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The authors' approach to using pattern-centered analyses and longitudinal data addresses how configurations of personal and contextual factors forecast the educational achievement and attainments of different youth across adolescence.

Patterns and Pathways of Educational Achievement Across Adolescence: A Holistic-Developmental Perspective

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Among those who ever attend college, the vast majority do so for the first time immediately following graduation from high school (National Center for Education Statistics, 1999). Immediate enrollment in college is an important first step in young people's completion of a college degree and enhancement of their prospects for employment and economic self-sufficiency. The choice to enroll in college is also a final step in a longer-term developmental process—one shaped during childhood and adolescence by individuals' scholastic aptitudes and achievements, the support of their families and friends, the quality of the schools they attend, and their socioeconomic circumstances.

Consistent with the aims of this volume, we provide an empirical illustration of how pattern-centered analytic techniques and longitudinal data can be used to explore how various psychological, behavioral, and contextual factors assessed in early adolescence are probabilistically associated with college enrollment rates among adolescents who complete high school. Early adolescence has consistently been shown to be an important juncture in young people's evolving educational trajectories (Carnegie Council on Adolescent Development, 1995). In an effort to complement research on factors in early adolescence that probabilistically forecast educational withdrawal prior to high school graduation (Cairns, Cairns, and Neckerman, 1989), we focus here on a positive educational outcome: college enrollment among students who graduate from high school.

The data reported here come from an ongoing longitudinal study of approximately fifteen hundred adolescents who were in seventh grade at

the outset of the study in 1991. The sample consists primarily of African American (60 percent) and white adolescents and their families living in a large county in Maryland (for details, see Eccles and others, 1997b; Roeser, Eccles, and Sameroff, 1998; and Sameroff, Seifer, and Bartko, 1997). Participating families were characterized by a wide range of socioeconomic backgrounds, but most were middle class. In 1997, youth who were academically “on time” would have graduated from high school and therefore were in a position to enroll in college. Our goal in this research was to identify subgroups of adolescents who were defined by configurations of factors in early adolescence that probabilistically forecast their subsequent decisions to enroll in college or not five years later.

Pattern-centered analytic approaches provide a good methodological fit with a view of educational achievement that is holistic and developmental in nature (Roeser and Galloway, 2002). The basic tenets of such a perspective are threefold. First, such a perspective is concerned with how multiple dimensions of individuals (demographic characteristics, multiple identities, motivation, mental health, and cognitive abilities) are associated with educational achievement and participation over time. Different adolescents are characterized by different profiles of such “person variables,” and such profiles provide insights into individual differences in educational outcomes (Snow, Corno, and Jackson, 1996). Second, such a perspective is concerned with how the manifold social environments that youth experience and co-create cultivate or thwart school-related motivation, regulatory capacity, and behavior. Understanding the differential social affordances and constraints in the family, the school, and the peer group in relation to educational outcomes among different subgroups of youth is a second important consideration in understanding individual differences in educational outcomes (Eccles, Wigfield, and Schiefele, 1998). Finally, a holistic and developmental perspective on adolescents’ educational functioning focuses on how outcomes in one developmental period are associated with those in the preceding and succeeding periods. These three ideas—what Roeser and Galloway (2002) termed the whole person, lifespace, and lifespan principles—are derived from a systems view of human development and are used to guide the present research.

The Whole Person

Adolescents’ scholastic aptitudes play an important proximal role in their educational achievement and participation. In his revised aptitude theory, Snow (1989) argued for a conception of scholastic aptitude that included not only cognitive abilities but also what he termed conative and affective processes. He defined cognitive abilities as individuals’ domain-specific procedural (such as skills) and declarative (such as facts and concepts) knowledge; conative processes as their domain-specific motivation (such as capability beliefs and interests) and volitional control; and affective

processes as temperament and emotional factors that bear on learning and achievement. Whereas cognitive abilities are instrumental in problem solving and performance on tasks once individuals engage with them, conative and affective processes are instrumental in the quality of commitment and choice individuals manifest (or do not) in relation to a task domain over time.

We operationalized scholastic aptitudes using measures of verbal and math abilities (cognitive), perceived academic competence beliefs and school-related values (conative), and mental health (affective). Adequate verbal and mathematical abilities are necessary for successful achievement in school, and positive beliefs about scholastic competence and the value of learning and education are necessary for the sustained commitment it takes to be successful in school, such as doing homework and going to class. In terms of mental health, an adequate level of well-being (and low distress) is necessary for individuals to move from a coping and self-protective mode to a learning and self-enhancement mode of functioning (Boekaerts and Niemivirta, 2000). As psychologists, we begin by identifying subgroups of adolescents based on the similarity of their aptitude profiles and then examine the sex and ethnic composition of emergent subgroups.

The Lifespace

In this section, we provide an overview of two different ways that we have used to consider the role of the social environment in adolescents' educational trajectories.

Adolescents' Social Statuses. Whole persons exist within various social strata and social worlds. For instance, sociological models of educational achievement and participation focus on how socioeconomic characteristics of adolescents' families, such as parents' level of education, occupation, and income, can affect educational attainments (Entwistle, 1990). It is well documented that adolescents of poor or less well-educated parents are significantly less likely to complete high school or go to college than are adolescents who have wealthier or better-educated parents (National Center for Educational Statistics, 1999). In this study, we replicated the usual findings that youth with parents who had some college education or less, made less money, and had less prestigious occupations were themselves significantly less likely to attend college after graduating from high school than youth whose parents were better educated, better paid, and in more prestigious jobs.

From a developmental perspective, however, these social address variables can be viewed as markers for other processes by which such statuses affect educational outcomes—processes such as parental socialization practices, quality of local schools, and peer networks (Bronfenbrenner, 1979). Consequently, although it is important to attend to social status variables, we do not give these variables a preferred status in our identification of

subgroups of youth. Rather, we focus on more proximal characteristics of adolescents' social worlds and then link these to distal socioeconomic characteristics of the adolescent's family.

Adolescents' Social Worlds. Contemporary developmental theorists view behavior and development as processes that are inextricably embedded in multiple interrelated contexts (Bronfenbrenner, 1979; Chapter One, this volume). From this perspective, the family, the school, and the peer group represent major catalysts for development insofar as these settings invite, permit, or inhibit youths' engagement and participation in progressively more complex interactions with their environment. Instantiating Magnusson's concept of synchronization (Chapter One, this volume), Bronfenbrenner (1993) differentiated "constructive" from "destructive" environments in terms of their developmental significance. Constructive environments consist of people and activity settings that foster a sense of inclusion and safety, scaffold processes of autonomous exploration and skill development, and invite increasingly more central participation in complex activities. Destructive environments undermine safety, exploration, and progressive participation.

