

4

This chapter explores the relationship between childhood aggressive behavior and later adjustment, with a focus on the transition to high school. Pattern-oriented prodigal analysis is used to identify four homogeneous groups, based on stability or change in risk and nonrisk status over time.

The Transition to High School: A Prodigal Analysis of Developmental Pathways

*Tom W. Cadwallader, Thomas W. Farmer,
Beverley D. Cairns*

There is an extensive literature concerning aggressive behavior and antisocial conduct in childhood and adolescence. Much is known about the relationship between childhood social behavior and later adaptation. High stability in patterns of aggressive or prosocial conduct over the first twenty years of life has been noted in both cross-sectional and prospective longitudinal investigations (Olweus, 1979; Patterson, 1992; Pulkkinen, 1992). Nevertheless, theories postulating linear developmental trajectories from childhood conduct to adult functioning have been modified or discarded in the face of new data. The current evidence suggests that many highly aggressive children desist from misconduct during adolescence (Loeber and Stouthamer-Loeber, 1998; Nagin and Tremblay, 1999). Other investigators point to the teen years as a risk period for the emergence of delinquent and maladaptive activities (Magnusson, Stattin, and Dúner, 1983; Moffitt and others, 1996).

Temporal differences in the onset of antisocial behaviors may imply differences in the causes, characteristics, and stability of those behaviors (Loeber and Hay, 1997). For example, some delinquent teenage males have no history of childhood assaultive or hostile conduct (Nagin and Tremblay, 1999). No linkage is indicated between their delinquency and either childhood or adolescent-onset aggressive behavior. In a review of empirical findings on juvenile aggression, Loeber and Stouthamer-Loeber (1998) argued that “the later onset individuals may be similar in presenting problems but

differ in their past history of problem behavior. . . . Thus, only by disaggregating populations into subgroups on the basis of behavioral histories and presenting problems can these groups be identified" (p. 245).

The Study

In this study, youth who were identified as extremely aggressive in childhood were matched on multiple indices with a nonrisk sample. The overarching goal of this research was to explore the effect of transition to high school. In this investigation, that transition period is embedded within ten years of adolescent development: from age ten to age twenty. Unless they dropped out or were held back, the participants in this study moved from middle school to high school at age fifteen. The years covering age ten to age twenty were explored in order to clearly define the accommodations these youth make to the demands of adolescence.

Isakson and Jarvis (1999) noted that "surprisingly few studies" (p. 1) have emphasized the transition to high school. This omission is particularly remarkable in the light of the many important correlates of this transition period. In the United States, high school entry is traditionally associated with the initiation of romantic relationships, part-time employment, and learning to drive an automobile. These factors have a bidirectional relationship with increased emancipation from parental scrutiny (Youniss, 1983) and may provide novel opportunities for social development.

Theoretical and Methodological Considerations. Richters (1997) observed that homogeneity is a central assumption of the research process. It is an assumption made in the recruitment of subjects, the selection and assessment of variables, and, ultimately, data analysis. Richters proposed a shift in focus from samples to individuals, in particular, individuals who are prototypical of a hypothesized developmental process. Certain methods have been identified to respond to the requirements of the holistic model, consistent with Richter's proposal. These methods involve the identification of homogeneous subsets of individuals based on common configurations of individual functioning. Such procedures are collectively referred to as pattern-oriented (or person-oriented) analyses (Bergman, 1998; Bergman and Magnusson, 1997; Block, 1971). This study employs a pattern-oriented method known as prodigal analysis, as described by Cairns and Rodkin (1998). The procedure is specifically intended to identify developmental pathways of individuals whose social adaptation changes over time, for better or worse.

