Age Similarities in Matching Pro- and Contra-Hedonic Emotional Strategies to Everyday Scenarios

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Abstract

Older adults are motivated to maximize positive affect in the present, to an even greater extent than young adults. Young adults will purposely feel negative and high arousal emotions (fear, anger) in order to achieve a goal. However, this type of contra-hedonic emotional alignment has not been extensively studied with older adults. We sought to address this gap in the literature. We expected older adults would be less likely than young adults to select high arousal and negative emotions within specific scenarios where those states could be useful. We further investigated whether individual differences in emotional knowledge predict pro and contra-hedonic emotion selection. In Study 1, 61 young adults and 64 older adults selected the emotion they would use to achieve a goal in 12 hypothetical problems that varied on the arousal and valence best suited for achieving the goal. The same strategy-scenario matching task was employed in Study 2 among 40 young and 40 older adults. Across both studies, young and older adults were equally likely to endorse affective strategies that matched both pro and contra-hedonic scenarios in all situations. Individual differences in emotional knowledge did not moderate performance on the strategy-situation match task in Study 2. We conclude that while older adults may be generally motivated to avoid negative and high-arousing emotions, they are just as likely as young adults to indicate that these states could be helpful in certain situations.

Keywords. aging, emotion, hedonic, contra-hedonic, individual differences

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Everyday Scenarios

Research in the psychology of human aging points to a rather positive view of emotional functioning and well-being in late adulthood (Charles & Carstensen, 2010; Consedine & Magai, 2006; Mather & Carstensen, 2005; Mroczek, 2001). Older adults report a decrease in the frequency of experienced negative affect relative to their younger adult counterparts (Carstensen, Pasupathi, Mayr, & Nessleroade, 2000; Gross, Carstensen, Pasupathi, Tsai, Skorpen, & Hsu, 1997; Mroczek & Kolarz, 1998), greater emotional control and mood stability (Lawton, Kleban, Rajagopal, & Dean, 1992; Phillips, Henry, Hosie, & Milne, 2006), and the ability to, at times, utilize a variety of regulation strategies for modulating affective experiences (Allard & Kensinger, 2014; 2018; Blanchard-Fields, 2007; Lohani & Isaacowitz, 2014; Shiota & Levenson, 2009).

A preponderance of research has focused on "pro-hedonic" links to well-being in old age. While it is common for individuals of all ages to place an emphasis on seeking pleasure and avoiding pain (Larsen, 2000; Tice & Bratslavsky, 2000), there may be instances in which negative, "contra-hedonic" affective experiences are desirable and/or useful (i.e., making oneself somewhat angry in anticipation of confronting someone who wronged you; slight anxiety/hypervigilance so as to engage in safe behaviors while driving in treacherous weather). In other words, negative affective states are sometimes desirable in the here-and-now if they portend future benefits (Tamir, 2005; Tamir & Ford, 2009; 2012; Tamir, Ford, & Gillam, 2013). Thus, the goal of the present study was to assess how age influences whether individuals would hypothetically draw on both pro and contra-hedonic emotions within situations where those affective states may be useful. Specifically, we examined whether younger and older adults

would endorse the potential utility of a pleasant or unpleasant affective state for addressing

corresponding pleasant and unpleasant affective scenarios.

Pro-Hedonic Emotionality in Old Age

Emotional well-being is often conceptualized as the presence of heightened levels of

positive affect and/or diminished or absent negative affect (Campos, Frankel, & Camras 2004;

Gross, 1998; Diener, Lucas, & Oishi, 2009). Older adults report higher levels of emotional well-

being relative to younger adults (Charles & Carstensen, 2007) and higher efficacy with

controlling negative emotions (Kliegel, Jäger, & Phillips, 2007). Several theoretical postulates

have been offered to account for positive affective trajectories in old age. One key theory argues

that as individuals age, they shift their priorities, reflecting an awareness of future time left in

life. Socioemotional selectivity theory (SST; Carstensen, Isaacowitz, & Charles, 1999) posits

that time horizons impact the goals individuals pursue. Younger age is associated with a more

expansive time horizon, whereby individuals are predominantly motivated toward information-

gathering goals that provide future-oriented benefits. However, increased age is associated with a

limited time horizon, leaving individuals more apt to pursue present-oriented goals related to

positive affectivity and emotional well-being. Thus, SST predicts that older adults will

predominantly pursue pro-hedonic goals in the service of maintaining or enhancing present well-

being (Carstensen, Mikels, & Mather, 2006).

Above and beyond older adults' motives to prioritize hedonic affect, there has been

recent work examining the contexts by which specific emotional preferences emerge in old age.

For instance, older adults demonstrate a keen desire to avoid negative affective states that are

highly intense and arousing (i.e., interpersonal conflicts; Birditt, 2014; Birditt & Fingerman,

2005; Blanchard-Fields, Mienaltowski, & Seay, 2007; Blanchard-Fields, Stein, & Watson, 2004;

Charles, Piazza, Luong, & Almeida, 2009). Furthermore, when exposed to highly arousing

elicitors, older adults are less successful at managing their affect. The strength and vulnerability

integration model (SAVI; Charles, 2010; Charles & Luong, 2013) argues that due to increased

physiological vulnerabilities in advanced age, older adults are more challenged when confronting

highly distressing situations. For instance, there is evidence that older adults experience poor

cardiovascular modulation during stress overload (Wrzus et al., 2014) and maladaptive levels of

cortisol secretion during days of high stress (Piazza, Charles, Stawski, & Almeida, 2013).

Additionally, older adults (along with some younger adults) tend to deploy avoidance behaviors

(i.e., distraction) when confronted with highly arousing information (Martins, Sheppes, Gross, &

Mather, 2016; Scheibe, Sheppes, & Staudinger, 2015). Finally, when individuals are evaluating

affective stimuli, increasing age is associated with experiencing heightened emotional arousal

(both positive and negative), and conferring decreased feelings of pro-hedonic pleasure (Keil &

Freund, 2009).

Despite the aforementioned evidence, pro-hedonic emotion motives (as would be

predicted by SST) may not always be relevant or even desired for promoting adaptive affective

outcomes. There likely are (or should be) instances where negative affective states could be

identified as beneficial to both present and longer-term well-being, indicating multiple pathways

to healthy emotional functioning in adulthood and old age.

Contra-Hedonic Emotionality

People often desire to extricate themselves from unpleasant emotions and either maintain

or enhance pleasant emotions; however, while less common, individuals do deliberately

experience negative affective states, broadening the range of emotional preferences and

pathways to well-being (Tamir & Bigman, 2014). For instance, there is evidence that individuals

actually make attempts to dampen rather than support pro-hedonic motives. Riediger,

Schmiedek, Wagner, and Lindenberger (2009) had participants report on a variety of emotional

goals during a week-long experience sampling procedure. Overall, goals to maintain/increase

negative affect and decrease positive affect occurred on 15% of sampling occasions. Thus, while

not pervasive, contra-hedonic emotional goals exist, and certain situations could elicit the need

or desire to deemphasize positive in the present and, rather, enhance the negative.

