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SPECIAL SECTION: Mixture Modeling in Personality Assessment

Introduction to the Special Section on Mixture Modeling in Personality Assessment

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Latent variable models offer a conceptual and statistical framework for evaluating the underlying structure of psychological constructs, including personality and psychopathology. Complex structures that combine or compare categorical and dimensional latent variables can be accommodated using mixture modeling approaches, which provide a powerful framework for testing nuanced theories about psychological structure. This special series includes introductory primers on cross-sectional and longitudinal mixture modeling, in addition to empirical examples applying these techniques to real-world data collected in clinical settings. This group of articles is designed to introduce personality assessment scientists and practitioners to a general latent variable framework that we hope will stimulate new research and application of mixture models to the assessment of personality and its pathology.

Formal theories of personality can be traced back to antiquity, such as Hippocrates and Galen's articulation of the four humors and temperaments. In many respects, these early articulations were remarkably prescient, and the linking of physiology and psychology, the body and the mind, endures in contemporary personality theory and research (Depue & Lenzenweger, 2005; DeYoung, 2013). What might seem more antiquated is the notion of a finite set of discrete *personality types*, given that modern personality science has mostly focused on dimensional traits. However, typological models still abound in research and practical settings and include, for example, Meehl's (1962) theory of schizotypy, the Myers–Briggs Type Indicator types (Myers & McCaulley, 1985), the Minnesota Multiphasic Personality Inventory code types (Greene, 2000), and, prominently, the *Diagnostic and Statistical Manual of Mental Disorders* personality disorders (American Psychiatric Association, 2013). A notable feature of typological theories is that they are decidedly *person-centered*, focusing on identifying subtypes of individuals, rather than quantifying individual differences on underlying variables. Given that a primary goal of a comprehensive personality assessment is to summarize an *individual's* functioning, typological theories of personality remain popular in the consulting room.

Models of personality based on categories make a strong assumption that personality can be summarized by a finite number of types and that a given individual has only one characteristic style (rather than aspects of many styles). In contrast, dimen-

sional theories (e.g., the Big Five traits or Five-factor model; Goldberg, 1990) assume that individual differences in personality are distributed continuously throughout the population. These two alternatives have given rise to the frequently cited *categorical-dimensional* debate that has played out in psychology and psychiatry (e.g., Kendell, 1975). Alternatively, it is conceivable that individual differences in personality are a blend of these two extremes characterized by a *hybrid* structure of dimensions combined with classes. Hybrid structures can take on different forms, including dimensions along which discrete classes are located, or discrete classes within which dimensions describe individual differences in personality. Regardless of the proposed structure, the viability of a proposed theory hinges on whether it can offer a firm and empirically justifiable foundation for the practice of assessment. Furthermore, whether more typological or dimensional, a well-articulated theory of personality structure can be tested using data and contemporary quantitative modeling techniques.

In the past, personality researchers made good use of both variable-centered (e.g., factor analysis) and person-centered (e.g., cluster analysis) analytic techniques. However, used in isolation, these techniques presuppose which structure provides a better fit to the data. This special series seeks to introduce and illustrate a general latent variable modeling framework that can address complex questions about the structure of personality and compare alternative hypotheses about latent structure. In two primers and four empirical papers, mixture modeling is introduced and applied to real data collected with popular personality assessment inventories and clinical interviews in a variety of samples.

Although the substantive focus and statistical techniques vary considerably among the articles in this special section, they share in common the use of latent variable models to characterize the underlying structure or longitudinal course of personality. The

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concept of a latent variable lies at the heart of each approach, although this term has been used in a variety of ways across disciplines (for an outstanding review of this literature, see Bollen, 2002). In personality and psychopathology research, latent variables typically refer to unobservable or hypothetical constructs that a scientist seeks to measure using measurable variables. For example, neuroticism could be considered a latent variable that a personality scientist might measure using a series of self-report questions hypothesized to tap into different aspects of the construct.

In some applications, researchers might have a priori hypotheses about the latent variables underlying their data and can construct a statistical model (e.g., a confirmatory factor analysis) that tests how well the data corroborate these hypotheses. In other cases, latent variables might be derived more empirically, such as using an exploratory factor analysis to identify potential latent factors that underlie responses on a psychometric instrument (Nunnally & Bernstein, 1994). Regardless of the extent to which the analysis is theory- versus data-driven, most latent variable analyses share the goal of deriving measures of hypothetical constructs that better capture the latent status of individuals than could be achieved using observed variables alone.