Principles of Prodigal Analysis. In order to identify prodigal cases, groups based on one or more specified features (for example, aggressive behavior) are defined initially and followed prospectively. The prodigal cases are the individuals who depart from the pathway predicted by their initial classification, as measured by some independent standard. After prodigal cases are identified, groups are reconfigured according to their

homogeneous characteristics. For example, a risk subject who follows a resilient developmental pathway would be included in a subset characterized by initial risk status and positive long-term progress. This restructuring process is intended to produce configurations that are distinguished by greater within-group homogeneity and increased differentiation among the subsets. Accordingly, prodigal analysis was expected to provide information about subgroups within a model defined by risk and nonrisk participants. Hierarchical linear modeling (HLM) analysis was used to model the developmental trajectories of these prodigal cases (Bryk and Raudenbush, 1987). Four dimensions were considered: aggressive behavior, peer affiliations, family influences, and adjustment at school and work. It was predicted that the highly aggressive group would include a subgroup of individuals for whom social adaptation improved during the teen years. A second group of matched controls, not nominated for aggressive conduct, provided a basis for comparison with the risk group.

It was hypothesized that the control group would include a number of youth who faced difficulties in social functioning during adolescence on the domains already identified. In sum, prodigal analysis was expected to identify four homogeneous groups: (1) a stable high-aggressive (risk) group, (2) a stable prosocial (nonrisk) group, (3) a group whose members improved in status over the study period, and (4) a group whose members declined in status over time. HLM growth curves in the various measurement domains were expected to reveal the timing and extent of developmental change unique to each of the four groups. A "shift" parameter was employed to test the fifteenth-year (high school) transition effect. The shift parameter allowed for a piecewise analysis of growth trajectories before and after age fifteen, as described by Willett, Singer, and Martin (1998).

Method

Data from the Carolina Longitudinal Study (CLS) were employed in this investigation. The CLS is described in detail in *Lifelines and Risks* (Cairns and Cairns, 1994).

Participants. The investigation involved a subset of the CLS sample. Eighty participants in two cohorts were identified as members of matched pairs. Forty students (ten males and ten females in each cohort) were judged to have the most serious problems of aggression in their school and grade by teachers, counselors, and principals. An additional group of forty nonaggressive control participants was identified and matched individually on the basis of cohort, sex, race, classroom attended, physical size, socioeconomic status (SES), and chronological age. To qualify for possible inclusion in the matched-control group, participants could not have received a school nomination for being highly aggressive. The validity of the selection to risk or nonrisk group was confirmed by direct observations, convergent peer nominations of aggressive behavior, and

independent teacher ratings of aggression (Cairns and Cairns, 1994; Cairns, Santoyo, and Holly, 1994).

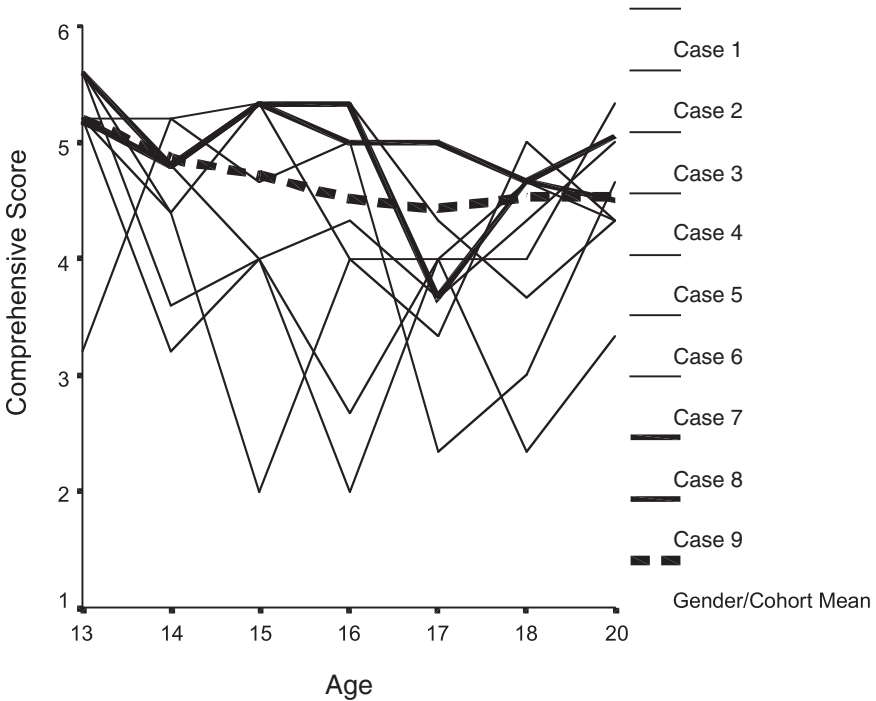
Measures. Two measures were employed to identify prodigal cases. The social cognitive interview (SCI) provided information relating to individual experience, social circumstances (such as SES, family composition, friendships, and conflicts) and narrative descriptions of life events. The social interaction scale (SIS) was designed to quantify year-by-year development on multiple levels of social functioning. The SIS was used to derive annual composite scores from ratings of the SCI. In addition to these measures, participants' criminal arrest records were obtained.

