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Age-Related Changes in Older Adults’ Anger and Sadness:

The Role of Perceived Control

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**Abstract**

This longitudinal study examined the experience of sadness and anger in a sample of older adults. Based on the discrete emotion theory of affective aging, it was expected that sadness, but not anger, would increase in older adulthood over time. In addition, we hypothesized that inter- and intra-individual differences in low perceptions of control would be more strongly associated with sadness than anger. The 10-year study followed 187 community-dwelling older adults (*M*age = 72.25, *SD*age = 5.81). At each of six waves, participants’ levels of sadness, anger, perceived control, and sociodemographic characteristics were assessed. Hierarchical linear modeling demonstrated that sadness, but not anger, linearly increased over time. These increases in sadness were evident only among older adults who reported low (but not high) levels of perceived control across the study period, and who experienced longitudinal declines (but not increases) in perceived control. In addition, non-linear within-person reductions in perceived control predicted participants’ sadness in the entire sample, but were associated with anger only in early, and not in advanced, old age. These findings support the discrete emotion theory of affective aging by documenting the distinctiveness of older adults’ anger and sadness. These two negative emotions differ in terms of both age-related changes and predictive person-related perceptions of control.

Keywords: aging; emotions; sadness; anger; perceived control

**Introduction**

The discrete emotion theory of affective aging (DEA) postulates that distinct negative emotions, such as sadness and anger, can promote different adaptive behaviors across the adult lifespan (Kunzmann, Kappes, & Wrosch, 2014). From this perspective, anger is likely to support the attainment of threatened, but attainable, goals, while sadness may facilitate psychological adjustment to irreversible losses and unattainable goals. Given age-normative losses and declines in the controllability of life circumstances (Heckhausen, Wrosch, & Schulz, 2010), DEA predicts that anger should be particularly salient in young adulthood, while the salience of sadness is expected to increase in old age. In support of these assumptions, research has demonstrated consistent evidence for an age-related reduction of anger. The evidence for age differences in sadness, however, is mixed, documenting either age-related stability (e.g., Tsai, Levenson, & Carstensen, 2000) or increase (e.g., Kunzmann & Grühn, 2005). One explanation for the latter inconsistency may be that age differences in sadness are not linear and only become evident during old age (Kunzmann, Richter, & Schmukle, 2012). In addition, an age-related increase in sadness may be observed particularly among older adults who perceive low or reduced control over their lives, since these perceptions could reflect increasing developmental losses and constraints (Drewelies et al., 2017). To address these possibilities, we examined the experience of anger and sadness in a heterogeneous sample of older adults over 10 years. We hypothesized that older adults would exert long-term longitudinal increases in sadness, but not anger. Moreover, we expected that low and reduced perceptions of control would predict steep increases in sadness, but not anger.

**Age-Related Changes in the Experience of Sadness and Anger**

Dimensional approaches to the study of emotions conceptualize broad factors, differing in valence and arousal (Bradburn, 1969; Watson, Clark, & Tellegen, 1988). Contrary to this approach, functional emotion theories consider that discrete negative emotions can enable humans to cope effectively with different situational circumstances that involve, for example, threat (through anxiety, Levenson, 1992), uncontrollable losses (through sadness, Nesse, 2000), or blocked goals (through anger, Carver & Harmon-Jones, 2009; Frijda et al., 1989; Keltner & Gross, 1999; Pekrun et al., 2007). From this perspective, negative emotions have evolved in phylogenesis to respond to different situational demands, aimed at reinstating a disturbed balance between individuals and their environments (e.g., Ekman, 1999; Lazarus, 1991; Nesse, 1990).

 DEA integrates a functional account of emotions with lifespan developmental theory. It provides a conceptual framework for explaining age differences in the salience and adaptive value of discrete emotions across the adult lifespan (Kunzmann et al., 2014). This theory postulates that the experience of discrete negative emotions depends on the extent to which they facilitate an effective management of age-specific developmental opportunities and constraints, residing in the environment, the person, or both. Consequently, specific negative emotions should be particularly salient during life periods when they are most likely to contribute to adaptive developmental outcomes (Kunzmann & Wrosch, 2017).

 DEA has been applied, thus far, to examining age differences in the frequency and intensity of two negative emotions, that is, anger and sadness. This line of work builds on lifespan developmental research, suggesting that young adulthood represents a life phase, during which individuals have plenty opportunities and few constraints to achieve a number of developmental tasks (Baltes, 1987; Heckhausen et al., 2010). Here, the experience of anger could contribute to overcoming removable goal blockages or reversing perceived injustice (cf. Weiner, 1985). Consistent with this possibility, motivational processes, such as assertiveness or persistent goal pursuit are typically prevalent in young adulthood and contribute to successful development (e.g., Brandtstädter & Renner, 1990; Wrosch, Heckhausen, & Lachman, 2000). Given that anger has evolved to support such problem-oriented behaviors, it should be particularly salient in young adulthood (Kunzmann et al., 2014).

Older adulthood, by contrast, can be characterized by increasing developmental constraints and irreversible age-related losses (Baltes, 1987; Heckhausen et al., 2010). As a consequence, the motivational and behavioral concomitants of anger may become less effective in old age, and the usefulness of other discrete emotions, such as sadness, is likely to increase. Sadness could serve adaptive function in old age, as it may have evolved to signal the need of social support (Andrews & Thomson, 2009) and facilitate psychological adjustment to unattainable goals or irreversible losses (Klinger, 1975; Nesse, 2000; Wrosch & Miller, 2009). Since such motivational responses are prevalent in older adulthood and forecast patterns of successful development (Brandtstädter & Renner, 1990; Heckhausen et al., 2010; Jobin & Wrosch, 2016), sadness should be particularly salient in old age (Kunzmann et al., 2014).

