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Intensity of Aggression in Childhood as a Predictor of Different Forms of Adult Aggression: A Two-Country (Finland and United States) Analysis

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Abstract

This study examined the prediction of different forms of adult aggression in two countries from child and adolescent aggression. It was based on two longitudinal projects: the Jyväskylä Longitudinal Study of Personality and Social Development (JYLS; $N = 196$ boys and 173 girls) conducted in Finland and the Columbia County Longitudinal Study (CCLS; $N = 436$ males and 420 females) conducted in the USA. The same peer-nominated items for aggression were used in both studies at age 8; comparable measures of aggression also were available in adolescence (age 14 in the JYLS/19 in the CCLS) and adulthood (ages 36/30 and 42/48). Results showed that in both countries and in both genders, aggression in childhood was linked significantly to physical aggression and lack of self-control of anger in adulthood but not to verbal aggression. This differential predictability of aggression over 40 years suggests that individual differences in physical aggression are more determined by lasting individual differences (including emotional reactivity) than are individual differences in verbal aggression.

The present study focused on gender and national differences in the long-term continuity of aggression from middle childhood to middle adulthood, and the different ways continuing aggression manifests itself in adulthood. By “continuity” we mean the extent to which individuals maintain their relative positions within the population on aggression. Existing studies on the continuity of aggression, like studies on the magnitude of aggression, have indicated smaller gender differences than expected. These studies mostly covered the age range from childhood through adolescence. In the present study, continuity was examined from middle childhood to middle adulthood – a span of 34 to 40 years. Few prior studies have approached this age range. The focus of the study does not imply that discontinuity of

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aggression from child to adulthood should be regarded as negligible or that all serious forms of aggression have their origin only during childhood. Rather, the goal was to explore with two longitudinal samples from different countries the extent of the continuity of child aggression to different forms of adult aggression, such as physical and verbal aggression and low self-control of anger, and the magnitude of gender differences in that continuity. The extent to which different forms of adult aggression show different predictability from child aggression is expected to provide insights into the processes underlying long-term aggressive behavior. For example, if the predictability is the same for both genders and all three forms of adult aggression, the hypothesis would be viable that there is continuity in an underlying trait of aggression independent of gender. On the other hand, differential predictability for physical and verbal aggression, for example, would suggest that different processes underlie those behaviors. Similarly, gender differences in what types of adult aggression are most predictable from childhood aggression suggest that gender not only has a main effect on aggression but moderates the processes that produce continuity.

Gender Differences in Aggression

Generally held conceptions of aggression have assumed that males are always more aggressive than females. Meta-analyses have, however, shown that gender differences in the magnitude of aggression, although quite reliably found in school-age children independently of the informants (Vierikko, Pulkkinen, Kaprio, & Rose, 2006), are smaller than expected, particularly in more recent studies compared to older studies (Coie & Dodge, 1998). Only about 5% of the variance in aggression is explained by gender differences (Hyde, 1984). Furthermore, the existence of gender differences depends on the method of measurement and the form of aggression. The mean level of physical and verbal aggression is higher among boys than among girls from toddler-hood onwards (e.g., Knight, Fabes, & Higgins, 1996; Loeber & Stouthamer-Loeber, 1998), but in self-ratings of indirect aggression females often score higher (Lagerspetz, Björkqvist, & Peltonen, 1988). In any case, the existence or non-existence of overall gender differences does not inform us much about the existence of gender differences in the continuity of aggression.

Continuity of Aggression Over Time

The existence of the continuity of aggression from childhood to adulthood has often been argued on the basis of studies on delinquency and antisocial behavior. Numerous studies have shown that aggressive behavior in childhood is associated with delinquent behavior in adolescence or adulthood. McCord (1983, 1994) and Patterson, Capaldi, and Bank (1991) in the USA; Farrington (1991, 1994) in the U.K.; Magnusson (Magnusson, Dunér, & Zetterblom, 1975; Magnusson, af Klinteberg, & Stattin, 1994) in Sweden; Pulkkinen (1992) in Finland; and Moffitt (Moffitt, 1990; Moffitt, Caspi, Dickson, Silva, & Stanton, 1996) in New Zealand have reported continuities from childhood aggression to antisocial behavior and criminality at later ages. Correspondingly, data from the Columbia County Longitudinal Study (CCLS) conducted in the USA revealed that the likelihood of being convicted of a crime by age 30 and the seriousness of the crime were significantly predicted by peer-nominated aggression at age 8 (Huesmann, Eron, & Dubow, 2002). Moffitt, Caspi, Rutter, and Silva (2001) noted that 10-year lagged correlations in antisocial behavior ranged from 0.12 to 0.36 for males and from 0 to 0.34 for females, depending on the measure of antisocial behavior and the age of the participants. Studies have shown that if aggression manifests itself early and is associated with other risk factors, such as disruptive behavior, hyperactivity, neurological deficits, and family adversities (e.g., Campbell, Shaw, & Gilliom, 2000; Dishion & Patterson, 1993; Loeber & Stouthamer-Loeber, 1998; Moffitt et al., 2001), then it places the individuals at the greatest risk for later criminality.

