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Developments in developmental research and theory

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\textbf{ABSTRACT}
Fostered in important respects by the lifespan movement, the study of behavioral development now places much more emphasis on individuality and plasticity than was the case for many decades. Promising emphases that are becoming more evident include the individual as the proper unit of analysis in developmental research, a process as well as a product orientation, and more careful attention to the roles of manifest and latent variables. Important methodological innovations are both arising from, and helping to reinforce these emphases.

\textbf{Malleability, Plasticity and Individuality: How Children Learn and Develop In Context} by Cantor, Osher, Berg, Steyer, and Rose (this issue) presents a rich set of ideas concerning the influences that bear on an individual’s psychological/behavioral development. As the authors review and discuss convincingly, human development is so much more multifaceted than was deemed to be the case in the past. The transactions that occur between the developing person and the changing environment are not a breezy “hello” but, rather a fervent, uninterrupted conversation. The overriding message is that there are many possible influences on and aspects of development and they allow for an amazing number of possible outcomes for a given individual. A particular developmental outcome (a behaving person) at any given time is one actual realization of an uncountable number of possible outcomes.

Seen in this light, the upshot is that individuality is the rule, rather than the exception. This conclusion invites serious reconsideration of many of the concepts used to characterize development and the methods that are used to study it. But that is not to suggest a laissez-faire abandonment of rigorous scientific methodologies. Rather, it alerts us to the innovative and powerful methods and concepts that are required to deal appropriately with the complexity of our task. It, thus, becomes ever more pertinent to examine how concepts and methods can be further adapted to one of the most difficult subject areas: the study of human development.

\textbf{Individuality}
To recognize all of the possible influences on the developing individual stretches the notion of normative development to the point that earlier accounts now seem naïve. Pictures, charts, tables, and so forth, to which an infant’s developmental progress could be compared and evaluated represents a simplistic view of development as a relatively fixed progression that occurs in more or less lock-step fashion. The life-span movement (e.g., Baltes, 1987) helped to loosen this highly constrained view of development, and concepts such as age-period-cohort effects, plasticity, multi-directionality, and so forth, provided a needed conceptual basis that has helped propel the study of development toward greater recognition of its complexity.

Individuality, in many respects, is the new normative. Some notion of normative benchmarks and developmental constraints remains valuable; however, but to be useful today, I believe they will have to be couched in abstract and latent variable terms rather than in manifest variable terms. In addition, more emphasis needs to be placed on concepts that are process-, rather than product-oriented.

\textbf{Latent vs. manifest variables}
Although probably not recognized in this way at the time, the ancient proverb, “Give a man a fish and he’ll eat for a day. Teach a man to fish and he’ll eat for a lifetime” incorporates the distinction between manifest and latent entities. A fish is a concrete entity that can be held and eaten. Fishing is not a concrete entity. It is an abstraction that can be made concrete in many different ways. The modern-day counterpart to the proverb might be expressed as, “Give a person a bass, a perch,
or a trout, etc., and they can eat for a day. Equip and instruct the person in fly-fishing, casting, or trolling, etc., and they can eat for a lifetime.” This restatement explicitly incorporates manifest variables (kind of fish) and latent variables (kind of fishing), which are mainstays of contemporary measurement/modeling in behavioral science. As argued elsewhere, latent, not manifest variables are the stuff of lawful relations that have generality (Nesselroade & Molenaar, 2016). And, generality is what we seek in lawful relations.

**Process vs. product orientation**

A process orientation, as opposed to a product orientation, conveys a certain “ongoingness” that I believe is highly germane to this discussion. By contrast, a product orientation conveys the idea of something that is already accomplished. On occasion, I have illustrated this distinction with the rather homely example of a scab versus a scar. A scar represents action completely in the past (healing); a scab indicates ongoing processes. This distinction is embodied in the contrast between life-span processes and age-stage notions of development. I believe it also bears on much of the empirical work conducted within the “individual differences” tradition of psychological research in a negative way. Individual differences are tacitly viewed as something that has already happened as opposed to something that is in the process of happening (Nesselroade, 2002). Such a perspective, however tacit it may be, inhibits use of a process orientation.

