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Time-Based Indicators of Emotional Complexity: Interrelations and Correlates

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Abstract

Emotional complexity has been regarded as one correlate of adaptive emotion regulation in adulthood. One novel and potentially valuable approach to operationalizing emotional complexity is to use reports of emotions obtained repeatedly in real time, which can generate a number of potential time-based indicators of emotional complexity. It is not known, however, how these indicators relate to each other, to other measures of affective complexity, such as those derived from a cognitive-developmental view of emotional complexity, or to measures of adaptive functioning, such as well-being. A sample of 109 adults, aged 23 to 90 years, participated in an experience-sampling study and reported their negative and positive affect five times a day for one week. Based on these reports, we calculated nine different time-based indicators potentially reflecting emotional complexity. Analyses showed three major findings: First, the indicators showed a diverse pattern of interrelations suggestive of four distinct components of emotional complexity. Second, age was generally not related to time-based indicators of emotional complexity; however, older adults showed overall low variability in negative affect. Third, time-based indicators of emotional complexity were either unrelated or inversely related to measures of adaptive functioning; that is, these measures tended to predict a less adaptive profile, such as lower subjective and psychological well-being. In sum, time-based indicators of emotional complexity displayed a more complex and less beneficial picture than originally thought. In particular, variability in negative affect seems to indicate suboptimal adjustments. Future research would benefit from collecting empirical data for the interrelations and correlates of time-based indicators of emotional complexity in different contexts.

Keywords

emotional complexity; experience sampling; positive and negative affect; aging

Our everyday life is intertwined with emotional experiences. We are saddened when our favorite sports team loses; we feel angry when someone thwarts us; and we feel proud seeing our children excel. Some people, however, have more complex emotional experiences than others do. They simultaneously experience different emotions, differentiate

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clearly among their own emotions, distinguish between their own emotions and those of others, or express a varied and nuanced set of feelings. Such differentiation of emotional experience is one aspect of emotional complexity and has been regarded as an important indicator of adaptive emotion regulation and mental health in adulthood and old age (Helson & Wink, 1987; Labouvie-Vief, Hakim-Larson, DeVoe, & Schoeberlein, 1989; Labouvie-Vief & Medler, 2002; Ryan & Deci, 2001).

Approaches to Emotional Complexity

Despite its purported relevance for adjustment, there is neither an agreed upon definition of emotional complexity nor an agreed upon approach to operationalizing it. One possible definition stems from a cognitive-developmental perspective on affective representations over the life span (Labouvie-Vief, Grühn, & Studer, 2010; Labouvie-Vief & Marquez, 2004; Labouvie-Vief & Medler, 2002). This approach proposes that the development of emotions emerges in synchrony with cognitive developments in the understanding of self, other, and one's internal states. The development in cognitive complexity supports increasingly complex representations of emotions, which develop from simple automatic schemas to more differentiated representations supporting complex emotional experience and abilities. The latter include the understanding of emotions in their social and moral functions, the differentiation of self's and others' emotions, and the capacity to regulate emotion (Labouvie-Vief et al., 2010). For example, to assess individuals' understanding and representation of emotions, Labouvie-Vief, DeVoe, and Bulka (1989) asked people to think aloud about four situations in which they felt particularly angry, sad, fearful, or happy. The resulting protocols were then evaluated with a coding scheme based on four levels of emotional complexity. This theoretical work on the development of emotions drew strongly on Loevinger's (1976) conception of ego levels, which emphasized the role of abstract thinking in personality development and the formation and organization of emotions. High ego level individuals accept conflict and contradictions, cherish objectivity, differentiate emotions, display good impulse control, and acknowledge interdependency. This cognitive-developmental perspective also undergirds the levels of emotional awareness model proposed by Lane and Schwartz (1987), in which people's responses to emotional vignettes are judged for increasing differentiation of action, thought, and feeling. Importantly, measures stemming from a cognitive-developmental perspective on emotional complexity show age patterns that are congruent with the development of the underlying cognitive processes, which evolve from childhood into late middle adulthood and decline thereafter (e.g., Labouvie-Vief, DeVoe, & Bulka, 1989; Labouvie-Vief & Medler, 2002).

In addition to these cross-sectional or laboratory methods, another approach to conceptualizing and operationalizing emotional complexity has been the use of persons' reports of emotional experiences over time, particularly focusing on the variability in persons' affective experiences. Variability in people's affective reports has been postulated as a stable person characteristic (Baumeister, 1991; Bem & Allen, 1974; Wessman & Ricks, 1966), providing relevant information about adjustment and well-being over and above simple mean level information. The investigation of persons' variability in emotional experiences over time has generated many different measures or indicators that may reflect emotional complexity. To our knowledge, however, these various indicators have not previously been organized in any coherent conceptual framework. Our review of the literature on these various indicators, therefore, suggests that they can be grouped into four classes: (a) covariation scores, (b) component scores, (c) emotional granularity scores, and (d) variability scores.

The *covariation score* is a person's intraindividual correlation between the broader dimensions of positive affect and negative affect over time. A correlation near zero indicates

that positive affect and negative affect are experienced independently, and this greater affect complexity is thought to reflect better adjustment (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Larsen & Cutler, 1996; Reich, Zautra, & Davis, 2003). In contrast, a correlation approaching minus one (−1.00) indicates that a person does not discriminate negative and positive affect but experiences them on a single, bipolar dimension. On a theoretical level, the dynamic model of affect (Davis, Zautra, & Smith, 2004; Reich et al., 2003) posits that under conditions of high stress or cognitive load, positive and negative affect are experienced on a single, bipolar dimension, which is thought to be a marker of poor emotion regulation. Under conditions of low stress and good emotion regulation, positive and negative affect are experienced independently.

Component scores are based on a principal component analysis (PCA) of each individual's affective reports over time. Rather than calculating a typical PCA for a set of variables from different persons at one occasion, this approach performs a PCA for a set of variables from different occasions for one person (P-technique; Cattell, Cattell, & Rhymer, 1947). This approach generates two different indicators. The first indicator is the number of principal components that are needed to account for the variation in each person's affective reports; a larger number of components is thought to indicate a more complex emotional life than a smaller number of components (e.g. Ong & Bergeman, 2004). The second component score is the variance that is not accounted for by the first extracted principal component of each person's affective reports. The first principal component indicates the variance shared across affect ratings over time, and the remaining portion indicates the amount of unshared variation. Hence, the larger the amount of unshared variance, the more differentiated and potentially complex are a person's affective reports (for similar procedures, see Block, 1957, 1961; Larsen & Cutler, 1996).