Continuity of aggression cannot, however, be inferred confidently solely on the basis of findings demonstrating that childhood aggression is related to antisocial behavior or crime in young adulthood. First, antisocial behavior is a broader construct than aggression and has many manifestations. Antisocial behavior encompasses not only delinquency and crime among youth and adults, but also disruptive behavior in children (Rutter, Giller, & Hagell, 1998). Second, criminal behavior is highly concentrated. A small number of people (about 5% of males and an even smaller proportion of females) accounts for half of all criminal convictions in samples studied in different countries (Pulkkinen, 1988). A person-oriented approach has revealed that adult antisocial behavior is most predictable on the basis of multiple aspects of childhood functioning including restlessness, lack of concentration, low school achievement, and aggression (Magnusson & Bergman, 1990; Pulkkinen, 1992). Aggression alone is a more modest predictor of crime (Magnusson, 1988, p. 159) or is predictive of crime only for the most aggressive (Pulkkinen, 1998). These results imply, as Magnusson and Bergman (1990) point out, that the relationship between aggression in childhood and later antisocial behavior “cannot be interpreted uncritically in terms of the role aggression plays in the development of these adjustment problems” (p. 113). Third, male criminality is related not only to aggression but also to high impulsiveness, low self-control, negative emotionality, sensation seeking, and other psychopathy-related personality characteristics (Pulkkinen, Virtanen, af Klinteberg, & Magnusson, 2000).

Fortunately, the studies predicting antisocial behavior and criminality from childhood aggression have been supplemented by numerous studies that have examined the continuity of aggression per se from childhood to young adulthood. Aggression generally has been defined as behaviors intended to injure or irritate another person (Buss, 1961; Coie & Dodge, 1998; Eron, Walder, & Lefkowitz, 1971; Loeber & Hay, 1997). Defined this way, aggression has been found consistently to display continuity from childhood to adolescence and young adulthood. In 1979 Olweus (1979) reviewed 16 longitudinal studies of aggression primarily among males with lags ranging from 6 months to 21 years and reported prediction coefficients ranging from 0.98 for 1 year with 13-year-olds to 0.36 for 13 years from ages 5 to 18. He noted that continuity coefficients from childhood to young adulthood generally decreased in linear fashion as the interval between the time points increased, and that the coefficients were similar regardless of the different methods for measuring aggression (e.g., teacher ratings, behavioral observations).

Gender Differences in the Continuity of Aggression Over Time

During childhood, equivalent continuity of aggression for the genders has generally been found. In a longitudinal study of a USA sample, Cairns, Cairns, Neckerman, Ferguson, and Gariépy (1989) confirmed that the continuity of teacher-rated aggressiveness was higher the shorter the time interval. Cairns et al. also found that the continuity of teacher-rated aggression from the 4th to the 8th grade was as high in girls as in boys (correlation coefficients 0.51 and 0.49, respectively). Correspondingly, age 6 aggression was correlated with age 11 aggression at 0.47 for boys and 0.50 for girls in the Metropolitan Area Child Study (Huesmann, 2001).

As children move into adolescence the continuity often has been found to be higher for males. In a large Finnish twin sample (2,279 girls and 2,311 boys), continuity of aggression from age 12 to 14 was somewhat higher in boys (.35) than in girls (.26); ($p < .001$) (Vierikko et al., 2006, p. 181). Similar results were found in the Columbia County Longitudinal Study (Huesmann, Eron, Lefkowitz, & Walder, 1984) in which aggression measured by peer nominations at ages 8 and 19 correlated .44 for males and .36 for females. Likewise, in the Finnish Jyväskylä Longitudinal Study of Personality and Social Development (JYLS), the correlation of teacher-rated aggression between ages 8 and 14 was 0.34 ($p < .001$) for boys and 0.23 ($p < .01$) for girls (Pulkkinen, 1987). However, the correlation of peer-nominated

aggression between ages 8 and 14 was 0.37 ($p < .001$) for both girls and boys. When teacher-ratings and peer nominations were combined, the correlations between ages 8 and 14 were .38 for males and .33 for females (Kokko & Pulkkinen, 2005). Thus, the continuity of girls' aggression varied more with informant than did the continuity of boys' aggression. Finally, in a 15-year long cross-national longitudinal study conducted in four countries by Huesmann and colleagues (Huesmann & Eron, 1986; Huesmann, Moise-Titus, Podolski, & Eron, 2003), continuity of aggression from age 6–10 to age 21–25 was significant for males in the USA, Finland, and Poland; in Finland, the continuity for females was about the same as for males; in the USA the continuity for females was significant but less than for males; and in Poland the continuity for females was not significant. In Israel, the continuity of aggression was non-significant for males and for females. In all countries childhood aggression was assessed through peer nominations, whereas early adult aggression was assessed using a composite score involving several measures (e.g., physical, verbal, indirect aggression) reported by oneself and others.

