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Article *in* Developmental Psychology · June 2017

DOI: 10.1037/dev0000362

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Final version accepted for publication in Developmental Psychology on March 30, 2017

Tune Yourself in: Valence and Arousal Preferences in Music-Listening Choices from Adolescence to Old Age

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Author Note: This research was funded by the Max Planck Society and supported in part by a Heisenberg stipend awarded to Michaela Riediger by the German Research Foundation [Deutsche Forschungsgemeinschaft, DFG], RI 1797/3-1. Michaela Riediger is now Chair of the Department of Developmental Psychology at the Friedrich Schiller University of Jena, Germany.
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Abstract

In previous studies, older as compared to younger individuals were more strongly motivated to regulate their momentary affect towards pleasant and calm states. Whether these motivational differences are also reflected in regulatory behavior and whether this behavior is efficient in terms of affect change, however, is unclear. To address these issues, we conducted three studies with samples ranging in age from adolescence to old adulthood. In Study 1, we developed a novel and age-fair music browsing paradigm for music of diverse musical styles, dates of origin, and affective characteristics. The time spent listening to self-selected music with varying levels of valence and arousal served as an indicator of affect-regulatory preferences in two different affectively relevant situations, namely after mood induction in Study 2 and before an upcoming discussion with a stranger in Study 3. As predicted, we found a higher preference for music with positive valence and low arousal in older as compared to younger individuals in both studies. Additionally, the efficacy of music listening as an affect-regulatory strategy was supported because individuals' current affect significantly changed from before to after music listening (Studies 2 and 3), whereas that was not the case in an active control group listening to neutral non-musical sounds (Study 3). These results extend previous research on affect regulation by demonstrating the utility of the music browsing paradigm as a behavioral indicator of affect-regulatory preferences in individuals from various age groups. They also provide evidence for age differences in, and affect-regulatory effects of, music-choice behavior.

Keywords: age differences, affect-regulatory behavior, music preferences, mood induction

Tune Yourself in: Valence and Arousal Preferences in Music-Listening Choices from Adolescence to Old Age

Affective experiences, such as anger, sadness, or joy, are an integral part of human life, and so are wishes to control or regulate them. Typically, people want to regulate their affect in a pro-hedonic manner; that is, they often want to enhance or maintain pleasant, and/or avoid or dampen unpleasant affective states (e.g., Riediger, Schmiedek, Wagner, & Lindenberger, 2009). Although this preponderance of pro-hedonic orientation is evident throughout the lifespan, there are occasional exceptions, and previous research has pinpointed interesting age differences in this regard. Adolescents, for example, are more likely than adults to report contra-hedonic orientations in their daily lives, that is, the wish to maintain or enhance negative, or to dampen positive affect. Older adults aged 60 years and above, in contrast, report pro-hedonic orientation (the wish to maintain or enhance positive, or to dampen negative affect) considerably more frequently than younger adults and adolescents do (e.g., Riediger et al., 2009; Riediger, Wrzus, & Wagner, 2014).

Although these findings are intriguing, several important questions remain unanswered to date. Firstly, the available evidence pertains to how people from different age groups *want* to influence their feelings, and is almost exclusively based on verbal self-report. Whether these motivational differences also yield differences in actual *behavior,* and whether these, in turn, impact the *outcomes* of affect regulation attempts, that is, changes in affective experiences, is still largely unclear. Secondly, so far, relevant studies have primarily addressed the *valence* dimension of regulatory motivation (i.e., the pleasantness–unpleasantness of the aspired affective states). Less is known about the respective role of affective *arousal* – how activating or deactivating aspired affective experiences are – even though awareness is growing that this dimension is relevant for understanding age differences in affective preferences (e.g., Charles, 2010; Keil & Freund, 2009; Kessler & Staudinger, 2009; Streubel & Kunzmann, 2011).

The purpose of the present research was to address these questions in a series of three studies in which we developed and applied a novel age-fair music-choice paradigm as a behavioral indicator of affective preferences. Music varies with regard to valence and arousal, just as affective experiences do, and listening to music can alter peoples' affective experiences (e.g., Västfjäll, 2002). In fact, affect regulation has been identified as an essential function of listening to music in various age groups (e.g., Juslin & Laukka, 2004). Music-listening choices are thus well-suited behavioral indicators of regulatory preferences in affectively charged situations. The purpose of Study 1 was to develop an age-fair music-choice paradigm and to establish its suitability in age-comparative research. Studies 2 and 3 employed this paradigm in age-heterogeneous samples spanning the age range from adolescence to old age. Both studies investigated whether behavioral indicators of affect-regulatory preferences (i.e., participants' music choices) replicate age-related differences in affect-regulatory preferences that have been observed in previous self-report studies. In Study 2, we further investigated whether music-listening choices are an effective means of affect regulation. The purpose of Study 3, finally, was to replicate findings of Study 2 in an independent sample and a different affectively relevant situation and to compare the efficacy of listening to self-selected affective music with an active control group listening to neutral non-musical sounds.

Below, we elucidate the conceptual background of this series of studies and the rationale underlying our predictions. We start out by addressing the roles that the valence and arousal dimensions of aspired affective states might play for age differences in affect regulation preferences from adolescence to very old age. Subsequently, we discuss music listening as a behavioral indicator of regulatory preferences and introduce the rationale for the novel music-choice paradigm that we developed for the present research. Finally, we summarize the logic behind the present series of studies and our hypotheses.

Age Differences in Affect Regulation Motivation: The Role of Valence and Arousal

Dimensional affect models propose that affective experiences can be characterized through their localization in a two-dimensional valence–arousal plane, that is, with regard to how pleasant or unpleasant and how activating or deactivating they are (e.g., Russell & Carroll, 1999). This assumption is widely acknowledged in emotion research, and it can be used to characterize affect-regulatory motivations as well.

Evidence on age-related differences in the *valence* of aspired affective states is accumulating. Riediger and colleagues (2009), for example, used a mobile-phone based experience-sampling technology to study the valence dimension of everyday affect regulation strivings in a sample ranging in age from 12 to 86 years. Participants reported on average 54 times in three weeks whether they currently wanted to dampen, enhance, or maintain various positive and negative feelings. The majority of reported affect regulation motivations were pro-hedonic, but there were also occasions when participants reported wanting to maintain or enhance negative affect or to dampen positive affect. Adolescents reported such contra-hedonic motivation most often, namely, in about 25% of the measurement occasions. There was a steep decrease in the frequency of reported contra-hedonic motivation between the adolescent and the young adult participants, and it declined further throughout the adult subsamples into old age. Pro-hedonic motivation, in contrast, showed an opposite pattern of age differences. It was least frequently reported by adolescents and young adults, and most frequently by older adults (Riediger et al., 2009, 2014).

A corresponding picture of age-related differences also emerged in other studies. Mares, Oliver, and Cantor (2008), for example, asked 18- to 82-year-old participants to report how much they sought or avoided several affective experiences in their everyday lives, and how much they regarded these experiences as useful or valuable. Again, younger adults were most likely to report preferences for negative affective experiences, whereas preferences for positive affect and emotional stability were more frequently reported the older participants were. Further empirical support derives from studies on age differences in media use.

Younger adults were more likely than older adults to indicate that they like movies eliciting sadness or fear. Older adults, in contrast, more often reported preferring heart-warming movies than their younger counterparts did (Bartsch, 2012; Mares et al., 2008).

Although a coherent picture is emerging from these studies, the prevailing reliance on participants' self-report is a limitation because only information that was accessible to their introspection and that they wanted to share with the researchers could be assessed, and self-report biases due to influences of memory, self-protection, or self-presentation processes cannot be ruled out. Thus, little is known about whether these differences in affect regulation motivation also play out in *behavioral* differences between age groups when enacting their regulatory preferences. Indirect support stems from studies showing an age-related shift across adulthood in memory and attention away from negative, and toward positive information (e.g., Carstensen & Mikels, 2005; Reed, Chan, & Mikels, 2014). For example, investigating individuals' gaze patterns when presented with positively or negatively valenced stimuli showed more pronounced preferences for positive stimuli in older than in younger individuals, and this effect was independent of induced affective experiences (Isaacowitz, Toner, Gorer, & Wilson, 2008; Murphy & Isaacowitz, 2010). To date, research has not provided a clear answer as to whether or not attentional preferences actually yield corresponding changes of affective experiences over time (cf. Isaacowitz et al., 2008). The present research used music-listening choices as a typical everyday behavioral indicator of affect-regulatory preferences that also allowed us to address the question whether behavioral differences in affect-regulatory preferences yield corresponding changes in affective experiences.

While the valence of aspired affective states has received much attention in age-comparative research, the *arousal* dimension has only recently moved into the focus of developmental researchers' interest. There is evidence that older adults tend to experience high-arousal states as generally unpleasant, whereas younger individuals differentiate between pleasant and unpleasant high-arousal states (Keil & Freund, 2009). This finding is consistent with evidence that older adults take much longer to recover their baseline heart rate after perturbations due to a stressful event than younger adults do (e.g., Wrzus, Müller, Wagner, Lindenberger, & Riediger, 2014). In fact, the Strength and Vulnerability Integration Model (SAVI; Charles, 2010) postulated that with increasing age, individuals become less flexible in their ability to regulate higher levels of unavoidable distress and physiological arousal. This supports our expectation of an age-related shift in affect regulation motivation throughout adulthood towards a higher likelihood of seeking positive affect in general, and low-arousal positive affect (e.g., contentment) in particular.

Indirect support for this prediction stems from studies showing that older as compared to younger adults report experiencing significantly more low-arousal positive affect than high-arousal positive affect (Kessler & Staudinger, 2009). Direct evidence, however, is still rare. One exception comes from a series of studies reported by Sands, Garbacz, and Isaacowitz (2016) who found preferences for low-arousal TV channels in older adults, whereas younger adults preferred high-arousal content. Another exception derives from an experience-sampling study from Scheibe, English, Tsai, and Carstensen (2013) indicating a clear preference for low-arousal positive affective states (e.g., peaceful) over high-arousal positive affective states (e.g., excited) in older adults. Thus, the age-related increase in pro-hedonic orientation may indeed pertain to low-arousal positive affect in particular. The present research investigated whether similar age differences are also evident in music-listening choices as a behavioral indicator of affect-regulatory preferences.

