



Developments in Methods for Person-Oriented Research

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The tenets of person-oriented research have been presented in 1997 (Bergman & Magnusson) and 2003 (von Eye & Bergman), and have been discussed widely since (e.g., Bergman, von Eye, & Magnusson, 2006; Bogat, von Eye, & Bergman, 2016; von Eye, Bergman, & Hsieh, 2015; von Eye & Bergman, 2009; von Eye & Bogat, 2006). The number of person-oriented research studies is rapidly increasing, and person-oriented research is generally considered a most useful approach in the behavioral sciences. Even in statistics, one finds interesting attempts to deal with *unobserved heterogeneity*, that is, variability that cannot be explained by standard variable relations, and that is not measurement error (see, e.g., Vermunt, 1997). In medicine, in particular in cancer research, person-oriented methods are, now, de rigueur. In 2016, we read that “A new breakthrough in cancer research could lead to a novel form of cancer treatment – one that is highly specialized for each patient. This discovery could lead to two kinds of treatment:

1. Making customized vaccines to target the core mutations in each patient.
2. Identifying which immune cells, or T-cells, can fight off those core mutations, then multiplying those T-cells in a lab¹.

It can be concluded that (1) the theoretical development of person-oriented research has reached a first moment of completeness, and (2) applications are under way in both

academic research and curative work with patients. Completeness cannot be claimed for the development of research methods for person-oriented studies. Discussions have been conducted in the literature in which methods of analysis, largely known from variable-oriented research were discussed and examined with respect to their applicability in person-oriented research (e.g., von Eye & Wiedermann, 2015), and existing methods have been examined under the question whether these methods can be employed to put the person-oriented tenets to the test (Sterba & Bauer, 2010a, 2010b).

These discussions are important and represent the beginning of the development of an arsenal of methods of analysis that are particularly suited for person-oriented research. However, these discussions are just the beginning. They lack in three aspects. First, although these discussions convincingly illustrate the applicability of methods to person-oriented research that had been developed in the era of variable-oriented research, they do not cover the full range of perspectives that person-oriented research can take. Second, they do not point to person-oriented-specific research strategies. Third, they all usually assume that the last tenet that was proposed by von Eye and Bergman (2003), that is, the tenet of dimensional identity, holds over individuals, time, and location.

This special issue presents a selection of articles that were written with the aim to do the next step. Methods of analysis are presented that represent extensions of existing methods or were newly designed, specifically to deal with issues of person-oriented research. In the next section of this introduction, we provide an overview of the articles in this special issue.

¹Retrieved on 3/5/16 from: <http://us.cnn.com/2016/03/04/health/cancer-treatment-research-breakthrough/index.html>

Overview of the Special Issue

In the first article of this special issue, Jaan Valsiner starts with a discussion of Windelband's concepts of nomothetic and idiographic approaches. The author argues that the two concepts have been misinterpreted in Psychology as irreconcilable opposites and suggests that developmental phenomena should be conceptualized as nomothetically ideographic. This approach has parallels in the development of methods of analysis from a person-oriented perspective. Methods have been proposed for single subject data, but, when these methods are applied, significance tests are still performed, that aim at generalization to larger bodies of individuals, that is, populations (e.g., Hamaker, Dolan, & Molenaar, 2005). Valsiner presents new methodological, theoretical developments.

From a methodological perspective, nomothetic and idiographic concepts are represented as variable-oriented, person-oriented, and idiographic methods. In the second article, Peter Molenaar continues his discussion (cf. Molenaar, 2015) on subject-specific methods (with a focus on dynamic factor modeling) and their potential to test the tenets of modern person-oriented research. Because dynamic factor modeling constitutes a variable-oriented method, the author then argues that the difference of person-oriented and variable-oriented methods is not fundamental but gradual in nature. Two examples are given to confirm this conjuncture: First, four sequential steps are described that link cluster analysis (a prime method of the person-oriented approach) and factor analysis (a variable-oriented method) without making any fundamental transitions. Second, the equivalence of latent profile analysis (again, an important person-oriented tool) and latent factor modeling (a variable-oriented "counterpart") is outlined.

The third article by Wolfgang Wiedermann and Alexander von Eye also contrasts variable- and person-oriented quantitative methods. The authors argue that many principles used in variable- and person-oriented methods have the same common theoretical origin. Based on this proposition, the authors then show that advances in variable-oriented methods may lead to new developments in person-oriented approaches. Specifically, Direction Dependence Analysis (DDA; Wiedermann & von Eye, 2015), as a variable-oriented method to derive empirical statements about the direction of effects in non-experimental studies, is extended to the person-oriented domain. The presented approach can be used to evaluate directional theories of intraindividual development.

The fourth article by Steven Boker, Angela Staples, and Yueqin Hu focuses on conceptual differences between so-called "dynamics of change" (which refer to processes of self-regulation of systems on a short time scale) and "change of dynamics" (how those self-regulating dynamics itself change over a longer period of time). The authors present a methodological framework to estimate changes in dynamics simultaneously with the dynamics of change. Structural Equation Models (SEMs) are presented for both, modeling system equilibria and the dynamics governing

regulation about the equilibria. A series of Monte-Carlo simulation studies is presented that demonstrates the applicability of the proposed models. The authors discuss data requirements and provide OpenMx scripts for model fitting.

