

Editorial

Methodological Innovations in Gerontology: Advances in Psychosocial Research

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Forty years ago, Baltes, Reese, and Nesselroade (1977) published their path-breaking textbook *Life-span Developmental Psychology: Introduction to Research Methods*, which delineated methods for studying individual differences and changes over the life course. The textbook's focus was explicitly interdisciplinary, emphasizing linkages among individual development, social contexts, and historical change. It is fitting that the articles featured in this special issue *Methodological Innovations in Gerontology: Advances in Psychosocial Research* bridge psychological and sociological principles. These papers exemplify the directive by Baltes and colleagues that “the complexity of the historical study of behavioral development within a changing biocultural context calls for unique methodologies and a heightened sensitivity to the pitfalls, blind alleys, and frustrations produced by malignant data” (1977: 13).

Since the publication of the text, the data, methods, and technologies available to scholars of aging have expanded dramatically, enabling explorations of new areas of study, or more sophisticated investigations of questions at the core of social gerontology. Researchers have moved beyond data resources focused on one individual at a single or two points in time, and instead investigate the experiences of individuals embedded in dyads, families, social networks, and neighborhoods, at multiple points in time. Technological advances such as portable devices for experience sampling and daily diary studies have led to an increased volume of individual-, meta-, and macro-level data, necessitating the development and application of statistical techniques to appropriately model psychosocial phenomena. Merging

traditional longitudinal designs, a hallmark of life course sociology, and within-person designs, the foundation of life-span psychology, has yielded measurement burst designs which allow for examinations of short-term fluctuations within the context of long-term changes. Detailed longitudinal data on large population-based samples enable scholars to explore the effects of complex life histories and trajectories on later-life outcomes.

In this brief essay, we describe the key contributions of the 15 studies published in the issue, highlighting their innovations with respect to their unit of analysis, measurement, data collection practices, and statistical modeling, and their capacities for advancing methodological rigor and replicability.

Unit of Analysis

The proliferation of dyadic, family, and network data has enabled researchers to investigate individuals' experiences within the marital dyad, multigenerational ties, social networks, and neighborhoods, at either single or multiple points in time for various scales of measurement. For example, Brinberg, Ram, Hülür, Brick, and Gerstorf (2017) acknowledge the marital dyad as an important social context, and show how dyad-level time series analyses can be applied to categorical, ordinal, or interval repeated measures. By examining older adults' within-day emotion and activity reports over seven days, they illustrate how grid-sequence analysis can be used to identify a taxonomy of dyads with different emotion dynamics. Their results can be used to generate dyad-level variables that capture innovative new aspects

of social relations including dynamic equilibrium, daily routines, and interdyad differences.

Two papers apply innovative dyadic methods to generate new substantive insights into late-life social relationships. [Lin and Wu \(2017\)](#) recognize that dyadic data pose vexing problems when the two reporters offer different appraisals of seemingly objective phenomena, such as the intergenerational transfer of financial resources or assistance. Using parent–child dyad data from the Panel Study of Income Dynamics (PSID), they developed multiple-indicator-and-multiple-cause (MIMIC) models to decompose parents' and adult children's reports of time and money transfers into a latent factor (true transfer) and unique factors (bias). They find that the parent's report of time given to children is the most reliable indicator of downward transfer, whereas the adult child's report of time given to parents is the most reliable indicator of upward transfer. Their work provides guidance to researchers who may need to interpret reports from one member of the dyad only, and powerfully shows that much of the variance in dyadic reports reflects bias on the part of either parents or children, depending on the type of transfer considered.

[Chen \(2017\)](#) used dyadic data from spouses in the PSID to explore whether older adults' well-being is affected by both their own and their partner's sleep patterns. This study represents an important advance, as it recognizes that older adults' sleep and subsequently their health may be affected by discrepancies in spouses' sleeping patterns, especially their bedtime and waking times. The results underscore the importance of considering spousal concordance and discordance in studies linking social relationships, health behaviors, and health outcomes.

[Suitor and colleagues \(2017\)](#) move beyond dyadic data and use an approach referred to as within-family differences. Using data from Longitudinal Study of Generations and Within-Family Differences Study, the team used data from three generations and included self-reported data from multiple children of a focal parent. These data enable researchers to explore questions like: which child's problems affect parental well-being, and do high-quality relationships with one child buffer the negative health consequences of strained relations with another? They find that one family member's aggregated assessment of ties with all children or both parents does not adequately capture the nuanced nature of relationships that the focal individual holds with each of her children.

Measurement

Innovations in measurement are essential for optimally operationalizing, describing, and identifying the correlates of key concepts in social gerontology. Especially for studies of health, innovations like anchoring

vignettes provide new information that builds on studies based primarily on self-reported data. [Grol-Prokopczyk \(2017\)](#) observes that anchoring vignettes have become increasingly popular as a measure of health, because they offer intergroup comparability of subjective survey items compared to standard self-rated health measures. By evaluating older adults' perceptions of the health of fictitious persons in vignettes in the Wisconsin Longitudinal Study, anchoring vignettes can be used to ascertain the standards individuals use when assessing their own health. The wording of vignettes matters, and can alter the appraisals made; [Grol-Prokopczyk](#) finds that general, universal vignette texts may be more effective "anchors" than ones describing highly specific conditions/procedures.

