A Latent Growth Curve Model of Delinquent Activity Among Adolescents

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Latent growth curve (LGM) modeling of a 4-wave longitudinal dataset was conducted to examine a segment of the age-related, quadratic curve for adolescent delinquent activity. A quadratic (inverted U-shaped) LGM model was supported for the sample of 1,016 adolescents and indicated a temporal pattern across the 4 waves of an increase in delinquent activity, a plateau or asymptote, and then an initial deceleration. A time-invariant predictor model was specified to account for variation in intraindividual change in delinquency. Male gender, lower family support, greater peer alcohol use, more stressful life events, and lower grades significantly predicted the intercept; a (less) difficult temperament predicted the linear growth parameter; and lower peer alcohol use, a less difficult temperament, and higher grades predicted the quadratic component that was associated with a deceleration in delinquency. Person-centered analyses for a subgroup of adolescents engaged in persistently high, versatile delinquent activity indicated that these adolescents had temperamentally higher activity levels, lower positive affect, greater inflexibility, more overt and covert conflict with best friends, more childhood conduct problems, and greater current substance use.

Issues pertaining to the stability and change of delinquent activities have long been of interest to behavioral scientists (e.g., Sampson & Laub, 1993; Tonry, Ohlin, & Farrington, 1991). It is widely recognized in the literature that retrospective accounts of criminals, and especially violent criminals, are marked by early onset (i.e., childhood) conduct problems, including high rates of aggression, a diversification of delinquent or criminal behaviors at an early age, and a relatively persistent pattern of socially deviant and illegal activity across time (e.g., Loebner, 1988; Loebner & LeBlanc, 1990; Sampson & Laub, 1993). Nonetheless, prospective studies of general population and high-risk samples have consistently indicated that only a portion of those children who manifest conduct problems in childhood proceed to become lifelong, or “career,” criminals (e.g., Farrington, 1990; Glueck & Glueck, 1950; Robins, 1966; Werner & Smith, 1982). The juxtaposition of these retrospective and prospective findings has contributed to more focused research questions about the causes and consequences of delinquency and the multiple developmental pathways leading toward and away from lifelong patterns of criminal involvement (e.g., Moffitt, 1994; Robins & Rutter, 1990; Sampson & Laub, 1993).

Research on adolescent development has indicated that this phase of the life span is characterized by autonomy striving and the engagement in a variety of risky and often illegal activities (e.g., Arnett, 1992; Dryfoos, 1990). Some investigators have suggested that the engagement in some level of risk taking is developmentally normative and even beneficial for adolescents in confronting the demands and psychosocial tasks of adolescence, and in preparation for the life tasks of young adulthood (e.g., Arnett, 1992; Baumrind, 1987). Prevalence data from national surveys clearly indicate that the majority of adolescents engage in some level of alcohol and substance use during the high school years, as well as some level of delinquent behavior (e.g., Elliott, Huizinga, & Menard, 1989; Johnston, O’Malley, & Bachman, 1991). Nevertheless, most of the available evidence suggests that the statistically normative engagement in delinquent activity in adolescence is phasic and that most adolescents will cycle or “mature” out of these behaviors when they assume new roles in young adulthood associated with family (e.g., husband or wife, parent) and work (e.g., employee) roles and responsibilities (e.g., Moffitt, 1993; Sampson & Laub, 1993). Several studies have supported the reduction of deviant behavior in young adulthood in association with the adoption of these new social roles (e.g., Miller-Tutzauer, Leonard, & Windle, 1991; Rutter, Quinton, & Hill, 1990).
For developmental scientists, there are (at least) three important research issues pertinent to the occurrence of delinquent activity during adolescence. First, there is increasing recognition that there are individual differences in intraindividual change in the expression of delinquent activity among adolescents. Adolescents vary in terms of important factors such as age at onset, rate of increase, and rate of deceleration for delinquent behaviors. Nevertheless, at the aggregate level, comprehensive reviews (e.g., Elliot, 1994; Farrington, 1986) have indicated that the peak period for the prevalence of delinquent activity is the teen years. Based on the extant findings (e.g., Farrington, 1986), in this study it was hypothesized that delinquent behavior would increase during the earlier portions of adolescence (around age 15–16 years), reach an asymptote or peak during the middle portion of adolescence (around 17–18 years), and then begin to decelerate at the initiation of the maturing process.1 Thus, one objective of this study was to confirm that a quadratic model would adequately account for patterns of intraindividual change in delinquent behavior during adolescence. Support for developmental functions to characterize time-ordered behaviors, such as delinquency, has been a goal of developmental psychology (e.g., Baltes, Reese, & Nesselroade, 1977; Wohlwill, 1973).

A second important research issue for developmental scientists concerns the identification of variables that predict variability in the patterns of intraindividual growth for delinquent behavior during adolescence. A broad range of theoretical models exists that seek to explain deviance, in general, or delinquency, specifically. A comprehensive review of these theories is beyond the scope of this article, but two broadband perspectives are highly relevant. First, a number of theories highlight the importance of socialization influences of parents and peers and emphasize the significance of ties, or emotional bonds, to conventional institutions (e.g., family, school, work) as important determinants of the expression of deviant behaviors (e.g., Brook, Brook, Gordon, Whiteman, & Cohen, 1990; Elliott, Huizinga, & Ageton, 1985; Jessor & Jessor, 1977; Sampson & Laub, 1993). For example, strong family attachment has often been viewed as a significant protective factor in many theories of deviant behavior (e.g., social control theory), and deviant peer relations have been viewed as salient proximal predictors of adolescent deviance (e.g., Elliott et al., 1985; Oetting & Beauvais, 1987). Similarly, lower school commitment and poorer grades have been identified as precursors to more serious delinquency and dropping out of school (e.g., Elliot et al., 1985; Fagan & Pabon, 1990). A second, broad perspective of relevance may be characterized as a dynamic, developmental systems orientation (e.g., Ford & Lerner, 1992; Windle & Davies, 1999; Zucker, Fitzgerald, & Moses, 1995). This perspective emphasizes the multifaceted (and multivariate) embedded nature of individual development and the expression of behaviors such as delinquency. Furthermore, this perspective recognizes the importance of studying individual differences in intraindividual change that are influenced by a range of dynamic intrapersonal, interpersonal, and social-cultural influences. In this article, there is a focus on a range of such influences, including individual (e.g., temperament), family, peer, and school-related influences as predictors of individual differences in intraindividual change in adolescent delinquent activity.