Nesselroade and Molenaar (2016) discussed the manifest/latent variable distinction in a manner that bears directly on the process versus product matter. They emphasized the importance of recognizing generality in the latent variables but individuality in the manifest variables that are used as indicators of the latent variables. In reference to the earlier example, a trout and a gar, although very different in appearance, are both recognized as fish.

Within a modeling framework, Molenaar and Nesselroade (2012) tried to advance this line of argument by explicitly identifying process as a latent concept that is general to individuals but could have idiosyncratic manifestations for particular individuals. They identified the latent elements of a dynamic factor analysis as representing a general process and the measurement parts (the linkages between the latent factors and manifest variables by which they could be indicated) as possibly idiosyncratic to the individual. The relations among latent variables (e.g., their auto- and cross-correlations [the process]), were modeled as invariant over individuals, thus identifying the abstract process as general. But the measurement models (how the process was actually manifested in a particular individual) were allowed to be different from one individual to another. Indeed, they might possibly involve different manifest variables for different people. Admittedly, this was a relatively simple way to define process but the example’s virtue was to illustrate that process as a general phenomenon that could manifest somewhat differently from one person to another can be rigorously modeled and tested.

Cantor, Osher, Berg, Steyer, and Rose (this issue) have emphasized the importance of individuality and how it affects the way we conceptualize and study development. Nesselroade and Molenaar (2016) stressed extending the recognition of individuality to the level of measurement to the point of questioning the appropriateness of standardized measurement as it is currently conceived.

Looking at development in the light of the foregoing discussion, it is clear that researchers will need to employ modeling and data analysis methods that are capable of handling a great deal of complexity. Dynamical systems modeling offers a rich set of concepts and methods for representing complex change processes. Concepts such as “sensitive dependence on initial conditions,” in which a small perturbation in the initial condition of a system results in large changes in its later manifestations open the doors to thinking about developmental processes in innovative ways. For instance, two systems (individuals) that might appear in similar states at one time can experience slightly different conditions that lead to huge differences between them at a later time. Boker et al. (e.g., Boker, Staples, & Hu, 2016) are effectively pushing this line of work forward at a rapid pace.

**The individual as the unit of analysis**

It seems to me that one of the consequences of the recognition of the rich possibilities of development and the need to emphasize individuality as have Cantor, Osher, Berg, Steyer, and Rose (this issue) is an inexorable push toward recognizing the individual as the proper unit of analysis, not only for the study of development but for the study of behavior generally. This orientation is not new but psychology’s overwhelming focus on individual differences has delayed acceptance of the notion that the proper unit of analysis for the study of behavior is the individual and not the differences between individuals. The roots of this thinking, which go deep into the story of our science, have been more effectively exposed by Molenaar (2004).
For further examination of the role of the individual as unit of analysis and its implications, see Nesselroade (2010). The emphasis raises concerns about such matters as generalizability and prediction and classification that seem to fly in the face of traditional concerns. Generalizability, for example, was argued to rest on an accrual basis rather than on representative sampling. This notion is especially pertinent to the study of process. If the nature of a process varies from one subgroup to another, sampling in a representative way from different subgroup seems downright reckless. Measurements are conducted on the observed variables not the latent ones, and, therefore, the results of analyzing a representative sample yields an amalgamation that, while representing them at the manifest level, may be meaningless at the latent level. Process seems better identified at the latent level, as we have contended.

Introducing changes in science

Turning matters topsy-turvy is not easy in science. Nor should it be. The value of inertia depends on context. Nevertheless, in light of the theoretical and empirical support that has been mustered over the past decades for individuality, plasticity, latent variable measurement models, longitudinal research, and other concepts, we urge the giving of more attention to designing research, basic and applied, in terms of modeling processes and focused on the individual as the unit of analysis. P-technique factor analysis (Cattell, 1963) and its derivatives such as dynamic factor analysis, as well as dynamical systems modeling, offer promising starting points for further expanding the array of tools for modeling developmental change with a clearer focus on the individual as the unit of analysis. Many rich concepts regarding developmental science are waiting. Methods and research practice must step out onto the floor to join them if the important dance so aptly described by Jack Wohlwill (1991) many years ago is to continue.

References


