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Country, Sex, and Parent Occupational Status: Moderators of the Continuity of Aggression from  
Childhood to Adulthood

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**Abstract**

Using data from two American and one Finnish long-term longitudinal studies, we examined continuity of general aggression from age 8 to physical aggression in early adulthood (age 21–30) and whether continuity of aggression differed by country, sex, and parent occupational status. In all samples, childhood aggression was assessed via peer nominations and early adulthood aggression via self-reports. Multi-group structural equation models revealed significant continuity in aggression in the American samples but not in the Finnish sample. These relations did not differ by sex but did differ by parent occupational status: whereas there was no significant continuity among American children from professional family-of-origin backgrounds, there was significant continuity among American children from non-professional backgrounds.

*Keywords:* aggression, continuity, cross-national, longitudinal study, occupational status, structural equation model

Country, Sex, and Parent Occupational Status as Potential Moderators of the Continuity of  
Aggression from Middle Childhood to Early Adulthood

The long-term continuity of aggressive behavior has been likened to that of general intelligence (Olweus, 1979). Individual differences in aggressive behavior have been found to be fairly stable across large spans of development spanning middle childhood through adulthood (e.g., Farrington & West, 1990; Huesmann, Dubow, & Boxer, 2009; Huesmann, Eron, & Dubow, 2002; Huesmann, Eron, Lefkowitz, & Walder, 1984; Kokko & Pulkkinen, 2005; Magnusson, 1988; Pulkkinen & Pitkänen, 1993). Recent longitudinal findings have suggested that the long-term continuity of children's aggressive behavior differs according to the type of aggressive behavior (e.g., direct physical vs. other forms) and measures of aggression, the sex of the child, and the child's cultural background (Kokko, Pulkkinen, Huesmann, Dubow, & Boxer, 2009). Importantly, differences in the item content of measures have prevented direct comparisons across longitudinal studies conducted in different countries.

Kokko et al. (2009) compared, using similar items to assess aggression, the long-term continuity of different forms of aggression in males and females in the USA and Finland. These countries provided an advantageous comparison because Finland and the United States have different levels of violence. For example, homicide rates in the USA are more than twice as high as those in Finland (United Nations Office on Drugs and Crime, 2013). The Finnish sample was drawn from the Jyväskylä Longitudinal Study of Personality and Social Development (JYLS) in which 369 individuals were by then assessed at ages 8, 14, 27, 36, and 42. When children were 8 years old, aggressive behavior was defined based on an average of 10 peer nominated items. The peer nomination measure included a mixture of different types of aggressive behavior: proactive, reactive, direct, and indirect aggressive behavior displayed physically, verbally, and facially. For clarification, it should be noted that indirect aggression is often used interchangeably to describe

social and relational manipulative aggression (see e.g., Archer & Coyne, 2005). However, we use the direct vs. indirect distinction also to indicate the direction of an aggressive act, whether it is intended directly at a target (e.g., another child) or indirectly at a target (e.g., through kicking objects when angry; Pitkänen, 1969). Furthermore, by physical aggression we refer to a physical mode of aggression, targeted at either other people or objects. Age-adjusted peer nominations of aggressive behavior also were obtained when children were 14 years of age. As adults, individuals in the JYLS rated seven items indicating their propensity to hit when angry, and tendency to verbally lash out and poor temper control.

Comparable data from the USA were drawn from the Columbia County Longitudinal Study (CCLS; Eron, Walder, & Lefkowitz, 1971; Huesmann et al., 1984; Huesmann, Dubow, Eron, & Boxer, 2006). In this study, 856 children were assessed at ages 8, 19, 30, and 48. As with the JYLS, child and adolescent measures of aggressive behavior in the CCLS were based on 10 peer nominations of physical and verbal aggression. Across the adult years, CCLS participants provided self ratings on four items reflecting severe physical aggression (choked, punched, hit, threatened with weapon), and four items reflecting milder physical aggression (e.g., starts a fight over nothing), as well as four items reflecting verbal aggression (e.g., feel like screaming, fighting, arguing).

In both samples, there was substantial continuity from aggression at age 8 to aggression at ages 14–19 to physical aggression by age 42–48, but continuity coefficients from adolescence to adulthood were higher among the American than Finnish participants, and within the USA, higher among male than female participants (Kokko et al., 2009). Conversely, there was no significant continuity in either country from childhood aggression to adult verbal aggression. The authors argued that there is probably a stronger biological basis for physical than for verbal aggression, which could account for the greater stability over time of physical aggression; verbal

aggression may be more influenced by situational factors. Genetically-informed studies provide indirect support for this notion (e.g., Brendgen et al., 2005; Eley, Lichtenstein, & Moffitt, 2003). In terms of the country differences, Kokko et al. (2009) noted a number of methodological differences in the measures used in the two countries. The items at age 8 were very similar in the CCLS and JYLS, but the physical aggression items in adulthood were more severe in nature in the USA study, which might account for the higher levels of continuity in physical aggression in the CCLS sample.

In the present study, we sought to extend the findings of Kokko et al. (2009) based on the JYLS and CCLS to include another sample from the USA, the Child Development Project (CDP) (Dodge, Bates, & Pettit, 1990), that represents a different historical cohort of children born in the 1980s. By comparing results from the two American samples, we could assess whether cohort differences affect the magnitude of continuity. In all three samples, we restricted the analyses to items that are highly comparable across data sets (general aggression in middle childhood assessed at age 8 through peer nominations; physical aggression in early adulthood, ages 21 to 30, assessed through self-reports) and use early adulthood as an endpoint in all three studies. We focus on the prediction of physical aggression in early adulthood even though Tremblay (2010) has found that physical aggression peaks around ages two to four years. Within adulthood most criminal acts are conducted in young adulthood (Tremblay, 2012), particularly violent crimes (Sampson & Laub, 2003) and Archer (2004) has shown that sex differences in the amount of physical aggression are at the highest level in early adulthood (at age 21–30); men use more physical aggression than women. Thus, the present study design allowed us to examine differences in continuity across countries and sex using comparable measures of aggression at similar ages. We also examined whether the Kokko et al. finding of a lower magnitude of

continuity of aggression in Finland than the USA is related to differences in the role of childhood parent occupational status and its relations with childhood aggression in the two countries.

