

## CHAPTER 19

# How and Why the Understanding of Developmental Continuity and Discontinuity is Important

### *The Sample Case of Long-term Consequences of Adolescent Substance Use*

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No story is a straight line. The geometry of human life is too imperfect and too complex, too distorted by the laughter of time and the bewildering intricacies of fate to admit the straight line into its system of laws. (Pat Conroy, 1995, p. 104)

In the complex array of distal and proximal causes of adulthood functioning, how prominent are the experiences and events of adolescence in general and adolescent substance use in particular? Indeed, what is the basis for expecting long-term consequences of any sort of behavior, characteristic, event, or social context across the life course? A typical way to address these fundamental questions is to invoke notions of developmental continuity or coherence across the life course and to focus, for example, on continuity of individual and

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contextual characteristics over time or the formative influence of earlier experiences on later functioning and adjustment (see McLeod and Almazon, this volume). Thus, to the extent that we find long-term consequences of adolescent substance use (or of any characteristic, behavior, social context, or event), we can assume a certain amount of developmental continuity across the life course.

But there is more than just continuity to a developmental perspective, especially one founded on dynamic person–context interactions across the life course. Discontinuity is as fundamental to development as is continuity. Both, as we discuss in this chapter, are critically important for understanding the long-term consequences of adolescent behavior, including substance use. The roots of adulthood functioning do not always extend back to childhood or adolescence. An acknowledgement that the influence of earlier experiences may be mediated, erased, or even reversed by later experiences (cf., Bandura, 1982; Lewis, 1999) provides a more realistic basis for considering how adolescent behaviors, characteristics, events, and social contexts relate to adulthood functioning. In particular, the transition from adolescence to adulthood can engender considerable discontinuity in ongoing trajectories of health and well-being. Thus, for some young people heavily involved in substance use as adolescents, the experiences that constitute the transition to adulthood are sufficiently positive to counter the influence of earlier substance use; for others, difficulties with transition experiences serve as catalysts of earlier substance use difficulties. Failure to recognize these and a multitude of other diverging pathways might lead to inaccurate conclusions about the possible long-term consequences of adolescent substance use.

In this chapter, we consider issues related to developmental continuity and discontinuity as they relate to linkages across the life course in general and particularly to long-term consequences of adolescent substance use on health and psychosocial adjustment in adulthood. Clearly, the topic of substance use consequences is of central concern in the substance use etiology and prevention literature. Building on decades of research that has often revealed relatively small long-term effects and inconsistent findings, scholars increasingly recognize that more complex questions about moderated effects and developmental pathways need to be considered. One purpose of this chapter is to facilitate this direction in the substance use literature by elucidating developmental considerations. At the same time, our focus on substance use consequences provides an important substantive vantage point for illustrating developmental issues regarding continuity and discontinuity across the life course. Thus, our second purpose is to illustrate various ways to conceptualize linkages between adolescent characteristics, behaviors, and events and adulthood functioning and adjustment. We hope to offer some insights into how and why considerations of continuity and discontinuity are essential for understanding developmental effects across the life course.

In the first section, we set the stage by drawing principles and concepts from life course development scholarship (and developmental science in general), defining continuity and discontinuity, and briefly describing developmental transitions and tasks. In the second section, we start with a selective overview of the substance use consequences literature. Then, informed by broader developmental perspectives on substance use etiology during adolescence and young adulthood (e.g., Cicchetti, 1999; Schulenberg & Maggs, 2002; Schulenberg, Maggs, Steinman, & Zucker, 2001; Windle & Davies, 1999), we discuss three central themes concerning continuity and discontinuity and examine their implications for understanding the long-term consequences of adolescent substance use: (1) temporally and developmentally causal linkages as they relate to developmental transitions, (2) the meaning of a given set of behaviors in terms of developmental tasks, and (3) interindividual differences in intraindividual change and variability. In the final section, we offer a summary of the mechanisms and

conditions of long-term consequences of substance use, discuss substantive and methodological challenges, and consider implications for theory and research on developmental linkages between adolescence and adulthood.

### **INDIVIDUAL DEVELOPMENT IN LIFE COURSE PERSPECTIVE: HOW AND WHY CONTINUITY AND DISCONTINUITY ARE IMPORTANT**

There is not one unified, agreed-upon developmental theory and, indeed, developmental scientists often disagree about the very meaning of development. Such disagreement has many benefits for our science and, given the enormity and complexity of human development, it is unlikely we will have a unified, fully agreed-upon theory of development any time soon (for comprehensive efforts, see e.g., Cairns, Elder, & Costello, 1996; Ford & Lerner, 1992). Nonetheless, there has been growing consensus about the need to consider the dynamic interplay between active individuals and social contexts in our conceptualizations and studies of human development (Baltes, Lindenberger, & Stausinger, 1998; Bronfenbrenner & Morris, 1998; Cairns, 2000; Elder, 1998; Lerner, 1998). Furthermore, while the points of entry into the study of human development are typically different for life course and life span studies (e.g., social structure and roles vs intraindividual phenomena, respectively), reflecting their respective origins in sociology and psychology, the two converge more than they diverge on such key issues as dynamic person–context interactions, cultural and historical embeddedness, multidirectional change, and lifelong development (e.g., Settersten, 2003; Shanahan & Porfeli, 2002). Also, more generally, concern with these issues reflects a developmental science perspective (e.g., Cairns et al., 1996), a broad framework that emphasizes holistic considerations of developing individuals in changing contexts, and advocates that the study of development (human and otherwise) is best advanced by interdisciplinary efforts.

The perspective we offer in this chapter is consistent with the broad interdisciplinary developmental science framework that emphasizes multidimensional and multidirectional developmental change across the life course, characterized by successive and dynamic mutual selection and accommodation of individuals and their contexts (Baltes, 1987; Elder, 1998; Lerner, 1982; Sameroff, 1987). Humans are considered to play a strong active role in their own development and social and physical environments are viewed as also playing strong roles (Brandtstädter & Lerner, 1999; Caspi & Moffitt, 1993; Lerner, 1982; Scarr & McCartney, 1983). Through a process of niche selection, individuals select environments and activities from differing ranges of options based on personal characteristics, beliefs, interests, and competencies. Selected ecological niches then afford various opportunities (Nurmi, 1993; Plomin, Fulker, Corley, & DeFries, 1997; Scarr & McCartney, 1983). This progressive accommodation suggests the qualities of coherence and continuity that appear to describe much of human development. But consistent with an emphasis on dynamic person–context interactions and multidirectional change, development is not necessarily expected to exhibit a smooth and progressive function and early experiences may not always have strong or lasting effects (e.g., Cairns, 2000; Lewis, 1999; Loeber & Stouthamer-Loeber, 1998). Thus, both continuity and discontinuity are anticipated across the life course.