Emotional granularity is defined as the tendency to represent emotional experiences with precision and specificity (Barrett, 1998; Feldman, 1995). People high in emotional granularity are thought to experience emotions in a discrete and differentiated fashion; that is, they experience one particular emotion at a given time rather than a mix of different emotions. For example, a person who reports being purely sad will obtain a higher granularity score than a person who is simultaneously sad, angry, and fearful. Granularity can be computed over all emotions or separately for positive and negative emotions. To do that, intraclass correlations are calculated across the measurement points for one person over all emotions or separately for positive and negative emotions (Tugade, Fredrickson, & Barrett, 2004). The intraclass correlations would be high if all emotions show similar mean levels. For a granularity score, the intraclass correlation is then subtracted from one (1.00) to get a score that is high if one or few emotions show different mean levels than the other emotions. Emotional granularity seems to be the opposite of the covariation score. Whereas emotional granularity is high when people report very discrete affects, covariation is high when people report a mix of different affects. However, a clear theoretical and methodological association between emotional granularity and emotional complexity has not yet been made, and some studies seem to discuss their findings about emotional granularity in terms of complexity (Ready, Calvalho, & Weinberger, 2008; Tugade et al., 2004). In particular, one could argue that having emotional experiences clearly differentiated from each other is a sign of a complex underlying representation of emotions (see Labouvie-Vief et al., 2010). Thus, for the purpose of the present study, we include granularity as a measure of complexity.

Finally, *variability measures* are related to a person's intraindividual variability in emotions over time (Röcke, Li, & Smith, 2009). Intraindividual variability can be computed as a person's intraindividual standard deviation over positive or negative affect terms. Another perspective on variability is to evaluate the number of emotions that actually vary across

time. Some persons may provide the same rating of an affect or emotion across all measurement points, resulting in zero variance for that emotion. In contrast, an emotion could be rated quite differently across time points, resulting in a larger within-person variance. The relationship of variability scores to emotional complexity is unknown. Although high variability could mean several things (e.g., lability, inconsistency), it seems reasonable that if there is low variability over time, then the other measures (noted above) would also indicate low complexity. Variability might be a measure of complexity given that variability over time seems to be a requirement for the other measures to show high complexity. However, high variability can also be considered as random fluctuation that might conceal true underlying patterns and associations. In that case, variability is important as a potential confounding variable.

We propose that these measures (covariation score, component scores, emotional granularity scores, and variability scores), which are based on repeated, experience-sampling reports of emotions, are called *time-based indicators of emotional complexity*. Complexity in experience-sampling reports of emotions has generally been regarded as an indicator of adaptive emotion regulation in adulthood. Empirical evidence for the adaptive significance of time-based indicators of emotional complexity, however, is limited. In an experience-sampling study of 184 adults, the number of principal components was inversely correlated with neuroticism, as hypothesized, but was not related to overall mental health and verbal fluency (Carstensen et al., 2000). In a daily diary study of 40 older adults, the number of principal components as well as the covariation score were, as expected, positively correlated with trait resiliency and negatively correlated with self-reported stress and neuroticism, but were not associated with health or life satisfaction (Ong & Bergeman, 2004). In a diary study with 53 students (Barrett, Gross, Christensen, & Benvenuto, 2001), people high in emotional granularity for negative emotions reported that they were more frequently engaged in emotion regulation strategies, especially when experiencing high intense emotions; positive emotional granularity was not associated with emotion regulation strategies. In an experience-sampling study with 130 adults (Tugade, Fredrickson, & Barrett, 2004), positive emotional granularity showed associations with two out of 14 coping scales: behavioral disengagement and mental disengagement. People who scored high in positive emotional granularity were more likely to take a pause before attempting coping efforts and were less likely to be self-distracted. Overall, some of the time-based indicators of emotional complexity are associated with adaptive outcomes. An open question is whether associations are consistent across the various indicators and adaptive outcomes.

Emotional Complexity across the Adult Lifespan

Regarding the developmental trajectories of emotional complexity, empirical evidence is mixed. The cognitive-developmental approach to emotional complexity provides a relatively clear age pattern, with a peak in late middle adulthood and an age-related decline thereafter (Helson & Soto, 2005; Labouvie-Vief, Chiodo, Goguen, Diehl, & Orwoll, 1995; Labouvie-Vief, Diehl, Jain, & Zhang, 2007; Labouvie-Vief et al., 1989; Lane, Sechrest, & Riedel, 1998). It is noteworthy, however, that in this line of research, older adults—although scoring lower than middle-aged adults—still typically have higher levels of emotional complexity than young adults. Findings from studies investigating age differences in time-based indicators of emotional complexity appear to be less consistent. In an experience-sampling study of adults from 18 to 94 years old (Carstensen et al., 2000), age was positively correlated with both the number of principal components and the covariation score ($r = .26$). For the latter, young and middle-aged adults showed a stronger negative correlation between positive and negative affect ($r = -.42$) than did older adults ($r = -.25$). These negative correlations indicate that people tend to be either in a positive or in a negative mood. In a follow-up study (Carstensen et al., 2011) of two additional experience-sampling waves after

5 and 10 years, only the covariation score was related to age, and only in wave 3 ($r = .24$), but not in wave 2 ($r = .08$). Using multilevel growth curve modeling, Carstensen and colleagues found a significant age-related change in the covariation score: With every age year, the intra-person correlation between positive and negative affect shifted toward zero by 0.003. That is, the covariation score at the age of 56 (centered age) of −.360 became −.330 at the age of 66, −.300 at the age of 76, etc. This shift from a negative correlation to a correlation closer to zero is interpreted as greater emotional complexity in old age. Re-test stabilities of the covariation score were, however, low ranging from .34 to .49.

In a daily diary study with older adults from 60 to 85 years, age was not associated with the number of principal components or the covariation score (Ong & Bergeman, 2004); however, the fairly narrow age range might have obviated age effects. Ready, Calvalho, and Weinberger (2008) conducted two diary studies. In Study 1, 21 young and 28 older adults participated in a 28-day diary study. In Study 2, 17 young and 17 older adults completed a 4-day diary study. The authors found a mixed pattern depending on the calculated score of time-based emotional complexity. For the 28-day study, the number of principal components and the covariation score revealed no age differences. The emotional granularity score was, however, higher in older adults than in younger adults. In the 4-day study, older adults showed lower emotional complexity in the covariation score. In a 30-day diary study with 239 adults ranging from 18 to 89 years, Hay and Diehl (2011) found no association between age and the covariation score, but a negative association between age and the component score. Röcke, Li, and Smith (2009) investigated age differences in intraindividual variability of positive and negative affect over 45 daily assessments. Older adults showed less variability in positive and negative affect than young adults measured by the intraindividual standard deviation across measurement points. Age differences were also evident when examining the number of items lacking variability (i.e., the same rating for at least 40 of 45 days): From the 10 positive and 10 negative affect items, older adults showed, on average, a lack of variability for 0.84 positive and 7.53 negative items, whereas young adults showed a lack of variability only for 0.06 positive and 4.00 negative items. Thus, older adults showed essentially no variability in negative affect. The lack of variability in older adults' affect reports might restrict the possibility to obtain high positive or high negative correlations in older adults' within-person structure. For example, a lack of variability may restrict the covariation score to be close to zero; if a variable does not vary, a correlation with this variable has to be (close to) zero.