Eccles and Midgley (1989) articulated a similar theoretical perspective in attempting to explain the long-standing observation that early adolescence is an educational turning point, with some youth showing continued engagement with school (leading toward high school completion) and others showing increasing school disengagement (sometimes leading to school withdrawal). They suggested that young adolescents need (1) non-comparative, noncompetitive settings in which to develop their competencies given their increased self-consciousness about their abilities; (2) opportunities for decision making given their burgeoning intellectual capacities, physical maturation, and desire for autonomy; and (3) supportive relationships with nonparental adults and peers given their needs to discuss the life changes they are undergoing and to establish some emotional autonomy from parents.

Similar to Bronfenbrenner's notion (1993) of constructive affordances, Eccles and Midgley (1989) suggested that family environments characterized by autonomy, support, warmth, and clear structure rather than excessive parental control provided a particularly good developmental fit with early adolescents' needs and thus were instrumental in fostering and maintaining academic motivation, mental health, and achievement. Highly controlling family settings were characterized as providing a developmental mismatch and were thought to undermine motivation, mental health, and consequently, achievement. Similarly, Eccles and Midgley (1989) suggested that school environments that emphasized personal improvement and mastery, student autonomy, challenging tasks, and personalized teacher-student relationships were developmentally constructive and facilitative of positive academic and social-emotional development. Conversely, they argued that young adolescents usually encounter a junior high school in which there is

an emphasis on social comparison and competition, teacher control, unengaging tasks, and student anonymity. They posited that it was this mismatch of school and young adolescents' needs that could explain, in part, declines in their academic and social-emotional functioning during this stage. Consistent with these ideas, we examine how young adolescents' home and school environments, conceptualized as developmentally appropriate (constructive) or inappropriate (destructive), are related to proximal patterns of academic motivation, mental health, and achievement in early adolescence, as well as distal educational decisions in late adolescence.

A holistic developmental perspective also affords an important role for peers in the shaping of academic life paths through adolescence. The decision to try hard in school or to skip school are examples of decisions over which peers have increasing influence across adolescence—decisions that can accumulate and contribute to downstream educational consequences (Berndt and Keefe, 1995). Because maintaining ties with one's peer group is so salient during adolescence, we assume that friends' values and the influence they exert over one another as a function of these values is another key mediator of educational pathways during adolescence. Thus, we include in our analyses adolescents' reports of the extent to which their peers espouse proeducational or school-alienated values.

One contribution to traditional developmental psychological perspectives is the central emphasis that personality and social psychologists place on individuals' construals of their social worlds. These construals, more so than so-called objective measures of environments, correspond to the psychologically active features of the situation and are functionally potent predictors of beliefs, feelings, and behavior (Lewin, 1936; Shoda, Mischel, and Wright, 1994). Thus, we emphasize adolescents' subjective perceptions of their home, school, and peer contexts and relate these to their contemporaneous cognitive and motivational aptitudes and achievement, as well as their subsequent educational decisions. (We have examined how adolescents' social context construals are related to their parents' views of these same contexts in Roeser, Peck, Eccles, and Sameroff, 2001.) We expected and found that adolescents' aptitudes and perceptions of their social worlds cohere in two specific ways: constructive environments are positively associated, and destructive environments are negatively associated, with scholastic aptitudes, achievement, and college attendance rates.

The Lifespan: Early Adolescence as Turning Point

We focused on early adolescence (ages ten to fourteen) because this is an important period in the lifespan for evolving patterns and pathways of educational achievement and participation (Carnegie Council on Adolescent Development, 1995). We know that youth who show problematic school motivation and achievement in early adolescence are more likely to experience a host of downstream problems in late adolescence, such as school

withdrawal, drug use, antisocial behavior, and pregnancy (see Dryfoos, 1990). Other studies have shown that the middle school years are, for many youth, marked by continuing patterns of academic success, social and emotional well-being, and subsequent educational achievement (Eccles and others, 1997b; Simmons and Blyth, 1987). Relatively few studies to date, however, have gone beyond assessing population-level patterns of change in educational functioning in early adolescence to focus on the educational trajectories of subgroups of youth. In this chapter, we use pattern-centered analyses to examine the idea that early adolescence is an educational turning point by examining how functioning among distinct subgroups of young adolescents relates to subsequent rates of college attendance.

Stages in Pattern-Centered Analyses

In this section, we describe briefly the six-stage process of pattern-centered analyses (PCAs) we used to instantiate a holistic-interactionistic (see Chapter One, this volume) exploration of academic achievement (see Table 3.1). In Stage 1, we determined which variables to use in identifying subgroups of individuals. We clustered individuals on psychological variables, such as aptitudes, and validated cluster solutions on behaviors, such as achievement. The selection of a parsimonious yet potent set of variables on which to cluster individuals is essential for maximizing the interpretability of clusters (see Chapter Two, this volume; Meehl, 1992). We used variable-centered factor-analytic techniques to reduce our first-order constructs to a small number of higher-order constructs.

Stage 2 involved the empirical identification of subgroups. We standardized our variables at the sample level within each wave of data and then used cluster analyses (with Ward's method and squared Euclidean distance as the measure of similarity) to identify subgroups. We determined which cluster solutions to retain for analysis based on considerations of within-group homogeneity and between-group heterogeneity, parsimony, the face validity of the solution, concurrent and predictive validity, and cross-time replicability of cluster solutions.

In Stage 3, we cleaned and condensed the clusters. In one case, we eliminated a cluster group that did not exhibit a theoretically meaningful pattern. Such "unclassifiable cases" are found in most samples (Bergman, 2001). Depending on our analytic focus, we also aggregated first-order, narrowband clusters into higher-order, broader-band clusters. This is similar to the practice of using higher-order factor analyses to aggregate first-order constructs into higher-order composites and thus to manage aspects of data complexity.

In Stage 4, we explored the discriminant and cross-informant validity of the cluster solutions in terms of theoretically related variables that were not used to form the clusters (Aldenderfer and Blashfield, 1984). Toward this end, we included measures collected from the consequential adults in

Table 3.1. Stages in Our Approach to Pattern-Centered Analyses

<i>Stage 1</i>	<i>Stage 2</i>	<i>Stage 3</i>	<i>Stage 4</i>	<i>Stage 5</i>	<i>Stage 6</i>
Selection of variables via theory • Education • Motivation • Development	Identification of clusters • Persons • Situations	Condensation of clusters into configurations • "Self Types" ^a • "Social Worlds" ^b • "Lifespaces" ^c • Persons by contexts ^d	Validation of clusters and configurations • Behavior • Cognitive abilities • Noncluster variables • Multiple raters • Multiple time points	Demography of clusters and configurations • Social class • Race • Sex	Longitudinal probabilistic associations • Point to point • Pathways • Lifespace analyses • Prodigal analyses

^aClusters of individuals identified based on psychological variables.

