but may engage with negative situations and experiences for instrumental reasons, to a greater extent than older adults. Tactic use may therefore vary systematically across age groups.

In the situation selection task, participants chose from among positive, negative, and emotionally neutral stimuli for 15 minutes. In the situation modification task, participants chose to view or skip content within positive and negative videos. In the attentional deployment task, participants' gaze was tracked to assess the degree to which they directed their visual attention toward or away from the most emotional parts of negative, positive, and neutral images. In the cognitive change/focus task, participants ranked their preferences for positive reappraisal, detached reappraisal, or negative focus before implementing each in turn while viewing videos. Similarly, in the response modulation task, participants ranked

preferences for expressive suppression, masking with positive expression, and expressing negative emotion, before implementing each in turn. The major outcomes of interest were behavioral measures, broadly defined: choices of what stimuli to engage with, whether to view or skip material, what parts of images to look at, and which cognitive and expressive tactics to employ.

This study expands past research in several ways. First, whereas past laboratory research has investigated small numbers of strategies (e.g., Livingstone & Isaacowitz, 2015; Shiota & Levenson, 2009), we examined representatives of each of the five emotion regulation strategies proposed by the process model within the same sample. This complements recent experience sampling research (e.g., Eldesouky & English, 2018).

Second, to our knowledge, this is the first study that distinguishes among emotion regulation tactics that introduce or engage with positive aspects, avoid or reduce negative aspects, and engage with negative aspects of situations and experiences. Although past theory and research has compared hedonic and contrahedonic motives (Riediger et al., 2009) and regulation (e.g., Tamir, 2016), it is possible that tactics that focus on increasing positive aspects and those that focus on decreasing negative rely on different resources and have different consequences. We therefore directly assessed each within the five tasks.

Third, to get a more comprehensive picture of emotion regulation across the adult lifespan, we included a middle-aged group of participants in addition to younger and older age groups. Extreme-group designs and differences in recruitment methods may artificially inflate effect sizes (see Freund & Isaacowitz, 2013). To avoid a restricted younger adult sample of college students, we also recruited all participants from the community and restricted participation to those ages 20–80.

Exploratory questions.

In addition to the main question of age differences in emotion regulation tactic preferences, we examined self-reported affect within each task. If older adults do spontaneously seek out positive and avoid negative aspects of the situation, we would also expect them to report more positive affect throughout each task, compared to younger adults. Second, after the laboratory tasks, we asked participants to indicate their preferences for using tactics both within the study and in everyday life. After having the opportunity to use each strategy in the lab, participants would be in a better position to reflect on experiences using specific tactics. We could also directly compare tactics across tasks within participants, which we did not do with the behavioral results from the lab tasks due to the differences in task design.

Hypotheses

Our primary hypothesis concerned age differences in tactic preferences within standardized emotion-eliciting tasks. Specifically, we predicted older adults would make more use of tactics that introduced or engaged with positive aspects (selecting and viewing a greater proportion of positive stimuli, attending to the most positive parts of images, choosing positive reappraisal and masking with positive expression); and avoided or reduced negative aspects (avoiding and viewing less of negative stimuli, attending away from the most

negative parts of images, choosing detached reappraisal and expressive suppression). In contrast, younger adults would be more likely to make use of tactics that engaged with negative aspects (selecting and viewing more negative stimuli, attending toward the most negative parts of images, choosing negative focus and expressing negative emotions).

Specifically, in the situation selection task, we hypothesized that older adults would choose more positive and fewer negative stimuli than younger adults. In situation modification, older adults would skip more negative content than younger adults, and view more positive content. In the attentional task, older adults would direct attention toward the most positive parts and away from the most negative parts of the images, whereas younger adults would direct attention toward the most negative parts. In the cognitive change/focus task, older adults would choose positive reappraisal first, and negative focus last, more often than younger adults, who would show weaker preferences. In the response modulation task, older adults would choose positive masking first, and negative expression last, more often than younger adults.

We did not have a priori directional hypotheses regarding differences between tactics that increased positive aspects and those that decreased negative ones. This might vary by strategy; past research has suggested stronger age differences in avoidance of negative content than attending to positive content in attentional deployment, but very little research directly comparing the two processes in other strategies exists. Inclusion of the middle-aged group was also exploratory; planned contrasts compared both middle-aged and older adults to younger adults.

Method

Participants

Power analyses prior to data collection indicated that 36 participants in each age decade were needed to reliably detect medium-sized effects for major hypotheses; we therefore aimed for 250 by the end of the calendar year 2015. Data from 233 participants were collected; data from eight participants were excluded, and 10 participants (1 YA, 4 MA, 5 OA) did not return for Part 2. Because we did not meet the sample size required for adequate power to test by decade, we combined two decades each into three age groups. We chose to categorize age groups rather than treat age continuously so as to compare to previous laboratory research on age differences in emotion regulation, which typically compares younger to older adults; however, analysis using continuous age as a predictor is included in supplemental materials. Sample characteristics and reasons for exclusion can also be found in supplemental materials.

Participants were 225 members of the greater Boston community (47% female; 49% White/Caucasian, 26% Black/African-American, 16% Asian/Asian-American, 6% multiracial, 4% Hispanic). Younger adults (YAs) were 72 individuals ages 20–39 (M=28.90, SD=5.42); middle-aged adults (MAs) were 72 individuals ages 40–59 (M=50.01, SD=5.56), and older adults (OAs) were 73 individuals ages 60–78 (M=68.53, SD=5.00). Participants were recruited through online and print advertisements, and were compensated $10/hour for their participation. All participants passed either the Mini-Mental State Exam screening for

cognitive impairment (i.e., 24/30 or higher; Folstein, Folstein, & McHugh, 1975) or the version adapted for telephone screening (i.e., 21/26 or higher; Newkirk, Kim, & Thompson, 2004). Because of scale differences, we calculated percentage correct out of possible points. Participants were not excluded based on current or past diagnosis of mental or physical illness; however, we did measure this; there were no age differences in likelihood of reporting mental illness or in self-reported health (see supplemental materials).

Materials

Task stimuli.—Stimuli were collected from the internet and pre-rated for valence, arousal, and relevance by 10 participants in each age decade (20s through 60s). They contained a variety of content, including clips from commercially produced movies, home videos, and news footage, and were intended to elicit a range of positive (joy, awe, calm) and negative (fear, anger, sadness) emotions. Because theory and past research suggest that arousal plays a role in how people approach emotional situations (Charles, 2010; Freund & Keil, 2013; Sands & Isaacowitz, 2017), we controlled for this by including an equal number of low- and high-arousal stimuli within each task. Different stimuli were used for each task (see supplemental materials for stimulus testing information and descriptions of individual stimuli used in the study). Additional measures and procedures completed by participants but not analyzed here are also listed in supplemental materials.

Situation selection.—Stimuli were six videos, six articles, and six slideshows of images: one high and one low arousal of each of the three valences (negative, neutral, and positive). Videos ranged in length from 1:17 to 3:00 minutes. Slideshows each consisted of 10 images with captions. Articles ranged in length from two to five pages and consisted primarily of text with maximum of one image per page. To ensure easy readability, all text was presented in large font (Arial size 18 in PowerPoint, presented full-screen at a resolution of 1440×900). Affect ratings appeared after each stimulus.

The affective environment is a medium-sized room containing three computer monitors on a long desk and a rolling chair to move among them. Each computer contained six stimuli of a single valence; valence location was counterbalanced across participants. During each selection period, a menu appeared on each computer, containing thumbnails and captions indicating the medium (video, article, slideshow) and a description of the 18 stimuli (see supplemental materials for a visual depiction of the setup). Participants used the mouse associated with each monitor to make selections and rate their affect.

Situation modification.—Stimuli were eight videos ranging in length from 0:50 to 3:03 minutes. There were four negative and four positive videos—two each of low- and high-arousal. Participants were randomly assigned to one of eight orders in a Latin-squares design. Affect ratings appeared after each video.

Attentional deployment.—Stimuli were 90 images from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 1995), from a subset that had been found to have no significant age differences in valence or arousal (Grühn & Scheibe, 2008). Images were presented in 18 blocks of 5 images grouped by valence and arousal; blocks

were semi-randomly ordered with the restriction that no valence or arousal level could be repeated more than twice in a row. Order was the same across all participants. Affect ratings appeared after each block.

Cognitive change/focus.—Stimuli were 10 videos ranging in length from 1:06 to 2:57. They were presented in pairs of one low- and one high-arousal video (counterbalanced), with four pairs of negative videos presented in a randomized order using a Latin-squares design, followed by one pair of positive videos (positive videos served to return participants to a baseline positive mood after eight negative videos before starting the next task). After each pair of negative videos, a neutral screensaver appeared for 30 seconds. Affect ratings appeared after each negative video and each neutral screensaver, with one rating after the pair of positive videos.

Expressive response modulation.—Stimuli were 10 videos ranging in length from 1:01 to 2:59. Stimuli were presented as in the cognitive change/focus task.

Affect ratings.—Throughout the study, participants rated their valence and arousal levels (labeled “activation” for participants) on two 9-point scales using the Self-Assessment Manikin (Bradley & Lang, 1994) with verbal anchors. Valence ranged from “most negative” (1) to “most positive” (9); arousal ranged from “most deactivated” (1) to “most activated” (9). The midpoint (5) was labeled as neutral in both scales. Participants were always instructed to rate how they were feeling “right now.” Baseline affect ratings were taken before each of the five tasks.

Eye tracking.—In the second session (attention, cognitive change/focus, response modulation tasks), participants’ gaze was tracked using an Applied Science Laboratories Model D6 Eye Tracker (Bedford, MA) and GazeTracker software (EyeTellect, Charlottesville, VA). Eye movements were recorded at a rate of 60Hz. Fixations were defined as an interval in which gaze was focused within 1° visual angle for 100 ms or more (Manor & Gordon, 2003). Polygonal LookZones were created around the most negative, positive, or salient parts of the image or video for negative, positive, and neutral stimuli, respectively. LookZones were determined by trained research assistants; a LookZone was identified if three out of five raters indicated it as a salient area. For example, an image of a snake had one LookZone around the snake’s head and open mouth.

Emotion regulation preferences questionnaires.—At the end of the second session, participants also completed a series of questionnaires designed for this study to examine overall emotion regulation preferences. The first asked them to rank their preference for using each of the emotion regulation strategies available to them within the study. Each strategy was described in plain terms, and participants ranked them from most preferred to least preferred. The second asked participants to indicate how likely they would be to use each strategy in everyday life, from 1 (very unlikely) to 7 (very likely). See supplemental materials for questionnaires.

Procedure

This research was approved by the Northeastern University Institutional Review Board (protocol #14–10-10). The study was run in two 2-hour sessions scheduled a week apart. All participants provided informed consent at the beginning of the study, were given an interim debriefing after the first session with the researchers' contact information, and were fully debriefed at the end of the second session.

Session 1.

Following informed consent, the participant completed vision and cognitive tests and completed a series of questionnaires. The researcher read standardized instructions to the participant explaining the affect rating scales, which would be used throughout the study.

Situation selection task.—This task was similar to past affective environment studies (Sands et al., 2018). The researcher read standardized instructions to the participant explaining the choice task, followed by a practice session using three neutral stimuli (one of each medium, not used in the main study) on one computer. Participants were told that for a period of 15 minutes, "You will have the freedom to choose from among any of the materials, on any of the computers, in whatever order you want, and you can view them for however long you want. There are no right or wrong choices; what you choose is up to you." The researcher answered any questions the participants had, left the room while the participants made their choices, and returned after 15 minutes. Participants finished viewing their last choice and rated their affect. Participants were given a chance to take a break or completed a neutral filler task for three minutes while the researcher set up the situation modification task.

Situation modification task.—This task was adapted from a previous situation modification study (Livingstone & Isaacowitz, 2015). The researcher read standardized instructions to the participant, telling them that they could choose to skip any content they did not wish to view by pressing the spacebar, which would fast forward 10 seconds, and that, "Whether you decide to skip a particular segment is up to you. You can choose to skip several segments or none." Participants practiced viewing and skipping videos while rating their mood for two neutral videos (not used in the main study). The researcher answered any questions the participant had, left the room while the participant completed the task, and returned when they were done. Participants then completed a questionnaire asking if they had skipped part of each video, and their reasons for skipping (or not). Following the task, participants were given an interim debriefing that did not reveal the study's purpose or hypotheses, and were compensated for their time.