In summary, time-based indicators of emotional complexity do not show a consistent pattern of age effects. Age differences seem to be small or may vary by the type of indicator. Two indicators—the covariation score (i.e., the within-person correlation of positive and negative affect) and the component score (i.e., the number of principal components with eigenvalues larger than 1 derived from a person's emotional reports over time)—were assessed most often in the context of age patterns. The covariation score was negatively associated with age in one study (Ready et al., 2008, Study 2), not associated with age in three studies (Hay & Diehl, 2011; Ong & Bergeman, 2004; Ready et al., 2008, Study 1), and positively associated with age in two related studies (Carstensen et al., 2000, 2011). The component score was negatively associated with age in one study (Hay & Diehl, 2011), not associated with age in two studies (Ong & Bergeman, 2004; Ready et al., 2008, Study 1), and positively associated with age in one study (Carstensen et al., 2000). It might be that indicators of time-based emotional complexity are highly context-dependent, producing age effects in some contexts only or are measuring different facets of emotional complexity with varying age patterns.

The Present Study

The primary goal of the present study, therefore, was to investigate the structure and function of the various time-based indicators of emotional complexity that researchers have proposed, in a sample of adults who reported their positive and negative affect five times per day for a week. We addressed three research goals. First, using a data-driven or empirical approach, we examined the degree to which different indicators of time-based emotional complexity converge with each other; that is, whether these indicators measure one or many different constructs. Given the inconsistent state of findings in this line of research, we think that a unifying theoretical framework for the different indicators of emotional complexity cannot be supported at this point in time. Rather, the use of a data-driven approach can provide valuable insights into the associations among time-based indicators of emotional complexity, which is an approach that has proven to be vital in other areas of psychology, such as the development of the Big Five personality model. If these indicators all reflect emotional complexity, then one would expect to find that these indicators share common variance, that is, that there is either one factor or a small number of highly interrelated factors underlying these time-based indicators of emotional complexity. In contrast, if these indicators reflect different constructs, one would expect many and partly unrelated underlying factors. In analog to the Big Five, one might either find that these indicators represent different interrelated facets (e.g. warmth, positive emotions, assertiveness) of one major construct (e.g. extraversion) or that these indicators represent different and practically unrelated constructs (e.g. extraversion, neuroticism, openness). Second, we were interested in whether age was associated with indicators of time-based emotional complexity. Apparently inconsistent age patterns could be a result of different indicators tapping different aspects of emotional functioning and resulting in differential trajectories over the lifespan (Ready et al., 2008). Thus, we examined age patterns of the indicators of time-based emotional complexity, but based on the available literature, no clear hypotheses about the associations with age seem warranted. Finally, the degree to which time-based measures of emotional complexity are related to indicators of adaptive functioning remains unclear. Therefore, we investigated whether these indicators correlate with a broad spectrum of adaptive functioning, including subjective well-being, psychological well-being, and personality. We expected that time-based indicators of emotional complexity would be associated with adaptive functioning. Moreover, we included two measures as proxies for the cognitive-developmental approach to emotional complexity—ego level and representation of self (Labouvie-Vief et al., 1989). If time-based measures of emotional complexity tap similar aspects of emotional complexity as measures from the cognitive-developmental approach, one would expect some degree of association.

Method

Participants

As part of a larger longitudinal project (Labouvie-Vief et al., 1995; Labouvie-Vief & Medler, 2002), individuals who were living in or near Detroit, Michigan were invited to participate in the experience-sampling study (see also Grühn, Rebucal, Diehl, Lumley, & Labouvie-Vief, 2008). A sample of 119 individuals was initially recruited for this study. Ten participants were excluded due to difficulty learning how to operate the device ($n = 1$), a stolen device ($n = 1$), or non-compliance ($n = 8$), which was defined as completing less than half of the planned 35 measurement points (5 times a day for 7 days). The final sample consisted of 109 participants (40 men and 69 women; 35 African American, 77 European American, 1 Asian, and 1 Other), ranging in age from 23 to 90 years ($M = 55.4$ years, $SD = 15.9$ years). The sample comprised mostly middle-class adults with respect to education (29 some high school, 47 some college, 33 beyond BA) and household income (31 below

$40,000, 52 between $40,000 and $100,000, 26 above $100.000). Most participants were married (64 married, 24 single, 14 divorced, 7 widowed).

Baseline Measures of Well-Being, Personality, and Cognitive-Developmental Complexity

During an initial assessment, participants completed measures of subjective and affective well-being, psychological well-being, personality, and cognitive-developmental complexity.

Subjective and affective well-being—Participants' subjective well-being was assessed using measures of life happiness, positive and negative affect, and depressive symptoms. Specifically, life happiness was assessed with a single item ("In general, my life has been…") to which participants responded on a 7-point scale ranging from *extremely unhappy* (1) to *extremely happy* (7). Positive and negative affect was assessed with the Positive Affect Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS has a total of 20 affect items, 10 for positive and 10 for negative affect. Participants indicated to what extent they felt each affect during the past few weeks on a 5-point scale ranging from *very slightly or not all* (1) to *extremely* (5). Internal consistencies were high (positive affect: $\alpha = .90$; negative affect: $\alpha = .87$). Depressive symptoms were measured with the Center for Epidemiological Studies – Depression scale (CES-D; Radloff, 1977). Unlike more clinically-oriented depression scales, the CES-D assesses milder depressive symptoms with an emphasis on depressed mood during the last week. The CES-D consists of 20 items, which people evaluate on a 4-point scale ranging from *rarely or none of the time* (0) to *most or all of the time* (3). Respondents' answers are summed into a total score, with higher scores indicating a higher frequency of depressive symptoms. The CES-D had good internal consistency ($\alpha = .90$).

Psychological well-being—In contrast to measures of subjective well-being that focus on positive and hedonic aspects of people's lives, Ryff's Psychological Well-Being Scale (PWBS; Ryff, 1989, 1995) measures the extent to which individuals perceive their lives as meaningful, worthwhile, and in their own control, and themselves as having good relationships with others. The PWBS operationalizes psychological well-being along six dimensions: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. Each dimension is assessed by 14 items on a 6-point scale ranging from *strongly disagree* (1) to *strongly agree* (6). The six scales had good internal consistencies (autonomy: $\alpha = .86$; environmental mastery: $\alpha = .92$; personal growth: $\alpha = .87$; positive relations: $\alpha = .89$; purpose in life: $\alpha = .90$; self-acceptance: $\alpha = .92$).