^bClusters of individuals identified on the basis of their perceptions of their families, school, and peer groups.

^cConfigurations of individuals identified by their "self type" crossed with their "social worlds" type.

^dTypes that add more information about social context from other informants.

adolescents' lives, such as their parents and teachers, to "validate" clusters created from adolescent self-report measures.

In Stage 5, after we had identified clusters of individuals based on their construals of salient psychological features of their various social contexts, we examined the distribution of demographic characteristics within and across the clusters.

Finally, in Stage 6, we examined the predictive validity of our clusters by linking them to long-term outcomes of interest. For example, in one such time-point-to-time-point analysis, we identified "types" and "anti-types" of individuals in early adolescence who were most and least likely to enroll in college in early adulthood (see Chapter Two, this volume; Cairns and Rodkin, 1995). In a second kind of analysis, referred to as pathway analyses, we examined continuity and change in patterns of functioning over time in relation to the outcome. This provides information on typical and atypical pathways from starting to end point. In a third kind of analysis, referred to as lifespace analyses, we examined how configurations of person and situation variables at one time relate to later developmental end points. Finally, each of these three approaches can be used in conjunction with prodigal analyses (Cairns and Rodkin, 1995). Prodigal analyses focus on why different individuals characterized by the same configuration at one point in time sometimes arrive at different developmental end points later in time.

Pattern-Centered Analyses

This section provides empirical illustrations of each of these different kinds of pattern-centered analyses in relation to adolescents' educational outcomes and trajectories: time-point-to-time-point, pathway, and lifespace analyses.

Point-to-Point Analysis. In the first analysis, we examined differential rates of college enrollment (the developmental end point) among subgroups of youth characterized by different patterns of scholastic aptitudes at seventh grade (the starting point). Our analysis followed the stages laid out in Table 3.1. Based on theory and prior research (Stage 1), we began by clustering youth into groups based on their pattern of self-reported academic motivation and mental health (aptitudes) during seventh grade (Stages 2 and 3). We then validated these so-called self or aptitude clusters by comparing them on other measures of academic and social and emotional functioning, including prior tests of verbal and mathematical ability, parent-reported rates of poor performance or failure in school, concurrent standardized test scores and teacher-rated grades, and adolescent self-reported future educational plans and self-esteem (Stage 4). We then described the demographics of youth in each cluster (Stage 5). Finally, we linked seventh-grade cluster memberships to later college enrollment decisions (Stage 6).

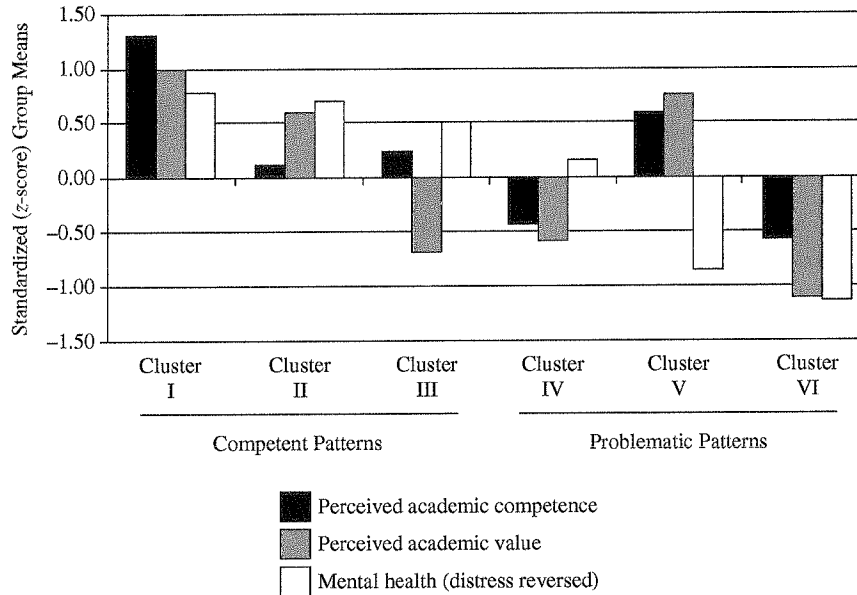
The clustering measures used included standardized z-scores of adolescents' conative and affective characteristics—specifically their perceived

academic competence, perceived value of school, and symptoms of emotional distress (see Roeser, Eccles, and Sameroff, 1998, for details). The six-cluster solution retained at seventh grade is presented in Figure 3.1 (Stage 3). (The emotional distress scale was reverse coded and labeled mental health for clarity of visual presentation.) The graph portion of the figure presents z -score means on the clustering variables by subgroup. Adolescents characterized by the first three self patterns (I through III) all showed above-average mental health, indicated by an absence of emotional distress, compared to the latter three subgroups. In addition, youth in these subgroups showed above-average (Cluster I) to average (Clusters II and III) perceived academic competence, and either above-average (Clusters I and II) or below-average (Cluster III) valuing of school. In contrast, youth in the last three self-patterns were characterized by poor motivation to learn (Cluster IV), poor mental health (Cluster V), or both (Cluster VI).

Results of the cluster validation analyses are presented in the table at the bottom of Figure 3.1. ANOVAs with Tukey's post hoc tests revealed a linear decrease in self-esteem from Clusters I to VI. Rates of academic failure also differed across these subgroups, with higher rates found among the poor academic motivation (Cluster IV) and the multiple problems (Cluster VI) youth. Youth in these two clusters also had lower educational expectations than the others; they expected to attend a two-year college, on average, whereas youth in the other clusters all expected to graduate from a four-year college, on average. Although not presented in the table, we also examined group differences in verbal and math abilities as measured by standardized California Achievement Tests administered during adolescents' third and fifth grades in elementary school. We found group differences in both verbal [language and reading subtests; $F(5,759) = 5.99$, $p < .01$] and mathematical [$F(5,759) = 7.42$, $p < .01$] ability. Youth in Cluster III (average competence, low school value) and Cluster I (multiple assets) had the highest verbal and math abilities; adolescents in Cluster IV (poor academic motivation) had the lowest scores, followed by those in Cluster VI (multiple problems). Cluster II (average competence and high value) and Cluster V (poor mental health only) showed average levels of verbal and math ability. Further analyses revealed that Maryland standardized math test scores and teacher-rated final grades in the core academic subjects differentiated the subgroups in the same way. Youth in Clusters III and I had the highest test scores and school grades (average was B); whereas youth in Cluster IV (poor academic motivation) had the lowest test scores and school grades (average was C) followed by those in Cluster VI (multiple problems; their GPA was C+). Clusters II and V showed average levels of school achievement.