Music Listening as a Behavioral Indicator of Affect-Regulatory Preferences: Towards an Age-Fair Music-Choice Paradigm

As a behavioral indicator of affect-regulatory preferences, we developed an age-fair music-choice paradigm. Music choices reflect preferences regarding both the valence and the arousal dimension, and can be monitored under experimental conditions. Just as is the case for affective experiences, one can characterize the affective nature of a given song with regard to its valence and arousal level (Bigand, Vieillard, Madurell, Marozeau, & Dacquet, 2005; Collier, 2007; North & Hargreaves, 1997; Thoma, Ryf, Mohieddini, Ehlert, & Nater, 2012; Vieillard et al., 2008). Furthermore, music listening has been reported as an important affect-regulation strategy (Thayer, Newman, & McClain, 1994; Van Goethem & Sloboda, 2011) among adolescents (Saarikallio & Erkkila, 2007), younger adults (Saarikallio, 2011), and older adults (Hays & Minichiello, 2005; Laukka, 2007). In addition, listening to music represents one of the most frequently stated leisure activities and interpersonal communication themes in everyday life (e.g., Rentfrow & Gosling, 2006) and thus bears the advantage of high ecological validity. After peaking in adolescence, the importance of music listening remains relatively high throughout adulthood (Bonneville-Roussy, Rentfrow, Xu, & Potter, 2013). Nevertheless, music preferences seem to differ by age, perhaps corresponding with changes in socio-emotional development (cf. Bonneville-Roussy et al., 2013; Hargreaves, North, & Tarrant, 2016). Hence, studying music preferences of individuals of different ages requires careful selection of music pieces in various styles to accommodate differences in listening habits and to develop an age-fair paradigm (e.g., North, 2010).

It has been debated whether music only expresses or also evokes emotions, but the majority of research findings indicate the latter (e.g., Juslin, Liljestrom, Vastfjall, & Lundqvist, 2010; Lundqvist, Carlsson, Hilmersson, & Juslin, 2009). Although the emotions that music expresses and evokes do not necessarily correspond to each other (Gabrielsson, 2001), they typically do: In several experiments, specific emotions have been successfully induced by listening to music (cf. meta-analysis by Westermann, Spies, Stahl, & Hesse, 1996). In addition, a few studies have used music preferences as an indicator of affect regulation motivation in adolescent and young adult samples (Chen, Zhou, & Bryant, 2007; Gibson, Aust & Zillmann, 2000; Hunter, Schellenberg, & Griffith, 2011; Thoma et al., 2012). Nevertheless, to the best of our knowledge, a systematic investigation of music-selection behavior comparing various age groups and connecting music selection to current affective states has not been conducted so far. Thus, we addressed this research gap and additionally examined the efficacy of music listening for actual changes of affective experiences.

The Present Research: Overview and Predictions

To investigate the open research questions highlighted above, we conducted a series of three studies. In Study 1, we addressed the measurement of affect-regulatory behavior beyond self-reported preferences and developed the music browsing paradigm that we applied in Studies 2 and 3. More specifically, in Study 1 we established the age fairness and suitability of our music browsing paradigm as a behavioral indicator of regulatory preferences for use in age-comparative research. To this end, participants from various age groups rated the valence and arousal levels of a large number of music pieces. Based on these ratings, we selected prototypical music exemplars of four valence–arousal quadrants (positive–high arousal, positive–low arousal, negative–high arousal, and negative–low arousal) with age-invariant rating patterns. To accommodate age differences in musical taste, we also ensured that this selection included a wide array of musical styles and time periods of origin.

In Studies 2 and 3, we examined age-related differences in music-listening choices (as indicators of affect-regulatory preferences) in two independent samples spanning the age range from adolescence to old age. In both studies, we created different affectively relevant situations by manipulating participants' momentary affective states (Study 2) and by making participants expect an upcoming discussion of a difference in opinion with an unknown person (Study 3). We ensured the effectiveness of our experimental manipulations across age groups with the help of manipulation checks.

In addition, we studied whether momentary affective states actually changed from before to after music listening and whether these changes were specific to music listening or were a result of listening to auditory input per se. To this end, we included an additional control condition in Study 3 where a group of participants listened to non-musical sound material instead of music pieces.

Based on the theoretical considerations and empirical evidence reviewed above, we hypothesized that individuals from different age groups differ in their *a-priori* preference for music selections. The older participants were, the more we expected them to prefer listening to positive low-arousal music (Hypothesis 1, Studies 2 and 3). We also expected music-listening choices to be effective means of affect regulation. That is, we expected affective changes in participants from before to after music browsing (Hypothesis 2, Studies 2 and 3). Finally, we predicted this effect to be specific to music listening, that is, to be distinguishable from within-person affect fluctuations during auditory perception of non-musical sound stimuli (Hypothesis 3, Study 3).

Study 1: Paradigm Development

In order to investigate age-related differences in music listening as an indicator of affect-regulatory preferences, it was first necessary to develop a tool that allows continuous monitoring of music-listening choices in an experimental setting. This tool further had to accommodate age differences in musical taste. With this aim, we developed a music browsing paradigm that is a user interface for the choice of music to listen to from a selection of pieces in various musical styles and valence and arousal levels. The music browser was modeled such that it resembled typical interfaces people use to listen to music in everyday situations (e.g., from CDs, MP3s, or online music databases using a smartphone). We also developed a sound-browsing paradigm as a parallel control task. The sound browser follows the same logic as the music browser, but includes non-musical auditory stimuli of neutral valence and arousal levels. For both songs and sounds, we aimed to include an age-fair selection of stimuli, that is, affective songs and neutral sounds that individuals of different age groups would perceive similarly with respect to their levels of valence, arousal, and familiarity.

Study 1: Method

The paradigm development followed a three-step procedure. We first pre-selected a large number of songs and sounds that were subsequently rated by individuals of various age groups on a number of dimensions. Based on these ratings, we then selected prototypical affective song and neutral sound exemplars that fulfilled our requirements of age fairness as described below. These selections were then incorporated in the age-fair music and sound browsing tasks used in Studies 2 and 3.

Step 1: Music and Sound Pre-Selection

Three members of our research team with high musical expertise (i.e., musical education and several years of professional music engagement) pre-selected 468 *songs* varying strongly in arousal and valence (high vs. low arousal, positive vs. negative valence), date of origin, and musical style to accommodate individual and age differences in musical taste and familiarity. About 60 songs belonged to each of eight musical styles (classical, jazz, pop, rock, heavy metal, electronic, hip-hop/RnB, folk/country). Preselected songs varied in publication date from 1607 to 2009 for classical music, and from 1940 to 2011 for the other musical styles. Song durations were edited so that they would not exceed a maximum of 5 minutes. The overall mean duration was 3.41 minutes (*SD* = 0.85).

Three other members of our research team further pre-selected 381 *sounds* by systematically searching through the following databases and online resources: International Affective Digitized Sounds (IADS; Lang & Bradley, 2007), Hörspielbox (http://www.hoerspielbox.de/frameset.htm), Brickfilms (http://brickfilms.com/resources), Salamisounds (http://www.salamisound.de), Freesound (http://www.freesound.org/index.php), and Audiyou (http://www.audiyou.de/index.html). All sounds were selected to meet the following criteria: (a) neutral valence and arousal (i.e., neither particularly negative or positive, nor particularly activating or deactivating), (b) fitting one of the following four categories: urban (e.g., weekly market), rural (e.g., softly splashing water), frequent/daily life (e.g., coffee machine), infrequent/exceptional (e.g., church bells).

Sounds shorter than 60 seconds were looped so that the duration of all sounds reached a mean value of 1.42 minutes (*SD* = 0.64).

Step 2: Music and Sound Ratings

Fifty participants (50% female) who were about equally distributed across five age groups (12–17, 18–29, 30–44, 45–59, and 60–80 years; mean age of 38.70 years, *SD* = 20.27 years) evaluated all pre-selected songs and sounds with regard to their perceived levels of *valence, arousal*, and *familiarity*. Each participant listened to 468 songs and 381 sounds in about eight age-homogeneous group sessions with approximately 100 songs and sounds per session presented in randomized order. The perceived level of valence was assessed on a 7-point rating scale ranging from -3 (heavy, dark) to +3 (bright, light), and the perceived level of arousal was assessed with a 7-point rating scale ranging from -3 (calm, relaxing) to 3 (agitated, activating). Additionally, participants answered questions concerning the familiarity ("How often have you heard this song / this kind of sound before?") using a rating scale ranging from -3 (never) to 3 (very often).

To ensure that ratings were not unduly distorted by potentially impaired hearing, we excluded people with hearing devices or diagnosed hearing impairments and additionally measured the hearing ability of all participants simultaneously for both ears based on the Hughson-Westlake procedure (Carhart & Jerger, 1959). All participants had hearing above the critical levels of > 46 dB for 250 Hz, > 31 dB for 500 Hz, > 33 dB for 1000 Hz, > 40 dB for 2000 Hz, and > 45 dB for 3000 Hz (Stenklev & Laukli, 2004; Wiley, Chappell, Carmichael, Nondahl, & Cruickshanks, 2008). Moreover, to avoid differences in music perception due to varying levels of musical expertise and interest, we ensured that all participants were musical laypersons, but interested in music. On a six-point rating scale from 1 (not at all true) to 6 (completely true), participants reported a relatively low level of musical practice ("I can play an instrument/several instruments well"; *M* = 2.39, *SD* = 2.46), a moderate knowledge of music (“I possess substantial musical knowledge”; $M = 2.86$, $SD = 1.49$), and strong interest in music (“I am very interested in music”; $M = 4.58$, $SD = 1.48$).

Participants were recruited from the participant database of the Max Planck Institute for Human Development in Berlin, Germany, and gave their informed consent. They received an expense allowance of 135 EUR (approximately $152) after the last testing session. Participation in this study was voluntary and could be terminated at any time with a proportional compensation of expenses. The study was approved by the ethics committee of the Max Planck Institute for Human Development in Berlin, Germany.

Study 1: Results and Discussion

Music and Sound Selection: Establishing Content Validity and Age Fairness of Stimuli

Music selection. Our aim was to identify an age-fair selection of prototypical representatives for each quadrant of the circumplex model (i.e., positive valence & high arousal, positive valence & low arousal, negative valence & high arousal, negative valence & low arousal). To accommodate age differences in music-listening habits and preferences, we ensured that all musical styles mentioned above were equally represented in all four quadrants, and that familiarity with the music selection as a whole did not differ between individuals from different age groups. To this end, we selected music pieces based on the participants’ ratings of their valence, arousal, and familiarity. The selection criteria were as follows: (a) Selected songs unambiguously fell within one of four valence–arousal quadrants, with mean ratings of valence and arousal being ≤ -0.5 or $\geq +0.5$ on a 7-point rating scale from -3 to +3. (b) Valence and arousal ratings of selected songs showed no significant differences between listeners from various age groups ($p > .05$). (c) Selected songs included a broad variety of musical styles and years of release, and average familiarity ratings did not differ between age groups ($p > .05$).