A third important research issue for developmental scientists is the study not only of findings based on aggregate (total) sample statistics and analyses, but also of person-centered analyses that focus on substantively meaningful subgroups (e.g., Cairns, Bergman, & Kagan, 1998; Magnusson & Bergman, 1988; Schulenberg, Wadsworth, O’Malley, Bachman, & Johnston, 1996). Such a person-centered approach is viewed as complementary to the aggregate, variable-based approach and may indeed provide important substantive information that may be masked in aggregate analyses. For example, Moffitt (1993) proposed two subtypes to describe adolescent delinquent activity, namely adolescent limited and life course persistent. The life course persistent subtype (approximately 5%–6% of adolescents) is characterized by a lifelong pattern of problems that begin in childhood with the manifestation of serious conduct problems, poor academic functioning, encounters with legal authorities, and so on, and that persists throughout adolescence and into criminal behavior in adulthood. By contrast, the remainder of adolescents are characterized as displaying age (adolescent) limited involvement in delinquent activity, but a subsequent maturing out in young adulthood. Because of the vast differences in the representation of life course persistent (5%–6%) and adolescent limited adolescents (94%–95%), any aggregate sample analysis or derived statistic (e.g., M, SD) is likely to be substantially influenced by the majority subtype of adolescent limited adolescents. From the perspective of development, there may be different antecedents and correlates of delinquent activity for adolescent limited and life course persistent adolescents; aggregated (total) sample statistical procedures may not be sensitive to such subgroup differences in antecedents and correlates. Furthermore, these person-centered analyses are guided by prior theory and research (e.g., Moffitt, 1993), and not simply the consequence of post hoc explorations (e.g., Cairns, Cairns, Neckerman, Gest, & Gariépy, 1988).

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1To replicate the age-crime curve from childhood to young adulthood was beyond the scope of this study; however, the four specified measurement points spanning a critical 2-year window (from 15.5 to 17.5 years) were adequate to test the hypothesized growth curve function.
The short-term, intensive prospective research design adopted in this study was guided by the conceptual notion that changes related to adolescent delinquent behavior occur in a dynamic manner and that the optimal design for evaluating such changes and predictors of these changes in adolescent delinquent behavior would benefit from measurement intervals of shorter duration. In addition, the prospective nature of the data collection would also eliminate or minimize errors associated with some other research designs (e.g., distortion or forgetting associated with long-term retrospective longitudinal designs). We directly tested the hypothesis of a quadratic function to represent the time course of delinquent behavior during adolescence by using latent growth curve modeling (LGM; e.g., McArdle, 1988; Meredith & Tisak, 1990; Stoolmiller, 1995). The prospective research design used in the study included four waves of measurement at 6-month intervals across school grades (10th–12th), or ages 15.5 to 17.5 years.

In addition to providing a direct test of the quadratic function of delinquent behavior for the four waves of measurement via an explicit quantitative model, predictors from several domains (e.g., family, peers, school), which have been identified as salient to the prediction of delinquency and crime, were included in the model specification (e.g., Blackburn, 1993; Elliott et al., 1985; Sampson & Laub, 1993). This was viewed as an important aspect of this article because these predictors were used not simply to predict a given static variable or end stage (e.g., delinquent behavior at a single occasion; lifetime criminal arrest status), but rather to predict the (mean) level, shape components (e.g., linear, quadratic), and dynamic (rate of) change in adolescent delinquent behavior across a relatively brief interval of time (i.e., 2 years). The selection of predictor variables in this study was guided by prior research (e.g., Elliott et al., 1985; Sampson & Laub, 1993) and included measures from the following four domains: intrapersonal, family, peer, and school. A measure of difficult temperament was used as an intrapersonal, or dispositional, characteristic that has been found to be predictive of early onset substance use and delinquent behavior (e.g., Blackson, Tarter, Martin, & Moss, 1994; Sampson & Laub, 1993; Windle, 1992). Difficult temperament refers to a constellation of characteristics (high activity level, arrhythmicity, inflexibility, behavioral withdrawal, poor mood quality, low task persistence) that have been associated with adverse outcomes in cross-sectional and longitudinal applications (e.g., Mazziade et al., 1990; Tubman, Lerner, Lerner, & von Eye, 1992; Tubman & Windle, 1995). A measure of perceived social support from family (Procidano & Heller, 1983) was used to assess adolescent perceptions of nurturance or attachment to the family.

Deviant peer relations have been viewed as a salient proximal predictor of adolescent delinquency and sub-

stance use (e.g., Elliott et al., 1985; Oetting & Beauvais, 1987) and an index of the percentage of friends using alcohol was used in this study. Lower school commitment and poorer grades have been identified as precursors to more serious delinquency and dropping out of school (e.g., Elliott et al., 1985; Fagan & Pabon, 1990) and a measure of grade point average (GPA) was used in this study as an indicator of academic functioning. The number of stressful life events was used as a measure of cross-contextual influences (e.g., family, peer, school), which may predict average levels and changes in delinquent activity during adolescence. The specified model is referred to as an LGM with time-invariant predictors, and represents the most frequently used model specification in the emerging LGM literature2 (e.g., Duncan, Duncan, & Hops, 1994; Stoolmiller, 1995). For this model, six predictor variables, measured at Time 1, were used to predict the major parameters of the LGM (i.e., the intercept, the linear component, and the quadratic component). In essence, this model specification evaluated how well the Time 1 (invariant) variables predicted average levels and changes in delinquency growth (or change).

In addition to specifying, testing, and evaluating the LGM, a complementary “person centered” approach was used to study alternative, subgroup life course trajectories (e.g., Cairns et al., 1998; Magnusson & Bergman, 1988; Schulenberg et al., 1996). On the basis of previous literature (e.g., Krueger et al., 1994; Moffitt, 1993), comparisons were made between a subgroup of adolescents who engaged in persistently high levels of delinquent behavior across the four waves of measurement, and a subgroup of adolescents who engaged in some level of delinquent behavior across the four waves of measurement (those reporting no level of delinquent activity across the four waves were deleted from these analyses).3 The persistently high delinquent behavior subgroup in this study may not constitute Moffitt’s (1993) life course persistent subtype,4 but may differ in significant ways from the remainder of adolescents such that they are at high risk for a range of

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2 An alternative LGM with time invariant and time varying predictors (e.g., Muthén, 1991; Muthén & Curran, 1997) was also specified and evaluated, but yielded highly similar conclusions with regard to the impact of the predictor variables. However, the time varying predictors (e.g., perceived family social support) were highly stable across the 6-month intervals (test–retest rs ranged from .78–.83) and thus were not optimal for evaluating time varying prediction.

3 Abstainers, that is, adolescents who reported no delinquent activity across the four waves of measurement or in their lifetime, represented 11.7% of the girls and 7.6% of the boys. In an extended analysis, not detailed here, abstaining adolescents placed a greater value on religion, had higher educational and occupational aspirations, and were less interested in dating behavior than other adolescents.