Session 2.—The researcher introduced participants to stationary eye tracking and read standardized instructions describing the affect rating scales to remind participants. Participants completed the three tasks listed below, with either a short break or a neutral filler task in between while the researcher set up for the next task.

Attentional deployment task.—This task was adapted from previous attentional deployment studies (e.g., Noh et al., 2011). Eye tracking was calibrated using a nine-point

procedure, and participants made a baseline mood rating. Participants were instructed to view images naturally as if they were viewing television. The researcher left the room while the participants viewed images for the attentional deployment task, and returned when the task was completed. Images appeared on screen for 6 seconds, with a fixation cross appearing for 1 second in between each image, and rating scales after each five-image block. Past research has found that age differences in positive viewing emerge quickly, but not immediately (i.e., after 500 ms; Isaacowitz, Allard, Murphy, & Schlangel, 2009); the 6-second duration was meant to allow discretion in what participants viewed within the image.

Cognitive change/focus task.—Participants were told that they would be viewing pairs ("blocks") of videos, the first of which they would view normally as if watching television at home. They were handed an index card with these instructions, which they set aside.

The researcher handed them three additional cards with instructions representing different tactics, and explained to the participant that the cards represented different "mindsets," and that they would use all of them, but would choose the order in which they used them. The participant read each instruction card aloud and practiced the strategy with two negative IAPS images, speaking aloud. Images remained on the screen until the participant understood and successfully followed the instructions. The researcher provided feedback on how to implement each strategy, giving examples of each of the three forms of cognitive change/focus if the participant needed help. Order of the cards presented and example images were randomized.

Cognitive change instructions were adapted from Shiota and Levenson (2009). The *objective mindset* (detached reappraisal) card read, "While you view the video, try your best to think about what you are seeing with an objective, detached attitude. For example, you could take the perspective of a medical professional watching an instructional video, or focus on the technical aspects of the film." The *positive mindset* (positive reappraisal) card read, "While you view the video, try your best to think about the positive aspects of what you are seeing. For example, you could look on the bright side, or try to find positive meaning in the situation." The *negative mindset* (negative focus) card read, "While you view the video, try your best to think about the negative aspects of what you are seeing. For example, you could focus on the bad things that are happening, or be aware of your own unpleasant feelings."

Participants were told that their first choice of the three should be the one that they were "most comfortable and familiar with, that you could choose if you could only choose one option." The second choice should be the one that they "would choose next as the one you are most comfortable and familiar with, if your first choice was not available." Their last choice should be the one that they are "least comfortable and familiar with, that you would only use if you could not use the other two." They were also told that they would be seeing two pleasant videos before moving onto the next task, to ensure that they did not save the best strategy for last (these videos were not analyzed here). They placed the cards in the order that they would use them, after the normal viewing card, and set them aside. They were instructed not to speak their thoughts aloud while viewing the task videos.

On-screen instructions prompted them to pick up and read the relevant cards aloud (including the top "normal-viewing" instruction card) as they went through the task. Participants saw one low-arousal and one high-arousal video (counterbalanced) for each block. Before each video, they were prompted to read (or re-read) the appropriate card aloud to remind themselves of the instruction; the researcher corrected any confusion via a microphone. After each video, they were prompted to rate their affect. Each block of negative videos was followed by a 30-second neutral video and another affect rating. The two positive videos and an additional mood rating completed the task. Participants were given no instructions for how to watch the positive videos.

This task and the expressive task below were loosely based on past emotion regulation choice research (e.g., Sheppes & Gross, 2011), in which participants choose from among a set of predetermined options before actually engaging in regulation. Changes to the procedure were designed to reduce cognitive demands related to switching among various tactics. We therefore used videos instead of images to allow for more dynamic yet predictable (building on content immediately preceding it) content as one would experience in an ongoing situation in real life. Rather than trial-by-trial, participants made their choices before exposure to the stimuli but after practicing each tactic, and employed them consecutively, rather than switching among the three options.

Response modulation task.—The response modulation task was similar to the cognitive task with the following differences: 1) the instructions on the cards differed, now reflecting response modulation tactics, and 2) for the practice session, participants viewed a series of 3 negative images presented for 4 seconds each, and rather than speak their thoughts aloud, they were asked to follow the expressive instructions on the cards.

The *hidden expression* (expressive suppression) card read, "This time, if you have any feelings as you watch the video, try your best not to let those feelings show. In other words, try to behave so that someone watching you would not know you are feeling anything at all." The *positive expression* (positive masking) card read, "This time, if you have any negative feelings as you watch the video, please try to keep a positive expression. In other words, try to 'grin-and-bear-it' or 'put on a brave face' despite your negative feelings." The *obvious expression* (negative expression) card read, "This time, if you have any feelings as you watch the video, try your best to make sure that your feelings show. In other words, try to behave so that someone watching you would definitely know what you are feeling." The researcher provided feedback on their expressions as they practiced, and answered any questions the participants had before leaving the room.

Overall emotion regulation preferences and use.—Following the response modulation task, participants completed questionnaires assessing their preferences for each emotion regulation strategy in the study and likelihood of using each emotion regulation strategy in everyday life. Participants were fully debriefed by the researcher and were compensated for their time.

Results

Overview of Analyses

Research questions and hypotheses.—The primary hypotheses centered on age differences in tactic preferences within each of the five tasks. Specifically, we hypothesized that compared to younger adults, older adults would choose more positive and less negative stimuli in the situation selection task, skip more negative and less positive material in the situation modification task, and fixate more in positive and less in negative parts of emotional images in the attentional task. In the cognitive change/focus and response modulation tasks, they would be more likely to choose tactics that increased positive aspects and less likely to choose tactics that engaged negative aspects first.

Analytic approach.—We first examined the data using frequentist analyses and traditional significance tests (with an alpha level of .05) using SPSS 24 (IBM, Armonk, New York). When significant, we followed up with contrasts comparing younger adults with middle-aged and older adults, to examine whether preferences for emotion regulation variations emerge in mid- or late-life.

We note that for the first three tasks in which arousal level may have influenced behavioral dependent variables (situation selection, situation modification, and attentional deployment), we include arousal as an additional factor. As participants made their choices before exposure to the videos in the last two tasks, arousal level would not have influenced choices, so arousal was not included.

Because past research has suggested, but not necessarily supported the idea, that age groups are similar in some emotion regulation use (e.g., Eldesouky & English, 2018; Sands et al., 2018), we also conducted parallel Bayesian analyses using JASP v. 0.8.4 (University of Amsterdam, The Netherlands). One benefit of Bayesian analysis is that it can estimate relative support for the null hypothesis, and thus evidence for similarity among age groups, whereas null hypothesis significance testing can only provide support for the alternative.

Bayes factors (BF) can be interpreted as a ratio of evidence for the alternative hypothesis over the null. In all cases, the Bayes factor represents the *relative* evidence for one hypothesis over the other. Below, we report Bayes factors in the form BF_{10}: The relative evidence for the alternative (H1, age differences) compared to the null (H0, age similarity; BF_{01} would reflect relative evidence for the null compared to the alternative). For ANOVA, we include Bayes factors for the inclusion (BF_{incl}) of each effect, which compares support for models that include the effect to models that do not.

To interpret Bayes factors, we use guidelines described in Lee and Wagenmakers (2013), where a BF_{10} between 3 and 10 is considered “moderate” evidence for the alternative hypothesis over the null, between 10 and 30 is considered “strong” evidence, between 30 and 100 is “very strong” evidence, and over 100 is “extreme evidence.” In contrast, a BF10 between 1/10 and 1/3 (.100 to .333) is considered moderate evidence for the null hypothesis over the alternative, between 1/30 and 1/10 (.033 to .100) is considered strong evidence for the null, between 1/100 and 1/30 (.001 to .033) is very strong, and less than 1/100 (< .001) is

extreme. A Bayes factor of 1 indicates equivalent support for both hypotheses; Bayes factors between 1/3 and 3 indicate only anecdotal evidence, and can be considered inconclusive; that is, the current data is not sufficient to update our knowledge about the respective hypotheses.

JASP output also provides model comparisons, in which variations of models are compared to the null hypothesis and against each other. For each ANOVA, we report the model with the most support, and how it compares to the null model (including only subject) and the next most likely models. We used default priors set in JASP, and conducted analyses in a way to parallel the frequentist approach. We also tested robustness against alternative priors; results are presented in supplemental materials. In ANOVAs, where tests of inequality of variance were significant, Greenhouse-Geisser corrections were used and adjusted degrees of freedom are reported. Post-hoc tests used Bonferroni-corrected alpha values.

Main Analyses: Testing Age Differences in Emotion Regulation Tactics

Situation selection.—The dependent variable was the number of choices in each stimulus valence category, with age group as a between-subject factor, and stimulus arousal as an additional within-subjects factor. Means and standard deviations for number of choices are reported in Table 1. On average, people made 9.80 choices (SD=3.50, range 1–23). There were no age differences in number of choices made, $F(2,221)=.27$, $p=.766$.

Main results are presented in Table 2 and Figure 1. The 3 (valence) × 2 (arousal) × 3 (age group) ANOVA found a main effect of valence, $F(1.94, 431.32)=13.14$, $p<.001$, $\eta_p^2=.056$, BF_{incl} =1.10e+7); and a significant interaction between age and valence, $F(3.89, 431.32)$, $p=.007$, $\eta_p^2=.031$, BF_{incl} =4.74). No planned pairwise comparisons were significant (ps>.05, ds<.16, BFs<3). Bayes factors suggested younger and older adults were similar in negative (BF=.184), neutral (BF=.196), and positive choices (BF=.276); and younger and middle-aged adults were similar (BF=.182) in neutral choices.

Follow-up within-subject tests showed that overall, people chose fewer negative than neutral ($p<.001$, BF=3318) and positive ($p<.001$; BFs>1000), but this was qualified by age. Younger adults chose fewer negative than neutral ($p=.002$, $d=.42$, BF=34.64) and positive stimuli ($p=.008$, $d=.36$, BF=9.85), but similar number of neutral and positive (BF=.152). Middle-aged adults showed no preference for any valence ($p=.478$, BF=.095). Older adults chose fewer negative than neutral ($p=.044$, $d=.29$, BF= 2.32), and fewer negative than positive ($p<.001$, $d=.51$, BF=593), but did not conclusively differ between neutral and positive ($p=.123$, $d=.24$, BF=.97).

Bayesian model comparisons indicated that the valence × age model with main effects was the best fitting compared to the null (BF_{incl}=2.14e+6), and was 2.2 times more likely than the second-best valence-only model. Analysis of effects favored the omission of arousal (BF_{incl}=.03), valence × arousal (BF_{incl}=.004), arousal × age (BF_{incl}=.010), and the three-way interaction (BF_{incl}=2.80e-5) from the model.

In sum, both frequentist and Bayesian approaches suggest that younger and older adults were similar in avoiding negative content (i.e., choosing more neutral and positive than

negative), whereas middle-aged adults showed no preference based on valence. In contrast, there were no age differences in positive choices. Additionally, age groups showed no evidence of differences in seeking out positive content (choosing positive over neutral stimuli) in any of the age groups.

Situation modification.—Data from five participants (1 YA, 2 MA, 2 OA) and two additional videos were missing due to data recording errors. To control for variation in video length, the dependent variable was the percent of skips out of possible skips (for example, a video of 180 seconds could have up to 18 skips). Across all videos for all participants, 44.7% of videos were skipped at least once. On average, people skipped 11.80% of videos (range 0 to 56.17%). Means and standard deviations for percentage skips taken are reported in Table 1. Main results are presented in Table 2 and in Figure 2.

The 2 (valence) × 2 (arousal) × 3 (age group) ANOVA revealed age groups were similar in percentage of skips taken across all videos, $F(2,217)=1.18$, $p=.308$, $\eta_p^2=.011$, BF=.108. There was a main effect of valence, $F(1,217)=171.79$, $p<.001$, $\eta_p^2=.442$, $BF_{incl}>1e+100$; a main effect of arousal, $F(1,217)=19.47$, $p<.001$, $\eta_p^2=.082$, $BF_{incl}=179555$; an interaction between valence and arousal, $F(1,217)=33.98$, $p<.001$, $\eta_p^2=.135$, $BF_{incl}=32229$. A significant three-way interaction, $F(2,217)=5.16$, $p=.006$, $\eta_p^2=.045$, $BF_{incl}=.145$, was not supported by Bayesian analysis.

