

## Relational Developmental Systems Theories and the Ecological Validity of Experimental Designs

### Commentary on Freund and Isaacowitz

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#### Key Words

Ecological validity · Experimental design · Identity of opposites · Opposites of identity · Optimization · Relational developmental systems theory

Conducting good science rests on asking good questions. In ideal situations, developmental scientists who frame their research by addressing theoretically predicated questions have the best opportunity to integratively link their empirical work to extant knowledge about how to describe, explain, and optimize intraindividual change and interindividual differences in intraindividual change [Baltes, Reese, & Nesselroade, 1977; Lerner, 2012]. However, to make such empirical contributions, questions need to be coupled with pertinent methods. Because of the fundamental importance of this link between question and method, theory becomes the primary and most important tool of the developmental methodologist [Collins, 2006; Little, Card, Preacher, & McConnell, 2009]. In short, theory should shape the selection of the methods used to address one's questions about human development. To state this relation in the negative, when methodological preferences determine the questions one asks, then (at best) weak science is the result.

Accordingly, any method – any research design, measurement approach, or statistical technique – may be useful within developmental science, depending on the theoretically-predicated question one asks. Indeed, depending on a given theory-predicated question, there may be multiple methods that might be appropriate to use to address the question. These methods may be either quantitative or qualitative. Moreover, to reduce the challenges associated with disentangling method variance and substantive variance, triangulating across multiple methods is always advisable in good scientific practice [Campbell & Fiske, 1959] and, today, such triangulation is increasingly involving mixed-methods research employing both quantitative and qualitative methods [Tolan & Deutsch, in preparation].

However, the tools available within the mixed-methods “portfolio” are diverse and growing [e.g., Molenaar, Lerner, & Newell, 2014]. Such diversity underscores the importance of theory for rationalizing methodological changes and makes asking appropriately theoretically derived questions the fundamental first step in empirical work. Within contemporary developmental science, variants of relational developmental systems theories [Overton, 2013; Overton & Müller, 2013] are models of the developmental process that are at the cutting-edge of the field [Lerner, 2006, 2012]. We will briefly review these theories, specify the prototypic questions derived from these theories, and then discuss the role of ecologically valid experimental designs discussed by Freund and Isaacowitz [this issue] as constituting a method useful to address relational developmental systems-derived questions.

### Relational Developmental Systems Theories: A Brief Overview

The study of human development has evolved from a field dominated by either split, psychogenic or biogenic approaches to what is now a multidisciplinary scholarly domain that seeks to integrate variables from biological through cultural and historical levels of organization across the life span into a synthetic, coactional system [Elder, 1998; Ford & Lerner, 1992; Gottlieb, 1997, 1998; Hood, Halpern, Greenberg, & Lerner, 2010; Lerner, 2012]. Reductionist accounts of development that adhere to a Cartesian dualism pull apart (split) facets of the integrated developmental system [Overton, 2010]. For instance, reductionist views typically elevate the importance of such split formulations as nature versus nurture, continuity versus discontinuity, stability versus instability, or basic versus applied science [Lerner, 2002, 2006].

These split approaches are rejected by proponents of relational developmental systems theories [e.g., Mistry & Wu, 2010; Overton & Müller, 2013]. Within contemporary theory, these split conceptions are eschewed in favor of a relational meta-model that emphasizes the study and integration of different levels of organization as a means to understand life-span human development [Lerner, 2006; Overton, 2013]. Accordingly, the conceptual emphasis in relational developmental systems theories is placed on mutually influential relations between individuals and contexts, represented as individual ↔ context relations. In such theories, the focus is on the “rules,” the processes, that govern or regulate exchanges between individuals and their contexts. Brandtstädter [1998] termed these relations “developmental regulations” and noted that when developmental regulations involve mutually beneficial individual ↔ context relations, then these developmental regulations are *adaptive*.

In addition to the possibility of adaptive developmental regulations between individuals and their contexts, another distinctive feature of relational developmental systems theories is the presence of (relative) plasticity in human development. Such plasticity reflects the potential for systematic change in individual ↔ context relations, a potential that derives from connections between the individual and the multiple levels of his or her changing context. In that this context includes history, temporality, the ubiquitous presence of change (the arrow of time [Overton, 2003]) and the potential for systematic change, then become core attributes of development across the life span [Baltes, Lindenberger, & Staudinger, 2006; Lerner, 1984].