### **Sex Differences in Continuity of Aggression**

By “continuity” in aggression over time, we mean the degree to which individuals retain their relative positions on aggression within the population across time points. It is important to realize that high continuity of aggression means both that highly aggressive individuals are tending to stay high in aggression over time but also that less aggressive individuals are tending to stay low in aggression over time (Huesmann et al., 2009). The long-term continuity of children’s aggressive behavior has been documented in many prior longitudinal studies (Olweus, 1979). Across childhood and early adolescence, the continuity of aggressive behavior was found to be similar among girls and boys in the study by Cairns, Cairns, Neckerman, Ferguson, and Gariépy (1989). Those authors reported continuities in teacher-rated aggression from age 9 to 13 to be .51 for USA girls and .49 for boys. In the Finnish JYLS study, continuity was equal among boys and girls from age 8 to 14 when aggression was measured by peer nomination ( $r = 0.37$  for both sexes,  $p < .001$ ), but there was a statistically significant sex difference in the continuity of aggression when teacher ratings were employed ( $r = 0.37$  for boys,  $p < .001$ ,  $0.13$  for girls, n.s.; Pitkänen-Pulkkinen, 1981). A higher continuity in teacher-rated aggression among boys than among girls from age 12 to age 14 was also found in a large Finnish twin-sample ( $r \sim 0.30$  for boys and  $0.20$  for girls; Vierikko, Pulkkinen, Kaprio, & Rose, 2006). When composite scores of peer nominations and teacher ratings were used in the JYLS, the correlations between aggression scores at ages 8 and 14 did not differ significantly between the sexes ( $.33$  for girls and  $.38$  for boys; Kokko & Pulkkinen 2005). Likewise, Huesmann (2001), using data from a study conducted in the USA in Illinois, reported non-significant differences in continuities of aggression from age



6 through 11 ( $r = 0.47$  for boys and  $0.50$  for girls), when a composite score of peer nominations and teacher reports was used.

From middle to later adolescence, similar continuities were reported for both sexes by Huesmann et al. (1984) who found in the USA CCLS a correlation  $0.44$  for boys and  $0.36$  for girls in peer-nominated aggression from age 8 to age 19. Nevertheless, Pulkkinen and Pitkänen (1993), in the Finnish JYLS, did not find significant continuity from age 8 peer nominated- and teacher-rated aggression to self-reported aggression at age 27 (correlations were, respectively,  $0.13$  and  $0.14$  for males, and  $0.13$  and  $0.08$  for females).

### **Country Differences in Continuity of Aggression**

Differences in the continuity of aggression have been reported across samples from different countries. Huesmann and colleagues (Huesmann & Eron, 1986; Huesmann & Moise, 1998; The Cross-National Television Study) reported on the continuity of aggression in four countries (United States, Finland, Poland, and Israel) between ages 6–10 and 21–25. In childhood, aggression was assessed through peer nominations; in early adulthood, aggression was defined as a composite index of physical, verbal, and indirect aggression reported by oneself and others. In all four countries there was high continuity of aggression in boys and girls over the three years of assessments during the 6–10 age period ( $.57$  to  $.82$ ). For the follow-up data acquired 15 years later, there was moderate continuity in aggressive behavior for males and females in the USA and Finland. In Poland, only males showed significant continuity of aggressive behavior. Finally, in Israel, there was only weak evidence for continuity of aggression for males and no evidence of continuity for females (Huesmann & Moise, 1998).

### **Predicted Socioeconomic Differences in the Continuity of Aggression between Finland and the USA**

Finland is a country characterized by high social equality. Compared to the USA, there are fewer cultural differences between children from differing socioeconomic status (SES) backgrounds. In countries characterized by social equality (e.g., Finland), there are fewer differences among children in, for example, their school achievement, school dropout rate, health and social problems, and trust in people, than in children from countries with less social equality (e.g., USA; Wilkinson & Pickett, 2010). In Finland, social justice is highly valued in the school system and dropout is rare (Sahlberg, 2011). Residential area is the major factor determining the child's school and residential areas are more socioeconomically mixed than in the USA, meaning that children from various SES backgrounds attend the same schools in Finland (Sahlberg, 2011). According to the Organisation for Economic Co-operation and Development (OECD; 2011), upper secondary education graduation rates (which include vocational schooling) were 95% in Finland, compared to 76% in the USA in 2009. In the OECD (2011) comparison, upper secondary education refers to education that prepares students for further, mainly theory-based, studies. The ages of graduates were on average 17 to 20 years (in Finland, 10% of the first-time graduates were 25 years). Further, the Programme for International Student Assessment (PISA) comparisons show that Finnish students do academically well in achievement tests (science, reading, math), and that test score differences between schools in the PISA results are exceptionally small (Sahlberg, 2011). According to Sahlberg (2011), one reason for the high academic skills of the Finnish students may be the fact that all Finnish teachers have to hold a master's degree from the university, whereas in the USA this kind of qualification is not required. Also, upward social mobility is quite common in Finland (e.g., Lynch, Kaplan, & Salonen, 1997; Wilkinson & Pickett, 2010). Social mobility is enhanced by the fact that higher education is free and state-supported in Finland. Thus, we predicted that aggressive children from low SES families (operationalized by low parent occupational status) in Finland may have more resources

than the American children and that these resources might serve as a protective factor that would decrease the likelihood of aggressive Finnish children remaining aggressive by young adulthood.

### **The Present Study**

Combined with the cross-cultural aggression continuity findings of Huesmann and Moise (1998), the findings of Kokko et al. (2009) suggest that the continuity aggressive behavior between childhood and adulthood is moderated by sex and cultural context. These intriguing findings have raised important interpretive questions, such as, are these “real” cultural differences or do the findings reflect differences across studies in measures of aggression and historical cohorts? Thus, we sought to extend the findings of Kokko et al. in several ways. First, we chose both childhood and adult aggression items that were nearly identical for all participants across the two countries. Second, we included a second USA sample born in the 1980s (the Child Development Project; Dodge et al., 1990) to compare continuities in this sample with those obtained in the CCLS and JYLS with participants born in the 1950s. We expected that continuities in aggression would be similar for the two USA cohorts. Third, we examined continuities from general aggression in childhood to physical aggression in adulthood, but we used the early adulthood period that corresponded well to assessment points in all three studies. We expected to find significant continuity of aggression across samples. In particular, in both countries, we expected that children high in aggression would remain high in early adulthood but that continuity of aggression would be stronger in the American samples than in the Finnish sample. Fourth, we examined whether sex moderated the continuity of aggression from childhood to early adulthood. We expected that there would be stronger continuity of aggression among males than females across the samples. Finally, we examined whether continuity in aggression might be moderated by parent occupational status. We expected to find more stability in

aggression among the American children from lower parent occupational status backgrounds than for Finnish participants from comparable backgrounds.

## Method

### Participants

The present analyses were based on three samples: the Finnish Jyväskylä Longitudinal Study of Personality and Social Development (JYLS; initial  $N=369$ ); the USA Columbia County Longitudinal Study (CCLS; initial  $N=856$ ); and the USA Child Development Project (CDP; initial  $N=585$ ). Although all three studies included multiple waves of data collection, we restricted the analyses for this study to the two most comparable childhood and early adulthood assessment points in each project: age 8 represents middle childhood in all three projects and ages 27, 30, and 21–26 represent early adulthood in the JYLS, CCLS, and CDP, respectively. Observations were excluded from the final statistical analyses examining differences in the continuity of aggression by childhood parent occupational status if there were missing data for childhood family background or if data were missing for both peer-nominated general childhood aggression and self-reported adult physical aggression. Percentages of observations excluded from the final analyses ranged from 0 for the JYLS to 6.7% ( $n = 39$ ) and 21.3% ( $n = 182$ ) for the CDP and CCLS, respectively.

