Implications of a Dynamic, Relational-Developmental-Systems Perspective for Research Design, Measurement, and Data Analysis in the Service of Understanding and Enhancing Youth Development and Learning

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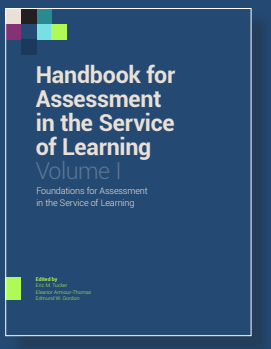

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Implications of a Dynamic, Relational-Developmental-Systems Perspective for Research Design, Measurement, and Data Analysis in the Service of Understanding and Enhancing Youth Development and Learning

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Abstract

This chapter discusses dynamic, relational developmental systems models of human development, explains the specific value of these models for enhancing development, and presents the specific features of methodology actualizing this usefulness to address inequities associated with this variation for diverse groups and, in particular, the individuals within diverse groups. We provide specific examples of this variation across the kindergarten through high school span for diverse youth, and discuss the skills needed for them to thrive in both academic and other key settings of development within and beyond this span. These examples underscore the continuing inequitable relationships, experiences, and opportunities for diverse U.S. school children that, at this writing, exist within the American education ecology. These inequities can be addressed by identifying and promoting the specific instantiations of dynamic developmentally-nurturant relationships, that is, relationships that promote the health and psychosocial well-being of individuals across life periods and contextual settings.[1]

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> *"No existing form of life is truly solitary and no organism is completely independent of others at all times in its history. This dependence of every individual on others is the prerequisite to social behavior"* (1968, p. 68).
>
> Ethel Tobach, Curator Emerita, *American Museum of Natural History*
> T. C. Schneirla, Curator Emeritus, *American Museum of Natural History*

The purpose of this chapter is to discuss the implications of a dynamic, relational developmental systems (RDS) approach to human development for research methods aimed at describing, explaining, and optimizing the skills needed to flourish in and across age periods and settings. Specific examples of these implications will involve youth developing across the kindergarten through high school (K-12) span and the skills needed for thriving in both academic and other key settings for behavior and development within and beyond this span.

Given this purpose, we will illuminate the variation in individual-context relations that occur for diverse groups and, in particular, each of the individuals within diverse groups. The specific examples we will provide underscore the inequitable relationships, experiences, and opportunities for U.S. school children that, at this writing, continue to exist within the American education ecology. We will explain that specific instantiations of these relations can positively or negatively moderate the presence of *developmentally-nurturant relationships* (i.e., relationships that promote the health and psychosocial well-being of individuals across life periods and contextual settings). Examples of specific contextual setting are of course the family, school/classroom, and neighborhood/community. Relationships in these settings can then impact subsequent developmental trajectories across the like span. Some of these instantiations may create inequitable and socially unjust conditions impacts; such adverse circumstances are more likely to de experienced by diverse young people (Cantor et al., 2021; Cantor & Osher, 2021a, 2021b; Spencer, 2006; 2024; Spencer & Dowd, 2024; Spencer et al., 2015).

Accordingly, to address the purpose of this chapter we will first explain why dynamic and relational theoretical models of human life are of specific value for enhancing development–for instance, regarding achievement in school settings and in life beyond such settings. We will review the defining features of such models. This presentation will allow us to usefully discuss the specific features of

methodology–research design, measurement, and analysis–involved in actualizing the usefulness of dynamic, relational developmental systems models.

Why Dynamic, Developmentally-Nurturant Relationships are the Foundation of Flourishing Across Life

As illustrated by the epigram that opened this chapter, no form of life comes into being independent of a relationship with another life and, therefore, relationships between all individuals and their context have fundamental adaptive significance. Moreover, biological life is not only dependent on a supportive social relational context. It must also unfold in a life-sustaining physical ecology. As such, biological life is complex and dynamic; it is dependent on a system of mutually-beneficial social and physical ecological relationships that sustain both an individual *and* the other individuals and the physical ecology that are needed to sustain any person's life (e.g., Lerner et al., 2024-b; Lickliter, 2016; Li & Julian, 2012; Noble, 2015).

Accordingly, across human life and in all settings within which individuals behave and develop, such mutually-beneficial relationships among people must be present and must be maintained. For example, parents must act to create such relationships in their families and, as children develop, youth agency must be directed to contribute to these relationships. Similarly, students and teachers must have such relationships in classrooms, both as a matter of ethical and moral functioning and because such relationship can moderate the development of student cognitive, affective, and behavior skills (e.g., intentional self-regulation, perspective taking ability, theory of mind, and character virtues; Cantor et al., 2021; Lerner & Matthews, 2024). Opportunities should be provided for students' growing agency to contribute to maintaining and enhancing developmentally-nurturant relationships in school settings. Therefore, understanding the presence of positive or problematic behavior and development in a setting, for instance, a child in a classroom, must involve the integrated measurement of both the child and the setting and, in particular, must assess whether the measurement of student-teacher relationships in the setting provides evidence of mutually-beneficial, developmentally nurturant student-teacher relationships.

However, the complexity of the measurement of such dynamic, developmental relationships is particularly challenging for human beings. For instance, infants and their caregivers must be attuned to, and create a goodness of fit with each

other, if the extended periods of human infancy and childhood that are emblematic of human development, are to be optimally traversed and, as well, if these relationships are to produce health and well-being for all members of an individual's proximal (e.g., home, classroom) and more distal (neighborhood, community, national) ecological systems (e.g., Bronfenbrenner, 1979, 2005; Bronfenbrenner & Morris, 2006; Chess & Thomas, 1999; Thomas et al., 1963). As a consequence, measures must be longitudinal to assess the ongoing dynamics between children and parents.

In turn, if teachers are to avoid burnout and maintain the energy and motivation to monitor and maintain developmentally-nurturant relationships with all of the students in their classrooms, then across the K–12 span students must increasingly contribute to such dynamic relationships. Again, then, assessment of the existence of such relationships must involve longitudinal measurement and, as well, a determination that valid age-appropriate and contextually-sensitive measures are used across the 13 years of development involved in the K–12 span.

Simply, within and across all developmental periods and all contexts it is vital to measure and analyze information about whether mutually-supportive individual-context relations are present. If there are no developmentally-nurturing relationships among humans, then thriving is obviated for all people involved in these coactions and even life itself may be threatened (Gould, 1977; Johanson & Edey, 1981).

Of course, no two human beings have exactly the same history of social relationships and of experiences with their physical ecology across time and place (Elder et al., 2015; Hirsch, 2004; Moore, 2002, 2015). Nevertheless, amid such variation, it is still possible to specify the characteristics of human relationships and experiences that place all individuals on positive and healthy pathways across the life span. We briefly review such dynamic relational concepts next. Each of these concepts has implications for assessing the coactions among youth and the key contexts of their lives and, therefore, for illuminating the coactions among students, teachers, and their classrooms and schools.

Key Concepts Within Dynamic, Relational Developmental Systems-Based Models

The dynamic, relational development system within which all human life develops has been shaped by the evolutionary biology of the species (e.g., Gottlieb, 1992; Jablonka & Lamb, 2005; Johanson & Edey, 1981; Lickliter, 2016; Moore, 2015; Noble, 2015). The embeddedness of humans within this evolutionary context has necessitated that mutually-influential relations between an individual and the context–which we will represent as individual ⇔ context coactions–also involve mutually-nurturant relations for humans to both survive, per se, and to thrive within and across the life span. Three concepts describe the evolutionary distinctiveness within which developmentally-nurturant relations have evolved and that enable healthy and positive human life to exist.

Neoteny, paedomorphy, and the cultural dimension of evolution.

