Interest in the strengths of youth, the plasticity of human development, and the concept of resilience coalesced in the 1990s to foster the evolution of the positive youth development concept (PYD; Lerner, Lerner, & Benson, 2011; Lerner, Phelps, Forman, & Bowers, 2009). As discussed by Hamilton (1999), the concept of PYD can be understood in three interrelated but distinct ways: as a developmental process, as a philosophy or approach to youth programming, and as instances of youth programs and organizations focused on fostering healthy or positive development among youth. In this chapter, we focus on the idea of PYD as a developmental process, as this framework has inspired considerable research across the adolescent period (Lerner et al., in press).

In the decade following Hamilton’s (1999) discussion of PYD, several models of the developmental process believed to be involved in PYD were used to frame descriptive or explanatory research across the adolescent period (Lerner et al., 2012). Although these models differ in important ways (Lerner et al., 2012), they all reflect ideas associated with relational developmental systems theory (RDST; e.g., Overton, 2010, 2011, 2012; Overton & Müller, 2012; see also Overton, Chapter 2, this volume). As such, these models carry with them methodological problematics—that is, theoretical and procedural issues that researchers must keep in mind when conducting RDST-derived research about PYD. The purpose of this chapter is to articulate these methodological problematics and their RDST roots, illustrate how existing PYD
research has addressed them, and provide practical implications for developmental scientists committed to conducting RDST-driven research on human development in general and on PYD more specifically (Lerner, 2006).

**RDST and the Roots of the PYD Perspective**

The study of PYD as a developmental process is rooted in an approach to developmental science that seeks to describe, explain, and optimize intraindividual change, and interindividually differences in intraindividual change, across the life span (Baltes, Reese, & Nesselroade, 1977). The contemporary theoretical frame for such scholarship involves RDST models (Overton, 2010, and Chapter 2, this volume). Models reflecting RDST include Bronfenbrenner’s biocological theory (e.g., Bronfenbrenner & Morris, 2006), action theory models of intentional goal-directed behaviors (e.g., Baltes, 1997; Brandstätter, 2006; Heckhausen, 1999), Elder’s (1998) life course theory, Magnusson’s (1999; Magnusson & Stattin, 2006) holistic person–context interaction theory (Sterba & Bauer, 2010), and the developmental systems formulations articulated by Ford and Lerner (1992) and Gottlieb (1998).

These models emphasize that the basic process of human development involves mutually influential relations between developing individuals and the multiple levels of their complex and changing contexts. These bidirectional individual ↔ context relations constitute the fundamental unit of analysis in the study of human development from a RDST perspective. Such relations regulate the pace, direction, and outcomes of development. When these “developmental regulations” involve individual ↔ context relations that benefit both the person and his or her ecology, they are considered “adaptive developmental regulations” (Brandstätter, 2006).

One key assumption of RDSTs—and the use of these theories to understand both adolescent development in general and to frame the PYD concept of developmental processes more specifically—is that there is always change and at least some potential for systematic change (i.e., plasticity) across the life span (Baltes, Lindenberger, & Staudinger, 2006; Lerner, 1984). This potential for change represents a fundamental strength of human development. Of course, plasticity means that change for the better or worse can characterize any individual’s developmental trajectory. Both RDST and the PYD perspective linked to it emphasize, however, that the developmental system is sufficiently diverse and complex such that researchers and practitioners may find some means to connect individual and context in ways that enhance the probability of change for the better and of promoting more positive features of human development (Baltes et al., 2006; Lerner, 2002, 2004; Lerner et al., 2009).

The adolescent period—the primary focus of much PYD research—is characterized by an enormous number of individual and contextual changes. For example, changes in the prefrontal cortex, increases in the interconnectivity among brain regions, and increases in dopamine levels provide both vulnerabilities of risk and opportunities for growth in cognitive control and self-regulation (Steinberg, 2010). At the same time, most youth in Western societies experience contextual changes, including changing
schools (e.g., Eccles, 2004) and an increased relevance of peer pressure for risk taking (e.g., Gardner & Steinberg, 2005). For youth in what has been termed third world nations but, today, are more frequently termed majority world nations, the pace of social change may be historically unique, relatively (or even markedly) abrupt, and may be accompanied by political and socioeconomic stressors that, at some times and in some places, may be life-threatening (e.g., in the case of revolutions or wars; Larson, Wilson, & Rickman, 2009; Silbereisen, 2005; Silbereisen & Chen, 2010). Moreover, adolescents have the cognitive, behavioral, and social relational skills to contribute actively and often effectively to their own development (Lerner, 1982; Lerner & Busch-Rossnagel, 1981; Lerner & Walls, 1999).

Due to the plasticity of the adolescent period, a strength-based view of adolescents, such as the PYD perspective, has been increasingly used as the lens of choice for viewing development both within the United States (e.g., Lerner et al., 2009) and internationally (e.g., Gestsdóttir & Lerner, 2007; Silbereisen & Lerner, 2007). Plasticity means that young people are capable of systematic change in structure and function, and the core idea of the PYD perspective is that this potential constitutes a strength that, if aligned with resources that might promote adaptive, healthy functioning (i.e., contextual variables that have been termed developmental ecological assets; Benson, Scales, & Syvertsen, 2011; Theokas & Lerner, 2006), then youth may be put on a more positive trajectory across adolescence (Lerner, Almerigi, Theokas, & Lerner, 2005).

Using these ideas, researchers have developed various models of how PYD may occur through aligning the strengths of young people and the resources that exist in their ecologies (e.g., Benson et al., 2011; Damon, 2004; Eccles, 2004; Hamilton & Hamilton, 2009; Larson, 2000; Lerner, Phelps, et al., 2009; Masten, 2001; Spencer, 2006). The model of the PYD process used by Lerner and colleagues (e.g., Lerner, Lerner, et al., 2005; Lerner, Lerner, von Eye, et al., 2011) explicitly draws on the individual ↔ context relational conception within RDST, and it has received the most empirical support (Heck & Subramaniam, 2009). Accordingly, we focus on this model as we discuss the methodological problematics of RDST-informed PYD research and draw on research derived from other PYD models as appropriate.

