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Emotional Complexity in Younger, Midlife, and Older Adults

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Abstract

Questions pertaining to emotional complexity in adult development are being pursued from a number of vantage points. The current studies sought to clarify the study of emotional complexity by comparing and contrasting two dominant perspectives on emotional complexity in different age groups (i.e. covariation and absolute-level approaches). Results indicate that emotional complexity is a multifaceted construct and that methodology will impact substantive findings and developmental trends that emerge from the data. Recommendations and considerations for future research are discussed, including, for example, within- versus cross-domain ideas of emotional complexity.

Keywords

aging; assessment; affect; older adults; complexity

Lifespan perspectives on adult development are mirroring a larger trend in psychological science to consider integrated perspectives on emotion (Reich, Zautra, & Davis, 2003). Specifically, questions pertaining to various aspects of emotional complexity are being pursued (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Charles, 2005; Magai, Consedine, Krivoshekova, Kudadjie-Gyamfi, & McPherson, 2006; Ong & Bergeman, 2004). There is some suggestion in this work of age differences in emotional complexity favoring older adults but consensus is hard to discern because investigators use different methods to assess emotional complexity.

That is, emotional complexity is multiply defined. The goal of the current studies was to integrate, compare, and contrast *two* dominant perspectives on emotional complexity.¹ We label these approaches the *covariation* and the *absolute-level* perspectives. According to the former, low covariation among discrete affects or between larger affect systems [i.e., positive (PA) and negative affect (NA)] indicate greater emotional complexity. Low covariation suggests the capacity to experience affects as independent yet potentially co-occurring (Carstensen et al., 2000; Ong & Bergeman, 2004; Tugade, Fredrickson, & Feldman Barrett, 2004). In the current studies, covariation was assessed across PA and NA (i.e., correlation

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¹Whereas the covariation and absolute-level approaches to emotional complexity appear frequently in the adult development literature, there are other perspectives. For example, Labouvie-Vief's cognitive-affective theory focuses on the interplay between cognitive and affective development to understand age-related differences in the complexity of emotional experiences (Labouvie-Vief, 1998, 2003).

coefficient (Carstensen et al., 2000)), amongst all discrete affects (i.e., factor analyses (Carstensen et al., 2000)), and among affect terms within domain (i.e., Intraclass Correlation Coefficients (ICC) (Tugade et al., 2004))

However, the covariation approach does not indicate if emotional experiences are complex but rather indicates the *potential* for emotional complexity. That is, this approach considers associations among affect terms but does not examine *levels* of emotion, which would indicate whether or not, for example, PA and NA actually co-occur. A complement to the covariation perspective focuses on emotional complexity in *absolute-levels* of emotional experience (Charles, 2005; Chipperfield, Perry, & Weiner, 2003; Magai et al., 2006). In the current study, absolute-level complexity was assessed via heterogeneity in mean affect ratings.

Across the different metrics of emotional complexity, methodological issues have the potential to impact substantive findings. For example, instruments that sample relatively more *pure* markers of PA and NA, such as the Positive and Negative Affect Scales (PANAS) (Watson & Clark, 1994), and that use an *extent* rating scale, typically produce lower, near-zero correlations between PA and NA (Watson, 1988). In contrast, instruments that include terms with *factorial complexity* (i.e., a mixture of PA and NA) have subscales that tend to be negatively correlated; these scales are termed pleasantness-unpleasantness scales and they might be problematic for emotional complexity research due to the negative correlations between PA and NA that are inherent in these measures. The current studies seek to advance research on emotional complexity by attending to these and other methodological considerations.

The Current Studies

Specifically, self-report affect data were gathered from younger and older adults in three studies, and in one study from midlife persons, using a variety of questionnaires, items, time frames, methods, and response formats. Together, these studies advance a more sophisticated understanding of the measurement and conceptualization of emotional complexity.

STUDY 1: DAILY DIARY STUDY

Method

Sample: The sample and methods for Study 1 are detailed in Ready, Weinberger, and Jones (2007; Study 1). The data reported here are from older ($N = 28$, M age = 71.6, $SD = 5.7$) and younger ($N = 21$, M age = 24.6 years, $SD = 6.2$) participants in a 28-daily diary study.