4 Several risk factors (e.g., low socioeconomic status, neuropsychological deficits, early school drop out) for Moffitt’s (1993) life course persistent delinquents are not likely to be present in this middle-class, school-based sample.
problematic outcomes in young adulthood (e.g., off-time for marriage, occupational difficulties, psychiatric and substance abuse problems), if not criminality. Comparisons were made between adolescents persistently high in delinquent behavior and what is referred to as a normative subgroup for a range of correlates (e.g., childhood conduct problems, current substance use) that have distinguished life course persistent and normative adolescents (e.g., Moffitt, 1993).

Method

Participants

The data used in this study were collected as part of a four-wave panel design (with 6-month intervals) focused on vulnerability factors and adolescent problem behaviors. The initial sample consisted of 975 high school sophomores (53%) and juniors (47%) recruited from three homogeneous suburban high schools in Buffalo, New York. Of the sample, 52% were girls \( n = 517 \) and 47% \( n = 458 \) were boys. The average age of the respondents at the first occasion of measurement was 15.54 years \( (SD = .66) \) and 98% were White. Of the sample, 70% were Catholic, 18% Protestant, and 12% other. (Note that these were not Catholic high schools but rather reflected the religious composition of participants in this community.) Of the caregivers, 96% of the fathers and 43% of the mothers were employed full-time outside the home (37% of mothers were employed part-time outside the home). Fathers completed an average of 13.79 years of education \( (SD = 2.01) \) and mothers completed an average of 13.55 years \( (SD = 2.39) \). The average number of children per family was three. The median family income was about $40,000, with only 3% of the sample reporting family income less than $12,000. Eighty-eight percent of the adolescents’ primary caregivers were currently married, 12% were divorced, and 1% were widowed. Approximately 76% of high school students eligible for the study participated; 24% did not return signed informed consent forms and did not participate in the study (see Procedure). At the second occasion of measurement (6 months later) the retention rate was 93%. Sample retention across waves of measurement was uniformly high, in excess of 90%.

A supplemental sample of 220 adolescents participated at the second, but not the first, occasion of measurement, and were eligible to participate at subsequent measurement occasions. These supplemental participants were added to the study to increase the sample size for some relatively low base rate variables (e.g., history of alcoholism) of interest to the objectives of the larger federally funded project. Statistical comparisons on sociodemographic variables (e.g., parental education level, income) and adolescent problem behaviors (e.g., alcohol use, delinquent activity) indicated that the supplemental sample did not differ in any systematic way from those participants who participated initially at the first measurement occasion. Because active informed consent procedures were used in this study, information on nonparticipants was not available; hence, it is unclear how representative the participating sample was relative to the total eligible sample except on major sociodemographic variables (e.g., sex and ethnic group composition), which did not reflect participant bias. It has been determined, however, that the drinking and substance use practices and rates of suicidal ideation and attempts among adolescents in this sample are highly similar to findings in national survey studies (see Reifman & Windle, 1995; Windle, 1996), suggesting that this sample is similar to other school-based samples of similar-aged adolescents.

Missing value estimation procedures in biomedical double-precision AM module (Dixon, 1992), were used to estimate missing values for participants under the plausible assumption for these data that “missingness” was attributable to an ignorable response mechanism\(^5\) (e.g., see Graham, Hofer, Donaldson, MacKinnon, & Schafer, 1997; Little & Schenker, 1995). The AM module uses the expectation-maximization algorithm to estimate missing values via what may be described as an iterative form of regression imputation. Less than 10% of the data were missing for most single variables, and a large portion of the missingness was attributable to the lack of participation of the supplemental sample at Wave 1. However, this supplemental sample did not differ systematically from the initial sample with regard to key variables (e.g., socioeconomic status level, sex, delinquent activity at Waves 2, 3, or 4) and thus their missing data may be viewed as missing at random. Participants were excluded from the missing value data estimation procedure if they only participated at one wave of assessment. The resulting sample size using the missing value estimation procedure was 1,016. For the LGMs specified and evaluated in this article, findings were approximately identical if those participants with missing values were deleted, or if the missing data estimation procedure was used.

Measures

Delinquent activity was measured with 16 items used in prior delinquency research (e.g., Elliott et al.,

\(^5\) An ignorable, or accessible, missing data mechanism suggests that missing data points, although not missing completely at random, are recoverable (i.e., can be reasonably estimated) via the use of available, accessible data. That is, data from other waves of measurement from the participant may be used, as well as data from other participants, to estimate the missing values. These estimated missing values are not a preferred substitute for the data that are missing, but may substantially reduce bias associated with pairwise or listwise deletion methods (see Graham et al., 1997).
A 6-point Likert-type scale (never, once, 2–3 times, 4–5 times, 6–9 times, 10 or more times) was used for each item in reference to the last 6 months. The existing literature indicates that three important features of delinquent activity are frequency, versatility, and persistence (e.g., Dishion, French, & Patterson, 1995; Moffitt, 1993). Simple frequency counts of delinquent activity may be useful in some research applications; however, frequency data are often highly non-normally distributed and essentially equate, for example, the commission of 10 acts of truancy with 10 acts of armed robbery. Given the research foci of this study, an index was formed to facilitate the identification of versatility in delinquent activity (i.e., engaging in a broad or narrow spectrum of delinquent acts), and of a persistent, versatile delinquent subgroup (e.g., Dishion et al., 1995; Moffitt, 1993). To form an index that reflected versatility, each delinquency item was scored as either 0 (never engaged in activity) or 1 (engaged in activity) for the 6-month period referenced. Scores ranged from 0 to 16 for each wave of measurement. These delinquency versatility scores were used in the specified LGMs in this study. Alphas (KR-20s) for the 16 items at Waves 1 to 4 were .70, .75, .78, and .75, respectively. Pearson correlations between the sum of the 16 dichotomously scored items and the sum of the 6-point Likert-type scale items (i.e., the frequency of delinquent activity) ranged from .77 to .82 across the four waves. Items varied in terms of severity of offense and included skipped school, hit teacher or parent, stole something that was valued at more than $20, beat up someone, destroyed public property, was suspended from school, and so on.

The persistent, versatile subgroup of adolescents was identified within sex groups by using cutoff scores around the 90th percentile. To meet the criterion for persistence, adolescents had to meet the versatility criterion across three or four waves of measurement. Hence, the persistent, versatile adolescents engaged in the highest levels of diverse delinquent activity consistently across time. The resulting percentage of persistent, versatile adolescents was 5.3% (n = 54). Adolescents who reported not engaging in any delinquent activity across the four waves of measurement (n = 112; 11.0%) were excluded from subsequent analyses because they were neither persistent nor normative in their delinquent activity. The remainder of the adolescents (n = 850; 83.7%) engaged in some level of delinquent activity, but did not meet the criterion for persistent; they were classified as normative.