As a result, 128 songs with 32 songs per quadrant, that is, 4 songs from each of the 8 musical styles, fulfilled these selection criteria. Statistical analyses confirmed that the selection of songs showed the intended levels of valence and arousal for each quadrant: Quadrant A (negative valence & high arousal), mean valence = -1.06 (*SD* = 0.42) and mean arousal = 1.36 (*SD* = 0.47); quadrant B (positive valence & high arousal), mean valence = 1.11 (*SD* = 0.39) and mean arousal = 1.16 (*SD* = 0.50); quadrant C (negative valence & low arousal), mean valence = -0.81 (SD = 0.37) and mean arousal = -1.00 (*SD* = 0.44); quadrant D (positive valence & low arousal), mean valence = 0.78 (*SD* = 0.37) and mean arousal = -0.72 (*SD* = 0.44).[1] Average song familiarity was moderate with a mean value of 0.63 (*SD* = 0.62). A multivariate analysis of variance (MANOVA) with the within-person centered factors valence, arousal, and familiarity of songs per quadrant as dependent variables and with the between-person factor age group did not yield evidence for significant differences between age groups with regard to the perceived level of the songs' valence, $F(4,45) = 0.32$, $p = .86$, $\eta^2 = .03$, arousal, $F(4,45) = 2.61$, $p = .50$, $\eta^2 = .18$, and familiarity, $F(4,45) = 1.53$, $p = .21$, $\eta^2 = .12$.

Sound selection. The purpose of sound selection was to compile an age-fair selection of affectively neutral non-musical auditory stimuli for an active control task in Study 3. For the selection of appropriate sounds we applied the same logic of criteria for age fairness as for the selection of songs: (a) Selected sounds were affectively neutral, with mean ratings of valence and arousal ≥ -0.5 and ≤ +0.5 on a 7-point rating scale from -3 to +3, respectively. (b) Valence, arousal, and familiarity ratings of selected sounds showed no significant differences between listeners from various age groups ($p > .05$). To parallel the assignment of songs to the four quadrants of the circumplex model, sounds were classified into four content categories (urban, rural, frequent/daily life, infrequent/exceptional).

The final selection consisted of 80 sounds in total and 20 sounds within each category. Category A (urban) contained sounds with a mean valence of 0.08 (*SD* = 0.57) and mean arousal of 0.54 (*SD* = 0.27); category B (rural) contained sounds with a mean valence of 0.04 (*SD* = 0.61) and mean arousal of -0.07 (*SD* = 0.49); category C (frequent/daily life) contained sounds with a mean valence of 0.19 (*SD* = 0.46) and mean arousal of 0.19 (*SD* = 0.60); and category D (infrequent/exceptional) contained sounds with a mean valence of 0.34 (*SD* = 0.34) and mean arousal of 0.51 (*SD* = 0.36). As expected, the average familiarity across all sounds was moderate, *M* = 0.47 (*SD* = 0.54).

To test the age fairness of our final sound selection, we computed a MANOVA with the within-person centered factors valence, arousal, and familiarity of sounds per category as dependent variables and with the between-person factor age group. Results showed non-significant differences between age groups for the perceived level of the sounds' valence, $F(4,45) = 0.73$, $p = .58$, $\eta^2 = .06$, arousal, $F(4,45) = 0.49$, $p = .75$, $\eta^2 = .04$, and familiarity, $F(4,45) = 1.89$, $p = .13$, $\eta^2 = .14$.

In sum, our findings confirm that we were successful in the age-fair selection of songs varying in valence and arousal levels, and of sounds that express comparably neutral levels of valence and arousal across the four content categories and that are equally familiar to individuals from various age groups.

The Music Browser: Functionality

The music browser was programmed in the experimental software E–Studio (Schneider, Eschmann, & Zuccolotto, 2012). It allows free browsing in the pool of pre-selected music pieces and continuously records users' browsing behavior (i.e., time spent listening to the various music pieces). The browsing procedure includes a three-step process, and the users can freely change their selections at any time.

In a first step, users choose a valence–arousal quadrant. To this end, four categories appear, labeled as collections a, b, c, and d. These collections are described by the anchors of the valence and arousal dimensions as either “heavy/dark” or “light/bright” (valence dimension) and as either “calm/relaxing” or “agitated/activating” (arousal dimension). Having selected the collection (quadrant) they would like to listen to, users are presented with a second screen prompting them to select a musical style. In a third step, a screen with a list of consecutively numbered songs from the selected quadrant and musical direction appears. The list does not contain any information on the title or artist performing the songs. Users can freely browse the songs from this list; selecting and listening to songs for as long or as briefly as they like. They can change their selection between quadrants (collection a, b, c, d), music styles, or songs at any time and can also adjust the volume to fit their preferences using buttons with plus and minus signs presented in the lower right corner.

The Sound Browser as a Control Task for Study 3

The sound browser was also programmed in E–Studio (Schneider et al., 2012) and shows a similar visualization and composition of options as the music browser, but includes the selection of the affectively neutral non-musical sounds described above as stimuli. In a first step, users are prompted to choose among four categories labeled as collections a, b, c, and d, and described along the two dimensions urban vs. rural and frequent/daily life vs. infrequent/exceptional. After selecting a collection, a list of consecutively numbered sounds pertaining to the previous selection appears for free browsing. As described for the music browser, changing the selection at any step of the procedure is possible at any time, and the volume is adjustable.

Study 2: Age-Related Differences in Music Browsing Behavior after Mood Induction

The purpose of Study 2 was to compare music-listening choices of individuals from different age groups to provide a behavioral indicator of their affect-regulatory preferences while experiencing affective states varying in valence and arousal levels. To this end, we monitored participants' music-selection behavior with the help of our music browser (see Study 1) in an age-heterogeneous sample after a mood induction. In order to reliably and comparably induce affective experiences varying in arousal and valence levels in individuals from different age groups, we modified the *Bingo game* (adjusting a paradigm first developed by Schaefer, Riediger, Li, & Lindenberger, 2017). Arousal was manipulated by varying the difficulty level and time pressure of this task, and valence, by providing bogus (positive or negative) performance feedback.

Study 2: Method

Sample and Procedure

The sample consisted of *N* = 222 participants, and was nearly equally balanced in gender across four age groups ranging from adolescence to old adulthood[2] (Table 3). Participants had hearing above the critical hearing thresholds (cf. Study 1) and were musical laypersons with a relatively low level of musical practice (*M* = 2.08, *SD* = 2.42), moderate musical knowledge (*M* = 2.86, *SD* = 1.75), and strong interest in music (*M* = 4.44, *SD* = 1.58).

The study consisted of a three-hour testing session with two to four participants from the same age group. Participation was reimbursed with 25 Euro (approximately $34). Participants were initially told that the purpose of the study was to investigate cognitive and emotional reactivity. After receiving information about the study and providing written consent, participants filled out a short demographic questionnaire and received instructions on, and practiced handling of, the music browser, which was introduced as an ostensibly unrelated secondary aspect of the study to be worked on in a later part of the session.

Then, participants completed three trials of the *Bingo game*. In each trial, ten target numbers, one after the other, were presented acoustically via headphones and shown visually at the top of a computer screen. The participants' task was to search for the presented target in a group of digits presented on the same screen, and to mouse-click on all identified targets. After participants had clicked on a target, it turned into a cross for 0.5 seconds before it disappeared and the remaining to-be-searched digits on the screen were re-arranged (thus disguising participants' actual task performance and making bogus performance feedback plausible). To manipulate the valence and arousal of participants' mood, they were randomly assigned to one of four conditions (described in more detail below), varying in task difficulty, time pressure, and bogus performance feedback. The age fairness of the *Bingo game* was established in a pre-study (see Appendix A for details).

Immediately before and after the *Bingo game,* participants reported their current level of contentment and tension. After the game was over, they were told that the experimenter needed some time to prepare the following tasks and that they should browse freely through the music selection of the music browser (developed in Study 1) to bridge the waiting time. During that time, the experimenter prevented any interaction with and between participants. After ten minutes, the music browser stopped and participants again reported how content and tense they currently felt. Following that, the experimenter debriefed participants about the experimental deception (i.e., about the initially disguised aim of this study and the bogus feedback participants had received after the *Bingo game*). As part of a larger assessment protocol, participants subsequently performed a perceptual information-processing speed test and a verbal intelligence test, and answered questions on depressive symptoms and musical expertise. The study was approved by the ethics committee of the Max Planck Institute for Human Development in Berlin, Germany

Mood Induction

The experimental design included a randomly assigned mood induction procedure manipulating the valence and arousal of participants' experiences in four conditions of the *Bingo game*: (a) negative & tense, (b) positive & tense, (c) neutral & tense, and (d) neutral & relaxed (see Figure 1).

The *valence* of participants' mood (positive, negative, neutral) was manipulated via bogus performance feedback, which was ostensibly generated automatically and shown on the computer screen immediately after the game. In the negative valence conditions, participants were told that they had performed poorly and could improve in comparison to the other participants in this study. In the positive valence condition, they were told that their performance was excellent and that they had achieved one of the best results in comparison to the other participants in this study. In the neutral valence condition, participants were told that they had performed as well as most other participants.

In order to induce different levels of *tense arousal* (Thayer, 1989), we varied the time pressure during the game as well as its difficulty by altering the number of digits among which the target had to be found. In the tense-arousal condition, participants had to finish the three trials of the game under time pressure (5.5 ms per called-out target) and with increasing difficulty levels (i.e., a decline in the average age-adjusted hit probability from about 75% in the first, to about 50% in the third trial). In the low-arousal condition, in contrast, participants had sufficient time per trial (11 ms), and the task difficulty remained constant at an average age-adjusted hit probability of about 90%. To keep the subjective task difficulties across trials and conditions comparable between participants from different age groups, despite age differences in sensory-motor speed, difficulty levels were adjusted to age-specific performance levels as established in the pre-study (see Appendix A for details).

========== Insert Figure 1 about here ==========

Measures

Perceptual and verbal skills. Perceptual skills were assessed via the paper-and-pencil version of the Symbol Digit Test (SDT; Lang et al., 2007). The SDT is a perceptual information-processing speed test where participants match numbers to symbols within 90 seconds with a legend of the corresponding numbers and symbols shown above the items. To assess verbal intelligence, participants answered the German multiple choice vocabulary test (MWT-A; Lehrl et al., 1992). In the MWT-A, participants have to identify the correct word among four other non-words in each item for a total of 36 items, sorted by increasing difficulty. Performances in the perceptual speed test and in the verbal intelligence test (Table 1) showed results in the expected range for each age group (cf. Sheridan et al., 2006).