Our emphasis on the conditions and mechanisms of continuity and discontinuity is informed by essential themes that have emerged from life course scholarship, specifically the notion of trajectories across the life course and how various developmental transitions relate

to those trajectories including how transitions can serve as turning points (Elder, 1998; Laub & Sampson, 1993; Rutter, 1996; Settersten, 2003). In addition, we draw heavily from broader life course developmental themes about interindividual (and inter- and intracohort) variation in life course trajectories and social role transitional experiences, the interplay of distal and proximal experiences and events, linked lives, and the cultural and historical embeddedness of the life course (Elder, 1998; Settersten, 2003; Shanahan, 2000).

Next, based on life course themes and more broadly a developmental science framework, we consider definitions of continuity and discontinuity and briefly discuss developmental transitions and tasks and their relation to continuity and discontinuity.

## Continuity and Discontinuity in Development: Overview of Issues

Notions of developmental continuity and discontinuity are complex, in part because they involve systems-level considerations and also because of definitional ambiguity and complexity (e.g., Kagan, 1980; Rutter, 1989; Sameroff, 2000; Werner, 1957). They are slippery and amorphous concepts, but such qualities do not take away from their critical importance to the understanding of development. Continuity and discontinuity are often viewed as being distinct from or at least more general than stability and change. Stability typically pertains to the rankorder stability of interindividual differences over time. If the rank ordering of individuals along a specific dimension changes little over time, then individual differences are viewed as stable (regardless of mean level changes). Change typically pertains to mean level change over time, usually at the group or subgroup level (regardless of rank order stability). These distinctions are not always followed in the literature, of course, but they are generally accepted (e.g., Baltes, Reese, & Nesselroade, 1977; Lerner, 1986). In contrast, there is less agreement about or at least less systematic use of terms concerning the meaning of continuity and discontinuity. In particular, views of continuity and discontinuity range from concern with qualitative or structural-level change to a concern with the overall level of adaptation across the life course.

Traditionally, within organismically based developmental psychology, continuity and discontinuity have been viewed in terms of underlying structural or qualitative change (e.g., Piaget, 1970; Werner, 1957). That is, discontinuity can reflect both quantitative and qualitative change, but the main distinction relates to qualitative change; if the underlying structure changes, for example, the emergence of new structure, purpose, or meaning, then there is discontinuity (Lerner, 1986). Similarly, continuity and discontinuity may be considered as descriptive or as explanatory, which draws a distinction between manifest behaviors (descriptive) and underlying purposes, functions, and meanings (explanatory) (e.g., Lerner, 1986). But continuity and discontinuity may also be considered in terms of connections and causative linkages across periods in life (e.g., Lewis, 1999), which we term ontogenic continuity (reflecting strong developmentally distal effects) and ontogenic discontinuity (reflecting strong developmentally proximal effects). In this chapter, we are primarily concerned with descriptive and explanatory, along with ontogenic, continuity and discontinuity; more generally, we are interested in the continuity and discontinuity of overall functioning and adjustment across the life course.

**DESCRIPTIVE AND EXPLANATORY CONTINUITY AND DISCONTINUITY.** Descriptive continuity refers to the same behavior or characteristic over time and explanatory continuity refers to the same underlying purpose, function, or meaning of behaviors/characteristics over time. Table 19-1 illustrates these dimensions.

**TABLE 19-1. Descriptive and Explanatory Continuity and Discontinuity**

Explanatory	Descriptive	
	Continuity	Discontinuity
Continuity	Homotypic continuity	Heterotypic continuity
Discontinuity	Functional discontinuity	Complete discontinuity

*Homotypic continuity* refers to the presence of both descriptive and explanatory continuity (Caspi & Roberts, 1999; Kagan, 1969). For example, high school students attending academically selective and challenging high schools may study hard through high school and college, with the goal of pursuing competitive professional careers. Despite changes in context, significant continuity may be visible in both their academic behaviors and the underlying purpose. Another example would be a young person who continues occasionally to use marijuana primarily for the sensation of getting high; if both the drug use and the main motivation (i.e., sensation seeking) remain unchanged over time, this would reflect homotypic continuity.

Often, however, behaviors vary across time while the underlying purpose or meaning of those varying behaviors remains invariant. This is termed *heterotypic continuity* (Caspi & Roberts, 1999; Kagan, 1969). So, once the academically oriented young people complete their formal education, their focus shifts from studying hard to working hard, with their underlying strong success orientation remaining unchanged. Likewise, if the sensation-seeking young person shifts from marijuana use to skydiving to invoke the same sensation, this would reflect heterotypic continuity. In general, positive adaptation to life’s tasks may be continuous across the life course, but many of the activities and behaviors associated with positive adaptation tend to be discontinuous (Masten & Curtis, 2000; Moffitt & Caspi, 2001; Rutter, 1996); thus, as we discuss in a later section, heterotypic continuity is especially useful in understanding how developmental tasks relate to substance use consequences.

*Functional discontinuity*, which can be considered the opposite of heterotypic continuity, occurs when the manifest behavior appears unchanged yet the underlying function or meaning of that behavior changes over time (i.e., descriptive continuity and explanatory discontinuity). For example, the sensation-seeking young person may continue to use marijuana but the primary reasons for using may shift, for example, from curiosity and rebellion to coping and affect regulation. Indeed, the reasons that one begins substance use (e.g., experimentation or social reasons) often are very different reasons for continued substance use (e.g., coping or self-medication reasons) reflecting functional discontinuity (e.g., National Institute on Alcohol Abuse and Alcoholism [NIAAA] 2000).

Shifts over time in both the manifest behaviors and underlying meanings/functions of those behaviors reflects *complete discontinuity*. The young person who uses drugs to cope with a high school that offers her or him no opportunities to succeed may no longer have such extreme coping problems once he or she leaves high school and thus may discontinue drug use.

**ONTOGENIC CONTINUITY AND DISCONTINUITY.** Development is a cumulative process and, thus, one’s life history sets the stage for current cognitive, emotional, and social functioning. This does not mean that early experiences inevitably determine later functioning (Lewis, 2000). Indeed, from a developmental science perspective emphasizing plasticity and development across the life course, the effects of early experiences may be countered or reversed by later experiences. This tension between the effects of earlier (developmentally distal) and later

**TABLE 19-2. Developmentally Distal and Proximal Effects (Ontogenic Continuity and Discontinuity)**

Developmentally proximal effects (ontogenic discontinuity)	Developmentally distal effects (ontogenic continuity)	
	Yes	No
Yes	Independent distal and proximal effects or mediated effects of distal effects via proximal effects	Only proximal (e.g., transition-based) effects or proximal effects cancel or reverse distal effects
No	Only distal (e.g., childhood) effects	No developmental effects

(developmentally proximal) experiences reflects an emphasis on what we term ontogenic continuity and discontinuity (cf. Masten, 2001). Table 19-2 illustrates these dimensions.