### The Five Cs Model of PYD and the 4-H Study of PYD

The Five Cs Model of PYD has been elaborated in the context of the 4-H Study of PYD (e.g., Bowers et al., 2010; Lerner, 2011; Lerner, Lerner, et al., 2005; Lerner, von Eye, et al., 2009; Lerner, von Eye, Lerner, Lewin-Bizan, & Bowers, 2010), a longitudinal study conducted by Lerner, Lerner, and colleagues and supported by a grant from the National 4-H Council. The purpose of the 4-H Study was to identify relationships between individuals and their ecologies that promote thriving, as well as those that may have a preventive effect in regard to risk/problem behaviors. Within the 4-H Study, thriving is conceptualized as the growth of attributes that mark a flourishing, healthy young person; these characteristics are termed the Five Cs of PYD: competence, confidence, character, connection, and caring (Eccles & Gootman, 2002;
Lerner, Lerner, et al., 2005; Roth & Brooks-Gunn, 2003a, 2003b). Table 3.1 lists definitions of the Five Cs that have been previously used.

The 4-H Study was designed to test the Five Cs Model of PYD by focusing on youth in their actual environments, rather than conducting randomized controlled trials. In these environments, youth and their parents—rather than research investigators—make decisions about how they spend their time. Accordingly, the 4-H Study represents one of the few empirical studies that examine the Five Cs and their relations with positive and problematic developmental outcomes as they occur in the actual lives of youth.

As noted earlier, a key hypothesis tested in this study was that if the strengths of youth can be aligned with the resources for positive growth, then young people’s healthy development may be optimized (Lerner, 2004). In addition, given that positively developing youth should be involved in adaptive developmental regulations, a thriving young person should act to contribute to the context that is benefiting him or her; there should be contributions to self, family, community, and civil society (Jelicic, Bobek, Phelps, Lerner, & Lerner, 2007; Lerner, Lerner, et al., 2005; Zaff, Kawashima-Ginsberg, & Lin, 2011). In other words, if positive development rests on mutually beneficial relations between the adolescent and his or her ecology, then thriving youth should be positively engaged with, and act to enhance, their world and should be less prone to engage in problem behaviors.

The developmental process envisioned by Lerner and Lerner (e.g., Lerner, Lerner, et al., 2005) involves adaptive developmental regulations between the strengths of youth and the developmental assets present in their ecologies. These mutually beneficial individual ↔ context relations are depicted as being associated with PYD (and,

<table>
<thead>
<tr>
<th>C</th>
<th>Definition</th>
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<tr>
<td>Competence</td>
<td>Positive view of one’s actions in domain-specific areas, including social, academic, cognitive, and vocational. Social competence pertains to interpersonal skills (e.g., conflict resolution). Cognitive competence pertains to cognitive abilities (e.g., decision making). School grades, attendance, and test scores are part of academic competence. Vocational competence involves work habits and career choice explorations, including entrepreneurship.</td>
</tr>
<tr>
<td>Confidence</td>
<td>An internal sense of overall positive self-worth and self-efficacy; one’s global self-regard, as opposed to domain-specific beliefs.</td>
</tr>
<tr>
<td>Connection</td>
<td>Positive bonds with people and institutions that are reflected in bidirectional exchanges between the individual and peers, family, school, and community in which both parties contribute to the relationship.</td>
</tr>
<tr>
<td>Character</td>
<td>Respect for societal and cultural rules, possession of standards for correct behaviors, a sense of right and wrong (morality), and integrity.</td>
</tr>
<tr>
<td>Caring</td>
<td>A sense of sympathy and empathy for others.</td>
</tr>
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Note. Based on Lerner et al. (2005) and Roth and Brooks-Gunn (2003).
by extension, with the Five Cs) and the enhanced probability of youth contributions to their ecology and the reduced probability of problem behaviors. The outcomes of these adaptive developmental regulations feed back to the individual and his or her context, and in doing so, create a qualitatively new individual ↔ context relation, in the sense of their unique locations in time and place (Elder, 1998; Elder, Modell, & Parke, 1993); as such, these relations are substantively nonrecursive. These relations provide as well a basis for further adaptive developmental regulations. These adaptive developmental regulations and their positive and problematic sequelae exist within the broader ecology of human development. This ecology includes both cultural and historical (temporal) variation, and thus introduces change at all levels of organization within the developmental system (Bronfenbrenner & Morris, 2006; Elder, 1998). Such changes are manifested by intraindividual change, by interindividual differences in intraindividual change, and by normative and non-normative contextual variation (Baltes, Reese, & Nesselroade, 1977).

At present, the 4-H Study of Positive Youth Development represents the most comprehensive “test” of the Five Cs Model of PYD. The study began in the fall of 2002, and data were collected annually from participants during their 5th- through 12th-grade years and included information about strengths of youth as well as their contexts. Using these data, researchers have assessed how the individual strengths of adolescents interact with aspects of their families, schools, and communities to promote the development of the Five Cs and other positive developmental outcomes (e.g., active and engaged citizenship; Zaff et al., 2011), as well as diminish the likelihood of risks and problems. Given the comprehensiveness of the 4-H Study and its close ties to the Five Cs Model, we use examples from it throughout our discussion of the methodological problematics involved in conducting RDST-derived PYD research.

Problematics for RDST Research

We have thus far discussed PYD as a theoretical approach framed by RDST. We have not, however, discussed how PYD researchers actually apply the tenets of RDST when generating and testing research hypotheses. To preview a key point about the fit between theory and research within this area of scholarship, it remains the case that many developmental scientists argue for relational theories while simultaneously using data collection and analysis methods that are not consistent with the complexity and nuance that RDST implies. Therefore, in the remainder of this chapter we describe conceptual and methodological problematics that currently pertain to PYD research derived from RDST. In particular, we discuss implications related to the assumptions that (1) development involves interrelated changes in a complex, multilevel system; (2) developmental trajectories of all individuals remain relatively plastic across the life span; and (3) examining relations in the presence of such complexity requires multimethod integration. Faithfully conducting research that follows from RDST requires that theoretical ideas be actualized through methodological choices related to research design, data collection, and analysis methods. This obligation is
characteristic, as Lerner and Overton (2008) note, of “good science—selecting all features of one’s methodology based on the nature of the (theoretically predicated) questions asked” (p. 250).