Follow-up one-way ANOVAs showed age groups significantly, but not conclusively, differed in skipping of low-arousal negative videos, $F(2,217)=3.44$, $p=.034$, $\eta_p^2=.031$, BF=.98, though no pairwise age comparisons reached significance (ps>.06), had Bayes factors over 3, or Cohen's d over .20. Age groups were similar in how much they skipped high-arousal negative videos, $F(2,217)=.62$, $p=.539$, $\eta_p^2=.006$, BF=.082; low-arousal positive videos, $F(2,217)=.29$, $p=.749$, $\eta_p^2=.003$, BF=.061; and high-arousal positive videos, $F(2,217)=1.30$, $p=.275$, $\eta_p^2=.012$, BF=.131.

Follow-up paired t-tests showed people skipped more negative content than positive, $t(219)=12.03$, $p<.001$, $d=.81$, BF=5.63e+22, and more low-arousal than high-arousal, $t(219)=4.71$, $p<.001$, $d=.32$, BF=2591. People skipped more negative low-arousal content than negative high-arousal, $t(219)=6.63$, $p<.001$, $d=.48$, BF=3.03e+7, but did not differ in skipping positive low- and positive high-arousal content, $t(219)=-1.26$, $p=.209$, $d=.09$, BF=.165.

Bayesian model comparisons suggest the best model was the valence × arousal with main effects (BF=3.5e+50), which was 8.5 times more likely than the next best-fitting model, which also included a main effect of age. It was also 200 times more likely than the full model with the three-way interaction.

In sum, people of all ages were more likely to skip negative material (avoid negative content) than positive material, and more low- than high-arousal material. More central to our hypothesis, older adults did not skip more negative or view more positive content than younger adults. The three-way interaction suggested that younger adults may have been

more likely to skip low-arousal negative content, but this was not robust and is contrary to the hypothesis that older adults would be more likely to skip negative content.

Attentional deployment.—The dependent variable was the percent fixation in LookZones relative to total fixation. Eye tracking data from 36 participants (10 YA, 12 MA, 14 OA) were missing due to either inability to calibrate (e.g., because of obscured pupils, glare from glasses) or technical problems. An additional 24 participants (7 YA, 11 MA, 6 OA) tracked for less than 50% of the time were excluded from analyses. Tracking exclusion did not vary by age, $\chi^2(4)=2.33$, $p=.675$. The remaining data included fixation from 56 YAs, 54 MA, and 55 OA. On average, participants fixated in LookZones 33.94% of the time ($SD=13.46$). Means and standard deviations for fixation are reported in Table 1. Main results are presented in Table 2 and in Figure 3.

The 3 (valence) × 2 (arousal) × 3 (age group) ANOVA showed a main effect of valence, $F(2,304)=27.02$, $p<.001$, $\eta_p^2=.151$, $BF_{incl}>1e+100$; a main effect of arousal, $F(1,152)=85.25$, $p<.001$, $\eta_p^2=.359$, $BF_{incl}>1e+100$; an interaction between valence and arousal, $F(1.92,292)=91.54$, $p<.001$, $\eta_p^2=.376$. $BF_{incl}>1e+100$; an interaction between age and valence, $F(4,304)=2.81$, $p=.026$, $\eta_p^2=.030$, $BF_{incl}=.155$; and an interaction between age and arousal, $F(1,152)=4.15$, $p=.043$, $\eta_p^2=.052$; $BF_{incl}=.063$. Bayesian analysis of effects supported omission of the interactions with age. Age groups were similar in percent fixation in LookZones overall, $F(2,152)=.41$, $p=.664$ $\eta_p^2=.005$, $BF_{incl}=.108$; and the three-way interaction was not supported, $F(3.84,292)=.24$, $p=.910$, $\eta_p^2=.002$, $BF_{incl}=.145$.

Follow-up tests of age differences in fixations across different valences and arousal levels were all non-significant and suggested age groups were similar when correcting for multiple comparisons ($ps>.05$, $ds<.20$, BFs<.16).

Across participants, people fixated the most in positive LookZones compared to neutral ($t=5.41$, $p<.001$, $d=.42$, BF=49409) and negative ($t=2.43$, $p=.049$, $d=.19$, BF=1.50), and more in negative than neutral ($t=3.41$, $p=.002$, $d=.27$, BF=22.60). They also fixated more in low-arousal than high-arousal LookZones, $t(163)=5.28$, $p<.001$, $d=.41$, BF=26954. Paired-samples t-tests showed that there were no differences in low- and high-arousal negative fixation ($p=.202$, $d=.10$, BF=.20) or in low- and high-arousal neutral fixation ($p=.548$, $d=.05$, BF=.11), but that people fixated more in low-arousal positive LookZones than in high-arousal, $t(158)=13.38$, $p<.001$, $d=1.06$, BF=3.95e+24.

Follow-up tests within each age group showed that younger adults fixated more in positive than neutral ($t=3.19$, $p=.007$, $d=.43$, BF=12.90) and negative ($t=2.51$, $p=.046$, $d=.34$, BF=2.52), but did not differ between negative and neutral ($t=1.26$, $p=.641$, $d=.17$, BF=.31). Middle-aged adults fixated more in positive than neutral ($t=3.13$, $p=.009$, $d=.43$, BF=11.04) and more in negative than neutral ($t=2.81$, $p=.021$, $d=.39$, BF=5.00), but did not differ between negative and positive ($t=.13$, $p>.999$, $d=.02$, BF=.15). Older adults fixated more in positive than neutral ($t=3.18$, $p=.007$, $d=.43$, BF=12.34), but did not differ in fixation to positive and negative ($t=1.41$, $p=.496$, $d=.19$, BF=.38) or neutral and negative ($t=1.73$, $p=.267$, $d=.24$, BF=.60). These latter effects were not significant, but Bayes factors were not sufficient to show similarity (i.e., > .30).

Bayesian model comparisons suggested the best model was the valence × arousal model with main effects (BF=9.51e+52), which was over 2000 times more likely than the model with the full three-way interaction, and 7 times more likely than the next best-fitting model, which included a main effect for age.

In sum, contrary to hypotheses, the age groups were similar to each other in their fixations, although there were some different patterns of within-group differences. Specifically, both younger and older adults showed evidence of positive-engagement tactics, whereas middle-aged adults showed both positive- and negative-engagement. Overall, participants fixated more in positive LookZones—specifically low-arousal positive—compared to neutral, but did not differ in fixation to negative and neutral images. In other words, people showed greater attention to positive content (positive content engagement), but did not necessarily look away from negative content (negative content avoidance).

Cognitive change/focus: Due to technical problems, choice data were not recorded for 3 YAs, 2 MAs, and 1 OA. Choice data were available for 209 participants (69 YA, 71 MA, 69 OA). The number of first choices in each cognitive category were tabulated for each age group. Results are presented in Table 3 and Figure 4. We conducted chi-square tests for each choice separately, with a binary outcome (0=no, 1=yes), first across all participants and then with age as a factor. For Bayesian analyses, sampling was specified as independent multinomial (age groups fixed). For overall effects, Bayesian binomial tests were used to follow-up; the test value of .33 was used. For age effects, Bayesian contingency tables were tested.

Age groups were similar in choosing the negative focus tactic first, $\chi^2(2)=.67$, $p=.715$, BF=.021; choosing detached reappraisal first, $\chi^2(2)=3.44$, $p=.179$, BF=.156; and choosing positive reappraisal first, $\chi^2(2)=3.01$, $p=.222$. BF=.152. Age groups did not significantly differ in choosing negative focus last, $\chi^2(2)=5.08$, $p=.079$, BF=.468; or in choosing positive reappraisal last, $\chi^2(2)=1.64$, $p=.440$, BF=.03. Age groups differed in choosing detached reappraisal last, $\chi^2(2)=9.21$, $p=.010$, BF=3.23: 54% of middle-aged participants chose detached reappraisal last, compared to 32% of younger adults and 32% of older adults.

Overall, people were more likely to choose the positive reappraisal tactic first (66%) than not, $\chi^2(2)=100.53$, $p<.001$, BF=3.46e+19, and were less likely to choose detached reappraisal (23%), $\chi^2(2)=10.11$, $p=.006$, BF=11.56; and negative focus tactics (11%), $\chi^2(2)=46.90$, $p<.001$, BF=4.98e+10. They were also more likely to choose negative focus last (52%), $\chi^2(2)=31.63$, $p<.001$, BF=435291, and less likely to choose positive reappraisal last (9%), $\chi^2(2)=55.28$, $p<.001$, BF=1.74e+13; choosing detached reappraisal last was no different from chance (39%), $\chi^2(2)=3.27$, $p=.195$, BF=.50.

In sum, people of all age groups strongly preferred the tactic of positive reappraisal over detached reappraisal and negative focus. The only age difference that emerged was that middle-aged participants were more likely than other age groups to rank detached reappraisal as the one they were least comfortable and familiar with. Thus, both younger and older adults showed a preference for increasing positive cognition over remaining neutral.

Contrary to hypotheses, younger adults were not more likely to choose negative focus than older adults.

Expressive response modulation.—Choice data were available for 211 participants (69 YA, 71 MA, 69 OA). The number of first choices in each response modulation category were tabulated for each age group. Results are presented in Table 3 and Figure 5. Analyses paralleled those in the cognitive change/focus section above.

Age groups were similar in choosing negative expression first, $\chi^2(2)=2.63$, $p=.269$, BF=.13; choosing expressive suppression first, $\chi^2(2)=2.30$, $p=.317$, BF=.09; and choosing positive masking first, $\chi^2(2)=.23$, $p=.890$, BF=.04. Age groups did not differ in choosing negative expression last, $\chi^2(2)=.5.55$, $p=.063$, BF=.44; or positive masking last, $\chi^2(2)=.61$, $p=.736$, BF=.05. Age groups did differ in choosing expressive suppression last, $\chi^2(2)=6.75$, $p=.034$: A follow-up logistic regression showed that younger adults were more likely to choose expressive suppression last (51%) than middle-aged adults (30%), $z=-2.54$, $p=.011$, BF=1.07, though the Bayesian contingency analysis was inconclusive.

Overall, people were more likely to choose the negative expression tactic first (42%), $\chi^2(2)=6.66$, $p=.036$, BF=2.76; but were not significantly less likely to choose expressive suppression (27%), $\chi^2(2)=3.79$, $p=.150$, BF=.45; or positive masking first (31%), $\chi^2(2)=.40$, $p=.819$, BF=.092. They were less likely to choose negative expression last (24%), $\chi^2(2)=7.97$, $p=.019$, BF=3.74, but not significantly more likely to choose expressive suppression (41%), $\chi^2(2)=5.93$, $p=.052$, BF=1.92, or positive masking last (35%), $\chi^2(2)=.15$, $p=.928$, BF=.092.

In sum, the only age difference that emerged was that younger adults were more likely to choose expressive suppression last than middle-aged adults, but this was not corroborated by the Bayesian analysis. Overall, people were slightly more likely to choose the negative expression tactic first and less likely to choose it last, indicating an overall preference for displaying or exaggerating negative emotion. Thus, the hypothesis that older adults would prefer positive masking and expressive suppression, and avoid negative expression, compared to younger adults, was not supported.

Testing Age Differences in Self-Reported Affect

If older adults seek out positive and avoid negative aspects within these tasks, we would also expect them to report more positive affect. For each task, we conducted an age × valence/tactic ANOVA, which varied by task. Specifically, in the first three tasks, tactic was represented by engagement and avoidance of the different valences, whereas in the last two tasks, tactic was represented by choice of specific instructions. Complete descriptive statistics can be found in supplemental materials, along with analyses including arousal as a factor.

Situation selection.—A 3 (valence) × 3 (age group) model showed age groups were similar in affect across the task, $F(2,150)=1.27$, $p=.284$, $\eta_p^2=.017$, $BF_{incl}=.279$. There was a main effect of valence, $F(2,300)=409.59$, $p<.001$, $\eta_p^2=.732$, $BF_{incl}>1e+100$, and an interaction between age and valence, $F(4,300)=3.42$, $p=.009$, $\eta_p^2=.044$, $BF_{incl}=1.12$, though

the Bayesian analysis was inconclusive for the latter effect. Follow-up one-way ANOVAs showed that age groups were similar in ratings of negative choices, $F(2,181)=.81$, $p=.446$, BF=.112, and neutral choices, $F(2,203)=1.14$, $p=.321$, BF=.137, but that older adults reported more positive affect after positive choices on average, $F(2,199)=6.13$, $p=.003$, BF=10.58; than younger ($p=.024$, BF=3.07) and middle-aged ($p=.001$, BF=16.08) adults.