Furthermore, the form or nature of a latent variable might differ depending on one's conceptualization. Many personality traits are conceived of as normally distributed latent variables, such that individual differences in trait expression are thought to vary continuously around the sample mean. Conversely, a personality scientist might hypothesize that a trait or behavior could vary discontinuously in the population, which could be represented by a categorical latent variable. For example, a rare characteristic such as sadism might be present in a fraction of individuals and entirely absent in most others. Although one can seek to resolve whether a latent variable is categorical or continuous on the basis of the data alone (Markon & Krueger, 2006), latent structure analyses are most informative when one has clearly delineated alternative hypotheses that constrain the statistical models to be considered (Molenaar & von Eye, 1994).

In the two conceptual articles that follow (Hallquist & Wright, this issue; Wright & Hallquist, this issue), we describe how continuous and categorical latent variable models can be combined to study the latent structure and longitudinal course of personality and psychopathology. In cross-sectional data, these "latent variable hybrids" (Muthén, 2008) can effectively measure non-normally distributed traits or personality features that manifest in qualitatively distinct ways across latent subgroups. Extended to longitudinal data, hybrid latent variable models inform an understanding of distinct patterns of personality change within latent subgroups, as well as the modal transitions in multitrait profiles over time. As we elaborate in the conceptual articles, traditional factor analytic and latent curve models are often the most appropriate techniques for many scientific questions, and the more complex hybrid models should ideally be undertaken because they best match a researcher's hypothesis.

Indeed, the four empirical articles that follow are exemplars of thoughtful applications of latent variable analyses that compare the dimensional, categorical, and hybrid representations of personality. Eaton, Krueger, Docherty, and Sponheim (this issue) explore the latent structure of magical thinking and provide an insightful description of how dimensional, categorical, and hy-

brid conceptualizations inform clinical assessment and decision making. Their analyses also underscore that dimensional trait models often provide a remarkably parsimonious representation of the data that fits better than models including categorical latent variables (Krueger & Markon, 2006). This might be particularly true when psychometric scales have been developed to test constructs that are hypothesized to be dimensional (cf. Gangestad & Snyder, 1991).

In a large sample of incarcerated individuals, Sellbom (this issue) characterizes differential trait expression among latent subtypes of offenders using factor mixture models of the Restructured Clinical (RC) scales from the Minnesota Multiphasic Personality Inventory-2. The results provide an example of the potential for traditional latent class analyses to extract an excessive number of putative subtypes when latent traits better account for covariation among psychometric items. In this study, a hybrid model composed of five subtypes varying on three traits better fit the data than latent trait or latent class models, and the subtypes exhibited distinct profiles of externalizing, internalizing, and thought disorder that aligned with previous studies of psychopathy and antisocial behavior.

Smith, Van Ryzin, Fowler, and Handler (this issue) demonstrate a pragmatic use of mixture modeling to extract distinct latent trajectory classes from a group of inpatients measured repeatedly over the course of their hospitalization. The authors also found that Rorschach scales differentiated class membership at intake, which offers a potentially useful piece of information for assessors. Finally, although the sample is too small to be definitive, in a series of exploratory models they show how Rorschach scales differentially predict rates of change in functioning within each class.

Olino, Stepp, Keenan, Loeber, and Hipwell (this issue) estimate a highly complex series of growth mixture models that establish distinct groups of parallel symptom change in depression and anxiety symptoms in adolescents. It is noteworthy that in both longitudinal articles, the mixture models offer improved model fit relative to a fully dimensional growth model. Nevertheless, the difficulties that can emerge when attempting to fit mixture models in real data emerge in Olino and colleagues' efforts, and many potentially interesting models were not estimable with their data despite the large sample size. Furthermore, Olino and his coauthors highlight the challenges that researchers often face when choosing among model solutions in real-world data. Their selection process demonstrates that fit indexes should serve as guides, but that ultimately the investigator must make choices in the context of theory and extant results, and as such might choose a slightly poorer fitting model that provides a better conceptual fit; failing to do so could lead one to accept a solution that fails to replicate in an independent sample. Estimating and interpreting these models can be a fruitful, but challenging, endeavor.

We hope that this special section stimulates further discussion and research among personality assessment scientists and practitioners by introducing a conceptual framework for thinking about the latent structure of personality and by showcasing a set of contemporary statistical models that aid in testing alternative theories. We encourage researchers to be inventive, and to consider including nontraditional personality variables, such as indexes derived from intensive repeated measurement, or combinations of self-report and physiological data (see, e.g., Zalewski, Lengua, Wilson, Trancik, & Bazinet, 2011). We also

hope that this exposition will lead to a more nuanced and revelatory discourse on long-standing problems (e.g., categories vs. dimensions), and that authors will consider a range of available models when formulating theories.