Big Five personality dimensions—The dimensions of neuroticism, extraversion, openness, conscientiousness, and agreeableness were assessed with the Mini-Marker questionnaire (Saucier, 1994). The Mini-Marker questionnaire contains 40 personality trait adjectives, which participants rated about themselves from *extremely inaccurate* (1) to *extremely accurate* (9). Scales showed high internal consistencies (neuroticism: $\alpha = .86$; extraversion: $\alpha = .88$; openness: $\alpha = .91$; conscientiousness: $\alpha = .93$; and agreeableness: $\alpha = .92$).

Cognitive-developmental complexity—We assessed two measures of self-complexity in the cognitive-developmental framework: ego level and representation of self. Measures of self-complexity aim to assess persons' complexity in representing oneself (Linville, 1985, 1987). Ego level is a well-established measure of self-complexity (Labouvie-Vief & Diehl, 1998). Ego level was assessed by the short form of the Sentence Completion Task (Hy & Loevinger, 1996) consisting of 18 sentence stems (e.g. 'Being with other people…'). A trained rater scored individuals' completions of these stems on a 10-point scale of ego complexity, using a scoring manual, and a total ego-level sum score was derived. Average

interrater reliability was high (r = .94) for a set of double-coded protocols. Representation of self was based on qualitative coding of participants description of self, of likes, and of dislikes. The coding ranged from concrete representations (0) to dynamic intersubjective representations (4). Detailed description of this measure and example responses are reported elsewhere (Labouvie-Vief et al., 1995; Labouvie-Vief & Diehl, 2000). Average interrater reliability was high (r = .83).

Procedure

Baseline assessment—Participants completed two 2-hour sessions. Testing was conducted by trained graduate students and held in small groups at locations in the participants' communities. Participants received $75 for the completion of the testing sessions.

Experience-sampling study—Each participant was trained individually in the proper operation of a handheld computer (Palm Pilot Tungsten E-2). The device emitted a beep-like signal five times per day at random times between 9:00 AM and 9:00 PM – with inter-beep intervals ranging from 15 minutes to 3 hours. Participants were instructed to carry the handheld computer device for seven consecutive days (5 beeps per day for a total of 7 days, resulting in a total of 35 possible signals) and to respond to questions when prompted. Participants were required to respond within 10 minutes after a beep, or the session terminated and was recorded as missed. For data recording, we utilized the iESP software, created by the Intel Research Seattle and University of Washington Computer Science and Engineering Department. The iESP is free and open source software (http://seattleweb.intel-research.net/projects/esm/iESP.html) and is a modified version of the ESP Software created by Lisa Feldman Barrett and Dan Barrett (2001) of Boston College.

Each time participants received a beep, they reported their current affective state on the 10 positive and 10 negative adjectives of the PANAS (Watson et al., 1988). The scale ranged from *not at all* (1) to *extremely* (5). After seven days, participants were compensated $125 for completing the experience-sampling study. Compliance in responding to beeps was high (86%).

Data Analysis

For each person, we computed a total of nine scores from the experience-sampling data for the four classes of time-based indicators of emotional complexity described earlier: (a) one covariation score, (b) two component scores, (c) three granularity scores, and (d) three variability scores. The *covariation* score was defined as the within-person correlation between daily reports of positive and negative affect ($r_{pos\text{-}neg}$). The association between positive and negative affect could range between −1 and +1. Greater complexity is inferred from less covariation (a correlation close to zero, see Carstensen et al., 2000). For both *component* scores, we performed a principal-component analysis accounting for variation in each person's affective reports over time (P-technique, Cattell et al., 1947). We took the number of principal components with eigenvalues greater than one for the first component score ($C_{\#PC}$). A greater number of principal components indicates a more complex affective space. The first principal component is extracted in a way that maximizes the amount of explained variance for all variables. Thus, the greater the amount of variance explained by the first principal component, the more variance is shared among variables, and the simpler is the affective structure. Thus, for the second *component* score, we subtracted the variance accounted for by the first extracted principal component of each person's affective reports from 100% ($C_{unshared}$). The greater the variation in affective reports, the greater is the portion of remaining or unshared variance, and the more complex is the affective report.

For the granularity scores, we computed intraclass correlations (McGraw & Wong, 1996; Shrout & Fleiss, 1979). For each person, the average intraclass correlation with absolute agreement between his or her emotions across the 35 measurement points was calculated and subtracted from 1 (see Tugade et al., 2004). Based on this procedure, we calculated an *emotion granularity* ($G_{Emotional}$) score across all 20 emotions, a *positive granularity* ($G_{Positive}$) score across all 10 positive emotions, and a *negative granularity* ($G_{Negative}$) score across all 10 negative emotions. Low granularity scores reflect high agreement among self-reported emotions over time, whereas high granularity scores indicate that different emotion terms are used to describe emotional experiences. That is, a person high in granularity reports one high emotion and low other emotions at any given point in time. In contrast, a person low in granularity reports to have many different emotions at any given point in time.

For the variability scores, we used the intraindividual standard deviation across the 35 measurement points. We calculated the intraindividual standard deviation separately for positive affect ($V_{Positive}$) and negative affect ($V_{Negative}$). In addition, we also defined a *fluctuation score* as indicating variability ($V_{Fluctuation}$). Fluctuation was defined as the number of items that show any variation across the 35 data points. By analyzing the data, we discovered that some persons reported the very same score on an item across all 35-measurement points, that is, for some persons, there were emotion items with zero variance.

Results

Results are organized around the three research questions. First, we investigated the interrelations of time-based indicators of emotional complexity. Second, we analyzed the association between age and the indicators. Third, we examined whether measures of time-based emotional complexity were indicators of adaptive functioning, by correlating complexity measures with the baseline assessment measures of well-being, personality, and cognitive-developmental complexity.

Associations Among Measures of Time-Based Emotional Complexity

Our first research question was whether indicators of time-based emotional complexity tap into similar or different aspects of emotional functioning that is whether these indicators measure the same construct or different constructs. Table 1 shows the correlations among the indicators of time-based emotional complexity. With one exception, the covariation score was not significantly correlated to any other measure. The covariation score was, however, negatively correlated with emotional granularity. The two component indicators, the number of principal components and the amount of unshared variance, were highly correlated and showed a similar association pattern with the other indicators. That is, both were negatively associated with positive variability and both were positively associated with the fluctuation score as well as the emotional and positive granularity score. Emotional granularity was associated with all other indicators of time-based emotional complexity. Positive and negative granularity showed a differential association pattern: in general, positive granularity was inversely associated with positive variability; negative granularity was inversely associated with negative variability. The fluctuation score—the number of items actually varying over time—was associated with both component scores, with the emotional and negative granularity score, as well as with positive and negative variability.

