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Editorial overview: Theories, methods, and applications of mixed emotions

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The concept *mixed emotions* refers to the experience of multiple emotions or affective states at the same time or the toggling between multiple emotions. Studies of mixed emotions include research on a number of distinct phenomena including the co-occurrence of feelings, blends of same and different emotion valences, flexible and dynamic appraisals of emotions and feelings, asynchrony of behavioral reactions and subjective feelings, spillover of moods, fluctuations in feelings, and transitions from one emotion to another. It brings to mind numerous questions about process, for example: Which emotions, emotion components, or affective experiences are mixed? How and why does the mixing process arise? How much time does the process take? When are emotions and affective states mixed: Do some situations / contexts afford a mixture and others not? What functions and outcomes are associated with mixed emotions? Overlaid with these questions, are others about individual and life-span developmental differences in the ability to experience mixed emotions as well as enquiries about measurement and analytic strategies.

Proposals that feelings may be mixed, blended, dynamic, and complex, provide a fertile ground on which to test theories of emotion and our understanding of basic processes. They also have implications for the study of decision-making, subjective well-being, and mental health. These themes were explored at an interdisciplinary conference in October 2015 organized by the University of Michigan Bio-Social Methods Collaborative and sponsored by the Institute for Social Research and the NIH National Institute on Aging (U13 AG047793). A summary of the conference discussions together with an archive of videoed presentations and slides is available online at: <http://biosocialmethods.isr.umich.edu/resources/mixedemotions/>. This collection of short reviews reflects current continued and

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evolving interest in many of the open research questions, methodological concerns, and application implications, raised during the 2015 conference. Together, the papers in this special issue highlight the broad scope of contemporary theory and research on emotions across different fields and provide a window into new insights spurred by the idea that mixed emotions are a phenomenon in need of explanation.

Four papers discuss theoretical refinements to accommodate the phenomenon of mixed emotions. **Hoemann, Gendron, and Barrett** consider the role played by the structure and function of the human nervous system in the generation of mixed emotions. They suggest that the human brain applies a Bayesian filter to incoming sensory input to generate context-sensitive predictions and categorize emotional experience. Within this framework, mixed emotions are viewed as the product of a complex sequential cascade of predictive models derived from discrete emotional events across the brain that appear to have occurred at the same time. Starting from a higher level of analysis, **Grossmann and Ellsworth** begin with the premise that emotional experiences are complex. After reviewing the many terms for mixed emotion in the literature, they use cross-national data to illustrate the importance of ensuring a concordance between the locus of theoretical focus and measurement level. For example, inconsistent findings about the complexity of emotional experience have been found when researchers analyze self-reports derived from global trait-like measures of the frequency and intensity of positive and negative emotions versus event-specific and momentary measures. Their cautionary conclusion is extended by **Ong, Zautra, and Finan** who highlight the relevance of accounting for the roles of time and uncertainty in theories about the dynamic processes underlying self-reports of mixed emotions. Perturbations in daily life triggered, for example, by unexpected environmental factors, stressful interpersonal interactions, or acute personal health issues, provide useful contexts in which to test theories that specify the conditions for observing different patterns of inter- and intra-individual co-occurrence and covariation in positive and negative emotions and emotional blends. A passing suggestion by these authors that it may also be important to understand the motivations that accompany emotions is picked up in the paper by **Larsen, Coles, and Jordan**. Following a review of basic research findings, they make the strong assertion that the field should move beyond debating whether or not mixed emotions can occur, to instead focus on understanding the mechanisms for *when* mixed emotions occur. For example, situations that make salient a conflict in personal goals, motives, or values can foster mixed emotions.

Throughout this issue, multiple authors conclude that further advances in our understanding of mixed emotions will depend on the integration of theoretical discourse with rigorous methods and analytic tools designed to capture complexity of experience. **Kreibig and Gross** articulate the value in combining data collection, experimental method, and data analysis techniques to conduct well-controlled laboratory studies on mixed emotions. Their paper is a state-of-the-art review for researchers wanting to begin the study of mixed emotions. They highlight the need for reliable and valid stimuli to generate mixed emotions in laboratory research. **Schneider and Schwarz** suggest that methodological challenges associated with the identification of complexity in emotional experience are similar to those known in the attitude literature regarding attitudinal ambivalence. They describe a new

mouse tracking method for assessing ambivalence and draw parallels to its potential application in the study of mixed emotions. This method would allow researchers to track the dynamics of conflict experienced in mixed emotions and may inform the development of new theoretical models. **Ferrer and Rast** also focus on analytic techniques utilized in studies that collect intensive measurements in order to examine covariations in dynamic patterns of physiological signals, behaviors, and emotional experiences over time. They discuss new modeling advances that can be applied to study the dynamics of emotional experiences during interactions between spouses and close partners. These models enable researchers to specify predictors of residual variance (i.e., variance attributable to random shocks or external sources that are not part of the data). The method could be extended beyond dyadic studies to study the covariation patterns of positive and negative emotions within individuals over time.