Perceived social support: Family (PSS–Fa). The PSS–Fa measure assessed the amount of perceived emotional support provided by family members (e.g., Procidano & Heller, 1983). The measure consists of 20 items with the four response options of “Generally FALSE,” “More FALSE than TRUE,” “More TRUE than FALSE,” and “Generally TRUE.” The response format of the PSS–Fa was modified in this study to a four-response-option format from the original dichotomous response format (plus a “don’t know” response option) proposed by Procidano and Heller to increase the discriminative utility of the measure (e.g., Windle & Miller-Tutzauer, 1992). The alpha coefficient for the PSS–Fa for this sample was .91.

Percentage of friends who use alcohol. Adolescents were requested to indicate the number of adolescents that they considered friends. Over 99% of adolescents reported at least one friend, with most reporting five or more. Adolescents were then requested to indicate how many of these friends consumed alcohol. Percentage scores were calculated by dividing the number of alcohol-using friends by the total number of friends and multiplying the dividend by 100, with a possible range of 0 to 100%.

Difficult temperament. The Revised Dimensions of Temperament Survey (DOTS–R; Tubman & Windle, 1995; Windle & Lerner, 1986) was used to assess difficult temperament. The DOTS–R is a 54-item, factor analytically developed self-report instrument that measures 10 temperament attributes: general activity level, approach–withdrawal, flexibility–rigidity, activity–sleep, positive mood quality, rhythmicity daily habits, rhythmicity eating, rhythmicity sleeping, persistence, and distractibility. Cronbach’s alpha for the 10 dimensions have been uniformly high and test–retest stability coefficients across a 6-week interval have ranged from .59 to .75 (Windle & Lerner, 1986). The correlations between parent–adolescent (intrarater agreement) ratings of adolescent temperament among a clinical sample of girls ranged from .66 to .79 (Luby & Steiner, 1993). To derive the difficult temperament index, the upper 30th percentile scores on six dimensions were used as criterion scores, with participants scoring in the upper 30th percentile receiving a score of 1 for each dimension in which the criterion was met, and otherwise receiving a score of 0; thus scores for the difficult temperament index ranged from 0 to 6. Difficult temperament dimensions included high activity level, low task orientation, inflexibility, behavioral withdrawal, poor mood quality, and biological arrhythmicity with regard to eating or sleeping habits (see Tubman & Windle, 1995, for further discussion of difficult temperament index).

Stressful life events. The list of life events was adopted from the Adolescent Life Change Scales (ALCES) of Yeaworth, York, Hussey, Ingle, and Goodwin (1980). Adolescents evaluated a total of 29
events for their occurrence or nonoccurrence within the past 6 months. The majority of events selected for inclusion in the study are typically classifiable as negative or undesirable (Vinokur & Selzer, 1975). Examples of events are death of a parent; failing one or more subjects; going to a new school; a change in appearance, such as glasses or braces; breaking up with boyfriend or girlfriend; having a problem with acne; and being overweight or underweight. Participants were requested to report whether each life event had occurred during the last 6 months.

GPA. The single item “What grades do you usually get in school?” was used with a 7-point Likert-type scale response format ranging from 1 (mostly As) to 7 (mostly Ds and Fs). The Pearson correlation between adolescents’ reports of GPA and official school records (which used a somewhat different measurement scale) was .78, hence supporting the validity of the self-report method. Dornbusch, Mon-Reynaud, Ritter, Chen, and Steinberg (1991) also reported a correlation of .79 between self- and school-reported GPA for a sample of approximately 5,000 students.

Childhood conduct disordered behaviors. The conduct disorder subscale of the Retrospective Childhood Problems measure (Windle, 1993) was used to assess, retrospectively, symptoms of conduct disorder. Seven items consistent with the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders (3rd ed., rev. [DSM–III–R]; American Psychiatric Association, 1987) were each rated on a 3-point response scale with options of 1 (not at all characteristic), 2 (somewhat characteristic), and 3 (highly characteristic of me) prior to age 12 years. Sample items were: “often was involved in fist fights with others,” “had problems with stealing,” and “was often truant (skipped school).” A dichotomous variable was created for this subscale by assigning scores of 1 to each of the seven items only if a 3 (highly characteristic) was endorsed (0 otherwise). Cronbach’s alpha for this subscale was .68 for boys and .69 for girls, and parent–adolescent correlations for a subset of parent–child pairs were .32 for boys and .34 for girls. Higher levels of conduct problems on this measure were significantly associated with greater alcohol consumption, higher levels of aggression against others, and more suicidal behaviors; lower reciprocity of relations was associated with higher levels of depression (Windle, 1994).

Alcohol consumption was measured with a standard quantity–frequency index (QFI) assessing beer, wine, and hard liquor consumption in the last 30 days (Armor & Polich, 1982). Respondents were asked how often they usually had each beverage in the last 30 days (responses on a 7-point scale from 1 [never] to 7 [every day]) and, when they had the beverage, on average how much they usually drank (10-point scale from 1 [none] to 10 [more than 8 cans, bottles, glasses, etc.], depending on the beverage). The QFI, based on all three beverages, provides a measure of the average number of ounces of ethanol consumed per day in the last month. Other substance use included the self-reported frequency of using marijuana or hashish and nonprescribed hard drugs (e.g., cocaine, stimulants, barbiturates, hallucinogens) during the last 6 months using 7-point Likert-type scales that ranged from 1 (never used) to 7 (used every day). The validity of self-reports of substance use has been supported in numerous research studies (e.g., Oetting & Beauvais, 1990; Winters, Stinchfield, Henly, & Schwartz, 1991).

Depressive symptoms. The Center for Epidemiological Studies Depression Scale (CES–D) was used to assess depressive symptoms among adolescents (Radloff, 1977; Roberts, Andrews, Lewinsohn, & Hops, 1990). The CES–D consists of 20 self-report items and provides a unitary measure of current depressive or distressing symptomatology. Cronbach’s alpha for the CES–D with this sample of adolescents was .90.

Procedure

Subsequent to receiving approval from school administrators to conduct the study, schools provided a
mailing list of the addresses of sophomores and juniors. A packet of materials, including a letter of introduction by the principal, a description of the study, and informed consent forms, was mailed to adolescents and their parents. Those individuals willing to participate in the study were requested to sign the informed consent form (both adolescent and one parent) and return it to the investigator in a self-addressed, stamped envelope. Confidentiality was assured with a Department of Health and Human Services Certificate of Confidentiality. Teachers made announcements about the study in home classrooms. Adolescents completed survey materials in large groups (e.g., 40–50 students) in their high school setting. A trained survey research team administered the survey to adolescents and neither teachers nor school administrators were in the room during the time the students completed the surveys. The survey took about 45 to 50 min to complete and participants received $10. A make-up date for testing was arranged for participants who were absent or unable to participate on the regularly scheduled day of testing. A similar procedure was used at each wave of measurement. Survey testing occurred in October and April of successive years.