Because the above model still only included a subset of the sample who had made choices from all three valences (51 YAs, 59 MAs, 43 OAs), we ran a one-way ANOVA testing averaged affect across the whole task. In this model, which included 73 YAs, 76 MAs, and 75 OAs, age groups did not significantly differ, $F(2,221)=2.57$, $p=.079$, BF=.456. Post-hoc pairwise comparisons showed that middle-aged adults reported slightly lower affect ($M=5.57$, $SD=1.22$) than older adults ($M=6.02$, $SD=1.18$), whereas younger adults fell in between and did not differ significantly ($M=5.81$, $SD=1.23$).

Situation modification.—A 2 (valence) × 3 (age group) ANOVA showed age groups did not significantly differ in affect across the task, $F(2,215)=.09$, $p=.913$, $\eta_p^2=.001$, $BF_{incl}=1.90$. There was a main effect of valence, $F(1,215)=1001.94$, $p<.001$, $\eta_p^2=.823$, $BF_{incl}>1e+100$, and an interaction between age and valence, $F(2,215)=7.64$, $p=.001$, $\eta_p^2=.066$, $BF_{incl}=10.93$. Follow-up one-way ANOVAs showed that age groups did not significantly differ in ratings of negative videos, $F(2,215)=2.87$, $p=.059$, BF=.595, but did for positive videos, $F(2,215)=5.18$, $p=.006$, BF=1.99, though neither Bayes factor was conclusive. Older adults ($M=7.65$, $SD=1.07$), but not middle-aged adults ($M=7.21$, $SD=1.12$), reported more positive affect than younger adults ($M=7.14$, $SD=1.01$) after positive videos, $t(215)=2.98$, $p=.003$, BF=2.50.

Attentional deployment.—A 3 (valence) × 3 (age group) ANOVA found age groups did not significantly differ across the task, $F(2,204)=1.70$, $p=.185$, $\eta_p^2=.016$, $BF_{incl}=16.80$. There was a significant main effect of valence, $F(2,408)=816.17$, $p<.001$, $\eta_p^2=.800$, $BF_{incl}=6e+15$, and an interaction between age and valence, $F(4,408)=6.05$, $p<.001$, $\eta_p^2=.056$, $BF_{incl}=87.85$. Follow-up one-way ANOVA showed age groups did not differ in affect during neutral blocks, $F(2,204)=1.68$, $p=.189$, BF=.219, but did for negative blocks, $F(2,204)=4.32$, $p=.015$, BF=2.19; and positive blocks, $F(2,204)=4.68$, $p=.010$, BF=2.98. Younger adults ($M=3.64$, $SD=1.02$) reported less negative affect after negative blocks compared to middle-aged ($M=3.20$, $SD=1.07$), $t(204)=-2.36$, $p=.019$, BF=2.86, and older adults ($M=3.14$, $SD=1.20$), $t(204)=-2.69$, $p=.008$, BF=4.42. Older adults ($M=7.04$, $SD=1.08$), but not middle-aged adults ($M=6.55$, $SD=.99$), $t(204)=-.11$, $p=.911$, BF=.182, reported more positive affect after positive blocks compared to younger adults ($M=6.57$, $SD=1.10$), $t(204)=2.60$, $p=.010$, BF=3.21.

Cognitive change/focus.—A 4 (instruction) × 3 (age group) ANOVA showed age groups differed in affect across the task, $F(2,202)=4.11$, $p=.018$, $\eta_p^2=.039$, $BF_{incl}=.689$: Younger adults ($M=4.15$, $SD=.96$) reported less negative affect than middle-aged ($M=3.82$, $SD=.97$), $t(205)=-2.07$, $p=.040$, BF=.668, and older adults ($M=3.72$, $SD=.88$), $t(205)=-2.07$, $p=.040$, BF=3.38. Instruction conditions did not differ, $F(3,606)=.68$, $p=.566$, $\eta_p^2=.003$, $BF_{incl}=.007$; and there was no interaction between age and instructions, $F(6,606)=.35$, $p=.910$, $\eta_p^2=.003$, $BF_{incl}=5.69e-5$.

Response modulation.—A 4 (instruction) × 3 (age group) ANOVA showed that age groups did not differ across the task, $F(2,173)=2.18$, $p=.116$. $BF_{incl}=.236$. Instruction conditions did not differ, $F(3,519)=1.06$, $p=.366$, $BF_{incl}=.026$; and there was no interaction, $F(6,519)=1.28$, $p=.263$, $BF_{incl}=.001$.

Within-subject comparisons across tasks.—As an additional exploratory analysis, we compared affect among age groups across tasks, in a 2 (valence/tactic: positive vs. negative) × 3 (age group) × 5 (task) ANOVA. Because situation modification did not include a neutral condition, we compared affect in positive valence/tactic choices and negative valence/tactic choices. Overall, age groups did not differ in their ratings of affect across the study, $F(2,123)=.46$, $p=.630$, $\eta_p^2=.007$. There was a main effect of valence/tactic, $F(1,123)=561.76$, $p<.001$, $\eta_p^2=.820$, and an interaction between valence/tactic and age, $F(2,123)=4.97$, $p=.008$, $\eta_p^2=.075$. A one-way ANOVA found age groups did not significantly differ in affect for positive valence/tactics across the study, $F(2,222)=2.94$, $p=.055$, but did for negative, $F(2,221)=3.43$, $p=.034$. Specifically, younger adults reported less negative affect than older adults during negative valence/tactics, $t(221)=-2.55$, $p=.012$.

There was a main effect of task, $F(4,492)=121.92$, $p<.001$, $\eta_p^2=.498$, and there was an interaction between task and age, $F(8,492)=3.21$, $p=.001$, $\eta_p^2=.050$. There was also an interaction between task and valence/tactic, $F(4,492)=164.31$, $p<.001$, $\eta_p^2=.572$, as well as a significant three-way interaction, $F(8,492)=3.12$, $p=.002$, $\eta_p^2=.048$, which was examined within each task above. Analysis broken down within age group can be found in supplemental materials.

Summary.—Within each of the five tasks, across valences/tactics, age groups differed only in the cognitive change task, where younger adults reported less negative affect than older age groups. Some evidence suggested that older adults were particularly responsive to positive stimuli when they were present. On the other hand, younger adults reported less negative affect than the other two groups after negative stimuli in the attention and cognitive tasks.

Self-Reported Preferences for Emotion Regulation Tactics

Study strategy ranking.—To get a sense of overall preferences for engaging with emotional materials (e.g., avoiding/decreasing negative aspects, introducing/increasing positive aspects, and engaging with negative aspects), we analyzed rankings participants made of the tactics available to them within the study. Using self-report in addition to behavioral indicators allows us to examine age differences and similarities in preferences from a different angle, specifically beliefs about emotion regulation tactics. We first ran a series of one-way ANOVA to test these differences, with planned contrasts comparing younger to both middle-aged and older adults. We then aggregated across the strategies to test age differences in overall tendencies to seek positive, avoid negative, and engage negative aspects of the situation. Lower rankings indicate greater preference. Complete descriptive and inferential statistics can be found in supplemental materials.

Age groups significantly differed in rankings of situation selection-avoiding negative, $F(2,203)=5.24$, $p=.006$, $\eta_p^2=.049$, BF=4.87; and cognitive-negative focus, $F(2,203)=4.46$,

p=.013, η_p^2 =.042, BF=2.50, though the Bayes factor was not conclusive for the latter. Younger adults ranked avoiding negative stimuli lower (preferred it more) than older adults (t=3.21, p=.002, BF=12.55), but did not differ from middle-aged adults. Younger adults ranked negative cognitive focus higher (preferred it less) than middle-aged (t=2.11, p=.036, BF=.233) and older (t=2.88, p=.004, BF=9.59) adults, though the younger vs. middle-aged difference was not supported by the Bayes factor.

Next, we computed means for all tactics aimed at avoiding negative aspects (avoiding negative stimuli, skipping negative material, attending away from negative content, detached reappraisal, and expressive suppression), all tactics aimed at increasing positive aspects (seeking positive stimuli, attending toward positive content, positive reappraisal, and positive masking), and both tactics aimed at engaging with negative aspects (negative focus and expressing negative emotion) to examine age differences. A 3 (age group) × 3 (tactic type) ANOVA showed tactic types varied in relative rankings, F(1,203)=200.78, p<.001, η_p^2 = .497, BF_{incl}>1e+100, and an interaction between age and tactic, F(4,406)=3.03, p=.018, η_p^2 = .029, BF_{incl}=1.72, though the Bayes factor was inconclusive for the interaction. Overall, participants ranked increasing positive aspects first, followed by decreasing negative, and engaging with negative. There were no significant age differences for decreasing negative aspects (BF=.333) or increasing positive (BF=.302), but age groups significantly differed in rankings of engaging with negative (BF=1.94): Younger adults ranked it higher (less preferable) than middle-aged (BF=5.37) and older adults (BF=2.90), who did not differ. Bayesian model comparison suggested that the tactic type-only model was 2.14 times more likely than the full age-by-strategy interaction model.

Finally, to examine overall pattern in emotion regulation strategies, we took the means of both situation selection, both attentional deployment, the three cognitive change/focus items, and the three response modulation items, and retained the single situation modification item. A 3 (age group) × 5 (strategy family) ANOVA showed age groups were similar in rankings overall, F(2,203)=1.63, p=.198, η_p^2=.016, BF_{incl}=.020. Strategies varied in relative rankings, F(4,812)=88.40, p<.001, η_p^2=.303, BF_{incl}=6e+15; and there was a significant interaction between age and strategy, F(8,812)=2.30, p=.019, η_p^2=.022, BF_{incl}=.097, though the Bayes factor did not support the interaction. Participants ranked situation selection as the most preferred (BFs>100), followed by attentional deployment (BFs>40), then cognitive change and situation modification (which did not differ, BF=.148), and finally response modulation (BFs>100). Follow-up one-way ANOVAs showed age groups did not differ on rankings for situation selection (BFs<2), situation modification (BFs<2), attentional deployment (BFs<.50), or response modulation (BFs<.40), but younger adults ranked cognitive change higher (preferred it less) than middle-aged (BF=8.96) and older (BF=16.54) adults; the older two groups did not differ (BF=.188). Bayesian model comparison suggested that the strategy-only model was 40 times more likely than the full strategy-by-age interaction model.

Preferences for use in daily life.—Finally, we analyzed ratings for how often participants reported using tactics in daily life using one-way ANOVA, first individually and then combining across tactic types (seeking positive, avoiding negative, and engaging negative aspects of the situation). In this case, higher ratings indicate greater preference. Complete descriptive and inferential statistics can be found in supplemental materials.

Age groups did not differ overall in ratings collapsing across all strategies, $F(2,206)=1.15$, $p=.319$, $\eta^2=.011$. They did, however differ on ratings of situation modification-reduce negative, $F(2,205)=4.27$, $p=.015$, $\eta^2=.040$, BF=2.11: Younger adults reported using it less in daily life than middle-aged ($p=.023$, BF=.854) and older ($p=.008$; BF=3.69) adults, though only the young-old difference was supported by Bayes factors.

Next, we took the means of all tactics involving avoidance of negative aspects (avoid negative situations, situation modification by reducing negative aspects, attending away from negative information, detached reappraisal, and expressive suppression), tactics involving increasing positive aspects (seeking positive situations, situation modification by increasing positive aspects, attending toward positive information, positive reappraisal, and positive masking), and those aimed at engaging with negative aspects (negative focus, expressing negative emotion).

Tactic types varied significantly in their ratings, $F(1.44, 295.88)=159.53$, $p<.001$, $\eta_p^2=.436$, $BF_{incl}=6e+15$; but the interaction between age and tactic was not significant, $F(3.12,295.88)=2.35$, $p=.070$, $\eta_p^2=.022$, $BF_{incl}=.060$. Across all age groups, people reported being more likely to introduce/increase positive aspects, followed by avoid/reduce negative, and were least likely to engage with negative (BFs>100). Bayesian model comparison suggested the strategy-only model was 62.5 times more likely than the age × strategy full model.