**Jyväskylä Longitudinal Study of Personality and Social Development (JYLS).** The JYLS is an ongoing longitudinal study, where the same participants have been followed up at 6–8-year intervals from ages 8 to 50 (Pulkkinen, 2006, 2009). Lea Pulkkinen (Pitkänen, 1969) started the study in 1968, when she randomly selected 12 complete school classes of second grade students (initial  $N = 369$ , 173 girls and 196 boys) to the study sample in the town of Jyväskylä, Finland; the initial nonresponse for the study was zero. Most of the children were born in 1959 and were about 8 years old at the baseline. All the JYLS participants were native Finns.

Information about children's social behavior (including aggression) was collected using peer nominations and teacher ratings. Data about parental socioeconomic status (parents' occupations) were collected from school records.

Information about the participants' aggression was collected at six time points, but in this study, in addition to age 8, we utilized information collected at age 27 (1986). At age 8, there were no missing data for the initial sample ( $N = 369$ ). At age 27, the mailed Life Situation Questionnaire was returned by 155 women (90% of the initial sample) and 171 men (87%), and 142 women (82%) and 150 men (77%) participated in a semi-structured interview (including questions about aggression). The study participants in adulthood have been representative of both the initial sample and the Finnish age-cohort group born in 1959 (Pulkkinen & Kokko, 2010). Data for self-reported adult physical aggression were missing for 77 participants (20.9%) of the initial sample; the respective figures for women and men were 31 (17.9%) and 46 (23.5%). The multiple group structural equation models conducted for this paper were estimated using the Mplus statistical program's implementation of full information maximum likelihood (FIML) estimation and included all sample participants ( $N = 369$ ).

**Columbia County Longitudinal Study (CCLS).** In the 1959–60 school year, almost the entire population of third graders in Columbia County, NY were assessed on peer-nominated aggression (initial  $N = 856$ ; 436 boys, 420 girls) in an attempt to measure the prevalence of aggression (Eron et al., 1971; Huesmann et al., 2006). Most of the children were born in 1951 and were 8 years old, and the children came from 38 public and private third-grade classrooms in the county. Over 90% of the initial sample of 856 participants was Caucasian; 51% were boys. The number of ethnic minorities (i.e., 3% African American, < 1% Asian or Pacific Islanders, < 1% Hispanic) was too small to allow separate analyses. About 4% of the participants' parents were born outside the USA. 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, Meeker, and Eells' (1960) 7-point scale). Information about aggression was collected at four time points, but for the purposes of this study, we focused on data collected at ages 8 (1960) and 30 (1981). Data for childhood household SES were missing for 182 (21.3%) of the initial study participants, 85 boys (19.5%) and 97 girls (23.1%).

At age 30 in 1981, 211 women (50% of the initial sample) and 198 men (45%) completed aggression measures as part of a wide-ranging assessment. The re-interviewed CCLS participants differed from the "drop-outs" on some dimensions. In the 1981 data collection wave, the mean age 8 aggression score for the total sample of male and female re-interviewed participants was found to be significantly lower than the mean score for drop-outs (i.e., by .17  $SDs$  for the 1981 sample); within sexes, men who were not re-interviewed had higher aggression scores than those who were re-interviewed, but there were no significant differences between re-interviewed and non-re-interviewed women. However, the plots of the distributions and statistics revealed that many of the most highly aggressive participants *were* re-sampled and there was no substantial restriction of range that might have made it difficult to detect relations between aggression and other variables. There were no significant differences between re-interviewed and non-re-interviewed participants on father's occupational status or level of parent education. Multiple group structural equation models examining the stability of aggression by sample for the CCLS and CDP and by country and by sex included all CCLS sample participants ( $N = 856$ ). Multiple group models examining potential differences in the stability of aggression by childhood SES included 674 (78.7%) of the initial CCLS study participants (323 females and 351 males). The Mplus program's implementation of FIML estimation is unable to include observations having missing data for the grouping variable used for multiple group structural equation models and therefore excluded 182 CCLS participants having missing data for childhood family SES.

**Child Development Project (CDP).** The CDP is a multi-site longitudinal study of child development (Dodge et al., 1990). Children were recruited in two cohorts when they entered kindergarten (age 5) in 1987 or 1988 at three USA sites: Knoxville and Nashville, TN and Bloomington, IN. The children's parents were approached at random during kindergarten pre-registration and asked if they would participate in a longitudinal study of child development. About 15% of children at the targeted schools did not pre-register. These participants were recruited on the first day of school or by subsequent contact. Of those asked, approximately 75% agreed to participate. The initial sample consisted of 585 families at the first assessment. Boys comprised 52% of the sample. Eighty-one percent (81%) of the sample were European American, 17% were African American, and 2% were from other ethnic groups. There were no immigrant families.

For purposes of comparability with the data collection points in the JYLS and CCLS, in this study we included data from seven assessment points in the CDP. When children were age 8, their classroom peers provided nominations regarding their aggressive behavior. At ages 21–26, participants completed self-report measures related to their own physical aggression during the past month; assessments from these six years were aggregated into a single young adulthood composite to be comparable to the composites from the JYLS and CCLS which measured aggressive behaviors during the past five years (CCLS) or typically committed (JYLS). Age 8 peer nomination data were available from 452 (77.3%) of the initial 585 participants, and young adult data were available from 482 (82.4%) of the initial participants. Participants who continued into adulthood did not differ from those who did not on measures of childhood aggression. Data for childhood parent occupational status were available for 580 (99.2%) of the initial participants. Multiple group structural equation models for the stability of aggression by sample for the CDP and CCLS and by country and by sex included 549 participants (268 female and 281 male

participants). The Mplus program's implementation of FIML estimation is unable to include observations having missing data for all dependent variables and therefore excluded 36 observations that had missing data for both childhood general aggression and adult physical aggression. Multiple group structural equation models examining potential differences in the stability of aggression by childhood parent occupational status included 546 (93.3%) of the initial CDP study participants (267 girls and 279 boys) and excluded 39 study participants having missing data for childhood background or both dependent variables.

### **Measures and Variables**

**Approach to selection of aggression items.** In order to select aggression measures that were comparable across the three data sets, we selected peer nominations of aggression at age 8 and self-reports of property destruction and interpersonal physical aggression in early adulthood. Regarding age 8 peer nominations of aggression, a comparison of the JYLS and CCLS is noteworthy because when Pulkkinen (JYLS) devised her measure of aggression for her doctoral dissertation (Pitkänen, 1969), she adapted several of Eron's peer nomination items (Banta & Walder, 1961; Walder, Abelson, Eron, Banta, & Laulicht, 1961; Wiggins & Winder, 1961), translated them from English to Finnish and then back to English. Later, it turned out that this measure had been used for base line data collection in the CCLS (Lefkowitz, Eron, Walder, & Huesmann, 1977). Table 1 shows the aggression items from childhood and adulthood across the three data sets.

In the present study, we selected items for peer-nominated aggression from the CDP that were most comparable with those used by the JYLS and CCLS. Each item for childhood general aggression was the number of times that a child was nominated by peers in his/her classroom for that item divided by the number of children in the classroom, expressed in percentages. The score



used for analyses was the natural log of the mean of all available items for childhood general aggression.

For adult physical aggression, we identified items in the CCLS and CDP that were most comparable to the two items used by the JYLS to measure self-reported direct physical aggression at age 27. Measures were also selected to best match the age of assessment across the three data sets: Age 27 for the JYLS, age 30 for the CCLS, and ages 21–26 for the CDP. Scale scores for adult physical aggression were computed by summing the response values for the two items. This measure was highly skewed so the natural log of the scale score was used for all statistical analyses.