Humans are the most *neotenous*–that is slowly maturing–of all animal species (Gould, 1977). As compared to protohominid and hominid ancestors and to other animal species in contemporary existence with *homo sapiens*, humans take a decade or more to reach skeletal-, organ system-, and particularly reproductive-maturity. Second, because of their neotenous growth, humans are also the most *paedomorphic* of all ancestral species; that is, humans maintain child-like physical and functional characteristics longer in their life spans (their *ontogeny*) than any of their ancestral species or, again, other contemporary species (Gould, 1977). For example, new neuronal growth accompanies the adolescent period of development, and new brain myelinization is in evidence in the seventh and eighth decades of life (Baltes et al., 2006; Dorn & Beltz, 2022; Paus, 2009). What is most salient about these two distinctly human developmental features is that the coaction of neoteny and paedomorphy combine to make humans more dependent on positive nurturing from developmentally-attentive caregivers for longer in their life spans than any other animal across either evolutionary history or contemporary circumstances.

In addition, a third facet of human beings pertains not only to the singularity of their evolutionary history among all past and present organisms but, as well, to the complexity of human development itself. The evolutionary history of human life involves the integration of four dimensions of processes. These dimensions are genetics, epigenetics, human behavior, and culture. In particular, it is the fourth of these dynamically-interrelated (i.e., mutually-influential and mutually-regulated)

dimensions of human evolution that creates the uniqueness of human life (e.g., Raeff, 2016; Rogoff, 2003).

Together, the nature and course of human development is unique among all species because of this suite of features of human life—neoteny, paedomorphy, and the four dimensions of human evolution. It is especially critical that the fourth, cultural dimension of human evolution be appreciated when attempting to specify what makes humans human. The cultural dimension is qualitatively and quantitatively different from what exists for other species. Humans singularly possess complex cultural creations, such as language and other symbolic systems and, as well, educational, economic, political, and religious traditions and institutions.

Such features combine to define human life and its purpose and meaning differently from our evolutionary ancestors and from all other living creatures. In fact, these features help to reveal what is individual about each human being and to explain why and how human variation is the norm and not the exception in human development. For youth who are assessed for their academic (e.g., science, technology, engineering, and math) skills or life skills (e.g., socioemotional learning or character attributes), the features of human evolution we have noted require integrated longitudinal measurement of both individual and context and the analysis of such relational data. In addition, measurement of the characteristics of individuality of each student must be measured as well and, compared not only to other students or to school, district, regional, or national norms but, and as important, to the individual students themselves. Such analysis of the person in relation to themselves is a data analysis approach that is termed ipsative, person-specific, or idiographic. We will discuss such analytic methods in great detail later in this chapter, but here it is important to emphasize that, without including such measurement in the assessment of student ⇔ context relations, educators, parents, or students themselves cannot know all facets of the person that drive their behavior, capacities, well-being, or possible futures (Lerner, 2021; Rose, 2016). In addition, as we now discuss some of the other key concepts associated with dynamic, relational developmental systems ideas about humans, we will highlight that these concepts also have important implications for measuring individual ⇔ context relations (see too Lerner, 2018; Moore, 2015; Overton, 2015 for additional details).

Embodiment

Overton (2015) explained that human development is embodied by 1. the physiological and morphological features of humans (e.g., neurobiology, genetics/epigenetics, and hormones), by 2. the coactions of psychological processes (e.g., involving cognitions, affect, and behaviors) with this first instance of embodiment, and by 3. the coaction of social and cultural processes with these first two instances of embodiment. Thus, Overton (2013) notes that:

> *"Embodiment includes not merely the physical structures of the body but the body as a form of lived experience, actively engaged with the world of socio-cultural and physical objects. The body as form references the biological point-of-view, the body as lived experience references the psychological subject standpoint, and the body actively engaged with the world represents the socio-cultural point-of-view"* (p. 103).

As an example of this embodiment, Immordino-Yang and colleagues (e.g., Immordino-Yang et al., 2019; Immordino-Yang & Yang, 2017; Immordino-Yang et al., 2023) point to evidence indicating that the individuals' cognitive, affective, and behavioral processes involved in meaning-making of their world are a product *and* a producer of meaningful changes in brain activity that result from the individual coacting with features of their specific contexts. Thus, developmental and educational sciences require theory-predicated and empirically systematic interrogation and, ultimately, the integration of the three domains of embodiment.

As well, understanding the current status of a student in a classroom and, arguably more importantly, using such information to help predict the student's range of developmental possibilities and life attainments will require valid measurement of all domains of embodiment, measurement that is longitudinal, and data analyses that validly depict the range of possibilities for every specific student. Recognition of the importance of such methods of data collection, measurement, and analysis is underscored by yet another concept from dynamic, relational developmental systems models.

Holism

Human life and development must be understood as involving multiple domains of development that coact in the holistically integrated dynamic developmental system. The concept of holism means that the "parts of the whole" (the embodied domains) of an individual:

> *"do not combine through an additive process. Instead, the combination may be better understood as a multiplicative process: When the parts combine, they produce, in combination, attributes of a novel whole that do not exist in the parts in isolation. What makes living systems unique is that they change systematically, through mutually-influential individual ⇔ context relations, into new, increasingly adaptive and complex forms (see Gould & Vrba 1982; Jablonka & Lamb 2005). The whole, through its self-organization, has unique systemic features that are not attributes of any part. Thus, the whole is not just quantitatively greater than the sum of its parts; it is qualitatively different from the sum of its parts"* (Cantor et al., 2021, p. 23).

For instance, the key methodological point associated with holism is that measurement of a student without also measuring the student's context is *meaningless*. A purported measure of a student's current capacity or future potential that results in the assignment of a score attached to an individual is useless unless that score is empirically understood (through integrated measurement of the student and context that has occurred across time—that is longitudinal–and that includes valid assessments of all domains of embodiment) to reflect holistic assessment. A score attached to a student that is not understood holistically as a score of the students and context at one specific time is both completely inadequate and potentially damaging to the well-being of a student. Without integrated understanding of the dynamics between students and all the contextual influences impacts on them, students who have lived or now live in challenging contextual circumstance, for example, because of marginalization associated with racism, poverty, and minoritization, cannot be accurately or adequately assessed (Cantor et al., 2021; Card, 2017).

By ignoring the developmental contextualization of the academic scores of any student, educators will (continue to) unfairly penalize marginalized students and, in turn, privilege in unjust ways students who have lived free of unjust marginalization and minoritization (Spencer, 2006, 2024; Spencer et al., 2015). Accordingly,

educational and development science must use methods of assessment and evaluation that know each student in the wholeness of their individuality (Cantor et al., 2021; Lerner, 2021; Lerner & Greenberg, 2025; Lerner & Matthews, 2024; Rose, 2016). We return then to the concept of specificity.

Specificity of Individual ⇔ Context Relations

As we have noted, human life and development are characterized by the specificity of an individual's course of individual ⇔ context relations across time and place (e.g., Bornstein, 2019; Elder et al., 2015; Molenaar, 2004; Rose, 2016). It is unlikely that any two people will have the same history across their lives in these relations (Bornstein, 2019; Hirsch, 2004; Rose, 2016). Said another way, the history of individual relations or relationships that occur across a human life are always specific to a person (Bornstein, 2019; Rose, 2016).

The Specificity Principle presented by Bornstein (2017, 2019, 2024; see too Lerner & Bornstein, 2021) depicts the dimensions of biological, psychological, behavioral, relationship, and contextual individuality that must be understood to provide a complete (embodied and holistic) account of human development and, as well, to maximize the chances that the application of human developmental theory-based research equitably promotes positive outcomes for every individual. Indeed, without recognition of specificity in models and measurement of human development (e.g., Molenaar, 2004; Rose, 2016), and in evidence-based policies and programs derived from such developmental scholarship, neither authentic equity nor social justice can be interpreted as useful contributions from developmental or educational science (Cantor & Osher, 2021).