Next, we examined how cluster membership was associated with adolescents' demography (Stage 5). A significant relation was found between cluster, sex, and race [$\chi^2(15, 936) = 31.65$; $p < .01$]. An examination of the adjusted standardized residuals for each cell of the cross-tabulation ($p < .05$;

Figure 3.1. Seventh-Grade Self Patterns: Validation and Relation to College Enrollment



Self-esteem	4.14 ^a	4.03 ^{ab}	3.75 ^b	3.34 ^c	3.30 ^c	2.90 ^d	F(5,951) = 54.65**
Fail or do poorly in a class	10% ^a	15% ^a	19% ^a	47% ^c	22% ^{ab}	34% ^{bc}	F(5,852) = 13.39**
Seventh-grade math achievement test	338 ^a	325 ^{bc}	335 ^{ab}	313 ^d	325 ^{bc}	324 ^c	F(5,785) = 9.84**
Seventh-grade GPA	3.11 ^a	2.73 ^{bc}	2.85 ^{ab}	2.08 ^d	2.69 ^{bc}	2.47 ^c	F(5,897) = 20.37**
Eighth-grade GPA	3.03 ^a	2.69 ^{bc}	2.83 ^{ab}	2.34 ^d	2.70 ^{bc}	2.47 ^{cd}	F(5,800) = 9.29**
Seventh-grade educational expectations	7.51 ^a	7.05 ^a	7.26 ^a	6.12 ^b	7.09 ^a	6.50 ^b	F(5,930) = 14.05**
College enrollment(% yes)	79 ^t	74 ^t	76	50 ^{at}	65	60 ^{at}	$\chi^2(5,640) = 25.62**$

Note: Self-esteem: 1 = unhappy with self, 5 = very happy with self. Seventh- and eighth-grade grade point averages were obtained from school records and are on a four-point scale: 0 = F, 1 = D, 2 = C, 3 = B, 4 = A. Educational expectations: 6 = two-year college; 7 = four-year college, 8 = advanced degree.

Groups that do not share a superscript of *a*, *b*, *c*, or *d* are significantly different from one another at the .05 (two-tailed) level using Tukey's highly significantly different comparisons for all possible pairs.

Groups denoted by the *t* and *at* superscripts are types and antitypes, respectively and are significant at the .05 (two-tailed) level using adjusted standardized residuals.

p* < .05; *p* < .001.

observed/expected count) revealed that white females were equally represented in all self-patterns; black females were overrepresented in the poor mental health-only group (Cluster V); black males were underrepresented in the multiple problems group (Cluster VI); and white males were overrepresented in the low valuing of school group (Cluster III).

A significant relation between subgroup membership and parental education was also found [$\chi^2(15, 917) = 52.83; p < .01$]. Youth in Cluster III (average competence and low school value) were most likely to have parents with four-year college and graduate degrees. In contrast, youth in Cluster II (average competence and high value) and Cluster IV (poor academic motivation) overrepresented families in which parents were the least well educated (the average was a high school diploma or less). Youth in the poor mental health (Cluster V) and multiple problems (Cluster VI) groups were overrepresentative of families in which the head of household, on average, had some college. Cluster I (multiple assets) youth came from families that represented the full spectrum of educational attainments; there was no one educational background that was over- or underrepresented in this subgroup. Finally, it is important to realize that despite these relatively higher- or lower-than-expected frequencies, sizable numbers of youth from every demographic status were present in every cluster group.

In the next stage of this analysis, we assessed the long-term educational outcomes for the seventh-grade clusters (Stage 6). The figures in the table portion of Figure 3.1 show that youth in Clusters I (multiple assets) and II (positive valuing of school) were significantly more likely than predicted by chance to attend college after graduating from high school. In contrast, youth in Clusters IV (poor academic motivation) and VII (multiple problems) were significantly less likely to do so. Youth in Clusters III and V attended at rates expected based on the marginal frequencies.

Pattern-centered analyses afford interesting opportunities for cross-cluster comparisons in which one assesses how individuals with different starting points end up at the same developmental outcome (equifinality) and how those with similar starting points end up at different outcomes (multifinality). Equifinality is exemplified by comparing youth in Clusters II and III; both groups show rates of college enrollment of around 75 percent, but this is an unexpectedly high rate for Cluster II. Youth in Cluster II overrepresent families in which the head of household has a high school diploma or less. In comparison, youth in Cluster III are more likely to be white males from the wealthiest families, with parents who are well educated (for example, they hold an advanced degree). What accounts for the fact that black and white males and females from households where parents had a high school diploma or less enrolled in college at rates similar to those who were predominantly white, male, and from relatively advantaged backgrounds? How did Cluster II youth develop such positive educational values, expectations, and eventual attainments? These are the kinds of follow-up questions we are pursuing.

Multifinality is exemplified by comparing youth in Clusters II and IV; both subgroups are characterized by an overrepresentation of parents who have high school diplomas or less, a factor usually associated with lower college attendance rates (National Center for Educational Statistics, 1999). This general pattern is confirmed by Cluster IV members, who are less likely to enroll in college after the completion of high school, but disconfirmed by

their Cluster II peers from a similar background who actually are more likely to enroll in college than predicted. Clusters II and IV youth did not differ in terms of their verbal and math abilities, but they did differ in their academic motivation, long-term educational plans, achievement, and self-esteem in middle school. It appears that motivation, mental health, and school achievement factors (but not social status or cognitive abilities) differentiate these groups in middle school and thus perhaps account for their educational choices over the longer term. But what is the source of this academic motivation, well-being, and achievement in middle school?

PCAs can also reveal resilient as well as optimal patterns of functioning. For instance, the fact that attendance rates for Cluster V youth are no less than expected by chance is substantively interesting in that, based on previous research, youth with poor mental health in early adolescence might have been expected to be less likely to enroll in college after high school (Kessler, Foster, Saunders, and Stang, 1995). One wonders about the source of this educational resilience. In terms of optimal functioning, Cluster I youth accomplished higher-than-expected college enrollment rates (almost 80 percent went on to college). These youth all had positive motivation, esteem, and achievement in middle school and were not under- or overrepresentative of any particular sex, race, or parental educational level. Given the social status and ethnic diversity of this subgroup, one wonders how features of their social worlds might have played a role in their attainments.