One key element to contra-hedonic emotional preferences could be the benefits that are

derived from such pursuits. Specifically, subverting any desire to feel good in the here-and-now

and immerse in a negative affective state could be desirable if that negative affective state is

appropriate to the context. In this way, emotional preferences are influenced by more than just

hedonic motives. Several studies have observed contra-hedonic emotional motives when such

emotions are adaptive to the situation. For instance, Tamir and colleagues have examined

individuals' willingness to experience negative affect in a variety of experimental settings. One

study revealed that participants who were motivated to confront a partner during a negotiation

were more likely to increase feelings of anger prior to the negotiation if such emotions were

deemed to be helpful for obtaining concessions from the partner (Tamir et al., 2013). A similar

study revealed that individuals were more likely to try to increase anger when presented with a

confrontation versus a collaborative negotiation goal (Tamir & Ford, 2012). Further research has

shown that individuals are willing to increase sad affect if the goal is to seek help from others

(Hackenbracht & Tamir, 2010), as well as increase fear when the goal is threat avoidance (Tamir

& Ford, 2009).

These studies on contra-hedonic motivations predominantly involved younger-aged

samples. This makes intuitive sense given evidence that adolescence and younger adulthood are

associated with a heightened prevalence of experiential negative affect (Larson, Moneta, Richards, & Wilson, 2002). However, the role of contra-hedonic motivations in emotional preferences has rarely been assessed across the adult lifespan. The few studies that have examined lifespan trajectories in pro and contra-hedonic emotional preferences have investigated individuals' self-reported affective motives during daily-life experiences. These studies have generally observed that contra-hedonic motives are more prevalent at younger relative to older ages. For instance, Riediger and colleagues' (2009) experience-sampling study assessed a lifespan sample of adults aged 14-86 and had participants report on desires to influence feeling states across a six-day period, including joyful, content, interested, angry, nervous, and downhearted. After reporting their level of current affect, participants reported how much they wished to dampen, maintain, or enhance each of those states. Here, pro-hedonic motivation would be indicated by a desire to maintain or increase positive affect and dampen negative affect; the reverse indicates contra-hedonic motives. While the full sample reported contra-hedonic affect motivations on 15% of measurement occasions, increased age was associated with decreased prevalence of contra-hedonic desires. Furthermore, older adults were much more likely to endorse pro-hedonic emotional preferences relative to the younger groups.

The limited number of studies assessing the dichotomy between pro and contra-hedonic motivations in emotional preferences across the adult lifespan suggests that while contra-hedonic goals are infrequently pursued by individuals at all ages, older adults pursue them even less so. However, questions remain regarding age trajectories in pro and contra-hedonic emotional preferences. The aforementioned research from Riediger and colleagues (2009) placed an emphasis on assessing how frequently individuals experience contra-hedonic states in their day-to-day life; yet, participants were not assessed as to whether they could identify the benefit of

contra-hedonic affective states during scenarios where a contra-hedonic motive could potentially be adaptive to a particular situation. Thus, it remains an open question as to whether older adults are able to denote when and where contra-hedonic states could provide an adaptive benefit. For this reason, the present studies were conducted to address the following two main goals: 1.) Examine potential age differences in the hypothetical endorsement of positive and negative affective states in order to manage everyday scenarios likely to engender pleasant and/or unpleasant affective reactions and 2.) (specifically in relation to Study 2) assess whether individual differences in emotional competency influence the tendency (or lack thereof) of younger and older adults to align scenarios and strategies based on shared valence-arousal combinations. Also, given the exploratory nature of this study, we were interested in identifying pleasant/unpleasant and high/low arousal affective scenarios that could be plausibly experienced with preferred pro- and contra-hedonic strategies.

Study 1

The main goal of Study 1 was to further assess age-related differences in pro and contra-hedonic emotion preferences. Prior research suggests that older adults are less willing to endorse contra-hedonic states relative to younger aged groups. One reason for this disparity is based on older adults' tendencies to avoid contra-hedonic affect due to a preponderant, hedonically oriented affective focus, as predicted by SST. However, while older adults may generally prefer to avoid contra-hedonic affect, it is possible that they are at least able to identify when pursuing negative affective states is beneficial. To this end, participants played an emotion matching "game" whereby scenarios were generated that provided participants with a particular goal. In addition to varying the scenarios on valence, given evidence that older adults may be especially sensitive to highly arousing emotions (Charles, 2010), we also varied the scenarios on arousal.

Each scenario could be addressed with thoughts/behaviors that corresponded to a pro or contra-hedonic emotional state that fell within four categories: low arousal positive (LAP: calm, content, peaceful), low arousal negative (LAN: sad, melancholic, supplicating), high arousal positive (HAP: excitement, joy, delight), and high arousal negative (HAN: anger, fear, disgust). For each scenario, participants were provided four potential cognitions/behaviors that could be pursued to accomplish the goal (each also corresponding to LAP, LAN, HAP, and HAN affective states). Participants were instructed to choose an option for addressing that goal. For instance, one scenario included participants purchasing an automobile at a dealership. The goal of this scenario was to purchase the desired automobile, at a reasonable price, and avoid being swindled by the salesperson. In this instance, the strategy that matched the valence and arousal of this strategy (HAN) would be to take a confrontational stance during the negotiation in order to maintain assertiveness. Thus, participants had to identify a preferred strategy for that particular context. A total of three scenarios were provided across each LAP, LAN, HAP, and HAN category, respectively.

Consistent with SST, we expected that older adults might choose strategies that would align with motivations to maximize positive affect. We expected an age by scenario interaction such that younger and older adults would be equally likely to endorse positive affective strategies for positive affective solutions in comparison to negative affective strategies for negative affective solutions. This is in keeping with research suggesting a preponderant focus among individuals, regardless of age, spending more time engaging in behaviors designed to maximize positive relative to negative affect (Riediger et al., 2009). However, in line with results from Riediger and colleagues (2009) revealing that pro-hedonic motives were greater at older relative to younger ages, this discrepancy in matching would be even greater for older adults, as they

would be more likely to match HAP and LAP scenarios to HAP and LAP solutions, respectively, to a greater extent than HAN and LAN scenarios to HAN and LAN solutions, respectively. Additionally, we predicted that younger adults would be more likely to match HAN and LAN scenarios to HAN and LAN affective solutions, respectively, to a greater extent than older adults. Again, this is due to prior literature suggesting that while contra-hedonic emotional states are infrequently pursued, younger individuals tend to pursue contra-hedonic affect more often than their older adult counterparts (Riediger et al., 2009).