Ontogenic continuity reflects a progressive and individual coherence perspective of development, where early experiences are strong contributors to future functioning and adjustment (cf. Caspi, 2000; Roberts, Caspi, & Moffitt, 2001). For example, within this perspective, events and experiences of childhood and adolescence are formative and become causes of future outcomes in adulthood. This perspective is the implied one underlying much of the literature that attempts to establish connections across different periods of the life course in general and the substance use consequences literature in particular. In contrast, a focus on more developmentally proximal influences (e.g., transition effects) reflects an ontogenic discontinuity perspective, whereby functioning and adjustment are assumed to be due more to recent and current experiences (Lewis, 1999). This general theme of indeterminacy in developmental course due to powerful proximal influences is consistent with Gergen's (1977) model of aleatory change, as well as the life course literature suggesting the power of developmental transitions in reversing the effects of earlier violence and delinquency (e.g., Laub & Sampson, 1993; Sampson and Laub, this volume; Uggen, 2000; Uggen and Massoglia, this volume).

As shown in Table 19-2, ontogenic continuity and discontinuity are not necessarily mutually exclusive. Distal and proximal influences are often intertwined: distal influences (e.g., ongoing parental unemployment during childhood) may structure proximal influences (e.g., limited financial resources, association with low achieving peers during late adolescence) and proximal influences may mediate the effects of distal influences (e.g., childhood events contribute to adulthood functioning via difficulties with the transition to adulthood). But proximal developmental influences in general and developmental transitions in particular may operate independently of distal influences or may even disrupt distal influences, thus setting the stage for discontinuity (see top right quadrant in Table 19-2). As we discuss in a later section, an emphasis on how developmentally distal and proximal effects interrelate is particularly useful in understanding how developmental transitions relate to substance use consequences.

#### **CONTINUITY AND DISCONTINUITY AS MORE THAN INDIVIDUALISTIC CHARACTERISTICS.**

The understanding of consequences of behaviors at one point in time on outcomes at another point in time must be immersed in considerations of not just individual continuity and discontinuity, but also the continuity or discontinuity of surrounding social context along with considerations of the broader cultural context and historical time (Shanahan, Sulloway, & Hofer, 2000). For example, any distinction between ontogenic continuity and discontinuity might rest on the continuity of one's social context. Likewise, as discussed more later, the transition to adulthood is typically accompanied by shifting role expectations (Mortimer & Simmons,

1978), which in turn can reflect descriptive or explanatory discontinuity. Cultures vary regarding support for and expectations regarding continuity and discontinuity across the life course (Furstenberg, 2002; Shanahan, Mortimer, & Krueger, 2002) and the same holds true for varying historical periods marked by technological and political shifts. And linkages across the life course in terms of the impact of consequences of earlier behavior on later adjustment are likely to be influenced by the normativeness of the given behavior, which often shifts historically. Specifically, it is reasonable to ask whether the consequences of adolescent substance use vary in part as a function of substance use prevalence (which has shifted dramatically over the past few decades) (Johnston, O'Malley, & Bachman, 2002). For example, would the increasingly normative behavior serve to decrease the long-term consequences for the average adolescent substance user?

Finally, questions about continuity and discontinuity are ultimately methodologically bound (Lerner, 1986; Mortimer, Finch, & Kumka, 1982; Werner, 1957), introducing the notion of artifactual continuity and discontinuity. Depending on one's approach, one may find more or less continuity than is actually the case (McAdams, 1994); moreover, what is found for the general case in regard to continuity and discontinuity may have little to do with the given individuals when they are combined to make up the general case (Cairns, 2000).

Additional important questions pertain to the mechanisms of continuity and discontinuity across the life course. Many of these mechanisms exist in the dynamic interplay between developing individuals and their changing contexts; two of particular interest here include developmental transitions and developmental tasks.

## Developmental Transitions and Tasks in Adolescence and Early Adulthood

Developmental transitions and tasks are related and sometimes even overlapping (e.g., the transition to marriage vs the task of selecting a mate). In general, transitions pertain more to the actual process of change and tasks relate more to accomplishments that contribute to and result from the changes (Elder, 1996; Schulenberg & Maggs, 2002). Both are of central concern when issues of continuity and discontinuity across the life course are considered.

The content and timing of developmental transitions and tasks, being historically and culturally embedded, are influenced greatly by social context (Bynner, 2000; Oerter, 1986). This chapter focuses on development within Western, pluralistic societies that are characterized by diverse, first world, postindustrialized economies. Our characterization of the ecological niches experienced by adolescents and young adults is based primarily on the United States and assumes a flexible educational system, significant individual freedom, and many opportunities for advancement, yet large income and social capital discrepancies and a limited social safety net. With the end of compulsory and fully publicly funded education after high school, U.S. adolescents are faced with many more choices and options, along with far less automatic institutional support. Divergence in life paths can be expected to increase as individual adolescents pursue or find themselves falling into a vast range of life situations, with diverse combinations and sequences of possible living arrangements, educational pursuits, jobs, romantic partnerships, parenting roles, and family relationships. While U.S. culture tolerates and often encourages some period of experimentation and "changing of mind" in the post-high school years (for single, non-parents attending college), the decisions, activities, accomplishments, and even "chance events" of these years can have lifelong salience (Bandura, 1982; Clausen, 1991; Maggs, Frome, Eccles, & Barber, 1997; Schulenberg, Maggs, & Hurrelmann, 1997).

**DEVELOPMENTAL TRANSITIONS.** Developmental transitions include major transformations in individuals, their contexts, and the relations between individuals and their contexts across the life course; transitions can and often do contribute in important ways to individual development (e.g., Bronfenbrenner, 1979; Graber & Brooks-Gunn, 1996; Schulenberg et al., 1997). Developmental transitions are often viewed globally as the connections between major life periods, such as the transition from childhood to adolescence. These global transitions usually include other identifiable (and less global) developmental transitions. In particular, there are internally based developmental transitions concerning physical, cognitive, emotional, and identity-related change and externally based developmental transitions concerning changes in social roles and contexts (Rutter, 1996). For example, the global transition from adolescence to adulthood includes a series of transitions involving perspective taking, emotional regulation, and identity, as well as transitions in social context (e.g., transitions into college, marriage, full-time employment).

