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Continuity of Aggression From Childhood to Early Adulthood as a Predictor of Life Outcomes: Implications for the Adolescent-Limited and Life-Course-Persistent Models

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Using data from the Columbia County Longitudinal Study, a 40-year longitudinal study following an entire county's population of third-grade students from age 8 to 48, we examine questions about the long-term consequences of aggressive and antisocial behavior in childhood, adolescence, and young adulthood. We found moderate levels of continuity of aggression from age 8 to 48 both for males and for females. Contrary to what some have proposed, we found that continuity of aggressiveness is owing to not only the high-aggressive participants staying high but also owing to the low-aggressive participants staying low. Compared with life-course-persistent low aggressives, we found that life-course-persistent high aggressives had consistently poorer outcomes across domains of life success, criminal behavior, and psychosocial functioning at age 48 (e.g., arrests, traffic violations, aggression toward spouse and divorces, depression, health, occupational and educational attainment). In contrast, adolescent-limited and child-limited aggressives did not differ from life-course-persistent low aggressives on the age 48 outcomes. Finally, the outcomes for late-onset (early adulthood) aggressives were also problematic in some domains though not as problematic as those for life-course-persistent aggressives. Aggr. Behav. 35:136–149, 2009. **© 2009 Wiley-Liss, Inc.**

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INTRODUCTION

One of the most consistent findings in aggression and criminology research is that aggression is a relatively "stable," self-perpetuating behavior that begins early in life [Farrington, 1989, 1995; Huesmann and Moise, 1998; Huesmann et al., 1984, 2002; Juon et al., 2006; Kokko et al., in press; Loeber and Dishion, 1983; Moffitt et al., 2001; Olweus, 1979; Tremblay, 2000; Zumkley, 1992]. In this case, stability refers to "continuity of position" within the population: the more aggressive child grows up to be the more aggressive adult. Some researchers [Loeber, 1982; Moffitt, 1990] have argued that the continuity in aggression found in many past studies is because of only a few highly aggressive people. According to Moffitt's [1993] developmental taxonomy, there are two types of aggressive people: those for whom aggression or antisocial behavior is stable and persistent (*Life-Course-Persistent*) and those for whom it is temporary and situational (*Adolescent-Limited*). Moffitt argues that only a very small percentage of aggressive or antisocial adolescents have the more stable, persistent form and that it is this small group that is driving the statistical continuity found in studies of aggression and antisocial behavior.

In this article, we use data from the Columbia County Longitudinal Study [Huesmann et al., 1984, 2006], a prospective study tracking the development of aggression of an entire county's population of third-grade students in 1960 from age 8 to 48. We examine several related questions about the

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long-term consequences of aggressive and antisocial behavior in childhood and adolescence. First, we examine the continuity of aggressive behavior and look at the extent to which continuity and change in those behaviors conform to ideas about life-course-persistent and adolescent-limited behaviors. We also test whether continuity of aggressive and antisocial behavior is a consequence of a few high-aggressive participants remaining high as some have suggested or more a consequence of a general tendency for people to retain their relative position in the population as they mature. Second, we examine the extent to which different patterns of continuity in aggressive and antisocial behavior from middle childhood to early adulthood (e.g., life-course-persistent low or high aggression, adolescent-limited aggression) predict negative (e.g., criminality) and positive (e.g., health, educational and occupational success) outcomes in middle adulthood.

Continuity of Aggression

Early studies examining the continuity of aggression focused primarily on males. Olweus [1979] reviewed 16 studies with lags ranging from 6 months to 21 years and reported strong evidence for the continuity of aggression. Olweus obtained disattenuated stability coefficients ranging from .98 for his own study of 85 13-year-olds in Sweden over a 1-year lag to .36 for Kagan and Moss's [1962] study of 35 5-year-olds, who were followed for 18 years. Olweus found that these stability coefficients for the same length lag were higher for older than younger boys, that the coefficients generally decreased linearly as the interval covered increased, and that the stability coefficients were similar for studies using different methods for measuring aggression (e.g., observation vs. teacher rating). Loeber and Dishion [1983] reviewed the literature on childhood problem behavior as a predictor of later delinquency and found that childhood problem behavior in males was the second best predictor of both delinquency and recidivism. Additionally, some landmark studies not included in these reviews found similar results. For example, Ensminger et al. [1983] found that among first-grade children growing up in a poor, Black, Chicago community, teacher-rated aggressiveness in the first grade significantly predicted delinquency 10 years later for males but not for females. McCord [1983], in her 40+-year study of 227 males in Cambridge, MA, found that childhood aggressiveness was a precursor of adult antisocial and criminal behavior for males.

In the 1980s and 1990s, studies began to examine the continuity of aggression both in males and females. Taken together, these studies suggest that the continuity of aggression throughout the life course is slightly higher for males than for females. In the Dunedin Study in New Zealand, Moffitt et al. [2001] have followed over 1,000 children from age 3 to 26. Multiple informants reported on the child's antisocial behavior across multiple time points. The pattern of longitudinal continuity correlations fit what Caspi and Roberts [1999] denoted as the "twin laws" of longitudinal correlations: the correlations decrease as the time between measurements increases, and the correlations for the same lag increase as the age of the participants increases. Across aggression measures and child ages, the correlations ranged from .74 to .32 for males and from .70 to .15 for females for a 1-year lag. For a 10-year lag, the correlations ranged from .36 to .12 for males and from .34 to 0 for females. In the Jyvaskyla Longitudinal Study of 369 Finnish children, Kokko et al. [in press], Pulkkinen and Pitkänen [1993], and Pitkänen-Pulkkinen [1981] also used multiple reports of the child's aggression across ages 8, 14, 20, 27, 36, and 42. The average obtained stability coefficients from age 8 to 14 were .50 for males and .28 for females. From age 8 to 27 they were .20 for males and .07 for females (see Pulkkinen's article in this issue for more recent waves of data). In the Cambridge Study of Delinquent Development, Farrington [1990, 2003] and Farrington and West [1981] have followed 411 boys growing up in London for 38 years from childhood into adulthood and found that measures of aggression from childhood were related to adult criminal convictions, violence, and chronic offending (see Farrington's article in this issue). In our own Columbia County Longitudinal Study [e.g., Eron et al., 1971; Huesmann and Moise, 1998; Huesmann et al., 1984], participants were interviewed at ages 8, 19, 30, and 48 between 1960 and 2000. Using structural modeling of a latent trait of aggressiveness over time, we [Eron and Huesmann, 1990; Huesmann et al., 1984; Huesmann and Moise, 1998] found disattenuated stability coefficients over 22 years from age 8 to 30 of .50 for males and .35 for females. We also have shown that the likelihood of being convicted of a crime by age 30 and the seriousness of the crime were significantly predicted by peer-nominated age 8 aggression [Huesmann et al., 2002].