Finally, we took the means of both situation selection, both situation modification, both attentional deployment, the three cognitive change/focus items, and the three response modulation items. A 3 (age group) × 5 (strategy) ANOVA showed age groups did not differ in overall ratings, $F(2,206)=1.36$, $p=.259$, $\eta_p^2=.013$, $BF_{incl}=.058$, and there was no interaction between age and strategy, $F(6.52,671.83)=.71$, $p=.653$, $\eta_p^2=.007$, $BF_{incl}=.111$. Strategies significantly differed, however, $F(3.26,671.83)=171.75$, $p<.001$, $\eta_p^2=.408$, $BF_{incl}>1e+100$. Participants reported using strategies most often in the order proposed by the process model: situation selection most often, followed by situation modification ($p=.003$, BF=50), attentional deployment ($p=.007$, BF=23), cognitive change ($p<.001$, BF>100), and response modulation ($p<.001$, BF>100). Bayesian model comparisons suggested the strategy-only model was over 5000 times more likely than the full age × strategy model.

Summary.—Across both sets of ratings, people of all ages reported favoring a combination of tactics that increased positive aspects of the situation or experience. At the specific tactic item level, age groups were generally similar in their ratings (as indicated by Bayes factors), which parallels the behavioral results from the laboratory study. However, where age groups did differ, the differences did not always align with laboratory results, indicating these methods may be assessing different constructs, with the self-reports perhaps assessing emotion regulation schemas or knowledge.

Discussion

Theorists and researchers have suggested that age differences in emotion regulation may explain high levels of emotional well-being in older adulthood. In testing this idea, we

hypothesized that when faced with a standardized situation, older adults would be more likely to introduce or increase positive aspects of the situation or experience and/or avoid or decrease negative aspects of the experience, compared to younger adults. In addition, we examined whether older adults would experience more affective well-being during these situations compared to younger adults. Finally, we examined self-reported preferences for these tactics within the study and in daily life.

Age similarities and differences in emotion regulation tactic preferences.

With some exceptions (described below), we found that age groups were generally *similar* in emotion regulation lab behavior and self-reported preferences (as indicated by *p*-values above .05 and Bayes factors less than .33, which indicate at least some support for the null hypothesis; in some cases, very small Bayes factors indicated very strong support for age similarity). In the situation selection task, younger and older adults chose similar numbers of positive, negative, and neutral stimuli to view. In the situation modification task, the three age groups skipped similar amounts of low-arousal positive, high-arousal positive, and high-arousal negative videos. In the attentional deployment task, the three age groups fixated similarly in negative, neutral, and positive LookZones. In cognitive change/focus and response modulation tasks, younger and older adults made similar first and last choices. In sum, the data did not support the hypothesis that older adults would vary in their tactic preferences; instead, in the cases listed above, the null hypothesis of age similarity in tactic preferences was actually supported.

Both younger and older adults showed a clear tendency toward positive tactics and away from negative engagement tactics, apparent in avoidance of negative material in situation selection and modification, and increasing positive engagement with attention and cognitive change. The one exception was in response modification, which participants generally preferred to express negative emotions when feeling them (possible reasons for this are discussed below). Thus, at least for antecedent-focused strategies, the baseline tactic preferences seem to be to avoid or minimize exposure to negative situations when stimuli are controllable, and to increase positive attention and thoughts when they are not.

The clear age differences that emerged (supported by both frequentist and Bayesian results) involved the middle-aged group. First, compared to the avoidance of negative content by younger and older adults in the situation selection task, middle-aged adults showed no preference based on valence. Second, when choosing cognitive strategies, middle-aged adults were more likely to avoid detached reappraisal (i.e., chose it last) than younger and older adults. These patterns could reflect sampling characteristics. The middle-aged participants in this study, in coming to the lab during business hours, were less likely to report being employed compared to the population of the Boston area. We note, however, that there were no age differences in self-reported health or incidence of mental illness.

Middle age could represent a phase in life in which experience has afforded some degree of knowledge about emotional situations. Negative information may still be relevant and support long-term goals, and the perception of limited time horizons may not yet be clear. Therefore, middle-aged people may be even more likely to engage with emotional content in some cases (such as seeking out information in situation selection or appraisals). We note,

however, that because there is little research on emotion regulation in middle adulthood, we did not present a priori hypotheses about this age group, and consider these results preliminary.

Age differences in affect.

There were also few significant age differences in self-reported affect within the various tasks. Given the degree of similarity in tactic preferences, we would not necessarily expect large differences in emotional experience due to emotion regulation. Older adults showed some evidence, however, of responding more positively to positive stimuli when they were present (i.e., in the first three tasks). In addition, younger adults reported less negative affect than older adults during the cognitive change task. This could be interpreted as evidence that the strategy may be more effective overall in younger adulthood, as some have suggested (Scheibe et al., 2015; Urry & Gross, 2010). However, the lack of interaction with instruction suggests that age groups differed in the normal viewing condition as well. We note that the Bayesian analyses for age differences in affect often produced relatively weak or inconclusive results, suggesting the need for a more direct test of age differences in effectiveness of these tactics.

Age and self-reported preferences for strategies.

Asking participants about the tactics they preferred allowed us to gauge the degree to which people of different ages might be aware of their preferences, and to compare across the tactics and tasks within people. Participants indicated their preferences at the end of the study, after they had some experience with each of the strategies and could compare across tactics. As in the lab tasks, age groups were quite similar. When ranking preferred strategies within the study, age groups agreed on (in order of most-to-least preferred) positive situation selection, positive attentional deployment, positive reappraisal, negative cognitive focus, attending away from negative material, expressive suppression, positive masking, and negative expression. Ratings were also similar when we combined tactics that introduced or increased positive aspects, those that avoided or decreased negative aspects, and those that engaged with negative aspects of the situation or experience.

In reports of use in daily life, the three age groups reported being similarly likely to use (in order of most-to-least likely) positive situation selection, positive situation modification, positive attentional deployment, attentional distraction, positive reappraisal, detached reappraisal, negative cognitive focus, expressive suppression, negative expression, and positive masking. Age groups were also similar in the combination of tactics that introduced or increased positive aspects and those that engaged negative aspects. A common theme across both questionnaires was that, when asked globally, participants favored tactics that introduced or increased positive aspects of situations and experiences, rather than those that avoided or decreased negative ones.

Two age differences did have both frequentist and Bayesian support. First, younger adults ranked avoiding negative situations as more preferable than older adults. This contradicts theoretical proposals that older adults would be more likely to avoid negative situations. However, age groups only differed in within-study rankings and not in daily life or in the

situation selection task, where the age groups were similar. Second, younger adults ranked cognitive change/focus (aggregated) as less preferable than middle-aged and older adults. This also contrasts with the idea that older adults would be less likely to prefer cognitive change (Scheibe et al., 2015; Urry & Gross, 2010), but again, this emerged only in within-study rankings and not in daily life.

Implications for the Study of Emotion and Aging

Our predictions of greater seeking of positive aspects and avoidance of negative aspects of emotional situations in older adulthood were not supported, and may seem to contradict theories and past research on aging and emotion. This does not mean that prior evidence is not valid, however, as there are several differences between past and current research. First, our dependent measures of interest were observable behaviors and choices, rather than cognitive processes typically examined in research on age-related positivity effects, or the self-reported measures of global use typically used in questionnaire and diary research. This study specifically tested possible age differences in tactic preferences within standardized situations. This is a useful approach because it can test whether, when facing a similar situation, younger and older adults demonstrate similar or different behavior. That said, other characteristics of the emotion regulation process may explain age differences in emotional experience. In particular, it will be important to directly explore the *frequency* of use of each of the tactics in daily life and the *success* with which those tactics are employed in maintaining and enhancing emotional well-being.

Second, these behaviors and choices occurred in a specific context, which intentionally introduced no particular demands of the participants. The primary interest was on spontaneous tactic preferences, that is, what people do when the researcher provided no specific goals. Past studies of age-related positivity effects have generally found larger age differences when participants are unconstrained by situational or cognitive demands (Reed et al., 2014). In this case, however, the tasks may have reduced age differences in behavior by activating emotional well-being goals for most participants. Specifically, the results here demonstrate both younger and older adults have strong tendencies to seek out positive and avoid negative aspects of the situation when no other goals are salient. In studies of age-related positivity effects, which typically use more clearly cognitive tasks (e.g., a dot-probe or memory test), younger adults may flexibly alternate between short-term well-being and long-term information acquisition goals, or prioritize long-term goals outright, leading them to engage more with negative information (Reed & Carstensen, 2012). Although this could also have occurred within the current study, it apparently did not. This does not directly contradict SST, however. Younger adults may still be more willing to engage with negative situations and stimuli in some situations. Perhaps, for example, priming a long-term instrumental (non-hedonic) goal, manipulating the benefits of information-seeking, or clarifying the benefits of contrahedonic regulation (e.g., in a confrontational situation; Tamir, 2009) may prompt younger adults, more than older, to seek out and engage more with negative experiences. The current findings do raise questions of (a) when and how contrahedonic or instrumental goals arise, (b) the degree to which they translate into tactic preferences, (c) whether the (rare) activation of contrahedonic motives contributes to wellbeing, and especially (d) whether these patterns vary with age.

The picture emerging from this research is primarily one of age similarity in emotion regulation behavior within the lab. In other words, given similar options, older adults made similar choices as younger adults. This aligns with studies of situation selection (Sands et al., 2018), and extends findings throughout the other stages of the process model. Bayesian analyses provided evidence for age similarity, and were useful for clarifying non-significant results. Given the specific context of the current study, we urge caution in generalizing age similarity in emotion regulation to other contexts. On the other hand, a recent daily diary study also failed to find age differences in use of several emotion regulation strategies and tactics in daily life (Eldesouky & English, 2018). Therefore, moving forward, the narrative of emotion regulation and aging may likely broaden to include instances of maintenance as well as improvement and decline. In explaining the link between age and well-being, then, age differences in emotion regulation may play only a small part, if any. Future research may focus instead on possible age differences in initial appraisal processes that may reduce emotional reactivity in the first place (as opposed to *re*appraisal processes, which change the initial appraisal in a way meant to change resulting emotions), or on the nature of self-reported well-being, for example, whether younger and older adults have different benchmarks when rating their emotional states.

Implications for the Study of Emotion Regulation

In addition to testing age differences in emotion regulation, this study was also designed to examine patterns of behavior in each of the five strategies outlined in the process model of emotion regulation (Gross, 1998). To our knowledge, this is the first study that systematically examined tasks representing all five strategies in the laboratory. Moreover, the sample is diverse in age, race, and educational background, and can therefore provide insight into normative behaviors in how people approach and interact with emotional content within a laboratory context.

One notable finding, discussed above, is the dominant preference for prohedonic tactics in antecedent-focused emotion regulation (situation, attention, and cognition). Because participants were not given emotion regulatory goals, their tactic preferences during these tasks were spontaneous, suggesting that, given the opportunity, most people (regardless of age) will avoid negative and seek out positive aspects of the situation. Prohedonic motives in emotion regulation are more often assumed than tested (Tamir, 2016), but the current laboratory findings are consistent with experience sampling (Riediger et al., 2009) and self-reported (Gross et al., 2006) research suggesting that prohedonic regulation is much more common than contrahedonic.

Moving beyond the distinction between prohedonic and contrahedonic behavior, the current research specifically found people generally avoided interacting with negative stimuli, but once they were faced with negative stimuli they could not control, they directed attention and cognition toward positive aspects (rather than simply directing attention away from negative stimuli or remaining detached and objective). No such prohedonic preferences were evident in response modulation (measured here by preferences for expressivity); indeed, the trend was toward greater preference for negative expression. One possible explanation is that expressivityfocused emotion regulation typically serves more of an interpersonal than

intrapersonal function, and any strong preferences that exist in social situations in everyday life were not activated in this context. In addition, expression of negative emotion, when felt, can be more adaptive than hiding it, especially for those who strongly value authenticity (English & John, 2013).

One other notable pattern was that across the sample, the self-reported likelihood of using a strategy in real life decreased linearly with each stage of the process model, with situation selection rated as most likely and response modulation as least likely. Although more recent versions of the process model have emphasized the iterative and cyclical nature of emotion regulation (Gross, 2015), it is interesting to note that the likelihood of regulating emotions was correlated with how early in the emotion-generative process the strategy targeted (Gross, 1998). This is especially notable as most lab studies have examined the latter stages of the model (Webb et al., 2012). The actual frequency with which people use the strategy in real life will require other research methods, however, such as experience sampling.