Of course, the specificity of individual ⇔ context relations does not negate the existence of facets of developmental processes that can be generalized across groups (i.e., differential group processes) and, as well, facets of developmental processes that are nomothetic (that are shared by all humans) (Allport, 1937, 1962; Emmerich, 1968). Kluckhohn and Murray (1953) made this point by explaining that it is simultaneously true that each human has attributes that are present in all other humans, that each human has attributes that are present in only some other humans, and that each human has attributes that are shared with no other humans (these attributes are labeled as *idiographic* or *person-specific*).

Implications of Dynamic, RDS-Based Concepts for Research Design, Measurement, and Analysis

In the enactment of good science, the methods selected for use in an empirical investigation should align with the questions being asked by the researcher. Indeed, methodologists studying human development have asserted that theory is the primary tool of developmental methodology (e.g., Collins. 2006). In other words, theory-predicated questions should guide the choice of methods (measures, designs, data analyses) used in developmental research. As noted in prior sections of this chapter, concepts of development associated with dynamic, RDS-based models of character development have specific implications for the questions asked in developmental and educational science research and, in turn, for the methods used to address the questions.

Neoteny and paedomorphy

Because of neoteny and paedomorphy, the assessment of individual ⇔ context relations must extend over large portions of the human life span to capture the changes that are involved in a person moving from birth to maturity. Accordingly, point-in-time measurement (e.g., as is studied in cross-sectional research designs) may be useful to address some empirical questions (e.g., the average scores for reading among students in Grades 2, 4, and 6 in a specific school or school district). However, only repeated measurement–longitudinal–designs can provide information about an individual's development (whether there are changes in individual students reading scores across Grade 2, 4, and 6).

Thus, cross-sectional designs (Baltes et al., 1977) only provide data about interindividual (between-person) differences within specific times of measurement, and these differences may or may not be due to developmental change or to treatment effects (e.g., Shonkoff et al., 2017). For instance, interindividual differences may reflect birth cohort differences and/or inadequately matched age groups (Baltes et al., 1977; Lerner, 2018). No data about intraindividual (within-person, ipsative, or idiographic) change can be derived from the point-in-time measurements gathered in cross-sectional studies. In addition, at least since the classic papers by Schaie (1965) and Schaie and Strother (1968), the ensuing 50+ years of developmental science research has repeatedly demonstrated that developmental trajectories derived from cross-sectional research do not align with developmental trajectories derived from longitudinal research. Simply, then, cross-sectional designs cannot provide

data illuminating the course of *development* across the life span (e.g., a growth mindset) among, or of enduring outcomes of, K–12 educational programs (e.g., the creation of a life-long learner; e.g., Baltes et al., 2006).

Embodiment

Because of embodiment, longitudinal measurement must involve measurement of both individuals and their contexts and, therefore, questions about the bases of a student's academic skills, likely pathways of educational and life attainments, or socioemotional or character attributes must interrogate the physical and physiological attributes of the student, the psychological and social characteristics of the student, and the social and cultural context of the student.

For instance, much of the data collected about positive attributes of human development (e.g., grit, character strengths, growth mindset, hopeful expectations about the future) solely involve surveys, a methodology that has well-known measurement problems (e.g., response bias, social desirability-based responses) in regard to establishing validity and reliability (Card, 2017; Clifton, 2020; Rioux & Little 2020). In addition, few survey measures of character have established measurement invariance across age, gender, ethnicity and, in particular, in regard to international generalizability, across nations and cultures (Putnick & Bornstein, 2016; Maasen et al., 2023; Tirrell et al., 2019). Furthermore, as explained by Nucci (2017, 2019, 2024), within dynamic models of human development meaningful change is a multifaceted, integrated, and dynamic developmental phenomenon and, as such, a narrow approach to measurement could not validly capture this complexity.

Accordingly, measurement models should include programmatic measurement of all three domains of variables comprising the embodied nature of all development processes, On the one hand, there has not been systematic assessment across the life span of the coaction between morphological and physiological processes with the specific manifestations of holistic thriving within person-specific processes. For example, are there specific times in K–12 education programs demonstrating effectiveness in promoting academic achievement, SEL competencies, and active and positively engaged citizenship? Are there specific tipping points for establishing life styles that, across decades, foster both physical and mental health and active stewardship of the planet that sustains human life and the well-being of future generations?

On the other hand, although there is considerable evidence about the link between sociocultural context and diverse facets of human development (e.g., Lerner et al., 2021a, Lerner et al., 2021b; Raeff, 2016), these links have rarely been extended to include coactions with the morphological and physiological dimension of embodied development processes. The result of these omissions is an impoverished understanding of the whole of a human being.

Holism

Because of holism, measures associated with the three levels of embodiment must be *integratively* assessed and analyzed for their statistical interactions and the possibility that measures of one or more of the attributes that are measured mediate changes in other scores. Much of the research literature on the development of thriving or well-being reports work about one or at most a few attributes. Indeed, single-topic scales (e.g., grit, growth mindset, curiosity) dominate research. In addition, many programs that undertake evaluations of their work focus on one or only a few attributes as outcomes of their interventions (e.g., see Lerner et al., 2021a and Lerner et al., 2021b for discussions).

As implied in our discussion of the methodological implications of embodiment, the absence of a holistic approach to all levels of organization constituting human life is complicated when only a narrow assessment of constructs representing each level is included in a measurement model. One basic tenet of statistical analysis is that when a main effect of a variable is embedded in a higher-order statistical interaction, interpretation of main effects is eschewed in deference to interpretations of the interaction effect. The joint ontological implication of embodiment and holism is that each human life is a result of a complex coaction among many variables within and across levels of integration, including, as we have emphasized, individual ⇔ context coactions (e.g., see Heckman et al., 2024). To understand the embodied and holistic role of thriving in the development of this complex system is a necessary, but admittedly daunting, challenge for developmental or educational science.

Of course, issues of feasibility, time, and financial resources limit the measurement model of any single study. Therefore, in order to design and implement research that can holistically measure individuals across time and place, a combined implication of embodiment and holism is that researchers must pursue a research

topic programmatically, perhaps ones that involve cross-laboratory efforts and are part of a collaborative national and international network.

At this writing, there are signs that support for such a program of scholarship in the study of the development of holistic thriving is being considered as a target of funding by some private foundations. The Templeton World Charity Foundation's Global Innovations in Character Development is a case in point (Dill & Simpson, 2024). The significance of this kind of integrative research will foster more complete definitions of health—and more important research questions such as what is a healthy person, how do researchers or educators define such health, or how do researchers or educators know that learning has been optimized in a given context and that a student is performing at the top of their developmental range?

Such integrative and programmatic funding will be more likely to appear prudent among funders if research about the embodied and holistic developmental system can be coupled with compelling evidence that, consistent with RDS-based ideas about the specificity of human development, the study of the specific complex and dynamic developmental course of individuals can be studied in the wholeness of their individuality (Lerner et al., 2022, 2024a; Lerner & Matthews, 2024), including the supports for the health and learning present on their contexts across life.

Developmentally nurturant relationships

Furthermore, the measurement model in such assessment must include indices of the presence or absence of developmentally nurturant relationships in the student's life and, more generally, of the impacts of contextual influences on every measurement made of the student. An open and dynamic system can be changed for the better or for the worse. The dynamic developmental system of a person manifesting holistic thriving is the same sort of dynamic system affecting a person manifesting problematic behavior across the life span. What, then, accounts for these interindividual differences?