Method

Participants. Sixty-three young adults (YA; ages 18-28 years) and 65 older adults (OA; ages 61-86 years) living in the Midwestern United States participated in this study. YAs were recruited from undergraduate psychology courses and compensated for their participation with course credit. OAs were recruited from the community and were financially compensated. Three participants (2 young, 1 old) were excluded from the full analyses, as they failed to follow directions or reported their primary language as something other than English, leaving a total sample of 61 YAs (ages 18-28 years, $M = 21.1$, $SD = 2.48$; 62.3% female) and 64 OAs (ages 61-86 years, $M = 68.7$, $SD = 5.63$; 56.3% female).

On average, participants rated their health as "very good" on a 5-point Likert-type scale, and both YAs and OAs reported having at least some college education. Sixty-seven percent of our sample was White, 15% Black, 12% Asian, and 6% "Other" or no response. All participants scored above the cut-off criterion of 24 on the Mini-Mental State Exam (Folstein, Folstein, & McHugh, 1975) and had normal or corrected-to-normal visual acuity (as determined from a Snellen eye chart).

Materials

Development and validation of the emotion regulation scenarios. We developed 12

scenarios for this study that varied on arousal level and valence. Each scenario was designed

with an emotional goal and four corresponding strategies for addressing that scenario that

corresponded to a HAP, HAN, LAP, and LAN state. There were three scenarios in each of the

four valence/arousal combinations. Furthermore, each scenario was developed with a specific

discrete emotion in mind: the strategy that matched the valence and arousal of the particular

scenario (i.e., HAP solution for a HAP scenario; Lench, 2018; Lench, Tibbett, & Bench, 2016).

For example, the anxiety felt when driving in inclement weather would map to the strategy of

maintaining hypervigilance, which could help a driver avoid potential threats. The scenarios and

strategy options, as well as the strategy that matched the valence and arousal of each particular

scenario, are presented in Supplementary Table 1.

Following the paradigm of MacCann and Roberts (2008), we validated these pro and

contra-hedonic scenarios by asking 25 experts in the domain of emotional problem-solving, here

defined as counseling and clinical psychology professionals with a master's degree or above, to

determine the effectiveness of each possible solution. Experts ranged in age from 24-76 years.

Fourteen of the participants in the validation study were presented with a multiple-choice format

in which they were asked to indicate which of the four presented options would be most

successful for meeting the specified goal (Forced Choice Group; 6 young and middle-aged adults

and 8 older adults). The other 11 participants (5 young and middle-aged adults and 6 older

adults) were asked to rate the effectiveness of each of the four solutions to the 12 problem

scenarios on a 6-point Likert-type scale (Effectiveness Rating Group). We randomly assigned

which format to send to each emotion regulation expert. For the Forced Choice Group, one of the

HAN scenarios was not matched with the HAN strategy created, and one of the LAN scenarios

had only 1 out of 14 matches with the LAN solution, so we revised the intended solutions for the

Driving and Funeral scenarios for the main study (#7 and #11 in Supplemental Table 1). Chance

matching for the four-option multiple-choice scenarios is 25%. Forced Choice matching for each

of the remaining 10 scenarios were all above chance ($M = 65.80\%$, $SD = 28.41\%$). For the

Effectiveness Rating Group, the mean effectiveness rating for the valence-arousal matched

responses ($M = 4.82$, $SD = .62$) was significantly higher than the mean rating for the non-

matched responses ($M = 2.79$, $SD = 1.31$, $p < .0001$). Supplementary Table 2 provides the

frequency of matches in the Forced Choice Group and the effectiveness ratings from the

Effectiveness Rating Group separately by age group. Overall, experts in emotion regulation

agreed with our *a priori* valence-arousal matchings. The LAP scenarios were the most likely to

reach 100% agreement. The HAN scenarios had the lowest agreement among experts. These

results suggested adequate content validity for the scenarios and solutions.

      To verify that the scenarios and solutions represented the intended valence and arousal,

we conducted a second validation study. We validated the valence and arousal of each scenario,

as well as the four possible solutions for each scenario, with a group of 21 young adults (20-30

years old; $M_{age} = 24.33$, $SD = 2.87$) and 18 older adults (58-80 years; $M_{age} = 65.61$, $SD = 5.14$).

Participants rated valence and arousal from -4 (very negative/very low arousal) to 4 (very

positive/very high arousal). The high arousal scenarios ($M = 1.99$, $SD = 1.25$) were rated as

significantly higher in arousal than the low arousal scenarios ($M = .89$, $SD = 1.08$; $t(38) = 7.49$, p

$< .0001$). The positive scenarios ($M = 1.66$, $SD = .96$) were rated as significantly more positive

than the negative scenarios ($M = -.62$, $SD = 1.36$; $t(38) = 8.42$, $p < .0001$). Similarly, the high

arousal solutions ($M = 1.23$, $SD = 1.00$) were rated significantly more arousing than the low

arousal solutions ($M = -.07$, $SD = 1.08$; $t(38) = 6.56$, $p < .0001$), and the positive solutions were

rated significantly more positive (*M* = 1.55, *SD* = 1.05) than the negative solutions (*M* = -.40, *SD* = .86; *t*(38) = 9.31, *p* < .0001).

   Emotion strategy-situation match task*.* The pro- and contra-hedonic affect scenarios were programmed in a visual novel engine (Ren'Py 6.99.11; Rothamel, 2015) to assess emotional-strategy match to the situation in a first-person manner (e.g., *You are trying to soothe a child to sleep*). Participants also selected from 12 instrumental music options to play in the background of the game during each scenario. The music options presented to the participants had been previously validated by a different group of 11 young and 12 older adults. Validation criteria for the music consisted of a rank-ordering approach where participants listed the first-reported, dominant emotion felt during the song as well as secondary and tertiary emotions, if they existed. There were six emotion choices: happy, excited, calm, anger/aggression, sad, and anxious. First, young adults selected the emotion word that best fit each of 29 songs. Next, we selected the 16 songs with the most consistent ratings of salient emotions in each of the four categories (HAP, HAN, LAP, LAN). The older adult group then rated this list of 16 songs. Using the same method, older adults selected the most salient emotion elicited by each song. From this second validation, the 12 songs with the most consistent ratings of salient emotions were determined. This meant that there were three songs for each of the four valence/arousal categories. The 12 finalized songs (of an original 16 options) for the emotion strategy-situation match task were associated with the specified, target emotions and were presented with the goal of encouraging the participant to immerse him/herself fully in the emotion strategy-situation matching task. This continuous music technique has been used in conjunction with mood inductions to help participants sustain a specific mood (Eich, Ng, Macaulay, Percy, & Grebneva, 2007). Thus, the main purpose of the music selection portion of the study was to help

participants immerse themselves within each affective scenario, and the focus of the main analyses did not include music matching performance as a main variable of interest.