Intensity of Aggression in Childhood as a Predictor of Different Forms of Adult Aggression

Previously published results from both the Columbia County Longitudinal Study and the Jyväskylä Longitudinal Study also have examined the general continuity of aggression from childhood into middle adulthood. For the Columbia County Longitudinal Study, Huesmann et al. (1984) reported significant correlations between peer-nominated aggression at age 8 and both the MMPI Scales F + 4 + 9 (0.30) and self-reported aggressiveness (0.25) at age 30 in males. The MMPI covers personality characteristics more broadly than teacher ratings and peer nominations of aggression. In females, peer-nominated aggression at age 8 correlated significantly with only the MMPI Scales (0.16). In the Jyväskylä Longitudinal Study, the measure of aggression combined from teacher-ratings and peer nominations at age 8 was significantly correlated with self-reported aggressiveness at ages 36 (0.28) and 42 (0.23) in males, but only at age 42 (0.19; at age 36 0.07) in females (Kokko & Pulkkinen, 2005). Thus, it seems that the extent of continuity into adulthood may also depend on the form of aggression being examined in adulthood, though no studies have examined this issue in any detail.

In summary, previous published studies have generally shown some continuity of general aggression from childhood all the way into middle adulthood but have not examined the predictability of different forms of adult aggression from childhood aggression. The reported gender differences in continuity have been very small in childhood but often been substantial in late adolescence and adulthood. Differences across countries also have been substantial at least for countries with quite different histories of socio-economic change during the developmental period.

The main purpose, then, of the present study was to examine the long-term predictability of *different forms* of aggression in middle-adulthood from the intensity of general aggression in middle childhood (possibly mediated through adolescent aggression) and to determine if the predictability was similar *across genders* and *across countries* with different rates of violence. In particular we compared the development of aggression in two similar cohorts that were born in the 1950s in Finland and the USA. The rationale for comparing the two countries was to determine whether the long-term predictability of aggression is bound to overall violence rates or a more general phenomenon. Finland and the USA have similar socio-economic systems and levels but have quite different levels of violence and intensity of aggression. For example, in 1998 the homicide rate in the USA was double Finland's and the major assault rate was ten times that in Finland (Seventh United Nations Survey on Crime Trends, 2004). By intensity of general aggression in childhood, we refer to the level of all types of aggression together – physical, verbal, indirect, etc. Prior research has shown high correlations in childhood between

these different manifestations, and factor analyses have indicated that they load highly on one dimension in childhood (Eron, Banta, Walder, & Laulicht, 1961; Pitkänen, 1969, p. 131).¹ On the other hand, substantial evidence exists that adult aggression is multidimensional with low correlations between some dimensions (Huesmann et al., 2003, p. 209)

Child and adolescent aggression were expected for a variety of reasons to be better predictors of adult physical aggression than of adult verbal aggression. First, physical aggression emerges developmentally prior to verbal aggression and thus might represent the most enduring type of aggression (Pulkkinen, 1998; Tremblay, Hartup, & Archer, 2005). Second, there are more social controls on physical aggression than on verbal aggression in early childhood. As a result of socialization by parents and other adults (e.g., teachers), for most children the expression of aggression may be channelled into prosocial, constructive acts for restructuring social situations. Physical aggression in middle childhood therefore indicates potentially longer lasting problems in socialization (Pulkkinen, 1982). Third, one also can expect that only a minority of individuals are physically aggressive in adulthood, whereas relatively more tolerable or socially acceptable verbal aggression might appear situation-specifically in most individuals at some point in adulthood.

Along with physical and verbal aggression, the third marker of aggressiveness we assessed in adulthood was low self-control of anger. Low self-control of anger is viewed as a cognitive-emotional deficit that would contribute to childhood aggression and persist into adulthood (Eisenberg, Fabes, Nyman, Bernzweig, & Pinuelas, 1994; Pulkkinen, 1982). Consequently, we hypothesized that childhood aggressiveness would also predict low self-control of anger in middle-adulthood. We also hypothesized that the predictability from childhood aggression of both adult physical aggression and of adult low self-control of anger would be higher for males than for females. Such a finding would be consistent with early findings about general aggression in adulthood.

Method

Participants

The participants in the present study were drawn from two prospective longitudinal studies: the Jyväskylä Longitudinal Study of Personality and Social Development (JYLS) conducted in Finland and the Columbia County Longitudinal Study (CCLS) conducted in the USA.

Finland: JYLS—In 1968, 12 complete school classes of second grade pupils ($N = 369$; 173 girls, 196 boys) in the town of Jyväskylä, Finland were selected randomly to be studied (Pulkkinen, 1982, 2006). These participants mostly were born in 1959 and were 8 years old. They constitute the original sample for the JYLS. Most of these participants have been followed from age 8 to age 42, with information on them being collected in multiple waves. Information about their aggression collected during four of these waves of measurement – at ages 8, 14, 36, and 42 – was used in the current study.