Developmental psychologists have made great strides in capturing diverse and nuanced aspects of psychosocial experiences including emotions, stress, and daily activity. [Schneider \(2017\)](#) shows that survey participants' response style biases are associated with age-related changes in cognitive abilities which undermine the convergent and predictive validity of affect measures. [Benson, Ram, Almeida, Zautra, and Ong \(2017\)](#) introduce diversity-type intraindividual variability constructs, including social, activity, stressor, and emotional diversity using intensive longitudinal data with continuous or binary scales of measurement. Focusing on emotion or "emodiversity," they provide recommendations for calculating diversity-type intraindividual variability constructs to further understand successful aging. [Koffer, Ram, and Almeida \(2017\)](#) also introduce new metrics in intraindividual variability but focus on categorical repeated measures data. They show how three numeric metrics and three nominal metrics can be used with daily diary data to measure dynamic characteristics of individuals' experiences within the stressor ecosystem. Pushing our conceptualization and calculation of intraindividual variability even further, [Liu, Bangerter, Rovine, Zarit, and Almeida \(2017\)](#) consider both intensity and frequency of daily negative affect in their calculations of diversity and intrinsic emotional fluctuation (IEC). Using two bursts of daily diary data, they create a day-to-day measure of the range and distribution of daily negative affect diversity. They expand on the notion that daily fluctuations in emotions are not entirely due to external circumstances and propose the IEC as a way to solve the problems of an intraindividual standard deviation that only quantifies general affective variability without controlling for contextual factors.

Data Collection Practices

Real-time methods that capture the lived experience of older adults have proliferated over the past decade. [Brick, Koffer, Gerstorf, and Ram \(2017\)](#) acknowledge that daily diary and experience sampling methods are

becoming easier to implement, yet may be burdensome to study participants. Feature selection is a way to minimize participant burden while maximizing predictive power; this is a data-driven machine learning process that permits researchers to choose measures that are maximally predictive of relevant outcomes. This process will facilitate decisions about which measures may be dropped from a study while maintaining efficiency of prediction and reducing costs to the researcher and the burden on participants.

The use of biomarker data has also flourished over the last decade, with major surveys obtaining blood, saliva, and hair samples to capture indicators of disease risk like stress hormones. Human gut microbiota is emerging as a particularly promising indicator of one's risk of metabolic and inflammatory disease, although few studies have rigorously evaluated the optimal collection of these data. [Herd and colleagues \(2017\)](#) describe in detail the process, pitfalls, and scientific value of using fecal samples to generate gut biome data, and demonstrate how multidisciplinary initiatives carried out by social and biological scientists are essential to advancing knowledge of the sources of late-life health disparities.

Statistical Modeling

The proliferation of individual-, meta-, and macro-level data, necessitate the development and use of statistical techniques to model psychosocial phenomena over time—whether the course of a single day, or long expanses of one's lifetime. [Brick, Gray, and Staples \(2017\)](#) outline methods to analyze the repetitive processes that occur in daily life, describing how processes co-occur, synchronize, or predict each other over time. Recurrence analyses quantify the simultaneous processes that interact with each other on a moment-to-moment basis. [Brinberg and colleagues \(2017\)](#) also focus on repeated measures, albeit for dyads rather than individuals. They developed an approach where each dyad's bivariate time series data are first reduced to a univariate dyad-level time series, and in a separate step summarized and examined for relations to other variables. By constructing and analyzing the dyad-level time series, intradyad dynamics lost in the immediate reduction to single scores are preserved.

Three articles propose innovative modeling techniques that advance our capacity to draw more rigorous conclusions regarding causal inferences and individual-level stability and change. [Infurna and Grimm \(2017\)](#) explore the reasons why disparate findings may emerge when utilizing different methodological approaches, how changing model specifications can create dramatically different findings, and how these patterns are linked to the distribution of a study's outcome measure. They show that assumptions underlying growth mixture modeling (GMM) are typically not tenable, which influences trajectory size and identification. Focusing on

four trajectories of resilience, they encourage researchers to increase their considerations of the assumptions underlying GMM.

[Bhatta, Albert, Kahana, and Lekhak \(2017\)](#) advance our knowledge of causal inference by adopting a novel approach to mediation analysis which explicitly considers dependencies among life course pathways. Using longitudinal data from India, they use natural effect models and directed acyclic graph to explicate the pathways linking early childhood factors with later-life well-being. [Wood and colleagues \(2017\)](#) similarly use longitudinal data to articulate specific theories about individual differences in intraindividual dynamics. Using an adult life-span sample of ecological momentary data over 21 days, they illustrate a method for operationalizing dynamics in affect with a multilevel stochastic differential equation model, showing how dynamics differ with age and trait-level tendencies.