 The empirical literature on age differences in the experience of anger and sadness largely consists of experimental studies that assessed groups of young and older adults and presented them with specific emotion-eliciting stimuli or asked them to relive emotion-evoking events. There are also two field studies that have investigated age differences in the frequency and intensity of sadness and anger on a typical day (Kunzmann & Thomas, 2014) as well as across multiple situations and several months (Kunzmann et al., 2013). Together, this body of work has consistently documented that older adults experience less anger than young adults (for a review, see Kunzmann & Wrosch, 2017). In addition, a study including middle-aged adults showed that anger may already start declining in early midlife and rebounds slightly in older adulthood, although levels of older adults’ anger remained considerably below their young adult counterparts (Kunzmann et al., 2013).

The literature on age differences in the experience of sadness, by contrast, is more mixed. While some studies document that older adults experience more sadness than young adults (e.g., Kunzmann & Grühn, 2005), other studies conclude that sadness is relatively stable across the adult lifespan (e.g., Tsai et al., & Carstensen, 2000). In addition, one study suggests that sadness may not be generally enhanced in old age, but instead could increase only during the later phases of older adulthood (Kunzmann et al., 2013).

**When Does Sadness Increase in Older Adulthood?**

To explain the differences in the age-related trajectories of sadness found across studies, we consider here the importance of capturing normative developmental losses and uncontrollable life circumstances in older adulthood. In this regard, one limitation of extant research is that we do not know whether studies documenting age-related stability in sadness (rather than an increase) sufficiently sampled older adults who experienced severe and uncontrollable developmental constraints. This limitation is essential to our theoretical framework, since DEA postulates that it is not age per se, but the age-related increases in the experience of uncontrollable life circumstances, that trigger increases in the salience and frequency of sadness (Chipperfield, Perry, & Weiner, 2003; Kunzmann et al., 2014, 2017).

To address this limitation, it would be useful to examine samples of older adults over an extended period of time. Given that irreversible losses most likely occur in the later parts of older adulthood (Baltes & Smith, 2003; Gerstorf et al., 2010; Smith & Baltes, 1997; Wrosch, Jobin, & Scheier, 2017), such an approach may reveal that the experience of sadness, but not anger, reliably increases as older adults advance in age. This possibility is consistent with results from a 5-year longitudinal study of German adults (Kunzmann et al., 2013). More research along these lines could provide consistent evidence for such differential increases of older adults’ sadness, but not anger, over longer periods of time and across different studies and cultural contexts.

In addition, it would be useful to assess older adults’ psychological experience of developmental losses and constraints more directly. Such experiences are likely represented in individuals’ levels of, or longitudinal reductions in, perceptions of control (Drewelies et al., 2017). In addition, given that individuals can greatly differ in terms of the number and the severity of losses that they experience as they age (e.g., Rowe & Kahn, 1997), the assessment of perceived control could help distinguish those older adults who perceive low or declining levels of control over their lives from their counterparts who perceive high or stable/increasing levels of control (arguably because they have encountered only relatively mild developmental constraints and losses). Seen from a differential aging perspective, perceived control may be a potent predictor of older adults’ sadness experiences because sadness should increase during old age particularly among those older adults who perceive their lives as uncontrollable (Kunzmann et al., 2014; for associations of perceived control with global negative emotions, see also Lang & Heckhausen, 2001).

Note that differences in perceptions of control may only in part reflect inter-individual differences in age-related losses (e.g., between-person differences in levels or changes in relatively intractable functional disability). In addition, they could relate to temporary changes and fluctuate in a non-linear fashion within individuals over time (e.g., within-person changes in the context of a specific disease, its treatment, and recovery; for meaningful within-person variation in perceived control, see Eizenman et al., 1997). As a consequence, it would be relevant for research to examine in between-person and within-person analyses whether perceived control predicts levels and changes of older adults’ sadness.

With respect to the prediction of older adults’ anger experiences, however, we would not expect comparably strong effects of perceived control. Although perceptions of uncontrollable life circumstances could at times also elicit anger experiences (e.g., during the onset of age-related declines, if some older adults are still hopeful to overcome certain problems), we note that older adults typically shift their motivational processes from striving for gains and overcoming problems to adjusting internally to developmental losses (Ebner, Freund, & Baltes, 2006). Thus, the motivation to counteract age-normative losses head-on should become relatively reduced in older adulthood, which makes it, according to a discrete emotion approach, less likely that perceptions of low control are strongly associated with older adults’ anger experience (Kunzmann & Wrosch, 2017).

**The Present Study**

 This study examined the experience of sadness and anger across older adulthood in six waves of data from a 10-year longitudinal study of community-dwelling older adults. We first hypothesized that as participants advanced in age over time, they would experience long-term longitudinal increases in sadness, but not in anger. Second, we hypothesized that such long-term longitudinal increases in sadness would be enhanced among participants who generally perceive their lives as less controllable or experience declines in perceived control across the study period. By contrast, increases in sadness were expected to be reduced or even absent among their counterparts who experience comparatively higher levels of, and fewer reductions in, perceived control. Finally, we considered that levels of perceived control can also vary over time in a non-linear fashion, and hypothesized that such intra-individual changes in perceived control would be reliably associated with participants’ sadness, but to a lesser extent with their anger. Since our theoretical rationale makes it possible that the predicted longitudinal findings could be more pronounced among individuals in advanced, as compared to early, old age, our analyses also included baseline levels of age (and sex and socioeconomic status as additional covariates).