**Development Occurs in a Complex Person–Context System**

The RDST approach to developmental science emphasizes holism as a fundamental guiding principle. In opposition to a fixed, atomistic reality composed of elements that preserve their identity regardless of context (Overton, 2010, 2012, and Chapter 2, this volume), holism views objects and events as necessarily related to the context in which they are embedded. The whole exists as an organized and self-organizing system of parts, each defined by its relations to other parts and to the whole itself (Overton, 2012, and Chapter 2, this volume). The key empirical question for developmental scientists interested in describing, explaining, and promoting positive human development in the context of a complex holistic system is therefore composed of five interrelated “whats”: What attributes of what individuals, in relation to what contextual conditions, and at what points in ontogenetic, family or generational, and cohort or historical time can be integrated to promote what instances of positive human development?

Armed with appropriate RDST-informed research questions, researchers must make methodological decisions that acknowledge (1) that developmental systems are embedded (Overton, 2010, 2012), that is, they are characterized by holism; (2) that individuals in part produce (i.e., direct) their own ontogenetic development; and (3) that systematic plasticity is present across the life span. We provide more details concerning each of these ideas.

**Focus on the System**

Once researchers embrace the concepts underlying RDST, the types of questions that they ask must necessarily shift, as exemplified in the multicomponent “what” question. A research framework informed by RDST must include multiple elements that together account for the plasticity and dynamism that constitute ontogeny. For such research to match the complicated theory from which it derives, researchers must consider the complex and dynamic developmental system of which the developing person is a part.

Several studies derived from the 4-H Study illustrate how to frame and test research questions that recognize the bidirectional relationships between developing persons and their changing contexts. For example, Urban, Lewin-Bizan, and Lerner (2010) showed that both the strengths of youth and the resources of their contexts are involved in youth thriving. Urban and colleagues explored whether youth intentional self-regulatory skills moderated the effect of participation in out-of-school-time (OST) activities in predicting PYD and risk outcomes among adolescents in low-resource neighborhoods. These neighborhoods were classified as low-resource because, using census data, the authors found that the opportunities available to youth in their ecological contexts along dimensions of human resources, physical or institutional resources,
collective activity, and accessibility were limited compared to other neighborhoods (see Theokas & Lerner, 2006, for more information on how this measure was derived). Urban and colleagues found that youth who reported the highest self-regulatory capacity benefited the most from involvement in OST activities. The strength of these relations was most evident in girls.

Future research should consider additional person- and context-level variables that might explain specific trajectories of youth development. For example, the findings of Urban and colleagues (2010) indicate sex differences, which might be explained more fully by accounting for additional person-level variables (e.g., age, race, socioeconomic status, religion, and household structure) in future studies. Although Urban and colleagues considered ontogenetic time, the relative influence of generational, cohort, or historical time might also explain why this evidence in support of the RDST-based PYD model seems to hold more for adolescent girls than for adolescent boys (Way, 2011). In addition, future research could account for more context-level variables, such as indicators of social capital and social networks. Such complexity implies that understanding how characteristics of individuals interact with aspects of their contexts requires a research focus on person ↔ context relations rather than simple aggregations of person- and context-level attributes.

**Person ↔ Context Relations as Units of Analysis**

Development is impacted by aspects of the individual and context, but the impact of any given personal or contextual characteristic can be interpreted only as part of a larger person ↔ context system. A specific level of competence may represent positive person ↔ context relations for some individuals in some contexts, but the same level of competence may represent neutral or even negative person ↔ context relations for other individuals or in other contexts (Masten & Coatsworth, 1998). In other words, person ↔ context relations will vary between individuals (Molenaar, 2007; Tobach & Greenberg, 1984). As such, the goal of RDST research is to capture and understand relations among the meaningful, adaptive person ↔ context relations (i.e., adaptive developmental regulations) that characterize development across diverse populations.

Accurately capturing the often idiographic nature of developmental regulations requires that researchers consider the contexts in which their participants are embedded, as well as which interactions with those contexts are adaptive. This problem can be tackled through idiographic research designs and analyses (see the section “Integrating Idiographic and Nomothetic Processes” for a more detailed discussion of this issue; see also Nesselroade & Molenaar, 2010, 2012), or they may alternatively be represented as a statistical interaction between self-reported measures of internal assets and objectively measured indices of contextual resources (e.g., Theokas et al., 2005).

Perhaps more appropriately, researchers can obtain and analyze nomothetic information through surveys that require participants to interpret survey questions idio graphically (e.g., Nesselroade, Gerstorf, Hardy, & Ram, 2007). For instance, researchers interested in assessing participants’ connection to their communities could obtain more useful information from a Likert-scaled item such as “How involved are you in
Theories of Positive Youth Development

your community? than by averaging several Likert-scaled items about community service, connection to a religious group, or participation in school-related organizations. The first question allows flexibility in how participants interpret community involvement, whereas the later set of questions constrains the possible domains in which connection can occur. Asking both types of questions, however, would enable researchers to ascertain empirically the links between the idiographically phrased item and the domain-specific items.

The Five Cs Model of PYD presents one example of how person ↔ context relations can be the target of both theoretical and empirical consideration when incorporated in a nomothetic research design. The Five Cs Model emphasizes the importance of adaptive developmental regulations and discusses each C as a strength arising from person ↔ context relations. High levels of each C require not only the presence of a personal strength (e.g., ability) but also the successful application of strengths within each individual's unique context. These strengths represent broad, multidimensional domains that allow youth to display qualitatively distinct yet equifinal pathways to thriving. For example, high scores on the C of Competence require the successful application of personal strengths in one or more contexts. Although additive (e.g., high levels of competence in multiple domains leads to a higher Competence score than high levels in fewer domains), the 4-H Study's measure of Competence allows youth to display competent behavior in any combination of academic, social, and physical domains. Similarly, the C of Connection implies relationships between an individual and his or her context but allows individuals to display connection to different components and their context, such as their schools, communities, families, and peers. Each of the Five Cs, then, represents person ↔ context relations as the unit of analysis.