Replication and Accessibility

The value of any novel method is determined, in part, by whether the results it generates from one population or sample can be replicated in other data resources. The importance of replication is apparent throughout this Special Issue. The papers make their innovations accessible and replicable by providing step-by-step instructions ([Benson et al., 2017](#); [Bhatta et al., 2017](#); [Brick, Koffer, et al., 2017](#); [Brinberg et al., 2017](#); [Herd et al., 2017](#); [Liu et al., 2017](#)), providing clear recommendations regarding measure development ([Grol-Prokopczyk, 2017](#)); tutorials with annotated programming code ([Benson et al., 2017](#)) and plotting tools ([Brick, Gray, & Staples, 2017](#)), details on modeling approaches and annotated Mplus input commands ([Schneider, 2017](#)), and clearly describing and conducting analyses with freely available software programs ([Chen, 2017](#); [Lin & Wu, 2017](#); [Suito et al., 2017](#); [Wood et al., 2017](#)). Collectively, these papers provide new tools and instructive roadmaps to help researchers in their own explorations of cutting-edge questions in social gerontology.

References

- Baltes, P. B., Reese, H. W., & Nesselroade, J. R. (1977). *Introduction to research methods: Life-span developmental psychology*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Benson, L., Ram, N., Almeida, D. M., Zautra, A., & Ong, A. (2017). Fusing biodiversity metrics into investigations of daily life and healthy aging: Illustrations and recommendations for emodiversity. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 73, 75–86. doi:10.1093/geronb/gbx025
- Bhatta, T. R., Albert, J. M., Kahana, E., & Lekhak, N. (2017). Early origins of later life psychological well-being? A novel application of causal mediation analysis to life course research. *The*

- Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 73, 160–170. doi:10.1093/geronb/gbx022
- Brick, T., Gray, A., & Staples, A. (2017). Recurrence quantification for the analysis of coupled processes in aging. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 73, 134–147. doi:10.1093/geronb/gbx018
- Brick, T., Koffer, R., Gerstorf, D., & Ram, N. (2017). Feature selection methods for optimal design of studies for developmental inquiry. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 73, 113–123. doi:10.1093/geronb/gbx008
- Brinberg, M., Ram, N., Hülür, G., Brick, T., & Gerstorf, D. (2017). Analyzing dyadic data using grid-sequence analysis: Inter-dyad differences in intra-dyad dynamics. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 73, 5–18. doi:10.1093/geronb/gbw160.
- Chen, J. H. (2017). Couples' sleep and psychological distress: A dyadic perspective. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 73, 30–39. doi:10.1093/geronb/gbx001
- Grol-Prokopczyk, H. (2017). In pursuit of anchoring vignettes that work: Evaluating generality versus specificity in vignette texts. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 73, 54–63. doi:10.1093/geronb/gbx048
- Herd, P., Schaeffer, N. C., DiLoreto, K., Jacques, K., Stevenson, J., Rey, F., & Roan, C. (2017). The influence of social conditions across the life course on the human gut microbiota: A pilot project with the Wisconsin Longitudinal Study. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 73, 124–133. doi:10.1093/geronb/gbx029
- Infurna, F., & Grimm, K. (2017). The use of growth mixture modeling for studying resilience to major life stressors in adulthood and old age: Lessons for class size and identification and model selection. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 73, 148–159. doi:10.1093/geronb/gbx019
- Koffer, R., Ram, N., & Almeida, D. M. (2017). More than counting: An intraindividual variability to approach to categorical repeated measures. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*. doi:10.1093/geront/gnw162.827
- Lin, I. F., & Wu, H. S. (2017). Intergenerational transfer and reporting bias: An application of the MIMIC model. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 73, 19–29. doi:10.1093/geronb/gbx080
- Liu, Y., Bangerter, L. R., Rovine, M. J., Zarit, S. H., & Almeida, D. M. (2017). Intrinsic emotional fluctuation in daily negative affect across adulthood. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 73, 100–112. doi:10.1093/geronb/gbw159
- Schneider, S. (2017). Extracting response style bias from measures of positive and negative affect in aging research. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 73, 64–74. doi:10.1093/geronb/gbw103
- Suitor, J. J., Gilligan, M., Pillemer, K., Fingerman, K. L., Kim, K., Silverstein, M., & Bengtson, V. L. (2017). Applying within-family differences approaches to enhance understanding of the complexity of intergenerational relations. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 73, 40–53. doi:10.1093/geronb/gbx037
- Wood, J., Oravec, Z., Vogel, N., Benson, L., Chow, S-M., Cole, P....Ram, N. (2017). Modeling intraindividual dynamics using Stochastic Differential Equations: An examination of age-related differences in affect regulation. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 73, 171–184. doi:10.1093/geronb/gbx013