Measures

Measures: Baseline Measures: Participants reported their positive and negative emotions for *today* and *in general* via a reliable computerized Emotion Judgment Task (Ready, Robinson, & Weinberger, 2006; Robinson, Ode, Moeller, & Goetz, 2007). They also completed the General Temperament Survey (GTS), which is a reliable, 90-item self-report measure of Negative Temperament (NT) and Positive Temperament (PT) (Clark & Watson, 1990; Watson & Clark, 1992) and were administered the Hopkins Verbal Learning Test – Revised (HVLT-R) to exclude persons with memory impairment (Benedict, Schretlen, Groninger, & Brandt, 1998).

Daily Diary Ratings: On the internet, participants rated the frequency of 10 emotions (1 = none, 7 = always) at the end of every day for four consecutive weeks. There were 5 positive emotions (happy, joyful, pleased, enjoyment/fun, content) and 5 negative emotions (depressed/blue, unhappy, frustrated, angry/hostile, and worried/anxious), adapted from Thomas and Diener (1990).

Results

Emotional Complexity: Covariation Perspective: For cross-sectional ratings, PA and NA were negatively correlated for *today* and *in general* and the differences between age groups were not significant (Table 1; $ps > .10$). For the averaged daily diary data, correlations between PA and NA also did not differ by age group (Table 1). Controlling individually for PT and NT had no significant ($p < .05$) effects on the correlations. For older persons, emotional complexity assessed via diary ratings was significantly correlated with NT ($r = -.58, p < .02$).

Hierarchical Linear Modeling (Raudenbush & Byrk, 2002) was used to determine the daily association between PA and NA (Level 1 model: $PA = \beta_0 + \beta_1 * NA + r$) and also if there were age group differences in these associations (Level 2 models: $\beta_0 = \gamma_{00} + \gamma_{01} * \text{Group} + u_0$; $\beta_1 = \gamma_{10} + \gamma_{11} * \text{Group} + u_1$). Results indicated that PA was significantly and negatively associated with NA ($\beta = -1.11, SE = .21, t = -5.38, p < .001$), such that greater PA meant lesser NA on any given day, but there was no significant difference between the age groups for the daily PA-NA association. Effects of PT and NT on the daily PA-NA association were not significant.

Factor-based indices of emotional complexity were obtained by principal component factor analyses on diary ratings within person and by recording the number of factors with eigenvalues ≥ 1 (Carstensen et al., 2000). The average number of factors did not significantly differ between older ($M = 2.87, SD = 0.74$) and younger adults ($M = 2.53, SD = 0.70$). NT was significantly ($p < .05$) correlated with the factor scores (younger $r = -.46$, older $r = -.52$).

An Intraclass Correlation (ICC) index of emotional complexity was calculated within valence (Tugade et al., 2004); lower ICC scores indicated greater complexity (i.e., less covariation among affect terms). Older adults had greater emotional complexity than younger persons for PA ($t = -2.20, p < .05$) and NA ($t = -2.14, p < .05$; Table 1). Greater NA complexity was significantly ($p < .05$) associated with lower NT for younger ($r = .53$) and older persons ($r = .42$). For younger adults, greater PA complexity was correlated with higher PT ($r = -.49$). The factor- and ICC-scores were significantly ($p < .05$) convergent for older (factor-score & ICC PA $r = -.61$; factor-score & ICC NA $r = -.53$) and younger persons ($rs = -.62$ and $-.57$, respectively).

Emotional Complexity: Absolute-level Perspective: Across all diary days, within person averages for each emotion were calculated and from these data, absolute-level scores were calculated (1 = least complex, 5 = most complex). Within valence, the number of items within .5 points of the highest item were tallied. The .5 cut-off was used because all values within .5 of the highest score also were within 1 SD of that score.