Depressive tendencies. To prevent possible effects on affective experiences due to emotional disorders, we assessed depressive tendencies using the 15-item version of the German depression scale (ADS-K; Hautzinger & Bailer, 1993). Participants were asked to indicate how often they had experienced different negative affective states (e.g., lonely, sad, anxious) during the last week on a four-point rating scale from 0 (rarely) to 3 (mostly). As shown in Table 1, mean depressive-tendency scores for each age group of our sample (N = 222) remained within the expected normative limits.

Momentary affect. Participants reported their momentary affective states at three points in time: before and after the mood manipulation and again after the 10 minutes of free music browsing (referred to here as T1, T2, and T3, respectively). Contentment ("content") and tension ("tense") served as indicators for the experience of positive valence and tense arousal in line with the intended mood manipulation effects. Both items were rated on a 7-point rating scale from 0 (not at all) to 6 (totally).

Music browsing behavior. We used the music browser developed in Study 1 as a behavioral indicator of affect-regulatory preferences. Participants freely browsed our music selection for 10 minutes, after having completed the *Bingo game* in one of the four mood induction conditions. The relative amounts of time spent listening to music with varying levels of valence and arousal represented the dependent variables in the analyses reported below.

========== Insert Table 1 about here ==========

Study 2: Results

Mood Induction: Manipulation Check

As a manipulation check to test whether the mood induction procedure had the intended effects, we analyzed participants' reports from before (T1) and after (T2) the *Bingo game* on how content and tense they currently felt. First, we ran analyses to confirm that participants' current affect did not differ between the randomly assigned experimental conditions at T1 (i.e., before the mood induction). Second, we tested whether the experimental conditions differed in the expected directions with regard to participants' within-person changes of momentary affect from T1 to T2 (i.e., from before to after the mood induction). Taken together, our findings confirm that the mood induction procedure had the intended effects in all investigated age groups, as described below.

No differences between conditions in momentary affect at T1. As expected, results of two ANOVAs showed no significant differences between conditions at T1 (i.e., *before* the mood induction) regarding participants' reports of contentment, $F(15, 209) = 0.98$, $p = .40$, $\eta^2 = .01$, and tension, $F(15, 209) = 1.42$, $p = .24$, $\eta^2 = .02$, at T1 (cf. Table 2).

Differences between conditions in within-person changes in momentary affect from T1 to T2. We additionally conducted two ANOVAs with the within-person changes of contentment and tension as dependent variables and the experimental condition as well as participants' age group as between-person factors. As expected, within-person change scores for feeling content (see Figure 2a) and tense (see Figure 2b) differed significantly and in the expected directions between conditions with $F(3, 218) = 18.38$, $p < .001$, $\eta^2 = .20$ for contentment, and $F(3, 218) = 3.91$, $p = .009$, $\eta^2 = .05$ for tension. There were no significant effects of age group for the change in contentment, $F(3, 218) = 0.28$, $p = .84$, $\eta^2 < .01$, or in tension, $F(3, 218) = 0.29$, $p = .83$, $\eta^2 < .01$.

Taken together, results from these manipulation checks indicate that the mood induction was successful and equally effective across age groups.

========== Insert Figure 2 about here ==========

Age Differences in Music Browsing Behavior

We conducted a two-way repeated measures ANOVA to compare the effects of age group and mood condition on total browsing time for music pieces within each of the four valence–arousal quadrants (in %). Results revealed a significant main effect of age group only (Table 2). In other words, music browsing behavior differed between age groups, but not between mood conditions. As expected, we found significant interactions between age group and music valence, age group and music arousal, as well as between age group, music valence, and music arousal. In line with Hypothesis 1, the time spent listening to music of positive valence (Fig. 3a) and low arousal (Fig. 3b) increased with age. Post-hoc Tukey tests showed that older adults spent significantly more time than all other age groups listening to music pieces with positive valence (ps < .04), and significantly more time than adolescents and young adults (ps < .01), but not middle-aged adults ($p = .27$), listening to music with low arousal. Additionally, adolescents and middle-aged adults differed significantly in the time spent listening to music with low arousal (with middle-aged adults browsing low-arousal music longer than adolescents, $p < .01$). Effects were robust when entering depressive tendencies to the model as a control variable, and the depression score had no significant effect on the music browsing behavior with ps > .05.

========== Insert Table 2 about here ===========

========== Insert Figure 3 about here ==========

Changes in Momentary Affect from Before to After Music Browsing

To investigate whether music browsing was associated with changes in affective experiences (Hypothesis 2), we analyzed the difference in experienced contentment and tension between mood conditions at T2 (after the manipulation check, but before music browsing) and compared these to differences between conditions at T3 (after music browsing). We also investigated the within-person change of contentment and tension from before (T2) to after (T3) music browsing.

Differences between conditions in momentary affect at T2 and T3. At T2, *after* mood induction but *before* music browsing, individuals in the four conditions differed significantly in how content, $F(3, 218) = 19.78$, $p < .001$, $\eta^2 = .21$, and how tense they felt, $F(3, 218) = 2.93$, $p = .03$, $\eta^2 = .04$ (cf. Figure 2). Further confirming the intended effects of the mood induction, a post-hoc Tukey test showed that at T2, participants in all four conditions differed significantly from one another in contentment ($p < .05$) except for those in the “negative & tense” and “neutral & tense” conditions ($p = .22$). Participants in the “neutral & relaxed” condition reported significantly lower levels of tense arousal than participants in the three “tense” conditions ($p < .03$). There was no evidence of age differences in the effectiveness of the mood induction for contentment, $F(15, 209) = 1.31$, $p = .27$, $\eta^2 = .02$. For tension, however, a significant age effect emerged, $F(15, 209) = 6.17$, $p < .001$, $\eta^2 = .08$, indicating that older adults experienced a significantly higher level of tension at T2 than adolescents and young adults did ($p < .03$).

Further analyses revealed that these differences between the four *Bingo game* conditions in affective experiences right after mood induction (i.e., at T2) had dissipated after ten minutes of music browsing at T3: There was a non-significant main effect of condition, $F(15,209) = 2.35$, $p = .06$, $\eta^2 = .03$, a non-significant main effect of age group, $F(15,209) = 0.99$, $p = .40$, $\eta^2 = .01$, as well as a non-significant interaction of Mood condition × Age group, $F(15,209) = 0.70$, $p = .71$, $\eta^2 = .02$ on contentment, indicating that there were no significant differences due to mood condition in the experience of positive affect after music browsing. For the experience of tension at T3, results showed a non-significant main effect of mood condition, $F(15,209) = 1.72$, $p = .16$, $\eta^2 = .02$, as well as a non-significant interaction of Mood condition × Age group, $F(15,209) = 1.62$, $p = .11$, $\eta^2 = .06$, but a significant main effect of age group, $F(15,209) = 7.18$, $p < .01$, $\eta^2 = .09$. A post-hoc test showed that older adults reported less tension at T3 than participants from all other age groups did, and that this was the case irrespective of mood condition ($p < .02$). This finding is remarkable in light of the fact that older adults had reported more tension at T2, before music browsing, than adolescent and young adult participants had, as reported above.

Within-person changes in momentary affect from T2 to T3. Experienced contentment differed significantly between T2 and T3 (before and after music browsing) in the three tense-arousal conditions. Participants in the “negative & tense” and “neutral & tense” conditions showed a significant increase in their experienced contentment, while participants’ contentment in the “positive & tense” condition decreased significantly (see Table 2). In contrast, contentment changes were not significant in the “neutral & relaxed” group. These findings can be explained by an already high level of contentment in the “positive & tense” and “neutral & relaxed” condition *before* music browsing (T2), which participants in the other conditions only reached after music browsing (T3). Moreover, individuals’ levels of tension in all conditions significantly decreased from before to after music listening, as expected (see Table 3). Taken together, these findings indicate that participants’ momentary affective experiences changed significantly in the ten minutes of music browsing across all mood conditions and all age groups, as predicted by Hypothesis 2.

========== insert Table 3 about here ==========

Study 2: Summary and Discussion

Taken together, Study 2 confirmed the expected age differences in music browsing behavior with regard to both the valence and the arousal dimension of selected music pieces (Hypothesis 1): Older adults listened to positive and low-arousal music for longer than participants from the other age groups did. This was the case across all four experimental conditions. Behaviorally, this confirms patterns of affective preferences (i.e., an age-related increase in preferences for positive low-arousal states) observed in previous studies using self-reports (Mares et al., 2008; Riediger et al., 2009; Scheibe et al., 2013) or attention tasks (Isaacowitz et al., 2008).

Results also showed that music listening was accompanied by changes in affective experiences, pointing to potential mood-regulatory effects of music listening (Hypothesis 2). While reports of experienced contentment and tension right after mood induction differed significantly between conditions, no differences in affective states were evident between conditions after 10 minutes of music browsing. A possible interpretation of these findings is consistent with the Affect Infusion Model (AIF; Forgas, 1995), which states that individuals aim to return to an affective baseline if they have experienced especially strong positive or negative affect. An alternative interpretation, however, which cannot be ruled out with the data available from Study 2, is that the change in affective states from before to after browsing was simply due to the passage of time and had nothing to do with listening to music. This alternative explanation was explored and extended in Study 3.

Study 3: Age-Related Differences in Music Browsing Behavior When Expecting an Upcoming Discussion of a Difference in Opinion

Study 3 focused on the replication of age-related differences in affect-regulatory preferences found in Study 2 in an independent sample and for another affectively relevant situation, namely interpersonal context. To create an interpersonal affectively relevant situation, participants were led to expect that they were to discuss a difference of opinion on a social dilemma with another participant. Additionally, the experimental approach of Study 2 was extended by an active control condition (sound browsing) to shed light on the efficacy of music browsing for the change of affective states and to rule out the alternative assumption that the mere passage of time accounted for changes in affect in Study 2.