Procedure

All information, aside from the MMSE and Snellen, was presented on a 17-inch computer monitor with volume-adjusted headphones. All text presented on the screen was in 14-point Arial typeface to allow for optimum reading for both young and older adults.

After obtaining informed consent, participants completed the vision and cognitive screening. Next, participants put on headphones and adjusted the volume to a comfortable level. Participants then browsed the 12 music selections (three in each of the four arousal/valence categories) and were instructed to choose their favorite song from each category (i.e., one from HAP, one from LAP, etc.) and to create a personalized label for the song to describe the mood the song elicited and simplify retrieval in the future (e.g., "Upbeat" to describe a highly arousing positive song).

Following the music labeling, participants were shown how to move through the emotion strategy-situation match task. Specifically, participants were told, "In this study you will be asked to solve some everyday problems. You will be given a goal and asked to solve a problem associated with that goal." Once the participant was sure that s/he understood the nature of the computer task, and felt comfortable with the controls, participants could complete the task at their own pace.

Participants were presented with all 12 previously validated scenarios in a pseudo-randomized order. Each scenario was presented via three consecutive screens. On the first screen, the situation was described. On the next screen, the explicit goal was presented, and participants were asked to select music that would help them align their thinking with the goal.

Once their music selection was playing, the third screen was presented, which listed the four

multiple-choice options for solving the problem. The four options corresponded to the four

different types of arousal/valence categories: HAP, HAN, LAP, or LAN. The options were

presented in a different order across questions. As all scenarios had an answer that matched the

valence-arousal combination of the situation, participants could choose a mismatched option. If a

mismatched option was chosen on the first attempt, a second attempt was offered. The number of

matched strategies chosen was summed for each scenario category with a possible range of 0 to 3

for each category.

After completing the emotion strategy-situation match task, participants completed the

demographics survey. Finally, participants were asked whether each of the scenarios were

relevant to their life experiences. For example, one of the scenarios dealt with purchasing a car.

During this question portion, participants were asked whether they had ever been in this situation

previously (Yes/No) and how likely they expected to encounter this situation in the future on a 0

to 100 scale, with 0 corresponding to "*Extremely Unlikely*" and 100 meaning "*Extremely Likely.*"

As can be seen in Table 1, most of the scenarios had been experienced by young and older adults

(median: 90%; range: 46-98%). Both young ($M = 74.24$) and older ($M = 64.85$) adults tended to

anticipate experiencing similar situations in the future. Although not perfectly equal across age

groups, both young and older adults appeared to judge the scenarios as self-relevant (in some

cases differentially relevant to their past versus future). These age differences in past versus

future experience are important to keep in mind when interpreting the findings.

After the survey, all participants were thanked, debriefed, and compensated for their time.

The institutional review boards at Cleveland State University and the University of Akron

approved the above protocol.

Analyses

To address the main study hypothesis, we conducted a 2 Age Group (young, old) × 4 Scenario (HAP, HAN, LAP, LAN) mixed-design ANOVA on strategy-situation matching. We also computed Bayes factors to test the strength of evidence in favor of the null hypotheses over the alternative hypotheses (or vice versa) using JASP 0.9.2 (2018, Amsterdam, The Netherlands). We conducted a Bayesian repeated measures ANOVA to compare a series of alternative models against the null model. The null models (H0) are equal matching across 1) age groups, 2) scenarios, and 3) the age group by scenario interaction. The alternative models (H1) were non-equal performance across 1) age groups, 2) scenarios, and 3) the age group by scenario interaction. The default JASP prior for fixed effects was used (r scale prior width = .5).

Results

We conducted a 2 Age Group (young vs. old) × 4 Scenario (HAP, HAN, LAP, LAN) mixed-design ANOVA on strategy-situation matching. The main effect of Age Group was not significant, $F(1, 123) = .55$, $p = .46$, $\eta_p^2 = .004$. The main effect of Scenario was significant, $F(2.64, 324.95)^1 = 22.00$, $p < .001$, $\eta_p^2 = .15$. Participants were more likely to match positive emotional solutions to positive emotional situations than negative emotional solutions/situations. Specifically, participants were significantly more likely to match HAP solutions to the HAP scenarios ($M = 2.42$, $SE = .06$) compared to the HAN ($M = 1.77$, $SE = .09$) and LAN ($M = 1.75$, $SE = .08$) scenarios, ps < .05. Similarly, participants were significantly more likely to match LAP scenarios ($M = 2.26$, $SE = .07$) compared to HAN and LAN scenarios, ps < .05 (see Table 2 and Figure 1). The predicted Scenario × Age Group interaction was not significant, $F(2.64, 324.95) = .48$, $p = .70$, $\eta_p^2 = .004$. Sensitivity analyses for the Scenario × Age Group interaction in G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) suggested that the minimum effect size we

were able to detect with power = .80, alpha = .05, and sample size = 125, was a small effect of f

= .13.

Bayesian analyses were consistent with these frequentist findings and provided

information regarding the strength of the evidence in favor of the null or alternative hypotheses.

There is moderate evidence that the null model was more favored than the Age Group model

(BF_{01} = 7.06). There is extremely strong evidence that the Scenario model is more favored than

the null model (BF_{10} = 1.96^{11}). Comparison of the main effects model with the interaction model

($3.458^{-11}/9.335^{-10}$) reveals strong evidence that the main effects model was preferred to the

interaction model, specifically by a BF of 27.03 (1/.037).

We also examined mismatches to determine whether older adults were more likely to

supply a positive emotional solution for a negative scenario than young adults. There were only

two categories of errors with significant age differences: older adults (M = .94, SE = .09) were

significantly more likely than young adults (M = .56, SE = .09) to choose a LAP strategy for a

LAN situation, $t(123)$ = 2.93, p = .004, d = .52; and young adults (M = .13, SE = .04) were

significantly more likely than older adults (older adults never made this mismatch) to choose a

HAN strategy for a LAN situation, $t(60)^{i}$ = 3.01, p = .004, d = .54 (percentage of mismatches by

age group are presented in Table 2).

We also examined the frequency and matching of second attempts for the scenarios. Not

surprisingly, given the main effect of scenario on matching for the first attempt data, these also

differed by scenario. However, the pattern is quite similar across age groups and seems to mirror

the findings from the first attempt data, so we do not consider the second attempt data further.