#### **Jyväskylä Longitudinal Study of Personality and Social Development (JYLS).**

Aggression at age 8 was a sum score of ten peer-nominated items, originally presented by Pulkkinen (Pitkänen, 1969; see also Pulkkinen, 1987): for direct offensive verbal aggression (e.g., “Who says nasty things to other children even if these had done nothing wrong to him”), for direct offensive physical aggression (e.g., “Who may attack somebody without any reason”), for direct defensive physical aggression (e.g., “Who may hurt another child when angry, e.g., by hitting, kicking, or throwing something”), for direct defensive verbal aggression (e.g., “Who quarrels with other children even for a slight reason”), for facial expressions of anger (e.g., respectively, “Who easily starts sulking” and “Who keeps sneering and making faces to other children”), and for indirect aggression (e.g., “Who teases others when angry when they do not notice” and “Who kicks pieces of furniture or other objects when angry at something” (see Table 1). For peer nomination, a list of names was prepared for each participant with similar pages for each item. Thus, an answer was given for each question on a separate page. The girls’ list of names contained the first name and, if necessary, the first letter of the surname of each girl in the class. The boys’ list of names contained the name of each boy in the class correspondingly. In the

instruction the number of peers to be identified for each question (not themselves) was left relatively undefined, although stress was laid on the importance of at least three names for each question (Pitkänen, 1969, p. 116). The score represents the mean percentage of times the child was nominated by classmates on the ten items (participants could nominate peers of the same sex; thus, a child's score was: total number of nominations received across the ten items / number of classmates times ten). The Cronbach's alpha was .94 for girls and .96 for boys.

Aggression at age 27 was indicated by two items, one assessing property destruction and one assessing interpersonal physical aggression: 1) "Do you break things?" and 2) "Do you hit other people?" Participants responded to each item along a 3-point scale: 0 = *not at all*, 1 = *sometimes*, 2 = *often*). The indices for the two items (property destruction, interpersonal physical aggression;  $r = .33$ ) were summed. Thus, scores on the scale could range from 0 to 4.

Parent occupational status was based on father's occupation when the participants were 8 years old (mother's occupation was used if she was a sole provider; Pitkänen, Lyyra, & Pulkkinen, 2005). Occupation was originally coded into three categories: 1 = *non-professional (blue-collar workers, e.g., cleaners, waiters)*, 2 = *lower professional occupational status (lower white-collar workers, e.g., nurses, engineers)*, and 3 = *higher professional occupation status (upper white-collar workers, e.g., managers, physicians)*. This resulted in 29% of the sample being classified as having professional occupational status. Since about 70% of the Finnish fathers had non-professional occupations (typical in the historical context of 1959 in Finland) we decided to use only two categories, non-professional and professional or supervisory parent occupational status, in all three samples. For comparative purposes, about 70% of the USA samples were also classified as non-professional participants. The label "non-professional" is used for clarity but one should note that the fathers in this category had various occupations,

some of which could be better described, particularly in the USA samples, using a broader category of blue-collar, unskilled, and skilled occupations.

**Columbia County Longitudinal Study (CCLS).** Peer-nominated aggression was assessed at age 8 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). The 10 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 (see Table 1). 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  $\alpha = .90$  or higher in multiple cross-national samples (Huesmann & Eron, 1986).

Aggression at age 30 was indicated by two items (one assessing property destruction, and one assessing interpersonal physical aggression) for which response options were re-coded for consistency with the other two studies: 1) “I get angry and smash things” (original response options were 0 = *never* to 4 = *almost always*; re-coded to 0 = *never*, 1 = *seldom/sometimes*, 2 = *often/almost always*); and 2) “In the past 5 years, have you ever slapped or kicked another adult?”; “if yes, how many times?” (original response scale was 1 = *once* to 4 = *four or more times*; re-coded to 0 = *no/never*, 1 = *once/twice*, 2 = *three times/four or more times*). The indices for the two items (property destruction, interpersonal physical aggression;  $r = .23$ ) were summed. Thus, scores on the scale could range from 0 to 4.

Parent occupational status was based on father's occupation, which was collected from parent interviews when the child was 8 years of age. We used an occupational coding scale developed by Warner et al. (1960) and adapted by Eron et al. (1971). Occupations were coded on a 10-point scale (0 = *laborers* to 9 = *professionals*). We re-coded Warner's index as follows: 1 = *non-professional (laborers, unskilled workers, semi-skilled workers, proprietors of small businesses, skilled workers, clerical workers)* and 2 = *professional occupational status (semi-professionals, officers of large businesses, professionals, proprietors of large businesses)*. This resulted in 30% of the sample being classified as having professional occupational status.

**Child Development Project (CDP).** Aggression at age 8 was assessed through sociometric interviews following the protocol described by Coie, Dodge, and Coppotelli (1982). These interviews were conducted during the winter of the school year in all classrooms in which at least 70% of children's parents gave consent. Children were shown a class roster and were asked to name up to three peers who fit each of three behavioral descriptors: "starts fights, says mean things to other kids, or pushes and hits kids"; "is mean to other kids to get what they want", and "gets mad even when they shouldn't...like when someone does something to them by accident" (see Table 1). The score used for analyses is the average percentage of times that a child was nominated as being aggressive by his or her classmates. The Cronbach's alpha was .82 for girls and .90 for boys.

Annually when participants were ages 21 to 24, they completed the Young Adult Self Report (YASR; Achenbach & Rescorla, 2003). Two items (i.e., "Damage or destroy own things" and "Damage or destroy others' things") from the YASR were rated on a 3-point scale (0 = *not true*, 1 = *sometimes true*, 2 = *very true or often true*). To achieve comparability with the JYLS and CCLS property destruction item, we took the maximum value on these two items across the four years (ages 21–24). For the interpersonal aggression item, participants at ages 23–26 were

asked, “How many times have you gotten into a fight or hit someone?” Responses were coded as 0 = *never*, 1 = *once/twice*, and 2 = *three or more times*. The two indices (property destruction, interpersonal physical aggression;  $r = .28$ ) were summed. Thus, scores on the scale could range from 0 to 4.

Parent occupational status was based on father’s occupation using the Hollingshead (1979) occupational system, which ranges from 1 = *menial service workers* to 9 = *business executives and major professionals such as doctors, lawyers, and scientists*. When there was no father in the family, the mother’s occupational status was used instead. For the purposes of the present analyses, we re-coded occupations into two categories: 1 = *non-professional (farm laborers/menial service workers, unskilled workers, semi-skilled workers, small business owners, clerical/sales workers, minor professionals)* and 2 = *professional parent occupational status (administrators, higher executives, proprietors of large businesses and major professionals)*. This resulted in 26% of the sample being classified as having professional parent occupational status.

### **Data Analysis**

We first present descriptive statistics for the key variables for all three studies – the Finnish JYLS, and the American CCLS and CDP studies. Then we use multiple group structural equation modeling to explore whether the continuity of aggression from middle childhood to adulthood differed by study. The samples for the three studies differed by country (USA versus Finland) and by birth year (1951 for the CCLS, 1959 for the JYLS, and 1982–1983 for the CDP). After that we examine whether continuity differs by sex or by childhood parent occupational status and the extent to which associations varied between the USA samples and between Finnish and the American samples.