Results

Sex Comparisons

Preliminary analyses focused on sex differences in the incidence of committing delinquent acts during the 6-month intervals for each of the four waves of measurement. These findings are summarized in Table 1 and are consistent with prior research (e.g., Canter, 1982; Windle, 1990) indicating that more boys than girls report the commission of aggressive activities (e.g., beating up someone on purpose) and more serious offenses (e.g., stealing, vandalism), but that few sex differences are indicated for less serious delinquent acts (e.g., had party without parents’ permission). Girls reported a higher incidence of “hitting”.

Table 1. Male and Female Self-Reported Delinquent Activity

<table>
<thead>
<tr>
<th>Delinquent Act</th>
<th>Time 1</th>
<th></th>
<th>Time 2</th>
<th></th>
<th>Time 3</th>
<th></th>
<th>Time 4</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Skipped School</td>
<td>30.6</td>
<td>32.9</td>
<td>47.8</td>
<td>46.1</td>
<td>40.2</td>
<td>40.9</td>
<td>53.5</td>
<td>52.8</td>
</tr>
<tr>
<td>Destroyed School or Other Public Property</td>
<td>26.4</td>
<td>12.5**</td>
<td>31.1</td>
<td>13.3***</td>
<td>32.8</td>
<td>12.9**</td>
<td>28.8</td>
<td>12.0**</td>
</tr>
<tr>
<td>Been Suspended From School</td>
<td>7.0</td>
<td>3.6</td>
<td>18.3</td>
<td>12.3'</td>
<td>18.5</td>
<td>8.4**</td>
<td>18.3</td>
<td>12.0'</td>
</tr>
<tr>
<td>Stayed Out All Night Without Your Parents’ Permission While They Were Away</td>
<td>38.9</td>
<td>33.5</td>
<td>32.1</td>
<td>29.8</td>
<td>39.6</td>
<td>35.2</td>
<td>30.9</td>
<td>31.0</td>
</tr>
<tr>
<td>Ran Away From Home</td>
<td>15.6</td>
<td>22.0</td>
<td>21.2</td>
<td>24.2</td>
<td>23.4</td>
<td>25.0</td>
<td>21.3</td>
<td>21.0</td>
</tr>
<tr>
<td>Hit Either of Your Parents or a Teacher</td>
<td>4.5</td>
<td>6.8</td>
<td>7.7</td>
<td>13.0'</td>
<td>8.8</td>
<td>11.9</td>
<td>7.1</td>
<td>8.5</td>
</tr>
<tr>
<td>Stolen From a Store Something Valued at $20 or Less (e.g., Jewelry, Makeup, Cigarettes)</td>
<td>5.7</td>
<td>10.5'</td>
<td>10.8</td>
<td>16.8'</td>
<td>9.2</td>
<td>11.6</td>
<td>6.3</td>
<td>10.0</td>
</tr>
<tr>
<td>Stolen From a Store Something Valued at More Than $20</td>
<td>23.3</td>
<td>14.1''</td>
<td>37.9</td>
<td>29.1''</td>
<td>33.3</td>
<td>23.3''</td>
<td>28.7</td>
<td>22.3</td>
</tr>
<tr>
<td>Broken Into Someone Else’s Home or Place of Business</td>
<td>4.8</td>
<td>3.2</td>
<td>9.9</td>
<td>6.4</td>
<td>10.3</td>
<td>5.7''</td>
<td>9.4</td>
<td>6.1</td>
</tr>
<tr>
<td>Stolen Belongings From Inside Someone Else’s Car (e.g., Tapes, Tape Deck, Packages)</td>
<td>8.1</td>
<td>2.4''</td>
<td>11.2</td>
<td>4.0''</td>
<td>13.8</td>
<td>3.8''</td>
<td>14.2</td>
<td>2.8''</td>
</tr>
<tr>
<td>Stolen Parts From Someone Else’s Car (e.g., Battery, Tires, Hubcaps)</td>
<td>5.0</td>
<td>0.6''</td>
<td>7.3</td>
<td>0.7''</td>
<td>8.0</td>
<td>1.2''</td>
<td>7.5</td>
<td>1.1''</td>
</tr>
<tr>
<td>Stolen a Car</td>
<td>1.4</td>
<td>0.4</td>
<td>2.6</td>
<td>1.6</td>
<td>3.0</td>
<td>0.9''</td>
<td>2.2</td>
<td>0.6</td>
</tr>
<tr>
<td>Sold Marijuana or Other Illegal Drugs</td>
<td>6.3</td>
<td>3.6</td>
<td>11.2</td>
<td>5.4''</td>
<td>10.7</td>
<td>4.5''</td>
<td>9.3</td>
<td>4.3''</td>
</tr>
<tr>
<td>Beat Up Someone on Purpose</td>
<td>23.6</td>
<td>9.9''</td>
<td>28.4</td>
<td>13.0''</td>
<td>24.3</td>
<td>11.7''</td>
<td>21.7</td>
<td>7.8''</td>
</tr>
<tr>
<td>Been Sent to Jail, Reform School, or a Juvenile Detention Center</td>
<td>0.9</td>
<td>0.6</td>
<td>2.4</td>
<td>1.9</td>
<td>2.8</td>
<td>0.9</td>
<td>3.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Note: Values are expressed as percentages. Sample size ranges for boys and girls across times of measurement were: Time 1 (boys = 438–447, girls = 502–506); Time 2 (boys = 539–546, girls = 575–579); Time 3 (boys = 530–536, girls = 576–580); Time 4 (boys = 505–508, girls = 538–542).

'p < .01. **p < .001.
either a parent or a teacher at Times 1 and 2, but no sex differences were reported for Times 3 and 4. These findings are consistent with findings by others (e.g., Agnew & Huguley, 1989) on the relatively high incidence of adolescents committing acts of violence against parents (or other adults), and of the perpetrator not being restricted to boys.

A repeated measures multivariate analysis of variance (MANOVA) model was used to evaluate the potential of a Sex × Time interaction. Sex was specified as a between-group factor and time as a within-subjects factor. The overall MANOVA model indicated statistical significance, $F(3, 1012) = 42.77, p < .001$. Sex and time were statistically significant main effects ($p < .001$), but the Sex × Time Interaction was not statistically significant. A plot of the observed means indicated sex differences in elevation (or mean levels), but the shape was similarly quadratic for both sexes.