At age 14 in 1974, 167 girls (97% of the original sample) and 189 boys (97%) were evaluated again by peers on their aggressive behavior. At age 36 in 1995, 137 women (79% of the original sample) and 146 (74% of the original sample; two men had died) completed an aggression inventory in the context of a semi-structured interview. At age 42 in 2001, the available sample size was reduced to 186 men (5 men had died and 5 had refused to participate) and 157 women (one woman had died and 15 had refused to participate); of these, 120 women (69% of the original sample) and 123 men (63%) completed an aggression inventory.

¹In the current study using measures of different forms of childhood aggression would not have been possible because of the way in which the USA data were coded, but it also seems inappropriate given the more one-dimensional nature of childhood aggression.

The attrition analyses of the sample for which at least some information was obtained at age 42 (Pulkkinen et al., 2003) indicated that the participants and non-participants did not differ from each other in their teacher-rated or peer-nominated social behavior (i.e., aggression, constructiveness, compliance, anxiety, emotional self-control, and behavioral activity) at ages 8 and 14 or in their grade-point averages collected from school archives at age 14. These results were replicated for the whole sample and for females and males separately. Thus, the participants represented an unbiased re-sampling of the original random sample. They also represented, as indicated by the comparisons with the Statistics Finland's data, the whole Finnish age cohort born in 1959 in, for instance, marital status, number of children, education, and employment rate.

However, pair-wise comparisons of the participants who had information about aggression available at ages 36 and 42 with the participants who did not have aggression information available at these ages revealed one difference among male participants: males for whom information about aggression was not available at age 36 had higher scores in peer-nominated aggression at age 8 than those males for whom there were data about aggression at age 36, $t(194) = 2.00, p < .05$; no such difference existed between age-42 male participants and non-participants and between female participants and non-participants at either age.

USA: CCLS—In the 1959–60 school year, almost the entire population of third graders in Columbia County, a semi-rural area of New York State, were assessed on peer-nominated aggression ($N = 856$; 436 boys, 420 girls; 95% Caucasian) in an attempt to measure the prevalence of aggression (Eron et al., 1971; Huesmann, Dubow, Eron, & Boxer, 2006). Most of the children were born in 1951 and were 8 years old. They constitute the original sample for the CCLS. Most of these participants have been followed from age 8 to age 48 with information on them being collected in multiple waves. Information about their aggression collected during the four waves of measurement – at ages 8, 19, 30, and 48 – was used in the current study.

At age 18–19 in 1970, immediately after they graduated from high school, 216 girls (51% of the original sample) and 211 boys (48%) were evaluated again by peers on their aggressive behavior. At age 30 in 1981, 211 women (50% of the original sample) and 198 men (45%) completed aggression measures as part of a wide-ranging assessment. At age 48 in 1999–2000, self reports of aggression from 485 (57%) of the original 856 participants (240 females and 245 males) were obtained. Although the number of relocated participants who refused to be interviewed (despite substantial financial incentives) was higher than expected, the completed re-interview rate of 57% over 40 years still provided a substantial sample for analysis.

The re-sampled CCLS participants differed from the “drop-outs” on some dimensions. In the 1970 and 1981 data collection waves, the mean age 8 aggression score for re-sampled participants was found to be significantly lower than the mean score for drop-outs (e.g., by .17 *SDs* for the 1981 sample). Similarly, re-interviewed participants in 2000 had significantly lower age 8 peer-nominated aggression scores than drop-outs (by .28 *SDs*). However, there was no significant difference in parent-reported aggression at age 8 between re-interviewed participants and drop-outs. Furthermore, the plots of the distributions and statistics revealed that many of the high aggressive participants *were* re-sampled and there was no substantial restriction of range that might have made it hard to detect relations between aggression and other variables. The age-48 re-interviewed participants and drop-outs also were compared on 1960 demographic variables. There was no significant difference in father's occupation, but it was found that the re-interviewed participants' parents were better educated in 1960, $t(703) = 3.62, p < .01$, and also lived in more costly housing at that time, $t(666) = 4.72, p < .01$. Re-interviewed participants also had higher age 8 IQ scores than drop-outs, $t(852) = 5.76, p < .01$ (average difference was 5.77, range for drop-outs = 52–138, *SD* = 14.95; range for re-

interviewed = 52–142, $SD = 13.82$). Again, although there were mean differences, the range for the re-interviewed participants was not restricted relative to the original range.

Measures and Variables

In order to make the analyses in the two samples as equivalent as possible, the measures of aggression that were used and the ages at which aggression was analyzed were selected to be as similar as possible. As a measurement of *Childhood Aggression*, we used peer-nominated aggression scores obtained at age 8 in both samples. For *Adolescent Aggression*, we used peer-nominated aggression scores obtained at age 14 in JYLS and at age 18–19 in CCLS. For *Adult Aggression*, we used self-reported aggression scores obtained at age 36 and again at age 42 in the JYLS, and we used self-reported aggression scores obtained at age 30 and again at age 48 in the CCLS.