We believe that the critical difference between a person who becomes an example of positive development or grows up to be a "menace to society" was famously stated by Theodore Roosevelt: "To educate a person in mind but not in morals is to educate a menace to society." The focus of education implied by Roosevelt is an instance of education targeted at a specific component of holistic human development (Nucci, 2024): Character education. This educational focus is a

topic that developmental scientists have studied quite extensively (Matthews & Lerner, 2024a, 2024b). These studies include a focus on formal (in-school) and informal (e.g., family socialization practices [Bornstein, 2024] or out-of-school time educational programs [Berkowitz & Baer, 2024]) a person experiences across the life span. Whereas this point may seem obvious, it nevertheless has methodological implications that will enhance understanding of the developmental bases of holistic thriving.

It is likely that, except for a few resolute genetic reductionists, that is, those writers who believe that the genes inherited at birth are a blueprint for all later development (e.g., Plomin, 2018), most developmental scientists would agree about the significance for shaping moral development and character strengths that exists within the formal and informal educational experiences that are part of a person's socialization. However, there have been far too few investigations of the processes that enable precise delineation of the specific formal and information educational experiences, and of the coactions among them, that are needed to promote specific features of character development among specific youth. Interrogating the conditions across life that eventuate in specific features of an individual's character attributes results, then, in framing empirical questions through the use of the Bornstein Specificity Principle (2017, 2019, 2024).

Specific instances of student ⇔ context relations

As we have already emphasized, because all scores attached to a student's academic record are not indices of the individual student, per se, but of specific instances of student ⇔ context relations, such dynamism must be measured and analyzed (e.g., see Deboeck et al., 2023). In addition, the insistence on such specificity does not deny that a comprehensive and integrative approach to measurement will reveal that, in the embodied measures of a student, some portion of the variation will reflect various facets of life present in all people, some portion of the variation will involve facets of life present in only some groups of people, and some portion of the variation will involve facets of life present only in one the specific person.

Bornstein's (2019) Specificity Principle involves programmatic developmental research that addresses a complex, multi-part question aimed at generating the evidence needed for precise knowledge of the bases of holistic positive

development. An example of the set of questions that may derive by framing research through use of this principle involves asking:

- What specific attributes of holistic thriving;
- For a person of what specific demographic or status characteristics (e.g., age, gender, race, ethnicity, religion, SES, etc.);
- Experiencing what specific formal or informal socialization (or education) experiences;
- In what specific setting(s) (e.g., family, school classroom, out-of-school-time setting, professional training, religious training);
- Of what intensity, duration, and engagement level;
- In what specific community, society, and culture;
- At what specific time in the life span;
- At what specific time in history;
- Will result in what manifestations of holistic thriving?

Research about holistic thriving must build into it change-sensitive measures suitable for use in addressing such a set of questions about the specifics of individual ⇔ context coactions that occur for specific youth, at specific times in life, and within and across specific settings. Developmental or educational research or program evaluations guided by such questions will enable holistic understanding of how each person can have a life span marked by mutually beneficial coactions between the self and a civil society.

In sum, although we believe that all researchers in developmental or educational science would likely acknowledge that all three instances of variance–variance associated with all humans (nomothetic variance), variance associated with only some people (group differential variance), and variance specific to the individual (idiographic variance)–inevitably exist in any human data set, not all of these researchers would insist that all three sources of variation are meaningful (e.g., Hamaker et al., 2018; Molenaar, 2004; Molenaar & Nesselroade, 2015; Rose, 2016). Whereas many researchers might contend that individually-specific fluctuations around population or sample means constitute random variation of error variance (e.g., Rose et al., 2013), the concepts that we have discussed as associated with dynamic, RDS-based models may lead a researcher to believe that such variance is

meaningful and requires the use of analytic statistical methods, such as dynamic structural equation modeling (DSEM; McNeish & Hamaker, 2020) or state space grids (e.g., Hollenstein, 2007) to test such beliefs. Because such interpretations of person-specific data are still relatively new and controversial at this writing (see Deboeck et al., 2023; Hamaker et al., 2018), it is useful to discuss in more depth this facet of the methodological implications of RDS-based concepts in more depth.

The Importance for Developmental and Educational Science of Measuring and Analyzing Person-Specific Data

Over the past two decades, substantial methodological innovations have been made in the person-specific study of human development. These innovations have not ignored or attempted to explain away through ontological reductionism the complexity of person-specific development or to treat nomothetic or differential variation as a "good enough" approximation of idiographic variation (Lerner, 2018, 2021). Quite to the contrary, the methodologists leading the way in person-specific measurement and data analysis have fully embraced such complexity (e.g., Deboeck et al., 2023; Hamaker et al., 2018; Mascolo & Bidell, 2020; Molenaar, 2004; Molenaar et al., 2014; Nesselroade & Molenaar, 2010; Ram & Gadzke-Kopp, 2023; Ram et al., 2005, 2014; Rose, 2016).

A useful reference point for the emergence of an emphasis on the importance of focus on the individual *qua* individual in pursuing a holistic and dynamically integrated understanding human development is a 2004 article authored by Peter C. M. Molenaar, "A Manifesto on Psychology as Idiographic Science: Bringing the Person Back Into Scientific Psychology, This Time Forever." Molenaar (2004, p. 202) noted that "Attention in psychological research is almost exclusively restricted to variation between individuals (interindividual variation), to the neglect of time-dependent variation within a single participant's time series (intraindividual variation)."

Indeed, writing more than a decade later, Hamaker et al. (2018, p. 820) observed that, when their *intensive* (i.e., densely-sampled observations across relative short periods of time) longitudinal research focused on within-person change begun (at about the time that Molenaar published his Manifesto), "gathering intensive longitudinal data was not only cumbersome, but it was also considered unnecessary by many, because short-term, within-person fluctuations were

assumed to reflect mere noise… [and not] the meaningfulness of short-term, within-person fluctuations." Similarly, McNeish and Hamaker (2020) explained that:

> *"Developmental process data… typically feature a few measurement occasions that are widely spaced over the observations window (often months or years apart). The primary focus is questions about the means of the outcome variable over the course of the observation window… how much do the means change from the first to the last measurement occasion?… These models tend to take a nomothetic approach in describing the overall mean across people…Moreover, when covariates are added to the model, the predominant focus is variables that affect the shape of the growth curve… Plainly stated, covariates for developmental process commonly explain between-person variability (factors that lead to differently shaped growth curves) but less commonly explain within-person variability (deviation around the growth curve)"* (pp. 611–612).

In essence, then, to understand holistically and dynamically integrative developmental processes of development, the study of an individual's repeated scores across time (i.e., the study of within-person, intraindividual change) must be combined with the study of variation in averages (nomothetic or differential changes). Moreover, and as we emphasized throughout this chapter, within dynamic, RDS-based models, holistic and dynamically integrated understanding of individual pathways of development must focus on integrated individual ⇔ context coactions, and not on either individual or context alone. Indeed, the necessity of understanding coactions with the specific setting or context of the individual in order to understand the course of the person's development is formally specified through Equations 1 through 5 in a provocative and convincing chapter by Heckman et al. (2024).

In short, there is rich and important support of the Molenaar (2004) Manifesto call for the idiographic study of the process of development and learning in general and, more particularly, for the importance of adding to the field a focus on the ways in which specific, dynamic individual ⇔ context relations are a foundational part of *all* developmental and educational processes (e.g., Cantor et al., 2019; Lerner et al., 224; Lerner & Matthews, 2024; Matthews & Lerner, 2024a, 2024b; Moore, 2015).