These fundamental features of relational developmental systems models provide a rationale for making a set of methodological choices that differ in design, measure-

ment, sampling, and data analytic techniques from selections made by researchers using split or reductionist approaches to developmental science. For instance, change-sensitive designs, measures, and data analytic techniques, and sampling individuals within ecologically representative settings and indexing development through measures and analyses of individual ↔ context relations, are prototypic methodological choices of scholars conducting research framed by relational developmental systems models [Geldhof et al., 2014]. Moreover, the emphasis on how the individual acts on the context to contribute to relatively plastic individual ↔ context relations fosters an interest in person-centered (as compared to variable-centered) approaches to the study of human development [e.g., Molenaar, 2008; Nesselroade & Molenaar, 2010].

In short, the conceptual emphasis of relational developmental systems models is placed on individual ↔ context relations. Moreover, given that all levels of the developmental system are integrated within these theories, models of these relations include biological-physiological processes, behavioral and social relationship processes, and physical, ecological, cultural, and historical processes [e.g., Bronfenbrenner & Morris, 2006; Lerner & Benson, 2013]. The embeddedness of the system in culture and history means that systematic changes in person ↔ context relations may exist across time and place [Elder, 1998; Elder, Shanahan, & Jennings, in preparation].

To understand the role of time and place in contributing to these bidirectional relations, developmental scientists may focus on either the role of the individual and/or the context in particular instantiations of individual ↔ context exchanges. Overton [2013] explains this changing focus in developmental analysis as involving different moments within a research program, one moment involving the idea of *the identity of opposites* and the other moment involving *the opposites of identity* [see also Overton & Müller, 2013]. The former idea recognizes that both individual and context define, and are mutually constituted by, each other in one moment, or point, in programmatic developmental inquiry. That is, Overton [2010] notes that:

The principle of the identity of opposites establishes the identity among parts of a whole by casting them not as exclusive contradictions as in the split epistemology, but as differentiated polarities (i.e., coequals) of a unified (i.e., indissociable) inclusive matrix; as a relation. As differentiations, each pole defines and is defined by its opposite. (p. 14)

The identity of opposites, therefore, emphasizes the fused person ↔ context relationship as the primary unit of analysis for understanding development.

The other moment that Overton [2010, 2013; Overton & Müller, 2013] discusses, the opposites of identity, allows one, in effect, to hold the other parts of the integrated system in abeyance, and focus on one part of the system; however, the ultimate aim is one of reintegrating the part into the whole at a subsequent moment. Overton [2013] explains that:

Although the identity of opposites sets constraints and opens possibilities, it does not in itself set a positive agenda for empirical scientific inquiry. The limitation of the identity moment of analysis is that, in establishing a flow of categories of one into the other, a stable base for inquiry that was provided by bedrock material *atoms* of the split metatheory is eliminated. In the split approach, no relativity entered the picture; all was absolute. Reestablishing a *stable base* – not an absolute fixity, nor an absolute relativity, but a relative relativity [Latour, 1993] – within relational metatheory requires moving to a second moment of analysis. This is the oppositional moment, where the figure of identity and ground of opposites reverses and opposites become figure. This moment becomes dominated by a *rela-*

*tional exclusivity* ... In this moment of opposition, the law of contradiction is reasserted and categories again exclude each other. As a consequence of this exclusion, parts exhibit *unique* identities that differentiate each from the other. These unique differential qualities are stable within any holistic system and, thus, may form relatively stable platforms for empirical inquiry. The platforms created according to the principle of the opposites of identity become *standpoints, points-of-view, or lines-of-sight*, in recognition that they do not reflect absolute foundations [Latour, 1993, 2004] but perspectives in a multiperspective world. They may also be considered under the common rubric *levels of analysis* when these are not understood as bedrock foundations. (pp. 47–48)

Clearly, then, in an integrative program of research, one needs both moments. That is,

A complete relational program requires principles according to which the individual identity of each concept of a formerly dichotomous pair is maintained while simultaneously it is affirmed that each concept constitutes, and is constituted by the other. [Overton & Müller, 2013, p. 35]

However, in programmatic developmental inquiry, one or the other moment may be of focal concern at a particular point in the course of the overall research project.