Individuals as Active Producers of Their Own Development

Developmental scientists aim to optimize contexts in ways that promote positive development, but recognize that individuals must also regulate their behavior in ways that take advantage of available resources. Developmental regulations represent the bidirectional ways individuals influence and are influenced by their contexts (e.g., Lerner, 2002). Individuals' influences on their developmental regulations (i.e., self-regulation) enable them to intentionally influence their own developmental outcomes (Brandstädter & Lerner, 1999; Lerner, 2002). When individuals intentionally contribute to their development in such a way that successfully aligns their interests, desires, and needs with available contextual resources, their intentional self-regulation is viewed as adaptive (e.g., Baltes et al., 2006; Brandstädter, 1998, 2006; Gestsdóttir & Lerner, 2008).

The 4-H Study has systematically investigated the processes through which adolescents adaptively and intentionally self-regulate, and thus actively contribute to and produce their developmental outcomes (e.g., Gestsdóttir & Lerner, 2007, 2008). Researchers involved in the 4-H Study have argued that a process of selecting goals, optimizing resources to achieve these goals, and adjusting expectations and strategies when they encounter obstacles toward achieving goals may explain how youth
draw resources from their contexts in ways that positively influence their development (Gestsdóttir & Lerner, 2008). This process of selecting, optimizing, and compensating (SOC; e.g., Freund & Baltes, 2002) has been found to be a key asset for individuals in achieving future positive developmental outcomes (Baltes et al., 2006).

For this reason, the 4-H Study has used measures of SOC to assess self-regulation in youth. For example, Schmid, Phelps, and Lerner (2011) assessed whether measures of SOC and hopeful future expectations (another self-regulatory strength) predicted positive and negative trajectories of youth development across grades 7–9. They found that both SOC and hopeful future expectations were associated with positive developmental trajectories. That is, youth with higher self-regulatory strengths, such as hopeful future expectations and SOC, were more likely to have the most favorable trajectories of PYD, community contribution, and in turn, trajectories involving fewer depressive symptoms. Bowers and colleagues (2012) similarly found that hopeful future expectations mediated the relationship between the quantity and quality of positive relationships youth have with adults and the development of aspects of PYD. Together, these studies illustrate that intentional self-regulation and hope can make important contributions to positive development across adolescence, and thus potentially enable adolescents to direct their lives in meaningful ways.

As has been noted throughout the 4-H Study, the relationship between intentional self-regulation and PYD appears to apply to adolescents regardless of demographic differences. However, examining the ways diverse youth contribute to their own development and utilize the resources to which they have access will require that researchers gain more information from youth about the contextual resources to which they have access and how much they value these resources (Leventhal & Brooks-Gunn, 2000; Leventhal, Dupere, & Brooks-Gunn, 2009).

In interpreting these results, researchers must view the above findings as occurring during a specific developmental period, for a particular sample of adolescents living in a specific historical epoch. Person ↔ context relations intertwine individuals and contexts across time in highly complex ways. Acknowledging and accounting for temporal complexity both facilitate and complicate the tasks of developmental scientists, however, because temporal complexity presents its own set of methodological problematics (Lerner, Schwartz, & Phelps, 2009; Wohlwill, 1973).

The Temporality of Complex Developmental Processes

Complexity in development implies that the developmental trajectories of all individuals remain relatively plastic across the life span (Lerner, 1984). Research derived from RDST accordingly acknowledges the existence of inter- and intraindividual variability in development. For instance, the stated goal of the PYD perspective is to optimize the trajectories of all youth—an objective that depends on the presence of plasticity in intraindividual change. The acknowledgment of such plasticity impacts research derived from RDST in many ways. We highlight key ideas related to developmental plasticity that are especially important for PYD researchers to consider.
Predicting Developmental Phenomena Requires Change-Sensitive Measurement Tools

Development and its plasticity can only be examined using tools that are themselves sensitive to change. Although not surprising at first glance, this statement suggests that the tools used to study development must be able to detect changes over a period of interest, which potentially excludes many scales designed to display high test–retest stability. For instance, research derived from the 4-H Study often treats the Five Cs of PYD as indicators of a single higher-order latent construct (e.g., Bowers et al., 2010). This higher-order construct tends to show generally flat developmental trajectories (e.g., Schmid et al., 2011), which suggests that the higher-order PYD construct is stable. The indicators of PYD encompass a very wide array of constructs, and it is difficult to discern whether item- or subscale-level changes correspond to meaningful changes at the higher-order construct (i.e., PYD) level. More research is needed to examine these alternatives, but a higher-order PYD construct that is not sensitive to item-level changes may explain why research predicting change in global PYD is markedly absent from the literature (or produces only weak relations; e.g., Lewin-Bizan, Bowers, & Lerner, 2010).

Researchers must also be cognizant that the very structure, or qualitative meaning, of a scale or construct may vary across time and place (Elder, 1998). This possibility underscores the importance of quantitative invariance testing and qualitative exploration of ecological validity across time and place. Bowers and colleagues (2010) have found support for the invariance of the Five Cs of PYD across grades 8–10, for instance; yet, they also suggest that what constitutes PYD differs between early and middle adolescence. Although prior work suggests a relation between athletic competence and the C of Competence among early adolescents (Phelps et al., 2009), the results of Bowers and colleagues’ (2010) study indicates that athletic competence does not indicate the C of Competence in middle adolescence.

Factorial invariance of a scale, however, does not necessarily mean that the construct of interest is itself invariant. In other words, the items in a particular scale may be invariant because of the strategy used to build the scale itself, or they may be invariant because the observed invariance truly reflects a property of the underlying construct. Many questionnaires are specifically designed to measure stable attributes, and so change-sensitive items are omitted during scale creation due to a lack of longitudinal reliability. Invariance in a scale that was specifically designed to be invariant over time says more about the scale’s construction than about the target construct’s actual meaning across the life span.

Qualitative research, which often includes interview or narrative data from participants (Denzin & Lincoln, 2005), can inform the development of a construct and/or the development of a quantitative measure for examining a particular construct across large populations of people. Qualitative research can also explore the presence of a construct at different points of development. For example, qualitative interviews often require participants to reflect on their current and past life experiences. The retrospective data garnered in this context provide another means through which time effects
of particular phenomena can be approximated. For example, when participants are asked to think about how their behavior in high school differed from their behavior in college, information about developmental changes that occurred as a function of person ↔ context relations (e.g., participants’ time-varying relationships with their teachers and peers) is being reported by the people who experienced these changes directly. Asking participants about changes they experienced and why the changes occurred often elicits a close examination of person ↔ context relations that may be hard to measure with quantitative scales, especially when the phenomenon of interest develops in a complex, nonlinear way.

