



Journal of
Developmental Psychology

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SPECIAL ISSUE

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Person-Centered and Variable-Centered Approaches to Longitudinal Data

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As the number and scope of longitudinal investigations have expanded, so too have strategies for analyzing prospective data. Different analytic techniques are designed to answer different types of research questions. Person-centered approaches identify groups of individuals who share particular attributes or relations among attributes. They are well suited for addressing questions that concern group differences in patterns of development. Variable-centered approaches describe associations between variables. They are well suited for addressing questions that concern the relative contributions that predictor variables make to an outcome. This special issue includes conceptual essays and empirical reports designed to demonstrate the complementary strengths of these two different approaches. The articles illustrate how the integration of person-oriented and variable-oriented approaches can lead to a more complete understanding of the processes and patterns of human development.

The field of developmental psychology has been profoundly changed during the past two decades by a dramatic surge in the collection and dissemination of longitudinal research. The process has accelerated of late as new resources and new methods have been applied to the collection and analysis of detailed prospective data from diverse groups to provide insight into an increasingly broad array of topics. The trend promises to continue as U.S. funding agencies have determined that large data sets collected with federal funds are public assets that must be shared with qualified investigators. As access to longitudinal data increases, an even greater proportion of our

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Brett Laursen received support for the preparation of this manuscript from the U.S. National Institute of Mental Health (MH58116).

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Merrill-Palmer Quarterly, July 2006, Vol. 52, No. 3, pp. 377–389. Copyright © 2006 by Wayne State University Press, Detroit, MI 48201.

Person-Oriented and Variable-Oriented Research: Concepts, Results, and Development

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Variable-oriented empirical research is based on the proposition that populations are homogeneous. Person-oriented research is based on the propositions that (1) distinct subgroups may exist and (2), if they exist, aggregate-level parameters may contradict parameters estimated for groups or individuals. This article first reviews the main tenets of person-oriented research with respect to developmental research. Three criteria of person-oriented research are proposed: (1) data are analyzed under the assumption that they were drawn from more than one population; (2) attempts are made to establish the external validity of groupings; and (3) groupings are interpreted based on theory. Illustrations use sample studies from the literature, for which both variable-oriented and person-oriented results are presented. Two groups of theorems and propositions of person-oriented research are presented. The first group is method-centered and posits that parameter estimates can be group-specific. Thus, aggregation can lead to conclusions that describe none of the individuals or groups in a population validly. The second, new group posits that certain data situations are particularly prone to misleading conclusions after aggregation. Finally, the ecological fallacy is discussed as one of the chief reasons why person-oriented research is necessary. Conditions for proper variable- and person-oriented research are outlined.

With this article we pursue three goals. First, we give an overview of concepts and tenets of person-oriented research. The overview is presented in comparison with variable-oriented research. Second, we develop criteria of person-oriented research and review a selection of results from empirical research suggesting that person-oriented research can be useful above and beyond variable-oriented research. Third, we present new theoretical developments in the domain of person-oriented research.

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Merrill-Palmer Quarterly, July 2006, Vol. 52, No. 3, pp. 390–420. Copyright © 2006 by Wayne State University Press, Detroit, MI 48201.

Variable- and Person-Centered Approaches to the Analysis of Early Adolescent Substance Use: Linking Peer, Family, and Intervention Effects With Developmental Trajectories

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This 4-year study of 698 young adolescents examined the covariates of early onset substance use from Grade 6 through Grade 9. The youth were randomly assigned to a family-centered Adolescent Transitions Program (ATP) condition. Variable-centered (zero-inflated Poisson growth model) and person-centered (latent growth mixture model) approaches were taken to examine treatment effects on patterns of substance-use development across early adolescence. Variable-centered analyses revealed treatment effects both on decreasing the likelihood of initiating substance use and on the rate of growth in substance use among those who initiated use. Person-centered analyses revealed the following five trajectories of early substance use: (1) no use, (2) low/rare use, (3) early accelerating use, (4) late-accelerating use, and (5) early high but decreasing use. Of note, random assignment to the ATP intervention was strongly predictive of following the decreasing-use trajectory. In addition, the early high but decreasing group was most likely to engage in the Family Check-Up and linked intervention services. These findings suggest that covariates of early adolescent substance use, as well as the effectiveness of prevention strategies, vary as a function of the developmental pattern underlying early adolescent risk.

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This project was supported by grants DA 07031, DA 13773, and DA 16110 to Tom Dishion from the National Institute on Drug Abuse. We are deeply grateful for the hard work of Dr. Kate Kavanagh and the Project Alliance research staff, study families, and participating schools, without whom this study would not be possible.

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Merrill-Palmer Quarterly, July 2006, Vol. 52, No. 3, pp. 421–448. Copyright © 2006 by Wayne State University Press, Detroit, MI 48201.

