editorial

Health Psychology and statistical methods

Out with the old and in with the new

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As psychologists, we have all had exposure to statistics and research methodology. Some of us may have embraced the experience with enthusiasm but others, however, have dreaded and still dread the experience. Despite ones level of enthusiasm or dread, we are still collectively guilty of continuing to use the techniques we were taught in our statistics 101 classes. To continue to conduct rigorous research, we have an obligation to update our knowledge. This Special Issue of the European Health Psychologist Bulletin is dedicated to showcasing a series of papers on a range of statistical approaches that are considered to be more sophisticated and comprehensive alternatives to the methods we currently use.

Highlights of the Special Issue

Three key themes unify the current collection of articles. First, we demonstrate that researchers are applying more sophisticated methods to the analysis and collection of longitudinal data in health psychology research. Second, we highlight the adoption of alternative and more comprehensive assessment methods to assess reliability and validity, a central issue in the measurement of psychological constructs. Finally, we present an article that outlines the application of Bayesian Statistics, an approach that is not necessarily new but often engenders in people some uncertainty towards its use.

In addressing the first theme, Ntoumanis (2014) provides an introduction to a robust and currently recommended statistical approach to analyse longitudinal repeated measures data with a hierarchical structure, Multilevel Modelling (MLM) (see Singer & Willett, 2003). Although MLM has clear advantages over other methods, it is not yet widely used in health psychology research. In this paper, the author presents different methods and procedures employed in MLM, unique advantages for its use, and examples of its application in health psychology research (e.g. motivation for physical activity). Next, Richardson and Fuller-Tyszkiewicz (2014) demonstrate how MLM can be used to analyse intensive longitudinal data collected by means of experience sampling method (ESM; or Ecological Momentary Assessment; Bolger & Laurenceau, 2013). ESM has the advantage of capturing real time emotions, thoughts, and behaviours. Although this approach is increasing in the empirical

1 For further discussion on the use of intensive longitudinal methods also see Stadler et al, also published in the *EHP* (2013, September issue; http://www.ehps.net/ehp/issues/2013/v15iss3_September2013/EHP_September_2013.pdf)

literature, research on the statistical analyses that best model the data obtained with ESM is limited. Using an example of an analysis undertaken to assess the relationship between positive affect and drinking behaviour, the authors illustrate and compare the application of different modelling approaches (log-linear model vs. non-linear models), and present the advantages of using the non-linear threshold dose-response approach to analyse data collected from ESM. In a final paper, Mohr (2014) provides further insight into the various applications of combining ESM and MLM in health psychology research, and explores the potential of using within-person processes (captured with ESM) as predictors of longer-term health-related outcomes, the so-called slopes-as-predictors method (see Mohr et al., 2013).

Our second theme focuses on reliability and validity. Gjalt-Jorn Peters provides a solid argument for abandoning the use of Cronbach's alpha (Cronbach, 1951) as an indicator of the internal consistency of a scale because, as he and others suggest (e.g., Sijstma, 2009) it is unrelated to internal consistency. Several alternative estimates (e.g. Greatest Lower Bound; Sijstma, 2009) have been proposed in the recent literature but, as the saying goes, "old habits are hard to break". To facilitate a transition to the use of these optimal estimates, the author discusses the creation of a user-friendly function to compute these indices in the open source statistical package R that does not necessarily require comprehensive knowledge of this software. In this paper, clear guidelines on how to estimate these alternative measures of reliability are provided, and considerations on the dynamics of reliability and validity and their distinction are discussed. Peters leaves us with the message that the use of a combination of reliability and validity diagnostics to assess scale quality is essential. In a follow-up commentary to the Peters article, Crutzen (2014) proposes that test-retest reliability, an important component of reliability, should also be included in a comprehensive assessment of scale quality. The author argues for the advantages of doing test-retest analysis and discusses available estimates that take into account changes in measurement error due to time (e.g. Coefficient of equivalence and stabilityl; Schmidt, Le, & Ilies, 2003). The author presents the procedures to compute the test-retest estimations in the R package.

In our final theme, the application of Bayesian Statistics is explored (see Kaplan & Depaoli, 2013). Van de Schoot and Depaoli (2014) acknowledge that although most of us have heard or read a few things about this type of statistical procedure, many of us are still clueless about its use, whether we should use it, and how to begin using it. The authors advocate that all types of conventional questions can be addressed with Bayesian statistics. In their article, they provide readers with an introduction to Bayesian statistics and definitions of the key concepts, as well as the advantages of its use over conventional statistical methods. In addition, the authors provide guidelines on how to report the implementation and results of Bayesian methods in empirical articles.

Conclusions

Psychology researchers are required to have a relatively extensive knowledge of statistical methodology and remain up-to-date with novel statistical methods, procedures, and software. The six contributions published in this Special Issue reflect diverse and stimulating perspectives on innovative, alternative and/or increasingly

popular statistical approaches. The collection of papers is intended to be of interest for readers with varying levels of statistical knowledge. It is hoped that these papers will spark both consideration of and/or further debate in the use of statistical methods used in health psychology research.

References

Bolger, N., & Laurenceau, J-P. (2013). *Intensive longitudinal methods: an introduction to diary and experience sampling research*. New York: Guilford.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*(3), 297-334. doi:10.1007/BF02310555

Crutzen, R. (2014). Time is a jailer: what do alpha and its alternatives tell us about reliability? *The European Health Psychologist, 16*(2), 70-74.

Kaplan, D., & Depaoli. S. (2013). Bayesian statistical methods. In T. D. Little (Ed.), *Oxford handbook of quantitative methods* (pp. 407-437). Oxford: Oxford University Press.

Mohr, C. (2014). Within-person indicators of health. *The European Health Psychologist, 16*(2), 52-55.

Mohr, C., Brannan, D., Wendt, S., Jacobs, L., Wright, R., & Wang, M. (2013). Daily mood-drinking slopes as predictors: a new take on drinking motives and related outcomes. *Psychology of Addictive Behaviors, 27*(4), 944-955. doi:10.1037/a0032633

Ntoumanis, N. (2014). Analysing longitudinal data with multilevel modelling. *The European Health Psychologist, 16*(2), 40-45.

Peters, G-J. Y. (2014). The alpha and the omega of scale reliability and validity: why and how to abandon Cronbach's alpha and the route towards more comprehensive assessment of scale quality. *The European Health Psychologist, 16*(2), 56-69.

Schmidt, F. L., Le, H., & Ilies, R. (2003). Beyond alpha: an empirical examination of the effects of different sources of measurement error on realibility estimates for measures of individual differences constructs. *Psychological Methods, 8*(2), 206-224. doi:10.1037/1082-989X.8.2.206

Sijtsma, K. (2009). On the use, the misuse, and the very limited usefulness of Cronbach's

Alpha. *Psychometrika, 74*(1), 107–120. doi:10.1007/s11336-008-9101-0

Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: modelling change and event occurnace*. New York: Oxford University Press

Richardson, B., & Fuller-Tyszkiewicz, M. (2014). The application of non-linear multilevel models to experience sampling data. *The European Health Psychologist*, 16(2), 46-51.

van de Schoot, R., & Depaoli, S. (2014). Bayesian analyses: where to start and what to report. *The European Health Psychologist, 16*(2), 75-84.

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