In order to convey a more structured perspective on the interrelation pattern, we first performed an exploratory principal components analysis on the nine indicators of time-based emotional complexity. This procedure suggested a four-factor solution. Based on the findings from the principal components analysis, we performed a confirmatory factor analysis (CFA) in Mplus (Muthén & Muthén, 2007). We used this procedure to test whether a model of 4 latent and uncorrelated factors would yield an appropriate structural

representation of the observed emotion complexity measures. This procedure is consistent with recommendations by Hopwood and Donnellan (2010) about using several factor analytic methods to determine the structure. It should be noted that despite the use of confirmatory factor analysis, this procedure was data-driven in nature. The final model is depicted in Figure 1.

The simple four-factor model, $\chi^2 = 36.29$, $df = 23$, $p = .04$, CFI = .97, TLI = .96, RMSEA = .07 [.01, .11], $p_{RMSEA<.05} = .19$, revealed a reasonable fit to the data. Factor loadings of the CFA are reported in Table 1. Three of the four factors had both positive and negative loadings. The first factor was called *emotional variation* with high loadings on the number of principal components, the amount of unshared variance from the first principal component (i.e. differentiation score), and the number of items that actually varied. We interpreted this factor as indicating individual differences in the number of how many different emotions were experienced ranging from few to many. The second factor was called *positive differentiation* with positive loadings on positive granularity, emotional granularity, the number of principal components, and the amount of unshared variance from the first principal component as well as a strong negative loading with positive variability. We interpreted this factor as indicating differentiation in positive affective reports due to its two high loadings on positive granularity and positive variability. The third factor was interpreted as *negative differentiation*. It showed high positive loadings of negative granularity and emotion granularity as well as negative loadings on negative variability and the number of varying items. The fourth factor was simply called *PA-NA covariation*. The main indicator was the covariance score with a small negative cross loading from emotion granularity. All four factors were uncorrelated with each other suggesting that these four factors represent completely independent constructs. However, four of the nine indicators showed cross-loadings making clear-cut interpretations of the factors less straightforward than would be desirable from a conceptual point of view.

Associations of Emotional Complexity with Age

To investigate our second research question, we examined the association between age and the time-based indicators of emotional complexity. Table 1 depicts the age associations for each indicator separately. With two exceptions, age was not associated with individual time-based indicators of emotional complexity. Age was negatively correlated with the fluctuation score: Older adults' emotional reports showed a greater number of non-varying items than younger adults' reports. This was particularly the case for negative emotions, as indicated by the negative correlation between age and the negative variability score. Some older adults never reported feeling 'upset' or 'guilty' during the observation period. We also investigated the possibility of non-linear associations with age. Neither the quadratic nor the cubic effect of age revealed significant associations with any indicator of time-based emotional complexity.

Relationships of Time-based Emotional Complexity to Well-being, Personality, and Cognitive-Developmental Complexity

We next examined whether time-based indicators of emotional complexity were indicative of a positive personality and developmental profile. Table 2 shows associations between the nine individual time-based indicators of emotional complexity and measures of adaptive functioning. Four indicators of emotional complexity were associated with a less positive profile. This pattern was the case for the two component scores—the number of principal components ($C_{\#PC}$) and the amount of unshared variance with the first principal component ($C_{unshared}$)—and two of the variability scores—variability in negative affect ($V_{Negative}$) and the fluctuation score ($V_{Fluctuation}$). Specifically, these two variability indicators showed strong and consistent associations with measures of lower subjective and psychological

well-being; persons who showed greater variability in their negative affect reported lower well-being than persons with lower variability. Three indicators of emotional complexity showed only isolated associations to poor adaptation. In particular, the covariance score showed no significant association to any measure, emotion granularity showed one significant correlation to depression and positive granularity showed two significant correlations to personal growth ($r = -.28$, $p < .01$) and ego level ($r = -.36$, $p < .01$). The two exceptions that revealed some indication of adaptive functioning were negative granularity ($G_{Negative}$) and positive variability ($V_{Positive}$): Persons who were high in negative granularity reported more self-acceptance ($r = .26$, $p < .05$) and less neuroticism ($r = -.21$, $p < .05$), whereas persons who showed more positive variability also reported more positive affect ($r = .28$, $p < .01$) and more personal growth ($r = .29$, $p < .01$). In general and in contrast to our expectation, however, time-based indicators of emotional complexity were not positively associated with measures of adaptive functioning.[1]

Discussion

There is a growing interest in measures of emotional complexity in adulthood and old age. In particular, emotional complexity has been considered as an indicator of adaptive emotion regulation and a resilient personality. This study was designed to clarify the use and meaning of various time-based indicators of emotional complexity that have been proposed by researchers, by examining the properties and correlates of time-based emotional complexity in an experience-sampling study. There were three main findings. First, indicators of time-based emotional complexity showed a complex pattern of associations among themselves. This pattern of associations did not support the notion of a unitary construct of emotional complexity. Second, older adults showed less variability in negative affect and less overall fluctuation in affect; however, age was unrelated to other measures of time-based emotional complexity. Third, time-based indicators of emotional complexity were generally not indicative of a positive or adaptive functioning in terms of well-being, personality, and cognitive-developmental complexity.

The Complexity of Time-Based Emotional Complexity

Our first goal was to test how different indicators of time-based emotional complexity are inter-related and whether they tap the same construct. The literature offers a variety of indicators, but few studies have examined two or more indicators simultaneously (e.g., Ready et al., 2008). If all indicators measure aspects of a broader construct of emotional complexity, there should be considerable overlap among these indicators. We investigated nine indicators of time-based emotional complexity and their interrelations, submitting the indicators to a combination of exploratory and confirmatory factor analysis, which resulted in a four-factor structure, in which the four factors were unrelated. This finding is not consistent with our expectation that there should be considerable overlap in these indicators, but suggests that there were four completely unrelated latent constructs. The first factor, emotional variation, indicated the overall variation in a person's affective reports. With the two high loadings on the component scores, this factor may indicate individual differences in the number of different emotional states a person can represent or feel. The second factor, positive differentiation, indicated the variation in positive emotions. Given the loading