**Methods**

**Participants**

Study participants completed up to six waves of data, collected over 10-years, in the context of the Montreal Aging and Health Study (MAHS, Wrosch, Schulz, et al., 2007). At baseline, 215 community-dwelling older adults were recruited into the MAHS through advertisements in local newspapers. The only inclusion criterion was that participants had to be 60 years or older, since we were interested in obtaining a normative sample of older adults. Subsequent waves of the study were conducted in two-year intervals, approximately after 2 (T2: *n* = 184), 4 (T3: *n* = 164), 6 (T4: *n* = 136), 8 (T5: *n* = 125), and 10 years of study (T6: *n* = 95). Because we were interested in examining changes in emotional experiences over time, we included all individuals who responded to the sadness and anger assessments in at least two waves of the study. One-hundred-eighty-seven participants met this criterion. At baseline, these participants were on average 72.25 years old (*SD* = 5.81; range = 64-94), 51.3 % were female, and 34.7% had obtained a university education. Included participants did not significantly differ from excluded participants on any of the baseline variables used in this study, all *p*s > .10. The distribution of sociodemographic variables was within the normative range of older Canadians residing at home (National Advisory Council on Aging, 2006).

**Procedures**

Individuals who were interested in participating in the study were screened on the phone and invited to the laboratory. Participants who were not able to travel to the laboratory were visited by the research assistants in their homes. At each wave, participants were asked to complete a general questionnaire and to respond to daily measures of emotional experiences over three non-consecutive days during the subsequent week. Non-consecutive days were chosen to minimize the influence of specific events on the collected measures. Participants were compensated financially for their efforts (CAD 50 for wave 1-3 and CAD 70 for wave 4-6). The procedures were approved by the University Research Ethics Committee, and informed consent was obtained from each participant.

**Measures**

 **Sadness and anger**. Participants were asked at each study wave to report the extent to which they experienced specific emotions during the day at the end of each of three non-consecutive days (typically over the course of one week). Three days were chosen to obtain reliable estimates of anger and sadness at each measurement point. The experience of sadness and anger were measured with single items (i.e., sad and angry), using 5-point Likert-type scales (0 = *very slightly* or not at all; 4 = *extremely*). Within each wave, positive associations were obtained across the three days between sadness scores (all *r*s = .27 to .83, all *p*s < .01; *M*[*r*] = .55, *p* < .01) and between anger scores (17 of 18 possible zero-order correlations were significant at *p* < .05; *r*s = .14 to .63, *p*s = .11 to < .01; *M*[*r*] = .41, *p* < .01). We computed sum scores of the three daily sadness (*M*T1 = 0.68, *SD*T1 = 1.28; *M*T2 = 0.89, *SD*T2 = 1.70; *M*T3 = 1.13, *SD*T3 = 1.79; *M*T4 = 1.06, *SD*T4 = 1.75; *M*T5 = 1.14, *SD*T5 = 2.21; *M*T6 = 0.99, *SD*T6 = 1.80) and anger items (*M*T1 = 0.54, *SD*T1 = 1.27; *M*T2 = 0.72, *SD*T2 = 1.44; *M*T3 = 0.67, *SD*T3 = 1.29; *M*T4 = 0.71, *SD*T4 = 1.43; *M*T5 = 0.64, *SD*T5 = 1.58; *M*T6 = 0.54, *SD*T6 = 1.28) for each wave by multiplying the averaged emotions by a factor three.[[1]](#endnote-1) Within each wave, single missing data were replaced by the person mean of the valid sadness and anger scores. Across waves, averaged sadness and anger scores were generally positively correlated, indicating some stability in the experience of sadness and anger over time (26 of 30 possible zero-order correlations were positive and significant at *p* < .05; *r*s = .08 to .57, *p*s = .28 to < .01).

**Perceived control.** We measured generalized perceived control by administering one-item at each wave. Participants were asked to rate on 11-point Likert-type scales (0 = no control, 10 = total control) the amount of control they had over their *life* overall these days (*M*T1 = 7.52, *SD*T1 = 1.91; *M*T2 = 7.53, *SD*T2 = 1.81; *M*T3 = 7.41, *SD*T3 = 2.05; *M*T4 = 7.37, *SD*T4 = 1.99; *M*T5 = 7.23, *SD*T5 = 2.06; *M*T6 = 7.28, *SD*T6 = 2.04). The mean scores of the sample were in a comparable, but somewhat lower, percentile range of the scale, as compared to lifespan studies that also include young and middle-aged adults (Lachman & Weaver, 1998; Infurna, Ram, & Gerstorf, 2013). The perceived control scores were positively correlated across waves (*r*s = .42 to .71, *p*s < .01), and growth-curve analysis indicated that, as to be expected, perceived control declined significantly over the study period (*coefficient* = -.05, *SE* = .02, *p* < .01; for specification of model see Table OSM 1). To obtain an indicator of change in perceived control, we saved the obtained individual change coefficients from the growth-curve model for further analysis. In addition, we averaged the scores of perceived control across waves to obtain an indicator of inter-individual differences in levels of perceived control over the entire study period. Higher values indicated relatively larger increases in, and higher levels of, perceived control, respectively.

**Sociodemographic variables.** Baseline measures of age, sex, and socioeconomic status were also included into the analyses. Age and sex were based on participants’ self-reports. In addition, the study included three self-report measures of socioeconomic status (SES): Education (no education = 3.4%, high school or trade = 31.8%, university education = 34.7%), income (less than $17,000 = 20.9%, 17,000 to 51,000 = 58.8%, more than $51,000 = 20.4%, and perceived socioeconomic status (*M* = 6.14, *SD* = 1.80; Adler et al., 2000). Because the three SES measures were positively correlated (*r*s = .39 to .53, *p*s < .01), we computed a composite score of SES for further analysis by averaging the three standardized measures (*M* = .02, *SD* = .81).