Individuals can shape their own developmental transitions as they actively influence and are influenced by their contexts (Lerner, 1982; Scarr & McCartney, 1983). As mentioned earlier, the transition to adulthood is characterized by increasingly diverse options, opportunities, and constraints (Shanahan, 2000) and, thus, behavioral choices may influence transition outcomes to a greater extent than ever before. Developmental transitions are embedded in a sociocultural context and therefore may vary by gender, class, culture, and historical period. Culturally and biologically based age-related expectations or “scripts” shape these transitions by providing normative timetables and developmental deadlines, for example for employment and parenthood (Heckhausen, 1999; Neugarten, 1979). Developmental transitions can be normative or non-normative and can vary in timing, sequence, and importance depending on their prevalence within a given population and on personal goals and life situations (Baltes, 1987; Nurmi, 1997).

Issues of continuity and discontinuity are central to understanding the power of major developmental transitions on individuals’ lives (Petersen, 1993; Rutter, 1996). At a global level, continuity in functioning tends to prevail during major transitions. Some developmentalists and personality psychologists have highlighted continuity in functioning, for example, because of ongoing person–context match across the transition (e.g., Davis & Millon, 1994) or because individuals rely on their intrinsic tendencies and behavioral repertoire in novel and ambiguous situations (e.g., Caspi, 2000). And when discontinuity in functioning is apparent during a major transition, it may simply reflect momentary disturbances (e.g., temporary identity difficulties during the transition to college), after which one’s ongoing trajectory will resume. Likewise, change in functioning during a transition that appears to reflect discontinuity may represent the continuity of adaptation (Rutter, 1992; Zucker, 2000). But consistent with a dynamic person–context interaction perspective and particularly with the notion of ecological transitions (Bronfenbrenner, 1979), major developmental transitions can permanently alter one’s ongoing trajectory of health and well-being (e.g., Schulenberg, Bryant, & O’Malley, in preparation). In a later section, we consider more specifically how developmental transitions contribute to continuity and discontinuity across the life course, focusing on implications for understanding long-term consequences of adolescent substance use.

**DEVELOPMENTAL TASKS.** Historically, developmental tasks have been defined as socially, psychologically, and biologically determined activities or projects that individuals are expected to accomplish at certain ages or stages of life (Havighurst, 1952). The content of such tasks originates in an interaction between species-typical biological capabilities and socially constructed norms and expectations (Neugarten & Danan, 1973; Oerter, 1986). While

such conceptualizations allow for some variation in the content, timing, and salience of tasks by gender, social capital, culture, and historical period (Hogan & Astone, 1986; Marini, 1985), a narrow interpretation of the task construct may be too prescriptive for most contextually oriented life span conceptualizations of human development (e.g., Baltes et al., 1998; Brandtstädter & Lerner, 1999). We offer a descriptive rather than a prescriptive interpretation of the concept of developmental tasks, concentrating on the normative activities, goals, and focus of various periods in the life course. In this regard, “normative” refers to what many people within a given social context or ecological niche commonly do, rather than what they *should* do (see Settersten, this volume). Moreover, despite observed similarities in the activities and interests of individuals within given periods of life, it is also important to remember that individual development is also idiosyncratic and regulated by goals unique to each person (Brunstein, Schultheiss, & Maier, 1999; Cantor, 1994; Oerter, 1986).

Although the discussion of developmental tasks has become less common in developmental theory and empirical research, viewing behaviors as indicative of the pursuit of developmentally normative tasks provides an organizational structure and explanation for otherwise apparently unrelated actions within and across time. For example, the task of developing an occupational identity may give meaning to diverse behaviors, including changing college majors, trying various volunteer and paid job experiences, or leaving a romantic partner to pursue an educational or job opportunity. Developmental tasks also illuminate process links of social constraints and expectations with individual behavior; within the range of perceived possibilities and options individuals may internalize normative developmental timetables, endorse particular tasks, and use them to guide their behavior (e.g., Heckhausen, 1999; Nurmi, 1993).

Descriptions of the major developmental tasks of adolescence and early adulthood often focus either on domains of development (e.g., biological, interpersonal) or on the acquisition of abstract personal qualities (e.g., responsibility, personal values) (Erikson, 1968; Havighurst, 1952; Neugarten & Datan, 1973; Oerter, 1986; Schulenberg et al., 1997; Wadsworth & Ford, 1983). Common developmental tasks of adolescence include adapting to the changes of puberty, developing independent or interdependent relationships with parents, and deciding on and pursuing educational goals. Sociological definitions of adulthood focus on the attainment of social roles (typically those of spouse, parent, worker) (Hogan & Astone, 1986); more recent evidence indicates that young adults themselves define adulthood more intangibly (and often inconsistently) in terms of taking responsibility for one’s actions and deciding on beliefs and values (Arnett, 2000, 2001; Shanahan, 2000). Although the specific tasks of adolescence are somewhat distinct from tasks of early adulthood (thus suggesting some discontinuity in behaviors and activities), the underlying purposes of general adaptation as well as of certain developmental tasks may nevertheless remain continuous (e.g., Masten & Curtis, 2000; Mortimer & Simmons, 1978). An adolescent who experiments with alcohol may be partly doing so in relation to affiliative developmental tasks associated with gaining independence from parents and bonding with peers; as a young adult, the young person may decrease alcohol use partly in connection with the affiliative developmental task of mate attraction/selection. While the behavior may be discontinuous over time, the functions of accomplishing the given developmental tasks reflect some continuity; clearly, as we discuss in a later section, developmental tasks and the continuities and discontinuities they engender promote understanding of substance use consequences.

Building on this general discussion of developmental continuity and discontinuity and how they relate to developmental transitions and tasks, we now turn to a more specific consideration of how these general concepts can help us to understand better the long-term consequences of adolescent substance use.

## IMPLICATIONS OF DEVELOPMENTAL CONTINUITY AND DISCONTINUITY FOR UNDERSTANDING CONSEQUENCES OF ADOLESCENT SUBSTANCE USE

A better understanding of the long-term consequences of adolescent substance use is important not only for the health and well-being of young people, but also for theoretical reasons concerning linkages across the life course. The implications of “getting it wrong” in terms of coming to erroneous conclusions about the existence and mechanisms of long-term effects of substance use are sizeable. One way to address fundamental questions about long-term consequences is to focus on cause–effect relations: the adolescent behavior (e.g., substance use) is the cause, some aspect of adulthood functioning is the effect (directly or indirectly), and all that transpires in between represents a fairly passive intervening variable that connects the two. Much of the empirical literature has approached the subject of the consequences of adolescent substance use in essentially this way, although recent work has started to attend more to the “in between” time. This chapter is offered to help conceptualizations and empirical studies continue in the more recent direction by elucidating developmental concerns and insights. Substance use consequences include a broad range of outcomes ranging from neurochemical to community-level ones and include, for example, physical, psychological, social, economic, educational, and legal consequences (e.g., Kandel, Davies, Karus, & Yamaguchi, 1986; Newcomb & Bentler, 1988a, 1988b). Our focus is on substance use consequences on health and psychosocial adjustment in adulthood; our emphasis is conceptual and selective (rather than comprehensive), illustrating the various ways to conceptualize linkages between characteristics, behaviors, and events across adolescence and adulthood, as well as across the life course.