[1]As mentioned in the introduction, variability might also be considered a confounding variable indicating (random) fluctuation. These fluctuations might actually cover up existing positive associations between other indicators of emotional complexity and measures of adaptive functioning. Therefore, we calculated partial correlations controlling for variability between other time-based indicators of emotional complexity and measures of adaptive functioning. In general, the pattern was practically unchanged. Most significant correlations remained significant after controlling for variability. Moreover, there was no case where controlling for variability resulted in a significant positive association between time-based indicators of emotional complexity and measures of adaptive functioning.

pattern, this factor ranged from persons who showed high variability in their positive mood and a trend to experience several positive emotions at a time to persons who displayed less variability in their positive mood but tended to experience one concrete positive emotion. Similar to positive differentiation, the third factor, negative differentiation, captured the variation in negative emotions. Negative differentiation captured individual differences ranging from persons who showed high variability in their negative mood and tend to experience a mix of negative emotions to persons who experience low variability in negative affect and tend to experience one discrete negative emotion. Both, positive and negative differentiation, seem to represent the conceptual idea of granularity that persons can differ in how discrete they experience emotions from very discrete experiences (e.g. anger) to rather broad and general experiences (e.g. distress). Finally, the fourth factor accounts for the covariation between positive and negative affect. Given the high loading of the covariation score, this latent factor is practically identical with the covariation score. Broadly speaking, persons could differ in how much they (a) differentiate emotions in their emotional experience, (b) experience discrete positive emotions, (c) experience discrete negative emotions, and (d) differentiate between positive and negative emotions. Although these factors are plausible and the model fit was good, this analysis was exploratory, and replication is needed to confirm the observed factor structure in other independent samples. In particular, the revealed factor structure was relatively complex with many indicators loading on two or three factors, making a clear one-to-one representation of the indicators to the latent factors less clear cut than would be desirable.

The pattern of findings suggests that the time-based indicators of emotional complexity measure different aspects of the four underlying latent constructs rather than one single construct. In particular, the finding that the four latent factors were uncorrelated is noteworthy. It suggests that persons can vary independently on these factors. Some persons may experience positive emotions very discrete (positive differentiation) but negative emotions very general and tied together (negative differentiation). Some persons may experience many different emotions (emotional variation) but their experience of positive and negative emotions is consistently in opposite direction (PA-NA covariation). Using the Big Five personality structure as a comparison, rather than being interrelated facets (e.g. warmth, assertiveness) reflective of one major construct (e.g. extraversion) these factors represent independent constructs (e.g. extraversion, openness). And to gain a better understanding—empirically and theoretically—of what these constructs are and how they are related to individuals' behavior and adaptation it seems necessary to establish independent assessments of these constructs. To do so would help advance theory development as well as the interpretation of findings in the emotional complexity literature. Hence, a unidimensional discussion of emotional complexity should be abandoned in favor of a multidimensional perspective (see also Grühn, Kotter-Grühn, & Röcke, 2010). In particular, the finding that positive and negative differentiation are separate constructs opens the obvious question for future research whether one is more adaptive than the other.

Despite the independence, the question remains whether the four latent factors derived in the present study measure aspects of emotional complexity or aspects unrelated to emotional complexity. It would be important to determine just what qualifies as emotional complexity. Thus, we need criteria to determine the conceptual and empirical framework of emotional complexity. Due to a lack of a unifying theory for these time-based indicators of emotional complexity, future research would benefit from computing different indicators in order to accumulate empirical evidence for the relationships among the indicators and their relations to other measures. In this context, it is noteworthy that emotion granularity might be considered a type of super-indicator associated with three of the four latent constructs of emotional complexity; that is, it appears to measure a broad spectrum. Given that emotion granularity incorporates this broad spectrum, it seems reasonable to propose that future

research would benefit from reporting at least this measure of time-based emotional complexity.

Time-based Emotional Complexity and Age

Past research on time-based indicators of emotional complexity showed inconsistent age patterns. Although we had no clear age prediction, we put forward the idea that the inconsistent age pattern may be a function of different types of indicators used. We found partial evidence for this interpretation. In particular, we found significant associations with age only for two variability indicators—negative variability and fluctuation. Consistent with findings by Röcke and colleagues (2009), we found that older adults were less variable in reporting negative affect. This reduced variability reflects the finding that older adults showed little or no variability for individual negative emotion items (see also Hay & Diehl, 2011). Thus, older adults showed a greater number of non-varying items than younger adults, especially for negative emotions. This finding was also consistent with patterns observed in the experience-sampling study by Carstensen and colleagues (2000), in which older adults experienced no negative emotion in 75% of all occasions. This finding might have significant implications for methodological questions regarding emotional complexity. For example, the lack of variability in older adults' negative affect reports might be problematic for the computation of some of the indicators of time-based emotional complexity. In particular, the covariation score—the correlation between positive and negative affect within each person—is based on the variation in both positive and negative affect. A lack of variability in one or both of these restricts the range of correlations. The lack of older adults' variability in negative affect might demand more measurement points in future research. An alternative speculation is that the high-arousal negative affect terms of the PANAS are not adequate items to assess negative affect in older adults' everyday experiences. Maybe low-arousing negative affect terms are more sensitive to assess older adults' negative affect (e.g. Kessler & Staudinger, 2009).

An interesting question is whether a lack of variability in older adults' reported negative affect is indicative of adaptation or maladaptation. From the pattern of associations we found with measures of well-being, personality, and self-complexity, high variability in negative affect were related to a maladaptive profile, and the older adults' lack of negative affect variability appeared to reflect an adaptive outcome. However, alternative interpretations of this pattern are possible. For example, older adults may show less negative variability because their lives may have fewer stressors and fewer "opportunities" to experience negative emotions due to fewer daily interaction partners, or older adults may be better able to avoid stressors. Another possibility is that older adults may be motivated to avoid negative psychological experiences. Some authors (e.g., Larsen & Prizmic, 2008) have speculated that older adults are less variable in negative affect because negative arousal taxes their physiological resources and, hence, burdens their system. Similarly, lifespan theories of emotional development (Labouvie-Vief et al., 2010) emphasize that some degree of contradiction and negativity might be necessary for further development and older adults may for several reasons, such as protection of cognitive and psychological resources, be less motivated to actively seek situations that create such contradictions and potential negativity.

In sum, this study found no evidence for greater complexity in older adults' affective reports over time. This finding is important and contrasts with the curvilinear age pattern observed in the cognitive-developmental tradition to emotional complexity (Labouvie-Vief et al., 1995; Labouvie-Vief et al., 2007; Labouvie-Vief et al., 1989), which shows a clear peak in late middle adulthood. From a developmental perspective, this would indicate, at the least, that the different approaches to emotional complexity might assess different developmental aspects of emotional complexity.