**Data Analysis**

To obtain general associations between variables within the sample, we first conducted preliminary correlational analyses of the averaged levels of sadness, anger, levels of perceived control, changes in perceived control, and sociodemographic variables.

Second, we examined the hypotheses of long-term longitudinal changes in anger and sadness by conducting two separate sets of growth curve models, using hierarchal linear modeling techniques (HLM 7.0). In the Level-1 models, we estimated variability in anger and sadness in separate models by an intercept, person-centered scores of time in study, and a residual term.[[2]](#endnote-2) In these models, the intercepts represented average levels of sadness or anger across the sample, and the time slopes represented the amount of yearly change in sadness or anger. Using the obtained coefficients and standard errors, follow up *Z*-tests were conducted to examine whether the obtained slope coefficients for sadness and anger were different from each other. In the subsequent Level-2 models, we examined whether levels of, and changes in, perceived control across waves (and sociodemographic variables) would moderate the obtained Level-1 coefficients for average levels (i.e. intercepts) and longitudinal changes (i.e., slopes) in sadness and anger. In a final step, we examined whether baseline age would further moderate the effects of perceived control on longitudinal changes in sadness and anger. Significant cross-level interactions were followed up by estimating the intercepts and slopes for the averaged upper and lower quartiles of the distribution of the moderator variables (e.g., perceived control). The exact models are specified in Table OSM 2.

Third, we examined the hypothesis that non-linear within-person changes in perceived control would also be associated with differential effects on participants’ experience of sadness and anger. To this end, we conducted separate HLM models, predicting Level 1 variability in sadness and anger by person-centered scores of perceived control and a residual term. To account for potential confounds between time-related fluctuations and longitudinal changes in emotional experiences, the Level-1 models also included person-centered time in study as a covariate.[[3]](#endnote-3) In these models, the intercepts represented averaged levels of anger and sadness across the sample, and the slopes represented the associations between within-person changes in perceived control and the outcome variables. Follow-up *Z*-tests were conducted to examine whether slope coefficients associated with perceived control were different for predicting the experience of sadness than anger. In subsequent Level-2 models, we included sociodemographic variables to explore whether age (and sex and SES) would moderate the obtained Level-1 coefficients. The exact models are specified in Table OSM 3. Across the different HLM analyses, Level-2 predictor variables were standardized prior to the analyses, and the reported effects were based on models using restricted maximum likelihood estimation and robust standard errors.

**Results**

**Preliminary Analyses**

The results of the correlational analysis of the main study variables are reported in Table 1. The analyses showed that the averaged experience of sadness and anger was moderately and positively associated with each other. In addition, participants generally experienced more anger and sadness if they reported lower, as compared to higher, levels of perceived control across the study period. Moreover, reductions in perceived control across the study period were positively associated with sadness, but not with anger. Finally, participants with a lower SES were more likely to experience anger than their higher SES counterparts.

**Long-Term Longitudinal Changes in Sadness and Anger**

 The Level-1 models, examining long-term longitudinal changes in sadness and anger, are reported in Table 2. The results showed that average levels of both emotions were significantly different from zero (see significant intercept coefficients). In addition, the models demonstrated a significant slope effect of time for the experience of sadness, but not anger. As depicted in Figure 1, sadness significantly increased over the 10-year period, while anger remained stable at a relatively lower level. Follow-up Z-tests, using the obtained coefficients and standard errors, showed that changes in sadness were significantly different from changes in anger, *Z* = 2.62, *p* < .01. The inclusion of time into the model explained 9.31% of the overall variability in participants’ sadness experiences. In addition, there was considerable variability around the average Level-1 intercepts (2s = 490.04 and 656.54, *p*s < .01) and slopes (2s = 204.06 and 249.10, *p*s = .17 and < .01) in both models.

 To explain the observed variability in average levels of, and longitudinal changes in, sadness and anger, a Level-2 main effect model was conducted, incorporating averaged levels of, and changes in, perceived control and sociodemographic variables. The results of these models are reported in Table 2 and showed that no significant effects of sociodemographic variables were obtained on average levels of, and longitudinal changes in, sadness and anger (see slope coefficients).[[4]](#endnote-4) In addition, the Level-2 models showed that averaged levels of perceived control predicted levels of both, sadness and anger (see Table 2). Participants who generally perceived lower, as compared to higher, levels of control reported higher average levels of sadness and anger. Of importance, the results further demonstrated that levels of, and changes in, perceived control both predicted longitudinal changes in sadness, but not in anger (see Table 2). Finally, the subsequent examination of potential Level-2 two-way interactions showed that baseline age did not significantly interact with levels or changes in perceived control in predicting levels or changes in sadness or anger (see Table 2). After controlling for sociodemographic variation, averaged levels of, and changes in, perceived control explained together 16.84%, of the variability in participants’ long-term longitudinal changes in sadness.

We plotted in Figure 2 the significant cross-level interactions by illustrating the long-term trajectories of sadness separately for participants who perceived high versus low levels of control (upper panel), and who perceived increases versus declines in perceived control (lower panel). The interactions were plotted, using the averaged upper and lower quartiles of the moderator variables as reference points.[[5]](#endnote-5) The obtained pattern of results showed that after 10 years of study, particularly high levels of sadness were observed among participants who reported low levels of, or relative declines in, perceived control. Simple slope analyses supported this interpretation of the data by documenting that sadness increased only among participants who experienced either low levels of perceived control (*coefficient* = .13, *SE* = .04, *p* < .01), or relative declines in perceived control (*coefficient* = .21, *SE* = .05, *p* < .01). By contrast, sadness did not significantly change over time among their counterparts who experienced either high levels (*coefficient* = .03, *SE* = .02, *p* = .10), or relative increases in (*coefficient* = -.04, *SE* = .05, *p* = .41), perceived control.