The Social Cognitive Interview. This semistructured face-to-face interview provided information about the participant, the participant's family, peer associations and conflicts, school completion or dropout, work history, and various other features of the participants' experience (for example, pregnancy and parenthood, substance use). The interview was in the format described by Cairns and Cairns (1994). For Cohort I of the CLS sample, assessments employing the SCI were obtained annually from the fourth grade (age ten) through twelfth grade (age eighteen), beginning in the 1981–82 school year. Cohort II participants were interviewed annually from the seventh grade (age thirteen) to age eighteen, beginning in 1982–83. An additional transition to adulthood interview was conducted at age twenty for all participants. Each interview was transcribed verbatim from audiotapes. Data from these transcripts were used primarily to explore the circumstances that gave rise to variation in developmental pathways, as reflected by ratings on the SIS.

The Social Interaction Scale. This scale was designed to provide year-by-year assessments of participants in the CLS through analysis of their SCIs. The purpose of this scale was to quantify year-by-year development on a comprehensive common index. Through exploration of the scaled scores, it was possible to plot both individual and group developmental trajectories for the sample participants. Dimensions in the comprehensive rating were hostility and aggressive behavior, social affiliations, family and home adjustment, and school, work, and social conduct. Rating overlaps were possible if the behavior had an impact on multiple domains. For example, an in-school suspension for fighting would affect the participant's score on both the school item and the hostility/assaultiveness measure. Ratings on individual items were scaled so that a higher score had a positive valence (for example, less aggression, better public conduct). Item scores were summed to provide a single annual score for each participant.

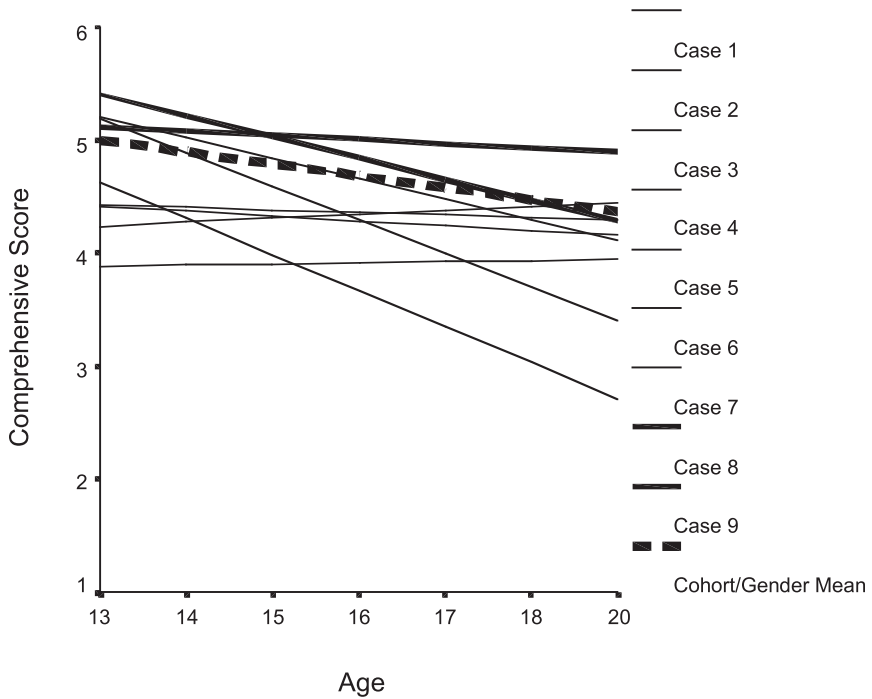
Results. To evaluate individual pathways of development, comprehensive scores on the SIS were plotted for each participant on a "spaghetti" plot based on gender by risk status within cohort. Figure 4.1a shows the raw scores by age for the at-risk females in Cohort II. These lines are plotted against the mean for all the females in that cohort.