**Developmental Trajectories May Be Nonlinear**

The trajectory of a plastic developmental system necessarily entails interactions within and among all levels of the system’s integrated structure. Development can involve nonlinear interactions (e.g., quadratic relations, multiplicative interactions) or may even follow nonlinear functional forms. Figure 3.1 illustrates linear (A and B) and nonlinear (C and D) functional forms. From a quantitative perspective, linear models may be helpful for roughly approximating such complex development; in truth, however, development likely extends beyond additively concatenated relationships among variables (Little, 2013).

Researchers may therefore benefit from applying statistical techniques that explicitly assume nonlinearity, including many of the techniques presented in this handbook. Grimm and Ram (2009) similarly discuss the application of structured latent curve models (e.g., Blozis, 2004; Browne, 1993), the parameter estimates of which do not necessarily correspond to additive relationships. For instance, they provide an example that specifies Gompertz-shaped growth. The Gompertz function represents S-shaped growth (see also Figure 3.1D), which allows researchers to more accurately model developmental trajectories with lower and upper local asymptotes. Despite the many potential uses for such models in the PYD literature (e.g., modeling S-shaped growth), the methods of this chapter can be applied flexibly to different types of developmental trajectories.

![Figure 3.1](image-url) **Figure 3.1.** Examples of possible developmental trajectories: (A) linear, (B) inverse U-shaped, (C) nonlinear with a lower asymptote, and (D) S-shaped.
development of community contribution), such models have been markedly absent from the literature. Extending the application of nonlinear models such as these, and those discussed elsewhere in this volume, is therefore an important direction for future RDST-derived research.

**Time Is a Proxy for Development**

Adding another layer of complexity to RDST-derived approaches to development is that development is simultaneously affected by processes that occur on multiple, loosely coupled timescales. Modeling complex developmental trajectories requires that researchers explicitly account for the many ways that time can be manifested in a developmental system. As noted by several authors (e.g., Elder, 1998; Lerner, Schwartz, et al., 2009; Little, Card, Preacher, & McConnell, 2009; Wohlwill, 1973), the concept of time can mean many different things in relation to an individual's development. Time might represent chronological factors (e.g., age in years), generational changes (e.g., people changing from an F2 to an F1 generation), historical factors (e.g., the Great Depression), idiographic experiential factors (e.g., years in school), nomothetic episodic factors (e.g., months since September 11, 2001), or idiographic episodic factors (e.g., years since the onset of puberty), for instance. Because these instantiations of time are, of course, all involved in life course changes, developmental researchers must pay close attention to how they conceptualize, measure, and analyze development as a function of the multiple meanings of time (Wohlwill, 1973).

Disentangling the effects of various instantiations of developmental time requires careful methodological forethought, both in terms of study design and data analysis. For instance, Schaie (e.g., 1965) and Baltes (e.g., 1968) discuss multiple study designs that allow researchers to disentangle the integrated effects of chronological time, age, and birth cohort. Among these, the cohort sequential design longitudinally follows participants from multiple birth cohorts and is often heralded as a key method that not only helps researchers make inferences about age-related changes across and among cohorts (e.g., Baltes et al., 1977) but also allows them to study developmental change in an accelerated fashion (Collins, 2006). The emphasis of RDST on complexity and integration highlights the importance of implementing such sophisticated research methods.

The 4-H Study represents a form of cohort sequential design that replaces the traditional concept of a birth cohort with the concept of a test–retest control cohort. In other words, the 4-H Study followed individuals from a single birth cohort but added previously unmeasured participants in each wave to allow for the examination of possible retest effects. This design, however, confounds factors that impact human development with factors that specifically impacted development within this birth cohort. Generalizing findings from the 4-H Study beyond the single birth cohort examined thus requires additional research that examines alternative birth cohorts of various types (e.g., multiple birth cohorts across multiple cultural settings).

Acknowledging that different instantiations of time can impact development has implications for how data are analyzed and how hypotheses are tested. Researchers
must ensure that they measure and analyze instantiations of time in a metric that is meaningful to the phenomenon of interest and at a rate that allows for the accurate representation of that phenomenon’s development (Lerner, Schwartz, et al., 2009; Wohlwill, 1973). Although studies of PYD have explicitly considered multiple metrics for measuring the progression of development, PYD research has been less effective at specifying and measuring phenomena at intervals consistent with their anticipated rate of development. For instance, Lerner, Schwartz, and colleagues (2009) drew on data gathered as part of the 4-H Study of PYD to show the implications of treating development as a function of either age or pubertal status.

Like most large-scale longitudinal studies, the 4-H Study only assessed participants annually (e.g., Lerner, Lerner, et al., 2005). Annual assessments may be appropriate for examining some developmental phenomena, but the choice of annual measurement in the 4-H Study was apparently made for reasons of practicality and funding rather than a theory of the x-axis. That is, annual assessments were not made because of a theoretical specification of the rate or form of change. Data from the 4-H Study might accordingly be appropriate for examining the development of some constructs but may only offer an initial glimpse into phenomena that develop over intervals shorter than 1 year.

**Understanding Complex Development Requires Multimethod Integration**

The integrative and iterative nature of relational developmental science highlights the importance of triangulation, or the “attempt to map out, or explain more fully, the richness and complexity of human behavior by studying it from more than one standpoint” (Cohen, Manion, & Morrison, 2000, p. 254). Although several researchers have drawn attention to the benefits of rigorous mixed-methods research in developmental science (e.g., Yoshikawa, Weisner, Kalil, & Way, 2008), faithful adoption of these techniques has been slow. Moreover, although several studies of PYD include the collection of both quantitative and qualitative forms of data, the majority of these studies are dominated by one form of data collection and analysis over another. Most commonly, qualitative interview data are collected to “supplement” or illustrate substantial quantitative data collection and analyses (i.e., mixed methods “lite”; Greene, 2012).