In sum, the continuity of aggressive and antisocial behavior is considered to be "one of the few 'knowns' in aggression and criminology research" [Juon et al., 2006; p 194]. A number of ongoing

prospective studies [e.g., Farrington, 2000; Huesmann et al., 2002; Huizinga and Jakob-Chien, 1998; Kokko et al., in press; Loeber et al., 1999; Pulkkinen and Pitkänen, 1993; Tremblay et al., 1999], although only beginning to report extensive data on middle and late adulthood behavior, confirm continuities from childhood aggression to late adolescent delinquency and early adulthood criminality. Of course, as researchers have pointed out [Huesmann and Moise, 1998; Loeber and Stouthamer-Loeber, 1998; Moffitt, 1993], most high-aggressive children do not end up as adult criminals. Nevertheless, early aggressive and antisocial behavior predicts a greater risk for becoming an adult criminal.

Individual and Statistical Continuity

Continuity correlation coefficients represent how well a scatter-plot of points relating early aggression to later aggression can be "fit' by a straight line, but there are always discrepancies from the average trend—individuals who start out aggressive and end up nonaggressive and vice versa. These discrepancies may be distributed normally over the range of aggression or they may be particularly notable at the low or high end of the range. The same overall correlation can be produced with quite different such distributions. This has led to disagreements over what the obtained statistical continuity actually represents. As noted earlier, some researchers have argued that the statistical continuity of aggression over time is owing to a few highly aggressive people [Loeber, 1982; Moffitt, 1990], which has led Moffitt [1993] to present a taxonomy of adolescent-limited vs. life-course-persistent antisocial behavior. According to Moffitt, only a small group of individuals exhibit high levels of aggression across time points, and this group accounts for the moderate levels of statistical continuity found across studies. For most other individuals, aggression is limited to one developmental period, particularly adolescence.

Using data from the Dunedin Study, Moffitt [1993] identified those boys who both scored above average on a measure of antisocial behavior at seven different ages and who were rated as highly antisocial by three different sources (parents, teachers, and self)—5% of the sample. For the entire sample, Moffitt reported a stability coefficient of .28 for teacher ratings, but when she excluded the 5% of chronically aggressive and antisocial individuals, she found a stability coefficient of .16. Loeber [1982] re-analyzed the data, and reported on other researchers' re-analyses of the data, from some of the most widely cited studies on the continuity of aggression to examine this issue. For example, Loeber cited Patterson's [1982] re-analysis of the 10-year data from the Columbia County Longitudinal Study described above. Lefkowitz et al. [1977] obtained a stability coefficient of .38 from age 8 to 19 for the sample as a whole. When Patterson broke down the sample by level of peer-nominated aggression at age 8 into various percentile ranges (85th–89th, 90th–94th, and $\geq$95th), he found that a higher percentage (38.5%) of children who were rated by their peers as aggressive at or above the 95th percentile also were rated in the same range 10 years later compared with those children in the other two groups (32.0 and 32.3%). However, these differences in percentages are small and the analysis does not examine the continuity of aggression for those who scored below the 85th percentile.

On the other hand, Huesmann and Eron [1989] and Huesmann and Moise [1998] have argued that individuals develop characteristic levels of aggression in childhood, and continuity means that there is a tendency to maintain their levels across time. Although substantial discontinuities no doubt occur, the notion is that such discontinuities are equally likely across the entire continuum of aggressive behavior. Using the three waves of data from the Columbia County Longitudinal Study, Huesmann and Moise [1998] divided participants into those who scored low on aggression at three time points (age 8, 19, and 30) and those who scored high on aggression at all three time points (median splits and $\pm$0.5 SD were used). Contrary to what some have proposed, continuity of aggressiveness did not appear to be a consequence of high-aggressive participants remaining high any more than low-aggressive participants remaining low.

In sum, numerous prospective studies have reported moderate levels of continuity of aggression across time, most often from childhood into late adolescence, with some studies extending into adulthood. These studies have confirmed moderate levels of continuity for different measures of childhood aggression (e.g., peer nominations, teacher reports) to late adolescent delinquency and early adulthood criminality. There remain disagreements, coupled with conflicting findings, regarding the issue of what accounts for the statistical continuity, most notably the argument that the statistical continuity of aggression over time is owing to a few highly aggressive people.

Aims of the Current Analyses

Using new data from the Columbia County Study, in this article we first extend the analysis that

Huesmann and Moise [1998] reported for age 8–30 to aggressive and antisocial behavior in middle adulthood at age 48. Second, we examine the extent to which different patterns of continuity in aggressive and antisocial behavior from middle childhood through early adulthood (i.e., life-course-persistent low or high aggression, adolescent- or child-limited aggression, late-onset aggression in early adulthood) predict negative outcomes as well as positive outcomes in middle adulthood.

METHOD

We analyzed data from the Columbia County Longitudinal Study, initiated in 1960 by Eron et al. [1971], when the original sample of 856 children, all of the third graders in Columbia County, NY, was first assessed at Wave 1 of what has now became a 40-year longitudinal study. This project has generated a large amount of data concerning how aggression develops from childhood into adulthood [see Eron et al., 1971, 1991; Huesmann et al., 1984; Huesmann and Moise 1988; Kokko et al., in press; Lefkowitz et al., 1977], as well as how childhood and adolescent aggression negatively affect indices of adulthood success [e.g., Dubow et al., 2006, in press; Huesmann et al., 2006]. Although little has been published thus far about predicting adult criminality in this sample, Huesmann et al. [2002] found that aggressiveness at age 8 increased the risk for arrest by age 30. In this article, we extend this analysis to predicting criminality through age 48.

