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Inter- and Intra-Individual Variation in Emotional Complexity: Methodological Considerations and Theoretical Implications

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Abstract

The degree of relationship between positive and negative emotional states or *emotional complexity* is a topic of ongoing methodological and theoretical debate. At issue is whether positive and negative emotions are opposite ends of a bipolar continuum or independent dimensions in a bivariate distribution with little degree of overlap. In this review, we summarize a body of work suggesting that the distinction between positive and negative emotions varies both between and within individuals over time as a function of cognition and changes in informational demands, a perspective called the Dynamic Model of Affect (DMA). In addition to providing a unifying theoretical model that specifies the conditions under which both bivariate and bipolar models of affect may be valid, the DMA offers an integrative, multidimensional affective framework through which models of resilience and stress adaptation may be articulated. Future work should continue to explore the contextual factors, especially those that have relevance for the complexity of information processing, as potential moderators of the dynamic interplay between positive and negative emotions.

Introduction

There is tremendous variety in the emotional states that constitute everyday life. Some people have emotional experiences that are wide in range and well differentiated, while others experience emotions in a highly diffuse and global manner. In their influential work on mood variability, Wessman and Rick [1] coined the term “affect complexity” to characterize the tremendous richness of individual emotional lives. Over the past four

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decades, disparate lines of research have tended to emphasize either a bipolar or bivariate approach to affect relationships [2–5]. The bipolar approach contends that positive and negative affective states vary along a single continuum from high levels of positive affect (PA) at one end to high levels of negative affect (NA) at the opposite end [6, 7]. In contrast, the bivariate approach posits that PA and NA are two distinct dimensions residing on separate measurement continua [8, 9]. Although both approaches are useful in describing the everyday experiences of affect, neither approach has been able to adequately explain the well-documented inconsistency in affective reporting that tends to emerge in studies of across-person (nomothetic) and within-person (idiographic) associations [10, 11].

In this review, we focus on methodological issues relevant to the conceptualization and measurement of emotional complexity. We appraise evidence for an integrative model, the Dynamic Model of Affect (DMA), that specifies the conditions under which emotional complexity varies both between and within individuals. Finally, we consider the theoretical implications of the DMA for understanding flexible adaptation to changing stressful circumstances and environmental demands.

Conceptualization and measurement of emotional complexity

While conceptualizations of emotional complexity have varied across studies, an emerging literature suggests that indices of complexity can be reliably grouped together according to the degree of *covariation* or *granularity* in the self-reported experience of emotion [12–14]. Measures of *emotional covariation* typically assess the degree of co-occurrence (i.e., mixed emotions) or correlation (i.e., emotional dialecticism) between PA and NA over time [15–17]. Greater dialectical and mixed emotional experience is associated with improved well-being and greater resilience [18–20], particularly among East Asians [21, 22] and older adults [23–25], though there is evidence that these associations may be in part due to individual differences in the affective states people value and their dialectical beliefs about change and interdependence [26, 16], as well as the amount of intra-individual variability in positive and negative emotional states [27, 12].

Another form of complexity is *emotional granularity* [13, 28] or the propensity to categorize and label emotional experiences in precise, discrete terms. More granular emotional experiences suggest a greater ability to make subtle distinctions among emotional states [e.g., fear, sadness, anger; 29] as they are experienced. Estimates of between-person granularity generated from diary and ecological momentary assessment data show consistent relations between low emotional granularity (particularly of negative emotions) and a wide range of psychopathologies, including borderline personality, social anxiety, and major depressive disorder [30–32]. Other research has similarly established an association between high granularity in positive emotions and adaptive coping and adjustment [e.g., 33]. This work suggests that like negative emotions, positive emotional states that can be represented in discrete emotion terms may have greater “informational value” than global affective states [34, 35], presumably because representing affective information as qualitatively distinct events reduces the misattributions people likely make about their own affective reactions [36, 37].