A more precise analysis of sex differences was also conducted by using a simultaneous group LGM across boys and girls. For each of the independent group models, all growth parameters (i.e., mean and variance) were statistically significant ($p < .01$) for the intercept, linear component, and quadratic component. The constrained, simultaneous group model indicated that boys and girls did not differ significantly with regard to variability about the linear and quadratic curve components, nor with regard to the correlations between the intercept and linear component, and the intercept and quadratic component, respectively. However, the groups did differ significantly ($p < .01$) with regard to mean and variance estimates for the intercept, and with regard to mean estimates for the linear and quadratic components. Similar to the findings reported in Table 1, boys, relative to girls, had higher average levels of delinquent activity and greater variability. They also had somewhat faster rates of both acceleration (for the linear component) and deceleration (for the quadratic component). Subsequent analyses were conducted on the pooled sex group samples, but sex was included as a predictor variable to address these sources of group differences.

**LGM Model**

Figure 1 depicts the LGM model that was used to evaluate hypotheses about the shape (e.g., linear, quadratic) of the LGM for delinquent activity across the four waves of measurement. The first factor (F1) is the intercept and contains sample information about the mean ($M_I$) and variance ($D_I$) of the collection, or group, of individual intercepts that describe each person’s growth curve. Therefore, $M_I$ represents the average estimated intercept derived from the estimated individual intercepts, and $D_I$ represents the variability in individual level intercepts about this average estimated intercept. Each of the four manifest variables (Delinquency 1–Delinquency 4) has “time steps,” or factor loadings, fixed to 1.0 on F1 to constrain the intercept, or height of the reference curve. Factors 2 (F2) and 3 (F3) represent components of the shape of the growth trajectories for delinquency across time. F2 represents the linear growth component of the individual trajectories, and F3 represents the quadratic, decelerating component of the trajectories. F2 and F3 each have two parameters, $M_I$ and $D_I$ and $M_Q$ and $D_Q$, respectively, which represent the mean and variance of the collection of individual linear and quadratic component estimates that describe each person’s growth curve. Orthogonal polynomial contrast coefficients were utilized to scale the shape of the growth components. This was accomplished by fixing the factor loadings with vectors of orthogonal polynomial coefficients. The resulting scaling metric for rate of growth reflects the average level of delinquency activity.
that higher average levels of delinquency were associated with more rapid growth in delinquency across time for that portion of the curve. The estimated correlation of Factor 1 and Factor 2 was .25 (p < .001), indicating that higher average levels of delinquency are, across time, associated with greater acceleration of delinquency, and slower deceleration toward desistance.

Table 2. Estimated Latent Means for Adolescent Delinquent Activity

<table>
<thead>
<tr>
<th>M</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Time 3</th>
<th>Time 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed</td>
<td>1.78</td>
<td>2.52</td>
<td>2.41</td>
<td>2.30</td>
</tr>
<tr>
<td>Estimated</td>
<td>1.81</td>
<td>2.40</td>
<td>2.56</td>
<td>2.28</td>
</tr>
</tbody>
</table>

\(^{6}\text{N} = 1016.\)

The variance of the error variables represents variance not accounted for by the growth factors and that may be due to the systematic, time specific influences or to random error (e.g., Stoolmiller, 1995). In the models specified in this article, error terms are assumed to be normally distributed and independent; Willet and Sayer (1996) demonstrated the ease with which such assumptions may be relaxed to estimate alternative error structures.
in delinquent activity. Hence, those adolescents with a less difficult temperament, a higher GPA, and a lower percentage of alcohol-using friends at Time 1 manifested the most rapid deceleration in delinquency across the time interval measured in this study. These predictors accounted for 17% of the variation in the quadratic component.

Comparisons of Normative and Persistent, Versatile Adolescents

To evaluate possible differences between the normative and versatile, persistent adolescent delinquency subgroups on characteristics of potential importance, two-group comparisons were made for individual temperament attributes, for close friendship characteristics, and for other emotional and behavioral problems. A composite measure of difficult temperament was used in the latent growth prediction models, but a further breakdown of the subscale is provided here. Because the “causal” direction of effects becomes a substantive concern when including other behavioral and emotional problems as predictors of delinquency (i.e., does marijuana use cause delinquency, or does delinquency cause marijuana use), these variables were not used in the latent growth models. They are, nevertheless, of importance to distinguishing normative and versatile, persistent subgroups (e.g., Moffitt, 1993). Table 4 provides a summary of these descriptive analyses. The findings indicate that the versatile, persistent subgroup had higher levels of general activity, were more inflexible, and had lower positive mood quality (i.e., lower positive affect). Their best (same-sex) friend relationships were characterized by higher levels of covert and overt conflict, and they reported more childhood conduct problems and more current alcohol and marijuana use.

Table 3. Correlation Matrix for Adolescent Delinquency Latent Growth Curve Models

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delinquency (Time 1)</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delinquency (Time 2)</td>
<td>.652</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delinquency (Time 3)</td>
<td>.541</td>
<td>.682</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delinquency (Time 4)</td>
<td>.508</td>
<td>.618</td>
<td>.680</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family Social Support</td>
<td>-.249</td>
<td>-.198</td>
<td>-.220</td>
<td>-.167</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol Using Friends</td>
<td>.386</td>
<td>.421</td>
<td>.379</td>
<td>.354</td>
<td>-.104</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficult Temperament</td>
<td>.221</td>
<td>.252</td>
<td>.152</td>
<td>.116</td>
<td>-.321</td>
<td>.114</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stressful Events</td>
<td>.419</td>
<td>.424</td>
<td>.336</td>
<td>.332</td>
<td>-.218</td>
<td>.226</td>
<td>.210</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade Point Average</td>
<td>-.296</td>
<td>-.337</td>
<td>-.335</td>
<td>-.258</td>
<td>.200</td>
<td>-.229</td>
<td>-.200</td>
<td>-.315</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex (1 = Boys, 2 = Girls)</td>
<td>-.115</td>
<td>-.136</td>
<td>-.165</td>
<td>-.156</td>
<td>-.063</td>
<td>.011</td>
<td>.023</td>
<td>.120</td>
<td>.134</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Grade Level (1 = 10th, 2 = 11th)</td>
<td>.056</td>
<td>.078</td>
<td>.070</td>
<td>.055</td>
<td>-.035</td>
<td>.021</td>
<td>.030</td>
<td>.026</td>
<td>.000</td>
<td>.017</td>
<td>1.0</td>
</tr>
<tr>
<td>M</td>
<td>1.786</td>
<td>2.524</td>
<td>2.415</td>
<td>2.296</td>
<td>56.690</td>
<td>61.250</td>
<td>1.180</td>
<td>6.328</td>
<td>4.910</td>
<td>1.510</td>
<td>1.481</td>
</tr>
<tr>
<td>SD</td>
<td>2.009</td>
<td>2.535</td>
<td>2.633</td>
<td>2.390</td>
<td>13.722</td>
<td>38.923</td>
<td>1.210</td>
<td>3.604</td>
<td>1.430</td>
<td>0.500</td>
<td>0.499</td>
</tr>
</tbody>
</table>