Study 3: Method

Sample and Procedure

The sample consisted of *N* = 149 participants from four different age groups (12–17, 18–29, 40–50, 60–75 years, *M* = 38.23 years, *SD* = 21.16), with equally balanced gender distributions within the age groups (51% male). Similar to Studies 1 and 2, participants' hearing was above the critical thresholds (cf. Study 1) and they were musical laypersons with a relatively low level of musical practice (*M* = 2.33, *SD* = 2.47), moderate musical knowledge (*M* = 2.56, *SD* = 1.62), and strong interest in music (*M* = 4.19, *SD* = 1.66). They were randomly assigned to one of two paradigms with *N* = 73 participants (mean age = 38.08, *SD* = 21.44) allocated to the music browsing, and *N* = 76 participants (mean age = 38.37, *SD* = 21.02), to the sound-browsing paradigm, respectively. All participants were recruited via the participants' database of Max Planck Institute for Human Development in Berlin, Germany. Testing sessions were conducted in the institute's lab, individually or in groups of two with durations of approximately 3 hours per session and a reimbursement of 25 EUR (approximately $34).

The participants were told that the purpose of this study was to investigate spontaneous conversation behavior between individuals unknown to each other. After giving their informed consent, participants answered a short demographic questionnaire and received instructions on handling the music or sound browser, which was introduced as being part of an allegedly unrelated project. Then, participants were confronted with a social-dilemma problem. They were instructed to first form their own opinion that they would discuss with another participant later. The social dilemma required deciding how to spend the development-aid budget of a club by choosing one of three morally acceptable opportunities with similar advantages and disadvantages (stipends for two different individuals or alternatively the renovation of the clubhouse). To ensure that all participants identified strongly with their own decision, they were asked to evaluate the consequences of their decision thoroughly and to note down their reasons for it. They were then given their ostensible conversation partner's response sheet, which endorsed a different decision than their own. Interpersonal goals for the anticipated discussion were manipulated by varying instructions regarding the strategies that participants were to employ (separation, neutral, affiliation; referred to below as goal condition). This manipulation was successful, but is not relevant for the research questions and findings reported in the present paper (see Appendix B for a detailed description of this additional aspect of the investigation). After being instructed for the discussion, participants were allowed to use the music or sound browser for ten minutes, allegedly to pass time until the other participant was available for the discussion. Participants then answered short questionnaires containing the manipulation check and other control variables within a larger assessment. Finally, they were debriefed about the purpose of the experimental manipulation and told that no conversation would take place, before receiving their reimbursement. The study was approved by the ethics committee of the Max Planck Institute for Human Development in Berlin, Germany.

Measures

Perceptual and verbal skills. We assessed the participant's perceptual and verbal skills as described in Study 2.

Social anxiety. As a control variable, the participants answered 6 of 20 items from the German Social Interaction Anxiety Scale (SIAS; Stangier, Heidenreich, Berardi, Golbs, & Hoyer, 1999: adopted from Safren, Turk, & Heimberg, 1998). The items were selected in order to assess participants' social anxiety with regard to the anticipated interaction with a conversation partner (e.g., "I am nervous when meeting people I do not know well").[3]

Momentary affect. As in Study 2, participants reported their momentary affective states at the beginning of the study as well as before, and again after the 10 minutes of music or sound browsing (i.e., at T1, T2, and T3, respectively). To accommodate participants' potentially multi-faceted affective responses to the experimental situation in Study 3, affect items in Study 3 were extended as compared to Study 2 so that the assessments involved 10 items in total. Participants indicated their momentary experienced level of positive high-arousal (joyful, determined), positive low-arousal (content, confident), negative high-arousal (nervous, agitated), negative low-arousal (depressed, ruminative) as well as tense arousal (tense, relaxed). Items were responded to on a 7-point rating scale ranging from 0 (not at all) to 6 (totally).

Music browsing behavior. We took the time spent listening to music with varying levels of arousal and valence as an indicator of affect-regulatory preferences as described in Study 2.

Sound browsing behavior. In Study 3, we implemented the sound browser (see Study 1) as a control condition for the music browser. Participants in the sound condition browsed freely through affectively neutral sounds over the same 10-minute period.

========== Insert Table 4 about here ==========

Study 3: Results and Discussion

Age Differences in Music Browsing Behavior

We conducted a two-way repeated measures ANOVA to compare the effects of age group (adolescents, young adults, middle-aged adults, older adults) and goal condition (separation, neutral, affiliation; see Appendix B) on the time spent listening to music according to the within-person factors of valence (positive, negative) and arousal (high, low). As shown in Table 5, age group had a significant effect on music browsing behavior that was independent of the goal condition. The interactions of valence with age group and arousal with age group were also significant. To follow up on the interactions of age group with valence and arousal, we conducted paired-sample *t*-tests. Regarding valence preferences (see left panel of Figure 4), results indicate that older and middle-aged adults spent significantly more time listening to music with positive valence than young adults did, $ps < .01$ (Figure 4a). Unexpectedly, adolescents did not differ significantly from any of the other age groups in time spent listening to music with positive or negative valence, $ps > .36$. Regarding arousal preferences (see right panel of Figure 4), results reveal that older adults spent significantly more time listening to music with low arousal than middle-aged adults and adolescents did (*p*s < .01) whereas young adults did not differ significantly from the other age groups in time spent listening to music with high or low arousal, *p*s > .40. These results are quite consistent with the findings of Study 2 and further substantiate our prediction of Hypothesis 1 regarding age-related differences in the preference for music with varying levels of valence and arousal.

========== Insert Table 5 about here ==========

========== Insert Figure 4 about here ==========

Changes in Momentary Affect from Before to After Music and Sound Browsing

To test our predictions in Hypotheses 2 and 3 (efficacy of music listening as affect-regulatory behavior), we analyzed differences between music- and sound-browsing conditions regarding changes in participants' momentary affective states from before to after browsing (T2–T3).

First, a MANOVA with goal condition, browsing condition (music vs. sounds), and age group as between-person factors on the change of momentary affect from T2 to T3 was conducted. The main effect of goal condition, the interaction of goal-by-browsing condition and age group for the change of current affect were non-significant at $p > .05$. Furthermore, we observed a significant main effect of browsing condition for the change in positive high-arousal, $F(6,142) = 5.10$, $p = .03$, $\eta^2 = .03$, as well as for the change in tension, $F(6,142) = 4.20$, $p = .04$, $\eta^2 = .03$, but non-significant results for the change in positive low-arousal, $F(6,142) = 0.37$, $p = .54$, $\eta^2 < .01$, in negative high-arousal, $F(6,142) = 0.01$, $p = .95$, $\eta^2 < .01$, as well as in negative low-arousal, $F(6,142) = 0.02$, $p = .90$, $\eta^2 < .01$. Hence, individuals who had browsed music increased significantly more in positive high-arousal ($M_{T3-T2} = 0.41$, $SD = 1.32$) and decreased more strongly in tension ($M_{T3-T2} = -0.56$, $SD = 1.00$) during the browsing period than those who had browsed sounds (positive high-arousal: M_{T3-T2} = -0.12, *SD* = 1.49; tension: M_{T3-T2} = -0.18, *SD* = 1.20). These findings indicate that across goal conditions, individuals experienced a significantly greater increase in positive high-arousal and a significantly greater decrease in tense arousal while listening to music as compared to listening to sounds, thus confirming Hypotheses 2 and 3.[4]

Study 3: Summary and Discussion

Overall, Study 3 replicated the findings of Study 2, indicating an age-related increase in the preference for music with positive valence and low arousal. As assumed in Hypothesis 1, older adults spent a significantly longer period of time listening to music with positive valence and low arousal than adolescents and younger adults did. Middle-aged adults only differed from older adults in the time spent listening to music with high arousal (Figure 4), indicating that the change in preference for positive valence might already become pronounced in middle age while the preference for low arousal may only become evident in older age.

Results on affect changes from before to after music browsing support the efficacy of music browsing as an affect-regulatory behavior, as expected in Hypotheses 2 and 3. While participants in the music browsing condition showed the expected changes in affective experiences towards a rather positive and less tense state, participants listening to neutral sounds showed no significant changes in the experience of positive high-arousal as well as tension.

General Discussion

This research was guided by an interest in age-related differences in behavioral manifestations of affect-regulatory preferences as indicated by music listening choices. Earlier research is extended by implementing a new age-fair music browsing paradigm (developed in Study 1) as a behavioral indicator of affect-regulatory preferences akin to everyday life experiences of individuals from different age groups. We used this paradigm in two studies with age-heterogeneous samples and measured music browsing behavior after induction of various affective states (Study 2) and after activation of different interpersonal goals (Study 3).

In line with our predictions from Hypothesis 1 and with previous findings (e.g., Carstensen & Mikels, 2005; Keil & Freund, 2009), participants in Studies 2 and 3 showed significant age-related differences in their music preferences regarding both the valence and the arousal dimension. As predicted, the preference for positive low-arousal music increased with participants' age in both studies. These findings support previous results on age-related differences in affect regulation motivation (e.g., Riediger et al., 2009) and extend this research by implementing music selection as an everyday behavioral indicator of affect-regulatory preferences. The only inconsistency between the results of Study 3 and those of Study 2 appeared for the middle-aged adults: They showed a similar browsing behavior as the older adults in Study 2, namely spending more time listening to music with positive valence and low arousal, while their preference for low-arousal music was not pronounced in Study 3. Accordingly, future studies need to establish precisely when the shifts of preferences for different levels of valence and arousal occur during adulthood. In line with previous research, results of the present studies confirm a significantly lower preference for negative affect in old age (e.g., Charles, Reynolds, & Gatz, 2001; Reed, Chan, & Mikels, 2014). The previous research has mostly focused on the valence dimension only, but awareness has recently been growing that the arousal dimension of affective experiences might be equally important as understanding age differences in affective preferences (Charles, 2010). The present findings of an age-related increase in the preference for low-arousal stimuli corroborate these assumptions and offer useful hints for the further investigation of longitudinal changes in arousal preferences across adulthood.

Beyond that, the results of Studies 2 and 3 indicate that the valence and arousal levels of participants' affective experiences changed significantly while listening to music. This suggests that music browsing was indeed an effective means of affect regulation, as predicted by Hypothesis 2. In Study 2, the differences in affective experiences between mood conditions at T2 (after mood induction and before browsing) had disappeared by T3 (after browsing), such that inter-group differences in experienced contentment and tension leveled out (towards an overall relatively high level of contentment and a relatively low level of tension). Thus, the present findings can be interpreted in line with previous findings suggesting that individuals reverse their currently experienced mood toward mood-incongruent responses to correct for an emotional bias (Forgas, 1995; Forgas & Ciarrochi, 2002). These mood effects of music browsing did not differ between participants from different age groups. This is interesting given the age differences in music browsing preferences described above. One possibility is that mood effects of music browsing might differ between age groups. It has been argued, for example, that younger individuals might be motivated to intensify momentary negative affect in the short term by listening to negative music as a strategy to enhance positive affect in the long term (Hunter, Schellenberg, & Griffith, 2011; Miranda & Claes, 2009; Van den Tol & Edwards, 2013). It remains an interesting task for future studies to disentangle such potential age-differential effects of music-listening choices on changes in affective experiences.