Despite growing scholarly interest in the measurement of emotional complexity, prior research indicates only modest congruence between indices of emotional covariation and emotional granularity [12, 7, 38, 39]. Russell and Carroll [7] concluded that the degree of relationship between PA and NA can vary depending upon the specific affect terms chosen, the time frame respondents use to judge affect, the specific response scales provided by the experimenter, and the degree of correlated measurement error across measures. Grühn et [12] concluded that low variability can also restrict the range of correlation between positive and negative emotional states. Brose et al. [27] similarly cautioned against using measures of co-occurrence to index the relationship between PA and NA (i.e., emotional complexity) and suggested that weak inter-affect correlations may simply reflect negligible amounts of intra-individual variance in NA rather than greater emotional complexity, per se. Finally, beyond statistical artifacts, differences in the contextual state of the person at the time of assessment influence the degree of correlation between PA and NA [40–42].

The dynamic model of affect

Zautra and colleagues proposed the Dynamic Model of Affect (DMA) to account for variability in the structure of affect over time and between persons. The model posits that the structure underlying affective experiences varies as a function of the degree of uncertainty [2, 43]. Stressful conditions increase uncertainty, placing cognitive demands on information processing, and in so doing tax the capacities of neural information processing networks to retain complex associations. Consequently, the DMA predicts that under high stress, affect becomes bipolar. Typically, this is experienced as high levels of NA accompanied by low levels of PA. As stress increases, attention is directed toward the most salient environmental stimulus, which in the context of stress is often of negative valence [44].

Empirical tests of the DMA have employed a wide range of participant samples and assessment techniques. Supportive evidence for the model comes from field and laboratory studies of daily [40, 45], acute [41, 46], and normative life stressors [e.g., bereavement and disability; 47, 48, 18, 41]. The seminal idiographic DMA studies employed “microlongitudinal” techniques to assess affect along with stressful life events over the course of multiple time points [45, 2, 43, 41]. This type of idiographic assessment allows one to observe the average association of PA and NA over time, as well as what happens to that association *when* a stressful or otherwise disruptive event occurs in the course of daily life. Even more, by repeatedly assessing these co-occuring experiences, one can determine whether the stressful event was of greater magnitude or occurred with greater frequency than the individual’s average experience over time. To capture these deviations from an individual’s mean, the independent variables are person-centered. A typical modeling strategy, then, may include person-centered NA as a predictor and estimate its association with PA over time in the context of a linear mixed model (the choice of which valence should be modeled as the independent versus dependent variable is arbitrary here, but may be guided by particular research questions). The resulting regression coefficient estimates the average amount of change in PA when NA increases by one unit, relative to an individual’s mean. By additionally modeling person-centered stress as a predictor and the interaction between stress and NA, one can then evaluate the degree to which the association between NA and PA varies as a function of within-person (momentary, daily, weekly, etc.)

deviations in stress. This modeling strategy permits an explicit evaluation of the DMA hypothesis that the structure of affect is bivariate when stress is low, and becomes increasingly bipolar as stress increases relative to an individual's average.

An extensive body of clinical data with patients challenged by chronic pain and mood disturbances provide further illustration of the dynamics that underlie affective relationships under stress [45, 49, 2, 43]. Chronic pain is a particularly informative context through which to observe the affective dynamics predicted by the DMA because pain is rarely static, and in many conditions presents in unpredictable flares of varying intensity and duration, thereby fostering a millieu of persistent uncertainty. Consistent with the DMA, Zautra, Affleck, et al. [44] reported that women with rheumatoid arthritis (RA) experienced greater bipolarity of daily affects on high- vs. low-stress days. Finan et al. [50] found the relationship between PA and NA varied across chronic pain disorders, with osteoarthritis patients demonstrating greater emotional complexity than fibromyalgia patients, a group that experiences a high incidence of mental health comorbidities and reports substantial affective distress and unpredictability of daily pain [51, 52]. Finally, an investigation by Williams et al. [53] suggested that the heightened apprehension and uncertainty characteric of anxiety disorder contribute to a less complex, more unidimensional affect structure. In sum, data have accumulated across a variety of different stressful contexts in support of the DMA, suggesting that stressful experiences alter affective relationships, shifting individual appraisals toward simpler, less complex, processing of affective information.