Participants and Procedures

Columbia County, NY, is semi-rural with a few heavy industries. Of its approximately 63,000 current residents, about 7,000 live in the largest city and county seat, Hudson. The county has had a depressed economy for the last 50 years, although it has begun to benefit from the encroachment of the New York City metropolitan area. When the study began in 1960, there were 38 public and private third-grade classrooms in the county, all of which were included in the sample. Over 90% of the original sample of 856 participants was Caucasian; 51% were male and 49% were female. The number of ethnic minorities (i.e., 3% African American, $<1\%$ Asian or Pacific Islanders, $<1\%$ Hispanic) was too small to allow separate analyses. In this first wave, 85% of the participants' mothers and 71% of their fathers also were interviewed. The participants came from a broad range of socioeconomic backgrounds ($M = 5.01$, SD = 2.23 on a 10-point scale of father's occupational status derived by Eron et al., 1971, based on Warner et al.'s, 1960, 7-point scale; this mean reflects jobs such as craftsmen, foremen, and skilled tradesmen) and displayed a wide range of intelligence (mean IQ of 104, SD = 14). The 427 participants (211 boys, 216 girls) who were reinterviewed in 1970 had a modal age of 19 years and had completed 12.6 years of education on average. In 1981, 409 of the original participants were reinterviewed (modal age 30; 198 males, 211 females). The average educational level of the sample was "some college or technical school," and the average verbal achievement, as indicated by an average of the spelling and reading scores on the Wide Range Achievement Test [WRAT; Jastak and Jastak, 1978], was 96.34 (SD = 19.22) reflecting average achievement. For the 523 participants (268 males, 255 females; 61% of the original sample) reinterviewed during 1999–2002, the mean age was 48.46 years (SD = 0.77); the average education level was between some college and a college degree; the average occupational attainment was middle-class status (the average occupational prestige code using Stevens and Hoisington's, 1987, prestige scores reflected jobs such as sales, bookkeepers, and secretaries); 69% of the original participants were living with their spouses. The average verbal achievement score on the WRAT was 99.15 (SD = 13.72).

The sample size for analyses over all four waves varies considerably depending on the variables studied and what kind of data the analysis requires, e.g., interviews, archival data, second person, or parent data. Most relevant for this article, complete data on aggression for the first three waves is available for 285 participants and for all four waves over 40 years for 230 participants.

Interviews. Data collection procedures for the first three waves of the study have been reported elsewhere [e.g., Eron et al., 1971; Huesmann et al., 1984, 2002; Lefkowitz et al., 1977]. At age 8, two main sources of data were utilized: classroom-based peer nominations and extensive individual parent interviews. At age 19, participants were administered a variety of self-report measures, as well as peer nominations, in individual interviews at a field office. At ages 30 and 48, interviews were conducted by computer in a field office and by mail/telephone for those participants who could not come to the office. At age 30, participants were paid $50 for their participation; at age 48, they were paid $100 for their participation. Interviews ranged from 2 to 4 hr.

Attrition information. At age 48, we interviewed 61% (523, 255 females, 268 males) of the

original sample of 856. Of the noninterviewed participants, 37 were confirmed dead, 112 had disappeared and could not be found despite intense efforts, 40 could not be interviewed because of distance and scheduling difficulties, and 144 refused. The number who refused to be interviewed (despite substantial financial incentives) was higher than expected, but the completed re-interview rate of 61% over 40 years still provides us with a sizable sample for analysis. However, we must ask whether the attrition introduced bias into the sample. A comparison of means on age 8 scores revealed that compared with participants who were re-interviewed at age 48, participants who were not re-interviewed had higher levels of aggression, $t(854) = 4.06$, $P < .001$ ($M_{\text{difference}} = 0.13$, $\text{SE}_{\text{difference}} = 0.03$), lower levels of popularity, $t(854) = 4.19$, $P < .001$ ($M_{\text{difference}} = 4.45$, $\text{SE}_{\text{difference}} = 1.06$), lower anxiety about behaving aggressively, $t(854) = 3.86$, $P < .001$ ($M_{\text{difference}} = 3.40$, $\text{SE}_{\text{difference}} = 0.88$), and lower IQ at age 8, $t(852) = 5.69$, $P < .001$ ($M_{\text{difference}} = 5.70$, $\text{SE}_{\text{difference}} = 1.00$). These effect sizes range from $r = .14$ to .19. However, we note that the plots of the distributions for these four age 8 variables revealed that many of the high-aggressive and low-competent participants *were* re-sampled and there was no substantial restriction of range that might have made it hard to detect relations between these age 8 variables and adult outcomes. There was no significant difference in age 8 father's occupational status between re-sampled participants and drop-outs.

Measures

Specific aggression measures for all waves. (1) *Peer-nominated aggression* was assessed at ages 8 and 19 using a peer-nomination procedure developed by Eron et al. [1971], who defined aggression as "an act whose goal response is injury to another object" (p 30). Their ten peer-nominated aggression items cover physical (e.g., "Who pushes and shoves other children?"), verbal (e.g., "Who says mean things?"), acquisitive (e.g., "Who takes other children's things without asking?"), and indirect (e.g., "Who makes up stories and lies to get other children into trouble?") aggressive acts. The score represents the proportion of times the child was nominated by classmates on the ten items (participants could nominate peers of either sex; thus, a child's score was: total number of nominations received across the ten items/number of classmates times ten). This measure is described in detail elsewhere [Eron et al., 1971; Huesmann et al., 1984], has been widely used, and has an $\alpha = .90$ in cross-national samples, including the Columbia County Longitudinal Study (CCLS) [Huesmann and Eron, 1986].

At age 19, because participants would already have left high school, interviews were conducted in the field office. Participants were first presented with a list of those original participants who had attended school with them at age 8, and were asked to identify those whom they now know "well enough to answer some questions about." Aggression was measured using the same peer-nominated items as at age 8, save for the omission of one item ("Who says, 'Give me that!'?"). Participants checked all the names that applied from the list of participants who fit each item. Each individual's score was computed as the number of times he or she was nominated on the nine questions divided by the number of times he or she could have been nominated (i.e., the number of participants who now knew the individual well). This measure was highly reliable ($\alpha = .90$ across the nine items). At ages 8 and 19, a log transformation was applied to the aggression scores to reduce skewness and kurtosis.