Certainly, this focus on the necessity of understanding dynamic individual ⇔ context specificity has been elevated by the influential scholarship associated with the Bornstein Specificity Principle (e.g., 2017, 2019; 2024). At this writing, this concept has attained the status of a foundational principle of developmental science. It should also be seen as a key idea within metatheories and theories used in educational science.

In the medical sciences, thoroughly understanding how a person responds to a given treatment (context) for a specific malady, and whether this individual is ultimately cured, cannot happen through comparisons to another individual or by using quantitative averages computed for groups. The knowledge can only be gained by demonstrating that improvement is occurring over time and place in the individual with specificity to the interventions applied. Such a demonstration must 1. show that the individual is improving because of the specific intervention; 2. identify the measurement of the quality or speed with which improvement is or is not happening; and ultimately 3. Ascertain whether the malady was completely eliminated. An intervention (context) could not be deemed successful unless such complete results could be demonstrated. Similarly, the ubiquitous specificity of individual ⇔ context relations over the course of the human life span means that, to comprehensively and holistically understand human development, learning, and behavior across the life span, scholars need to identify the idiographic, differential, and nomothetic dimensions of a target process (e.g., Cantor et al., 2021; Lerner, 2018; Molenaar, 2004; Molenaar & Nesselroade, 2015; Rose, 2016).

Overton (2014) acknowledged that persisting difficulty existed in countering reductionists' criticism by advocates of dynamic, RDS-based developmental models. He wrote in 2014 that proponents of RDS-based models did not have sufficient methodological means to demonstrate that the models they forwarded could be rigorously and convincingly empirically interrogated. However, and as implied by the researchers using the Molenaar Manifesto and the Bornstein Specificity Principle as the frame for their studies of human development, the presence of precisely such methodological tools has been burgeoning. It is useful to briefly discuss them.

For instance, in discussing how a dynamic approach to structural equation modeling (i.e., DSEM; McNeish & Hamaker, 2020) can provide evidence of meaningful person-specific pathways of development and, as well, enable comparison of these within-person changes with the average pathway of change

for the group within which individuals are embedded, Hamaker et al. (2018, p. 820) explain that:

> *"one of the most valuable properties of intensive longitudinal data is that they provide a unique opportunity to study processes within-person as they unfold over time… To investigate the underlying dynamics of intensive longitudinal data, researchers have been borrowing techniques from other disciplines—like econometrics, physics, and engineering—where they have a long history of studying processes over time using time series analysis and dynamic systems theory. A common characteristic of these techniques is their focus on the way a preceding state of the system (e.g., person or dyad) gives rise to the subsequent state. This allows for a unique perspective on processes… and extends our more conventional approaches to intensive longitudinal data, which tend to focus on concurrent relationships between variables, rather than their dynamic interplay over time."*

At this writing, several recent studies (e.g., Abbasi-Asl et al., in press-a, in press-b; Michaelson, 2021; Yu et al., 2020, 2021, 2022a) have used DSEM to study the dynamics of attributes of academic-related skills (e.g., self-regulation, executive functioning), socioemotional functioning and character (e.g., well-being, mood, empathy), and physiological functioning (e.g., adequacy of sleep, cortisol levels).

Of course, this very brief reference to ways in which dynamic systems methods can illuminate the structure and function of person-specific relations with context–and at levels of organization that reflect the breadth of the embodied, developing person –is far from exhaustive. There are many other methods for assessing the complexity of dynamic individual ⇔ context that exist and others continue to be created (e.g., Brinberg et al., 2022; Hollenstein, 2007; Mongin et al., 2022). However, it is certainly beyond the scope of this chapter to provide tutorials about these dynamic methods. Our purpose, then, is only to point to the fact that methods to address the complexity of the embodied, holistic, and dynamic, relational development system exist and, if past is prelude, will continue to burgeon in subsequent decades.

Developmental and educational science that includes person-specific measurement and analysis enhances developmentally nurturant individual ⇔ context coactions

However, if person-specific coactions include developmentally-nurturant relations, then the probability of healthy and positive outcomes, such as thriving and learning, increases for all individuals (e.g., Cantor et al., 2021; Lerner, 1984; Lerner & Lerner, 2019). Indeed, if basic and applied research seek to move beyond only the description and explanation of developmental change among groups of individuals and, as well, to also discover ways to optimize developmental pathways through life for individuals, then understanding the bases of these developmentally-nurturant coactions will increase; scientists will learn how the theory-predicated application of such knowledge can be an important and unique additional benefit to all individuals assessed by such scholarship; of most important focus at this writing are marginalized and minoritized youth who have inequitably and unjustly developed within contexts where the proportion of adverse individual ⇔ context coactions or of insufficiently nurturant individual ⇔ individual coactions is substantially greater than developmentally-nurturant instances of such coactions (e.g., Spencer, 2024; Spencer & Dowd, 2024; Spencer et al., 2015).

Of course, individuals across their life spans should be the focus of such work. Importantly, there is voluminous literature documenting the presence of relative plasticity (the potential for systematic change and malleability) across the life span (Baltes et al., 2006; Immordino-Yang et al., 2019; Fischer & Bidell, 2006; Lerner, 1984, 2018, 2021). Nevertheless, individuals developing across the first two decades of life should be the focus of the integration of basic and applied scholarship for researchers and educators interested primarily in the K–12 span.

In sum, to understand and enhance the development of each youth in the wholeness of their specific individuality, RDS-based concepts have several important implications for research design, measurement, and data analysis that, in a useful program of scholarship, should be systematically employed. Measures that are change sensitive, valid, invariant across person, time, and place, and reliable must be used to provide data illuminating the dynamic relations between the two sides of the bidirectional arrow we have discussed throughout this chapter. In other words, measures must be created and used that are capable of

detecting changes if and when they occur because of the dynamics of mutual influence involved in coactions at all levels of the human development system, both within and across individuals, time, and place (Elder et al., 2015).

Conclusions

We believe that the future contributions of all sciences that seek to enhance the lives of humans from birth through adolescence and of course, as well, in the ensuing decades of the life course will gain greatly from framing their research and program evaluation work with ideas derived from dynamic, RDS-based models and methods. Importantly, these methods include ones that enable illumination of the ways in which idiographic fluctuations within short periods of time contribute to contemporaneous development *and* to the more directly observable qualitative and transformative changes that occur over longer periods of time, from birth to maturity. Perhaps even more important will be more discoveries of the diverse character of individual pathways and how such variation may (or may not) moderate nurturant coactions across time and place. As noted by Ram et al. (2014), a key question that we believe is vital to address in future research is: Precisely how do these fluctuations influence the transformations that reflect the qualitative changes that mark nomothetic and differential change across longer time spans and, as well, the entire course of life?

Our hope is that the documentation and dissemination of these contributions of dynamic, RDS-based models and methods and the information they carry about human growth and change will spur the growth of diverse sources of funding for basic and applied scholarship. Admittedly, theoretically-informed scholarship providing empirical evidence about the complexity of describing, explaining, and optimizing the development of holistic thriving in individual human beings is itself complex and expensive to enact. Nevertheless, only such scholarship can demonstrate how to unlock human potential and foster the adaptive development of all children and adolescents, especially youth who have been marginalized and minoritized because of living in contexts with low probabilities of experiencing developmentally-nurturant coactions. Only such scholarship can effectively replace such outcomes of development for these children, and provide for all youth, a developmental history of coactions that create vibrantly thriving individuals whose lives are marked by physical and mental health, well-being, and the acquisition of skills enabling the successful use of learning-to-learn skills across the life span.

The development of ecosystems and nurturant contexts designed for such holistic thriving will counter inequities and unjust (and undeserved) experiences (Stafford-Brizard, 2016). Such contexts will help create a citizenry that lives with and for others (Lerner et al., 2024-b). Such citizens will possess a sustained commitment to contribute in specific ways to self, family, and the institutions of civil society, social justice, and democratic civil society across the course of their lives.