Finland: JYLS—At age 8, aggression was computed as an average score on 10 peer-nominated items (Kokko & Pulkkinen, 2005), such as, “Who attacks others without reason?”, “Who says nasty things to other children even if they had done nothing wrong?”, “Who takes other children’s possessions?”. The items covered proactive, reactive, direct, and indirect aggression displayed physically, verbally, and facially. Peers nominated at least three same-sex children (not themselves) who displayed the aggressive behavior in question. A child’s score for each item was formed by the number of nominations received in the class in relation to the maximum number of votes (Pulkkinen, 1987; coefficient alpha = .92; average inter-item $r = .53$).

At age 14, one compounded item of highly correlating aggressive acts with high loadings on the general factor for aggression (Pitkänen, 1969) was used: “Attacks without reason, teases others, says naughty things”. The participant’s score was formed in the same way as at age 8.

At ages 36 and 42, aggression was assessed using 7 self-reported items, of which four were drawn from the Aggression Questionnaire by Buss and Perry (1992) and three were developed by Pulkkinen for the JYLS (Kokko & Pulkkinen, 2005). Coefficient alphas for the whole scale were .70 at age 36 and .69 at age 42. Three subscales of adult aggression were calculated by averaging the items: *Physical aggression* (two items, “Given enough provocation, I may hit another person” and “Once in a while I cannot control the urge to strike another person”), *verbal aggression* (two items, “When people annoy me, I may tell them what I think of them” and “If I am teased or attacked I will tease or attack back to the same degree”), and *low self-control of anger* (three items, “I have trouble controlling my temper”, “Sometimes I fly off the handle for no good reason”, and “I often get angry and easily land in disputes or fights”). Participants rated themselves on a scale varying from 1 = *describes me poorly* to 4 = *describes me very well*. Coefficient alphas for the subscales with average inter-item correlations in parentheses were .64 (.47), .50 (.33), and .66 (.39) at age 36; and .66 (.49), .33 (.20), and .68 (.41) at age 42, respectively. In our analyses, we combine the age 36 and 42 aggression measures of each form of aggression into one measure of that form of aggression in adults; so the relatively low reliability of verbal aggression at age 42 alone need not be of concern.

USA: CCLS—At age 8, aggression was measured using 10 peer-nominated items, such as, “Who pushes and shoves other children?”, “Who says mean things?”, “Who takes other children’s things without asking?” These items were comparable to what was used in the JYLS. The score represents the proportion of times the child was nominated by his or her classmates on any of the 10 aggression items (Huesmann & Eron, 1986; coefficient alpha = .90; average inter-item $r = .47$).

At age 18–19, 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!’?”; Lefkowitz, Eron, Walder, &

Huesmann, 1977). Participants first were presented with a list of those original participants who had attended school with them in 1960 at age 8, and were asked to identify those whom they now know “well enough to answer some questions about.” Participants then answered each of the 9 peer-nomination questions (e.g., “Who pushes and shoves others?”) by checking off all the names that applied from the list of participants. 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. This measure was highly reliable with an internal consistency of .90 (average inter-item $r = .50$) across the nine items.

At age 30, aggression scores were derived from self-ratings of serious physical aggression and verbal aggression (Huesmann et al., 1984). *Severe physical aggression* was measured by 3 items asking how many times in the past five years (from 0 to 4 or more times) the person had “choked, punched, or beaten another adult;” had “slapped or kicked another adult;” or had “threatened or actually cut someone with a knife or threatened or shot at someone with a gun” (Huesmann et al., 1984; coefficient alpha = .60; average inter-item $r = .33$). *Verbal aggression* was computed as an average score on 4 “feel like” items (e.g., “How often do you feel like screaming, losing your temper at people, being a little rude to people, or picking a fight or arguing with people?”). Participants responded from 0 = *never true* to 4 = *almost always true* (coefficient alpha = .73; average inter-item $r = .40$).

At age 48, aggression scores were derived again from self ratings of severe physical aggression and verbal aggression, and in addition from self ratings of lack of self-control of anger. *Severe physical aggression* was computed by averaging 4 items very similar to those used at age 30 (“In the last year, how often have you slapped or kicked someone, punched or beaten someone, choked someone, or threatened or actually cut another person with a knife, or threatened or shot at another person with a gun?”), with two additional items indicating milder aggression (i.e., “Start a fight over nothing,” and “Push or shove other people”). For each of the items, participants rated themselves on a scale varying from 0 = *never* to 3 = *a lot*, and the scores for all items were averaged to compute the scale score. Coefficient alpha for the scale was .60 (average inter-item $r = .27$). *Verbal aggression* was assessed as described above for age 30 except that “say mean things to other people” was used instead of “screaming”. Coefficient alpha was .77 (average inter-item $r = .46$). *Lack of self-control of anger* was comprised of 3 items taken from the Brief Symptom Inventory (BSI; Derogatis, 1992) and 2 items taken from Eisenberg et al.’s (1994) emotional control scale. The three BSI items were: “In the past seven days how much have you been bothered by ‘feeling easily annoyed or irritated,’ or by ‘temper outbursts that you could not control,’ or by ‘getting into frequent arguments’” (response choices were: 0 = *not at all*, 1 = *a little bit*, 2 = *moderately*, 3 = *quite a bit*, 4 = *extremely*). The two Eisenberg items, which were reverse scored on a scale from 1 to 7, were “When I get angry, it is easy for me to still be rational and not overreact,” and “I am slow to become angry, nervous, or upset”. Coefficient alpha for the combined 7-item scale was .63 (average inter-item $r = .25$).