(2) *Severe physical aggression* was assessed at ages 19, 30, and 48 through participants' self-reports of how often in the last year they engaged in each of four behaviors (e.g., choked someone, slapped or kicked someone, punched or beaten someone, knifed or shot at someone or threatened to do it; 1 = never to 4 = a lot; scores were log-transformed for analysis owing to skewness) ($\alpha = .66$).

(3) *Aggressive personality* was measured at ages 19, 30, and 48 by taking the sum of scales 4, 9, and F from the Minnesota Multiphasic Personality Inventory [MMPI; Hathaway and McKinley, 1940]. In earlier studies by our group [e.g., Huesmann et al., 1978, 1984], the summed *T*-scores of these three scales reflected a reliable and valid measure of antisocial-aggressive behavior. For these scales, participants read 143 statements and indicated whether each was true (1) or false (0) in describing themselves. *T*-scores were computed for each scale, and a total score for each respondent was computed from the sum of the three *T*-scores ($\alpha = .78$).

The aggressiveness we are assessing with these measures is certainly "antisocial" behavior, but we are not assessing nonaggressive antisocial behaviors with these measures. Thus, we view these measures as assessing a latent construct that we call "aggressiveness." At different ages, different measures may be differentially important in assessing this latent trait; therefore, in our past research we have typically used multiple indicators of aggression at

every age where they are available and for both genders [Huesmann and Guerra, 1997; Huesmann et al., 1984, 2002; Metropolitan Area Child Study Research Group, 2002]. At each age, where more than one aggression measure exists (i.e., ages 19, 30 and 48), we compute a measurement model for combining the measures. The measurement parameters derived from the model represent how aggressiveness manifests itself on the average, and the derived estimation equations allow one to estimate the composite "aggressiveness" for any individual.

For the analyses in this article, aggressiveness is represented by the peer-nomination measure alone at age 8; by the combination of peer nominations, self-reported severe physical aggression, and aggressive personality assessed by the MMPI F, 4, and 9 scales at age 19; and by the combination of self-reported severe physical aggression and aggressive personality assessed by the MMPI F, 4, and 9 scales at ages 30 and 48. These composite scores are standardized within each wave of data to provide a standard scale on which individuals' locations can be compared across waves independently of total sample shifts in aggressiveness.

Adult outcomes. (1) *Self-reports of criminal behavior*: At ages 30 and 48, we obtained access to the records of the New York State Criminal Justice System, and we were able to check criminal records of all 856 original participants. At age 30, we were able to determine the criminal records of 332 of the original 436 males (76%). We found that 68 of these 332 (20%) had arrest records. However, probably because of problems with name changes, we were able to determine the criminal records of only 206 of the original 420 females (49%), and found that only 12 (5.8%) of them had been arrested. At age 48, we followed a similar procedure and obtained criminal records on a much smaller sample from New York State alone, but we were unable to obtain records from any national database because of "human subject protection" concerns of the national agencies. Judging these samples to be too small for statistical reliability, we focus in this article on the self-reports of criminal behavior provided by all the participants we interviewed at age 48.

Based on measures developed by Elliott et al. [1985], participants were asked to indicate, "for anything other than a minor traffic offense," whether they had been arrested within the last 5 years, and if so how many times (0–9 or more times). In these analyses, we included the variable of whether the participant had been arrested.

(2) *Self-reports of traffic violations*: Participants were asked "how many driving tickets (moving violations)" they had received in the past 5 years (0–9 or more).

(3) *Antisocial behaviors*: Participants rated the extent to which they had engaged within the last year in 19 different antisocial behaviors [Elliott et al., 1985]. Sample items included: "How often have you thrown rocks or bottles at people?" and "Have you ever taken something from a store without paying for it?" A 4-point scale was used for responses to these items, ranging from 0 = "never" to 4 = "more than twice." Coefficient α was .79.

(4) *Aggression*: The composite aggression score described above for Wave 3 was computed again for Wave 4 from the participants' scores on the MMPI scales F, 4, and 9 and the severe physical aggression scale.

(5) *Aggression toward spouse*: Spousal/partner aggression was measured by nine items from the *Home Violence Questionnaire* [Straus et al., 1980]. Participants who were currently married or had recently lived with a partner or spouse indicated the frequency with which they directed threatening (e.g., with a knife or a gun) or physically aggressive (e.g., pushed or shoved, beat up) acts toward their partner in the last 12 months. These ratings were also made by spouses/partners about the participant's behavior toward him or her. Ratings were made on a 10-point scale ranging from 0 to "9 or more." Coefficient α for these items was .72 for self-reports and .90 for other reports. We averaged the participant's report of aggression toward the spouse and the spouse's report of the participant's aggression toward him/her.

(6) *Divorce*: Participants indicated if they had ever been divorced (0 = no, 1 = yes).

(7) *Depression*: Participants completed the *Brief Symptom Inventory* (*BSI*) of the *Symptom Checklist—90* [Derogatis, 1992], a widely used measure of psychological distress. The BSI is a checklist for which respondents are asked to endorse how much they have experienced each of 53 psychological symptoms within the last 7 days on a 5-point scale ranging from 0 = "not at all" to 4 = "extremely." The BSI provides subscales for nine clinical syndromes; we report on the depression scale in these analyses [coefficient $\alpha = .85$; Derogatis, 1992].

(8) *Self-reported health*: Participants' perceived healthiness was assessed using items adapted from the *MOS 36-Item Short-Form Health Survey* [Ware and Sherbourne, 1992]. Participants responded to five questions about their overall physical health. The first question asked participants to rate their health on a 5-point scale of 0 = "poor," 1 = "not so

good," 2 = "good," 3 = "very good," and 4 = "excellent." Participants then rated how true or false four statements were regarding their general health (e.g., "I seem to get sick a little easier than other people," "I am as healthy as anybody I know"). These ratings were made on a 5-point scale of 0 = "definitely false" to 4 = "definitely true." Scores were computed by taking the mean of these five items, with higher scores indicating better perceived health (coefficient $\alpha = .82$).