Absolute-level scores did not significantly differ between older and younger adults (Table 1). For older adults, NA absolute-level was associated with lower NT ($r = -.43, p < .05$). Convergence between absolute scores and covariation metrics (i.e., factor-scores and ICC-scores) were investigated. For the full sample, NA absolute complexity was significantly ($p < .05$) associated with ICC PA ($r = -.35$). For older adults, NA absolute complexity was significantly ($p < .05$) associated with ICC PA ($r = -.44$) and ICC NA ($r = -.38$).

The daily ratio of PA to NA [i.e., Ratio = $PA/(PA+NA)$]; (Schwartz, Reynolds, Thase, Frank, & Fasiczka, 2002)] was significantly lower in younger ($M = .65, SD = .11$) than older persons ($M = .73, SD = .08; t = 2.87, df = 47, p < .01$); thus, from the perspective that more mixed emotions suggest complexity, this result suggests greater complexity in younger than older persons. However, from another perspective, the ratio scores correlated significantly with ICC NA ($r = -.32, p < .05$), such that a greater ratio was associated with greater complexity; there also were significant associations with PT ($r = .31$) and NT ($r = -.50$). For older adults, the

correlations between ratio scores and ICC NA ($r = -.54$) and NT ($r = -.48$) were significant and the latter association also was significant for younger persons ($rs = -.43$).

Summary and Discussion—Overall, evidence of greater emotional complexity in older relative to younger adults was mixed. Based on the ICC metric (e.g., Tugade et al., 2004), older adults had greater emotional complexity than younger persons, but according to the ratio scores, the emotional experiences of younger persons could be interpreted as more complex. There was moderate convergence between some measures of emotional complexity and older adult data were somewhat more convergent than for younger persons. There also were mixed and age-specific findings about links between emotional complexity and temperament. Thus, whereas there is some overlap between different metrics, emotional complexity appears to be a multifaceted construct.

Prior research suggested that PA and NA were more positively correlated in older than younger persons (Carstensen et al., 2000). Our different results are not totally surprising because our affect scale had features (e.g., a frequency format, factorially-mixed items) that tend to increase correlations between PA and NA. When associations between two scales are strong, it may be difficult to test for age-related differences in emotional complexity. Below is a brief, semi-replication project with a different affect measure in which we continue to explore convergence and divergence between different perspectives on emotional complexity.

STUDY 2, FOUR-DAY DIARY STUDY

Overview and Methods

Participants and Measures: Daily diary data were collected over the four-day Thanksgiving holiday using an affect measure that had more independent PA and NA scales (i.e., the PANAS) than in Study 1. The sample and methods are described in Ready et al. (2007; Study 2). Participants were 17 older (M age = 68.7 years, $SD = 4.8$; 100% Caucasian) and 17 younger adults (M age = 22.9, $SD = 3.3$; 82% Caucasian) screened to be in good mental, physical, and cognitive health.

The daily diary was completed via the internet and included demographic information and the PANAS (Watson, Clark, & Tellegen, 1988). The PANAS exhibits strong internal consistency (PA $\alpha = .90$; NA $\alpha = .87$) and 2-month test-retest reliability (PA $r = .47$; NA $r = .39$).

Study 2 Results and Discussion

Emotional Complexity: Covariation Perspective: The mean correlation between PA and NA, averaged over diary days, for younger adults did not differ significantly from older adults (Table 1). Similar to Study 1, results of HLM analyses indicated a significant effect for daily PA to be associated with lower NA ($\beta = -.59$, $SE = .23$, $t = -2.56$, $p < .05$). There also was a significant age group effect ($\beta = .64$, $SE = .28$, $t = 2.33$, $p < .05$); the negative PA-NA association was stronger for older than younger persons.

Emotional Complexity: Absolute-level Perspective: Following Study 1, absolute-level complexity scores were tallied (1 = least complex, 10 = most complex). NA absolute complexity was greater in older than younger persons ($t = 3.42$, $df = 21.77$, $p < .01$; Table 1). Next, ratios of PA to NA were calculated within day. Mean ratios were significantly greater in older than younger persons (older $M = .72$, $SD = .06$; younger $M = .60$, $SD = .07$; $t = 5.34$, $df = 32$, $p < .01$).