**Within-Person Variation in Sadness and Anger**

The results of the within-person analyses examining whether time-related fluctuations in perceived control were also associated with participants’ experience of sadness and anger are reported in Table 3. The obtained Level-1 results, examining averaged levels (i.e., intercept) and within-person changes (i.e. slopes) in sadness and anger, showed significant intercept coefficients, indicating that average levels of sadness and anger across the sample were significantly different from zero. More importantly, the Level-1 models further demonstrated that within-person variation in perceived control was significantly associated with participants’ experience of sadness and anger (see Table 3).

Figure 3 displays the within-person associations between perceived control and the experience of sadness and anger, plotted for the averaged upper and lower quartiles of the within-person distribution of perceived control. The findings indicate that in waves participants perceived lower levels of control than their average levels, they also experienced higher levels of sadness and anger. In addition, the obtained patterns suggest that the within-person slope was somewhat steeper for the prediction of sadness than anger. However, post-hoc *Z*-tests, examining potential differences between the within-person slopes of perceived control in predicting sadness and anger suggested that this difference was not significant, *Z* = .98, *p* = .33. Within-person variation in perceived control explained 6.42% and 10.82% of the variability in sadness and anger. In addition, there was considerable variability around the average Level-1 intercepts (2s = 484.20 to 615.02, *p*s < .01) and control slopes (2s = 161.68 to 197.87, *p*s = .29 to < .01).

To explore potential moderators of the observed Level-1 effects, we included sociodemographic variables (i.e., age, sex, and SES) as predictors of the obtained intercepts and slopes (see Table 3) into the subsequent Level-2 models. The results did not show significant effects with respect to the prediction of averaged levels of emotional experiences (i.e., intercepts), except for an effect of socioeconomic status on levels of anger. A higher socioeconomic status was associated with less anger. In addition, the prediction of within-person associations between perceived control and participants’ emotional experiences showed that participants’ age significantly moderated the within-person effect of perceived control on participants’ anger, explaining 7.41% of the variance in the association between perceived control and anger. No further significant effects were obtained in these analyses.

The significant cross-level interaction effect is illustrated in Figure 4 by plotting the within-person association between perceived control and participants’ experience of anger separately for age 65 and age 80. The obtained pattern of results suggests that the within-person association between relatively reduced levels of perceived control and increased levels of anger was observed only in early old age (i.e., age 65), but not in advanced old age (i.e., age 80). Simple slope analyses were consistent with this interpretation of the data by showing a significant within-person slope among participants at age 65 (*coefficient* = -.21, *SE* = .06, *p* < .01) and a non-significant within-person slope among participants at age 80 (*coefficient* = -.01, *SE* = .06, *p* = .92).

**Discussion**

This longitudinal study showed in a sample of community-dwelling older adults that the intensity of sadness, but not anger, significantly increased over ten years of study. In addition, it demonstrated that increases in sadness, but not anger, became paramount among older adults who experienced either relatively low levels of, or reductions in, perceived control. By contrast, longitudinal increases in sadness were not observed among their counterparts who generally perceived their lives as more controllable or experienced increases in perceived control. Finally, the reported results revealed non-linear within-person associations between changes in perceptions of control and participants’ emotional experiences. The latter results suggested that intra-individual associations between relatively reduced levels of perceived control and sadness were obtained across the entire age range, while intra-individual reductions in perceived control predicted anger only among participants in early, but not advanced, old age. The hypothesized effects were independent from sociodemographic variation (i.e., sex and socioeconomic status) and substantial, explaining between 6.4% and 16.8% of the variability in the observed outcomes.

The study’s findings address some of the inconsistencies in research on age differences in the experience of sadness and anger. Although this body of work consistently showed an age-related reduction in anger experiences, it also suggested either age-related stability or increases in individuals’ sadness experiences (for reviews, see Kunzmann et al., 2014; 2017). On the basis of previous research (Kunzmann et al., 2013), we had suggested that these mixed results could relate to the possibility that age differences in sadness, but not anger, become evident only during older adulthood. This may be the case because severe developmental constraints and irreversible losses are most likely to occur in the later parts of older adulthood (Baltes & Smith, 2003; Gerstorf et al., 2010; Smith & Baltes, 1997; Wrosch et al., 2017), and according to DEA are likely responsible for an increased experience of sadness (Chipperfield et al., 2003; Kunzmann et al., 2014).

Consistent with this possibility, the reported results showed that there was not much of a difference in the baseline experience of older adults’ sadness and anger, when most participants were still in early old age. Ten years later, however, participants’ levels of sadness were approximately twice as high as their levels of anger (see Figure 1). This pattern of findings replicates previous work in a different cultural context and over a longer period of time (Kunzmann et al., 2013). Moreover, it demonstrates that age-related increases in older adults’ sadness, but not anger, become pronounced over longer periods of time, when many individuals confront increasing levels of irreversible developmental losses and constraints (Baltes, 1987; Heckhausen et al., 2010).