(9) *Problem drinking*: At age 48, a four-item scale was used to assess the participant's self report of problem drinking. Sample items included, "I have been arrested or involved in an accident as a result of drinking" and "After starting to drink, it is difficult to stop before becoming intoxicated." Participants responded to these items on a 4-point scale (0 = has never happened to me, 1 = has happened once, 2 = happens sometimes, and 3 = happens frequently). The total score is the average of the responses to the items. If a participant indicated no drinking in the past year, a score of zero was assigned for problem drinking. Internal consistency reliability was .63.

(10) *Occupational status* was assessed using occupational prestige codes following Stevens and Hoisington [1987]. Codes are provided for 889 specific occupations within 13 occupational categories (e.g., executive, administrative, and managerial; professional specialty; technicians; sales; protective service; mechanics/repairers; machine operators and inspectors). Higher codes indicate greater prestige. The codes range from 153 (ushers) to 810 (physicians). Two raters coded the participants' occupations. On a subsample of 162 occupations coded by each rater, the correlation between their assigned codes was $r = .81$.

(11) *Educational attainment* was assessed using a 7-point scale ranging from 1 = did not finish high school to 7 = doctorate or law degree.

(12) *Verbal achievement* was assessed using the WRAT [Jastak and Jastak, 1978] reading and spelling scores. Participants interviewed on the phone received the spelling test, and participants interviewed in person received the reading test. The scores were standardized by the age norms for the test given to have a mean of 100 and an SD of 15.

(13) *Frequency of religious attendance*: Participants indicated their frequency of religious service attendance ("How often do you attend religious services?," rated as 1 = "never," 2 = "less than once/year," 3 = "1–2 times/year," 4 = "several times a year," 5 = "about once a month," 6 = "2–3 times a month," 7 = "nearly every week," 8 = "every week," and 9 = "several times/week") [Eron et al., 1971].

RESULTS

Continuity of Aggression From Age 8 to 48

One accepted way to investigate the continuity of aggression over multiple waves is to use structural equation modeling to hypothesize a latent trait of aggressiveness with the continuity in observed measures being explained mostly through the path coefficients relating the latent trait in each wave to the next. Using this technique with the first three waves of data in the Columbia County Study, we [Huesmann et al., 1984] found disattenuated stability coefficients over 22 years from age 8 to 30 of .50 for males and .35 for females. We recomputed this model with the current data on the 523 participants whom we re-interviewed in Wave 4. For this four-wave model, the disattenuated continuity coefficients were very similar as before: 50 for males (see Fig. 1) and .42 for females (see Fig. 2). The actual continuity correlations were somewhat less as shown in Table I, but the continuity correlation for most lags in years was still higher for males than females. For both genders, continuity was greater from age 19 onward than prior to age 19. Recall that in all these analyses, adult aggression is represented by a composite of physical aggression and aggressive personality.

In understanding how a variety of evidence supports or does not support alternative views of continuity, one must keep in mind certain important statistical principles. First, even if a 10-year stability coefficient is as high as .5, the best prediction one can make about any individual's standardized aggression score 10 years later is that it will retreat 50% of the distance toward the mean for the population. Second, because aggression is always a positively skewed characteristic with many individuals scoring near zero and few scoring very high, truncating the high end of the distribution will always substantially reduce the correlation of aggression with any other variable including itself. Thus, such a reduction says little about "who" is contributing to continuity over time.

Given these principles, one way to examine "who" is contributing to the stability is to adopt Loeber's [1982] approach of comparing how many initially high and low participants stay high or low. Huesmann and Moise [1998] did this with data from the first three waves of the Columbia County Study. We now apply this approach to the four

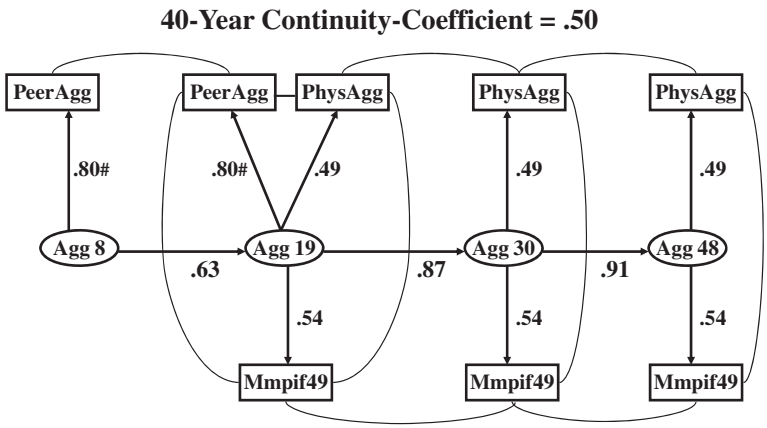

Fig. 1. The continuity of trait aggression over 40 years for 268 males estimated by a structural equation model. $\chi^2(16) = 24.16$, $P > .08$, RMSE = .047, GFI = .977. ♯ indicates that the coefficient was fixed at a value calculated from Wave 123 data [Huesmann et al., 1984]. All other printed coefficients are significant at $P < .0001$. RMSE, root mean-square error; GFI, goodness of fit index.

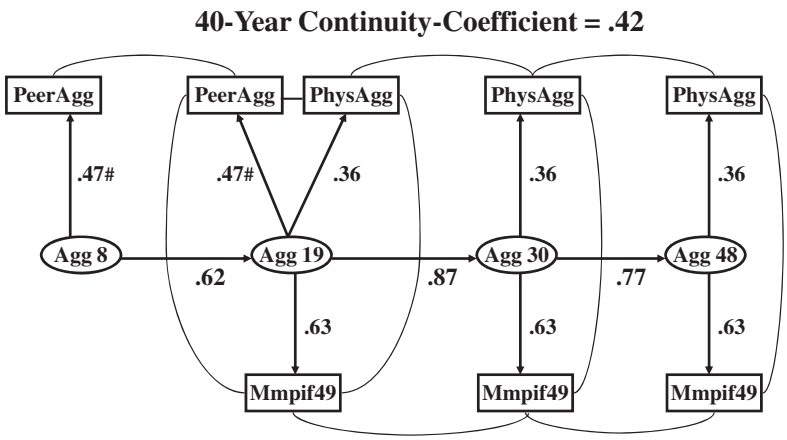

Fig. 2. The continuity of trait aggression over 40 years for 255 females estimated by a structural equation model. $\chi^2(16) = 20.77$, $P > .18$, RMSE = .030, GFI = .979. ♯ indicates that the coefficient was fixed at a value calculated from Wave 123 data [Huesmann et al., 1984]. All other printed coefficients are significant at $P < .0001$. RMSE, root mean-square error; GFI, goodness of fit index.