Figure 4.1a. Spaghetti Plot of Raw Social Interaction Scores from Nine Females in the Risk Sample of Cohort II, Showing Two “Prodigal” Cases



Mean scores were calculated across the seven- to ten-year rating period to confirm preliminary assessments and provide a decision rule regarding borderline cases. Individual means were subtracted from the overall mean for the appropriate reference group (gender within cohort). This simple computation produced a sum for each individual that was positive or negative. If a risk participant had an individual score that was higher than the group mean (producing a negative sum), that person was identified as a prodigal case. And if a nonrisk participant's personal score was lower than the group mean (producing a positive sum), that individual was identified as a prodigal case. Thirty-one cases were identified by this method. All of the cases identified in this manner had been previously noted through inspection of the raw score plots. Regression lines were fitted for each person in a cell and compared to the group mean for comparison with raw score plots. A sample plot of regressed trajectories for the risk females in Cohort II is provided in Figure 4.1b. Note that two females (indicated by solid black lines) were classified as prodigal cases in this cell. The following designations were used to

Figure 4.1b. Linear Regression of SIS Scores of the Nine Females in the Risk Sample of Cohort II



clarify identification of the subsets: (1) risk ($n = 25$); (2) nonrisk ($n = 22$); (3) demoted, for those who shifted from nonrisk to risk status ($n = 15$); and (4) promoted, for participants who shifted from risk to nonrisk status ($n = 16$).

Modeling Summative Ratings over Time. HLM was used to describe the growth curves of the four subgroups. This analysis described the developmental pathways across adolescence based on SIS comprehensive scores, gender, risk status, and age fifteen shift. A two-level hierarchical model was specified. At level one, the growth curves of SIS comprehensive ratings were modeled for each participant from ages ten through twenty. A backward elimination strategy was employed; reiterated parameter estimation and testing were performed. Following Peixoto (1990) and others, lower-order parameters were kept in the model whenever there was a significant higher-order parameter. The intercept for age was centered at age fifteen in order to produce accurate estimates of growth coefficients (Muthén and Curran, 1997). Centering the intercept at age fifteen allows the intercept to be interpreted as the “average value of Y ” over the study period (Willett, Singer, and Martin, 1998). Age fifteen has the added advantage of being a substantively meaningful time point: the transition to high school. The shift parameter