The results from this study further point to the importance of perceived control in the age-related experience of older adults’ sadness and anger. Here, the reported findings suggest that inter-individual differences in levels of, and changes in, perceived control predicted long-term longitudinal increases in sadness, but not anger. That is, participants who generally experienced high levels of, or relative increases in, perceived control during the study period did not report an increase in sadness over time. Their counterparts, by contrast, who experienced relatively low levels of, or declines in, perceived control encountered steep increases in their long-term trajectory of sadness (see Figure 2). This pattern of findings may indicate that perceptions of low and reduced control reflect, in part, age-related developmental losses and constraints (Drewelies et al., 2017). By contrast, perceptions of high or increased control may reflect that some participants experienced only mild or no developmental losses and constraints, which according to DEA would make it more likely that their levels of sadness remain stable at a low level (Kunzmann et al., 2014).

Based on our theoretical model, these findings could imply that perceptions of control represent a cognitive mechanism that links age-related losses with the experience of discrete emotions (for the role of cognition in emotion, see also Lazarus, 1982, Lazarus & Folkman, 1984). Nonetheless, we acknowledge that our study did not examine age-related losses directly, and that inter-individual differences in perceptions of control are likely associated with factors beyond objectively occurring changes in older adults’ lives. They could also represent relatively stable individual differences that are partially independent from objective age-related changes and determine individuals’ coping tactics and their emotional experiences (Wrosch, Heckhausen, & Lachman, 2006).

We further note that chronological age was not associated with levels of sadness or anger, and that the obtained longitudinal trajectories of sadness and anger were not further qualified by participants’ chronological age at baseline. Even though our theoretical rationale would have made it possible that increases in sadness (based on reduced perceptions of control) are more pronounced among those participants who were older at baseline, one explanation for this lack of effects may be found in the relatively young mean age of our sample at baseline (i.e., 72 years). The long follow-up period (i.e., 10 years), by contrast, made it possible that even relatively young participants aged from early to advanced older adulthood during the study period, and thus may have experienced increases in developmental losses and reduced control perceptions that were sufficiently severe to trigger an enhanced experience of sadness over time. In this regard, it would be interesting to keep following our study participants to examine whether their levels of sadness continue to increase as they approach the end of life, when many individuals show a steep drop across different areas of functioning (e.g., Gerstorf et al., 2010).

The reported study also showed evidence for the importance of time-varying changes in perceptions of control for older adults’ emotional experience. Since aging is not necessarily a unidirectional process of continued loss (Baltes, 1987), we had suggested that perceptions of control could also vary in a non-linear fashion over time (e.g., in the context of a disease, its treatment, and recovery), and predict a differential experience of older adults’ sadness and anger (Eizenman et al., 1997). The results from the within-person analyses showed that, independent of time in study, larger intra-individual reductions in perceptions of control were significantly associated with higher levels of sadness across the entire sample. By contrast, intra-individual reductions in perceived control predicted higher levels of anger only among participants in early, but not advanced, old age (see Figure 4). These findings are consistent with our hypotheses, since perceptions of low control were not associated with anger in advanced old age (but they predicted sadness in advanced old age). They further resemble some of the results obtained in the longitudinal analyses. That is, in particular in advanced old age (or when individuals enter advanced old age over time), reduced perceptions of control can be a reliable predictor of sadness, but not anger. Note that the observed effects of intra-individually declining levels of perceived control could also reflect instability in perceived control, which has been linked with adverse developmental outcomes in older adulthood (Chipperfield, Campbell, & Perry, 2004).

In addition, our findings shed light on some of the extant literature on age differences in anger. In this regard, the temporarily enhanced levels of anger obtained in young-old participants who concurrently perceived low levels of control may inform research, suggesting that although anger already declines in early midlife, it can slightly rebound in older adulthood (Kunzmann et al., 2013). To address this possibility, we had suggested that there may also be times when low control perceptions could enhance older adults’ feelings of anger; for example, if older adults encounter the onset of age-related declines (e.g., a certain disease), and even if their perceptions of current control are low, they may still be hopeful that the problem could be resolved in the future. Such circumstances may be experienced particularly in early old age, when age-related problems are generally less intractable (Baltes & Smith, 2003; Wrosch et al., 2017). In addition, they could elicit anger and mobilize energy, which individuals may use to cope with a respective problem. Such a process, however, may be less likely to be observed in advanced old age, when developmental losses and constraints become typically less controllable (e.g., Baltes & Smith, 2003). Clearly, more research on the emotional adjustment to age-related changes is needed, including fine-grained temporal analyses and experimental designs, to examine whether the onset of developmental losses in older adulthood could trigger a process of subsequent anger and sadness experiences.

Overall, the present study has important implications for life-span developmental theories and research on emotional experiences. In this regard, the obtained age-differential trajectories of older adults’ sadness and anger suggest that, different from dimensional approaches to emotional aging (e.g., Carstensen, 2006; Labouvie-Vief, 2003), DEA can identify important differences in the experience of specific negative emotions as older adults advance in age. From this body of theory, sadness, but not anger, is likely to increase its salience during old age, since sadness (but not anger) may have evolved in phylogenesis to support the adjustment to irreversible losses (Nesse, 2000). In addition, the underlying theoretical presumptions of a discrete emotions approach consider that the experience of different negative emotions may depend on the extent to which they facilitate an effective management of age-specific developmental opportunities and constraints (Kunzmann et al., 2014). A discrete emotion approach thus provides a well-suited explanatory model for identifying individual differences in emotional experiences across the lifespan.