For the structural equation model (SEM) analyses, parameters were estimated using full information maximum likelihood (FIML) estimation procedures to handle missing data (Graham, 2009). The Mplus program's (Muthén & Muthén, 1998–2010) implementation of FIML estimation uses all available data from each observation for the estimation of model parameters. Observations that are missing data for all included dependent variables – peer-nominated childhood general aggression and self-reported adult physical aggression – are not included by Mplus in statistical analyses performed using FIML estimation procedures. For the first series of multigroup SEM analyses examining the stability of aggression across the three samples – USA CCLS sample, USA CDP sample, and Finland JYLS sample – all observations were included for the JYLS and CCLS which both have complete data for childhood general aggression. For the CDP, 36 observations having missing data for both childhood and adult aggression were excluded from the statistical analyses. For the multiple group structural equal analyses by childhood parent occupational status, observations were also excluded by the Mplus program if they had missing data for the grouping variable childhood SES ( $N = 182$  for the CCLS and  $N = 5$  for the CDP sample). Percentages of sample observations included in the analyses of the stability of aggression by childhood parent occupational status ranged from 78.7% for the CCLS ( $N = 674$ ) to 93.3% ( $N = 546$ ) and 100% ( $N = 369$ ) for the CDP and JYLS, respectively. Sample sizes for subgroups were examined for each set of multiple group analyses to insure that all subgroups included at least 10-20 observations for each estimated parameter per conventionally recommended guidelines (Kline, 2005).

Overall goodness of fit for the structural equation models was evaluated using Bentler's (1990) normed comparative fit index (CFI), the Tucker Lewis index (TLI), and the root mean square error of approximation (RMSEA). CFI and TLI values of at least .95 and RMSEA values of .05 or less were defined as indicating good model fit (Hu & Bentler, 1999). Multiple fit

statistics were used because each has associated strengths and weakness and there is no consensus regarding any single best index for ascertaining the lack of fit of a model to the observed data. Nested structural models were compared using the Satorra-Bentler scaled difference chi-square test ( $\Delta SB\chi^2$ ; Satorra & Bentler, 2001). A significant chi-square difference value indicates a significant loss of fit by constraining the structural pathways to be equal.

Statistical analyses for descriptive statistics and correlations were conducted using the SAS statistical software package (version 9.2; SAS Institute, Inc, Cary, NC). The Mplus statistical software package was used to conduct all SEM analyses (version 6; Muthén & Muthén, 1998–2010).

## Results

### Preliminary Analyses

We began by examining descriptive statistics (Table 2) and correlations among the key variables within each study (Table 3). The bivariate correlations in Table 3 showed no significant relation between age 8 aggression and adult aggression for the Finnish study, but showed significant relations for both of the American studies. This pattern was essentially the same for both male and female participants, with the exception that in the CCLS, for female participants, the relation between childhood and early adulthood aggression approached significance ( $r = .12$ ,  $p < .10$ ). The bivariate correlations also suggest that the continuity of aggression may differ by childhood parent occupational status for the two USA studies: Age 8 aggression was significantly correlated with adult physical aggression for CCLS and CDP study participants from non-professional childhood occupational backgrounds, but not for participants from professional childhood occupational backgrounds. There is also preliminary evidence for differences by country: childhood aggression was not significantly correlated with adult physical aggression for Finnish study participants at either level of childhood parent occupational status.

**Continuity of Aggression by Country, Sex, and Childhood Parent Occupational Status**

**Continuity of aggression by country.** We used the simple structural equation model diagrammed in Figure 1 to estimate the continuity of aggression from childhood to adulthood. We first estimated the parameters of a three group model where the structural paths for continuity of childhood aggression to adult physical aggression for the two American studies were constrained to be equal. Then we compared the fit of this model with the fit of a saturated model in which the paths were free to vary across all three studies. Sex was included in these models as a covariate. The fit of the model that constrained the paths for the American studies to be equal and freely estimated that for the JYLS was not significantly worse than that for the unconstrained model and fit the observed data well,  $\Delta SB\chi^2(1) = 0.128, p = 0.720$ ; CFI = 1.00; TLI = 1.00; RMSEA = 0.000, suggesting that the continuity of aggression did not differ significantly across the two American studies. Child aggression significantly predicted adult physical aggression in both the CCLS ( $B = .08, \beta = .17, p = .000$ ) and the CDP ( $B = .08, \beta = .21, p = .000$ ) studies, but not in the JYLS ( $B = .01, \beta = .02, p = .787$ ). Constraining the structural path for the Finnish JYLS to be equal to those for the two American studies produced a significantly worse fit of the model to the observed data,  $\Delta SB\chi^2(2) = 6.56, p = 0.038$ ; CFI = 0.96; TLI = 0.82; RMSEA = 0.062, confirming previous findings of differences in the continuity of aggression by country for samples from the USA and Finland (Kokko et al., 2009). Thus, this first set of models indicated that childhood general aggression significantly and equally predicts adult physical aggression in both American studies but does not predict adult physical aggression for the Finnish JYLS study participants.

**Continuity of aggression by country and sex.** Our second set of models examined whether these relations differed by sex and again explored potential differences by study and country. We first compared the fit of a model in which the structural paths were constrained to be



equal for male and female participants within each with the fit of a model in which the structural paths were free to vary across sex for each of the three data sets. Separate multiple group models were first conducted for each study to assess potential differences by sex within each sample. The fit of the model in which the paths were constrained to be equal across sex was not significantly worse than the fit of the unconstrained model for any of the three samples (JYLS:  $\Delta SB\chi^2(1) = 0.71, p = 0.40$ ; CCLS:  $\Delta SB\chi^2(1) = 2.10, p = 0.147$ ; CDP:  $\Delta SB\chi^2(1) = 0.34, p = 0.558$ ). Thus, we cannot conclude that continuity of aggression is different for males and females in any samples. However, this conclusion must be treated cautiously in regard to the CCLS study because, as shown in Table 3, childhood aggression is correlated with adult aggression more strongly for males than females ( $r = .24$  versus  $r = .12, z$  difference = 2.80,  $p < .01$ ). From this, we would conclude that the continuity of aggression from childhood to adulthood may differ for males and females in the CCLS study when it is considered in isolation without any consideration of potential confounders which could bias estimates of unadjusted bivariate correlation.

**Continuity of aggression by family of origin occupational status within and across studies.** We next examined whether the continuity of aggression differed by level of childhood parent occupational status within each study by comparing the fit of a model in which paths were constrained to be equal for the professional and non-professional occupational groups with the fit of a model in which these paths were free to vary across the two groups. The constrained model fitted no worse than the unconstrained model in Finland,  $\Delta SB\chi^2(1) = 0.440, p = 0.507$ , indicating that continuity does not vary with parent occupational status in that country. For both levels of occupational status there was no evidence of continuity. For the American CDP sample, the constrained model did fit worse than the unconstrained model,  $\Delta SB\chi^2(1) = 7.639, p = 0.006$ , with significant continuity for the children who were from the non-professional family background ( $B = .10, \beta = .26, p = .000$ ) and no significant continuity for the children from the professional

family background. For the USA CCLS sample, as in Finland, the constrained model fitted no worse than the unconstrained model,  $\Delta SB\chi^2(1) = 0.184, p = 0.668$ , indicating that there was no significant difference in continuity estimates for the children from non-professional and professional family occupational backgrounds.