In addition to demonstrating the importance of comparing across strategy families, this research also demonstrates the importance of examining tactics within strategies (see also McRae, Ciesielski, & Gross, 2012). Tactics may stem from different goals (e.g., reduce negative experience, increase positive, acquire information), require different resources (e.g., visual distraction from negative content may require less cognitive effort than actively searching for positive parts of an image), and have different short- and long-term consequences (e.g., seeking out positive situations may create new opportunities, avoiding negative situations may reduce both risk and opportunities). To date, however, we know little about the tactics by which these strategies are employed (but see McRae et al., 2012). Here, we selectively explored several tactics within each strategy, demonstrating that some are more preferred than others (e.g., positive reappraisal is much more popular than detached), but we were not comprehensive (e.g., acceptance was not measured). Moreover, tactics themselves can be complex (e.g., focusing on negative aspects may have both negative and positive consequences; Hamilton et al., 2011), suggesting the need to examine emotion regulation at multiple levels of abstraction.

Limitations and Future Directions

The research represents the first laboratory study to examine each of the five strategies proposed by the process model within the same sample, and here we note some specific design considerations. First, as much as possible, we drew on past research to design each of the tasks, for example, by using the affective environment (Sands et al., 2018) and instructions from previous studies of cognitive change and expressive suppression (Shiota & Levenson, 2009). However, this means that the emotion regulation tasks were not similar enough to compare directly. Statistically, the first three tasks assessed continuous measures, whereas the latter two choice tasks were assessed using categorical preferences. We could therefore only compare among the strategies in self-reported preferences and not in the lab tasks. Methodologically, the choices in the last two tasks were more explicit than the first three; however, instructions to participants in each of the five tasks emphasized that people were free to choose how to engage with their task. Nonetheless, we believe this research shows the advantages of examining patterns among multiple strategies, rather than

examining them individually (see also Aldao & Nolen-Hoeksema, 2013). For example, people showed much stronger preferences for positive over detached reappraisal, and much weaker preferences for expressive regulation tactics. Although this has been done using experience sampling (e.g., Heiy & Cheavens, 2014), the current study shows it is possible—and useful—to examine several strategies in the lab as well.

Second, we defined "situation" as interaction with a particular stimulus (video, image, article) so as to be consistent across all tasks, and progressively reduced emotion regulation options in a way that followed the process model (for example, after situation selection, participants were no longer allowed to select their stimuli; after situation modification, they could no longer alter the duration of the content). In this way, as in the original formulation of the process model (Gross, 1998), participants were increasingly restricted in how they could regulate their emotions. In some cases, however, we cannot rule out concurrent use of different emotion regulation strategies (for example, the use of spontaneous reappraisal during the other tasks). However, because of instructions highlighting behavioral and cognitive options within each task, we believe that the most likely strategy people would employ within a given task was the one most salient. For example, when participants are given choices of how to appraise videos, they may be less likely to use response modulation. Some research has shown that when given the option to use situation selection, people are less likely to use attentional deployment (Isaacowitz, Livingstone, Richard, & Seif El-Nasr, 2018).

Third, our goal in this study was to create a set of standardized opportunities for participants to make choices and engage in behaviors that could shape emotional experiences. Although we chose stimuli that people could naturally come across in daily life (news videos, emotion-eliciting images), this level of experimental control required some tradeoff in terms of ecological validity. In particular, the strategies that people use in the laboratory may not be the same ones they use in daily life. The current research showing what people of different ages *could do* when given similar opportunities should be supplemented with research investigating what people *actually do* in their everyday lives. Moreover, our focus was on choices people made within emotion-eliciting situations. The primary outcome of interest was on the actual choices and behaviors, but it will be important in the future to examine the decision-making processes underlying these choices, and whether these vary with age.

Conclusions

The current research examined possible age differences in how people engage with emotional situations and stimuli when given opportunities to introduce or increase positive aspects, avoid or decrease negative aspects, or engage with negative aspects of the situation or experience. Overall, the results suggest that default tactic preferences across the lifespan are prohedonic when goals are open-ended, shifting from avoiding and decreasing negative situations to incorporating positive cognition (attention and reappraisal) within negative situations. Rather than the predicted age differences in how younger and older people engaged with emotional situations, however, younger and older adults showed remarkable similarity in their situation selection, modification, attention, cognitive, and expressive

preferences. The study of aging and emotion regulation may therefore shift to include similarity and continuity as well as differences.

Context

This project represents a natural extension of work conducted in our lab testing age differences in emotion regulation use and effectiveness. Earlier work had examined attentional deployment (Isaacowitz, 2012), situation selection (e.g., Rovenpor et al., 2013), and other strategies derived from the process model (e.g., Lohani & Isaacowitz, 2014) in a piecemeal way, that is, one or two strategies at a time. We saw an opportunity to combine major theories of adult emotional development (SST, SAVI) and emotion regulation in the general population (the highly generative process model), and to compare age patterns across all five stages of the process model. We decided to examine age patterns in emotion regulation tactics aimed at increasing positive, decreasing negative, and engaging with negative aspects of the situation or experience in a lifespan sample of adults, to test the idea that age differences in emotional experience stem in part from age differences in emotion regulation. Recent advancements in statistical and methodological understanding (e.g., increased accessibility of Bayesian tools) also provided the ability to examine where age groups were similar, which had been suggested (but not directly tested) in recent non-significant findings (e.g., Livingstone & Isaacowitz, 2018; Sands et al, 2018). As emotion regulation research becomes more nuanced, the approach of examining patterns across multiple strategies in diverse samples will become increasingly useful in refining our understanding of emotion.

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 AG948731 to D.M.I.

References

Aldao A, & Nolen-Hoeksema S (2013). One versus many: Capturing the use of multiple emotion regulation strategies in response to an emotion-eliciting stimulus. Cognition and Emotion, 27, 753–760. 10.1080/02699931.2012.739998 [PubMed: 23130665]

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

Bradley MM, & Lang PJ (1994). Measuring emotion: The self-assessment manikin and the semantic differential. Journal of Behavior Therapy and Experimental Psychiatry, 25, 49–59. 10.1016/0005-7916(94)90063-9 [PubMed: 7962581]

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]

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

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

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

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]

English T, & John OP (2013). Understanding the social effects of emotion regulation: The mediating role of authenticity for individual differences in suppression. Emotion, 13, 314–329. 10.1037/a0029847 [PubMed: 23046456]

Fan J, McCandliss BD, Sommer T, Raz A, & Posner MI (2002). Testing the efficiency and independence of attentional networks. Journal of Cognitive Neuroscience, 14, 340–347. [PubMed: 11970796]

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]

Freund AM, & Isaacowitz DM (2013). Beyond age comparisons: A plea for the use of a modified Brunswickian approach to experimental designs in the study of adult development and aging. Human Development, 56, 351–371. 10.1159/000357177

Freund AM, & Keil A (2013). Out of mind, out of heart: Attention affects duration of emotional experience. Cognition and Emotion, 27, 549–557. 10.1080/02699931.2012.725574 [PubMed: 22963519]

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]

Gross JJ, & John OP (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. Journal of Personality and Social Psychology, 85, 348–362. 10.1037/0022-3514.85.2.348 [PubMed: 12916575]

Grühn D, & Scheibe S (2008). Age-related differences in valence and arousal ratings of pictures from the International Affective Picture System (IAPS): Do ratings become more extreme with age? Behavior Research Methods, 40, 512–521. 10.3758/BRM.40.2.512 [PubMed: 18522062]

Hamilton JP, Furman DJ, Chang C, Thomason ME, Dennis E, & Gotlib IH (2011). Default-mode and task-positive network activity in major depressive disorder: Implications for adaptive and maladaptive rumination. Biological Psychiatry, 70, 327–333. 10.1016/j.biopsych.2011.02.003 [PubMed: 21459364]

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]

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, Allard ES, Murphy NA, & Schlengel M (2009). The time course of age-related preferences toward positive and negative stimuli. Journal of Gerontology: Psychological Sciences, 64, 188–192. 10.1093/geronb/gbn036

Isaacowitz DM, & Choi YS (2012). Looking, feeling, and doing: Are there age differences in attention, mood, and behavioral responses to skin cancer information? Health Psychology, 31, 650–659. 10.1037/a0026666 [PubMed: 22149125]

Isaacowitz DM, Livingstone KL, Richard M, & Seif El-Nasr M (2018). Aging and attention to self-selected emotional content: A novel application of mobile eye tracking to the study of emotion regulation in adulthood and aging. Psychology and Aging, 33, 361–372. 10.1037/pag0000231 [PubMed: 29658753]

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]

Isaacowitz DM, Wadlinger HA, Goren D, & Wilson HR (2006). Selective preference in visual attention away from negative images in old age? An eye-tracking study. Psychology and Aging, 21, 40–48. 10.1037/0882-7974.21.1.40 [PubMed: 16594790]

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.

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. [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]

Lang PJ, Bradley MM, & Cuthbert BN (1995). International affective pictures system (IAPS): Technical manual and affective ratings. Gainesville, FL: University of Florida: The Center for Research in Psychophysiology.

Lee MD, & Wagenmakers E-J (2013). Bayesian cognitive modeling: A practical course. Cambridge, UK: Cambridge University Press.

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 (2018). The roles of age and attention in general emotion regulation, reappraisal, and expressive suppression. Psychology and Aging, 33, 373–383. 10.1037/pag0000240 [PubMed: 29620382]

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]

Manor BR, & Gordon E (2003). Defining the temporal threshold for ocular fixation in free-viewing visuocognitive tasks. Journal of Neuroscience Methods, 128, 85–93. 10.1016/S0165-2070(03)00151-1 [PubMed: 12948551]

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

Mather M, & Carstensen LL (2003). Aging and attentional biases for emotional faces. Psychological Science, 14, 409–415. 10.1111/1467-9280.01455 [PubMed: 12930469]

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

Newkirk LA, Kim JM, & Thompson JM (2004). Validation of a 26-point telephone version of the Mini-Mental State Examination. Journal of Geriatric Psychiatry and Neurology, 17, 81–87. 10.1177/0891988704264534 [PubMed: 15157348]

Nikitin J, & Freund AM (2011). Age and motivation predict gaze behavior for facial expressions. Psychology and Aging, 26, 695–700. 10.1037/a0023281 [PubMed: 21707182]

Noh SR, Lohani M, & Isaacowitz DM (2011). Deliberate real-time mood regulation in adulthood: The importance of age, fixation, and attentional functioning. Cognition and Emotion, 25, 998–1013. 10.1080/02699931.2010.541668 [PubMed: 21432641]

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

Pelli DG, & Robson JG (1988). The design of a new letter chart for measuring contrast sensitivity. Clinical Vision Sciences, 2, 187–199.

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.

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]

Rosenbaum JG (1984). The biggest reward for my invention isn't money. Medical Economics, 61, 152–163. [PubMed: 10265890]

Rouder JN, Morey RD, Verhagen J, Swagman AR, & Wagenmakers EJ (2017). Bayesian analysis of factorial designs. Psychological Methods, 22, 304–321. 10.1037/met0000057 [PubMed: 27280448]

Rovenpor DR, Skogsberg NJ, & Isaacowitz DM (2013). The choices we make: An examination of situation selection in younger and older adults. Psychology and Aging, 28, 365–376. 10.1037/a0030450 [PubMed: 23088197]

Saarni C (1984). An observational study of children's attempts to monitor their expressive behavior. Child Development, 55, 1504–1513. 10.2307/1130020

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. [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]

Sheppes G, & Gross JJ (2011). Is timing everything? Temporal considerations in emotion regulation. Personality and Social Psychology Review, 15, 319–331. 10.1177/1088868310395778 [PubMed: 21233326]

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]

Sorkin DH, & Rook KS (2006). Dealing with negative social exchanges in later life: Coping responses, goals, and effectiveness. Psychology and Aging, 21, 715–725. 10.1037/0882-7974.21.4.715 [PubMed: 17201492]

Snellen H (1862). Letterproeven tot Bepaling der Gezichtsscherpte (Utrecht).

Tamir M (2009). What do people want to feel and why? Pleasure and utility in emotion regulation. Current Directions in Psychological Science, 18, 101–105. 10.1111/j.1467-8721.2009.01617.x

Tamir M (2016). Why do people regulate their emotions? A taxonomy of motives in emotion regulation. Personality and Social Psychology Review, 20, 1999–222. 10.1177/1088868315586325

Tamir M, John OP, Srivastava S, & Gross JJ (2007). Implicit theories of emotion: affective and social outcomes across a major life transition.Journal of Personality and Social Psychology,92, 731–744. 10.1037/0022-3514.92.4.731 [PubMed: 17469955]

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. [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.

