

EDITORIAL



The science of learning and development: Entering a new frontier of human development theory, research, and application

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The study of human development is emerging into a new era of theory-predicated methodological innovation in research and application. The Spotlight Series on the *Science of Learning and Development* (SoLD) involves three core articles: Cantor, et al. (2018), Osher, et al. (2018), and Darling-Hammond, et al. (2019) and, as well, commentaries regarding these articles. Together, the articles and commentaries place developmental science at the frontier of refining conceptions of human development within models informed a dynamic, relational developmental system metatheory (Overton, 2015). The articles present a theoretical approach involving opportunities to enhance the life paths of all individuals, no matter the instances of diversity they represent, including variation in levels of adversity or challenge they may have experienced in childhood, infancy, or even prenatally because of poverty, racism, or health and sociocultural disparities. In addition, the scholarship presented in the SoLD articles and commentaries presents key ways in which developmental scientists are creating innovations in developmental methodology—involving research design, measurement, and data analysis—that, together, couple new tools for research and the use of these tools in creative and heretofore unapproached research and applications aimed at optimizing human development from “birth to maturity” (Kagan & Moss, 1962).

Focusing on the mutually influential individual ⇔ context relations that are the fundamental unit of analysis within dynamic conceptions of human development, the SoLD articles integrate data from levels of organization spanning biology through social and cultural contexts to emphasize the plasticity and specificity that characterizes the developmental pathway of each person across the life span. The dynamic relations among variables across all levels of organization integrated within the dynamic developmental system mean

that theories (models) that split processes or variables apart (e.g., as in claims that biology, in one form or another, for instance evolution or genes, is the prime determinant of change), as in reductionist models such as sociobiology (Rushton, 2000), behavior genetics (Plomin, 2018), or evolutionary psychology (Buss & von Hippel, 2018), are conceptually flawed (Lerner, 2018). They are also empirically counterfactual in regard to the role of genes in evolution (e.g., Jablonka & Lamb, 2005; Woese, 2004) and human development (e.g., Joseph, 2014; Moore, 2015; Richardson, 2017).

In short, the SoLD articles and associated commentaries take a holistic and nonreductionist view of the developmental process. The authors emphasize that this holistic approach to the life course must be coupled with dynamic change-sensitive methods, involving measures, research designs, and data analytic procedures. These methods should begin inquiry at the individual level and chart idiographic pathways and, then, aggregate data across people, time, and place when empirically appropriate (Bornstein, 2017; Elder, Shanahan, & Jennings, 2015). Simply, as explained by Molenaar and Nesselroade (2015) and Rose (2016), developmental processes are nonergodic and, therefore, methods that are able to identify such specificity must be the first set of theory-predicated tools used to understand the dynamics of human development (e.g., Ram & Grimm, 2015). Coupled with methods (e.g., idiographic filtering; Molenaar & Nesselroade, 2015) that involve the use of approaches such as the dynamic factor model at the level of the individual, but that then can generate group-differential or nomothetic latent constructs that enable generalization across participants, developmental scientists may capture the nonergodic nature of intraindividual change and, as well, produce generalities about groups that apply equally to the individuals within them.

These methods can provide a new evidence-base for applications aimed at enhancing specific pathways of development and, more particularly, the specific health, education, and life successes or each person (e.g., Halfon & Forrest, 2018). The SoLD articles and commentaries offer rich and innovative ideas for such idiographic enhancement of each person's life trajectory. The authors present ideas for translating dynamic research findings into applications useful to measure changes across life in constructs (e.g., intentional self-regulation, executive functioning, relationship skills, growth mindset, and resilience) vital for thriving and achievement, perhaps especially for individuals who have experienced trauma or adversity in life. In addition, the articles focus specifically on the transformation of educational practice and emphasize the ways in which teacher training and school and classroom structure and function should be revised to maximize the opportunities for each person to achieve success in school and in life.