Although much has been learned about the effects of stress on affective dynamics, people differ in emotional complexity [54–56], and a number of studies have focused on individual difference factors that are likely to be important in accounting for variability in the structure of affect over time. In particular, core deficits in informaton processing, including higher levels of cognitive simplicity [42, 40], neuroticsm [25, 23], hostility [45] and lower levels of mood clarity [43], trait PA [57], psychological resilience [47], and subjective perceptions of approaching death [58] have all been implicated as factors that increase vulnerability to affective simplification during times of stress. Overall, the available evidence suggests that individual differences, especially those that have relevance for differentiation of emotional experience, warrant further investigation as potential moderators of the interplay between PA and NA.

Implications

There are a number of theoretical implications of the DMA. Perhaps the most fundamental implication is the idea that a person's level of stress should not be ignored when asssessing affective states [2]. This implies that the degree of relationship between PA and NA (i.e., emotional complexity) may vary depending upon information processing demands (e.g., the degree of stress the indivdiual is under at the time of assessment, as well cognitive and affective processing styles). A related implication is that at least two dimensions are needed to fully classify human emotions, one that assesses the level of NA and accompanying motivations and another that gauges the extent of PA and accompanying approach processes. Although including within- and between-person context effects will make analytic models of

affective well-being more complicated, it seems clear that such sources of variance require greater empirical attention in future studies [44].

In line with the two-factor framework, the DMA may be expanded beyond the study of emotions and individual differences to incorporate social relationships and community well-being. The underlying premise is that social factors relevant to adaptive responding are separable into positive and negative domains and that similar to the experience of emotional complexity, the ability to sustain a complex view of social relationships during times of stress may be a key to resilience and optimal health [59, 60]. Davis et al. [45] reviewed evidence from a range of studies across different chronic pain populations and found support for a two-factor model of social complexity, suggesting that pain patients' perceptions of the positive and negative features of their social relationships become more simplified and inversely coupled during pain episodes. Likewise, emergent infrastructures (e.g., the built and natural environment, social capital, civil governance) that foster and sustain a coherent sense of community, while also aiding in recovery from crisis and disaster may contribute to social and community resilience [61–63]. Finally, the capacity to sustain partial separation of positive and negative states while under stress may have major implications for psychosocial treatment of chronic stress and other health-related disorders. Zautra [64] cited evidence that mindfulness-based approaches to stress reduction may offer a means of broadening emotional awareness and thus help to sustain positive emotional engagement under stressful conditions. Consequently, psychological interventions that facilitate the processing of emotions and social relationships with greater complexity might foster adaptive coping and adjustment to chronic stress and illness [2, 45].

Conclusion

In support of the DMA, the studies discussed in this review suggest that the relationship between PA and NA varies both within and between individuals. The DMA offers a set of testable hypotheses governing the conditions under which the two affects would be independent and conditions in which they are inversely coupled. Affective states appear to become less differentiated with increased stress and among individuals who show a propensity to process information in a less complex fasion. Conversely, the ability to maintain emotional complexity in the face of stress may represent a key pathway underling resilience and flexible adaptation. Efforts to target affective states in vulnerable populations should consider the social context, and future studies should continue to explore the range of stressful life experiences and individual differences that may have implications for emotional complexity and adaptive functioning.

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•• of outstanding interest

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Highlights

- Emotional complexity reflects the degree of relationship between PA and NA.
- The DMA predicts variation in complexity as a function of cognition and stress.
- The ability to sustain emotional complexity under stress may foster resilience.