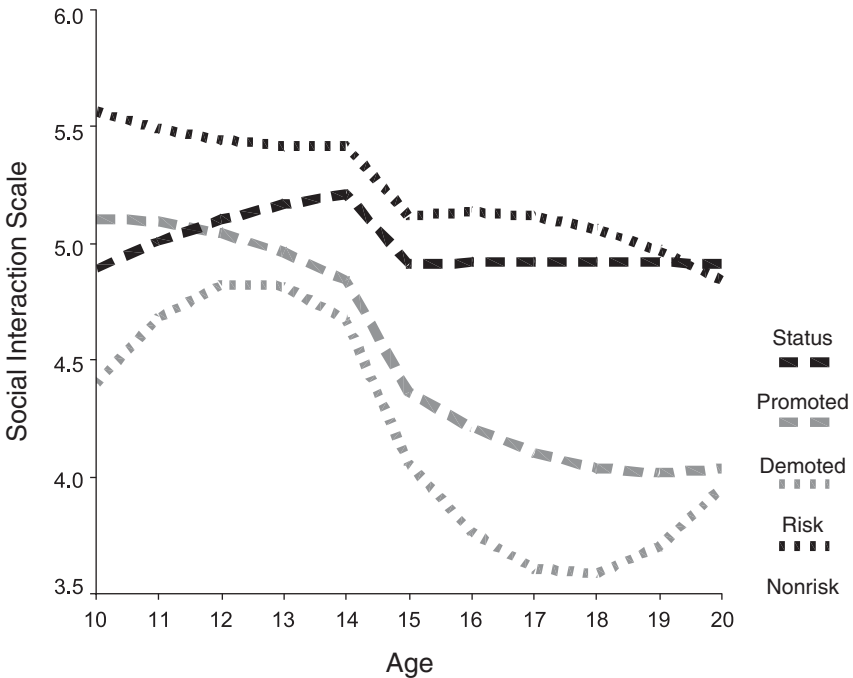
Table 4.1. Estimated Parameters for SIS Comprehensive Scores

Parameter	Estimate (SE)	t Value	p <
Age fifteen, π_{0i}			
Intercept, β_{00}	5.29 (.09)	59.73	.0001
Promoted, β_{01}	-0.21 (.11)	-1.96	n.s.
Demoted, β_{02}	-0.75 (.11)	-6.98	.0001
Risk, β_{03}	-1.06 (.10)	-10.98	.0001
Gender, β_{04}	-0.17 (.06)	-2.72	.01
Shift, β_{05}	0.32 (.12)	2.74	.01
Linear, π_{1i}			
Intercept, β_{10}	0.03 (.07)	0.53	n.s.
Promoted, β_{11}	-0.03 (.08)	-0.33	n.s.
Demoted, β_{12}	-0.21 (.08)	-2.61	.01
Risk, β_{13}	-0.40 (.07)	-5.51	.0001
Quadratic, π_{2i}			
Intercept, β_{20}	-0.02 (.01)	-1.31	n.s.
Shift, β_{25}	0.03 (.03)	1.12	n.s.
Promoted \times Shift (< 15), β_{021}	-0.02 (.02)	-1.13	n.s.
Demoted \times Shift (< 15), β_{022}	-0.03 (.02)	-1.41	n.s.
Risk \times Shift (< 15), β_{023}	-0.08 (.02)	-4.29	.0001
Promoted \times Shift (> 15), β_{121}	0.02 (.02)	0.88	n/s
Demoted \times Shift (> 15), β_{122}	0.04 (.02)	2.10	.05
Risk \times Shift (> 15), β_{123}	0.09 (.02)	5.07	.0001

was coded 0 (age fifteen and younger) and 1 (after age fifteen). Interactions between the shift parameter and comprehensive scores for participants, as a polynomial function of age, were included to allow the two segments (before and after age fifteen) to differ not only in means but also in slopes. Table 4.1 contains the means and standard errors for the parameters that were retained in the final model. The pathways indicated by this model are illustrated in Figure 4.2. The nonrisk group was the default comparison group. There were no significant mean differences between the promoted and nonrisk groups (β_{00} and β_{01} in Table 4.1). The means for the demoted and risk groups differed significantly from the nonrisk and promoted groups (see β_{02} and β_{03} estimates in Table 4.1). A significant main effect was found for the age fifteen shift (see β_{05}). An interaction between status and the shift parameter was also observed, as described below.