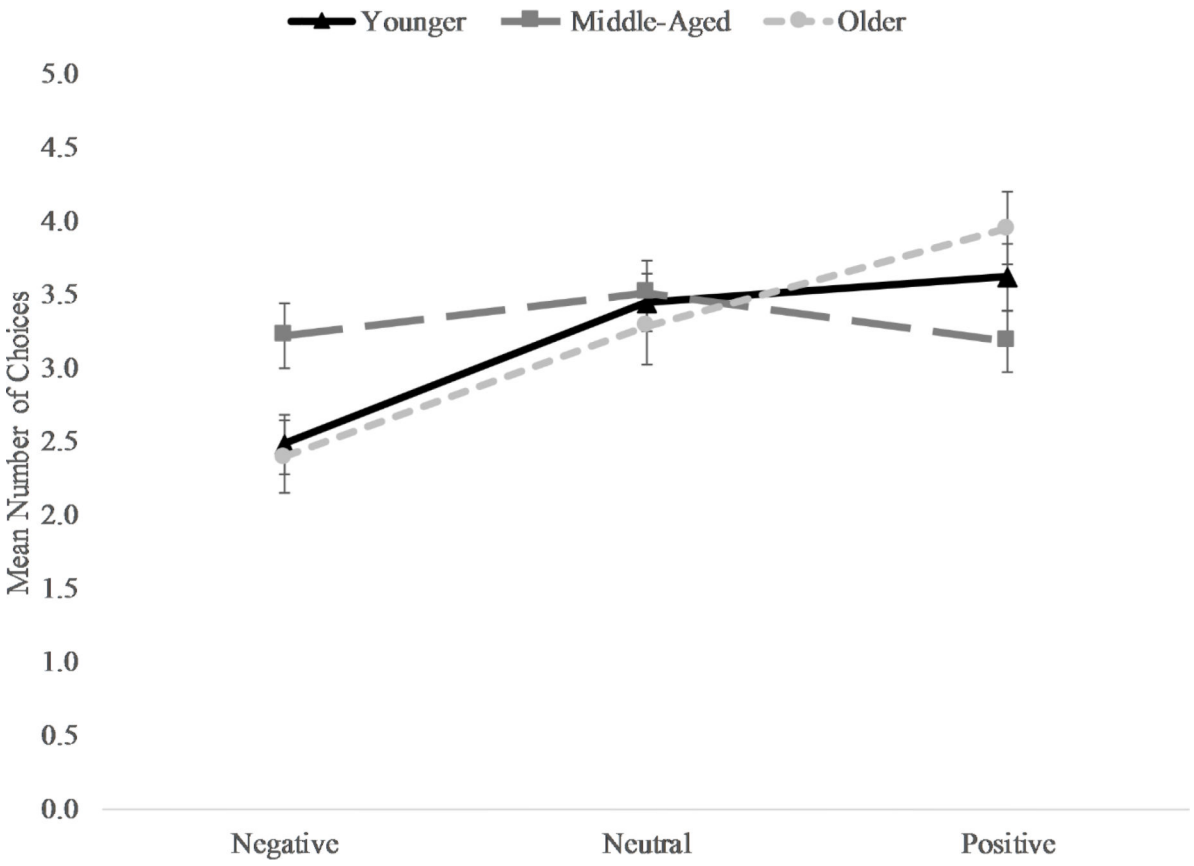

Figure 1.
Mean number of choices by younger, middle-aged, and older adults in the situation selection task. Error bars represent standard errors.

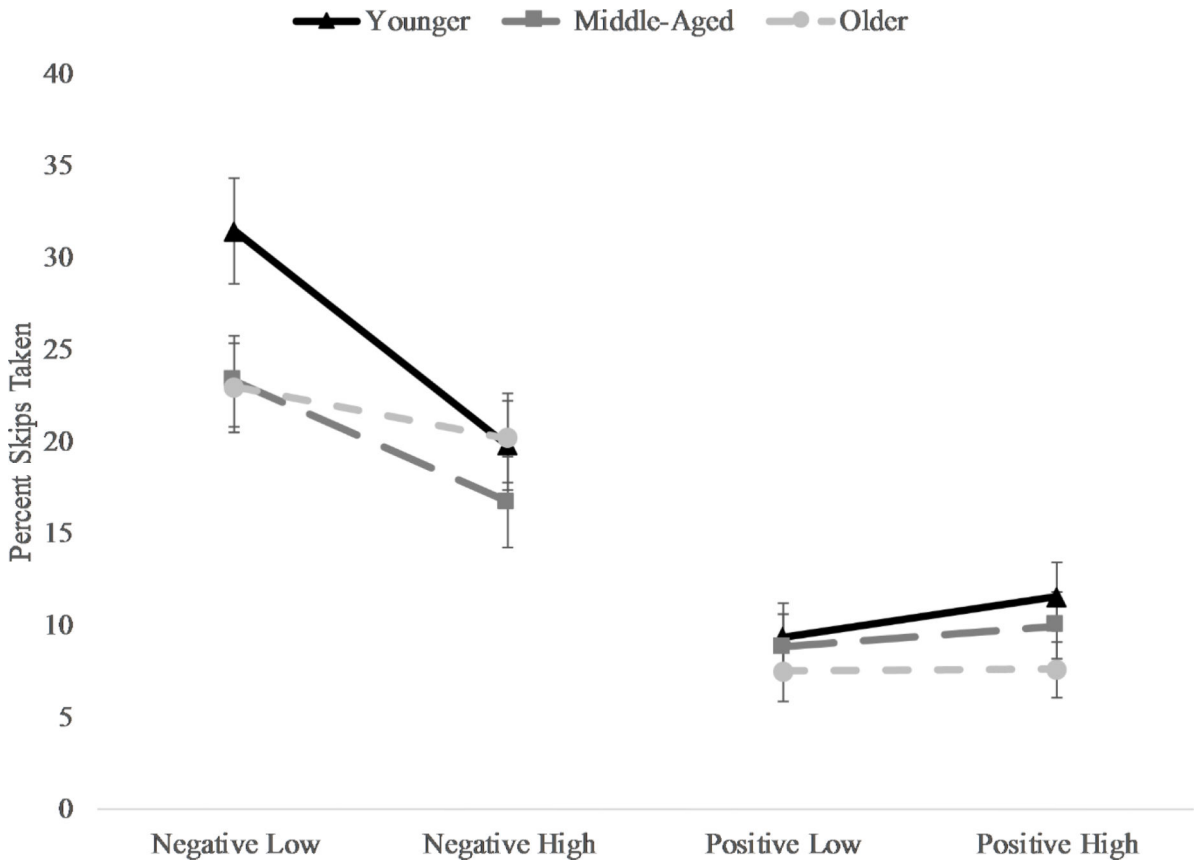

Figure 2.
Mean percentage of skips made by younger, middle-aged, and older adults in situation modification task. Error bars represent standard errors.

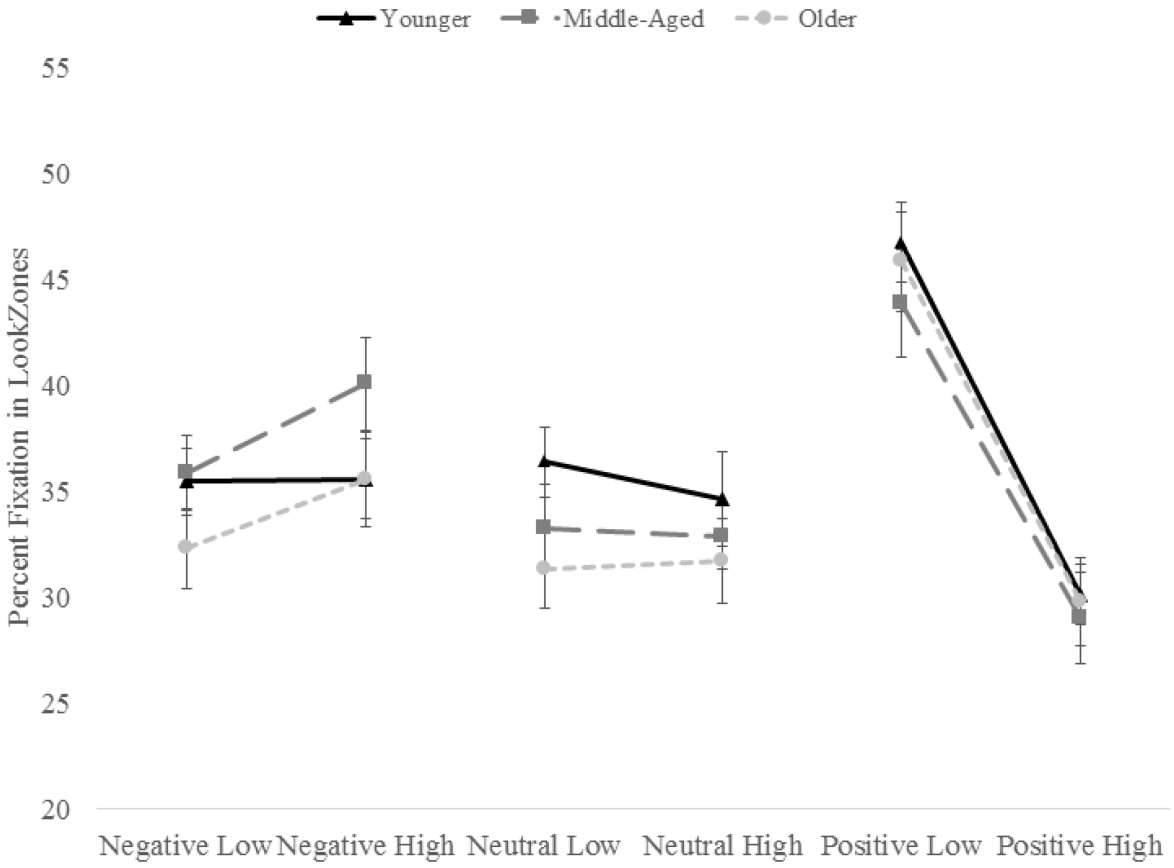

Figure 3.

Mean fixation in LookZones relative to total fixation duration by younger, middle-aged, and older adults in attentional deployment task (negative, neutral, and positive images). Error bars represent standard errors.

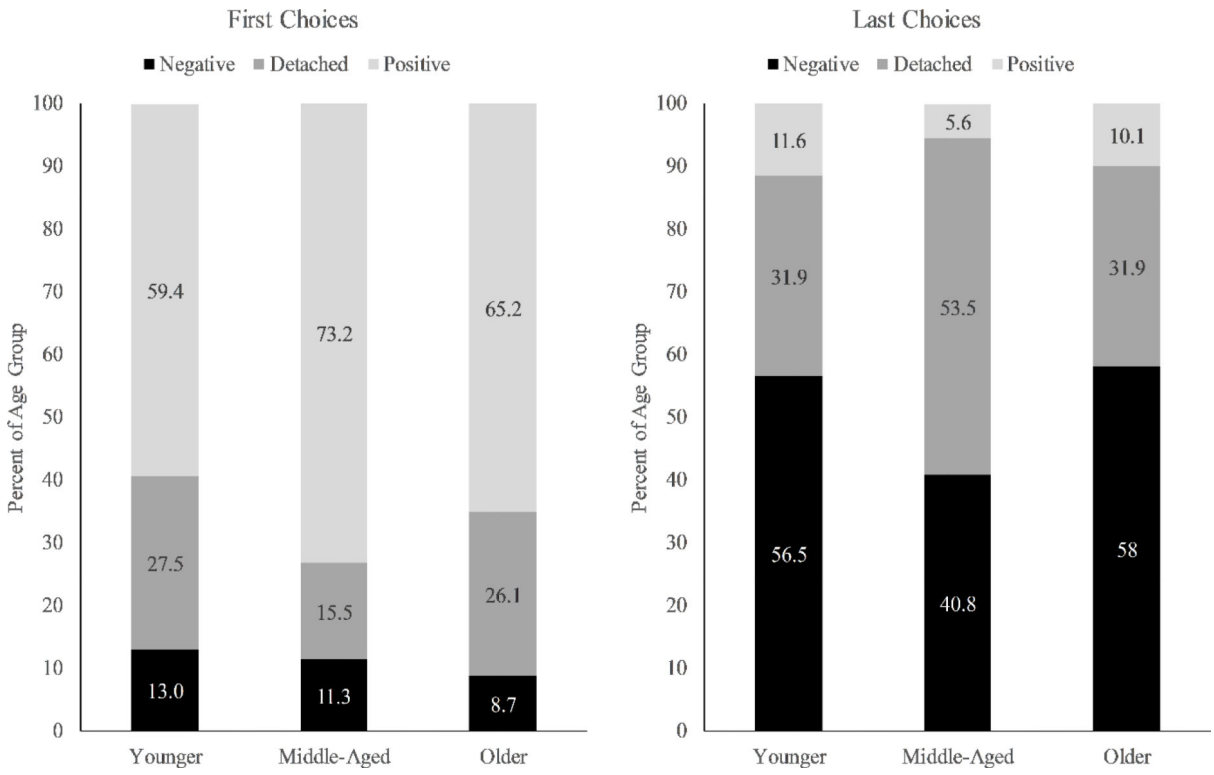

Figure 4.