In sum, as eloquently, integratively, and convincingly presented in the SoLD Spotlight Series, the current state of developmental science is one in which theory, methodology, and application are finally catching up to one another. The SoLD articles and commentaries lead us to believe that the time is exactly right for enacting the theoretical and methodological steps needed to enhance understanding of how developmental scientists *should* collect and analyze data to generate evidence applicable at the individual level. As well, the articles explain how the work of developmental scientists may be specifically actionable in regard to practice and policy promoting life spans of personal thriving and social contribution among the diverse people of our world.

References

- Bornstein, M. H. (2017). The specificity principle in acculturation science. *Perspectives on Psychological Science*, 12(1), 3–45.
- Buss, D. M., & von Hippel, W. (2018). Psychological barriers to evolutionary psychology: Ideological bias and coalitional adaptations. *Archives of Scientific Psychology*, 6(1), 148–158.
- Cantor, P., Osher, D., Berg, J., Steyer, L., & Rose, T. (2018). Malleability, plasticity, and individuality: How children learn and develop in context. *Applied Developmental Science*, 1. doi:10.1080/10888691.2017.1398649
- Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2019). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, 1. doi:10.1080/10888691.2018.1537791
- Elder, G. H., Shanahan, M. J., & Jennings, J. A. (2015). Human development in time and place. In M. H. Bornstein & T. Leventhal (Eds.), *Ecological settings and processes in developmental systems*. In Volume 4 of R. M. Lerner (Editor-in-Chief), *Handbook of child psychology and developmental science* (7th ed., pp. 6–54). Hoboken, NJ: Wiley.
- Halfon, N., & Forrest, C. (2018). The emerging theoretical framework of life-course health development. In N. Halfon, C. Forrest, R. M. Lerner, & E. Faustman (Eds.), *Handbook of Life Course Health Development* (pp. 19–43). New York: Springer.
- Jablonka, E., & Lamb, M. (2005). *Evolution in Four Dimensions: Genetic, epigenetic, behavioral, and symbolic variation in the history of life*. Cambridge, MA: MIT Press.
- Joseph, J. (2014). *The trouble with twin studies: A reassessment of twin research in the social and behavioral sciences*. New York, NY: Routledge.
- Kagan, J., & Moss, H. A. (1962). *Birth to maturity*. New York: Wiley.
- Lerner, R. M. (2018). *Concepts and theories of human development*, 4th ed. New York: Routledge.
- Molenaar, P. C. M., & Nesselroade, J. R. (2015). Systems methods for developmental research. In W. F. Overton, & P. C. Molenaar (Eds.), *Theory and method. Volume 1 of the Handbook of Child Psychology and Developmental Science* (7th ed., pp. 652–682). Hoboken, NJ: Wiley.
- Moore, D. S. (2015). *The developing genome: An introduction to behavioral epigenetics*. New York: Oxford University Press.
- Osher, D., Cantor, P., Berg, J., Steyer, L., & Rose, T. (2018). Drivers of human development: How relationships and context shape learning and development. *Applied Developmental Science*, 1. doi:10.1080/10888691.2017.1398650
- Overton, W. F. (2015). Process and relational developmental systems. In W. F. Overton, & P. C. M. Molenaar (Eds.), *Theory and method. In Volume 1 of Handbook of Child Psychology and Developmental Science* (7th ed., pp. 9–62). Hoboken, NJ: Wiley.
- Ram, N., & Grimm, K. J. (2015). Growth curve modeling and longitudinal factor analysis. In W. F. Overton & P. C. M. Molenaar (Eds.), *Handbook of Child Psychology and Developmental Science, Volume 1: Theory and Method* (7th ed., pp. 758–788). Editor-in-chief: R. M. Lerner. Hoboken, NJ: Wiley.
- Plomin, R. (2018). *Blueprint: How DNA makes us who we are*. London, UK: Allen Lane.
- Richardson, K. (2017). *Genes, brains and human potential: the science and ideology of human intelligence*. New York: Columbia University Press.
- Rose, T. (2016). *The end of average: How we succeed in a world that values sameness*. New York: HarperCollins Publishers.
- Rushton, J. P. (2000). *Race, evolution, and behavior* (2nd Special Abridged Edition). New Brunswick, NJ: Transaction Publishers.
- Woese, C. R. (2004). A new biology for a new century. *Microbiology and Molecular Biology Reviews: MMBR*, 68(2), 173–186.