A significant main effect for gender was indicated (β_{04} estimates in Table 4.1). The gender difference was that females had lower mean levels of functioning (intercepts) relative to males but similar slopes; that is, male and female growth curves revealed similar changes over time. The demoted and risk groups showed significant linear declines in adjustment across the measurement period (significant linear effect of the demoted subset, β_{12} , and risk, β_{13}). The nonrisk and promoted groups maintained relatively stable growth curve estimates throughout adolescence. There were significant interaction effects between status and the shift parameter as a quadratic function of age. Ratings for the risk group declined significantly at age fifteen (β_{023}). After

Figure 4.2. HLM Growth Curves of Cumulative Ratings of Adolescent Functioning



age fifteen, both the demoted and risk groups staged a recovery of sorts, resulting in a significant upswing (or leveling) in growth curve slopes (see β_{122} and β_{123} , Table 4.1, and Figure 4.2).

Discussion

The matched pairs subset of the CLS sample included a group of highly aggressive children who were at risk for a variety of negative outcomes in adolescence (such as school failure or delinquency) due to their assaultive, externalizing conduct. As hypothesized, however, we found that a significant proportion of this group found opportunities for improved functioning during their adolescent years. Other youth, not originally identified as aggressive or at risk, suffered significant declines in social adjustment throughout the measurement period. The focus of this investigation was on the fifteenth year, the age at which most of these students made the transition from middle school to high school. The HLM model revealed a significant transition effect. It was anticipated that the transition to high school might provide some opportunity for positive behavioral realignment, but there was little evidence to support that proposition. Rather, the transition was a challenge for all and a setback for some. Regardless of their risk status,

participants experienced increased difficulties in social adjustment during the transition to high school. There was an interaction between risk status and the transition measure. On one hand, a steep and ongoing decline is observed in the growth curves of youth in the risk and demoted groups, whereas the trajectories of the promoted and nonrisk groups indicate a less pronounced drop. On the other hand, both the risk and demoted groups experienced a positive turn as they approached young adulthood. Ratings for the highest-risk youth appear to bottom out around age eighteen and even move upward by age twenty. This revival is consistent with Werner and Smith's finding (1992) that "most high risk youths with serious coping problems in adolescence had staged a recovery of sorts by the time they reached their early 30s" (p. 193). Nevertheless, many of the youth described here entered adulthood with a history of school dropout, arrest, and a host of other difficulties, including teen parenthood, incarceration, and substance abuse.

It is ironic to consider that many parents interpret high school entry as a time when their children have achieved some level of personal responsibility and independence. For some youth, age fifteen appears to be a period of particular susceptibility to negative influences and risk for increased deviance or maladaptive conduct. In addition to entry into a new social environment, these teens are confronted with shifting expectations in interpersonal relations, new forms of aggressive expression (Xie, Swift, Cairns, and Cairns, forthcoming), increased academic demands, and new freedoms.

Participants in this study were characterized by frequent realignment in their year-to-year adjustment. Figure 4.1 underscores an important feature of development: "Lives in progress are moving targets" (Cairns and Cairns, 1994, p. 221). The plot lines in Figure 4.1 reveal that each participant had at least one year when her adjustment score approached or surpassed the mean for all the females in that cohort. For most of these young women, conditions did not support continued improvement in levels of functioning beyond one good year.

This moving-targets phenomenon was not unique to risk-status females. Every participant had good and bad years. The second decade of life was a difficult time for most, with the greatest variation among at-risk youth. The main effect of gender—that females had lower overall social adaptation ratings—may reveal a reporting bias (that female adolescents are more forthcoming about their conflicts and difficulties), or it may represent a real difference in the social experiences, challenges, and consequent levels of adaptation of teenage boys and girls.