Thus, again, results support a multifaceted conceptualization of emotional complexity. For example, in the same sample and using the same data, older adults exhibited lesser complexity on two metrics (i.e., daily associations between PA and NA; ratio of PA to NA) and greater

complexity on another (i.e., absolute NA complexity). Below, we further explore age group differences from the covariation perspective of emotional complexity, using a variety measures of positive and negative emotion and also by including midlife persons in the study.

STUDY 3, AUTOBIOGRAPHICAL MEMORY AND EMOTION STUDY

Method

Sample: Older ($n = 24$; M age = 74.1, $SD = 6.9$), midlife ($n = 26$; M age = 55.1, $SD = 6.9$), and younger persons ($n = 25$; M age = 19.09 years, $SD = 0.9$) participated. Younger adults were recruited through a University-based on-line experiment system. Older and middle-aged persons were recruited from the community. Exclusion criteria were: history of neurologic or psychiatric diagnosis, self-reported memory problems, self-reported *poor* or *fair* health.

Participants were administered the American National Reading Test (ANART) to estimate verbal IQ. An ANOVA tested for group differences on the ANART ($F(2,72) = 32.29, p < .01$); post-hoc Tukey tests revealed that older adults had significantly ($p < .05$) higher T-scores ($M = 53.2, SD = 3.7$) than younger adults ($M = 46.7, SD = 2.5$); midlife persons were significantly lower than older adults and greater than younger persons ($M = 51.2, SD = 2.4$).² Chi-square tests revealed no significant group differences in sex (% female: younger 80%, midlife 88%, older 71%) or ethnicity (% Caucasian: younger 80%, midlife 100%, older 96%).

Measures: First, participants rated their current mood with the PANAS. Then, each participant recalled one negative and one positive autobiographical event that occurred between six months and five years ago (Comblain, D'Argembeau, & Van der Linden, 2005). Events were to have occurred at a particular time and place and not to have lasted longer than a day (Comblain et al., 2005; Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002), however, the *emotional reaction* to the event could last longer than one day. Half of the participants randomly recalled a negative event first and half recalled a positive event first. Narratives were tape-recorded for coding.

Participants rated the event on the Memory Characteristics Questionnaire-modified (MCQ-m) before the next story. The original MCQ (Johnson, Foley, Suengas, & Raye, 1988) assesses characteristics of memories. Following Comblain et al. (2005), a subset of MCQ items were modified for this study. On 7-point scales, participants rated the *extent* of negative and positive emotions *at the time* of the event (i.e., *then* ratings) and during recall (i.e., *now* ratings).

Event narratives were coded for number of positive and negative idea units (i.e., sentence/phrase that conveyed a complete thought) by trained research assistants (RAs). Intra-class correlations (ICCs) were good to excellent for positive (.80 to .97) and negative idea units (.74 to .89). Narratives also were coded for thematic content: Physical/health; Death/dying; Social/interpersonal; Occupation/education; Recreation/travel; Other. Median kappa agreement for initial coding was .71 (1.0 to .50). For all coding, discrepancies were resolved via discussion.

Results and Discussion

Emotional Complexity: Covariation Analyses: Greater emotional complexity in PA-NA correlations was found in older and midlife relative to younger persons ($p < .05$; Table 1). Older and younger correlations on the MCQ-m also were significantly ($p < .05$) different for *then* ratings; there was a trend between midlife and younger persons ($p < .10$; Table 1). Results suggested greater complexity in younger persons.

²Since there were age-group differences on the ANART, all analyses were re-run while co-varying for ANART scores. Results indicate that the ANART had no significant effects on results.

Narrative Coding

Narrative Coding: Preliminary Analyses: For the positive narratives, there were no significant age group differences for thematic content (all $ps > .10$); for the negative narratives, older adults reported more physical/health related events than midlife and younger adults ($X^2 = 13.36$, $df = 2$, $p < .01$). There also were age group differences for the length of positive ($F(2,52) = 5.69$, $p < .01$) and negative narratives ($F(2,57) = 10.74$, $p < .01$). Younger persons told significantly ($p < .05$) shorter positive stories than midlife and older persons and significantly shorter negative stories than midlife persons. Older adult negative stories also were significantly shorter than midlife persons. Thus, proportion measures of positive and negative idea units were calculated, by dividing positive and negative idea units by total units in each narrative.