Finally, we analyzed the music-match data to examine the degree to which individuals in

different age groups selected music that matched the affective tone of the scenario. We submitted

the music-match data to a 2 (Age Group) × 4 (Scenario) mixed-design ANOVA to determine

whether there were age or scenario differences in matching the mood of the music to the mood

for the scenario. The main effect of Scenario was significant, $F(3, 369) = 24.15$, $p < .0001$, $\eta_p^2 =$

.16. Pairwise comparisons revealed that participants were more likely to match the music in the

HAP ($M = 1.55$, $SE = .10$; out of 3 possible) and LAP ($M = 1.68$, $SE = .09$) scenarios than the

HAN ($M = .98$, $SE = .07$) and LAN ($M = .89$, $SE = .08$) scenarios, ps $< .001$. Neither the main

effect of Age Group, $F(1, 123) = 2.14$, $p = .15$, $\eta_p^2 = .017$, nor the Age Group × Scenario

interaction reached significance, $F(3, 369) = 2.32$, $p = .075$, $\eta_p^2 = .018$. This marginal interaction

was driven by significant age differences in the HAN music-match accuracy with young adults

selecting the matching music more than older adults ($M_{YA} = 1.21$, $SE = .11$; $M_{OA} = .75$, $SE = .09$;

$t(123) = 3.33$, $p = .001$, $d = .59$. There were no significant age differences in music-match

accuracy for the other three scenarios. Strategy-situation match accuracy was only related to

music-match accuracy for older adults in the HAN scenarios, $r(64) = .35$, $p < .004$.

Discussion

Overall, more age similarities than differences emerged in terms of the hedonic and

contra-hedonic strategy-situation matching task. In line with our predictions, both younger and

older adults predominantly matched positive affective strategies with positive affect scenarios,

with no age differences in terms of performance. However, contrary to our predictions, no age

differences emerged in terms of matching negative affective strategies to negative affective

scenarios. Based on SST postulates, we expected that older adults would more likely state a

willingness to endorse positive affective solutions when presented with negative affective

scenarios. Thus, at least within these hypothetical contexts, older adults were just as likely as

younger adults to identify the potential utility of negative affect in certain contexts.

Our results showing that both younger and older adults were more likely to match positive affective strategies with positive affect scenarios in comparison to negative affect matching is in keeping with past research noting individuals' greater likelihood/desire to pursue hedonic affect in their daily lives (Riediger et al., 2009). Nevertheless, while less frequent, the present results suggest a willingness to identify the usefulness of contra-hedonic affect, regardless of age, in certain contexts.

One potential limitation regarding Study 1 could be that we had participants focused more on the "correct" strategy (i.e., by giving them a second attempt) rather than encouraging participants to be more open-ended as to what they, themselves, would actually choose. Here, participants may have chosen strategies based on what was expected rather than what they would actually pursue if placed in that situation. In essence, this task could have been testing participants' knowledge in regard to fitting hedonic strategies with hedonic scenarios, and vice versa for contra-hedonic. In order to address these limitations, a second study was conducted that de-emphasized the "accuracy" component of the strategy-situation match task and included a measure of emotional knowledge to determine whether strategy-situation match performance was at all related to specific components of emotional competency.

Study 2

We conducted a second study to replicate and extend findings from Study 1. Given that the strategy-situation match task was novel (and placed an emphasis on accurate matching), and we were interested in the extent to which responses in this task relate to general emotion knowledge, we conducted a second study on a new sample of young and older adults. We expected to replicate findings from Study 1, with only a main effect of scenario on the strategy-situation match task with matching accuracy higher on the positive scenarios (HAP and LAP)

than the negative scenarios (HAN and LAN). We did not expect age differences in matching

accuracy or an age by scenario interaction. For emotional knowledge, the Profile of Emotional

Competence (PEC) scale (Brasseur, Grégoire, Bourdu, & Mikolajczak, 2013) was employed.

Past work has shown that individual differences in dispositional traits and emotional knowledge

can predict performance on an emotional laboratory task. In one study, older adults with higher

levels of trait optimism were more likely to rapidly regulate out of a negative mood in a

laboratory emotion regulation task than older adults with lower levels of optimism (Larcom &

Isaacowitz, 2009). In a study of emotional decision-making in a task simulating airport security

screening, individuals who were higher in emotional intelligence ability were more likely to pick

photographs of individuals high in negative traits (e.g., aggression) to detain (Alkozei, Schwab,

& Killgore, 2016). A third study found that trait emotional intelligence was positively and

significantly correlated with performance on a social-cognitive theory of mind task (Ferguson &

Austin, 2010). Therefore, we included a measure of emotional knowledge in Study 2 to explore

the extent to which individual differences in emotional knowledge relate to strategy-situation

matching for young and older adults. Here, we expected age similarities on measures of

emotional knowledge, consistent with results from Study 1 showing that young and older adults

may take similar approaches to emotional situations (Hypothesis 2). But we also explored the

possibility that we might observe age differences in emotional knowledge because of either older

adults' avoidance of high-arousal negative emotions or older adults' greater experience in

regulating their emotions compared to young adults. Specifically, we were interested in whether

age differences emerged in the Utilization of One's Own Emotions and Intrapersonal Emotional

Competence subscales that were likely most relevant to the strategy-situation match task

parameters employed. Finally, we expected greater emotional knowledge on those two specific

subscales would be related to greater matching on the strategy-situation matching task

(Hypothesis 3).

Method

Participants

We used G*Power 3.1.9.2 (Faul et al., 2007) to estimate the sample size required to test

our hypotheses with power = .80 and alpha = .05. The main effect of Scenario from Study 1 was

a large effect (f = .42), so a total sample size of 10 participants was sufficient to detect this

within-subjects main effect. We did not expect a main effect of age group, but to detect a

medium effect size of f = .25 for the main effect of age group, 82 participants were required.

Although we did not expect an Age x Scenario interaction based on Study 1, we wanted to power

the study to detect a medium interaction effect. For a medium effect size of f = .25, 24

participants were required. For hypothesis 3, past work found a range of effect sizes from small

to large for the relationship between emotional knowledge and emotional performance in a lab

task (Alkozei, Schwab, & Killgore, 2016, r = .25; Ferguson & Austin, 2010, r = .21; Larcom &

Isaacowitz, 2009, η_p^2 = .11). To detect a moderate correlation between emotional knowledge and

matching (ρ = .30), we needed 84 participants, and to detect a large (ρ = .50) correlation, we

needed 29 participants. Thus, given the effects found in Study 1 and based on estimates of effect

sizes from the literature, we aimed to collect a total sample size of 80 participants, which

powered out study to detect moderate to large effects. We also conducted Bayesian analyses to

examine the strength of any null effects.

Forty young adults (19-35 years; M_{age} = 28.95, SD = 3.92; 32.5% female) and 40 older

adults (58-81 years; M_{age} = 64.45, SD = 5.32; 62.5% female) were recruited from Amazon

Mechanical Turk using TurkPrime (Litman, Robinson, & Abberbock, 2016). We set inclusion

criteria as primary language English, living in the United States, 95% or better approval rate, and

over 100 Human Intelligence Tasks (HITS) completed. Six percent of the sample was Hispanic;

87.5% were White, 6% Black, 2.5% Asian, and 3.8% Latino/Latina. Eighty-nine percent of the

sample had completed some college or greater. All participants completed the survey and passed

the attention check. The range to complete the study was 1.92 to 46.15 minutes, with young

adults completing the study in 10.81 minutes (on average) and older adults completing it in 15.45

minutes (on average). We excluded three young adult participants who completed the survey in

less than three minutes because we felt this indicated rushing through the study. This left 37

young adults and 40 older adults for analyses. The patterns of results remain the same with and

without the outliers excluded. Participants were compensated $2 for their time.