Conclusion and Future Directions

This study found that highly confrontational and assaultive behavior in late childhood had limited predictive value for determining outcomes in early adulthood. The students whose early risk status evaporated over time were

most interesting. There is little likelihood that these youth were false positives, that is, that they were misidentified as highly aggressive youth. Recall that the procedures employed to identify the highly aggressive subset included at least two independent nominations from school personnel and behavioral observation by outsiders. A more reasonable postulate is that the promoted youth seized opportunities for greater acceptance and adjustment in their middle school years and beyond. The method employed here to identify prodigal individuals was suited to a study population of matched pairs. In the absence of an experimental design that specifies homogeneous subsets a priori, cluster analysis provides a simple and logical way of disaggregating the sample into groups that are similar on some dimensions of interest (Bergman, 1998).

As a direction for future research, Cairns and Rodkin (1998) propose a further analytic step in which individuals become the focus. Hypotheses regarding possible turning points can be evaluated on a case-by-case basis. For example, recall that three students in the risk category graduated from high school. It would be interesting to find some common characteristics among those exceptional students. It is useful to be able to shift focus between attention to the idiosyncratic details of individual lives and the wide brush strokes offered by sample-level statistical analyses. Pattern-oriented analyses of homogeneous subsets have been designed to respond to the call for sharper attention to developmental processes (Cairns, Bergman, and Kagan, 1998; Nesselroade and Boker, 1994; Magnusson and Casaer, 1992). The method for identifying prodigal individuals is based on systematic, quantifiable analysis of the whole sample. A valuable feature of this procedure is the ability to pinpoint individuals who are prototypical of a developmental phenomenon.

Acknowledgments

The data reported here are from the Carolina Longitudinal Study. The research was supported by National Institute of Mental Health grant P50 MH52429 to the Center for Developmental Science of the University of North Carolina at Chapel Hill, and a National Institute of Child Health and Human Development research training grant HD07376. We thank Robert Cairns, Gilbert Gottlieb, Dylan Swift, Hong-ling Xie, and the staff at the Center for Developmental Science for their assistance and helpful comments on drafts of this chapter.

References

- Bergman, L. R. "A Pattern-Oriented Approach to Studying Individual Development: Snapshots and Processes." In R. B. Cairns, L. R. Bergman, and J. Kagan (eds.), *Methods and Models for Studying the Individual*. Thousand Oaks, Calif.: Sage, 1998.
- Bergman, L. R., and Magnusson, D. "A Person-Oriented Approach in Research on Developmental Psychopathology." *Developmental Psychopathology*, 1997, 9, 291–319.
- Block, J. *Lives Through Time*. Berkeley, Calif.: Bancroft, 1971.
- Bryk, A. S., and Raudenbush, S. W. "Application of Hierarchical Linear Models to Assessing Change." *Psychological Bulletin*, 1987, 101, 147–58.