REFERENCES

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.
- Bollen, K. A. (2002). Latent variables in psychology and the social sciences. *Annual Review of Psychology*, *53*, 605–634. doi:10.1146/annurev.psych.53.100901.135239
- Eaton, N. R., Krueger, R. F., Docherty, A. R., & Sponheim, S. R. (this issue). Toward a model-based approach to the clinical assessment of personality psychopathology. *Journal of Personality Assessment*.
- Depue, R. A., & Lenzenweger, M. F. (2005). A neurobehavioral dimensional model of personality disturbance. In M. F. Lenzenweger & J. F. Clarkin (Eds.), *Major theories of personality disorder* (2nd ed., pp. 391–453). New York, NY: Guilford.
- DeYoung, C. G. (2013). The neuromodulator of exploration: A unifying theory of the role of dopamine in personality. *Frontiers in Human Neuroscience*, *7*, 762. doi:10.3389/fnhum.2013.00762
- Gangestad, S. W., & Snyder, M. (1991). Taxonomic analysis redux: Some statistical considerations for testing a latent class model. *Journal of Personality and Social Psychology*, *61*, 141–146. doi:10.1037/0022-3514.61.1.141
- Goldberg, L. R. (1990). An alternative “Description of personality” The Big Five factor structure. *Journal of Personality and Social Psychology*, *59*, 1216–1229.
- Greene, R. L. (2000). *The MMPI-2: An interpretive manual*. Boston, MA: Allyn & Bacon.
- Hallquist, M. N., & Wright, A. G. C. (this issue). Mixture modeling methods for the assessment of normal and abnormal personality, Part I: Cross-sectional models. *Journal of Personality Assessment*.
- Kendell, R. C. (1975). *The role of diagnosis in psychiatry*. Oxford, UK: Blackwell Scientific.
- Krueger, R. F., & Markon, K. E. (2006). Reinterpreting comorbidity: A model-based approach to understanding and classifying psychopathology. *Annual Review of Clinical Psychology*, *2*, 111–133.
- Markon, K. E., & Krueger, R. F. (2006). Information-theoretic latent distribution modeling: Distinguishing discrete and continuous latent variable models. *Psychological Methods*, *11*, 228–243.
- Meehl, P. E. (1962). Schizotaxia, schizotypy, schizophrenia. *American Psychologist*, *17*, 827–838.
- Molenaar, P. C. M., & von Eye, A. (1994). On the arbitrary nature of latent variables. In A. von Eye & C. C. Clogg (Eds.), *Latent variables analysis: Applications for developmental research* (pp. 226–242). Thousand Oaks, CA: Sage.
- Muthén, B. O. (2008). Latent variable hybrids: Overview of old and new models. In G. R. Hancock & K. M. Samuelsen (Eds.), *Advances in latent variable mixture models* (pp. 1–24). Charlotte, NC: Information Age.
- Myers, I. B., & McCaulley, M. H. (1985). *A guide to the development and use of the Myers-Briggs Type Indicator* (2nd ed.). Palo Alto, CA: Consulting Psychologists Press.
- Nunnally, J. C., & Bernstein, I. (1994). *Psychometric theory* (3rd ed.). New York, NY: McGraw-Hill.
- Olino, T. M., Stepp, S. D., Keenan, K., Loeber, R., & Hipwell, A. (this issue). Trajectories of depression and anxiety symptoms in adolescent girls: A comparison of parallel trajectory approaches. *Journal of Personality Assessment*.
- Sellbom, M. (this issue). A factor mixture model approach to elaborating on offender mental health classification with the MMPI-2-RF. *Journal of Personality Assessment*.
- Smith, J. D., Van Ryzin, M. J., Fowler, J. C., & Handler, L. (this issue). Predicting response to intensive multimodal inpatient treatment: A comparison of single- and multiple-class growth modeling approaches. *Journal of Personality Assessment*.
- Wright, A. G. C., & Hallquist, M. N. (this issue). Mixture modeling methods for the assessment of normal and abnormal personality, Part II: Longitudinal models. *Journal of Personality Assessment*.
- Zalewski, M., Lengua, L. J., Wilson, A. C., Trancik, A., & Bazinet, A. (2011). Emotion regulation profiles, temperament, and adjustment problems in preadolescents. *Child Development*, *82*, 951–966.