Measures

     Emotion strategy-situation match task. The strategy-situation match task from Study 1

was used again, with a few modifications. The 12 scenarios were presented in a random order

across participants using Qualtrics software (Qualtrics, Provo, UT). As in Study 1, participants

were instructed to select from a multiple-choice list the strategy that they would most likely

choose if confronted with each scenario. What was different in this study was that, 1)

participants were only permitted one answer for each scenario, and 2) no music was selected or

played during the task. Matching score was a sum of number of matched responses for each of

the four arousal/valence combinations (HAN, LAN, HAP, LAP).

     Emotional knowledge. To assess emotional knowledge, participants completed the 50-

item PEC scale (Brasseur et al., 2013). This scale has been validated with a sample of

participants ranging in age from 15 to 84 years and showed good internal consistency and good

concurrent and discriminant validity. For each item, participants responded on a scale of *1* (*does*

not describe me at all/never respond this way) to *5* (*describes me very well/experience very often*). The scale consists of 10 subscales and 3 global scales. We were interested in one subscale and one global scale: *Utilization of One's Own Emotions* and *Intrapersonal Emotional Competence*. The Utilization of Own Emotions consisted of five items (i.e., "*I use my feelings to improve my choices in life*," α = .69), and the Interpersonal Emotional Competence scale consisted of 25 items (α = .88). For each subscale, reverse-worded items were reverse-scored and then the average was computed.

Analyses & Results

Hypothesis 1: No Age Differences in Strategy to Situation Matching

To investigate whether there were age or scenario differences in strategy-to-situation matching, we conducted a 2 (Age Group) × 4 (Scenario) mixed-design ANOVA with Age Group as a between-subjects factor. Similar to Study 1, there was main effect of Scenario, $F(3, 225) = 17.51$, $p < .001$, $\eta_p^2 = .19$. Participants were more likely to match LAP strategies to LAP scenarios ($M = 2.13$, $SE = .09$) than all other scenarios (HAP $M = 1.72$, $SE = .08$; HAN $M = 1.47$, $SE = .11$; LAN $M = 1.27$, $SE = .09$; $ps < .001$; Table 3 and Figure 2). Participants were also more likely to match the HAP strategies to HAP scenarios relative to LAN scenarios, $p < .001$. These findings were somewhat similar to those of Study 1, except rather than the two positive scenarios showing higher matching than the two negative scenarios as in Study 1, the LAP scenario was matched most frequently relative to all other scenarios. It is also important to note that the means in Study 2 ($M = 1.65$, $SE = .09$) were lower than the means in Study 1 ($M = 2.05$, $SE = .39$), perhaps because in Study 2 participants did not receive any feedback when they did not select the matched strategy during the first choice. Neither the main effect of Age Group ($F(1, 75) = .29$, p

= .59, η_p^2 = .004) nor the Age Group × Scenario interaction ($F(3, 225)$ = 1.68, p = .17, η_p^2 = .02)

reached significance.

We also computed Bayes factors to test the strength of evidence in favor of the null

hypotheses over the alternative hypotheses (or vice versa) using JASP 0.9.2 (2018, Amsterdam,

The Netherlands). We conducted a Bayesian repeated measures ANOVA to compare a series of

alternative models against the null model. The null models (H0) are equal performance across 1)

age groups, 2) scenarios, and 3) the age group by scenario interaction. The alternative models

(H1) were non-equal performance across 1) age groups, 2) scenarios, and 3) the age group by

scenario interaction. The default JASP prior for fixed effects was used (r scale prior width = .5).

Bayesian analyses were consistent with these frequentist findings and provided information

regarding the strength of the evidence in favor of the null or alternative hypotheses. There is

moderate evidence that the null model was more favored than the Age Group model (BF_{01} =

5.85). There is extremely strong evidence that the Scenario model is more favored than the null

model (BF_{10} = $1.43e^8$). Comparison of the main effects model with the interaction model ($3.61e^{-8}/1.42e^{-7}$) reveals moderate evidence that the main effects model was preferred to the interaction

model, specifically by a BF of 4 (1/.25). In summary, we found similar findings in Study 2 as

reported in Study 1, with no age differences in strategy-to-situation matching.

Hypothesis 2: No Age Differences in Emotional Knowledge

To assess whether there were age similarities in the subscales and global scales of the

PEC, we conducted two univariate ANOVAs. The univariate results for the Utilization of Own

Emotions subscale were similar for young (M = 3.55, SD = .62) and older (M = 3.51, SD = .63)

adults' scores, $F(1, 75)$ = .06, p = .80, η_p^2 = .001. We also conducted Bayesian ANOVAs for age

effects on the Utilization of Own Emotions subscale and found moderate support for the null

model, BF_{01} = 4.12 (BFs between 3 and 10 are considered moderate; Quintana & Williams, 2018). The univariate results for the Intrapersonal global scale were similar for young (M = 3.75, SD = .54) and older (M = 3.86, SD = .56) adults, $F(1, 75)$ = .80, p = .37, η_p^2 = .01. A Bayesian ANOVA for the Intrapersonal Global scale suggested that the null model was favored 3:1 (BF_{01} = 3.00), suggesting moderate evidence in favor of the null model for age differences in the Intrapersonal scale.

Hypothesis 3: Emotional Knowledge Associated with Matching

To examine whether greater emotional knowledge would be related to higher matching accuracy on the strategy-situation matching task, we computed zero-order correlations among the two PEC scales of interest and the matching scores for each scenario type. Across age group, LAP matching scores were negatively related to Utilization of Others' Emotions (N = 77, r = -.47, p < .001). When examined separately by age group, the relationship between LAP matching and Utilization of Other's Emotions was only significant for young adults (n = 37, r = -.58, p < .001). This suggests that individual differences in emotional knowledge may have been more strongly related to matching for young adults than older adults.

Discussion

As with Study 1, results from Study 2 observed no age differences in matching performance across the hedonic and contra-hedonic scenarios. Additionally, matching performance was higher for hedonic (namely LAP) relative to contra-hedonic scenarios for both age groups, which is also consistent with results from Study 1. One key goal of Study 2 was to determine whether aspects of emotional knowledge would be related to strategy-situation matching. Contrary to our predictions, none of the predicted subscales on the PEC (i.e.,

Utilization of Own Emotions and Global Emotional Competence) were significantly related to situation-strategy match performance.

The only significant association between strategy-situation match performance and emotion knowledge were observed for LAP performance. Here, the Utilization of Other's Emotions subscale were negatively correlated with LAP performance. This association should be interpreted with caution given that only one of the three scenarios was interpersonal in nature (i.e., soothing a crying baby). Thus, there is little evidence that components of emotional knowledge, at least as operationalized in the PEC, were related to situation-strategy match accuracy as predicted.