Note: N = 1,016. The covariance metric was used in all models specified in this article. Rounding to the third decimal place may contribute to minor deviations between the fit of models cited in this article and those derived on the basis of the data provided in this table.
Discussion

The LGM methodology used in this application provided a systematic approach to evaluate the (quadratic) shape of delinquent activity across four waves of measurement during adolescence, as well as to facilitate the evaluation of several predictors of latent growth. By specifying LGMs that incorporated parameters corresponding to linear and quadratic components, a formal statistical model was tested and the quadratic function emerged as plausible to characterize the latent growth pattern of delinquency for this adolescent sample. The quadratic pattern indicated an acceleration in delinquency between Time 1 and Time 2 that reached an asymptote at Time 3, prior to deceleration at Time 4. These findings are consistent with data collected on a larger segment of the age–crime curve (e.g., Farrington, 1986), but are, of course, restricted to the 2-year interval focused on in this study.

The short-term intensive longitudinal research design used in this study provided a method of explicitly testing a highly specific, time-related hypothesis about the age–crime curve for a community (i.e., high school) sample of adolescents, with results similar to those obtained with institutional and cross-national samples (e.g., Farrington, 1986; Moffitt, 1994). The deceleration in the developmental pattern of delinquency reported in this study may be interpreted as the initiation, or early phases, of maturing out for some adolescents. Preparation for continued post-high school education or gainful employment subsequent to graduation may precipitate this initial desistance pattern, which may become more pronounced with the adoption of adult social roles (e.g., spouse, parent) over the subsequent years of early adulthood. Such a pattern would be consistent with what Moffitt (1993) labeled “adolescent limited” delinquent involvement. According to Moffitt, the vast majority of adolescents will manifest this adolescent limited pattern, reflective of statistically normative transgressions that often occur within the peer context.

It is also of interest to note that the quadratic function characterized cross-temporal patterns of delinquency for boys and girls. Much prior research on antisocial behaviors and delinquency has focused principally on boys due to the presumed higher base rates, especially for violent activities. However, recent research on adolescent delinquent activity has indicated that girls do indeed engage in relatively high levels of statistically normative delinquent activity, and that some forms of aggressive activity (e.g., covert aggression) not commonly measured in existing “male oriented” surveys may occur at high rates among girls (e.g., Caspi, Lynam, Moffitt, & Silva, 1993; Zoccolillo, 1993). For example, Cairns et al. (1988) indicated that adolescent girls engaged in more indirect forms of aggression (e.g., gossiping, social manipulation, ostracism) rather than more direct confrontational approaches manifested by boys. Zoccolillo (1993) argued persuasively that differences in antisocial behavior between boys and girls remain uncertain given our current state of knowledge. The findings in this study are clear in indicating a high level of similarity in the shape (latent growth) of delinquency across adolescence for boys and girls, although boys still reported

| Table 4. Temperament, Friendship Characteristics, and Problem Behaviors by Delinquency Subgroup |
|---------------------------------------------|-------------|----------------|-------------|------|-----------|------|
| Variable                                   | Normative Subgroup | Persistent Subgroup | M | SD | M | SD | F | df |
| Temperament                                |              |                  |    |    |    |    |    |    |
| General Activity Level                      | 19.60        | 4.51             | 21.64        | 3.41         | 10.14** | 1,867 |
| Withdrawal–Approach                        | 19.87        | 3.53             | 19.42        | 3.59         | 0.80    | 1,866 |
| Rigidity–Flexibility                       | 14.83        | 2.68             | 14.04        | 3.11         | 4.08*   | 1,867 |
| Positive Mood Quality                      | 23.96        | 4.14             | 22.24        | 5.18         | 7.96*   | 1,863 |
| Rhythmicity                                | 40.07        | 7.83             | 39.12        | 7.50         | 0.69    | 1,862 |
| Task Orientation                           | 19.38        | 4.51             | 18.27        | 4.61         | 2.89    | 1,857 |
| Close Friendship Characteristics            |              |                  |    |    |    |    |    |    |
| Self-Disclosure                            | 14.20        | 2.94             | 13.85        | 3.27         | 0.71    | 1,950 |
| Reciprocity of Relations                   | 14.45        | 2.48             | 14.35        | 2.05         | 0.08    | 1,950 |
| Covert Conflict a                          | 10.10        | 2.08             | 9.39         | 2.70         | 5.66*   | 1,947 |
| Overt Conflict a                           | 9.97         | 3.67             | 8.24         | 3.64         | 11.38** | 1,950 |
| Problem Behaviors                          |              |                  |    |    |    |    |    |    |
| Childhood Conduct Problems                 | 9.25         | 2.10             | 12.15        | 2.84         | 93.34*** | 1,995 |
| Alcohol Consumption b                      | 0.42         | 0.87             | 1.26         | 1.29         | 44.16*** | 1,943 |
| Marijuana Use                              | 2.36         | .19              | 2.65         | .48          | 91.62*** | 1,951 |
| Illicit Drug Use                           | 2.32         | .09              | 2.47         | .36          | 72.36*** | 1,951 |
| Depressed Affect                           | 15.28        | 10.17            | 17.26        | 10.77        | 1.93    | 1,950 |

*Higher scores indicate less conflict. **For alcohol use, 0.50 ounces of ethanol per day would correspond to an average of 1 drink per day or 30 drinks per month.

p < .05, **p < .01, ***p < .001.
higher levels of more interpersonally violent and severe forms of delinquent activity.

With regard to the predictors of the intercept (i.e., initial levels of delinquency) and other latent growth parameters, support was garnered for the significance of variables from the intrapersonal, family, peer, and school performance domains.

Higher average levels of delinquent activity were predicted by a higher percentage of friends using alcohol, lower family support, higher levels of stressful life events, a more difficult temperament, male gender, and poorer academic functioning. These findings are consistent with previous research (e.g., Elliott et al., 1985; Mazziade et al., 1990; Oetting & Beauvais, 1987) and suggest that a constellation of intertwined individual and social factors are associated with variability in delinquent activity. These predictors accounted for respectable levels of variation ($R^2 = 45.7\%$).