Results

Descriptive Results

Differences in procedures and measures prevented comparisons of mean aggression scores *between* ages and countries; however, some gender comparisons *within* countries could be made. In childhood and adolescence, USA males scored significantly higher on peer-nominated aggression than USA females (at age 8, $t(854) = -7.75$, $p < .001$; at age 19, $t(425) = -7.74$, $p < .001$). At age 30, USA males scored higher than females on severe physical aggression, $t(400) = 3.08$, $p < .001$, and marginally higher on verbal aggression, $t(400) = 1.67$, $p < .10$. However, by age 48 there were no significant differences in severe physical aggression, verbal aggression, or self-control of anger.

In Finland, we could not assess gender differences in peer-nominated aggression in childhood or adolescence because nominations in Finland were same-sex limited. Comparisons of male and female adult self-reported aggression revealed that as in the USA, in young adulthood Finnish males scored marginally higher than females on verbal aggression, $t(312) = -1.84$, $p < .10$. However, unlike in the USA, Finnish males and females did not differ on physical aggression in young adulthood (at age 36), and Finnish females scored significantly lower on self-control of anger than did males, $t(312) = 2.21$, $p < .05$. (No comparison could be made with the USA sample as self-control of anger was not measured in young adulthood in the USA.) Finally, as in the USA, by middle adulthood (age 42) there were no significant differences between males and females on physical aggression, verbal aggression, or self-control of anger. In summary, by middle adulthood there did not seem to be pronounced gender differences in aggression, but in earlier years there were differences with boys being more overtly aggressive when there were differences.

Longitudinal Correlations

The correlations over time within the Finnish sample are shown in Table 1 and within the USA sample in Table 2. In both cases, correlations for females are shown above the diagonal and correlations for males are shown below the diagonal.

As can be seen from these tables, there was substantial continuity of aggression within childhood/adolescence for both females and males in both countries. Age 8 aggression correlated significantly with age 14 aggression in Finland for both males and females, and age 8 aggression correlated significantly with age 19 aggression in the USA for both males and females. One also can see that within the adult years, in both genders in both countries there was continuity in verbal aggression (from age 36 to 42 in Finland and from age 30 to 48 in the USA). For males, there also was significant continuity in physical aggression in both countries within adulthood, but for females, there was significant continuity in physical aggression only in the Finnish sample. Finally, within the Finnish sample, there was continuity within adulthood for self-control of anger both for males and females. In general, the “within adulthood” continuities in the USA were lower than those in Finland, but one must remember that the time lag in the USA between the two adulthood measurements was 18 years compared with only 6 years in Finland. Generally, these data indicated substantial continuity in aggression within childhood/adolescence and again within adulthood in both countries.

The correlations from childhood/adolescent aggression to adult aggression were not nearly as strong as the within childhood or within adulthood correlations. However, there were some significant correlations for males and females in both countries. Also, for males and females in both countries the adolescent peer-nominated measure of aggression seemed to be a better predictor of adult aggression than did age 8 peer-nominated aggression. The different patterns of relations to each different form of adult aggression suggested that different components of adult aggression might be differentially related to childhood/adolescent aggression.

An examination of the within adulthood correlations among the three components of adult aggression that were assessed (physical, verbal, and low self-control of anger) revealed moderate and significant inter-correlations that were somewhat higher for males than for females, particularly in Finland. The moderate magnitude of these correlations suggested that, although there likely was a common underlying construct of aggressiveness affecting all the manifest variables in adulthood, there also were unique factors affecting each of them. This finding is thus also consistent with our expectation that intensity of childhood and adolescent aggression would differentially predict different forms of adult aggression.