Although this design can be informative, developmental scientists have yet to take full advantage of the array of mixed-methods designs available to them, several of which call for substantial and rigorous qualitative and quantitative data collection and analyses (Creswell & Plano Clark, 2011). We believe that approaching PYD research from an RDST framework requires developmental scientists to embrace a more pragmatic approach by collecting multiple forms of data while considering the ways data are integrated in the discussion of findings. Of the multiple mixed-methods designs identified in social science research, a convergent parallel mixed-methods design may hold significant promise for future research in developmental science. Informed by the paradigm of pragmatism (Creswell & Plano Clark, 2011), this design prevents
researchers from becoming “the prisoner of a particular [research] method or technique” and from simply presenting findings derived through different methods alongside each other but discussing them separately (Robson, 1993, p. 291; see also Felizer, 2010).

Truly mixed-method designs require much more than simple triangulation of quantitative and qualitative methods. Next we discuss additional methodological dichotomizations that RDST researchers must fuse if they wish to obtain a broad understanding of any phenomena of interest.

**Integrating Idiographic and Nomothetic Perspectives**

Since Allport (e.g., 1942) introduced Windelbrandt’s terms “idiographic” and “nomothetic” to psychology’s vocabulary (see Marcel, 1977, and Holt, 1962, for reviews), researchers and theorists have debated whether the province of psychology is to study common (i.e., nomothetic) characteristics shared by all people or the idiosyncratic (i.e., idiographic) characteristics that make each person unique. Emmerich (1968) added a group differential focus to this discussion. In addition to arguing that each person is like all other people (the nomothetic approach in the Kluckholn & Murray, 1948, formulation) or that each person is like no other person (the idiographic approach in the Kluckholn & Murray, 1948, formulation), Emmerich added that each person is like only some other people (in the Kluckholn & Murray, 1948, formulation). As Holt (1962) commented over 50 years ago, the idiographic versus nomothetic debate is “one of the hardiest perennial weeds in psychology’s conceptual garden” (p. 376) and indeed it remains a source of considerable discussion to date (e.g., Lamiell, 2009).

Marcel (1977) notes that the implications of this debate extend beyond psychology’s conceptual purpose to include the specific methods researchers use to investigate research questions and test hypotheses. From a methodological perspective, RDST-based positions such as the PYD perspective take a middle road (see also Kluckholn & Murray, 1948) by acknowledging that developmental science requires a synthesis of idiographic, group differential, and nomothetic methods. In practice, unfortunately, such synthesis is rare. Nomothetic analyses have remained the primary tool in the methodological arsenals of developmental researchers interested in PYD (as well as across psychological research in general; Molenaar, 2004, 2007; Molenaar & Nesselroade, 2012; Nesselroade & Molenaar, 2010) from a quantitative perspective.

Most large-scale longitudinal studies of youth development are designed to address nomothetic issues. The 4-H Study is typical of these studies in that it relied on measuring a large sample of youth annually. This data collection schedule optimally facilitates nomothetic quantitative analyses such as growth curve analyses, and the data also may be used for the comparison of analytically derived, differential groups through techniques such as cluster analysis (e.g., Zarrett et al., 2009) and mixture modeling (e.g., Bowers, Gestsdóttir, Geldhof, Nikitin, & von Eye, 2011). These types of analyses provide important information about development; when applied to many participants across relatively few time points, however, they cannot provide truly idiographic information.
Data collection methods that support idiographic analyses involve collecting data from fewer individuals but across more occasions (e.g., Nesselroade & Molenaar, 2010). These types of data are commonly collected in several areas of psychological research, although they often are analyzed using nomothetic methods (e.g., growth curve analyses). For example, diary and experience sampling methods often are used in health and mental health research (e.g., Myin-Germey et al., 2009), personality research (Conner, Tennen, Fleeson, & Barrett, 2009), and the study of relationships (Laurenceau & Bolger, 2005). Similar techniques have been used with adolescent samples (e.g., time use studies such as Larson & Verma, 1999) but are rarely used to study developmental phenomena from an idiographic perspective. These types of data, however, could provide valuable information about development from an RDST perspective. The use of truly idiographic quantitative analysis methods, such as dynamic factor analysis (Molenaar & Lo, 2012), the idiographic filter (Nesselroade et al., 2007), and recent integrations of these techniques (Molenaar & Nesselroade, 2012), could enable researchers to more fully understand the nature of developmental phenomena such as PYD and how these constructs change across adolescence.

Interindividual qualitative analyses can also provide valuable and rich information about groups of youth in a particular program, but they may fall short of promoting a truly idiographic and nuanced understanding of an individual’s experiences of a phenomenon or developmental context. Within the broad range of qualitative data collection and analysis methods, however, are several person-centered techniques that could be used within RDST-informed PYD research. Narrative inquiry, for example, provides one way to examine the experiences of, and stories told by, “particular actors, in particular social places, at particular times” (Abott, 1992, p. 428). In addition to focusing on the particular, this idiographic approach allows researchers to highlight the diverse ways in which individuals produce their own development. Moreover, such an approach can lead to the possible discovery of developmental phenomena unique to a person or differential group. If, for instance, PYD research focused more on the experiences of minority youth in the United States, who often feel alienated from civic institutions and less politically efficacious than youth who are part of the majority and middle-class culture (Kirshner, 2009), we could possibly discern facets of PYD, such as critical consciousness, that may be an essential part of optimizing the positive development of all youth, and especially of marginalized youth in the United States and internationally (Hershberg & Lykes, 2012). This construct might be an important “C” of PYD that could encourage youth participation and contribution while simultaneously enabling researchers to identify forms of youth participation and contribution that are often overlooked in research—that is, organizing and activism—that have been identified as arenas wherein marginalized young people contribute to their communities, civic processes, and their own development by attacking social problems head on (Ginwright, Noguera, & Cammarota, 2006). In addition, inclusion of this potential “C” in the PYD model may elicit research regarding the already established Cs in the model and explain why, rather than simply conclude that marginalized youth reportedly experience low levels of them (e.g., Hart & Atkins, 2002). The issue of idiographic versus nomothetic measurement also has implications for researchers’
choice of correlational versus experimental research designs, to which we turn next. Although both approaches offer some degree of flexibility between idiographic versus more nomothetic measurement, experimental designs explicitly control environmental conditions in order to uncover nomothetic laws of human development. As such, supplementing nomothetic findings with the findings from idiographic studies may require additional integration of experimental and correlational research designs.