Accordingly, although the identity of opposites moment underscores the co-constitutions of individual and context, the opposites of identity moment enables either a person-focused or a context-focused perspective. For instance, research focusing on how the individual acts on the context to contribute to the plastic relations with it fosters an interest in individual agency [or on intentional self-regulation; Gestsdóttir & Lerner, 2008] – on individuals as producers of their own development [Lerner, 1982; Lerner & Busch-Rossnagel, 1981]. This focus is best instantiated by person-centered (as compared to variable-centered) approaches to the study of human development and thus, as well, to the study of interindividual differences in intraindividual processes [Molenaar & Nesselroade, in preparation; Nesselroade & Molenaar, 2010].

In turn, research focusing on how the context may impact the individual may suggest the use of a particular instantiation of an experimental design, one wherein individuals are randomly assigned to experience particular ecologically valid [Brunswik, 1955] contextual conditions. With appropriate controls [i.e., the three control groups involved in the Solomon four-group design; Solomon & Lessac, 1968], researchers may estimate the extent to which context may account for variation in individual behavior and development. In essence, this use of ecologically valid experimental designs is the approach suggested by Freund and Isaacowitz to gain better understanding of the role of the actual ecology of human development in intraindividual change and interindividual differences in intraindividual change.

### **The Place of Ecologically Valid Experimental Designs in Research Inspired by Relational Developmental Systems Theories**

In a theoretically predicated approach to developmental research framed by relational developmental systems theory, it may seem at first blush that experimental designs have little to contribute to understanding the course of ontogenetic change, and that other explanatory, exploratory, or descriptive designs might be more appropriate. However, as we have argued, whether experiments are useful within such a

theoretical approach depends, first, on the link that a researcher forwards between his or her theory-predicated question and the method or methods selected to address the question. Second, this use depends on what is meant by an experiment.

It is useful to consider this second question first. Traditionally, in the developmental science of the 1950s through the 1970s [e.g., Reese & Lipsitt, 1970], experimentation in the study of human development involved focus on internally valid designs. In such designs, researchers seek to eliminate threats to their being able to attribute the variance in the dependent variable to the manipulated variance in the independent variable. Such threats are ruled out through controls. However, many of the experiments actually conducted during the decades wherein experimental child psychology was a predominant approach taken by developmental researchers [i.e., from the 1940s into the early 1970s; see White, 1970] did not have adequate controls to rule out threats to internal validity. That is, the three control groups in the Solomon and Lessac [1968] formulation were rarely used in studies of human development.

Solomon and Lessac explained that the typical experiment included only one control group (pre-test, no manipulation, post-test), a group included to account for the predicted differential variance associated with experiencing the manipulation as compared to only the pre- and the post-tests. However, this design did not control for the variance that may be associated with the reactive effects of the pre-test (and thus a second control group, involving no pre-test but a manipulation and a post-test, was needed) or for the variance that may be associated with maturation or development (and thus a third control group, involving neither a pre-test nor a manipulation, but only a post-test, was needed). Despite the absence of all three control groups, and thus the presence of threats to internal validity, a focus on experimental designs continued to be a method of choice of many researchers [Reese & Lipsitt, 1970].

Much research continues to consider the two-group design, with only the first of the three control groups noted by Solomon and Lessac used. Oddly, this approach is applied in randomized controlled trial research with samples across the life span and is mistakenly called the “gold standard” of experimental designs, despite the lack of appropriate controls. Nevertheless, by the end of the 1970s, developmental scientists were moving away from a focus on issues of internal validity.

Hultsch and Hickey [1978], writing in this journal, pointed out that issues of external validity were important if one took theoretical positions that were attentive to the contextual conditions associated with time and place [Elder, 1998; Elder et al., in preparation]. By external validity, Hultsch and Hickey meant features of experimental design that would allow generalization to other samples, to studies that employed similar constructs but different measures, or to findings that might be generalized to different historical periods and places.