In 1978, Kandel pointed out that the determinants of adolescent drug use had been investigated far more than the consequences. A decade later, Newcomb and Bentler (1988a) stated “There has been little theory development regarding the impact of adolescent drug use on later life” (p. 25). To that point, there had been a scarcity of empirical studies testing theories about the impact of adolescent drug use on later outcomes and, indeed, an overarching problem of the substance use empirical literature has been that it is often atheoretical. Since then a number of longitudinal studies have examined the effects and sequelae of substance use in early to late adolescence on many aspects of adult functioning in young adulthood. The findings from the various studies have been mixed, in part because results differ somewhat for alcohol use versus the use of illicit drugs. In general, however, there has been more support for negative consequences than for positive consequences. One study that took an explicit life-course perspective found that use of alcohol and illicit drugs in early adolescence increased the risk of dropping out of school and making “precocious transitions” such as becoming pregnant or impregnating someone and premature independence from parents (Krohn, Lizotte, & Perez, 1997). Newcomb and Bentler (1988a, 1988b) found that marijuana use, use of illicit drugs other than marijuana, and heavy alcohol use (but not moderate alcohol use) had significant negative effects on aspects of young adult functioning, including family problems, health problems, psychosomatic complaints, relationship problems, emotional distress, and trouble with drugs/alcohol. Brook, Adams, Balka, and Johnson (2002), in a sample composed largely of African Americans and Puerto Ricans in New York city, reported that early adolescent marijuana use predicted significantly to less favorable education and occupation outcomes 5 years later. In a very different sample—adolescents in Colombia—Brook, Rosen, and Brook (2001) found that marijuana use in early adolescence predicted later anxiety and depressive symptoms.

Other studies (e.g., Brook, Richter, & Rubenshane, 2000; Brook, Richter, Whiteman, & Cohen, 1999; Brook, Whiteman, Finch, & Cohen 1996; Chassin, Pitts, & DeLucia 1999; Friedman, Granick, Bransfield, Kreisher, & Schwartz, 1996; Kandel et al., 1986; Newcomb, Scheier, & Bentler, 1993; Windle, 1999) have found that substance use (as measured by several substances including alcohol use, heavy drinking, marijuana, illicit drugs) in middle to late adolescence (ages 15–21) can be significantly although not always powerfully predictive of poor functioning in young adulthood (usually ages 18–27). In these and other relevant studies, measures of adult functioning included poor occupational performance, unconventional adult roles, psychiatric disorders, mental health, adult drug use, delinquency, autonomy, and competence.

In some studies, however, some unclear and ambiguous relationships of adolescent substance use and adulthood functioning were found. Chassin et al. (1999) found that while illicit drug use had a negative effect on young adult autonomy and competence, heavy alcohol use in young adulthood was either uncorrelated or positively correlated with higher levels of competence. Newcomb and Bentler (1988a) found that while there were several negative consequences of drug and *heavy* alcohol use during adolescence, adolescent *moderate* alcohol use predicted reduced family problems, loneliness, and self-derogation in young adulthood.

One theme in most studies is that a primary mechanism of long-term substance use consequences is the continuity (or at least descriptive continuity) of substance use. Indeed, it does appear to be the case that substance use (especially the use of licit drugs) is relatively stable (in terms of rank order stability) from adolescence to adulthood (e.g., Bachman, Wadsworth, O'Malley, Johnston, & Schulenberg, 1997; Bachman, O'Malley, Schulenberg, Johnston, Bryant, & Merline, 2002; Galaif, Stein, Newcomb, & Bernstein, 2001; Kandel et al., 1986; Ullman & Newcomb, 1999).

The relative stability notwithstanding, it is clear that there are different patterns of substance use trajectories during adolescence and the transition to adulthood (e.g., Bates & Labouvie, 1997; Muthén & Muthén, 2000; Schulenberg, Wadsworth, O'Malley, Bachman, & Johnston, 1996) and recent research has started to consider how these different trajectories relate to consequences (e.g., Hill, White, Chung, Hawkins, & Catalano, 2000; O'Malley & Schulenberg, 1997; Schulenberg & O'Malley, 1998). For example, Rehm and Fischer (1997) found that long-term "harm" is not linked to alcohol use per se but is associated with different patterns of consumption and Hill et al. (2000) found that distinct trajectories of binge drinking during adolescence significantly predicted both positive and negative outcomes in adulthood.

As mentioned at the beginning of this chapter, a developmental perspective on substance use etiology (e.g., Schulenberg & Maggs, 2002; Schulenberg et al., 2001; Windle & Davies, 1999) provides three foci that are central to our purpose here: (1) temporally and developmentally causal linkages as they relate to developmental transitions, (2) the meaning of a given set of behaviors in terms of developmental tasks, and (3) interindividual differences in intraindividual change and variability. Next, we discuss the implications of each of these foci for the understanding of long-term consequences of adolescent substance use.

### **Temporally and Developmentally Causal Linkages: A Focus on Developmental Transitions between Adolescence and Adulthood**

The issue of causal linkages must be considered first in any attempt to understand how functioning in adolescence and in adulthood may be related and more specifically how substance

use in the adolescent years may relate to adjustment/functioning in adulthood. In particular, in the case where evidence of cross-time prediction is obtained, one must ask to what extent such a relationship is due to adolescent characteristics, behaviors, or events *causing* adulthood functioning. Alternatively, the relationship could be due to selection (“third variable”) influences or to a mutually reinforcing web of contemporaneous influences. In the case of selection, a more fundamental or temporally prior characteristic (e.g., academic orientation) (Newcomb, McCarthy, & Bentler, 1989) may contribute to both teenage substance use and adulthood functioning. In the case of concurrent influences, for example, the intertwined and related factors of teenage substance use, delinquency, and spending time with deviant friends may all combine to shape adulthood functioning. If the relationship appears to be causal (e.g., effects on adulthood functioning remain after controlling for potential third variable effects and effects contemporaneous with adolescent substance use), then what does the causal linkage look like? For example, the effects of adolescent substance use on adulthood occupational attainment appear to be mediated through educational attainment, at least for men (Schuster, O’Malley, Bachman, Johnston, & Schulenberg, 2001). This set of key issues is fairly well understood, or at least recognized, in the relevant substance use consequences literature (e.g., Brook & Brook, 1990; Newcomb & Bentler, 1988a).