Mother and Caregiver Sensitivity Over Time: Predicting Language and Academic Outcomes With Variable- and Person-Centered Approaches

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Sensitive and responsive caregiving is associated with better cognitive and language outcomes. Using the longitudinal data set from the National Institute for Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development, this study asks how changes in the sensitivity of both mothers and caregivers from 6 months to 6 years relates to language and academic outcomes at the start of formal schooling. Three questions are posed: (1) How variable is the quality of caregiving that children experience from mothers and child care providers during early childhood? (2) Do children benefit from both sensitive parents *and* sensitive caregivers? (3) Are changes in sensitivity over time related to cognitive and language outcomes at the end of preschool and the beginning of formal education? Person-centered and variable-centered analyses revealed that children experience changing patterns of sensitivity across time, that children benefit from sensitive interactions with all adults, and that changes in the sensitivity children experience across time are associated with both language and cognitive outcomes.

Stimulating and responsive caregiving environments promote social and cognitive development (Shonkoff & Philips, 2000). A substantial body of research attests to this claim (see Bornstein & Tamis-LeMonda, 1989, and Tamis-LeMonda & Bornstein, 2002, for reviews). Adults who take turns in interactions with young children, share periods of joint focus, and express positive affect provide infants and toddlers with a secure base for exploring their world

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This research was supported by NICHD grant HD25455-07 to both authors.

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Predictive Validity of Personality Types Versus Personality Dimensions From Early Childhood to Adulthood: Implications for the Distinction Between Core and Surface Traits

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This study compared the long-term predictive validity of person-centered personality types and variable-centered personality dimensions assessed between ages 4–6 years in a population sample of 154 children. Results indicated that the predictive power of both approaches was remarkably robust between age 17 and 22, and even increased in the case of aggressiveness. At age 22 the long-term predictive ability of both types and dimensions was about equal, both in terms of the multivariate percentage of explained variance and the number of significant longitudinal correlates. This pattern is consistent with the notion that personality types and variables represent core personality domains that predict a wide range of longitudinal outcomes. However, the predictive ability of both approaches was larger for personality traits and intelligence than for social relationships outcomes. Implications for the distinction between core and surface traits are discussed.

For a long time, personality psychologists have stressed the importance of considering the within-person organization of personality traits. In the United States, Allport's now-famous definition states that "personality is the dynamic organization *within the individual* of those psychophysical traits that determine his unique adjustments to his environment" (1937, p. 48; emphasis added). A theoretical rationale for such an approach is that complex systems such as the human psyche are best described by the

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Merrill-Palmer Quarterly, July 2006, Vol. 52, No. 3, pp. 486–513. Copyright © 2006 by Wayne State University Press, Detroit, MI 48201.

Trajectories of Reading Development: A Follow-up From Birth to School Age of Children With and Without Risk for Dyslexia

Heikki Lyytinen, Jane Erskine, Asko Tolvanen, Minna Torppa, Anna-Maija Poikkeus, and Paula Lyytinen, *University of Jyväskylä, Finland*

In order to understand why some children are vulnerable to difficulties in their language development and their acquisition of reading skill, the Jyväskylä Longitudinal Study of Dyslexia followed 200 Finnish children from birth to school age. Half of these children had a family history of reading problems and were considered at risk for dyslexia; the other half were not at risk. A novel analysis, mixture modeling, revealed four subgroups with differential developmental trajectories to early reading. The subgroups who showed either a “dysfluent trajectory” ($n = 12$; 11 at risk vs. 1 control) or a “declining trajectory” ($n = 35$; 24 vs. 11) contained more children with familial risk for dyslexia. The subgroup showing an “unexpected trajectory” contained equal numbers of at-risk and non-risk children ($n = 67$; 33 vs. 34). The subgroup displaying a “typical trajectory” ($n = 85$, 38 vs. 47) contained more children born without dyslexia risk. This differential development of skills revealed that there are at least three troubled routes along which a child may ultimately encounter difficulties in reading acquisition. The most explicit routes are characterized by problems in either phonological awareness, naming speed, or letter knowledge—problems that increase in severity with age.

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The Jyväskylä Longitudinal Study of Dyslexia (JLD) belongs to the Finnish Center of Excellence Program (2000–2005) and has been supported by the Academy of Finland, Niilo Mäki Institute, and University of Jyväskylä. We would like to thank the families in the study. Thanks also to the reviewers and editors of this journal for their valuable comments on earlier versions of the text.

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Merrill-Palmer Quarterly, July 2006, Vol. 52, No. 3, pp. 514–546. Copyright © 2006 by Wayne State University Press, Detroit, MI 48201.

Emotional Availability in Mother-Child Dyads: Short-Term Stability and Continuity From Variable-Centered and Person-Centered Perspectives

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Emotional availability (EA) is a prominent index of socioemotional adaptation in the parent-child dyad. Can basic psychometric properties of EA be looked at from both variable (scale) and person (cluster) points of view in individuals and in dyads? Is EA stable and continuous over a short period of time? This methodological study shows significant short-term stability and continuity in EA as measured with individual and dyadic Emotional Availability Scales and in clusters of individuals and dyads on EA scores in 52 mothers and their 5-month-olds observed twice at home. This work documents psychometric properties of the emotional availability construct from both variable and person orientations.