While such research is important to conduct if one is attentive to many of the ideas derived from relational developmental systems theory, Freund and Isaacowitz note that a third type of validity must be attended to in order to fully embrace the implications of relational developmental systems theory. Inspired by the ideas of Brunswick [1955], and legitimated as a focus of such scholarship by the moment of the opposites of identity discussed by Overton [2013], Freund and Isaacowitz note that an important tool of developmental scientists is ecologically valid experiments. They contend that such experiments should be used as a method when a researcher wants to elucidate contextual sources of variance in the individual ↔ context relation

that reflect the lived lives of people in particular places, developing within particular historical periods.

We agree that when such research is conducted, especially when it is conducted with sensitivity to the other types of validity, it can be an important asset in the methodological armamentarium of developmental scientists conducting research predicated on relational developmental systems theoretical models. Indeed, ecologically valid experiments might be especially useful in a program of research addressing the key questions of developmental science.

### *Key Questions in Developmental Science*

We have noted that the purpose of developmental science is to describe, explain, and optimize intraindividual change and interindividual differences in intraindividual change. When the goals of developmental science are pursued within the relational developmental systems conception that we have described, and that has been forwarded, as well, by Freund and Isaacowitz, it is clear that scholars must ask a complex, multipart question. They must ascertain:

- (1) what fundamental attributes of individuals (e.g., what features of biology and physiology, cognition, motivation, emotion, ability, physiology, or temperament);
- (2) among individuals of what status attributes (e.g., people at what portions of the life span, and of what sex, race, ethnic, religious, geographic location, etc. characteristics);
- (3) in relation to what characteristics of the context (e.g., under what conditions of the family, the neighborhood, social policy, the economy, or history);
- (4) are likely to be associated with what facets of adaptive functioning (e.g., maintenance of health and of active, positive contributions to family, community, and civil society)?

These multiple, nested sets of conditions indicate that each person should be studied as a unique individual developing in relation to a complex and potentially also unique (for him or her) set of ecological conditions [e.g., Molenaar, 2008, 2010; Nesselrode & Molenaar, 2010].

Addressing such questions is difficult to do across a career, much less within one study. Therefore, in a relational developmental science-derived program of research, one would follow Overton's [2013] conceptions of integrating, within the programmatic set of studies one conducted, both the identity of opposites and the opposites of identity. Accordingly, the third point of the multipart question noted above could be profitably pursued in an ecologically valid experiment. Such work could identify what characteristics of the context under what conditions of the family, the neighborhood, social policy, the economy, or history, etc. are related to important individual outcomes. When integrated with findings from studies addressing the links among points 1, 2, and 4, the ecologically valid experiment could provide information reflecting a research moment involving the opposites of identity in regard to focusing on the context of human development. This information could enhance the understanding of the nuances of the individual ↔ context relations that shape the trajectories of individuals across ontogenetic times and ecological settings.



In addition, as an outcome of researcher-introduced changes in the lived experiences of the people involved in the experiment, such scholarship could provide developmental scientists with insights into how the ecology of human development can be changed in ways that optimize opportunities for positive human development. Indeed, in his last book, Bronfenbrenner [2005] envisioned just such a role for experiments conducted with validity within the ecology of human development [see also Bronfenbrenner & Morris, 2006]. This vision recognizes that research programs that reflect the lived lives of participants are more likely to result in findings and conclusions that inform useful applications (e.g., programs and policies) of the research.

### Conclusions

Framed by the idea of the opposites of identity [Overton, 2013], ecologically valid experiments can be a significant methodological tool of developmental scientists who are programmatically testing the individual ↔ context relations of focal concern in models of human development, models derived from relational developmental systems theories. As Overton [2013] explained, such use of this type of experiment is a necessary part of a complete relational program of research.

Moreover, and especially if a researcher also maximizes attention to internal and external validity, ecologically valid experiments can be important parts of efforts to enhance human life through evidence-based programs and policies aimed at changing for the better the ecology of human development [Bronfenbrenner, 2005]. When combined with research addressing all portions of the multipart “what” questions noted above (through returning to the research moment reflecting the integration of opposites), ecologically valid experiments may transcend reliance on the reductionist use of randomized controlled trials to understand individual ↔ context relations. Within the complete relational program of research described by Overton [2013], the ecologically valid experiments discussed by Freund and Issacowitz could become the new “gold standard” for research aimed at optimizing the course of life span human development.

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