Another set of key issues that appears to get less attention in the substance use consequences literature pertains to what happens in between adolescent substance use and adulthood functioning. Of course, few if any researchers would want to argue that this “in between” time is largely a passive medium through which individuals pass unscathed. However, by not attending to this interval, the implied assumption is that events and experiences during the interval period are not of central concern for understanding long-term consequences. From our perspective, the events and experiences during this interval in general and the various developmental transitions in particular can help explain continuities and discontinuities between adolescence and adulthood and, thus, help provide a better understanding of the conditions and mechanisms of substance use consequences. In particular, in drawing on the previous discussion of ontogenic continuity and discontinuity, we see the advantages of focusing on the relation between developmentally distal effects (e.g., potential effects of earlier substance use) and developmentally proximal effects (e.g., experiences of success and failure in negotiating the various transitions into adulthood).

How can developmental transitions help explain continuity and discontinuity? Schulenberg and Maggs (2002; see also Schulenberg et al., 2001) discuss five interrelated conceptual models concerning how developmental transitions relate to health risks in general and substance use in particular. These models have broad implications (see also Graber & Brooks-Gunn, 1996) for the study of development and, as we discuss in this section, they also have implications for understanding continuities and discontinuities in overall adjustment during developmental transitions. In the *overload model*, major or multiple transitions overwhelm one’s coping capacity, resulting in decrements in health and well-being. In the *developmental match/mismatch model*, transitions serve to increase or decrease the match between the individual’s developmental needs and contextual affordances, resulting in increases or decreases in health and well-being. In the *increased heterogeneity model*, developmental transitions exacerbate individual differences in ongoing well-being trajectories. In the *heightened vulnerability to chance events model*, the exploratory behavior engendered by major transitions can increase exposure and reactivity to positive and negative novel experiences. In the *transition catalyst/impediment model*, health risks (e.g., getting drunk with peers) can assist in or impede successfully negotiating various transitions and tasks. These five models are not mutually exclusive; given the multiplicity of developmental transitions as well as of health

risks and opportunities, all five models are likely to operate across individuals in a given population and within individuals over time. While some of the models can be viewed as competing ones (especially the first three), they are more appropriately viewed as representing the diverse array of connections between developmental transitions and the course of well-being (see Schulenberg & Maggs, 2002; Schulenberg et al., 2001).

**DEVELOPMENTAL TRANSITIONS AS CONDUITS OF CONTINUITY.** Developmental transitions can contribute to or be associated with developmental continuity, such that adolescent behaviors and experiences (e.g., substance use) are likely to have more powerful effects on adulthood functioning, for better or worse. For example, major developmental transitions, such as from high school to college or from living with parents to living alone, oftentimes function more as proving grounds than as turning points (cf. Rutter, 1996). Consistent with the developmental match/mismatch model (Eccles, Lord, Roeser, Barber, & Hernandez Jozefowicz, 1997), if such transitions provide a progressive increase in developmentally appropriate challenges through which young people can experience competence, then it is likely that those who were doing well prior to the transition will continue to do well during and after the transition. Likewise, if a developmental transition serves to maintain a continued person–context mismatch or continued developmentally unstimulating opportunities, then the effects of previous difficulties on adult adjustment may be amplified. In this sense, developmental transitions (representing proximal effects) can serve to mediate the impact of earlier experiences (distal effects) on later adjustment.

Consistent with the increased heterogeneity model previously noted, challenging transitions can serve to magnify existing strengths and weaknesses, thus increasing interindividual differences in adjustment (i.e., the so-called “Matthew effect”); (Dannefer, 1987; Merton, 1968). Young people with a history of difficulties (perhaps with negotiating earlier transitions) may have trouble negotiating new transitions and, thus, fall further behind their well-functioning peers. Thus, those who do well during adolescence, academically and otherwise, continue to do well in negotiating the transition to postsecondary education; in contrast, those who were doing poorly during high school, academically or otherwise, might experience increased difficulties during the transition to postsecondary education (e.g., Compas, Wagner, Slavin, & Vannatta, 1986). To the extent that substance use was a reason for or a component of difficulties during high school, then it is likely that the transition will intensify effects of substance use. Those doing well already likely have more resources to deal with the stress of the multiple transitions and perhaps more resources to select those post-high school contexts that best match their needs, which will increase positive adjustment. Previous substance use for this group, if any, will likely have few long-term effects given the continued positive direction of all aspects of their lives.

**DEVELOPMENTAL TRANSITIONS AS TURNING POINTS.** Transitions can also contribute to/explain developmental discontinuity, such that the effects of adolescent behaviors and events on adulthood functioning are minimized or even countered. In this way, developmental transitions serve as turning points (Elder, 1998; Rutter, 1996), providing developmentally proximal effects that outweigh or overturn developmentally distal effects (i.e., high ontogenic discontinuity and low ontogenic continuity)—(see Table 19-2). Thus, consistent with the developmental match/mismatch model, if the transition from full-time school to full-time work results in a markedly better match between activities and challenges offered by the context and the young person’s interests and life goals, then difficulties experienced during adolescence (e.g., use of illegal drugs to alleviate boredom and feelings of incompetence) may

not have lasting effects. Likewise, if the given transition results in a markedly worse match, then the effects of positive experiences of (or lack of difficulties during) adolescence on adulthood functioning may be muted or reversed. To the extent that both of these cases are represented in longitudinal study samples, then the long-term consequences of adolescent substance use would be found to be limited. Similar findings would likely result when transitions overwhelm young people's coping capacities (the overload model) or contribute to the occurrence and effects of novel experiences (heightened vulnerability to chance events model).

#### **SUBSTANCE USE AS A DETERRENT TO SUCCESSFUL DEVELOPMENTAL TRANSITIONS.**

Thus far we have considered transitions as conduits of continuity (thus intensifying adolescent effects) or as turning points (thus dampening or reversing adolescent effects). In both cases, the implications are that transitions can intensify or dampen the long-term consequences of adolescent substance use. But it is also important to view developmental transitions as being influenced by substance use and its short-term consequences. Thus, consistent with the transition catalyst/impediment model, adolescent substance use may contribute to a postponement of developmentally appropriate transitions. This has been recognized in the substance use consequences literature as the "amotivational syndrome" (Newcomb, 1987; Newcomb & Bentler, 1988a) in which substance use is thought to contribute to the avoidance of developmentally beneficial experiences related to identity formation. In addition, adolescent substance use may contribute to (or be associated with) an earlier entry into adulthood roles (premature adulthood) related to, for example, employment (Bachman, Safron, Syala, & Schulenberg, in press; Mortimer & Johnson, 1998; Newcomb & Bentler, 1988a). In such cases, difficulties with successfully negotiating developmental transitions into adulthood can be viewed as long-term consequences of adolescent substance use.