Furthermore, it became evident that older adults' levels of tension were reduced more strongly from before, to after music browsing than the other age groups'. These findings support results from other studies suggesting a more effective mood repair among older adults after experiencing negative affective states (e.g., Kliegel, Jäger, & Philipp, 2007), but extend them to the arousal dimension. Our findings are also consistent with propositions of the SAVI model (Charles, 2010), which claims that older adults seek to avoid high-arousal states. They suggest that when avoidance of tension is not possible, older adults might be particularly motivated to reduce experienced tension and more effective in doing so.

We also took up the question of efficacy of music browsing by comparing changes in affective states between individuals listening to affective music and those listening to neutral sounds. As predicted in Hypothesis 3, participants in the music browsing condition in Study 3 changed significantly in their affective experiences from before to after browsing, such that experiences of positive high-arousal were enhanced, and experiences of tense arousal decreased. In contrast, participants in the sound-browsing control condition in Study 3 showed no significant changes in their complementary momentary affective experiences from before to after listening to sounds. The present findings bring valuable evidence to the previously discussed challenge of interrelating assumed affect-regulatory behavior with corresponding changes in actual affective experience (e.g., Isaacowitz & Blanchard-Fields, 2012; Mather & Carstensen, 2005). Evidence from the presented studies highlights music browsing behavior as a reliable indicator of affect-regulatory preferences that lead to changes in current affect from before to after browsing. However, further evidence is needed to substantiate this claim. Since other studies suggest a longer phase of recovery from a high-arousal event in older adults (e.g., Wrzus et al., 2014), it would be useful to relate affective preferences to physiological measures of arousal and to shed light on age-related differences in the duration and intensity of the regulation of arousal. Thus, one option for future research to extend the present findings involves the inclusion of additional continuous measures of autonomous arousal that could be related to music browsing behavior. Affective features of the selected music could then be related to physiological reactivity indicating affect regulation.

Conclusions

Overall, our research extends previous findings by closing the gap between age-related differences in affect regulation based on self-report and actual behavior. Study 1 provided the basis for developing age-fair music- and sound-browsing paradigms for this research. Applying these paradigms in Studies 2 and 3 in age-heterogeneous samples ranging in age from adolescence to old adulthood showed consistent age differences. Thus, the present research adds substantially to our understanding of age differences in affect-regulatory preferences after (Study 2), as well as in anticipation of (Study 3), different affectively relevant situations that are independent of current affect and salient interpersonal goals. Additionally, our results substantiate the crucial role of arousal when investigating affect-regulatory preferences in individuals from varying age groups.

The implementation of the music browser turned out to be highly valuable as a continuous measure indicating affect-regulatory behavior in an experimental setting while establishing a situation close to everyday experiences of various age groups. Significant changes in affect reflect the efficacy of listening to self-selected music as an affect-regulation strategy. Balancing the music selection to participants' musical background and listening habits (various musical styles from different decades, familiarity equally balanced across age groups) as described in Study 1, and adjusting task difficulty to participants' performances in the *Bingo game* (pre-study to Study 2, cf. description in the Appendix A) ensured a comparable situation across age groups. In conclusion, the development and implementation of our music browsing paradigm offers a reliable, age-fair, and easily applied method for the further investigation of affect-regulatory preferences in various experimental contexts.

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Footnotes

[1] To test the consistency of valence and arousal perceptions, participants in Study 3 rated each song they had heard during the 10 minutes of music browsing (min = 7 and max = 30 number of ratings per song). Results confirmed the assignments of the songs to the four affect quadrants based on evaluations from Study 1: The perceived valence differed significantly between the negative (quadrant A, mean valence = -0.95, *SD* = 1.06; quadrant C, mean valence = -0.97, *SD* = 0.73) and positive quadrants (quadrant B, mean valence = 0.83, *SD* = 1.19; quadrant D, mean valence = 0.89, *SD* = 1.05), $F(4,109) = 80.62$, $p < .001$, $\eta^2 = .25$; furthermore the perceived arousal differed significantly between the high (quadrant A, mean arousal = 1.52, *SD* = 0.55; quadrant B, mean arousal = 1.69, *SD* = 0.63) and low arousal quadrants (quadrant C, mean arousal = -1.14, *SD* = 0.65; quadrant D, mean arousal = -0.39, *SD* = 0.97), $F(4,109) = 87.19$, $p < .001$, $\eta^2 = .26$, as expected.

[2] The initially recruited sample comprised *N* = 225 participants. Three persons were excluded from the analyses reported below because they did not fulfill the requirement of being within the age-normative range of cognitive abilities and depressive symptoms as assessed according to norm values of standardized measures for fluid-cognitive skills (i.e., perceptual information-processing speed test as assessed with the Symbol Digit Task; Lang, Weiss, Stocker, & von Rosenbladt, 2007), crystalline-cognitive skills (i.e., vocabulary as assessed with the Mehrfachwahl-Wortschatz-Test A; Lehrl, Merz, Burkard, & Fischer, 1992), and depressive tendencies (as assessed with the German depression scale ADS-K; Hautzinger & Bailer, 1993). See Measures section for further details on these tasks.

[3] According to Stangier et al. (1999), a value of 30 indicates critical levels of social anxiety in the original SIAS consisting of 20 items, which corresponds to a value of 1.5 per item. Therefore, we applied a cut-off score of > 9 for our 6-item adaptation of the SIAS. None of the participants in our study exceeded this threshold (cf. Table 4). Scale reliability

including the six items used in the present study reached an adequate value of Cronbach's α = .84.

[4] Results of a MANOVA on the momentary affective experience yielded no indication of differences between goal conditions at T1 (before goal induction) for the experience of positive high-arousal $F(2,143) = 0.45$, $p = .64$, $\eta^2 < .01$; positive low-arousal, $F(2,143) = 0.28$, $p = .75$, $\eta^2 < .01$, negative high-arousal, $F(2,143) = 0.62$, $p = .54$, $\eta^2 = .01$, negative low-arousal, $F(2,143) = 0.75$, $p = .47$, $\eta^2 = .01$, and for tension, $F(2,143) = 0.59$, $p = .56$, $\eta^2 = .01$; or T2 (after goal induction) for positive high-arousal, $F(2,143) = 0.55$, $p = .58$, $\eta^2 < .01$; positive low-arousal, $F(2,143) = 0.37$, $p = .70$, $\eta^2 < .01$, negative high-arousal, $F(2,143) = 1.34$, $p = .26$, $\eta^2 = .02$, negative low-arousal, $F(2,143) = 0.79$, $p = .46$, $\eta^2 = .01$, and for tension, $F(2,143) = 0.48$, $p = .62$, $\eta^2 = .01$. These results indicate that the experience of current affect was not affected differently by the manipulation of interpersonal goals.

Tables

Table 1

Sample Composition in Study 2 and Descriptive Statistics for the Control Variables (Perceptual and Verbal Skills, and Depressive Tendencies) by Age Group

Age group	Age *M* (*SD*)	Number of participants in experimental groups				Perceptual skills *M* (*SD*)	Verbal skills *M* (*SD*)	Depressive tendencies *M* (*SD*)
		Negative & tense	Positive & tense	Neutral & tense	Neutral & relaxed			
Adolescents (12–17 y.)	14.8 (1.63)	12	14	14	14	56.89 (11.29)	25.51 (4.74)	10.91 (6.68)
Young adults (20–30 y.)	24.1 (3.65)	14	14	14	14	68.69 (11.68)	30.29 (2.35)	10.39 (6.02)
Middle-aged adults (40–50 y.)	45.4 (7.15)	12	12	14	14	55.92 (11.55)	31.13 (2.65)	8.58 (5.29)
Older adults (65–75 y.)	69.6 (3.70)	15	14	14	14	47.85 (11.49)	31.88 (2.90)	6.98 (4.73)

Note. Descriptive statistics given for the sample size of $N = 222$ participants including 51.8% women in total, with 50% female adolescents, 50.9% female young adults, 55.8% female middle-aged adults and 51.8% female older adults.

Table 2

Change of Momentary Affect in Study 2: Mean Values at Baseline (T1), before (T2) and after (T3) Music Browsing for Participants' Experiences of Contentment and Tension by Mood Condition and Differences Between T2 and T3

	Contentment					Tension				
Mood condition	T1 *M (SD)*	T2 *M (SD)*	T3 *M (SD)*	*t*	*d*	T1 *M (SD)*	T2 *M (SD)*	T3 *M (SD)*	*t*	*d*
Negative & tense	4.00 (1.30)	2.44 (1.51)	3.39 (1.39)	4.26**	0.66	1.60 (1.19)	2.43 (1.35)	1.51 (1.28)	-4.48**	-0.70
Positive & tense	3.96 (1.31)	4.36 (1.32)	4.03 (1.40)	-2.57*	-0.24	1.76 (1.42)	2.46 (1.89)	1.22 (1.51)	-6.26**	-0.73
Neutral & tense	3.79 (1.38)	3.00 (1.43)	3.67 (1.64)	4.41**	0.46	1.70 (1.29)	2.47 (1.56)	1.31 (1.42)	-5.58**	-0.78
Neutral & relaxed	4.23 (1.18)	3.79 (1.21)	4.01 (1.18)	1.90	0.18	1.56 (1.26)	1.70 (1.49)	0.95 (1.19)	-4.39**	-0.56

Note. Sample parameters indicating the mean value and standard deviation of experienced positive valence ("content") and tense arousal ("tense") at baseline (T1), before (T2) and after (T3) music browsing and the *t*-values of a paired *t*-test between dependent samples from T2 and T3. Cohen's *d* indicates the standardized effect size. * for $p < .05$. ** for $p < .01$.