Models for Predicting Adult Aggression

To assess the predictability of different forms of adult aggression from childhood and adolescent general aggression, we employed structural equation modeling (SEM) using AMOS 4.01 (Arbuckle & Wothke, 1999) with full information maximum likelihood estimation. In each SEM model, we formed latent factors for different forms of adult aggression by combining the two adult measurement points, that is, ages 36 and 42 in the JYLS and ages 30 and 48 in the CCLS. These latent factors were formed because, as previously shown (Kokko & Pulkkinen, 2005), there is high continuity in aggression within adulthood, and because we were interested in the shared variance of adult aggression indices. First, we estimated a model in which a second order latent factor of adult aggression (comprised of first order latent factors for physical aggression, verbal aggression, and low self-control of anger) was predicted by child and adolescent aggression, and adolescent aggression was further predicted by child aggression. We tested this model as a four-group model (Finnish females and males, USA females and males); the parameters were estimated with no constraints across countries or genders). This model did not reproduce the observed correlations within reasonable bounds of error ($Chi\ square = 95.27, df = 48, p < .001$), although the absolute deviations were not large ($RMSEA = .028$). Because this model did not fit well, and because the longitudinal correlations in Table 1 and Table 2 suggested different degrees of continuity for different forms of aggression, we estimated models separately for each different form of adult aggression. These three models are shown in Figure 1, Figure 2, and Figure 3. In each case, the model was estimated as a four-group model (Finnish females, Finnish males, USA females, USA males) with parameters unconstrained, and then with parameters (as a group and individually) constrained to be the same across genders, across countries, and across genders and countries.

Physical Aggression

The four group unconstrained model for predicting physical aggression is shown in Figure 1. The model fits the data adequately ($Chi-square = 13.58, df = 8, p = .093, RMSEA = .024, CFI = .99, AIC = 109.58$). In this model (as in the models for verbal aggression and self-control of anger shown below in Figure 2 and Figure 3), aggression in childhood (age 8) significantly predicted aggression in adolescence (age 14/19) for females and males in Finland and the USA. Figure 1 also shows that aggression in adolescence in turn significantly predicted physical aggression in adulthood (ages 30/36 and 42/48). The explained variance of adult physical aggression was higher in the USA sample than in the Finnish sample. It was 24% for USA females ($p < .001$) and 49% for USA males ($p < .001$); the respective figures were 8% ($p < .01$) and 12% ($p < .001$) for Finnish females and males. There was no significant independent effect of age 8 aggression on adult physical aggression other than the effect mediated through adolescent aggression. Deleting the direct path from age 8 aggression to adult physical aggression did not produce a significantly worse fit of the model to the data ($AIC = 102.52, Chi-square\ difference = 0.94, df = 4, p = .919$) indicating that the entire effect of age 8 aggression on adult physical aggression seems to be mediated through adolescent aggressiveness. Constraining the paths to be the same for both genders produced a significantly worse fit ($p < .05, AIC = 114.31$) and constraining the paths to be the same for both countries produced a marginally worse fit ($p = .077, AIC = 108.97$).

Verbal Aggression

The unconstrained model for predicting verbal aggression is shown in Figure 2 and fits the data adequately ($Chi-square = 13.86, df = 8, p = .085, RMSEA = .024, CFI = .99, AIC = 109.86$). Adolescent aggression at age 14/19 by itself did not significantly predict adult verbal aggression in any country or gender. Additionally, the paths from age 8 aggression directly to adult verbal aggression were all non-significant, and removing these paths did not significantly reduce the fit of the model ($AIC = 106.27, Chi-square\ difference = 4.41, df = 4, p = .353$). The

variance in adult verbal aggression explained by childhood and adolescent aggression was consequently rather low: 4% ($p < .05$) for Finnish females and 7% ($p < .01$) for Finnish males, and 1% (n.s.) for USA females and 5% ($p < .001$) for USA males. Nevertheless, the total effects of childhood and adolescent aggression on adult verbal aggression were significant for males in both countries and females in Finland indicating that the combination of direct effects and indirect effects of age 8 aggression together has a small but significant influence on adult verbal aggression. Constraining the paths to be the same for both genders produced a significantly worse fit ($p < .05$, $AIC = 111.54$) and constraining the paths to be the same for both countries produced a marginally worse fit ($p = .095$, $AIC = 108.67$).

Low Self-Control of Anger

The path model for predicting low self-control of anger is shown in Figure 3 and fits the data quite well ($Chi-square = 2.043$, $df = 4$, $p = .728$, $RMSEA = 0.00$, $CFI = 1.00$, $AIC = 86.04$). For females, the effects of prior aggression on low self-control of anger in adulthood were almost identical in the two countries with the entire effect of age 8 aggression on adult self-control of anger being mediated through adolescent aggression. The explained variance in adult self-control of anger was 5% ($p < .05$) for Finnish females and 4% ($p < .001$) for USA females. For males, however, the results were quite different in the two countries. In Finland, there was no significant direct effect of childhood aggression on adult low self-control and only a small effect of adolescent aggression on adult low self-control of anger. Only 2% (n.s.) of the variance in adult self-control of anger was explained by prior aggressiveness in Finland. In the USA, however, for males there was a significant direct effect of both adolescent aggression and age 8 aggression on low self-control of anger in adulthood. The explained variance in adult self-control of anger from childhood and adolescent aggression was 9% ($p < .001$) for USA males. Constraining the paths to be the same for both genders or both countries produced significantly worse fits ($p < .01$, $AIC = 94.97$ and $p < .05$, $AIC = 88.04$, respectively). However, the model fit just as well ($Chi-square = 4.4$, $df = 7$, $p = .733$) when only the adolescent aggression to adult self-control paths were constrained to be the same regardless of gender or country.