Correlates of Time-Based Indicators of Emotional Complexity

To investigate whether time-based indicators of emotional complexity reflect adaptive functioning, we selected a set of measures to represent a broad spectrum of adaptive functioning, namely subjective well-being, psychological well-being, and personality. A general – at least implicit – notion in the literature is that emotional complexity should be associated with indicators of adaptive functioning. The findings were not consistent with this notion.

Four of the nine indicators of emotional complexity were generally associated with markers of poor adaptive functioning. The four indicators include the two component scores—the number of principal components and the amount of unshared variance with the first principal component—as well as two of the variability measures negative—variability and the fluctuation score. In contrast to past research, this pattern of findings suggests that greater time-based emotional complexity indicates a less positive profile of adjustment in adulthood. It might be that these four indicators are measures of inconsistency or fragmentation rather than complexity. In this context, it is noteworthy that three out of these four indicators are the indicators for the latent factor emotional variation. Thus, emotional variation might not be an aspect of emotional complexity but rather an indication of emotional volatility and perhaps increased emotional vulnerability. The remaining five indicators of time-based emotional complexity showed only insular associations to measures of well-being and personality. Two of them, positive variability and negative granularity, however, revealed a few associations indicative of a positive profile. Overall, however, the pattern of findings suggests that most measures of time-based emotional complexity are not indicative of adaptive functioning. Finally, it is noteworthy that the magnitude of the significant associations was rather modest, indicating rather small amounts of shared variance.

There are three potential explanations that we can offer for this somewhat surprising finding. Consistent with ideas from the cognitive-developmental perspective on emotional complexity, Labouvie-Vief and colleagues (Labouvie-Vief, Diehl, Jain, & Zhang, 2007; Labouvie-Vief et al., 2010; Labouvie-Vief & Medler, 2002) suggest that the representation of emotions involve not only different levels of complexity but also different degrees of integration. Integration refers to combining different and diverging ideas about the self and others in meaningful ways. Thus, a crucial issue is whether individuals can *integrate* complexity into adaptive adjustments. For example, based on the cognitive-developmental approach, Labouvie-Vief and Medler (2002) investigated four groups differing in emotional complexity and integration: “Integrated” individuals were high in both complexity and integration; “complex” individuals were high in complexity and low in integration; “defended” individuals were low in complexity and high in integration; and “dysregulated” individuals were low in both complexity and integration. There were two key findings: First, the integrated adults showed the best adaptation profile, reporting high empathy, tolerance of ambiguity, openness to affect exploration, and secure attachment. Second, complexity per se was not a characteristic of adaptive functioning. In some persons, complexity was associated with dysfunctional adjustment. Both complexity and integration have to be high for optimal functioning. High complexity without integration could reflect fragmentation and indicate a ruminative or maladaptive profile. From this perspective, time-based indicators of emotional complexity seem to be tapping into complexity but maybe without integration. Consistent with this interpretation, the time-based indicators were not related to the two measures of self-complexity—ego level and self-representation—both of which are derived from a cognitive-developmental perspective on emotional complexity (e.g., Labouvie-Vief et al., 1995a; Labouvie-Vief & Medler, 2002). This finding challenges the goal of a theory that conceives of emotional complexity as a unitary construct.

An alternative interpretation for the observed pattern of findings between indicators of time-based emotional complexity and adaptive functioning might be that we have not assessed the relevant adaptive outcomes. In order to get a general picture, we assessed a broad spectrum of adaptive functions—subjective well-being, psychological well-being, and personality. However, it could be that the indicators of time-based emotional complexity are related to more specific criteria and contexts of adaptive functions. For example, research on emotional granularity has shown associations to better coping and emotion regulation strategies (Barrett et al., 2001; Tugade et al., 2004). Thus, adaptive correlates of high emotional complexity from experience-sampling data may be evident only in stressful situations where coping resources are challenged, such as proposed by the Dynamic Model of Affect. Zautra and colleagues (e.g., Zautra, Potter, & Reich, 1997; Zautra, Reich, Davis, Nicolson, & Potter, 2000) suggests that the association between positive and negative affect (the covariation score) is more negative and significantly different from zero under stressful circumstances and closer to zero under non-stressful circumstances. Future research may benefit from investigating a broader spectrum of situations together with specific aspects of emotion regulation.

Comparing findings from different studies is complicated by the fact that studies utilized different measures of current affect. In the current study, we used the PANAS, which was also used by two other studies (Ready et al., 2008; Röcke et al., 2009). The PANAS was developed to assess the two broader dimensions of positive and negative affect, but not specific emotions such as joy, anger, or sadness. Thus, an alternative interpretation for the lack of associations between the time-based indicators of emotional complexity and measures of well-being and personality might be the use of the PANAS, which might have constrained these associations. A different composition of affect terms in the affect measure may reveal a different and maybe more positive pattern of associations. Thus, future research, especially if adults of all ages are involved, may benefit from a broader assessment of affect states.

Future Research and Conclusion

Future research would benefit greatly from a theoretical framework of how the different time-based indicators of emotional complexity should be related. Currently, we are not aware of a unifying theoretical framework that could accomplish an integration of the different indicators of time-based emotional complexity. Given the lack of a unifying theory-driven approach, future research may consider a more data-driven approach that then could be linked back to theory development. To accumulate empirical evidence for the interrelations and correlates of time-based indicators of emotional complexity, future studies should report different indicators when conducting empirical research. Only by contrasting the different operationalizations is it possible to disentangle different concepts, ideas, and explanations. Similarly, time-based indicators of emotional complexity are—at least implicitly—assumed to be stable person characteristics (Baumeister, 1991; Wessman & Ricks, 1966). The stability of time-based indicators of emotional complexity has still to be established in longitudinal measurement-burst designs; that is, intensive repeated sequences of assessments distributed over several years (Salthouse & Nesselroade, 2010; but see Carstensen et al., 2011).

Time-based conceptualizations of emotional complexity in themselves do not appear to be correlates of a positive and adaptive profile. It might be that experience-sampling studies of affective reports are suboptimal in determining a person's emotional complexity. There are at least two arguments for this point. First, variation in daily affective reports may depend on the social context. A relaxing vacation week may show little variation, whereas a challenging workweek may show strong variations. Thus, the context of emotional complexity—when and how emotional complexity is expressed—should be investigated.

Second, affective reports over time measure 'normal' ranges of affect. But it is an open question whether normal variation could indicate the 'possible' range of affective reactions. Much like 'normal' walking speed probably does not indicate a person's running speed during a competition, normal affective states may not indicate the realm and potential for emotional processing and emotion regulation under stressful situations. Future research would benefit greatly from a unifying theory of time-based measures of emotional complexity—what they are, how they are measured, and how they are interpreted. We hope that research on the temporal association of affective reports helps us to understand the structure and function of affect.