Emotional availability (EA; Emde, 1980; Emde & Easterbrooks, 1985) is a relationship construct that refers to the quality of emotional exchanges between parents and their children and focuses on the two partners' accessibility to each other and their ability to read and respond to each other's communications (Biringen & Robinson, 1991). Maternal emotional displays serve to communicate, to engage and maintain child attention, to extend social interaction, and to mark important dyadic events (Martin, Clements, & Crnic, 2002). Reciprocally, children provide multiple cues that express their emotional needs (Barnard, 1976; Barnard et al., 1989).

We thank E. Beatty, S. Bottjer, R. Chang, M. Chatham, D. Falk, M. Heslington, K. Hill, M. Kline, S. Latif, A. Rakow, E. Reitz, K. Schultess, T. Toney, I. Vaughn, and C. Varron for assistance.

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Predicting Interpersonal Competence and Self-Worth From Adolescent Relationships and Relationship Networks: Variable-Centered and Person-Centered Perspectives

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A two-year longitudinal investigation examined adolescents' ($N = 100$ girls and 99 boys) perceptions of social support in relationships with mothers, close friends, and romantic partners from Grade 10 (ages 14–16) to Grade 12 (ages 16–18). Adolescents, mothers, and close friends also provided descriptions of the participants' global self-worth and interpersonal competence. Variable-centered and person-centered analyses revealed that perceived social support tends to be similar across relationships and stable over time. Variable-centered analyses indicated that social support in mother-adolescent relationships was uniquely related to adolescent global self-worth; that social support in close friendships was uniquely related to social acceptance, friendship competence, and romantic competence; and that social support in romantic relationships was uniquely related to romantic competence. Person-centered analyses indicated that adolescents who reported high social support in all three relationships had higher self-worth and greater interpersonal competence than those who did not have a romantic relationship and who reported low social support in relationships with mothers and close friends; and that scores for adolescents who had a romantic

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The cooperation of all Project STAR participants is gratefully acknowledged. Special thanks to Ashley Hall, Christine Clark, Natasha Elkovitch, Julia Kremer, and Bill Burk for their assistance with this project. Support for this investigation was provided by a grant to Wyndol Furman from the U.S. National Institute of Mental Health (MH50106). Brett Laursen received support for preparation of this manuscript from the U.S. National Institute of Mental Health (MH58116).

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Merrill-Palmer Quarterly, July 2006, Vol. 52, No. 3, pp. 572–600. Copyright © 2006 by Wayne State University Press, Detroit, MI 48201.

The Person-Oriented Versus the Variable-Oriented Approach: Are They Complementary, Opposites, or Exploring Different Worlds?

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The present commentary gives a brief overview of the person-oriented and variable-oriented approaches, how they are commonly used in longitudinal research, and what one should take into consideration before using either approach. In addition to presenting an empirical example on girls' adjustment problems using both approaches, this commentary uses the contributions in the present issue of *Merrill Palmer Quarterly* to illustrate some of the main issues surrounding these two perspectives. Special attention is also given to the contrast between the person-oriented and variable-oriented approaches in terms of aggregation and disaggregation, model appropriateness and usefulness, and prediction as a goal. Future directions with regard to implementing a person-oriented approach are discussed, including the importance of conceptual clarity, practical and theoretical training, and method development.

The scholarly contributions to this issue of *Merrill Palmer Quarterly* included a person-oriented approach and a variable-oriented approach. Each article presented results using both methodological approaches when analyzing longitudinal data from a specific research area. In this commentary we focus on a discussion of what we perceive are the main issues involved when contrasting the person-oriented approach with the variable-oriented approach, many of which were raised in the contributions.

To provide a conceptual framework for our discussion, we will begin with a brief overview of the nature of the person-oriented and variable-oriented approaches, including tentative definitions at the theoretical and methodological level, how the two approaches are commonly used together

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The Uses of Longitudinal Data and Person-Centered Analyses in the Study of Cognitive and Language Development

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Researchers in the fields of cognitive and language development have made less use of large-scale longitudinal designs and of person-centered approaches to data analysis than have researchers in the fields of social and personality development. It is argued that differences among domains of developmental psychology in the research methods employed reflect traditional differences in the goals of these fields. The study of cognitive and language development has sought primarily to discover the universals of development and their underlying mechanisms, whereas the fields of social and personality development have been more concerned with explaining differences in developmental trajectories and outcomes. A selective review of studies of cognitive and language development illustrates this connection between research questions and research methods. It is suggested that as research on cognitive and language development increasingly focuses on individual and group differences, scholars in these fields might profitably make greater use of large-scale longitudinal studies and of person-centered approaches to data analysis.

A recent query posted on a child language bulletin board asked for nominations of the five most influential studies in the field of psycholinguistics (Ratner, 2005). The developmental studies among the replies included one study of speech perception in 1- and 4-month-olds (Eimas, Siqueland, Jusczyk, & Vigorito, 1971); one cross-sectional study of speech perception in 7-, 9-, and 11-month-olds, with a longitudinal replication (Werker & Tees, 1984); one cross-sectional study of children's understanding of English morphology from ages 4 to 7 years (Berko, 1958); and one longi-

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I am grateful to David Bjorklund, Bruce Tomblin, and Brett Laursen for comments on earlier versions of this paper, and to Letitia Naigles for archival assistance.

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