TABLE I. Pairwise Correlations of Latent Trait of Aggressiveness Over Time in the Columbia County Longitudinal Study (Correlations for 420 Females Above the Diagonal and for 436 Males Below the Diagonal)

	Age 8 aggression	Age 19 aggression	Age 30 aggression	Age 48 aggression
Age 8 aggression		$.23^{***}$	$.15^{*}$	$.13^{*}$
Age 19 aggression	$.37^{***}$		$.44^{***}$	$.45^{***}$
Age 30 aggression	$.35^{***}$	$.61^{***}$		$.56^{***}$
Age 48 aggression	$.29^{***}$	$.41^{***}$	$.56^{***}$	

Note: Owing to missing data, sample sizes for individual correlations are greatly reduced from the total sample size. $^{+}P < .10$, $^{*}P < .05$, $^{**}P < .01$, $^{***}P < .001$.

waves of data. The participants on whom we had four waves of data were divided into those who scored low on aggression at all four time points (ages 8, 19, 30, and 48) and those who scored high on aggression at all four time points. Two different criteria are used: (1) above or below the overall median in a wave and (2) above or below the 33rd and 67th percentiles for a wave. (Of course, because only the complete data sample is used and more high aggressives disappear over time, the number below the median in any wave will be greater than the number above the median.)

The results of both tabulations are given in Table II. First, consider the data for all participants combined. One can see that regardless of the criterion used, just as many initially low-aggressive participants stay low (e.g., 37% when median is used) throughout the life course as initially high-aggressive participants stay high (e.g., 35% when median is used). Contrary to what some have proposed, continuity of aggressiveness is not owing to the high-aggressive participants staying high any more than it is to the low-aggressive participants staying low.

The picture changes somewhat, however, when the classifications are broken down by gender. Of course, more females are classified as low at any time because females are, on average, less aggressive than males with the way aggression was measured in this study. The question is—who is contributing to the continuity correlations in each gender? Overall, consistent with what has been reported in previous studies, males show a little greater tendency to maintain position in the population (40%) than do females (33%). However, the most interesting difference is that there is a greater tendency for initially high females to move out of the high category (only 18% stay) than there is for initially high males to move out of the high category (47% stay). On the other hand, males and females have very similar tendencies to stay in the low category (36% females stay and 38% males stay). In summary, the continuity of aggression found in males seems to be somewhat more owing to the high aggressives staying high than it is for females; however, for both genders the stability of both ends of the distribution contributes to the continuity over time. It would be incorrect to think that the moderately high continuity coefficients are owing to just a few high or low participants maintaining their positions.

Finally, while the focus of this paper is on the outcome of different life-patterns of aggression, it is illuminating to examine what age 8 child and family characteristics predict life-course-persistent aggression. To do this we compared the four-wave life-course-persistent-aggression group with the four-wave life-course-persistent-non-aggression group using logistic regression. The results are shown in Table III. One can see that being a male, having

TABLE II. Distribution of Participants in the Columbia County Longitudinal Study Who Were "High" or "Low" on Aggression in All Four Waves (Ages 8, 19, 30, and 48) for 230 Participants With Data at All Four Waves

	Number of participants who are LOW during all four waves	% of participants LOW at age 8 who are LOW during all four waves	Number of participants who are HIGH during all four waves	% of participants HIGH at age 8 who are HIGH during all four waves
HIGH and LOW defined by above or below total sample median for wave				
All participants				
141 children LOW at age 8	52	37%	–	–
89 children HIGH at age 8	–	–	31	35%
Females				
80 children LOW at age 8	29	36%	–	–
38 children HIGH at age 8	–	–	7	18%
Males				
61 children LOW at age 8	23	38%	–	–
51 children HIGH at age 8	–	–	24	47%
HIGH defined by above 66.6 percentile for wave, LOW defined by below 33.3 percentile for wave				
All participants				
99 children LOW at age 8	18	18%	–	–
46 children HIGH at age 8	–	–	10	22%

Note: The number of children categorized initially as LOW and HIGH at age 8 in this analysis is not the same because of greater attrition among the high-aggression participants. The data for the "triadic" categorization could not be computed by gender because the sample sizes would be too small.

TABLE III. Logistic Regression Predicting Life Course Persistent Aggression over Age 8 to 48 Compared to Life-Course Persistent Non-Aggression over Age 8 to 48

Age 8 Predictor Variable	Odds Ratio	Significance
Subject's gender	4.2	.027
Subject's IQ	1.0	n.s.
Parents report "hitting" subject	3.5	.048
Parents "reject" subject	1.3	.018
Parent's education	0.25	.008

parents who hit you, having parents who reject you, and having parents with lower education all have significant effects in increasing the odds that a child will have life-course-persistent aggression. In contrast, none of these factors increased the risk of adolescent-limited-aggression significantly.

What Life-Course-Persistent Aggression Predicts

Having shown that there are significant numbers of people who are above average in aggressiveness consistently throughout life and that there are significant numbers who are below average in aggressiveness consistently throughout life, we now will look at the long-term consequences of being in these categories. To do this we defined several subsets of individuals on the basis of their composite aggression scores in the first three waves of the Columbia County Study (ages 8, 19, and 30) and examined how they turned out in the fourth wave at age 48.