The study further informs extant life-span developmental research by providing two explanations for the mixed findings regarding age-related changes in sadness (i.e., stability or increase) versus anger (i.e., consensus on decline) across the adult lifespan. First, our findings suggest that it is important to cover a wide longitudinal age range in order to document an enhanced salience of sadness over anger in older adulthood (see also Kunzmann et al., 2013). This should be the case because severe developmental constraints and losses are likely to elicit sadness and are more frequently observed in the later parts of older adulthood (Baltes & Smith, 1987). Second, the psychological perception of control seems to play an important role in the age-related experience of older adults’ sadness. Increases in sadness were observed particularly among those older adults who experienced low levels of, or reductions in, perceived control. These findings suggest that perceptions of low or reduced control could reflect occurring developmental losses and constraints, which are likely to increase the salience of older adults’ sadness.

In addition, our study contributes to the literature on age effects of discrete emotions by providing some evidence that the experience of anger can at times also be enhanced during older adulthood. This possibility was observed as a function of time-varying fluctuations in perceived control among individuals in early old age. Given the non-linear nature of these findings, it may be that temporarily enhanced anger experiences occur particularly when older adults encounter a new challenge (e.g., a disease). However, future research is needed to replicate these findings and examine whether such temporary anger experiences motivate individuals to overcome a respective problem or are dysfunctional and forecast a reduction of older adults’ quality of life (e.g., for anger and potential health declines in old age, see Kunzmann & Wrosch, in press).

Finally, the study’s results may have some methodological implications for research on different emotions across the lifespan. Although our study did not include young adults, research comparing young and older adults may be well advised to sample a wide range of older adults to ensure that their participants encounter age-normative levels of developmental losses. In addition, it should incorporate psychological perceptions of age-related problems or other variables that could reflect objective age-related changes (e.g., indicators of biological age such as telomeres, Aubert & Lansdorp, 2008) to capture the heterogeneity of the aging process and identify groups of individuals who exert different trajectories of certain emotions. We feel that such research has much potential to further illuminate the predictors, experience, and functions of discrete emotions across the lifespan. In addition, it may provide important answers to whether human aging can be characterized by emotional gains, emotional losses, or both.

**Limitations and Future Research**

 This study has a number of limitations that need to be addressed in future research. First, the data are of correlational nature and the study is based on a relatively small longitudinal sample of older adults. These limitations prevent us from generalizing the study’s results to the entire aging population and arriving at causal conclusions. For example, emotional experiences could also influence perceptions of control, and there may be additional variables (e.g., traits) that could forecast both, perceived control and emotions. To substantiate our conclusions, future research should address these issues by studying larger and representative samples of older adults and implementing appropriate experimental studies (e.g., manipulating perceived control).

 Second, the study focused on the subjective experience of discrete emotions and did not include measures of other emotion response systems, such as emotional expression and physiology (e.g., Levenson, 2000). We therefore suggest that it is important to conduct more research, assessing subjective, physiological, and behavioral aspects of emotions simultaneously. Such an approach may reveal whether different aspects of emotions follow similar trajectories from the early to later phases of older adulthood and can be predicted by inter- and intra-individual differences in perceived control.

 Third, the study was based on a sample of older adults and did not include individuals in early adulthood and midlife. Thus, changes in emotional experiences that accrue from young adulthood to old age could not be identified in our study. As a consequence, future research should examine in age-heterogeneous studies whether low and reduced perceptions of control exert effects in young adulthood and midlife that are similar to the documented patterns in early old age. Alternatively, such effects may be different in young adulthood, when many individuals confront particularly favorable opportunities for overcoming age-normative challenges (Heckhausen et al., 2010), in that a loss of perceived control could mainly trigger young adults’ anger, but not sadness.

 Fourth, our study did not examine the consequences of age-related changes in older adults’ experience of sadness and anger. Since DEA postulates that sadness, but not anger, may influence motivational behaviors that facilitate adjustment in older adulthood (Kunzmann, 2014), individual differences in levels and increases in sadness could promote older adults’ long-term well-being and health. Levels and increases in the experience of anger, by contrast, could be comparatively maladaptive in predicting older adults’ well-being and health over longer periods of time (Kunzmann & Wrosch, in press).

Finally, our approach focused on the experience of sadness and anger as two distinct negative emotions because the theoretical case for an age-differential experience and motivational function of these two emotions has been most elaborated thus far (Kunzmann et al., 2014). However, other emotional experiences such as guilt or regret can also motivate adaptive behaviors in younger samples (e.g., Castonguay et al., 2015; Roese & Summerville, 2005), but may no longer be effective among older adults who encounter reduced opportunities and increasing constraints on their development (for regret and age, see Wrosch, Bauer, & Scheier, 2005). Thus, a more comprehensive theoretical analysis of the functions of a variety of positive and negative emotions across the lifespan is needed to expand on the current predictions of DEA. We feel that further research from a discrete emotion approach is warranted to identify the circumstances that contribute to an age-differential experience of different emotions and illuminate their long-term contributions to patterns of successful development across the lifespan.

**Conclusion**

This longitudinal study demonstrated in a community-dwelling sample of older adults that the experience of sadness, but not anger, increased over 10 years of study. In addition, it documented that low levels of, and declines in, perceived control are potent predictors of older adults’ sadness experiences. Finally, time-varying fluctuations in temporarily reduced perceptions of control were reliably associated with older adults’ sadness across the entire age range, but predicted their anger only in early, and not in advanced, old age. These findings support the discrete emotion theory of affective aging (DEA, Kunzmann et al., 2014) and identify psychological perceptions of control as a potential mechanism involved in the experience of discrete negative emotions in older adulthood.