Percentage of each age group choosing negative cognitive focus, detached reappraisal, and positive reappraisal first (left) and last (right). Percentages are presented within the bars.

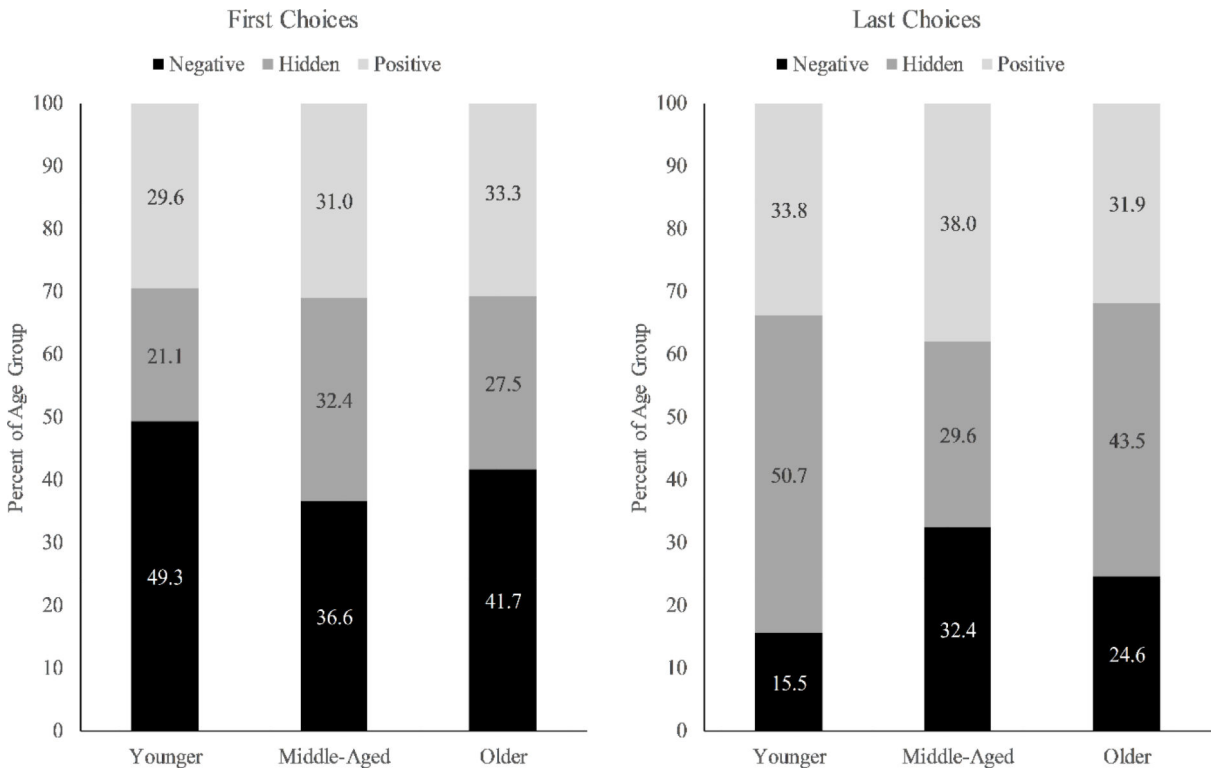

Figure 5.

Percentage of each age group choosing negative (obvious) expression, expressive suppression, and positive expression (masking) first (left) and last (right). Percentages are presented within the bars.

Table 1

Means and Standard Deviations for Dependent Variables in Situation Selection, Situation Modification, andAttentional Deployment Tasks

Category	Younger	Middle-Aged	Older	Total
Situation Selection (Number of Choices)				
Negative All	2.48 (1.73)	3.22 (1.95)	2.39 (2.13)	2.70 (1.97)
Negative Low	1.25 (0.91)	1.56 (1.02)	1.31 (1.19)	1.37 (1.05)
Negative High	1.23 (1.10)	1.62 (1.17)	1.08 (1.19)	1.32 (1.17)
Neutral All	3.44 (1.67)	3.51 (1.87)	3.28 (2.31)	3.41 (1.96)
Neutral Low	1.82 (1.01)	1.61 (1.18)	1.67 (1.25)	1.70 (1.15)
Neutral High	1.62 (1.06)	1.86 (1.07)	1.61 (1.30)	1.70 (1.15)
Positive All	3.62 (1.94)	3.18 (1.83)	3.95 (2.13)	3.58 (1.99)
Positive Low	1.82 (1.10)	1.60 (1.06)	2.08 (1.12)	1.83 (1.11)
Positive High	1.79 (1.07)	1.55 (1.15)	1.87 (1.23)	1.73 (1.16)
All Choices	9.77 (2.78)	10.03 (3.55)	9.61 (4.08)	9.80 (3.50)
All Low	4.89 (1.56)	4.83 (1.97)	5.11 (2.10)	4.94 (1.89)
All High	4.64 (1.66)	5.09 (2.09)	4.62 (2.25)	4.79 (2.02)
Situation Modification (Percent of Skips Taken)				
Negative All	23.94 (19.94)	19.04 (20.43)	21.15 (19.90)	21.35 (20.11)
Negative Low	31.40 (24.23)	23.26 (21.22)	22.91 (20.74)	25.81 (22.34)
Negative High	19.75 (20.68)	16.67 (21.51)	20.16 (20.70)	18.84 (20.70)
Positive All	10.40 (13.45)	9.25 (14.25)	7.34 (11.78)	8.99 (13.21)
Positive Low	9.35 (15.61)	8.80 (15.54)	7.49 (14.27)	8.55 (15.11)
Positive High	11.53 (16.01)	9.94 (15.78)	7.56 (12.84)	9.67 (14.97)
All Videos	18.01(15.56)	14.75 (16.41)	15.10 (15.08)	15.93 (15.70)
All Low	21.38 (17.91)	16.69 (17.00)	15.90 (15.98)	17.96 (17.07)
All High	16.02(16.08)	13.61 (16.80)	14.63 (15.41)	14.74 (16.07)
Attentional Deployment (Percent Fixation in LookZones)				
Negative All	34.72 (13.11)	37.95 (15.30)	34.18 (14.14)	35.59 (14.20)
Negative Low	25.29 (11.60)	37.23 (13.66)	32.55 (13.35)	35.00 (12.91)
Negative High	35.40 (14.74)	41.05 (17.16)	36.18 (16.17)	37.44 (16.10)
Neutral All	33.43 (12.33)	33.15 (12.60)	31.61 (13.30)	32.74 (12.69)
Neutral Low	35.79 (12.66)	33.64 (14.61)	31.93 (13.60)	33.84 (13.62)
Neutral High	32.00 (12.43)	33.78 (11.61)	32.22 (14.14)	32.63 (12.72)
Positive All	39.59 (13.80)	37.07 (15.68)	35.81 (16.25)	37.50 (15.26)
Positive Low	46.63 (15.03)	45.93 (17.51)	45.05 (17.58)	45.89 (16.60)
Positive High	29.89 (10.93)	30.10 (15.40)	30.60 (14.59)	30.19 (13.60)
All Images	35.51 (11.30)	36.14 (13.48)	33.29 (13.47)	34.98 (12.76)
All Low	40.22 (14.00)	38.17 (14.88)	34.00 (14.72)	37.48 (14.67)
All High	31.98 (11.97)	34.56 (14.02)	32.76 (13.51)	33.09 (13.14)

Table 2

ANOVA Results for Situation Selection, Situation Modification, and Attentional Deployment

Effect	df[a]	F	p	η_p^2	$BF_{Inclusion}$[b]	Support
Situation Selection: 3 (valence) × 2 (arousal) × 3 (age group)						
Age	2, 222	0.11	.898	.001	0.801	Anecdotal
Valence	1.94, 431	13.14	< .001	.056	1.10e+7	Extreme H1
Age × Valence	3.89,431	3.59	.007	.031	4.74	Moderate H1
Arousal	1,222	1.55	.214	.007	0.034	Strong H0
Age × Arousal	1,222	3.02	.051	.026	0.010	Very Strong H0
Valence × Aro	1.99, 444	0.43	.654	.002	0.004	Extreme H0
Age × Val. × Aro	4.00, 444	1.17	.323	.010	2.80e-5	Extreme H0
Situation Modification: 2 (valence)x 2 (arousal)x 3 (age group)						
Age	1, 217	1.18	.308	.011	0.108	Moderate H0
Valence	1, 217	171.79	<.001	.442	∞	Extreme H1
Age × Valence	2, 217	1.84	.161	.017	0.155	Moderate H0
Arousal[c]	1, 217	19.47	<.001	.082	179555	Extreme H1
Age × Arousal	2, 217	2.18	.115	.020	0.063	Strong H0
Valence × Aro	1, 217	33.98	<.001	.135	32229	Extreme H1
Age × Val. × Aro	2, 217	5.16	.006	.045	0.145	Moderate H0
Attentional Deployment: 3 (valence)x 2 (arousal)x 3 (age group)						
Age	1, 152	0.41	.664	.005	0.138	Moderate H0
Valence	2, 304	27.02	<.001	.151	∞	Extreme H1
Age × Valence	4, 304	2.81	.026	.036	0.473	Anecdotal
Arousal	1, 152	85.25	<.001	.359	∞	Extreme H1
Age × Arousal	2, 142	4.15	.018	.052	0.057	Strong H0
Valence × Aro	1.92, 292	91.54	<.001	.376	∞	Extreme H1
Age × Val × Aro	3.84, 292	0.24	.909	.003	0.011	Very strong H0

[a] *Notes.* Where degrees of freedom include decimals, Mauchly's test of sphericity was significant and the Greenhouse-Geisser correction was used.

[b] The $BF_{inlusion}$ reflects the degree of support for including the effect in the model, compared to omitting it.

Table 3

Frequency and Percentage (in Parentheses) of Participants Choosing Cognitive Change/Focus and Response Modulation Options

Choice	Younger	Middle	Older	Total	χ^2	BF[a]
Negative First	9 (13%)	8 (11%)	6 (9%)	23 (11%)	0.67	0.021
Objective First	19 (28%)	11 (16%)	18 (26%)	48 (23%)	3.44	0.156
Positive First	41 (59%)	52 (73%)	45 (65%)	138 (66%)	3.01	0.152
Negative Last	39 (57%)	29 (41%)	40 (58%)	108 (52%)	5.08	0.468
Objective Last	22 (32%)	38 (54%)	22 (32%)	82 (39%)	9.21*	3.23
Positive Last	8 (12%)	4 (6%)	7 (10%)	19 (9%)	1.64	0.029
Response Modulation						
Negative First	35 (49%)	26 (37%)	27 (39%)	88 (42%)	2.63	0.133
Hidden First	15 (21%)	23 (32%)	19 (28%)	57 (27%)	2.30	0.093
Positive First	21 (30%)	22 (31%)	23 (33%)	66 (31%)	0.23	0.036
Negative Last	11 (16%)	23 (32%)	17 (25%)	51 (24%)	5.55	0.441
Hidden Last	36 (51%)	21 (30%)	30 (44%)	87 (41%)	6.75*	1.07
Positive Last	24 (34%)	27 (38%)	22 (32%)	73 (35%)	0.61	0.046

Note.

[a]Bayes factors were computed using independent multinomial sampling with fixed columns (age group).

*$p < .05$.