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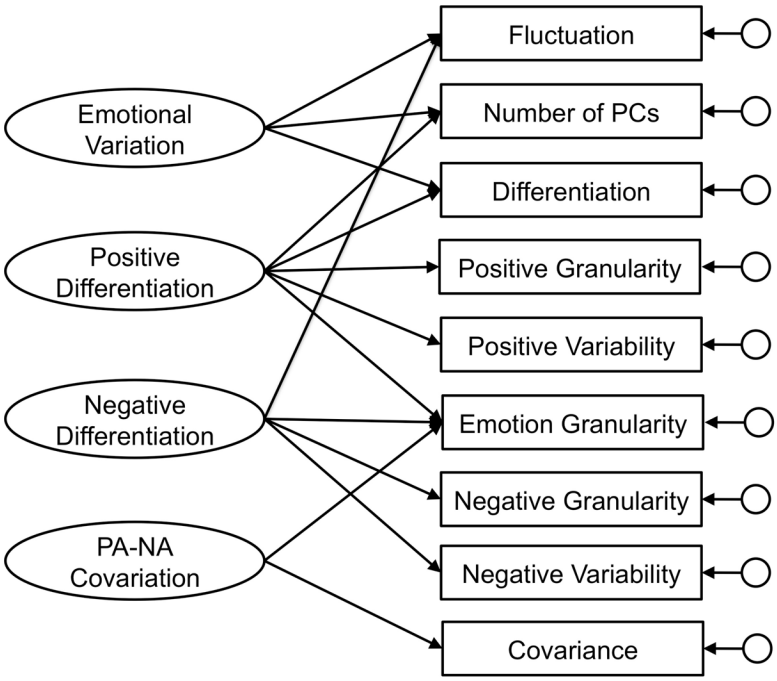

Figure 1.
Confirmatory factor analysis on indicators for time-based emotional complexity.

Table 1

Correlations Among Indicators of Time-Based Emotional Complexity and Their Factor Loadings on Four Latent Factors

Complexity Indicators	Age	Complexity Indicators								Latent Factors			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	EV	PD	ND	COV
(1) $r_{neg\text{-}pos}$	.03												.99
Component Scores													
(2) $C_{\#PC}$	−.14	.07								.85	.49		
(3) $C_{unshared}$	−.09	.08	.77**							.62	.59		
Granularity Scores													
(4) $G_{Emotional}$	.03	−.37**	.27**	.36**							.66	.30	−.48
(5) $G_{Positive}$	.13	.12	.41**	.49**	.54**						.88		
(6) $G_{Negative}$	.13	.02	.02	.08	.30**	.07						.73	
Variability Scores													
(7) $V_{Positive}$	−.16	−.14	−.27**	−.42**	−.56**	−.69**	−.18				−.79		
(8) $V_{Negative}$	−.36**	−.03	.13	.08	−.33**	.05	−.60**	.19				−.87	
(9) $V_{Fluctuation}$	−.32**	−.04	.47**	.33**	−.24*	−.07	−.58**	.23*	.69**	.51		−.70	

Note. Factor loadings are from the confirmatory factor analysis. $r_{neg\text{-}pos}$ = Covariation score. $C_{\#PC}$ = Component score: Number of principal components. $C_{unshared}$ = Component score: Amount of unshared variance. $G_{Emotional}$ = Granularity score: Emotions. $G_{Positive}$ = Granularity score: Positive emotions. $G_{Negative}$ = Granularity score: Negative emotions. $V_{Positive}$ = Variability Score: Positive. $V_{Negative}$ = Variability score: Negative. $V_{Fluctuation}$ = Variability score: Fluctuation. EV = Emotional variation. PD = Positive differentiation. ND = Negative differentiation. COV = PA-NA covariation.

* $p<.05$.

** $p<.01$.

Table 2

Associations Between Indicators of Time-Based Emotional Complexity and Subjective Well-Being, Psychological Well-Being, Personality, and Self-Complexity

		Component Scores		Granularity Scores			Variability Scores		
	$r_{neg\text{-}pos}$	$C_{\#PC}$	$C_{unshared}$	$G_{Emotional}$	$G_{Positive}$	$G_{Negative}$	$V_{Positive}$	$V_{Negative}$	$V_{Fluctuation}$
Subjective Well-Being									
Life Satisfaction	.02	−.23*	−.19*	−.03	−.16	.03	.00	−.27**	−.24*
Trait Positive Affect	−.11	−.12	−.06	.16	−.16	.18	.28**	−.20*	−.17
Trait Negative Affect	.08	.19*	.16	−.07	.07	−.13	−.07	.44**	.33**
Depression (CES-D)	−.07	.25*	.16*	.37**	.08	−.07	−.03	.40**	.37**
Psychological Well-Being									
Autonomy	−.14	−.21*	−.18	−.01	−.11	.10	.12	−.16	−.20*
Environmental Mastery	−.08	−.09	−.14	.14	.07	.12	−.01	−.30**	−.30**
Personal Growth	−.13	−.06	−.19	−.08	−.28**	.09	.29**	−.19*	−.10
Relations with Others	.08	−.13	−.14	.06	−.05	.16	.03	−.19*	−.29**
Purpose in Life	−.14	−.01	−.17	.09	−.11	.12	.17	−.31**	−.22*
Self-Acceptance	−.03	−.21*	−.13	.06	−.02	.26*	−.02	−.30**	−.39**
Personality									
Neuroticism	−.05	.23*	.14	−.05	.04	−.21*	.06	.23*	.24*
Extraversion	.08	−.07	−.04	−.01	.00	.10	−.01	−.04	−.10
Conscientiousness	.05	−.28**	−.22*	.00	−.04	.07	−.05	−.12	−.24*
Agreeableness	.14	−.20*	−.11	.00	−.02	.03	−.06	.00	−.13
Openness to Experience	.04	−.16	−.15	−.01	−.10	−.04	.03	.10	−.02
Self Complexity									
Ego Level	−.18	−.25*	−.25*	−.15	−.36**	−.09	.14	−.09	−.09
Self Representation	−.04	−.20	−.18*	v.10	−.13	−.17	.00	−.04	.02

Note. $r_{neg\text{-}pos}$ = Covariation score. $C_{\#PC}$ = Component score: Number of principal components. $C_{unshared}$ = Component score: Amount of unshared variance. $G_{Emotional}$ = Granularity score: Emotions. $G_{Positive}$ = Granularity score: Positive emotions. $G_{Negative}$ = Granularity score: Negative emotions. $V_{Positive}$ = Variability Score: Positive. $V_{Negative}$ = Variability score: Negative. $V_{Fluctuation}$ = Variability score: Fluctuation.

* $p<.05$.

** $p<.01$.