Table 3

Music Browsing Behavior in Study 2: Results of a Two-Way Repeated Measures ANOVA With Age Group and Mood Condition as Between-person Factors and Valence and Arousal as Within-person Factors on Total Music Browsing Time (in %)

Effect	SS	*df*	MS	*F*	η^2
Between-person factors					
Age group	8.99	3	3.00	3.00*	.04
Mood condition	3.81	3	1.27	1.27	.02
Age group × Mood condition	11.72	9	1.30	1.30	.05
Error	208.62	209	1.00		
Within-person factors					
Valence	0.03	1	0.03	0.03	.00
Arousal	0.02	1	0.02	0.02	.00
Valence × Arousal	0.02	1	0.02	0.02	.00
Valence × Age group	16.26	3	5.42	5.22**	.07
Arousal × Age group	25.42	3	8.48	8.27**	.11
Valence × Arousal × Age group	8.34	3	2.79	3.65*	.05
Valence × Mood condition	4.36	3	1.47	1.41	.02
Arousal × Mood condition	0.95	3	0.32	0.31	.00
Valence × Arousal × Mood condition	1.77	3	0.59	0.51	.01
Valence × Age group × Mood condition	6.93	9	0.77	0.74	.03
Arousal × Age group × Mood condition	3.78	9	0.42	0.41	.02
Valence × Arousal × Age group × Mood condition	2.57	9	0.29	0.37	.02
$\text{Error}_{\text{Valence}}$	217.05	209	1.04		
$\text{Error}_{\text{Arousal}}$	214.02	209	1.03		
$\text{Error}_{\text{Valence x Arousal}}$	160.20	209	0.77		

Note. SS = Sum of squares, MS = Mean square. Analyses were computed with *z*-standardized values due to violations of normality based on significant results from a Kolmogorov-Smirnov-Test with $p < .05$ for the valence and arousal factors between age groups and mood conditions. A Levene test for homogeneity of variances indicated that the assumption of inhomogeneity of variances was violated between age groups and conditions for two of the four within-person factors valence and arousal at $p > .05$. Therefore, Greenhouse-Geisser correction was applied. * $p < .05$, ** $p < .01$.

Table 4

Sample Composition in Study 3 and Descriptive Statistics for the Control Variables (Perceptual and Verbal Skills, and Social Anxiety) by Age Group

Age group	*N*	Age *M* (*SD*)	Perceptual skills *M* (*SD*)	Verbal skills *M* (*SD*)	Social anxiety *M* (*SD*)
Adolescents (12–17 y.)	36	14.67 (1.89)	43.53 (4.81)	26.71 (2.85)	2.31 (0.89)
Young adults (18–29 y.)	38	23.08 (3.45)	49.79 (7.06)	30.32 (1.97)	2.11 (1.01)
Middle-aged adults (40–50 y.)	38	46.53 (3.38)	38.06 (7.42)	31.78 (1.39)	1.78 (1.23)
Older adults (60–75 y.)	37	68.19 (4.49)	31.21 (5.45)	31.58 (2.32)	1.47 (0.97)

Note. The sample included 50% female adolescents, 50% female young adults, 47.4% female middle-aged adults, and 48.6% female older adults.

Table 5.

Music Browsing Behavior in Study 3: Results of a Two-way Repeated Measures ANOVA With Age Group and Goal Condition as Between-person Factors and Valence and Arousal as Within-person Factors on Total Music Browsing Time (in %)

Factors	SS	*df*	MS	*F*	η^2
Between-person factors					
Age group	0.17	*3*	0.06	5.53**	.21
Goal condition	0.01	2	0.01	0.57	.02
Age group × Goal condition	0.11	6	0.02	1.79	.15
Error	0.63	61	0.10		
Within-person factors					
Valence	0.02	1	0.02	0.016	.00
Arousal	0.001	1	0.001	0.001	.00
Valence × Arousal	0.001	1	0.001	0.001	.00
Valence × Age group	22.72	3	7.42	5.56**	.22
Arousal × Age group	13.06	3	4.35	3.69*	.16
Valence × Arousal × Age group	6.06	3	2.02	2.06	.09
Valence × Goal condition	1.54	2	0.77	0.58	.02
Arousal × Goal condition	8.55	2	4.28	3.63*	.11
Valence × Arousal × Goal condition	2.43	2	1.22	1.24	.04
Valence × Age group × Goal condition	14.39	6	2.40	1.80	.15
Arousal × Age group × Goal condition	3.29	6	0.55	0.47	.04
Valence × Arousal × Age group × Goal condition	1.72	6	0.29	0.29	.03
$Error_{Valence}$	81.43	61	1.34		
$Error_{Arousal}$	71.92	61	1.18		
$Error_{Valence\ x\ Arousal}$	59.72	61	0.98		

Note. SS = Sum of squares, MS = Mean square. Analyses were computed with *z*-standardized values due to violations of normality based on significant results from a Kolmogorov-Smirnov-Test with $p < .05$ for the valence and arousal factors between age groups and mood conditions. A Levene test for homogeneity of variances indicated that the assumption of inhomogeneity of variances was violated between age groups and conditions for two of the four within-person factors of valence and arousal at $p > .06$. Therefore, a Greenhouse-Geisser correction was used. * $p < .05$, ** $p < .01$.

Figures

***tense* arousal** (increasing difficulty)			***lower* arousal** (similar difficulty)
***negative* valence** (negative feedback)	***positive* valence** (positive feedback)	***neutral* valence** (neutral feedback)	***neutral* valence** (neutral feedback)
Group I: **“positive tense”**	Group II: **“negative tense”**	Group III: **“neutral tense”**	Group IV: **“neutral relaxed”**

Figure 1. Group assignment for the 4 (Condition) x 4 (Age group) between-person design with varying mood induction via *Bingo game* in Study 2. Arousal was manipulated via varying task difficulty and working time. Valence was manipulated via varying bogus feedback in the *Bingo game.*

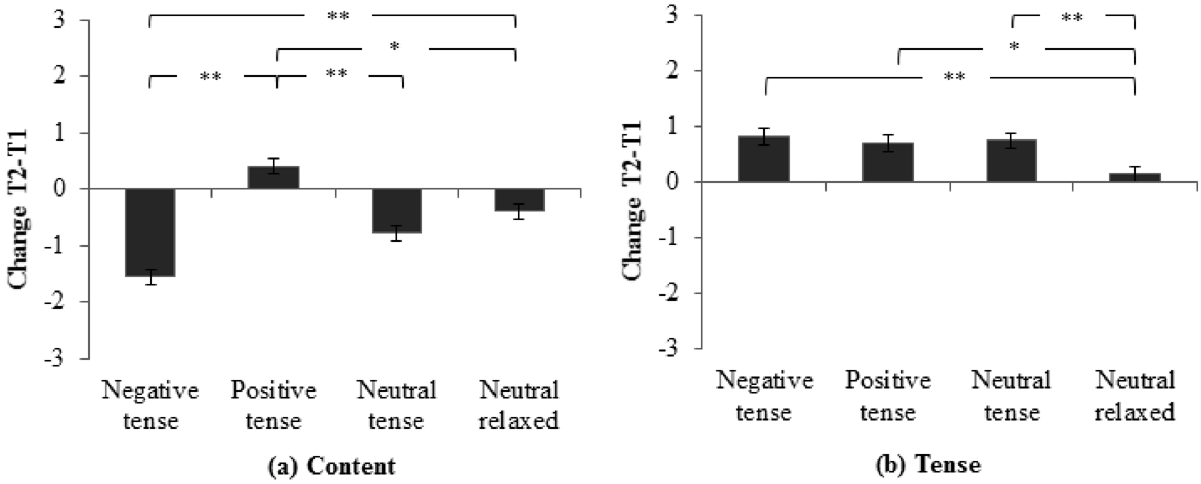

Figure 2. Manipulation check for Study 2: Within-person change scores for feeling “content” and “tense” from before (T1) to after (T2) mood induction by condition. Error bars represent +/- 1 *SE*. Significant differences between mood conditions are marked with * for $p < .05$ and ** for $p < .01$.

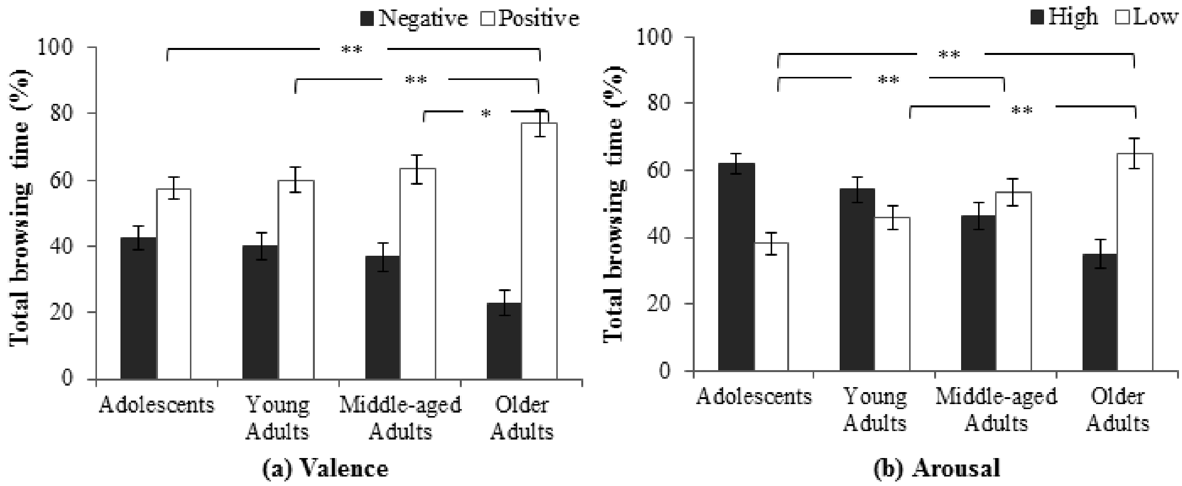

Figure 3. Music browsing behavior in Study 2: Total time of listening to music (in percent) for (a) valence and (b) arousal dimensions of overall mood conditions by age. Error bars represent +/- 1 *SE*. Significant differences between age groups are marked with * for $p < .05$ and ** for $p < .01$.