Emotional complexity: Correlations between positive and negative idea units from the narratives were calculated (Table 1) and for the positive event, the correlation was significantly ($p < .05$) greater in older and midlife persons as compared to younger adults, suggesting greater emotional complexity in the older two age groups. Thus, again, findings of age-group differences in emotional complexity were mixed in Study 3; general trends and issues pertaining to the measurement of emotional complexity that emerged from all studies are discussed below.

GENERAL DISCUSSION

Emotional complexity is a multifaceted construct. The goal of the current studies was to integrate and compare the covariation and absolute-level complexity approaches to emotional complexity, and within these perspectives, to explore important methodological issues.

The current studies demonstrated that the manner in which emotional complexity is defined and measured could have profound effects on the developmental implications that are drawn from the data. That is, for example, from the perspective that lesser covariation between PA and NA reflects greater complexity, findings were split between older than younger adults (Table 2). However, for discrete emotions, results were somewhat more consistent across studies because, when age effects were found, they tended to favor greater emotional complexity in older than younger persons. Not surprisingly, some metrics of emotional complexity demonstrated convergent validity, but not all.

Thus, one avenue along which clarity may be gained is careful consideration of whether and how emotional complexity *within* valence domain differs from emotional complexity *across* domains. For example, older adults tended to have more complex experiences *within* rather than *across* valence domains, an idea which is consistent with our previous research demonstrating that older adults store positive and negative information in a more differentiated manner than younger persons (Ready et al., 2006). Older adults may have more separation in their experience and stored knowledge of PA and NA but they also may have richer, more heterogeneous experiences within domain. It was not the goal of the current studies to determine why such developmental trends emerge but in our previous research, we hypothesized that greater distinction between positive and negative experiences for older persons might be due to stronger positive and negative emotion schemas in older relative to younger adults (Ready et al., 2006).

Another issue to emerge from these studies was that data pertaining to the same event can point to very different implications about emotional complexity depending, for example, if the emotion data were gathered via an explicit rating task or implicit coding of an autobiographical event (Study 3); or if respondents were asked to focus on current versus past emotions (Study 3); or if diary data were averaged across days or not (Study 2). Thus, to risk stating the obvious,

definition and measurement of emotional complexity should matter a great deal to the field of adult development because there is a risk of mixed and confusing signals from emotional complexity research when different metrics are compared.

Measurement issues also matter if one is curious as to potential correlates of emotional complexity. In Study 1, for example, many metrics of emotional complexity were associated with lesser NT, but not all and there appeared to be some age-related trends in the data. That is, we found greater convergence between NT and emotional complexity in older than younger persons but a link between complexity and PT was found only for younger adults. Thus, pathways to and from complexity may vary by age and perhaps by other important individual difference factors.

Another issue to tackle is whether or not particular metrics of emotional complexity have similar meanings for persons of different ages. Along these lines, there was some suggestion that emotional complexity may be a more unified construct in older than younger adults. As future investigators follow-up on these and other important developmental issues (e.g., the temporal stability of emotional complexity), methodology should be at the forefront of their thinking. Emotion measures with subscales or items that are relatively independent may be most ideal, to avoid the rather uphill task of finding differential age group effects or developmental change on scales that are too interdependent, a difficulty in Study 1. Measures that sample affect relevant to different age groups also should be sought (Lawton, Kleban, & Dean, 1993).

There are limitations to the current studies. Only one study collected sufficient repeated measures of PA and NA to conduct covariation analyses on discrete affects. Also, the diary data were collected via the internet, with distinct advantages (e.g., accuracy of data collection) and disadvantages (e.g., samples biased towards greater socioeconomic status) (Ready, Weinberger, & Jones, 2007). Finally, samples were small and were ones of convenience.

In summary, the current studies contribute to a better understanding of some challenges and important theoretical and methodological issues to attend to in emotional complexity research. Emotional complexity is a topic of considerable interest to developmental psychologists but is multiply defined. We hope our results stimulate discussion and interest in methodology that will shape and guide future research into this important topic.