References

Abbasi-Asl, R., Yu, D., Tirrell, J. M., Keces, N., Dowling, E. M., Hasse, A., Mackin, M., Olander, K., Douglas, K., Kibbedi, P, N., Wanyama, J, R., Sim, A. T. R., Lerner, J. V., & Lerner, R. M. (in press-a). Character development among Ugandan youth: A person-specific approach. *Journal of Moral Education*.

Abbasi-Asl, R., Lerner, R. M., Keces, N., Yu, D., Tirrell, J. M., Dowling, E. M., Mackin, M., Hasse, A., Olander, K., Sim, A. T. R., Lerner, J. V., Douglas, K., Kibbedi, P. N., & Wanyama, J, R. (in press-b). Measuring character among Ugandan youth: An integrative differential and idiographic approach. *International Journal of Behavioral Development*.

Allport, G. W. (1937). *Personality: A psychological interpretation*. Holt.

Allport, G. W. (1962). The general and the unique in psychological science. *Journal of Personality, 30*(3), 405–422.

Baltes, P. B., Lindenberger, U., &Staudinger, U. M. (2006). Life span theory in developmental psychology. In R. M. Lerner (Ed.), *Theoretical models of human development*. Handbook of child psychology (Vol. 1, 6th ed., pp. 569–664). Hoboken, NJ: John Wiley & Sons.

Baltes, P. B., Reese, H. W., & Nesselroade, J. R. (1977). *Life-span developmental psychology: Introduction to research methods*. Monterey, CA: Brooks/Cole.

Berkowitz, M. V., & Baer, M. C. (2024). PRIMED for character education: Deriving design principles for effective practice from empirical evidence. In M. D. Matthews and R. M. Lerner (Eds.), *Routledge International Handbooks of Multidisciplinary Perspectives on Character Development*, Volume I: *Conceptualizing and Defining Character* (pp. 104–120). New York, NY: Routledge.

Bornstein, M. H. (2017). The specificity principle in acculturation science. *Perspectives in Psychological Science, 12*(1), 3–45.

Bornstein, M. H. (2019). Fostering optimal development and averting detrimental development: Prescriptions, proscriptions, and specificity. *Applied Developmental Science, 23*(4), 340–345.

Bornstein, M. H. (2024). Parenting as panacea: Toward generational advancements of early character virtues and mature civic responsibility. In M. D. Matthews and R. M. Lerner (Eds.), *Routledge International Handbooks of Multidisciplinary Perspectives on Character Development*. Volume II: *Moderators, Threats, and Contexts* (pp. 88–115). New York, NY: Routledge.

Brinberg, M., Ram, N., Conroy, D. E., Pincus, A. L., & Gerstorf, D. (2022). Dyadic analysis and the reciprocal one-with-many model: Extending the study of interpersonal processes with intensive longitudinal data. *Psychological Methods, 27*(1), 65–81.

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge, MA: Harvard University Press.

Bronfenbrenner, U. (2005). *Making human beings human: Bioecological perspectives on human development*. Thousand Oaks, CA: Sage.

Bronfenbrenner, U., & Morris, P. A. (2006). The bioecological model of human development. In W. Damon & R. M. Lerner (Eds.) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (6th ed., pp. 793–828). Wiley.

Cantor, P., & Osher, D. (Eds. (2021a). *The Science of Learning and Development: Enhancing the Lives of All Young People*. New York: Routledge.

Cantor, P., & Osher, D. (2021b). The future of the science of learning and development: Whole-child development, learning, and thriving in an era of collective adversity, disruptive change, and increasing inequality. In P. Cantor and D. Osher (Eds.), *The Science of Learning and Development: Enhancing the Lives of All Young People* (pp. 233–254). New York: Routledge.

Cantor P, Lerner R. M., Pittman K., Chase P. A., &, Gomperts, N. (2021). *Whole-child development, learning, and thriving: a dynamic systems approach*. New York: Cambridge University Press.

Card, N. A. (2017). Methodological issues in measuring the development of character. *Journal of Character Education, 13*(2), 29–45.

Chess, S., & Thomas, A. (1999). *Goodness of fit: Clinical applications from infancy through adult life*. Philadelphia, PA: Brunner/Mazel.

Clifton, J. D. W. (2020). Managing validity versus reliability trade-offs in scale-building decisions. *Psychological Methods, 25*(3), 259–270.

Collins, L.M. (2006). Analysis of longitudinal data: The integration of theoretical model, temporal design, and statistical model. *Annual Review of Psychology, 57,* 505–528.

Deboeck, P. R., Geldhof, G. J., & Yu, D. (2023). Implications of dynamic systems for future methodology in developmental and learning science. In C. D. Lee, R. M. Lerner, V. L. Gadsden, & D. Osher (Eds.), *The science of learning and development. Review of Research in Education, Volume 47* (pp. 100–115). Sage.

Dill, H.T., & Simpson, J. T. (2024). The Templeton Philanthropies. In M. D. Matthews and R. M. Lerner (Eds.), *Routledge International Handbooks of Multidisciplinary Perspectives on Character Development*. Volume II: *Moderators, Threats, and Contexts* (pp. 535–549). New York, NY: Routledge.

Dorn, L. D., & Beltz, A. M. (2022). Puberty: Foundations, findings, and the future. In L. J. Crockett, G. Carlo, & J. E. Schulenberg (Eds.), *APA Handbook of Adolescent and Young Adult Development* (pp. 3–19). APA Publications.

Elder, G. H., Shanahan, M. J., & Jennings, J. A. (2015). Human development in time and place. In M. H. Bornstein and T. Leventhal (Eds.), *Handbook of child psychology and developmental science, vol. 4: Ecological settings and processes in developmental systems* (7th ed., pp. 6–54). Wiley.

Emmerich, W. (1968). Personality development and concepts of structure. *Child Development, 39*(3), 671–690.

Fischer, K. W., & Bidell, T. R. (2006). Dynamic development of action and thought. In R. M. Lerner (Ed.), *Theoretical models of human development. Volume 1 of Handbook of Child Psychology* (6th ed., pp. 313–399). Editors-in-chief: W. Damon & R. M. Lerner. Wiley.

Gottlieb, G. (1992). *Individual development and evolution: The genesis of novel behavior.* Oxford University Press.

Gould, S. J. (1977). *Ontogeny and phylogeny.* Cambridge, MA: Belknap Press of Harvard University Press.

Gould, S., & Vrba, E. (1982). Exaptation: A missing term in the science of form. *Paleobiology, 8,* 4–15.

Hamaker, E. L., Asparouhov, T., Brose, A., Schmiedek, F., & Methén, B. (2018). At the frontiers of modeling intensive longitudinal data: Dynamic structural equation models for the affective measurements from the COGITO Study, *Multivariate Behavioral Research, 53*(6), 820–841.

Heckman, J. J., Galaty, B., Tian, H. (2024). The economic approach to personality, character, and virtue. In M. D. Matthews and R. M. Lerner (Eds.), *Routledge International Handbooks of Multidisciplinary Perspectives on Character Development*, Volume I: *Conceptualizing and Defining Character* (pp. 55–103). New York, NY: Routledge.

Hirsch, J. (2004). Uniqueness, diversity, similarity, repeatability, and heritability. In C. Garcia Coll, E. Bearer, & R.M. Lerner (Eds.), *Nature and nurture: The complex interplay of genetic and environmental influences on human behavior and development* (pp. 127–138). Mahwah, N.J.: Erlbaum.