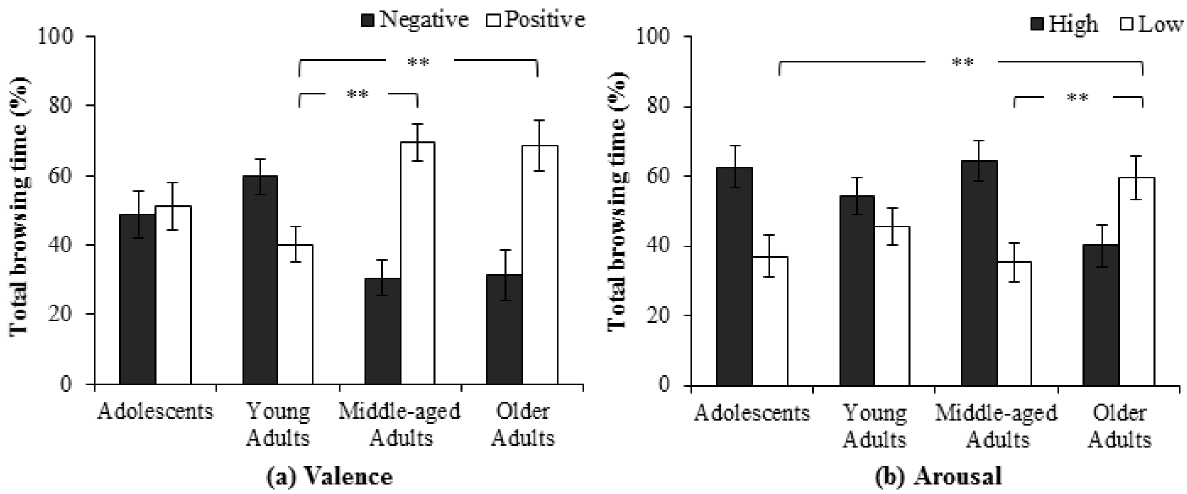

Figure 4. Music browsing behavior in Study 3: Total time of listening to music (in percent) for valence (a) and arousal (b) dimensions across all conditions and grouped by age. Error bars represent +/- 1 *SE*. Significant differences between age groups are marked with * for $p < .05$ and ** for $p < .01$.

Appendix A

Pre-Study to Study 2: Developing the *Bingo Game* and Establishing the Age Fairness of the Four Experimental Conditions

The purpose of this pre-study was to ensure the plausibility, effectiveness, and age fairness of the *Bingo game* and its four mood-induction conditions.

Sample and procedure. The sample included *N* = 40 participants (mean age = 37.97, *SD* = 21.42; *n* = 10 adolescents aged 12–17 years, *n* = 10 young adults aged 18–29 years, *n* = 10 middle-aged adults aged 40–50 years, *n* = 10 older adults aged 65–75 years). Gender was equally distributed in all age groups.

The Bingo game. The *Bingo game* followed the same logic as described in the Methods section for Study 2. The only difference was that in the pre-study, the arrangement of to-be-searched digits was not re-arranged after a called-out target had been successfully identified.

Induction of arousal: Time pressure and task difficulty. In order to induce different levels of arousal, we varied the allotted amount of time participants had to work on each trial as well as the trial's difficulty. In the three *tense-arousal conditions* ("negative & tense," "positive & tense," "neutral & tense"), participants had to finish three trials under time pressure (5.5 ms per called-out number) and with increasing difficulty. Task difficulty was varied by increasing the number of digits among which participants had to search for the called-out targets. The final set-up featured declines in age-adjusted average hit rates from about 75% in the first, to around 50% in the third trial. To achieve this despite age differences in sensory-motor speed, task difficulty (i.e., the number of to-be-searched digits per trial) was adjusted to age-specific performance levels: From the first to the third trial, adolescents were presented 32, 40, and 48 to-be-searched digits; young adults, 40, 48 and 56; middle-aged adults, 24, 32, and 40; and older adults, 16, 24, and 32, respectively. In the fourth condition ("neutral & relaxed"), participants had twice as much time per target (11 ms) and the age-adjusted difficulty remained constantly low at an average hit rate of around 90%. To achieve this, difficulty levels remained constant across trials at 32, 40, 32, or 24 to-be-searched digits for adolescents, young, middle-aged, and older adult participants, respectively.

Manipulating valence. Valence was manipulated via bogus performance feedback as described in the Methods section of Study 2.

Measures. Having completed the *Bingo game*, participants reported how motivated they had been to reach a good result (motivation check), how pleased or annoyed they were with their performance feedback (manipulation check), and how well the performance feedback matched their subjective performance evaluation (plausibility check). Responses were given on a 7-point rating scale ranging from 0 (not at all) to 6 (totally).

Results and discussion. Participants were highly motivated to solve the *Bingo game* across all conditions, ranging from $M = 4.22$, $SD = 1.48$ in the “negative & tense” condition to $M = 5.60$, $SD = 0.79$ in the “positive & tense” condition. In the “positive & tense” condition participants were most pleased with their result as expected, $M = 5.10$, $SD = 0.29$, and differed significantly from those in other conditions at $p < .001$, with an overall effect of $F(3,36) = 13.88$, $p < .001$, $\eta^2 = .54$. In the “negative & tense” condition, participants were most annoyed with their result as expected, $M = 3.33$, $SD = 1.12$, and differed significantly from those in other conditions at $p < .01$, with an overall effect of $F(3,36) = 6.83$, $p = .001$, $\eta^2 = .36$. Taken together, these results confirmed that our manipulation of the valence of participants’ current affect was successful and suitable for implementation in Study 2. Results of the plausibility check further showed a moderate correspondence of the received bogus performance feedback with participants’ subjective performance evaluations across all experimental conditions ($M = 2.93$, $SD = 1.27$ on a 7-point rating scale), but correspondence differed significantly across conditions, $F(3,36) = 3.53$, $p = .02$, $\eta^2 = .23$. Post-hoc multiple comparisons, however, showed non-significant differences between conditions ($p > .06$), except for a negative response tendency in the “neutral & tense” condition in comparison to the other experimental conditions. This finding indicates that the bogus feedback given in the condition with neutral feedback and high-arousal induction was less plausible than in the other conditions. As a consequence, we decided to enhance the plausibility of the bogus feedback in Study 2 by modifying the game such that after clicking a target, it turned into a cross for a short time (0.5 s), then disappeared, and the arrangement of remaining to-be-searched digits on the screen changed. In this way, the bogus nature of the performance feedback was made less transparent, as monitoring their own performance levels was made more difficult for participants.

Appendix B

The Manipulation of Interpersonal Goals in Study 3

In Study 3, we manipulated the interpersonal goals participants had for an expected discussion of a difference in opinion with another participant. The *instrumental-affect perspective* (e.g., Riediger & Luong, 2016; Tamir, 2009; Tamir, Ford, & Gilliam, 2012) provided the conceptual foundation for this manipulation. It proceeds from the idea that affective states can vary in how instrumental they are for the attainment of individual’s goals. In the present research, we explored this idea with regard to two broad categories of interpersonal goals, namely separation (i.e., strivings to create interpersonal distance by emphasizing one’s own independence and individuality; Beyers, Goossens, Vansant, & Moors, 2003; Grotevant & Cooper, 1986) and affiliation (i.e., strivings to establish interpersonal closeness, and to emphasize relatedness and commonality; Hoppmann & Blanchard-Fields, 2010; Lang & Carstensen, 2002). High-arousal negative affect such as anger has been shown to facilitate processes associated with interpersonal distancing or separation (Tamir & Ford, 2011; Van Kleef, De Dreu, & Mansted, 2004). In contrast, positive states (such as contentment) have been proposed to facilitate processes associated with creating interpersonal closeness and affiliation (Mauss et al., 2011). Proceeding from the instrumental affect perspective, we explored whether participants’ regulatory preferences (music browsing behavior) varied depending on their interpersonal goals for the expected discussion (separation vs. affiliation).

Goal manipulation. We manipulated the salience of separation and affiliation goals by making participants expect their engagement in a discussion on a social dilemma and instructing them to either distance themselves from the diverging opinion of their discussion partner (separation condition), find a harmonious solution with their discussion partner (affiliation condition), or discuss naturally (neutral condition; see also Sample and Procedure section in Study 3).

Manipulation check. The three experimental conditions differed significantly in the self-reported interpersonal goal salience for the upcoming conversation (item assessing separation goal: “Even though my conversational partner disagrees, I will definitely stick to my opinion,”, item assessing affiliation goal: “It is of great importance to me that my conversational partner and I find a solution acceptable to both of us”; rated on a 7-point scale ranging from 0 = totally disagree to 6 = totally agree), as intended. The Goal condition × Self-reported goal salience interaction, $F(2, 60) = 7.03$, $p = .002$, $\eta^2 = .19$, showed significantly higher self-reported salience of the affiliation goal in the affiliation and neutral conditions than in the separation condition (ps < .001), and a significantly higher self-reported salience of the separation goal in the separation condition in comparison to the affiliation condition ($p = .02$), but not to the neutral condition ($p = .44$; Figure B1). Across all conditions, the differences between age groups were not significant ($ps > .06$).

========== Insert Figure B1 about here ==========

Effects of interpersonal goal salience on music browsing behavior. The only significant effect involving goal condition pertained to participants’ arousal preferences for their musical choices: Individuals listened to music with high arousal for significantly longer periods in the neutral control condition than in the separation and affiliation goal conditions (ps < .05). Importantly, there was no indication that the observed age-related differences in music browsing differed between goal conditions (i.e., no evidence for an age group-by-goal condition interaction) with ps >.05.

Discussion. Age differences in music browsing behavior detailed in the main part of this manuscript were independent of interpersonal goal condition. The interpersonal goal factor of the experimental paradigm mattered only insofar as individuals across all age groups showed a higher preference for high-arousal music in the neutral control condition as compared to the separation and affiliation goal condition. This might indicate a *pre*-processing behavior in preparation for an upcoming demanding situation. It seems reasonable that individuals in the separation and affiliation goal conditions (who received instructions on how to behave in the discussion) anticipated a higher level of arousal for the upcoming conversation than individuals in the control condition (who were instructed to behave naturally) and were thus motivated to listen to music that would help them to down-regulate their current level of arousal.

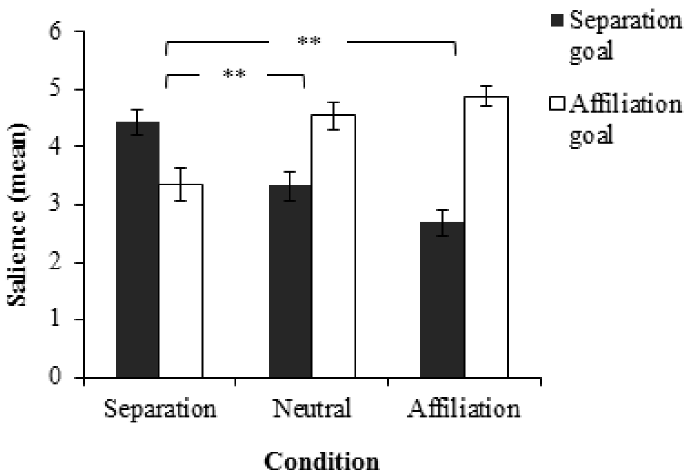

Figure B1. Manipulation check in Study 3: Mean self-reported salience of separation and affiliation goals in the three different goal conditions. Error bars represent +/- 1 *SE*. Significant differences between goal conditions are marked with * for $p < .05$ and ** for $p < .01$.