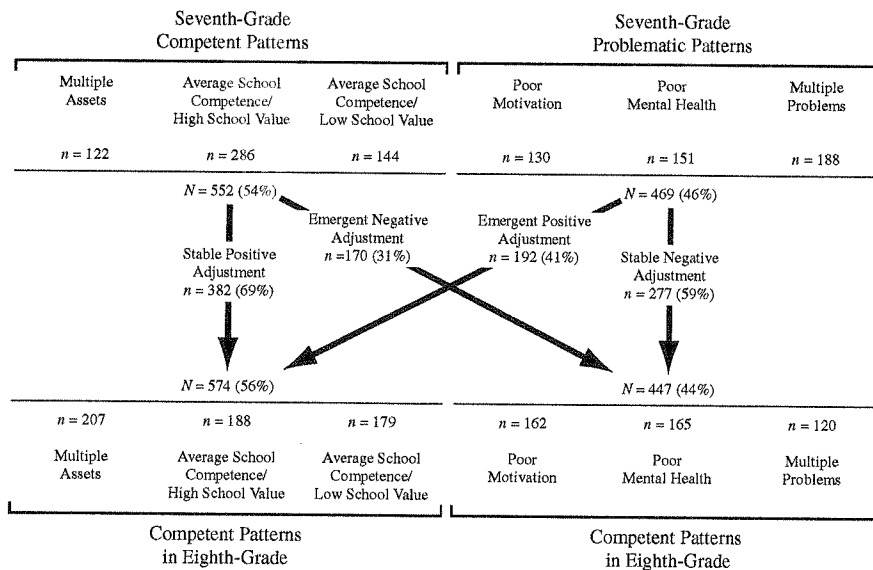
Pathway Analyses. An extension of the point-to-point analysis involves an exploration of the pathways of functioning that eventuate in enrollment in college or not among different youth. In this study, we defined pathways in terms of adolescents' cross-time change or continuity in patterns of functioning from seventh to eighth grade (near-term pathways) and the link of near-term pathways to the later choice to enroll in college or not (long-term pathways). First, we reclassified adolescents into subgroups at the end of eighth grade using the same cognitive and affective measures used at seventh grade. We again found the same six patterns identified at seventh grade (Roeser and Peck, 1999). Next, we linked cluster membership at seventh and eighth grades. We began by creating two broadband self patterns at each time point by aggregating the three relatively competent (Clusters I through III) and the three relatively problematic self patterns (Clusters IV through VI) together into overarching competent and problematic patterns, respectively. (It is important to note that the more narrowband cluster membership information is not lost in this aggregation, but only backgrounded temporarily. Strategically aggregating and disaggregating, folding in and unfolding the data in this way, can allow for the pursuit of complex developmental questions in a parsimonious fashion.)

Seventy percent of those youth who were classified as having a competent pattern at the beginning of seventh grade were similarly classified at

the end of eighth grade (see Figure 3.2). The stability for those showing the initially problematic pattern was 60 percent. Thus, approximately two-thirds of the adolescents in this sample showed intraindividual (broadband) stability in their academic and social-emotional functioning over time, whereas one-third showed some pattern of change during middle school.

Two analyses were conducted to link near-term pathways of functioning in middle school to later college enrollment decisions. First, we added up the number of “good” years that adolescents had in middle school (0–2) and related this to college enrollment rates while controlling for adolescents’ verbal and math ability (combined California Achievement Tests) and socioeconomic status (SES; a composite of parental education, occupational status, and income). Results of the ANCOVA showed that ability [$F(1,475) = 71.18; p < .01; \eta^2 = .06$], SES [$F(1,475) = 33.30; p < .01; \eta^2 = .05$], and the number of good motivation and mental health years in middle school [$F(2,475) = 11.10; p < .01; \eta^2 = .05$] were all related to later college enrollment decisions. The eta squares for each effect reveal that the ability, self pattern, and SES variables all have equal relative predictive relations with the outcome. The unadjusted rates of college enrollment for adolescents with zero, one, or two good years in middle school were 48 percent, 66 percent, and 80 percent, respectively (all significantly different from one another). The corresponding rates adjusted for

Figure 3.2. Continuity and Change in Self Pattern Across Middle School



Note: N = 1,021 continuous seventh- to eighth-grade sample.

verbal and math ability and SES were 53 percent, 66 percent, and 77 percent, respectively.

In a second analysis, we unfolded the aggregated broadband clusters at seventh grade back into the six narrower-band clusters (see Figure 3.1). We then assessed how these starting points at seventh grade were linked (or not) to pathways toward college enrollment. This analysis extends and complements the point-to-point analysis by adding information on continuity and change in functioning over a two-year period in middle school. In Table 3.2, we present those pathways that were probabilistically more (that is, typical) and less (that is, atypical) likely based on the seventh-grade starting patterns.

Among those who began seventh grade with one of the three competent patterns (see Figures 3.1 and 3.3a), a significant relation was found between starting pattern and Pathways 1 through 4 [$\chi^2(6,324) = 29.12; p < .01$]. Youth in Cluster I (multiple assets) were overrepresented on Pathway 1 (college after two “good” middle school years); youth in Cluster III (low school value only) were overrepresented on Pathway 2 (college after a good, then a bad, year) and, to a lesser degree, Pathway 4 (no college after a good then bad year). No particular cluster was associated with improbable Pathway 3 (no college after two “good” years), and no particular pathway was associated with improbable Cluster II (college enrollment among youth whose parents are high school educated or less).

For those who began seventh grade with one of three problematic patterns (see Figures 3.1 and 3.3b), a significant relation was found with Pathways 4 to 6 [$\chi^2(6,267) = 17.67; p < .01$]. Adolescents in Cluster IV

Table 3.2. Summary of Linkages Between Seventh-Grade Pattern of Functioning and Long-Term Pathways to College Enrollment or Not

<i>Seventh-Grade Cluster Description</i>	<i>Long-Term Pathways</i>	
	<i>Overrepresentation (Typical Pathways)</i>	<i>Underrepresentation (Atypical Pathways)</i>
<i>Competent self patterns</i>		
Cluster I: Multiple assets	Pathway 1	Pathways 2 and 4
Cluster II: Average competence, high value		
Cluster III: Average competence, low value	Pathways 2 and 4	Pathway 1
<i>Problematic self patterns</i>		
Cluster IV: Poor academic motivation	Pathway 8	Pathway 5
Cluster V: Poor mental health	Pathway 5	Pathways 6 and 8
Cluster VI: Multiple problems	Pathway 6	Pathway 5
<i>Unexplained</i>		
Cluster ? ^a	Pathways 3 and 7	

Note: Results are based on adjusted standardized residuals for cross-tabulation of Clusters I through III by Pathways 1 through 4; and for Clusters IV through VI by Pathways 5 through 8. Adjusted standardized residuals of $|1.65|$ were considered significant.