Hollenstein, T. (2007). State space grids: Analyzing dynamics across development. *International Journal of Behavioral Development, 31*(4), 384–396.

Immordino-Yang, M. H., Darling-Hammond, L., & Krone, C. R. (2019). Nurturing nature: How brain development is inherently social and emotional, and what this means for education. *Educational Psychologist, 54*(3), 185–204.

Immordino-Yang, M. H., Nasir, N. S., Cantor, P., & Yoshikawa, H. (2023). Weaving a colorful cloth: Centering education on humans' emergent developmental potentials. In C. D. Lee, R. M. Lerner, V. L. Gadsden, & D. Osher (Eds.). *The science of learning and development. Review of Research in Education,* 2023 (pp. 1–45). Sage Publications.

Immordino-Yang, M. H., & Yang, X.-F. (2017). Cultural differences in the neural correlates of social–emotional feelings: An interdisciplinary, developmental perspective. *Current Opinion in Psychology*, 17, 34–40.

Jablonka, E., & Lamb, M. (2005). *Evolution in Four Dimensions: Genetic, epigenetic, behavioral, and symbolic variation in the history of life*. Cambridge, MA: MIT Press.

Johanson, D. C., & Edey, M. A. (1981). *Lucy: The beginnings of humankind*. New York: Simon & Schuster.

Kluckhohn, C., & Murray, H. A. (1953). Personality Formation: The Determinants. In C. Kluckhohn, H. A. Murray, & D. M. Schneider (Eds.), *Personality in Nature, Society, and Culture* (2nd ed., pp. 53–69). New York, NY: Alfred A. Knopf.

Lerner, R. M. (1984). *On the nature of human plasticity*. New York: Cambridge University Press.

Lerner, R. M. (2018). *Concepts and theories of human development* (4th ed.). New York, NY: Routledge.

Lerner, R. M. (2021). *Individuals as Producers of Their Development: The Dynamics of Person Context Coactions*. New York, NY: Routledge.

Lerner, R. M., & Bornstein, M. H. (Eds.). (2021). Enriching the Study of Human Development Through the Use of the Specificity Principle: Theory, Research, and Application. *Journal of Applied Developmental Psychology, 73/74/75*.

Lerner, R. M., Bornstein, M. H., & Jervis, P. (2022). The Development of positive attributes of character: On the embodiment of specificity, holism, and self-system processes. *Human Development, 66*(1), 34–37.

Lerner, R. M., & Greenberg, G. (Eds.). (2025). *The Heredity Hoax: Challenging flawed genetic theories of human development*. New York, NY: Routledge.

Lerner, R. M., Jervis, P., & Bornstein, M. H. (2021a). Enhancing the international study of positive youth development: Process, specificity, and the sample case of character virtues. *Journal of Youth Development, 16*(2–3), 402– 422.

Lerner, R. M., King, P. E., Dowling, E. M., & Bowers, E. P. (2024-b). On being and becoming human through accompaniment and telos: Ontological convergences between Christian anthropology and the science of human development. *Journal of Psychology and Theology*. https://doi.org/10.1177/00916471241300154

Lerner, R. M., & Lerner, J. V. (2019). An idiographic approach to adolescent research: Theory, method, and application. In L. B. Hendry & M. Kloep (Eds.), *Reframing Adolescent Research* (pp. 25–38). London and New York: Routledge.

Lerner, R. M., Lerner, J. V., Murry, V. M., Smith, E. P., Bowers, E. P., Geldhof, G. J., Buckingham, M. H. (2021b). Positive youth development in 2020: Theory, research, programs, and the promotion of social justice. *Journal of Adolescent Research*, *31*(4), 1114–1134.

Lerner, R. M., & Matthews, M. D. (2024). Character development: Then, now, and next. In M. D. Matthews and R. M. Lerner (Eds.), *Routledge International Handbooks of Multidisciplinary Perspectives on Character Development, Volume II: Moderators, Threats, and Contexts* (pp. 684–704). New York, NY: Routledge.

Lerner, R. M., Yu, D., Abbasi-Asl, R., Keces, N., Gonçalves, C., Buckingham, M. H., Dowling, E. M., Tirrell, J. M., Mackin, M., Olander, K., Hasse, A., & Dunham, Y. (2024-a). Towards a dynamic, idiographic approach to describing, explaining, and enhancing the development of SEL. *Social and Emotional Learning: Research, Practice, and Policy, 4,* 1–8. https://doi.org/10.1016/j.sel.2024.100050

Li, J., & Julian, M. M. (2012). Developmental relationships as the active ingredient: A unifying working hypothesis of "what works" across intervention settings. *American Journal of Orthopsychiatry, 82*(2), 157–166. https://doi.org/10.1111/j.1939-0025.2012.01151.x

Lickliter, R. (2016). Developmental evolution. *WIREs Cogn Sci* 2016. https://doi.org/10.1002/wcs.1422

Maassen, E., D'Urso, E. D., van Assen, M. A. L. M., Nuijten, M. B., De Roover, K., & Wicherts, J. M. (2023).The Dire Disregard of Measurement Invariance Testing in Psychological Science. *Psychological Methods*. https://dx.doi.org/10.1037/met0000624

Mascolo, M. F., & Bidell, T. R. (Eds.). (2020). Handbook of integrative developmental psychology: Festschrift for Kurt W. Fischer. Routledge.

Matthews, M. D., & Lerner, R. M. (Eds.). (2024a). *Routledge International Handbooks of Multidisciplinary Perspectives on Character Development*, Volume I: *Conceptualizing and Defining Character.* New York, NY: Routledge.

Matthews, M. D., & Lerner, R. M. (Eds.). (2024b). *Routledge International Handbooks of Multidisciplinary Perspectives on Character Development*, Volume II: *Moderators, Threats, and Contexts*. New York, NY: Routledge.

McNeish, D., & Hamaker, E. L. (2020). A primer on two-level dynamic structural equation models for intensive longitudinal data in Mplus. *Psychological Methods, 25*(5), 610–635.

Michaelson, L. E., Berg, J., Boyd-Brown, M. J., Cade, W., Yu, D., Geldhof, G. J., Yang, P-J., Chase, P. A., Osher, D., & Lerner, R. M. (2021). Intraindividual fluctuations in sleep predict subsequent goal setting in adolescents. *Journal for Person-Oriented Research, 7*(2), 78–87.

Molenaar, P. C. M. (2004). A manifesto on psychology as idiographic science: Bringing the person back into scientific psychology, this time forever. *Measurement, 2*(4), 201–218.

Molenaar, P. C. M., & Nesselroade, J. R. (2014). New trends in the inductive use of relation developmental systems theory: Ergodicity, nonstationarity, and heterogeneity. In P. C. Molenaar, R. M. Lerner, and K. M. Newell (Eds.), *Handbook of Developmental Systems and Methodology.* (pp. 442–462). New York, NY: Guilford Press.

Molenaar, P. C. M., & Nesselroade, J. R. (2015). Systems methods for developmental research. In R. M. Lerner, W. F. Overton, & P. C. M. Molenaar (Eds.), *Handbook of child psychology and developmental science: Theory and method* (7th ed., Vol. 1, pp. 652–682). Wiley.

Mongin, D., Uribe, A., Cullati, S., & Courvoisier, D. S. (2022). A tutorial on ordinary differential equations in behavioral science: What does physics teach us?. *Psychological Methods*. http://dx.doi.org/10.1037/met0000517

Moore, D. S. (2002). *The dependent gene: The fallacy of nature vs. nurture*. New York: W. H. Freeman.

Moore, D. S. (2015). *The developing genome: An introduction to behavioral epigenetics*. New York: Oxford University Press.