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Table 1**Emotional Complexity: Age Group Differences**

	Younger	Midlife	Older
PA-NA Correlations			
Study 1: 28-Day Diary Study			
Affect <i>Today</i>	-.32 [*]	na	-.52 [*]
Affect <i>In general</i>	-.36 [*]	na	-.56 [*]
Averaged Daily Diary	-.66 [*]	na	-.61 [*]
Study 2: 4-Day Diary Study			
Averaged Daily Diary	-.47	na	.31
Study 3: Autobiographical Study			
Affect <i>Now</i>	-.33 ^a	.27	.28
MCQ-m			
Neg. Event Then	-.31 ^b	-.59 [*]	-.73 [*]
Neg. Event Now	-.01	.06	-.31
Pos. Event Then	-.11 ^{b,c}	-.54 [*]	-.82 [*]
Pos. Event Now	.08	-.42 [*]	-.10
Autobiographical Narratives			
Negative Event	.28	.60 [*]	-.30
Positive Event	-.26 ^a	.53 [*]	.70 [*]
ICC Scores (Study 1)			
PA Mean (SD)	0.86 (0.11) ^b	na	0.78 (0.15)
NA Mean (SD)	0.72 (0.14) ^b	na	0.60 (0.24)
Heterogeneity Scores			
Study 1			
PA Mean (SD)	2.76 (1.04)	na	2.64 (1.34)
NA Mean (SD)	3.10 (1.22)	na	3.04 (1.32)
Study 2			
PA Mean (SD)	3.60 (1.35)	na	3.53 (1.77)
NA Mean (SD)	3.40 (1.55) ^b	na	6.82 (3.78)

Note. PA = Positive Affect. NA = Negative Affect. MCQ-m = Memory Characteristics Questionnaire – modified. 'na' = not available.

^{*}
 $p < .05$.

^a Value is significantly ($p < .05$) different than corresponding value for midlife and older adults.

^b Value is significantly ($p < .05$) different than corresponding value for older adults.

^c Trend ($p < .10$) for value to be different than corresponding value for midlife persons.

Table 2**Summary of Results: Age Group Differences for Emotional Complexity and Correlates of Emotional Complexity**

Emotional Complexity (EC) Measure	Study and Results
Covariation Metrics	
Positive-Negative Emotion Associations (across domain)	
PA-NA Scale Correlation	1,2: No age group differences 3: Greater EC in older and midlife than younger persons for current self-report emotion
Autobiographical Emotion Ratings	3: Lesser EC for older than younger adult ratings of past emotions
Narrative Emotion Ratings	3: Greater EC in older than younger persons for narratives of positive events
Daily PA-NA Associations (HLM)	1: No age group differences 2: Lesser EC in older than younger persons for daily association between PA and NA
Discrete Emotion Associations	
Factor scores (across domain)	1: No age group difference in EC; Greater EC associated with lesser NT
ICC scores (within domain)	1: Greater EC in older than younger for PA and NA; Greater NA EC associated with lower NT for whole sample; Greater PA EC for younger associated with greater PT 1: ICC and factor-scores indicated significant convergent validity
Absolute Complexity Metrics	
Mean Emotion Ratings across Days (within domain)	1: No age group difference in absolute complexity; For older adults, greater NA absolute complexity associated with lesser NT 1: Absolute and covariance indicators of EC showed modest convergent validity 2: Greater NA absolute complexity in older than younger
Ratio of PA to NA (across domain)	1: Ratio greater in older than younger; Greater NA ICC complexity associated with greater ratio; Ratio scores positively correlated with PT and negatively correlated with NT 2: Ratio greater in older than younger

Note. *Across domain* refers to emotional complexity across ratings or measures of positive and negative emotion. *Within domain* refers to emotional complexity within positive or negative emotion measures. PA = Positive Affect; NA = Negative Affect; HLM = Hierarchical Linear Modeling; NT = Negative Temperament; PT = Positive Temperament; ICC = Intraclass Correlation Coefficient.