We next used a four-group model, with subgroups for non-professional and professional childhood parent occupational backgrounds for the CDP and CCLS samples, to examine potential differences in the relation between childhood aggression and early adulthood physical aggression by level of childhood parent occupational status for the two American studies. We again included sex in this model as a predictor of both age 8 and adult aggression. The structural equation model is shown in Figure 1. The parameter estimates for the unconstrained four-group model indicated that childhood aggression significantly predicted adult physical aggression for participants who were from non-professional childhood parent occupational backgrounds in both samples but was not significant for CDP and CCLS participants from professional occupational backgrounds. A constrained model equating the structural paths from childhood aggression to early adulthood physical aggression within each occupational group for the two studies fit the observed data as well as the unconstrained model,  $\Delta SB\chi^2(2) = 2.625, p = 0.2691$ ; CFI = 0.994; TLI=0.967; RMSEA = 0.032. Peer-nominated childhood general aggression in the constrained model significantly predicted adult physical aggression for the USA participants who were from non-professional childhood occupational backgrounds ( $B = .10, p < .001$ ;  $\beta = .26$  for the CDP and  $B = .10, p < .001$ ;  $\beta = .21$  for the CCLS), but was not related to adult physical aggression for those from professional childhood backgrounds ( $B = .014, p = .629$ ;  $\beta = .04$  for the CDP and the CCLS).

Finally, we re-estimated the parameters of the model shown in Figure 1 with data added from the Finnish JYLS study to consider whether the continuity of childhood aggression to early

adulthood physical aggression differed by national context as well as by childhood parent occupational level. Specifically, we tested the fit of a 6-group model (Study(3) by occupation-level(2)) constraining the continuity of aggression to be equal for the CCLS and CDP participants who were from non-professional childhood occupational background, and constraining the continuity of aggression to be equal across all three studies for the participants who were from professional childhood occupational background. The continuity of aggression for JYLS study participants who were from non-professional childhood occupational background was also constrained to be equal to that for those from professional childhood occupational background in Finland and the USA. The path coefficients from this final model are shown in Table 4 with tests of significance of the path coefficients. This constrained model fits the observed data very well,  $\chi^2(4) = 2.73, p > .60$ ; CFI = 1.00; RMSEA = .000. The implication is that there is equal and significant continuity of aggression in the two American samples for participants who are from non-professional parent occupational backgrounds, but there is not significant continuity in the Finnish sample for participants who are from non-professional childhood parent occupational background. The pooled sample used for the final set of multiple group models, including all three data sets, enabled us to estimate these relationships with greater precision, increasing our power to ascertain significant differences in the continuity of aggression by parent occupational status for the two American samples. In contrast, there is no significant continuity of aggression from childhood to early adulthood in either country for participants who are from professional childhood occupational background. These results also support the conclusion that the continuity of aggression for children in the USA does not vary much between participants born in the 1950s and the 1980s, located in different parts of the country, and assessed with different study teams and methods.

## Discussion

The main aim of the present study was to examine continuity from childhood general aggression to early adult physical aggression in the USA and Finland. This report builds on previous findings, based on the comparison between the American CCLS and Finnish JYLS (Kokko et al., 2009), that the continuity in aggression from childhood to mid-adulthood is stronger in the USA than in Finland and that, in the latter, the continuity is higher among males than among females (Kokko et al., 2009). First, we included a new USA sample, namely, the Child Development Project (participants born in the 1980s compared with those born in the 1950s in the CCLS and JYLS), which allowed the investigation of possible cohort differences in the continuity of aggression. Second, we used early adulthood, instead of mid-adulthood, as an endpoint for adult physical aggression. The reason for this was that the three studies had similar aggression items available at more comparable ages at that time point. In their previous study, Kokko et al. (2009) speculated that one of the reasons for the higher continuity observed in the USA sample was due to its use of more severe items for aggression in mid-adulthood than in the Finnish sample. In the present study, the items were selected carefully so they were nearly identical. Third, we analyzed whether family of origin parent occupational status moderated the continuity of aggression and whether it did so differently in the USA and Finland.

### **Continuity in Aggression by Country and Sex**

Our results revealed that, as predicted, there was continuity from age 8 general aggression to early adulthood (ages 21–30) physical aggression in the American samples; however, contrary to our hypothesis, no continuity was observed in the Finnish JYLS sample. As predicted, the continuity was similar in the two American samples. These findings imply that there exist country-differences but not cohort-differences within the American studies in the continuity of aggression. In contrast to our expectations, we generally did not find that continuity of aggression

was higher among males than females but rather observed equally high continuity (the USA) or no continuity (Finland) between the sexes.

Compared to the previous study (Kokko et al., 2009) in which significant continuity from child general aggression to middle adulthood physical aggression in Finland was obtained, the present findings revealed no significant continuity. It should be noted that both a different age point (age 27 in the current study compared to ages 36 and 42 in the prior study) and a different measure of adult aggression (two items, indicating breaking and hitting, at age 27 compared to Buss and Perry (1992) physical aggression items at ages 36 and 42) was used in the JYLS in this study. The Buss and Perry items captured the feeling that one would like to act physically aggressively whereas in the present study, the items were focused on actual physical aggressiveness. The present finding of similar continuity of aggression from childhood into adulthood among CCLS females and males is also different from what was previously found by Kokko et al. (2009). It should be noted that there we included more severe items for age-30 aggression (i.e, had “choked, punched, or beaten another adult”, “slapped or kicked another adult”, and “threatened or actually cut someone with a knife or threatened or shot at someone with a gun”) than in this study. Severe aggression can be assumed to be most predictable on the basis of early aggression and be more typical of men than women.

### **Continuity in Aggression by Parent Occupational Status Status**

This study revealed that the continuity in aggression was only evident among the USA children whose family occupational status was non-professional, including blue-collar, unskilled, and skilled workers. The present items for both childhood and adulthood aggression were carefully selected from a pool of aggression items. They were matched based on the content and also using statistical indicators, such as their descriptive information and factor loadings. Consequently, we maintain that these findings may reflect real cultural differences in the

continuity of aggression. There are several theoretical explanations for the differences in the continuity of aggression among children from non-professional family occupational backgrounds in the USA and Finland.