The topic of dynamic modeling is further discussed by Anton Grip and Lars Bergman. In the fifth article, these authors present a methodological toolbox to evaluate nonlinear dynamic processes also in situations with just a few measurement occasions. The authors give an accessible introduction to principles of nonlinear dynamical system (NOLIDS) modeling and illustrate how this methodology can be applied in developmental sciences. NOLIDS is then used to test the interactionistic theory on the development of boys' problem behavior. Specifically, the authors analyze the growth of boys' externalizing problems as regarded in the context of linked internalizing problems. Results suggest that the NOLIDS approach may have several advantages over standard regression approaches to study developmental processes.

Next, in the sixth article, Alexander von Eye and Wolfgang Wiedermann discuss approaches to evaluate interindividual differences in intraindividual development in the categorical variable domain. The authors introduce configural lag analysis which combines principles of Configural Frequency Analysis (CFA) and techniques to model lag structures in longitudinal data. CFA has been identified as one of the prime methods in person-oriented research (cf. Bergman, Magnusson, & El-Khoury, 2003). The proposed extensions can be used to identify meaningful longitudinal patterns for the individual. Further, models are proposed that can be used to compare individuals in such longitudinal patterns. The authors demonstrate the feasibility of the new CFA models using empirical data from a study on the development of drinking behavior in alcoholics.

So far, we focused on longitudinal data scenarios to derive statements about the individual. However, it is important to realize that the person-oriented methodological toolbox also contains statistical methods to derive conclusions about the individual in the cross-sectional domain. Because the modern person-oriented approach (cf. Bergman & Magnusson, 1997; von Eye et al., 2015) identifies individual patterns of information as conceptual/analytic units ("pattern summary") while assuming that a small number of patterns is sufficient to explain observed variation ("pattern parsimony"), methods such as cluster analysis, latent class analysis, and latent profile analysis are well-suited to test person-oriented hypotheses in cross-sectional settings. The seventh article by András Vargha, Lars Bergman, and Szabolcs Takács is devoted to cluster-analytic techniques. Specifically, the authors address the issue of internal validity of cluster solutions and present an accessible overview of common cluster quality coefficients (QCs). Using Monte-Carlo simulation experiments, the authors illustrate that QCs can be affected by various factors (such as number of input variables) and that QC values can be very high even if any real cluster structure is absent. Further, focusing on the relative improvement of QCs, the authors propose a new criterion which can be used to overcome erroneous interpretations of cluster solutions.

While basic principles of Item Response Theory (IRT) have been integrated into the person-oriented methodology (see, e.g., von Eye et al., 2015), the eighth article by Rainer Alexandrowicz gives a more complete treatment on the role of person ability parameters in person-oriented research. Starting with a general introduction to the Rasch-Model, the author carefully elaborates how item characteristics affect person ability estimates and their standard errors. Further, the author proposes a new model fit criterion which takes the implicit assumption into account that a certain raw score (i.e., the sum of solved items) most likely emerges by solving the easiest items up to that raw score. The proposed model-fit criterion identifies cases, where entirely different sets of solved items lead to the same observed raw score. The presented approach is, thus, of particular use for person-oriented researchers because counterintuitive individual patterns can be identified.

The issue of counterintuitive responses is also taken up in the ninth article by Ivo Ponocny and Christian Weismayer. In contrast to the previous articles, and new to the discussion of person-oriented research methods, these authors introduce potential advantages of qualitative and mixed methods² approaches in the person-oriented domain. The authors contrast results of quantitative subjective well-being ratings with information obtained from semi-structured interviews on the perceived quality of life. Through a careful analysis of top global self-evaluation ratings, it is shown that problematic aspects of the participants' lives (only communicated verbally) may still exist for respondents that present themselves as overall satisfied. Thus, by taking a holistic perspective, the authors discuss how to integrate quantitative and qualitative information to explain counterintuitive responses.

Finally, the last article by Anne Bogat, Cecilia Martinez-Torteya, Alytia Levendosky, Alexander von Eye, and Joseph Lonstein brings us back to potential consequences of strictly focusing on the variable-oriented approach. The authors convincingly demonstrate that the person-oriented approach may be used to resolve contradicting empirical results. Specifically, the authors focus on the physiological manifestations of stress and discuss contradicting theories how stress exerts its damaging effects (one line of research suggests that stress increases cortisol production and cortisol over-production leads to biological dysregulation, another line of research posits that stress decreases cortisol production to the point of problematic deficiency). The authors applied Latent Profile Analysis (LPA) to identify five distinct profiles of cortisol secretion, stress, and mental health in women. The majority of profiles have not been found in the literature yet, which suggests that current theories are too simplistic and do not adequately consider heterogeneity in women's responses to stress.

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²Note that the term "mixed methods" refers to the line of methodological research that focuses on combining quantitative and qualitative research paradigms and should not be confused with "mixed" models which refer to considering both, fixed and random effects, in regression models.

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