**Experimental versus Correlational Research Designs**

Relational developmental science may represent a paradigm shift from traditional psychogenic ideas in psychology and the traditional focus in this field on experimental methods designed to disentangle cause from effect (Overton & Lerner, 2012). As Cattell (1966) notes, a great deal of psychological research has followed in the experimental tradition and has accordingly focused on data derived from rigidly controlled experiments.

Although not denying the importance of experimental methods and analyses, individuals represent more than simple summative aggregations of base-level components (e.g., neurons, personality traits). Stressing embodiment (Overton, 2010), relational developmental systems science points to the deep and complex relations that connect all possible units of analysis into a synthetic and developing whole. Relational developmental systems scientists therefore tend to favor integrative multivariate analyses and the simultaneous use of contextualized inductive and deductive analytical techniques over experimental methods that attempt to “wash out” individual differences and the influence of the ecologically valid environment. As such, relational developmental researchers often implement correlational methods derived from the traditions of Pearson and Galton (see Cattell, 1966). Common methods may emphasize partial and semipartial relations (e.g., multiple regression models) or treat multiple related items as imperfect indicators of underlying latent constructs (e.g., factor analysis, structural equation modeling).

The complexity of the developmental system, however, suggests that some relationships will be difficult to capture through such ecologically valid observational work. Research that draws information from the natural ecology may make it especially difficult to focus on subtle, nuanced, infrequently occurring, or internalized or “private” facets of the developmental system. Developmental scientists may therefore draw on the strengths of experimental methods to help ascertain such attributes involved in, as well as the outcomes of, PYD-focused programs and activities. For example, Tierney, Grossman, and Resch (1995) used an experimental design to evaluate the Big Brothers/Big Sisters program, a community-based mentoring intervention. The study addressed nine PYD constructs (including social, emotional, cognitive, and behavioral competencies, positive identity, and prosocial norms). Researchers randomly assigned participants to the intervention condition or a wait-list control group. The evaluation demonstrated positive results on behavioral and attitude measures. Although such uses of experimental design are insufficient to describe, explain, or optimize change in the relational developmental system, careful coordination of experimental
and correlational designs might provide a more nuanced picture of the developmental system as a whole.

In short, RDST research has been generally approached from a correlational framework, with occasional experimental studies used to support correlational findings. Correlational analyses better capture development as a complex phenomenon; such studies also allow for more flexibility in hypothesis generation. Thus, rather than approaching data from a framework that specifies experimental deduction, correlational studies more easily allow for the dynamic interplay between induction and deduction, which we discuss below.

**The Inductive–Hypothetico-Deductive Spiral**

Just as prerelational theories often led scientists to artificially split parts from the theoretical whole (i.e., genes vs. environment; see Overton, 2010), pre–relational developmental systems researchers commonly emphasized the independence of inductive versus deductive logic when deriving and testing hypotheses. Taken to extremes, strict application of only inductive or deductive logic can respectively lead to verificationism or an unrealistically strict form of empiricism (Little, 2013). Neither extreme aligns well with the tenets of relational developmental science. Relational-developmental theories specify development as occurring through nonrecursive relations between separate components of a larger system, and from these theories it follows that the practice of relational developmental science progresses through iterative processes of induction and deduction (see Overton, 2012).

As Cattell (1966, p. 14) noted, most scientific advances begin “with dim, fleeting, and far-flung hypotheses, gleaned from the faint movement of straws in the wind.” These inductively derived hypotheses become the subject of later deductive testing. Deductive testing may contradict such theories in their infancy and lead the scientist to dismiss them as arising from the observation of an interesting chance event. Other times, however, data from a first deductive test supports the initial hypothesis and provides fodder for additional inductive consideration and hypothesis refinement. These refinements lead to additional deductive testing, and so on, with each turn of this inductive–hypothetico-deductive spiral (Cattell, 1966) providing stronger and stronger evidence for the initial theory or for some alternative derived from it.

The development of the PYD perspective itself exemplifies this process. As mentioned earlier in this chapter, a new vision and vocabulary for discussing young people began to emerge in the early 1990s (Lerner, Almerigi, et al., 2005). These discussions were led not only by academic researchers from a variety of disciplines such as developmental science (e.g., Lerner, Brentano, Dowling, & Anderson, 2002) and community psychology (e.g., Trickett, Barone, & Buchanan, 1996), but also by practitioners in the field of youth development (e.g., Floyd & McKenna, 2003; Little, 1993; Pittman, Irby, & Ferber, 2001; Wheeler, 2003) and policymakers concerned with improving the life chances of diverse youth and their families (e.g., Cummings, 2003; Gore, 2003). These interests converged in the idea that youth are resources to be developed, rather than problems to be managed (Roth & Brooks-Gunn, 2003a, 2003b).
From these ideas, researchers began developing conceptual frameworks of PYD, such as the Five Cs Model (Lerner, 2004; Lerner, Almerigi, et al., 2005). Researchers then began efforts to “establish that the concept of PYD, as it had been discussed in the literature, had empirical reality, both in its purposed structure and covariation with other key individual and ecological variables” (Lerner, Lerner, et al., 2005, pp. 18–19). With data from the first wave of the 4-H Study of PYD, Lerner and colleagues found empirical evidence for five first-order latent factors, each corresponding to one of the Cs. Once the structure of PYD from this framework was empirically verified, researchers began to use the concept in models linking characteristics of PYD with other individual and ecological aspects of youth’s lives.

This research has, in turn, sparked additional theorizing about the model. For example, Hershberg and Lykes (2012) have suggested that qualitative studies with minority youth may help discern processes involved in youth development that could be particularly salient to optimizing the development of youth in specific cultural settings, in the majority world, and/or in underresourced communities wherein they may be systematically marginalized from participating in activities typically recognized as indicating PYD (e.g., raising the concept of critical consciousness discussed earlier). This example also illustrates how qualitative and quantitative research can complement each other as theorizing and research in a particular area of human development moves up and down the inductive–hypothetico-deductive spiral. Historically, quantitative research has been associated with deductive approaches and qualitative research with inductive, but a thorough survey of methods within each of these traditions shows that there is tremendous diversity. Our conception of an RDST framework supports varying levels of induction and deduction within both qualitative and quantitative approaches, and indeed we argue that the full variety is necessary to move PYD research forward in a way that is consistent with RDST.