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**Footnotes**

Table 1

*Zero-Order Correlations Between the Main Study Variables (N = 187)*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| 1) Sadness |  |  |  |  |  |  |
| 2) Anger | .51\*\* |  |  |  |  |  |
| 3) PC-L | -.50\*\* | -.39\*\* |  |  |  |  |
| 4) PC-I | -.16\* | -.04 | .13 |  |  |  |
| 5) Age | -.04 | -.04 | .05 | -.05 |  |  |
| 6) Female | .07 | .04 | -.04 | -.01 | -.00 |  |
| 7) SES  | -.13 | -.15\* | .09 | -.10 | -.06 |  -.13 |

*Note.* PC-L = levels of perceived control. PC-I = increases in perceived control. SES = socioeconomic status. Sadness, anger, and PC levels represent averaged constructs across waves.

\* *p* < .05; \*\* *p* < .01.

Table 2

*Results from HLM Analyses Examining Longitudinal Changes in Sadness and Anger (N = 187)*

|  |  |  |
| --- | --- | --- |
|  | Sadness | Anger |
|  | Average levels(Intercept) | Yearly change(Slope) | Average levels(Intercept) | Yearly change(Slope) |
|  | *Coefficient (SE)* | *T-Ratio* | *Coefficient (SE)* | *T-Ratio* | *Coefficient (SE)* | *T-Ratio* | *Coefficient (SE)* | *T-Ratio* |
| Level-1  | .989 (.089) |  11.11\*\* | .074 (.017) | 4.42\*\* | .649 (.066) | 9.89\*\* | .015 (.013) | 1.15 |
| Level-2  |  |  |  |  |  |  |  |  |
| Age  | -.043 (.080) | -0.54 | -.011 (.016) | -0.69 | -.021 (.056) | -0.38 | -.019 (.013) | -1.48 |
| Female | .058 (.072) | 0.80 | -.001 (.016) | -0.09 | .024 (.058) | 0.42 | .023 (.013) | 1.82 |
| SESPC-LPC-IAge X PC-LAge X PC-I | -.089 (.067)-.601 (.089)-.105 (.103).143 (.098)-.192 (.107) | -1.33-6.77\*\*-1.021.45-1.79 | .012 (.014)-.037 (.018)-.102 (.040).010 (.023).010 (.042) | 0.82-2.01\*-2.55\*0.420.23 | -.093 (.064)-.356 (.076)-.007 (.077).100 (.063).025 (.066) | -1.44-4.68\*\*-0.101.580.38 | .003 (.009)-.013 (.018)-.059 (.031).002 (.018).024 (.030) | 0.32-0.75-1.890.100.80 |

*Note.* Analyses were conducted separately for sadness and anger. PC-L = levels of perceived control. PC-I = increases in perceived control. SES = socioeconomic status. *Df*s = 186 (Level-1); 181 (Level-2 main effects); 180 (Level-2 interactions). \* *p* < .05; \*\* *p* < .01.

Table 3

*Results from HLM Analyses Examining Within-Person Changes in Sadness and Anger (N = 187)*

|  |  |  |
| --- | --- | --- |
|  | Sadness | Anger |
|  | Average levels(Intercept) | Perceived control change(Slope) | Average levels(Intercept) | Perceived control change(Slope) |
|  | *Coefficient (SE)* | *T-Ratio* | *Coefficient (SE)* | *T-Ratio* | *Coefficient (SE)* | *T-Ratio* | *Coefficient (SE)* | *T-Ratio* |
| Level-1  | .989 (.089) | 11.08\*\* | -.162 (.045) | -3.62\*\* | .646 (.065) | 9.91\*\* | -.104 (.039) | -2.65\*\* |
| Level-2  |  |  |  |  |  |  |  |  |
| Age  | -.074 (.100) | -.73 | .062 (.046) | 1.34 | -.046 (.060) | -0.76 | .078 (.037) | 2.12\* |
| Female | .084 (.086) | 0.97 | -.020 (.045) | -0.46 | .041 (.064) | 0.64 | -.034 (.038) | -0.91 |
| SES | -.149 (.083) | -1.80 | -.008 (.052) | 0.16 | -.149 (.063) | -2.38\* | .037 (.037) | 0.58 |

*Note.* Analyses were conducted separately for sadness and anger. SES = socioeconomic status. Results were further controlled for time in study at Level-1. *Df*s = 186 (Level-1); 183 (Level-2). \* *p* < .05; \*\* *p* < .01.

Figure 1

*Longitudinal Changes in Sadness and Anger*

Figure 2

*Longitudinal Changes in Sadness Among Participants Who Perceived High Versus Low Average Levels (Upper Panel) and Declines Versus Increases (Lower Panel) of Perceived Control*

Figure 3

*Within-Person Associations between Perceived Control and Sadness and Anger. (The Range of X-Axes Values Represents the Upper and Lower Averaged Quartiles of the Distribution)*

Figure 4

*Within-Person Associations between Perceived Control and Anger as a Function of Participants’ Baseline Age (Plotted for Age 65 and 80. The Range of X-Axes Values Represents the Upper and Lower Averaged Quartiles of the Distribution)*

1. Ratings of daily sadness in normative populations are frequently relatively low, and comparable levels have been reported in other studies (e.g., Verkuil et al., 2015). [↑](#endnote-ref-1)
2. We person-centered time in our analyses because it has been argued that non-centered time could result in an underestimation of the variance in random slope coefficients (e.g., Blozis & Cho, 2008). [↑](#endnote-ref-2)
3. The pattern of obtained effects did not change if time in study was excluded from the analyses. [↑](#endnote-ref-3)
4. We also tested quadratic effects of age on the longitudinal trajectories of sadness and anger, which were also non-significant (*p*s > .82). [↑](#endnote-ref-4)
5. Note that the upper and lower averaged quartiles of the unstandardized changes in perceived control were .40 and -.62, respectively. These reference points indicate actual increases versus declines in perceived control across the study period. [↑](#endnote-ref-5)