^aThe “?” refers to the fact that no identified cluster was probabilistically associated with Pathways 3 and 7.

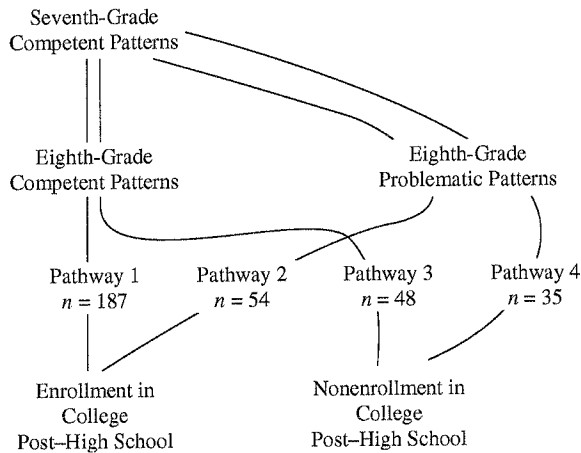
(poor academic motivation) were overrepresented on Pathway 8 (no college after two “bad” middle school years). Adolescents in Cluster V (poor mental health) were overrepresented on Pathway 5 (college after emergent positive functioning in middle school). Surprisingly, adolescents in Cluster VI (multiple risks) were overrepresented on Pathway 6 (college after two “bad” years). Understanding what turned these youth around after two difficult years in middle school is an interesting study we plan to pursue in the future.

Lifespace Analyses. In order to add contextual information to these analyses of individual-level functioning, we next turned to an examination of how adolescents with different sets of experiences in their home, at school, and with peers differed in their near functioning and subsequent educational decisions. To do this, we used the two broadband (positive and problematic) self patterns at the end of eighth grade as proxies for near-term functioning. We then created social world clusters based on adolescents’ perceptions of their home, school, and peer contexts at the end of eighth grade. These social world clusters were crossed with the broadband self patterns to create “lifespace configurations,” or person-in-context configurations (see Table 3.1, Stages 2 and 3). These configurations were then related to subsequent educational decisions (see Table 3.1, Stage 6).

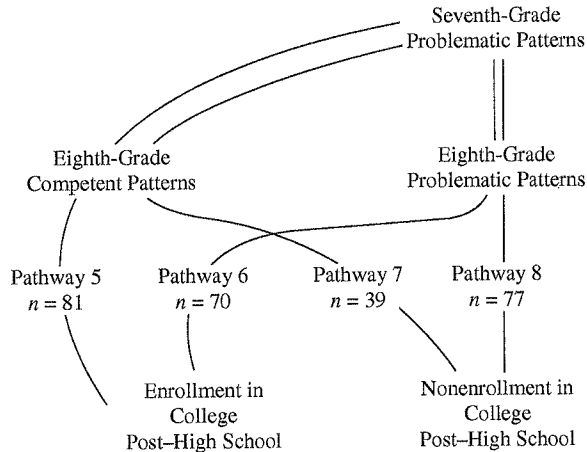
Based on higher-order factor analyses and our theoretical perspective on constructive and destructive contexts, we created two scales for each context (home, school, peers) that reflected salient constructive or detrimental psychological features of these environments in terms of adolescents’ academic motivation, achievement, and mental health (see Table 3.1, Stages 1 and 2). (Both the first- and higher-order scales we describe are statistically reliable: Cronbach’s alpha > .75.) Constructive family settings were assessed using adolescents’ perceptions of the cognitive components of Baumrind’s authoritative parenting style (1971). This higher-order measure indexed adolescents’ reports that their parents explained rules, elicited their opinions on family matters, and included them in decision making. Detrimental family settings were assessed in terms of authoritarianism at home. This higher-order composite included youth reports of strict rules, harsh parental punishment techniques, such as yelling and hitting, and a general sense that parents were overly controlling and critical. Constructive middle school contexts were assessed using an aggregate score of adolescents’ reports of their school as focused on mastery, effort, and improvement; providing opportunities for student choice and voice in the classroom; offering meaningful curricula; and having emotionally supportive teachers (Maehr and Midgley, 1991). To assess detrimental middle school contexts, we aggregated adolescents’ perceptions of their school as focused on social comparison and differential treatment of students by their ability, sex, or race. We conceived of this as a controlling, “status-oriented” culture that was ill matched with early adolescents’ needs. To assess the peer context, we asked adolescents to report on the extent to which their friends were characterized by conventional behaviors and values

Figure 3.3. Short- and Long-Term Educational Pathways

a. Pathways of Functioning from Middle School to College Enrollment or Not: Competent Starting Patterns



b. Pathways of Functioning from Middle School to College Enrollment or Not: Problematic Starting Patterns



Source: Center for Community-Service Learning, California State University, Northridge. Reprinted by permission.

that included doing well in school and aspiring to attend college (constructive) and by less conventional behaviors such as skipping school and stealing (for destructive behaviors, see Jessor and Jessor, 1977).

Cluster analyses were again used to identify subgroups of early adolescents with different profiles of social worlds. An eight-cluster solution was retained. For reasons of parsimony and theoretical clarity, we later condensed this to a five-cluster solution (see Table 3.1, Stage 3). The first cluster was labeled “positive worlds” and contained 46 percent of the sample. Youth in this

group reported constructive homes, schools, and friends. The second cluster was labeled “stressed family/positive friends” because the outstanding characteristic of this pattern was a mixture between an authoritative and an authoritarian home and conventional peers. This group contained 10 percent of the sample. The final three clusters (III, IV, and V) were all characterized by above-average scores on the destructive family scale, below-average scores on the constructive school scale, and below-average scores on the constructive peers scale. These three clusters represented 12 percent, 31 percent, and 11 percent of the sample at eighth grade, respectively. Cluster III was distinguished primarily by family risks, Cluster IV was distinguished by both family and school risks, and Cluster V was distinguished by risks in all three social worlds.