### **Meaning of Substance Use: A Focus on Developmental Tasks**

At the population level, the adolescent years are characterized by an increased willingness to engage in behaviors considered by society to be risky, harmful, or even antisocial (Elliott, Huizinga, & Ageton, 1985; Johnston et al., 2002; Moffitt, 1993). For the majority of individuals, the likelihood of committing a delinquent act, engaging in substance use, or perpetrating some form of misbehavior is at its lifetime peak during, roughly, the decade following the start of high school. The high prevalence of some risk behaviors, such as alcohol use and sexual behavior, suggests that these behaviors are normative, at least in a statistical sense, for older adolescents and young adults. Such a statement does not suggest these activities should be considered ideal, only that they are common. For the majority of individuals, involvement with minor delinquency and with frequent or heavy substance use tends to subside with the acquisition of adult roles, particularly the roles of spouse, parent, and worker (Bachman et al., 1997; Gotham, Sher, & Wood, 1997). For an important minority of individuals, however, substance use during adolescence represents a sign or a potential cause of significant, ongoing problems. So, how can we know if someone will be in the "maturing out" group or in the ongoing problem group?

There are several ways to address this question. The frequency and/or intensity of substance use represent intrinsic risks for developing tolerance or addiction and increasing the probabilistic risk of serious injuries or other negative outcomes. Prior adjustment difficulties such as inadequate social skills, low academic performance, or psychopathology may represent a prior third cause of both the substance use and the negative "outcomes" or such prior

difficulties may interact with substance use, making experimentation more risky for some than others (Maggs et al., 1997). And from a developmental perspective, it is essential to examine the meaning of substance use from the young person's perspective—specifically, to consider substance use in relation to developmental tasks (e.g., Schulenberg et al., 1997, 2001; Windle & Davies, 1999).

Despite the sizeable destructive aspects of substance use (e.g., Brook et al., 2002; Newcomb & Bentler, 1988a, 1988b; Kandel et al., 1986), there may also be some constructive aspects in terms of developmental tasks, particularly in regard to identity exploration and bonding with peers (e.g., Baumrind, 1987; Chassin, Presson & Sherman, 1989; Maggs, Almeida, & Galambos, 1995; Shedler & Block, 1990; Silbereisen & Noack, 1986). When substance use is limited in intensity and time, when it occurs in conjunction with otherwise healthy exploration and experimentation, and when rare but acute negative consequences are avoided, young people typically move safely into young adulthood where they take on new developmentally appropriate tasks such as occupational exploration and commitment and family formation. This represents heterotypic continuity, namely the combination of descriptive discontinuity and explanatory continuity, as the behavior changes but underlying purpose of adaptation remains. Specifically, during adolescence substance use may function at least in part to accomplish particular developmental tasks, thus reflecting age-normative (while not necessarily optimal) behavior; during early adulthood, substance use may cease but the underlying purpose of adaptation continues as new age-appropriate tasks are approached and accomplished. In such cases, the long-term consequences of adolescent substance use would likely be slight. In contrast, when substance use during adolescence is frequent, intense, and prolonged, when it reflects prior adjustment difficulties, or when it is used as a dominant coping strategy, then more serious acute and continuing difficulties and longer term consequences are likely to be extensive. And, of course, there is always a risk that substance use during adolescence (or at any other time) can have serious acute effects that may have enduring consequences.

Substance use that begins with the purpose of exploration and then escalates and becomes more a matter of coping style than of exploration represents functional discontinuity (i.e., behavior is continuous, purpose is discontinuous). This change in purpose illustrates the difficulties both of young people to regulate their experimental substance use and of researchers trying to study substance use in relation to developmental tasks. To the extent that substance use during adolescence moves beyond experimental use (e.g., in the service of various developmental tasks) and becomes more a strategy of coping, long-term negative consequences of substance use would be expected. Furthermore, as was true in regard to substance use deterring successful negotiation of developmental transitions, substance use also may deter the approach to and successful resolution of various developmental tasks. To the extent that success in resolving developmental tasks represents competence (Masten & Curtis, 2000), then some important consequences of substance use during adolescence may play out in terms of continued problems with developmental tasks.

## **Interindividual Differences in Intraindividual Variability and Change**

Issues of intraindividual variability and change and interindividual differences in such variability and change have long been defining themes of life course studies, life span development, and perhaps most explicitly developmental science (e.g., Cairns et al., 1996; Settersten, 2003). Given the common themes of dynamic person–context interactions and multidirectional change, individual differences in processes and effects of linkages across the life course

are expected. Implicit throughout much of this chapter is the notion that there are wide individual differences in the long-term consequences of adolescent substance use, partly as a function of differential experiences of continuity and discontinuity during the transition from adolescence to adulthood (Windle, 1988). Simply, what is found to be true in our research regarding the elusive normative case may not be true for many or most young people. Instead, it may be more meaningful to identify developmental types according to how constructs are found to co-vary over time within individuals (e.g., Cairns, Cairns, Rodkin, & Xie, 1998; Magnusson & Bergman, 1988; Nagin & Trembley, 2001; Schulenberg et al., 2001; Seidman, Chesir-Teran, Friedman, Yoshikawa, Allen, & Roberts, 1999).

Rapid developments in statistical modeling and software are significantly expanding the potential focus and scope of longitudinal analyses. Whereas repeated measures analyses of variance examine mean-level developmental trajectories within stable groups (e.g., male vs female), the newer generations of growth modeling procedures simultaneously estimate intraindividual time-based trajectories and test whether interindividual differences in the parameters of these trajectories are a function of time invariant and time-varying predictors (Muthén & Curran, 1997; Nezlek, 2001; Raudenbush, Bryk, Cheong, & Congdon, 2001). No longer are researchers forced by their selection of ANOVA versus regression-based approaches to focus only on mean-level group differences or on the stability of interindividual differences. By moving beyond the sole analysis of fixed between-person effects over a series of two-wave chunks of time, growth curve and variability models open up an exciting range of new questions that can now be addressed when adequate data are collected (Nesselroade & Ghisletta, 2000; Rose, Chassin, Presson, & Sherman, 2000; Stoolmiller, 1995). For example, in our use of some of the newer approaches to growth curve modeling, we have examined across-time linkages between susceptibility to peer pressure, peer alcohol use, and adolescent alcohol use (Schulenberg & Maggs, 2001) and have considered the long-term impact of trajectories of substance use during adolescence and young adulthood on mid-adult functioning (O'Malley & Schulenberg, 1997; Schulenberg & O'Malley, 1998).