Conclusions and Future Directions

RDST models of human development such as the PYD perspective emphasize that changes in the mutually influential relationships between individuals and the multiple levels of their contexts constitute the basic process of human development (Overton, 2010, 2011, 2012, and Chapter 2, this volume; Overton & Müller, 2011). As the present chapter has detailed, the RDST framework entails several conceptual and methodology considerations. Over the past decade, the PYD perspective has been adopted by researchers studying adolescence, by practitioners in youth development, and by policymakers concerned with improving the lives of youth and their families (Lerner et al., 2012). Therefore, the tenets and assumptions of RDST models, and thus the PYD perspective, have implications for the work of researchers and practitioners interested in promoting the positive development of all young people, and for contributing to the promotion of social justice (Lerner & Overton, 2008). In particular, we have discussed three assumptions that are most relevant for this work: (1) development involves interrelated changes in a complex, multilevel system; (2) developmental trajectories of all
individuals remain relatively plastic across the life span; and (3) examining relations in
the presence of such complexity requires multimethod integration.

Taking these assumptions into account, to frame and test a set of questions within
RDST models is a formidable challenge for researchers. Such framing requires multi-
level, multivariate, and multimethod longitudinal research that must attend to both
intraindividual change and interindividual differences in intraindividual change. There-
fore, research derived from RDST entails considerable commitment, both in time and
resources, of an interdisciplinary team of researchers. In addition, well-designed RDST
research entails gaining the commitment and engagement of research participants in
order to obtain the data necessary to test RDST-derived questions and hypotheses.

For example, in RDST research, bidirectional individual ↔ context relations con-
stitute the fundamental unit of analysis, and the individual is an active producer of his
or her own development. Therefore, rather than focus on the socially defined contexts
(e.g., family, school, neighborhood) that mark much of the research on development,
researchers should also collect information about the active individual’s attributes in
relation to the subjective social context that the individual deems important.

A concurrent challenge when deciding how to design and implement a study that
appropriately addresses all of these issues is that researchers must also consider the
political, financial, and academic climate within which a study is conducted. That is,
research should not be conducted only with an RDST framework, but it should also
be recognized that research is conducted within an RDST framework. What would
be the most feasible, practical, and fundable research agenda, given the current policy
and funding priorities? As systems science methods are meant to complement tradi-
tional research methods (Urban, Osgood, & Mabry, 2011; Urban et al., Chapter 4,
this volume), would it make more sense to conduct a series of small studies that focus
on particular variables within a broader framework, or would a more comprehensive
study that accounts for multiple variables at multiple levels over multiple time points
be the appropriate agenda to follow?

The goal of applied developmental science is to describe, explain, and optimize
human development. Often, optimizing development involves designing and imple-
menting research-based interventions; however, conducting intervention studies
framed within a relational developmental systems approach to applied developmental
science raises questions about the use of randomized control trials (RCTs) in tests of
causality. There are several financial, practical, and ethical concerns inherent in con-
ducting an RCT in an applied setting. In addition, there are also methodological and
conceptual shortcomings in undertaking an RCT, such as limited external validity,
contamination, endogeneity, and the infrequency of use of the Solomon four-group
design, which involves two control groups other than the typical one involving pretest
and posttest but no manipulation (i.e., there is a control group that involves no pretest
but includes the manipulation and the posttest—as a control for the reactive effects of
pretesting; and there is a control group that includes only the posttest—as a control for
maturation; Solomon & Lessac, 1968). For example, an RCT is not appropriate when
researchers seek to determine whether an intervention prevents rare events or when
the intervention requires active participation, both of which would be the case for many PYD-derived interventions. An overarching challenge to conducting research in the current era is that many funding mechanisms require the use of RCTs unless there is a strong justification for a quasi-experimental design. The prevailing commitment to RCTs by some funding organizations adversely affects researchers who work in applied settings and who recognize that an RCT design may be inappropriate, impossible, or inadequate for the situation in which they conduct research. A PYD researcher must work to provide justification to overcome a mindset in both the research and practice communities that claims that RCTs are the “only way to be sure about cause and effect.”

Fiduciary issues also arise in considering the work of practitioners as RDST-derived models become more popular with individuals working to enhance the positive growth of young people (Beets et al., 2009; Duerden, Witt, Fernandez, Jolliff, & Theriault, 2012; Kurtines et al., 2008). It is not always clear what particular developmental processes are explicitly used in the “philosophical” approaches to youth programming pertinent to PYD or in the particular instances of youth programs designed to foster PYD (Lerner, Bowers, et al., 2012). This uncertainty most likely occurs because most youth programs in the United States are not evaluated (cf. Catalano, Berglund, Ryan, Lonczak, & Hawkins, 1999) and, most critically, a theory of change and an evaluation design logic model (Weiss, 1972) are absent from most programs (e.g., see Roth, Brooks-Gunn, Murray, & Foster, 1998). These omissions may be a result of a lack of understanding about the essential need for such frames for programs, but they may also be a casualty of the limited budgets of youth-serving programs. Practitioners often choose to spend funds on programming elements in which youth participate rather than on scientifically rigorous evaluation. Even if funds were available to practitioners, programs framed by the PYD perspective would entail a level of complexity and oversight that can be identified in, let alone attained, by only a select few programs (e.g., Catalano, Haggerty, Oesterle, Fleming, & Hawkins, 2004; Flay & Allred, 2003; Kurtines et al., 2008). A review of these programs illustrates that university–community collaborations are critical for RDST-derived scholarship and practice success (Kurtines et al., 2008; Lerner & Simon, 1998).

Therefore, academic institutions as well as policymakers and funding institutions should work to establish and develop real collaborations with partners in the community. These partners, in turn, must recognize the importance of research-based designs and scientifically rigorous evaluation and also work to recruit and accept the resources available at academic institutions. Both sides must work to identify the mutually beneficial relations that can produce programs and research agendas that are practical, efficient, fundable—and thus sustainable (Lerner & Overton, 2008). With such researcher–community collaborations, RDST-based models such as the PYD perspective (Lerner et al., 2012) can enhance the quality of the information obtained about youth, can provide a more likely to-be-deployed basis for evidence-based practice, and may afford more, and more ecologically valid, contributions to promoting social justice for the diverse young people of the world.
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RELATIONAL DEVELOPMENTAL SYSTEMS THEORY