Those who were below average in composite aggressiveness in all three waves are called life-course-persistent low aggressives. There were 75 such individuals (42 females and 33 males). Those who were above average on composite aggressiveness in all three waves are called life-course-persistent aggressives. There were 48 such individuals (12 females and 36 males). Those who were above average on aggressiveness at age 19 but below average at ages 8 and age 30 are called adolescent-limited aggressives. There were 23 such individuals (10 females and 13 males). Those who were above average on aggressiveness at age 8 but below average at ages 19 and 30 are called childhood-limited aggressives. There were 23 of them (12 females and 11 males). Those who were above average on aggressiveness at age 30 but below average at ages 8 and 19 are called late-onset aggressives. There were 27 of them (16 females and 11 males). Finally, there were 82 of the 285 complete participants with wave 1, 2 and 3 aggression data who did not fall into any of these categories. Having created these categories, we then examined several indices of life outcomes at age 48 that each group experienced and compared these averages against the baseline average of the life-course-persistent low-aggressive group.

Table IV reports the average scores of each trajectory group on the age 48 outcome measures of interest. It is very clear from these data that the life-course-persistent high aggressives had consistently poorer outcomes at age 48 compared with life-course-persistent low aggressives and the other groups. For example, 7% of the life-course-persistent aggressives were arrested between ages 30 and 48, whereas no one in any of the other groups was arrested during that time. The life-course-persistent aggressives also had about twice as many moving traffic violations as the nonaggressives and they scored significantly higher on general aggression and aggression toward their spouses. Forty-nine percent of them had been divorced compared with 18–22% in the other groups. They were significantly more likely to report "problems with alcohol" than the low aggressives and scored as significantly more depressed. They reported significantly worse health, and they displayed significantly lower verbal achievement, educational attainment, and occupational prestige at age 48 compared with the life-course-persistent low aggressives. Finally, they attended religious services significantly less than the low aggressives.

The sample size in the life-course-persistent group was large enough to allow comparisons separately by gender, and the significance of these comparisons is indicated in each cell as well. The lack of significance for females in these comparisons needs to be interpreted with caution because of the much smaller number of females in the life-course-persistent group (11 females versus 31 males). Given the small sample size, it is particularly notable that divorce, poor health outcomes, and problem drinking are significantly more likely for life-course-persistent aggressive females than for the non-aggressive females.

In contrast to these results, the childhood-limited aggressive and adolescent-limited aggressive groups showed few negative outcomes compared with the life-course-persistent low aggressives. Both of these groups did report more problems with alcohol than the low aggressives, and the adolescent-limited group scored higher on the trait of aggression at age 48 than did the low aggressives. However, those were the only differences.

Finally, the late-onset adult aggression group displayed a number of more negative outcomes than the low-aggressive group though not nearly as many as

TABLE IV. Mean Scores on Adult Outcome Measures Among Categories of Participants Based on Their Aggression Levels Throughout the Life Course and Comparisons of Each Category With Life-Course-Persistent Low Aggressives

	Life-course aggression category				
Adult outcomes at age 48	Life-course-persistent low ($N = 75$) Mean (SD)	Life-course-persistent high ($N = 48$) Mean (SD)	Adolescent-limited ($N = 23$) Mean (SD)	Childhood-limited ($N = 30$) Mean (SD)	Late-onset ($N = 27$) Mean (SD)
Negative outcomes					
Ever arrested proportion	0.00 (0.00)	**0.07* (0.26)**	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Traffic violations	0.42 (0.75)	**0.79*** [*m*] **(1.16)**	0.50 (0.92)	0.48 (0.95)	0.41 (0.85)
Antisocial behavior	0.0016 (0.0090)	0.0159 (0.074)	0.0083 (0.036)	0.0023 (0.011)	0.0024 (0.011)
Aggressive behavior	−0.42 (0.34)	**0.32***** [*m, f*] **(0.70)**	**−0.20* (0.51)**	−0.48 (0.19)	**0.10*** (0.73)**
Aggression toward spouse	0.01 (0.06)	**0.14**** [*m*] **(0.31)**	0.01 (0.03)	0.01 (0.02)	**0.13*** (0.17)**
Ever divorced proportion	0.18 (0.39)	**0.49***** [*m, f*] **(0.51)**	0.26 (0.45)	0.22 (0.42)	0.32 (0.48)
Depression	50 (7.8)	**55**** [*m*] **(11)**	49 (8.7)	51 (9.9)	**54** (10)**
Problem drinking	0.20 (0.35)	**0.69***** [*m, f*] **(0.55)**	**0.56** (0.57)**	**0.50** (0.42)**	**0.41* (0.43)**
Positive outcomes					
Self-reported health	3.0 (0.61)	**2.7**** [*f*] **(0.85)**	2.8 (0.78)	3.2 (0.76)	**2.6* (0.84)**
Occupational prestige	520 (112)	**463*** [*m*] **(134)**	481 (99)	524 (118)	559 (108)
Educational attainment	4.4 (1.5)	**3.2***** [*m*] **(1.3)**	4.1 (1.6)	3.9 (1.5)	3.9 (1.3)
Verbal achievement	105.0 (11.8)	**96.8***** [*m*] **(11.1)**	103.2 (9.39)	100.4 (13.2)	107.8 (8.87)
Frequency of religious attendance	4.5 (2.6)	**2.8***** [*m*] **(1.9)**	**3.3^{+} (1.9)**	4.7 (2.3)	4.4 (2.8)

Note: Entries in bold font with asterisks denote significant differences in comparison with the life-course-persistent low group. The letter *m* and *f* in parenthesis after the asterisks denote that the effect was also significant separately for males and/or females. $^{+}P<.10$, $^{*}P<.05$, $^{**}P<.01$, $^{***}P<.001$.

those displayed by the life-course-persistent aggressives. These are participants who were below average on aggressiveness through the end of their teen years, and then suddenly started behaving aggressively in young adulthood. Despite the late onset of this aggression, they show significantly higher problem drinking, depression, and spouse aggression, and significantly poorer health than their peers who remained below average on aggression into their 40s.