To create eighth-grade lifespace configurations, we crossed the two broadband aptitude patterns with the five social world patterns (see Table 3.3). The resulting configurations reflect a strong and systematic statistical relation between self and context patterns [$\chi^2(4,882) = 230.83; p < .01$]. Adolescents with a competent self pattern were overrepresented in context Cluster I and described as having a positive lifespace configuration (PLC). Conversely, according to the bottom-right quadrant of the table, youth with problematic self patterns were overrepresented in context Clusters III, IV, and V (characterized by family, school, and peer risks). The increasing size of the standardized residuals in these cells indicates that as the number of subjectively experienced detrimental social contexts increases, so too does the overrepresentation of youth reporting academic and mental health problems (Sameroff, Seifer, and Bartko, 1997). We collapsed all of these youth into a single higher-order group labeled collectively as those with a negative lifespace configuration (NLC). Together, these results support the notion that constructive environments and scholastic aptitudes cohere and that destructive environments and academic and social-emotional problems cohere. Note also, however, that Table 3.3 reveals the existence of two “off-diagonal” subgroups that represent antitypes. In the upper-right-hand quadrant are youth who report consistently positive social worlds but nonetheless feel alienated from self and school (“vulnerable lifespace configuration”). In the bottom left-hand quadrant are youth who report relatively positive academic and social-emotional functioning yet difficult home and school or peer contexts (“resilient lifespace configuration”).

Next, we examined the high school dropout (7 percent), high school graduation without college enrollment (27 percent), and college enrollment (67 percent) rates among youth for whom we had complete data from eighth grade through post-high school. Although there was considerable sample attrition, this latter statistic was identical to the national average for that year (National Center for Educational Statistics, 1999). We found an overall significant relation between eighth-grade lifespace configuration and the early adult outcomes [$\chi^2(6,442) = 48.22; p < .01$]. Youth with a PLC were less likely to drop out of the study, drop out of high school, or graduate from high school and not go on to college. They were overrepresentative of those

Table 3.3. Crossing Broadband Self Patterns by Social World Patterns at Eighth Grade: Chi Square Results, Observed Counts, and Standardized Residuals

Social World Patterns	Percentage of Sample	Broadband Self Patterns	
		Competent Patterns (n = 580)	Problematic Patterns (n = 464)
		N _{obs} (Standardized Residual)	N _{obs} (Standardized Residual)
Pattern I: Positive worlds	46%	321 (6.3*)	89 (-7.0*)
Pattern II: Stressed family, positive friends	11%	63 (1.0)	37 (-1.2)
Pattern III: Family risks	19%	69 (-2.7*)	103 (3.0*)
Pattern IV: Family and school risks	11%	25 (-3.8*)	71 (4.3*)
Pattern V: Multiple risks	12%	9 (-6.4*)	95 (7.1*)

$\chi^2 (4, N = 882) = 230.83, p \leq .001$

Note: Values denoted by the asterisks indicate types (where the value is positive) and antitypes (where the value is negative) and are significant at the .02 (two-tailed) level using adjusted standardized residuals.

who graduated and did enroll in college, however. Youth with an NLC showed the opposite trends. Among those for whom we had outcome data in these two configurations, 81 percent of those with a PLC, and only 44 percent with an NLC, attended college. Vulnerable (60 percent) and resilient (70 percent) youth were not more or less likely to enroll in college than expected by chance. These results show a five-year longitudinal relation between aptitudes and social experiences in middle school and later educational outcomes. Perhaps more interesting than this evidence for developmental continuity are subgroup analyses revealing discontinuities between eighth-grade lifespace configurations and early adult outcomes.

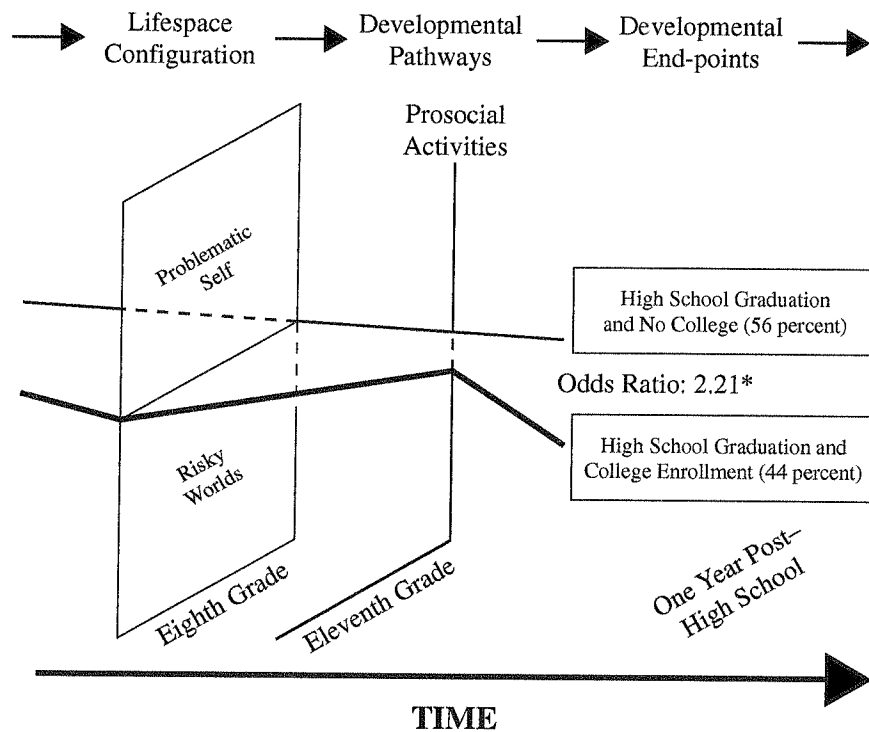
Prodigal Analyses. We used a prodigal analysis to examine why 56 of the 126 youth who seemed to have everything going wrong in their lives during eighth grade (NLC) nonetheless graduated from high school and enrolled in college despite the improbability of this outcome. What factors were behind this prodigal pathway? Univariate *t*-test and cross-tabulation analyses revealed some initial differences on income: youth with an NLC in middle school who were in wealthier families, compared to those from poorer families, were more likely to enroll in college later. Thus, material resources seem to have been one important factor.

Drawing on research that has documented the positive effects of youth involvement in extracurricular activities on educational outcomes, especially among youth facing other risks in their lifespace (Eccles and Roeser,

1999), we examined the role that activity involvement might play in positive educational outcomes among some of the NLC youth. We assumed that adolescents' involvement in positive activities such as hobbies, organized sports, volunteer work, church activities, the arts, and clubs could help develop their skills, motivation, and positive peer associations, as well as connect them with nonparental role models (McLaughlin and Irby, 1994). Developing these assets could deflect some of the NLC youth away from dropping out of high school or not enrolling in college after high school graduation.