Nesselroade, J. R., & Molenaar, P. C. M. (2010). Emphasizing intraindividual variability in the study of development over the life span. In W. F. Overton (Ed.), *Handbook of life-span development. Vol. 1: Cognition, biology, methods* (pp. 30–54). Editor-in-chief: R. M. Lerner. Hoboken: Wiley.

Noble, D. (2015). Evolution beyond neo-Darwinism: A new conceptual framework. *The Journal of Experimental Biology*, *218*, 7–13.

Nucci, L. (2017). Character: A multi-faceted developmental system. *Journal of Character Education, 13*(1), 1–16.

Nucci, L. (2019). Character: A developmental system. *Child Developmental Perspectives, 13*(2), 73–78.

Nucci, L. (2024). The Development of Morality and the Character System: Implications for the Notion of Virtue. In M. D. Matthews and R. M. Lerner (Eds.), *Routledge International Handbooks of Multidisciplinary Perspectives on Character Development*, Volume I: *Conceptualizing and Defining Character* (pp. 295–309). New York, NY: Routledge.

Overton, W. F. (2013). A New Paradigm for Developmental Science: Relationism and Relational-Developmental Systems. *Applied Developmental Science, 17*(2), 94–107.

Overton, W. F. (2014). Relational developmental systems and developmental science: A focus on methodology. In P. C. M. Molenaar, R. M. Lerner, & K. Newell (Eds.), Handbook of developmental systems theory and methodology (pp. 19–65). New York, NY: Guilford Press.

Overton, W. F. (2015). Process and relational developmental systems. In R. M. Lerner, W. F. Overton, & P. C. M. Molenaar (Eds.), *Handbook of child psychology and developmental science: Theory and Method* (7th ed., Vol. 1, pp. 9–62). Wiley.

Paus, T. (2009). Brain development. In R. M. Lerner, & L. Steinberg (Eds.), *Handbook of Adolescent Psychology* (3rd ed., pp. 95–115). Wiley.

Plomin, R. (2018). *Blueprint: How DNA makes us who we are*. London: Allen Lane.

Putnick, D. L., & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental Review*, 41, 71–90.

Raeff, C. (2016). *Exploring the dynamics of human development: An integrative approach*. New York: Oxford University Press.

Ram, N., Chow, S.-M., Bowles, R. P., Wang, L., Grimm, K., Fujita, F., Nesselroade, J. R. (2005). Examining interindividual differences in cyclicity of pleasant and unpleasant affects using spectral analysis and item response modeling. *Psychometrika, 70*(4), 773–790.

Ram, N., Conroy, D. E., Pincus, A. L., Lorek, A., Rebar, A., & Roche, M. J., Coccia, M., Morack, J., Feldman, J., & Gerstorf, D. (2014). Examining the interplay of processes across multiple time-scales: Illustration with the intraindividual study of affect, health, and interpersonal behavior (iSAHIB). *Research in Human Development, 11*(2), 142–160.

Ram, N., & Gadzke-Kopp, L. (2023). Running toward network models of individuals and their contexts. In C. D. Lee, R. M. Lerner, V. L. Gadsden, & D. Osher (Eds.), *The science of learning and development. Review of Research in Education, Volume 47* (pp. 181–184). Sage.

Rioux, C., & Little, T. D. (2020). Underused methods in developmental science to inform policy and practice. *Child Development Perspectives*, 14(2), 97–103.

Rogoff, B. (2003). *The cultural nature of human development*. New York: Oxford University Press.

Rose, L. T., Rouhani, P., & Fischer, K. W. (2013). The science of the individual. *Mind, Brain, and Education*, *7*, 152–158.

Rose, T. (2016). *The end of average: How we succeed in a world that values sameness*. Harper-Collins Publishers.

Schaie, K. W. (1965). A general model for the study of developmental problems. *Psychological Bulletin, 64,* 92–107.

Schaie, K. W., & Strother, C. R. (1968). A cross-sequential study of age changes in cognitive behavior. *Psychological Bulletin, 70*, 671–680.

Shonkoff, J. P., & Center on the Developing Child (2017). *Building a system for science-based R&D that achieves breakthrough outcomes at scale for young children facing adversity.* Cambridge, MA: Center on the Developing Child, Harvard University.

Spencer, M. B. (2006). Phenomenological variant of ecological systems theory (PVEST): A human development synthesis applicable to diverse individuals and groups. In W. Damon & R. M. Lerner (Eds.) & R. M. Lerner (Vol. Ed.), *Handbook of child psychology: Vol. 6. Theoretical models of human development* (6th ed., pp. 829–894). Wiley.

Spencer, M. B. (2024). Character virtue, social science, and leadership: Consequences of ignoring practice. In M. D. Matthews and R. M. Lerner (Eds.), *Routledge International Handbooks of Multidisciplinary Perspectives on Character Development, Volume II: Moderators, Threats, and Contexts* (pp. 633–657). New York, NY: Routledge.

Spencer, M. B., & Dowd, N. E. (2024). *Radical Brown: Keeping the promise to America's children*. Harvard Education Press.

Spencer, M. B., Swanson, D. P., & Harpalani, V. (2015). Development of the self. In M. E. Lamb (Volume Ed.), *Handbook of child psychology and developmental science*, Volume 3: *Socioemotional processes* (7th ed., pp. 750–793). Editor-in-Chief: R. M. Lerner. Wiley.

Stafford-Brizard, B. (2016). *Building Blocks For Learning: A framework for comprehensive student development*. Turnaround for Children.

Thomas, A., Chess, S., Birch, H. G., Hertzig, M. E., & Korn, S. (1963). *Behavioral individuality in early childhood*. New York: New York University Press.

Tirrell, J. M., Geldhof, G. J., King, P. E., Dowling, E. M., Sim, A. T. R., Williams, K., Iraheta, G., Lerner, J. V., & Lerner, R. M. (2019). Measuring spirituality, hope, and thriving among Salvadoran youth: Initial findings from the Compassion International Study of Positive Youth Development. *Child Youth Care Forum*, *48*(2), 241–268.

Tobach, E., & Schneirla, T. C. (1968). The biopsychology of social behavior of animals. In R. E. Cooke & S. Levin (Eds.), *Biologic basis of pediatric practice* (pp. 68–82). New York: McGraw-Hill.

Yu, D., Geldhof, G. J., Buckingham, M. H., Goncalves, C., Yang, P-J., Michaelson, L. E., Berg, J., Ni, Y., & Lerner, R. M. (2022a). "Today, I cared about how a classmate felt:" Fluctuations in empathy are linked to daily mood in adolescence. *Journal of Applied Developmental Psychology*. https://doi.org/10.1016/j.appdev.2021.101386

Yu, D., Goncalves, C., Yang, P-J., Geldhof, G. J., Michaelson, L., Ni, Y., & Lerner, R. M. (2022b). Does prior night's sleep impact next day's executive functioning? It depends on an individual's average sleep quality. *Journal for Person-Oriented Research, 8*(1), 10–23.

Yu, D., Yang, P. J., Geldhof, G. J., Tyler, C. P., Gansert, P. K., Chase, P. A., & Lerner, R. M. (2020). Exploring idiographic approaches to children's executive function performance: An intensive longitudinal study. *Journal for Person-Oriented Research, 6*(2), 73–87.

Yu, D., Yang, P-J., Michaelson, L., Geldhof, G. J., Chase, P. A., Gansert, P. K., Osher, D. M., Berg, J. K., Tyler, C. P., Goncalves, C., Park, Y., Boyd-Brown, M. J., Cade, W., Theokas, C., Cantor, P., & Lerner, R. M. (2021). Understanding child executive functioning through use of the Bornstein specificity principle. *Journal of Applied Developmental Science. 73*, 101240.