To test whether the above results for comparing the groups could be an artifact of the differing gender distributions in the groups, we re-compared the means in each group with the means of the life-course low aggressives using an analysis of covariance in which the effects of gender were partialed out. All of the differences between the life-course-persistent high-aggressive and life-course-persistent low-aggressive groups remained significant except for the differences in arrest rates and traffic violation rates. Thus, in general, gender differences cannot account for the poorer life outcomes experienced by life-course-persistent high aggressives.

In these analyses, we calculated trajectories of aggression as determined by individuals' relative positions in the distributions of aggression scores at each wave. This method of trajectory analysis differs from the latent class trajectory methods that are now applied commonly in research on the development of aggression from childhood to adolescence [e.g., Broidy et al., 2003; NICHD, 2004]. However, such latent class methods rely on repeated identical absolute measures to indicate aggression—e.g., yearly frequency counts of a specific aggressive act. Within our life-course developmental perspective spanning childhood through adulthood, this method of analysis is less appropriate because the nature, meaning, and measurement of aggressive acts vary significantly over time [Boxer et al., 2005; Tremblay, 2000].

DISCUSSION

In this study using data from a large cohort of individuals that were first assessed at age 8 and re-sampled at ages 19, 30, and 48, we addressed two issues. First, we examined the continuity of aggression from middle childhood (age 8) through middle adulthood (age 48) in order to assess the extent to which stability or change at the extreme ends of the aggression continuum accounts for continuity. We observed a moderate degree of continuity in aggressive behavior over time with somewhat higher continuity for males. In contrast to earlier assertions by others that continuity in aggression is mostly driven by highly aggressive individuals staying in that position over time, we found that continuity was just as much the result of low aggressives remaining low as high aggressives remaining high.

Second, we applied the framework advanced by Moffitt [1993] of "adolescent-limited" vs. "life-

course-persistent" aggression to our sample in order to examine the middle adulthood consequences of different patterns of aggressiveness from middle childhood to early adulthood. Consistent with prior research and theory regarding the nature and correlates of life-course-persistent antisocial behavior, we observed that individuals who remained high in aggression from age 8 through 30 fared most poorly in comparison with others on a variety of criminal and psychosocial outcomes. This is one of the first studies to extend the Moffitt framework out to middle adulthood, and consequently has important implications for advancing theory and research on the development of aggressive behavior.

Although much of the earlier research illuminating moderate to high continuity in aggression over time focused exclusively on males, sex differences in continuity have been receiving increasing attention as the samples of studies incorporating both males and females have aged. In this study, we observed somewhat greater continuity of aggression for males than we did for females, with some important differences in continuity coefficients across sex. For males, coefficients were statistically significant and in the moderate range for all intervals (rs = .34–.60). For females, aggression at age 8 was only related sizably to aggression at age 19; relations of age 8 aggression to aggression during adulthood were modest (rs < .20). Person-oriented trends in aggression continuity also differed by sex. We found that males who were highly aggressive in childhood were more likely to remain highly aggressive in adulthood than were females who were highly aggressive in childhood. Conversely, we found that females rated at low levels of aggressiveness during childhood were more likely to remain low in aggressiveness in adulthood than were males who were rated low in aggressiveness during childhood.

In evaluating these results, one must realize that the aggressiveness we measured was heavily weighted toward physical aggression. Our assessments at each time point include general measures of aggressiveness (peer nominations and MMPI scales), but from adolescence onward also include specific measures of physical aggression. Further, our peer-nomination inventory, through broad, mainly includes items tapping overt and direct expressions of aggressive behavior more common among males. Across ages, males typically are found to be more physically aggressive than females, and even if females display these aggressive behaviors, they may be more likely to be subjected to environmental responses that socialize physical aggression out of their behavioral repertoire [Eron and Huesmann, 1989].

Despite important sex differences, our continuity analyses underline the critical observation that continuity in aggressive behavior is a population-level phenomenon that is not driven principally by highly aggressive individuals remaining so over their life course. This lends weight to the common assertion that aggressiveness is in essence a relatively stable behavioral trait that can be measured reliably as an individual-difference variable [Huesmann and Eron, 1989]. Of course, individuals "move out" of relatively high or low positions in the population, and the exploration of factors accounting for this instability is a critically important task for future research. Given the moderate genetic heritability of aggression [Miles and Carey, 1997] and tendency for cross-generational behavioral modeling and social transmission of aggressiveness [Dubow et al., 2003], the factors accounting for changes in individuals' propensities to behave aggressively are probably environmental and most likely extra-familial as well.

The observed differences in age 48 outcomes as the function of middle childhood to early adulthood patterns of persistence in aggression are striking and emphasize the potential burden of a life-course tendency to behave more aggressively than one's peers. Individuals who were consistently above average in aggression at ages 8, 19, and 30 exhibited a wide range of difficulties by age 48 including more arrests, more traffic violations, more marital problems, and more health concerns. These individuals also had the lowest levels of occupational prestige and educational attainment.

There is also good news for society in these results. Outbreaks of aggressive behavior that are limited to middle childhood or that are limited to adolescence (but not both) were shown to have few long-term negative consequences. These results are consistent with prior findings that have suggested that many children grow out of early childhood problem behaviors [Duncan et al., 2007] and experience adolescent aggression as a short-term deviation with few long-term consequences [Moffitt, 1993]. It is during these periods that situational and contextual stimuli probably have the strongest short-term effects on behavior, producing deviations from long-term trends.

Perhaps our most surprising finding was that the small number of individuals who suddenly became above average in aggression at age 30 experienced significant negative consequences later in adulthood. This late-onset aggression group displayed higher levels of aggression, depression, and problem drink-

ing, and poorer health at age 48 than did the life-course-persistent low aggressives. Interestingly, the majority of this group was female, whereas the majority of the other groups was male. There is a wealth of research on "early starters," or individuals who show serious antisocial behavior at a young age and go on to exhibit the highest levels of general problem behavior [Frick, 2006; Hinshaw et al., 1993; Patterson et al., 1991], and of course Moffitt [1993] has demonstrated the presence of individuals who "flirt" with aggression and antisocial behavior during adolescence. However, the notion that some individuals might be "late starters" controverts the typical view that, on average, aggressiveness declines throughout development. It will be important for future research to examine social experiences or individual liabilities accounting for the emergence of high levels of aggression in early adulthood.

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