The strongest prospective (Time 1) predictors of the cross-temporal deceleration, or desistance, pattern were lower involvement with alcohol-using peers, a less difficult temperament, and higher academic performance. These Wave 1 prospective predictors of adolescent desistance have often been identified as protective factors in the literature (e.g., Hawkins, Catalano, & Miller, 1992; Werner, 1987). That is, affiliation with a less deviant peer group, a less difficult temperament, and better academic functioning have been associated with positive outcomes (e.g., better mental health, less substance abuse and criminality) even among children exposed to highly adverse circumstances (e.g., poverty, low birth weight). Hence, it appears that these personal and social characteristics are also of importance for adolescents initiating desistance of age normative delinquent involvement.

These more aggregate sample findings on latent growth (change) and predictors of growth were complemented in this study by the use of person-centered analyses focused on comparisons among theoretically based distinct subgroups. The descriptive comparisons between normative and versatile, persistent adolescent subgroups indicated some important differences that are consistent with, but not identical to, Moffitt’s (1993) theory. The persistent, versatile delinquent adolescents had substantially higher levels of (retrospectively reported) childhood conduct disorder symptoms and heavier current substance use than the normative comparison group. Moffitt also proposed that the peer relations of versatile, life-course persistent delinquents are likely to be short-lived, to be centered on illegal activities, and to have lower levels of loyalty or positive regard. This study supports this general notion with regard to close friendship relations in that versatile, persistent adolescents reported higher levels of overt and covert conflict with their best friends than did normative adolescents. Furthermore, specific temperament characteristics differed between the two groups, with the persistent group reporting higher levels of general activity, greater inflexibility to changes in one’s environment, and lower positive affect. These temperamental characteristics may contribute to lifelong patterns of negative interactions with others and to dysfunction in interpersonal domains (e.g., Newman, Caspi, Silva, & Moffitt, 1997; Tubman & Windle, 1995). Thus, although distinct from Moffitt’s (1993) life-course persistent subtype due to sample selection factors, the versatile, persistent delinquent adolescents identified in this study reported numerous intrapersonal and interpersonal deficits and a multiproblem profile that clearly poses risks for subsequent difficulties in young adulthood and possibly beyond.

The use of the complementary aggregate sample, variable-based approach and the subgroup, person-centered approach (e.g., Cairns et al., 1998; Magnnusson & Bergman, 1988) in this study yielded valuable, but somewhat different, information about adolescent delinquent behavior. The findings from the variable-based approach were consistent with previous research (e.g., Farrington, 1986) in confirming that, for the aggregate sample, delinquent behavior may be modeled via a quadratic function. This is important substantively because it suggests that most adolescents will mature out of normative delinquent behavior without intensive or extensive interventions. However, there were considerable individual differences in intraindividual change associated with the aggregate quadratic growth model of delinquent behavior. That is, analogous to the derivation of a mean for distribution of individual scores, the estimated parameters for the aggregate quadratic growth model do not separately identify participants in the upper (or lower) portions of the distribution (e.g., those with the lowest or highest levels of delinquent activity). The person-centered approach, guided by Moffitt’s (1993) conceptualization, facilitated an evaluation of a subgroup of adolescents who engaged in a pattern of persistent, versatile delinquent behavior with a more normative subgroup. Such subgroup comparisons are vitally important to understanding different developmental trajectories and pathways, with potentially significant implications for prevention, intervention, and social policy. Thus, the use of both variable-based and person-centered approaches provided unique information in understanding adolescent delinquent behavior. Nevertheless, both approaches converged in identifying important risk variables (e.g., temperament, friends’ alcohol use, school grades) associated posi-

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The socioeconomic indicator of family income was also used in a separate analysis, but was not a statistically significant predictor. This may be due to the true absence of a significant socioeconomic status delinquency relation (e.g., Tittle & Meier, 1990), or to the restrictions on family income in this study toward the middle income portion of the U.S. population.
tively with high levels of delinquent behavior and with a deceleration in delinquent behaviors across time.

It should be acknowledged that this study has some important limitations that may restrict its generalizability. First, the high school-based sample is predominantly White, middle class, and from maritally intact families, hence precluding the generalizability of findings to other samples (e.g., inner city, poor, African American or Hispanic adolescents) or a more representative range of family types (e.g., single mothers). Second, the majority of data used in this study was based on self-report measures, although the reliability and validity of the self-report measures used have been supported in prior research with adolescents given the confidentiality protocol used in this study (e.g., Elliot & Huizinga, 1989; Hindelang, Hirschi, & Weis, 1979; Moffitt, 1989). Third, the age range used in this study (ages 15–19 years) is restricted in that significant portions of the age range for increases (e.g., ages 11–14) and decreases (ages 20–22 years) in delinquent activity were not measured; however, this limitation does not restrict tests of the hypothesized relations in this study, nor detract from the contributions contained therein.

In summary, the findings of this study support the quadratic hypothesis of adolescent delinquency and are generally consistent with Moffitt’s (1993) theory of meaningful subtypes, or subgroups, of adolescent normative (or limited) and versatile, persistent delinquency types, with this study containing a subgroup with the risk profile somewhat reminiscent of the life course persistent delinquency pattern described by Moffitt. The LGM modeling approach used in the study was useful for testing the quadratic hypothesis and for identifying predictors (e.g., higher academic functioning, lower percentage of alcohol-using friends, less difficult temperament) of the deceleration of delinquency across time. Because of the sampling restrictions of this study (e.g., primarily White, middle-class adolescents from maritally intact families), these findings need to be replicated with other samples (e.g., minority populations) to buttress the generalizability of the quadratic hypothesis and the salience of these (and other) predictors. In addition, follow-up studies into adulthood are needed to identify which of those versatile, persistent adolescents will continue to engage in antisocial activities, express emotional difficulties, and manifest a persistent pattern of maladjustment or criminality.

Despite the limitations of this study, the findings do highlight three issues that merit the consideration of applied developmental scientists. First, even though the vast majority of adolescents engage in delinquent activity during adolescence, the majority will mature out of this behavior; hence, there is no need for an overly reactive intervention policy. Second, a small but important subset of adolescents are at high risk for possibly life-long patterns of criminality and destructive behavior. Further screening to identify and intensively intervene early in the life span with these adolescents may be optimal from the perspective of disrupting (and “retracking”) their life course trajectories. It is improbable that universal, short duration, single component interventions will be sufficient to modify the deviant behaviors of these high-risk adolescents. Rather, extensive multilevel interventions that focus on personal abilities (e.g., social competence) and perceptions (e.g., of self-efficacy), family and peer relations (e.g., anger control strategies, social skills training), and community resources (e.g., youth centers) are needed to provide a more comprehensive approach to address the difficulties of these troubled youth. Third, these findings clearly illustrate the importance of studying time-ordered behavior across time within a developmental perspective to facilitate the study of individual differences in intradimensional change. Such a time-ordered approach will also be necessary to understand the short- and long-term consequences of intervention programs designed to alter delinquent behavior and foster healthy life course development.

References


A LATENT GROWTH CURVE MODEL


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