One key modification from Study 1 to Study 2 was not providing feedback after the initial strategy choice for each scenario. This was done in order to minimize potential demand characteristics whereby participants were choosing strategies based on what they perceived to be "correct" in the eyes of the experimenters, as well as to reduce practice effects. Thus, only the first option chosen was used to determine match performance. While this modification did not facilitate any age differences on the task, matching performance was diminished in Study 2 relative to Study 1. Here, both younger and older adults were less likely to endorse a HAN, LAN, and HAP strategy for the corresponding HAN, LAN, and HAP scenario, respectively. However, while endorsement of negative and high arousing strategies for respective scenarios was diminished, participants were still choosing these corresponding strategies more so than the other options (see Table 3). Hence, HAN, LAN, and HAP strategies may have been less preferred among participants in the present studies, there were certain situations whereby both hedonic and contra-hedonic matching emerged. This indicates that older adults are just as likely

as younger adults to identify the potential utility of pursuing specific pleasant and unpleasant (including arousing) states when it could perhaps be useful to do so.

General Discussion

The aim of the present studies was to examine how aging affects pro- and contra-hedonic emotion selection. Participants were given a specific scenario with four emotional solutions, which varied on arousal and valence. We anticipated that older adults would be more likely to identify a positive emotional solution as most adaptive, and less likely to identify high-arousal solutions as adaptive, when compared to young adults, regardless of the stated target goal and its match; however, our results suggested much more similarities between age groups than differences. Performance between ages was similar among scenarios across both studies, with differences only emerging in the identification of LAP over LAN for old, and young adults being more likely to match a HAN solution for a LAN target in Study 1. In Study 2, both younger and older adults were more likely to match a LAP solution to a LAP scenario relative to the other three categories. Together, this suggests that both younger and older adults may identify positive emotions as more adaptive than negative when solving a problem. However, in certain situations, if a target scenario was unpleasant and/or highly arousing, older adults (similarly to younger adults) indicated the appropriateness of the matched strategies.

Based on results from Study 1, we were interested in determining whether performance on the strategy-situation match task was in any way related to individual differences in emotional knowledge/competence. This was motivated by the possibility that participants were not merely identifying the affective strategies they, themselves, would actually implement within a given scenario but rather stating which strategy best fits the emotional context given the parameters of the task. Thus, in Study 2, we implemented a measure of emotional knowledge, the PEC scale

(Brasseur et al., 2013), to examine associations between individual differences in emotional competency and strategy-situation matching. No age differences emerged in terms of global emotional knowledge/competence, or the specific subscale of Utilization of Own Emotions. Furthermore, when examining associations between strategy-situation match performance and domains of emotional comptency presumed to be associated with our main task (namely the Utilization of Own Emotions subscale), no significant relationships emerged. Thus, it is possible that strategy choices in Study 2 were more reflective of the strategies that participants would actually pursue when confronted with the corresponding scenarios rather than endorsement based on presumed expectations of experimental context (i.e., choosing a HAP strategy because it would be expected for a HAP scenario) that would track with individual differences in basic emotional knowledge. It is also possible that the domain-general measure of emotional knoweldge/competence we chose was not sensitive enough for revealing the specific nature of strategy-situation matching afforded by our affective scenarios. Nevertheless, given the novelty of our strategy-situation match task, additional research is needed to determine whether certain individual difference factors/affective skills influence how hedonic and contra-hedonic affect is willingly experienced across a variety of emotionally evocative contexts among younger and older adults.

Overall, both young and older adults matched positive situations to a positive solution more so than a negative solution, which is in line with recent lifespan studies revealing that, regardless of age, individuals are more likely to pursue pro-hedonic relative to contra-hedonic goals in everyday life (Riediger et al., 2009). However, the age similarity in reporting both pro-hedonic and contra-hedonic states as being most effective when the context was appropriate for such pursuits in the present study provides an interesting contrast to evidence from Riediger and

colleagues who observed diminished contra-hedonic motives among older relative to young adults. One key distinction between the present study and prior work is ours (to our knowledge) is the first to assess whether older adults are less likely to identify the adaptive value of negative affective states for instrumental (i.e., goal-relevant) purposes. Here, we assessed whether individuals would report the appropriateness of specific positive and negative states in scenarios where an explicit goal was provided, as opposed to examining whether individuals pursue contra-hedonic states absent a definable goal. Thus, while individuals (especially older adults) are less likely to pursue contra-hedonic motives in their day-to-day dealings, both young and older adults similarly identified when pro and contra-hedonic strategies/states could be useful when an affective goal was at stake.

Our results that younger and older adults were more likely to match positive (both HAP and LAP in Study 1 and LAP in Study 2) more so than negative contexts is somewhat in keeping with prior studies examining arousal-based emotional processing and regulation across adulthood. At least in the context of age-related positivity, positive relative to negative preferences are higher, particularly for older adults, when processing low relative to high arousing information (Dolcos, Katsumi, & Dixon, 2014; Kensinger, 2008; Streubel & Kunzmann, 2011). This is also in line with our overall predictions that older adults would be less likely to identify the utility of high arousal solutions, given prior evidence suggesting that older adults prefer to disengage rather than confront high-intensity emotional scenarios (Scheibe, Sheppes, & Staudinger, 2015). This aligns well with Charles' (2010) SAVI model, which argues that older adults are less adept at engagement-oriented (i.e., cognitive reappraisal) strategies in highly arousing contexts.

Overall, the present findings suggest age-related continuity in instrumental emotional identification. Thus, emotional competency in old age may also go beyond hedonic considerations by encompassing the acknowledgement that contra-hedonic states can be linked to emotional utility. Furthermore, a unidirectional view of emotional well-being in old age may not be sufficient. Related work on age-related trajectories in mixed affective experiences provides additional evidence in this regard. More complex, intermixed emotional experiences (e.g., the simultaneous experience of pleasant and unpleasant affective states, also referred to as "poignancy," Ersner-Hershfield, Mikels, Sullivan, & Carstensen, 2008) tend to increase with age (Schneider & Stone, 2015). Hence, the ability to "take the good with the bad" has been associated with benefits to physical health capacities (Hershfield, Scheibe, Sims, & Carstensen, 2013) and emotional resiliency (Davis, Zautra, & Smith, 2004). A hallmark of emotional competency throughout the adult lifespan likely includes the ability to manage the up and down regulation of positive and negative affective states (and, at times, their co-occurrence) so as to strive for, and obtain, desirable outcomes. Our present results are related to this nuanced view of emotion dynamics in adulthood and old age.