- Cairns, R. B., Bergman, L. R., and Kagan, J. (eds.). *Methods and Models for Studying the Individual: Essays in Honor of Marion Radke-Yarrow*. Thousand Oaks, Calif.: Sage, 1998.
- Cairns, R. B., and Cairns, B. D. *Lifelines and Risks: Pathways of Youth in Our Time*. Cambridge: Cambridge University Press, 1994.
- Cairns, R. B., and Rodkin, P. "Phenomena Regained: From Configurations to Pathways." In R. B. Cairns, L. R. Bergman, and J. Kagan (eds.), *Methods and Models for Studying the Individual*. Thousand Oaks, Calif.: Sage, 1998.
- Cairns, R. B., Santoyo, C., and Holly, K. A. "Aggressive Escalation: Toward a Developmental Analysis." In M. Potegal and J. Knutson (eds.), *Escalation of Aggression: Biological and Social Processes*. Mahwah, N.J.: Erlbaum, 1994.
- Isakson, K., and Jarvis, P. "The Adjustment of Adolescents During the Transition into High School: A Short-Term Longitudinal Study." *Journal of Youth and Adolescence*, 1999, 28, 1–26.
- Loeber, R., and Hay, D. F. "Key Issues in the Development of Aggression and Violence from Childhood to Early Adulthood." *Annual Review of Psychology*, 1997, 48, 371–410.
- Loeber, R., and Stouthamer-Loeber, M. "Development of Juvenile Aggression and Violence: Some Common Misconceptions and Controversies." *American Psychologist*, 1998, 53, 242–259.
- Magnusson, D., and Casaer, P. *Longitudinal Research on Individual Development: Present Status and Future Perspectives*. Cambridge: Cambridge University Press, 1992.
- Magnusson, D., Stattin, H., and Düner, A. "Aggression and Criminality in a Longitudinal Perspective." In K. T. Van Dusen and S. A. Mednick (eds.), *Antecedents of Aggression and Antisocial Behavior*. Norwell, Mass.: Kluwer-Nijhoff, 1983.
- Moffitt, T. E., and others. "Childhood-Onset Versus Adolescent-Onset Antisocial Conduct Problems in Males: Natural History from Ages Three to Eighteen Years." *Development and Psychopathology*, 1996, 8, 399–424.
- Muthén, B. O., and Curran, P. J. "General Longitudinal Modeling of Individual Differences in Experimental Designs: A Latent Variable Framework for Analysis and Power Estimation." *Psychological Methods*, 1997, 2, 371–402.
- Nagin, D., and Tremblay, R. E. "Trajectories of Boys' Physical Aggression, Opposition, and Hyperactivity on the Path to Physically Violent and Nonviolent Juvenile Delinquency." *Child Development*, 1999, 70, 1181–1196.
- Nesselroade, J. R., and Boker, S. M. "Assessing Constancy and Change." In T. Heatherton and J. Weinberger (eds.), *Can Personality Change?* Washington, D.C.: American Psychological Association, 1994.
- Olweus, D. "Stability of Aggressive Reaction Patterns in Males: A Review." *Psychological Bulletin*, 1979, 86, 852–857.
- Patterson, G. R. "Developmental Changes in Antisocial Behavior." In R. DeV. Peters, R. J. McMahon, and V. L. Quinsey (eds.), *Aggression and Violence Throughout the Life Span*. Thousand Oaks, Calif.: Sage, 1992.
- Peixoto, J. L. "A Property of Well-Formulated Polynomial Regression Models." *American Statistician*, 1990, 44, 26–30.
- Pulkkinen, L. "The Path to Adulthood for Aggressively Inclined Girls." In K. Björkqvist and P. Niemela (eds.), *Of Mice and Women: Aspects of Female Aggression*. Orlando, Fla.: Academic Press, 1992.
- Richters, J. E. "The Hubble Hypothesis and the Developmentalist's Dilemma." *Development and Psychopathology*, 1997, 9, 193–229.
- Werner, E. E., and Smith, R. S. *Overcoming the Odds: High Risk Children from Birth to Adulthood*. Ithaca, N.Y.: Cornell University Press, 1992.
- Willett, J. B., Singer, J. D., and Martin, N. C. "The Design and Analysis of Longitudinal Studies of Development and Psychopathology in Context: Statistical Models and

- Methodological Recommendations." *Development and Psychopathology*, 1998, 10, 395–426.
- Xie, H., Swift, D. J., Cairns, B. D., and Cairns, R. B. "Aggressive Behaviors in Social Interaction and Developmental Adaptation: A Narrative Analysis of Interpersonal Conflicts During Early Adolescence." *Social Development*, forthcoming.
- Youniss, J. "Social Construction of Adolescence by Adolescents and Their Parents." In H. D. Grotevant and C. R. Cooper (eds.), *Adolescent Development in the Family*. New Directions for Child Development, no. 22. San Francisco: Jossey-Bass, 1983.

TOM W. CADWALLADER is an assistant professor in the Department of Criminal Justice Administration at California State University, Hayward.

THOMAS W. FARMER is the director of the Social Development and Intervention Research Program at the Center for Developmental Science and an assistant professor in the School of Education at the University of North Carolina, Chapel Hill.

BEVERLEY D. CAIRNS is the codirector of social development research at the Center for Developmental Science at the University of North Carolina, Chapel Hill.