Using a sum score of eleventh-grade youth activity involvements in a hierarchical logistic regression analysis, we examined the unique effect of activity involvement on the decision to enroll in college after controlling for NLC youths' race, sex, family income, parental education, and prior achievement (see Figure 3.4). After accounting for the demographic factors (none of which was significant in the final model), we found that NLC

Figure 3.4. Prodigal and Typical Pathways for Youth with a Negative Lifespace Configuration in Middle School: Deflection from Typical Pathway by Activity Involvement at Eleventh Grade



Note: Controlling for sex, race, parental education, family income, and eighth-grade grade point average.

* $p < .05$.

youth who were a standard deviation or above on the activity involvement scale were more than twice as likely to enroll in college than other NLC youth. Provisions for safe, productive, after-school activities appear important for getting youth who are alienated and live in alienating worlds to stay on track educationally (McLaughlin and Irby, 1994). A prodigal analysis of PLC youth revealed similar effects of negative life events on PLC youth. We are now extending these analyses by examining the educational outcomes of youth who appear vulnerable despite constructive social worlds and resilient despite destructive social worlds.

Conclusion

The purpose of this chapter was to demonstrate the utility of pattern-centered analytic techniques for addressing complex developmental questions. In particular, we were interested in understanding how configurations of factors in early adolescence, an important period in evolving educational life paths, might probabilistically forecast educational choices made early in adulthood among an economically diverse sample of African American and white adolescents and their families. Consistent with the metatheoretical assumptions underlying the use of pattern-centered analyses (for example, that the whole is greater than the sum of the parts), we drew holistically on social-demographic (for example, social status), social-contextual (for example, social world), psychological (for example, aptitude), and behavioral (for example, achievement) variables to understand different patterns and pathways of educational achievement among distinct subgroups of adolescents over time.

Results revealed that a diversity of individual and social-experiential patterns of processes in early adolescence are associated with youths' subsequent choices to participate in higher education. These results corroborate the voluminous research on how parents' socioeconomic capital, that is, their educational background, income, and occupation, predicts the educational attainments of their children. Youth from poorer or less well-educated families went on to college at lower rates. However, once we introduced notions of aptitude and social worlds into the mix of predictive factors, these apparently commonsense relations of socioeconomic status variables to outcomes did not always hold. For instance, our point-to-point analysis of the relation between patterns of aptitudes and demographic factors in seventh grade and subsequent college enrollment decisions five years later revealed that some youth (Cluster II) with positive motivational and cognitive aptitudes whose parents were not college educated could go on to college at rates equal to those of a group of predominantly white and male adolescents whose parents were well educated and wealthy (Cluster III). Furthermore, we found that youth with relatively high levels of emotional distress in early adolescence could also go on to college at expected rates if they managed to maintain their commitment to education and sense of academic competence. Finally, the

youth with multiple assets, that is, those with the greatest rates of college enrollment, who were characterized by positive motivation, mental health, and achievement, represented youth from across the SES spectrum. These findings run counter to those that suggest that SES and mental health variables have rather deterministic relations to educational outcomes, and they also provide evidence that academic motivational processes have important implications for long-term educational attainments.

In our analysis of near- and far-term pathways linking middle school functioning to later college enrollment decisions, we found evidence that SES, cognitive ability, and affective and cognitive factors in early adolescence all contributed equally and additively to the prediction of who later would go on to college. Furthermore, if the period of early adolescence is a turning point for educational life paths, it is a period of complex turnings. Some youth who had two bad years in middle school nonetheless recovered and went on to college, and some with two good years in middle school did not. Although these were atypical patterns and the more typical finding was continuity in functioning from middle school to post-high school, these off-diagonal subgroups nonetheless raise interesting and important developmental questions about resilience and change in human life paths over time. What processes can turn youth with difficulties around or deflect those with many strengths from realizing their potential?

We addressed these kinds of questions in relation to how different lifespace configurations among different subgroups of youth in early adolescence were associated with different rates of college enrollment in early adulthood. As predicted, we found that youth who reported constructive social environments at home, in school, and with friends were also more likely to show positive motivational and cognitive aptitudes, near-term educational achievement, and college enrollment after high school. We also found that youth with poor academic motivation, mental health, and achievement in early adolescence were more likely to report developmentally detrimental social spheres of experience with families, schools, and peers. As expected, these youth were less likely to enroll in college after high school. This suggests substantial coherence between academic and socioemotional functioning and the nature of the social environments that youth experience at home, in school, and in the after-school hours.

What was perhaps most interesting in these lifespace configuration analyses was the “prodigal individuals” whose educational pathways deviated from what was normative for their original subgroup. We found that youth growing up with significant personal and situational risks could nonetheless stay on track educationally and enroll in college if they spent their free time in positive activity involvements during high school, an effect that was more powerful than the effect of parental income on the college enrollment decisions of these youth.

These results highlight the universe of possibilities that exist when focusing on the patterning of multiple process variables over time in relation

to important developmental end points. Our results suggest that no variable of interest, whether a social status, a social experience, or a psychological aptitude, is an island unto itself in the shaping of educational life paths. The contribution of each factor is in part conditioned by its relation to the others.

General Implications

Pattern-centered techniques, whether based on mathematical algorithms, multi-informant nominations, or some other method, have several underused advantages in relation to the study of educational achievement and participation during adolescence (Roeser and Galloway, 2002). First, they take the researcher beyond statistically average trends in data analysis and focus on substantively or theoretically interesting subgroups whose functioning may not be represented at all by average trends. We brought attention to such off-diagonal or atypical groups in each section of this chapter to illustrate the possibilities of these techniques in this regard. Second, they allow for an examination of configurations of multiple predictor and outcome variables at the same time. They can also offer a parsimonious way to examine higher-order interactions among predictor variables. Third, and perhaps most important, they focus on the person as the focal unit of analysis and thus are consistent with many of the tenets of modern developmental theory in which, at the individual level of analysis, the person is seen as the organizing principle of his or her own development (Magnusson, 2000). Finally, pattern-centered techniques enable investigators to examine patterns and pathways of functioning in ways that may, given the focus on holistic patterning of variables within subgroups, speak to the “case-like” reasoning of practitioners in educational and clinical settings. Such techniques, when coupled with the assumptions of contemporary systems thinking, provide a powerful complement to existing research on development and schooling during adolescence. They also provide a rich set of possibilities for future research on the diversity of selfways, experienced social worlds, and social statuses that shape educational pathways among different subgroups of adolescents in U.S. schools today.

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