First, educational possibilities are more equal across socioeconomic status (SES) groups in Finland than in the USA. College and university education is free and state-supported in Finland which enhances social mobility. Because educational attainment and staying in school correlate with lower aggression (Henry, Caspi, Moffitt, Harrington, & Silva, 1999; Underwood & Coie, 2004) and aggression promotes school failure and lower achievement (Huesmann, Eron, & Yarmel, 1987), these educational resources might serve as a protective factor that would decrease the likelihood of aggressive Finnish children remaining aggressive by young adulthood. So, we conducted supplemental analyses investigating whether achievement in school might be the real moderator, which might be correlated with parent occupational status in the USA but not in Finland.<sup>1</sup> We discovered that the participants' family occupational status was equally correlated with their own adult educational achievement in Finland ( $r = .284, p < .001$ ) and in the SES American samples ( $r = .284, p < .001$ , for the collapsed sample). Consequently, differing relations of parent occupational status to education or academic achievement does not seem to explain why there is a difference in continuity of aggression for youths who are from non-professional family backgrounds. The most plausible conclusion would seem to be that there is an unidentified element that moderates continuity of aggression but that has not been assessed in this study. It is possible that the school environment functions as such a moderator.

Second, in the USA, perhaps youths from families of higher occupational status who display problematic behavior have more resources to find treatment and social support. Further, families of high occupational status youths may be more likely to be able to deal effectively with schools and juvenile justice systems to deflect the trajectory of aggression a child is displaying.

Because equality and social justice are highly valued in the Finnish school system, these kinds of disparities in resources are less evident in Finland. As an example of the social equality, the residential area is the major factor determining the child's school in Finland. The Finnish housing policy has encouraged equality between residential areas and the schools have a mix of students from different socioeconomic backgrounds. Consequently, differences between schools in student achievement are small (Sahlberg, 2011). Conversely, there is more socioeconomic segregation in the USA, with lower SES children attending schools of lower quality than higher SES children (Organization for Economic Cooperation and Development, 2012).

Third, income equality is much higher in Finland than in the USA (Wilkinson, 2011; Wilkinson & Pickett, 2010). Wilkinson argues that income inequality is associated with social problems, particularly those that are more common among lower socioeconomic status groups, such as health problems and mistrust. In countries with high inequality of income, different sub-cultures of behavioral norms and other features related to socioeconomic status may emerge. In Finland, such sub-cultural differences are almost non-existent. In future studies, it would be important to include factors that might explain the observed relation between child and adult aggression among the lower SES USA children.

The present results regarding differences in the continuity of aggression among individuals from different family occupational backgrounds appear not to be cohort-specific, as the findings were quite similar in the American cohorts born in the 1950s and the 1980s. But it is to be noted that social mobility in the United States has decreased in recent years, with children who grow up in higher income families being 22 times more likely to be in the top 5% of income earned during adulthood than children who grow up in lower income families (Hertz, 2006).

### **Limitations and Conclusions**

There are a few issues that need to be considered when interpreting the present results. First, we operationalized adult physical aggression with just two items in each sample. More items might have increased the reliability of the scale. However, the selected items were carefully matched across samples and correlate well with other aggression items assessed in their respective samples in early adulthood. Second, in the JYLS and CCLS samples, adult aggression was measured at one time point, at ages 27 and 30, respectively, whereas in the CDP, it was computed by averaging the aggression scores across ages 21 to 24 (property destruction) and 23 to 26 (interpersonal aggression) because differing sets of scale items were included within different waves of data collection. But it should be noted that the combined data for the CDP approximates the five year span used for the CCLS item (which referred to the past 5 years) and the more open-ended question used by the JYLS. A further important point to consider in comparing results from the CDP to those from the JYLS and CCLS involves the ages of the samples at the time of the adulthood aggression assessments. The CDP participants were ages 21-26, a period during which the prefrontal cortex is in its final stages of development (Jetha & Segalowitz, 2012). Development of the prefrontal cortex is associated with better emotional regulation and executive function tasks such as planning ahead (Steinberg, 2008; Steinberg et al., 2009), which, in turn, are related to lower levels of aggression (Krämer, Kopyciok, Richter, Rodriguez-Fornells, & Münte, 2011). Therefore, differences in findings comparing the CDP with the JYLS and CCLS participants, who were slightly older than the CDP participants at the time of the adulthood aggression assessment, may be accounted for by differences in brain development. This concern is mitigated given that the results from the somewhat younger CDP sample and somewhat older CCLS sample in the United States were quite similar, whereas both of the American samples differed from the Finnish sample.



Third, ethnic origin and immigration status are linked to both the income level and occupational status, but for various reasons, we were unable to consider their role in our analyses. In the JYLS and CCLS, there is no or very little variation in the ethnic origin or immigration status of the participants. In the CDP, there were no immigrant families. However, there existed some variation in the ethnic background: about 80% of the participants were of European American origin and 20% of African American or other origin. We replicated the analyses on the continuity of aggression from childhood into early adulthood by including the variable for ethnic origin (combining the groups for African Americans and other ethnic subgroups to create an indicator for being a member of ethnic minority group vs. being Caucasian) as a covariate and found that there were minimal changes in the estimated coefficients for the continuity of aggression from middle childhood to early adulthood. This means that the estimated coefficients for the continuity of aggression were not biased when race/ethnicity was not included in the estimated models.

Fourth, in North America, particularly, students with similar SES backgrounds occupy certain schools. Consequently, the inclusion of the class/school variable in the statistical analyses would have been valuable. We were unable to include school socioeconomic status for all three samples: In the CDP, this information was not available. Despite any differences between schools in parental occupational status when the children were age 8, children moved on to different junior high and high schools. Of course, it is possible that indices of the overall school context (e.g., financial resources, academic achievement, aggression) could also influence the individual's early adulthood aggression, but these variables were not available at the school level to examine school context effects. We also expect that parent occupational status is more stable over time than the parent occupational composition of children's schools over time. Instead, we included individual family parent occupation status, rather than parent occupation at the school

level during middle childhood as an index of family of origin socioeconomic influences on the individual's aggression in early adulthood. Fifth, we acknowledge that there are several other indicators for family socioeconomic status other than parent occupational status, such as parent education and family income (e.g., Bradley & Corwyn, 2002). In the present study, only parent occupational status was available in all the studies.

Notwithstanding these limitations, we consider the present study an important attempt to identify moderators of continuity of aggression from childhood to adulthood in the USA compared to Finland. The present study samples utilized exceptionally similar items to measure childhood and adult aggression and parent occupational status. The selection of the child aggression items of the JYLS was originally partly based on the already published CCLS items, and the CDP items were matched with these older longitudinal studies. The inclusion of the CDP allowed an examination of potential cohort-differences in the USA. In future research, it would be important to replicate the present findings in the continuity of aggression in still other countries differing in their resources available to support youth development, and including additional factors other than family occupational background that might moderate the degree of continuity of aggression from childhood to adulthood. Other analytic techniques to examine continuity can also be used. For example, it has been previously shown that less than 10% of children are on a consistently high trajectory for physical aggression from childhood to adolescence (e.g., Tremblay, 2010) and that these children are at the highest risk for later serious violence (e.g., Loeber, Lacourse, & Homish, 2005). Furthermore, mother's low education and early childbearing have been the strongest risk factors, particularly in boys, for having consistently high aggression throughout childhood (Nagin & Tremblay, 2001). Consequently, in the future, it would be interesting to examine whether there are cultural differences in this high aggression trajectory and whether family SES plays a role in this continuity.