Limitations and Future Directions

One limitation of the present studies is that the scenarios were merely hypothetical. Unlike previous work on hedonic and contra-hedonic emotional goal pursuits (Tamir & Ford, 2012; Tamir et al., 2013), participants were not actually solving problems. It would be important to test whether these findings hold in situations where participants are solving actual – rather than hypothetical – problems. In essence, the present task primarily asked participants to denote which emotion-relevant strategy would be most effective for accomplishing an emotion-relevant goal. However, we did not examine 1) whether younger and older adults would report a

willingness to actually immerse in the most effective pro- or contra-hedonic state, and/or 2)

actually do so when prompted. Thus, future research should include assessments of age

differences in the actual execution of pro- and contra-hedonic emotion choices. To encourage a

more immersive experience, we asked participants to select music that would facilitate their

problem-solving in Study 1. There was a lot of variability in whether participants selected the

music type that matched the most effective emotion in Study 1, and we do not know whether the

music affected participants' moods. It would be important for future work to assess the

emotional experience of participants during the emotion problem-solving task.

Additionally, theory of mind or perspective taking could have played a role in the

accuracy of young and older adults selecting the most effective strategy for the situation given

that these were hypothetical. There is a possibility that age differences in theory of mind (Henry,

Phillips, Ruffman, & Bailey, 2013) led to young and older adults approaching the task

differently. Future research might include a theory of mind or perspective-taking measure to

examine whether accuracy correlates with theory of mind.

Future work should also investigate whether young and older adults agree on the

situations that call for negative emotions. We attempted to mitigate this limitation by validating

the scenarios with younger and older adult counseling and clinical psychology experts and lay

raters. There was general agreement among the experts (comparable across age) on the a priori

matching between the situation and most appropriate solution. Furthermore, lay raters' valence

and arousal ratings for the scenarios and strategies generally comported with our a priori

categorizations. Nevertheless, additional research would be helpful in identifying the varied

scenarios that can be adaptively pursued with hedonic and contra-hedonic states based on

instrumental motives for younger and older adults. We also found some age differences in the

degree to which individuals had experienced something similar to our scenarios, which may have influenced the results.

In Study 1, we provided feedback to participants and allowed them to respond with a second answer if their first attempt was not "correct." We took this approach to allow for more flexibility in responding: When solving problems with emotion-relevant strategies, if the first attempt is not successful, individuals may select a different strategy to continue to try to solve the problem. However, this methodological feature may have influenced performance across the course of the task. Indeed, when we examined accuracy as a function of presentation order, accuracy on the second half of the scenarios was significantly greater than on the first half of the scenarios. This practice effect was significant across age and separately by age group. We adjusted for this possibility in Study 2 and, not surprisingly, there was a decrease in matching performance for the HAP, HAN, and LAN scenarios.

The scenarios we used were intentionally extreme in what type of emotion would best solve the problem. When more ambiguity arises, as is likely in daily interactions, older adults' preferences for avoiding high arousal and negative emotions may play more of a role. This is consistent with ideas regarding the flexibility of emotion regulation strategies (Blanchard-Fields, 2007); age or individual differences in flexibility may be an important predictor of successful hedonic and contra-hedonic emotion regulation when considering the varied landscape of problem scenarios.

Conclusions

The present studies have several contributions to the literature. First, we introduced a new task to investigate situations where up-regulating negative emotions are identified as useful. We used this task to test whether older adults are able to identify the adaptive nature of experiencing

negative and high arousal emotions in a context where it would be appropriate to do so. Importantly, when a situation is best solved using negative and/or high arousal emotions, older adults are just as likely as young adults to report the most effective emotions. These findings expand the literature on emotions and aging beyond preferences and strengths to the practical and useful: When the rubber meets the road, older adults may endorse negative and high arousal emotions in certain situations whereby those emotions are perceived as effective for solving a problem.

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Table 1

Scenario Relevance for Young and Older Adults (Study 1)

	Percent Responded "Yes" Experienced		Likelihood Encounter in Future (0-100); Mean (SE)		
Scenario	Young	Old	Young	Old	*t*
High Arousal Positive					
1. Movie	97	80	79.75 (2.83)	53.91 (3.85)	5.41**
2. Vacation	71	88	76.02 (3.22)	64.78 (4.12)	2.15*
3. Guests	64	95	68.30 (3.30)	66.41 (3.95)	.37
Low Arousal Positive					
4. Flow	95	89	84.54 (2.44)	75.97 (3.52)	2.00*
5. Child	77	95	70.51 (4.23)	47.50 (4.07)	3.92**
6. Mindful awareness	89	92	81.05 (3.27)	71.67 (3.43)	1.98
High Arousal Negative					
7. Driving	82	98	75.41 (3.36)	81.83 (2.63)	1.51
8. Car	46	91	69.85 (3.65)	66.13 (3.73)	.71
9. Project deadline	93	98	79.02 (3.34)	58.63 (3.94)	3.95**
Low Arousal Negative					
10. Ticket	59	81	55.77 (3.59)	43.41 (3.20)	2.58*
11. Funeral	84	95	66.11 (3.58)	73.58 (3.49)	1.49
12. Advice	93	98	84.56 (2.73)	74.38 (3.17)	2.42*

Note. * *p* < .05; ** *p* < .001

Table 2

Study 1: Percentage of Response Types by Category for Young and Older Adults

Intended	Response							
	HAP		LAP		HAN		LAN	
Target	Young	Old	Young	Old	Young	Old	Young	Old
HAP	**78.1%**	**80.2%**	15.8%	15.6%	4.9%	4.2%	1.0%	0
LAP	13.6%	11.4%	**74.9%**	**76.0%**	7.1%	10.4%	4.4%	2.0%
HAN	17.5%	19.8%	16.4%	14.0%	**60.1%**	**57.3%**	6.0%	8.8%
LAN	13.6%	11.5%	20.2%	31.3%	4.4%	0	**61.7%**	**55.2%**

Table 3

Study 2: Percentage of Response Types by Category for Young and Older Adults

	Response							
Intended	HAP		LAP		HAN		LAN	
Target	Young	Old	Young	Old	Young	Old	Young	Old
HAP	**61.4%**	**52.5%**	11.4%	20.0%	11.4%	5.0%	15.8%	22.5%
LAP	7.0%	5.0%	**67.5%**	**75.0%**	21.1%	13.3%	4.4%	6.7%
HAN	13.2%	17.5%	29.8%	26.7%	**52.6%**	**46.7%**	4.4%	9.2%
LAN	4.4%	5.8%	30.7%	34.2%	21.9%	18.3%	**43.0%**	**41.7%**

Figure Caption

Figure 1. Panel A: Study 1 scenario-to-solution matching scores by scenario type. Bars are standard errors of the mean. Panel B: Study 2 scenario-to-solution matching scores by scenario type. Bars are standard errors of the mean.

Footnotes

[i]Due to violations of the equality of variance assumption, the reported degrees of freedom and *p* value are from the equal variances not assumed test.