The seven other papers in the collection address theoretical and methodological insights gained from studies of emotional experience and mixed emotions in different age groups and different experimental, cultural, and health-related contexts. Three contributions address questions raised by life-span theories and studies. **Charles, Piazza, and Urban** review the *when*, *where*, and *why* questions about processes underlying mixed emotions from a life-span perspective. They review conflicting answers to these questions derived from two prominent life-span theories about emotion covariation. The Theory of Dynamic Integration posits that compared with younger age groups, older adults report fewer mixed emotions due to age-related decline in the cognitive capacity to process and integrate complex emotional experiences. In contrast, Socioemotional Selectivity Theory proposes that mixed emotions arise in the context of events that signal an end or transition in the life course and that exposure to these situations is more frequent in old age. Given mixed findings in the literature to date about mixed emotions across the lifespan, they call for renewed efforts to clarify theory and measurement. **Isaacowitz and Ossenfort** extend this discussion by examining a different proposal derived from the Socioemotional Selectivity Theory, namely that older adults are motivated to prioritize positive emotional experiences. They contrast findings consistent with this proposal obtained in laboratory studies on selective attention to emotional stimuli with findings from studies about everyday entertainment preferences (e.g., TV programs) that suggest that few age differences arise when individuals construct their own affective environments. From a life-span motivational perspective, **Mejia and Hooker** make the argument that, although mixed emotions play an important role in the pursuit of goals throughout adulthood, the literature to date has not given much attention the relation between these two processes. Mixed emotions may be associated with different motives and experiences in goal pursuit, such as uncertainty about which goal to pursue, and the use of different regulation strategies in service of goal pursuit. From a different perspective, **Dunning, Fetchenhauer, and Schlösser** discuss the ways that background and anticipated emotions associated with expected outcomes infuse the decisions people make about financial investments, travel, and household consumption. Mixed emotions, they suggest, may arise at different stages in the decision-making process due to a competition between action-related and anticipatory processes. They review findings about mixed feelings of guilt and regret elicited in complex experimental betting games involving risky decisions that pitch trust in the possible actions of a confederate against the personal desire to profit. As

suggested in the paper by Grossman and Ellsworth, cultural expectations and values can also shape the complexity of emotional experience. **Miyamoto, Ma, and Wilken** review socio-cultural factors that influence differential preferences for positive versus negative emotions in East-Asian and West cultures. They focus on a representation of an emotional system characterized by processes of valuation, regulation, and experience and explore predictions about mixed emotions derived from interdependence and dialectical theoretical frameworks. Mixed emotions are also increasingly studied by researchers interested in their role and manifestation in cardiometabolic and mental health outcomes. **Trudel-Fitzgerald, Qureshi, Appleton, and Kubansky** contrast the longstanding tradition in epidemiological research on affective disorders such as depression and anxiety to focus on single emotions with psychological research that considers mental illness as the constellation of maladaptive cognitions with a dysregulated emotional system. They propose that, in the light of current efforts to document the biological pathways associated with co-occurring positive and negative emotions that enhance physical health, much more work needs to be done to establish and understand impact of biobehavioral processes associated with mixed emotions in pathological health outcomes. A recent study described by **Chen, Lwi, Hua, Haase, Miller, and Levenson** illustrates the potential of carefully-designed studies to shed light on the disruptive impact on subjective emotional experiences associated with localized areas of neurodegeneration observed in patients with diagnosed frontotemporal dementia and Alzheimer's disease. Patients with these diagnoses frequently report feelings that are inconsistent with their facial expressions and mixtures of emotional experiences that are non-normative for specific situations.

As this set of papers reveals, the study of mixed emotions can provide a test for competing theories of emotion and emotional development. It offers opportunities for grappling with measurement issues relating to affective phenomena as they occur in real time, and raises questions about appropriate metrics for integrating across dimensions and timescales in the study of affect. Mixed emotional states are reported as frequent, perhaps even typical, in day-to-day subjective experience. Understanding them is thus intrinsically interesting and informative to the study of emotion. Discussions begun in our October 2015 conference and extended in the papers in this special issue underscore the value of new measurement approaches and new research paradigms that use multiple data sources, including biological and behavioral science variables, for shedding light on the nature and role of mixed emotional phenomena.

Biographies

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Richard Gonzalez received his PhD from Stanford University in Psychology. He is currently Professor of Psychology and Statistics at the University of Michigan. He studies decision making, applied statistics, measurement and research methodology. He is currently

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Jacqui Smith is a Professor of Psychology at the University of Michigan and Research Professor at the Institute for Social Research. She is Co-PI of the Health and Retirement Study and PI of NIA-funded projects on subjective well-being and the collection of retrospective life histories. Her current research focuses on differential associations between components of subjective well-being (experienced, evaluative, and eudaimonic) and health, self-perceptions of aging, and the role of early-life factors on late-life outcomes.

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