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**Footnotes**

<sup>1</sup>Adult educational attainment was coded as follows: in the JYLS (at age 27), 1 = *completed primary and secondary schooling but no tertiary education or vocational training*; 2 = *completed some vocational training*; and 3 = *higher vocational qualifications or university* and in the CCLS (at age 30) and the CDP (at age 24), 1 = *a high school diploma or less*; 2 = *completed some college or vocational training*; and 3 = *completed a Bachelor's degree or higher*.

<sup>2</sup> $\Delta SB\chi^2$  is the Satorra-Bentler scaled chi-square difference test used to test for differences in nested structural equation models estimated with full information maximum likelihood.

Table 1

*Measures for Childhood Peer-Nominated General Aggression and Adult Self-Reported Physical Aggression by Study*

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Study	Measure
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**Jyväskylä Longitudinal Study of Personality and Social Development (JYLS)**

Age 8 peer-nominated general aggression

Which of your classmates may hurt another child when angry, e.g. by hitting, kicking, or throwing something?

Who quarrels with other children even for a slight reason?

Who easily starts sulking (their look reveals that they are angry although they do not say a word)?

Who kicks pieces of furniture or other objects when angry at something?

Who may attack somebody without any reason?

Who says naughty things to other children even if these had done nothing wrong to him?

Who keeps sneering and making faces at other children?

Who teases others when angry when they do not notice?

Who teases smaller and weaker peers when angry at something?

Who may take other children's possessions?

Adult self-rated physical aggression

Do you break things?

Do you hit other people?

**Columbia County Longitudinal Study (CCLS)**

Age 8 peer-nominated general aggression

Who does not obey the teacher?

Who often says, "Give me that?"

Who gives dirty looks or sticks out their tongue at other children?

Who makes up stories and lies to get other children into trouble?

Who does things that bother others?

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Study	Measure
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Who starts a fight over nothing?

Who pushes or shoves children?

Who is always getting into trouble?

Who says mean things?

Who takes other children's things without asking?

Adult self-rated physical aggression

I get angry and smash things

In the past 5 years have you ever slapped or kicked another adult?

How many times?

**Child Development Project (CDP)**

Age 8 peer-nominated general aggression

Who starts fights...says mean things and hits other kids?

Who is mean and bossy...tries to push other kids around to get what they want?

Who gets mad, even when they shouldn't...like when someone does something to them by accident?

Adult self-rated physical aggression

Destroys own things

Destroys others things

How many times have you gotten into a fight or hit someone?

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Table 2

*Descriptive Sample Statistics for Measures of Interest in the Three Studies*

	Finnish JYLS ( <i>N</i> = 369)		USA CCLS ( <i>N</i> = 856)		USA CDP ( <i>N</i> = 585)	
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
Percentage of male participants	53%		51%		52%	
Childhood parent occupational status						
Non-professional (percent)	71%		70%		74%	
Professional (percent)	29%		30%		26%	
Age 8 peer-nominated general aggression <sup>a</sup>	18.37	14.79	12.73	14.00	10.51	12.91
Adult self-reported physical aggression <sup>b</sup>	0.23	0.54	0.69	0.88	0.45	0.82

<sup>a</sup>The scale represents the average percentage of times that a child was nominated as being aggressive by his/her peers; <sup>b</sup>The scale ranges from 0 to 4.

Table 3

*Correlations between Age 8 Peer-Nominated General Childhood Aggression and Adult Self-Reported Physical Aggression by Study and Stratified by Childhood Parent Occupational Status and Sex for the JYLS, CCLS, and CDP*

	JYLS	CCLS	CDP
Full sample	.02	.20****	.22****
<i>N</i>	292	391	385
Correlations by sex			
Males	.07	.24****	.21***
<i>N</i>	150	192	193
Females	-.05	.12*	.17**
<i>N</i>	142	199	192
Correlations by parent occupational status			
Non-professional	-.02	.23****	.28****
<i>N</i>	203	242	275
Professional	.09	.16	-.04
<i>N</i>	89	98	119

*Note.* Both aggression measures were natural-log transformed for this analysis.

\* $p < .10$ . \*\* $p < .01$ . \*\*\* $p < .05$ . \*\*\*\* $p < .01$ . \*\*\*\*\* $p < .001$ .

Table 4

*Unstandardized (B) and Standardized (β) Coefficient Estimates from Multiple Group Structural Equation Models for the Continuity of Childhood Age 8 Peer-nominated General Aggression to Adult Self-Reported Physical Aggression by Parent Occupational Status and Study*

Occupational Status Level of Parent Dependent variable		Finnish JYLS				USA CCLS				USA CDP			
		Non-professional		Professional		Non-professional		Professional		Non-professional		Professional	
Predictor		B	β	B	β	B	β	B	β	B	B	B	β
Adult aggression	Age 8 aggression	0.01	0.03	0.01	0.03	0.10***	0.21***	0.01	0.02	0.10***	0.26***	0.01	0.03
	Sex (M=1, F=0)	-0.01	-0.02	0.13*	0.40*	0.12*	0.26*	-0.03	-0.07	0.05	0.11	0.10	0.27†
Age 8 aggression	Sex (M=1, F=0)	-0.05	-0.06	-0.09	-0.11	0.61***	0.59***	0.43**	0.40**	0.66***	0.54***	0.40*	0.38*

*Note.* Both aggression measures were natural-log transformed for this analysis. Path coefficients are based on model in which age 8 to adulthood path coefficients for aggression were constrained to be equal for professional participants in three studies and for non-professional participants in the Finnish JYLS. Path coefficients for aggression for the non-professional participants in the two USA samples were also constrained to be equal. The resulting model fit the data well,  $\chi^2(3) = 2.73, p > .60$ ; CFI = 1.00; RMSEA = .000.

†  $p < .10$ . \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .



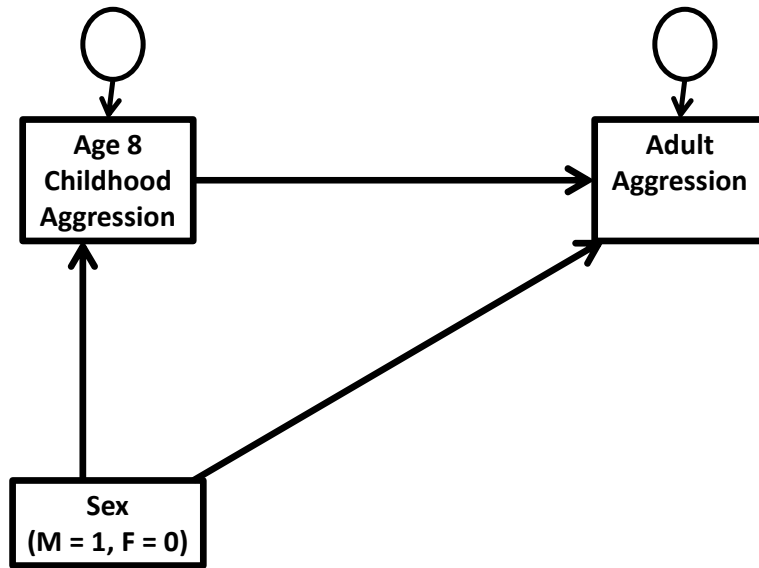


Figure 1. *A diagram of the structural equation model used to estimate continuity of aggression from childhood to adulthood controlling for sex effects on aggression.*