Important questions about the correlates and consequences of adolescent substance use can be addressed using these new methods. For example, there are strong within- and across-time positive associations between the substance use of adolescents and that of their peers. In addition to examining whether association with deviant or substance-abusing peers in early adolescence predicts later heavy substance use, when developmental trajectories in substance use are plotted at the individual level across multiple occasions, between-person predictors of differential change patterns can be identified (Maggs & Schulenberg, 1998; Schulenberg & Maggs, 2001). Moreover, the extent to which fluctuations and changes across time in peer associations co-vary with substance use can be evaluated, asking whether adolescents engage in heavier use when they are in the company of heavier using peers. Trajectories can also be used as predictors of outcomes, for example, do adolescents who exhibit early and steep onset of substance use experience greater consequences than those who start later or increase more slowly? (For example, see O'Malley & Schulenberg, 1997.)

## CONCLUSIONS AND IMPLICATIONS

Drawing from a developmental science framework in general and life course developmental scholarship in particular, we have argued that a better understanding of developmental continuity and discontinuity provides a more realistic and fruitful basis for examining linkages

across the life course. Consistent with an organismic metamodel (Reese & Overton, 1970), developmental psychology has traditionally viewed continuity and discontinuity in terms of underlying structural/organizational change at the individual level (e.g., Werner, 1957). Consistent with a life course perspective, developmental continuity and discontinuity can be considered at the individual level, at the individual–context interaction level, and at the cultural/social level; clearly, developmental continuity and discontinuity are inextricably connected with constancy and change in one’s social contexts (Lewis, 2001; Shanahan et al., 2000) and are directly and indirectly influenced by historic trends and events.

In this final section, we briefly consider the mechanisms and conditions of long-term consequences of substance use, substantive and methodological challenges, and implications for theory and research on developmental linkages between adolescence and adulthood.

### **The Conditions and Mechanisms of Long-term Consequences**

In the substance use consequences literature, our hope is that the driving questions evolve from “are there long-term effects of adolescent substance use? and, if yes, what are they?” to “under what conditions do long-term effects occur?”

Powerful linkages across the life course are more likely to be found when there is strong continuity in functioning and adjustment, in one’s primary social contexts, in the match between individual needs and contextual affordances, in the underlying goals of adaptation, and in the specific culture and historical period. In such cases, what happens early in life may have powerful connections (though not necessarily directly causal connections) to what happens later, for better and worse. In addition, with specific regard to substance use, it is likely that adolescent substance use will have long-term consequences for adult functioning under some or all of the following conditions: (1) substances are used as a major part of one’s coping repertoire during adolescence, more than in service to various normative developmental tasks; (2) substance use contributes to life-altering accidents or other negative events (e.g., arrest), and (3) substance use is ongoing.

Thus, we argue that developmental continuity and discontinuity serve to structure and otherwise influence long-term consequences. In particular, continuity/discontinuity may function as moderators of consequences, where the greater the continuity, the stronger the anticipated consequences. Or, continuity/discontinuity may serve as intermediate steps in a causal chain, for example, substance use itself may contribute to continuity or discontinuity, which themselves are part of a web of outcomes.

### **Substantive and Methodological Challenges**

Identification of continuity and discontinuity is often a subjective and imprecise undertaking. Likewise, metaphors and definitions of developmental transitions are often complex, conceptually rich, and very difficult to define operationally. As we have discussed, developmental transitions can operate as a source of potentially long-term discontinuity, a cause of temporary fluctuations or disturbances in adjustment, or a possible conduit of continuity in functioning. Furthermore, between-person differences in the content, timing, and sequence of transitional changes such as the completion of full-time education or the transition to parenthood are great. They may vary systematically (but often in unknown and complex ways) by gender, cohort, social class, ethnicity, country, and other social contextual moderators.

Despite recent improvements in software and statistical modeling capabilities, important methodological challenges remain in the quest to document and understand the extent to which human behavior influences subsequent health and development. This is no less true in the domain of adolescent substance use. Although anecdotal evidence of tragic and irrevocable effects of substance use abound, long-term consequences of adolescent substance use often elude scientific documentation. One key challenge is to distinguish temporary perturbations from long-term cumulative and systematic change. Adjustment difficulties during major life transitions may simply represent transitory states or behaviors or they may be the first signs of continuing maladjustment. A second challenge is the selection of optimal time intervals between data collections in order to best capture phenomena that occur with variable timing, rates, and sequences for different individuals. Developmentalists have traditionally emphasized the need for longitudinal data collection over long intervals but are increasingly recognizing the complementary value of intensive data collection over shorter intervals, known as measurement bursts (Nesselrode & Schmidt, McCollam, 2000). A third set of challenges has to do specifically with substance use: many grave negative consequences (e.g., death or spinal cord injury) are very low frequency events and as such are difficult to predict statistically, resulting in low percentage of variance accounted for at the population level; likewise, individuals who suffer significant negative effects are much more likely to be lost to attrition in long-term longitudinal follow-ups (e.g., Hedeker & Rose, 2000). Fourth, even with large samples followed longitudinally (Loeber & Farrington, 1997; Offord, 1997), researchers are faced with the perennial challenge of ruling out selection effects and third variable causes. Experimental designs, the hallmark of clean conclusions regarding causal linkages, are impossible or inappropriate for many questions regarding the consequences of potentially risky human behaviors such as substance use. Finally, drawing connections between earlier behaviors and events and later potential consequences will remain one of the fundamental challenges of our science; often such connections are circuitous and indirect (e.g., Rutter, 1996) and, just as often, the connections that apply to some individuals in some contexts do not apply to all (e.g., Cairns, 2000).

### **Extending the Sample Case**

Our focus on the long-term consequences of adolescent substance use provides an important substantive vantage point for considering how developmental continuity and discontinuity relate to linkages across the life course. Obviously, much of what we have considered would apply equally well to other so-called adolescent problem behaviors. But it is also likely that the conditions and mechanisms of continuity and discontinuity operate in a similar fashion for indices of optimal development and across other major life transitions.

Nearly a half century ago, Werner (1957) concluded, "Development cannot be comprehended without the polar conceptualizations of continuity and discontinuity" (p. 137). We wish to conclude here with a similar thought: although conceptualizations of development have undergone radical changes regarding dynamic person-context interactions over the past four decades, the dialectics of continuity and discontinuity still represent the core of development.

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