Discussion

The goal of the present study was to investigate in females and males in two countries (Finland and the USA) the predictability of different forms of adult aggression from aggression in middle childhood using as comparable measures as possible. Our specific interest was to examine whether the intensity of aggression in childhood/adolescence predicted differentially to three forms of adult aggression, that is, physical aggression, verbal aggression, and low self-control of anger, and whether the continuity varied by gender and country. We had hypothesized that the predictability of adult aggression from child aggression through adolescent aggression would be higher for adult physical aggression than for adult verbal aggression. Our results revealed this to be true. There was greater predictability of adult physical aggression and low self-control of anger than of adult verbal aggression. Further, as predicted, much of the child effect on adult aggression was mediated through adolescent aggression. Childhood and adolescent aggression together predicted adult physical aggression significantly both for males and for females in both countries though the amount of explained variance varied by gender and country. Within the USA sample, the explained variance of adult physical aggression was three to four times higher than within the Finnish sample. Also, within the USA sample, the explained variance of male physical aggression was twice as high as for females; within the Finnish sample there were no gender differences.

This finding of stronger predictability of adult physical aggression from childhood and adolescent aggression may be partly explained by a stronger biological basis for physical

aggression. As argued by Tremblay (2000), physical aggression is “ontogenetically” prior to less severe forms of aggression, such as verbal aggression or indirect aggression. Although physical aggression generally decreases with increasing age, it can be assumed that individuals maintain their relative positions in this form of aggression more so than in other forms of aggression. Verbal aggression, being more socially acceptable for adults than physical aggression, is likely to be more heavily influenced by situational factors than physical aggression and more likely to appear from time to time in people who are not characteristically aggressive. This line of reasoning is given indirect support by a study which indicates that physically aggressive antisocial behavior and its continuity from childhood to adolescence is explained more strongly by heritable genes compared to the continuity of non-aggressive antisocial behavior; the latter is influenced both by heritability and shared environment (Eley, Lichtenstein, & Moffitt, 2003). Furthermore, a genetically informed study of 6-year-old twins found more of a genetic contribution for physical aggression but only a weak genetic contribution for social aggression (Brendgen et al., 2005). The highest risk for early-onset and persistent aggression is observed among those children who possess high levels of biological and social risk factors (Brennan, Hall, Bor, Najman, & Williams, 2003). Still, as the explained variance in adult physical aggression in this study indicates, there is much individual variation in the continuity of aggression that is explained by factors other than earlier aggression. Low self-control of anger indicated by, for instance, “I have trouble controlling my temper” reflects underlying emotional processes. Continuity in them was expected to be higher than in verbal expressions of aggression. The results confirmed this assumption.

As for the gender differences in the continuity of aggression, in line with our expectations based on previous studies (see Huesmann, 2001; Huesmann et al., 1984), higher continuity from earlier aggression to adult physical aggression was observed among USA males compared to USA females. In the Finnish sample, however, the gender difference was not significant. It is possible that the more severe items for physical aggression used in the USA study than in the Finnish study affected the finding of higher continuity to physical aggression observed among the USA participants. Severe physical aggression may be more predictable from earlier aggression than is less severe physical aggression. In future studies, it would be relevant to take into account the intensity of aggression in the measures of aggressive behavior for the study of the threshold for the intensity in both the predictor and outcomes measures of aggression.

As for the cultural differences, the greater predictability of physical aggression in the USA compared to Finland, and greater predictability of physical aggression among the USA males than among females compared to no gender differences in the Finnish sample, are findings warranting further study. These might indicate real cultural differences, but methodological issues also might explain differences. For example, there was a shorter measurement interval from adolescence to adulthood in the USA than in the Finnish sample (11 years in the USA sample, ages 19 to 30; 22 years in the Finnish sample, ages 14 to 36). On the other hand, one should note that the USA measure administered at age 19 asked the participants to recollect the aggressive behavior of their peers during the last few years (i.e., middle adolescence). Thus, with respect to the time periods actually sampled the interval difference between the Finnish JYLS and the USA CCLS probably was not substantive.

A clear strength of the present study is that it was based on two long-term longitudinal studies, both of which have collected information about aggressive behavior at several age points, in childhood and adulthood, using similar methods (i.e., peer nominations in childhood, self-reports in adulthood). In fact, at age 8, the same peer-nominated items were used in both studies. By the time Pulkkinen began the JYLS in 1968, Eron (Eron et al., 1961) already had published his measure of child aggression; Pulkkinen used the same method and some of the items in her instrument for JYLS. This made the present comparison and the study of developmental

pathways of aggression possible. Because there was a change in the informant of aggression from school age (childhood and adolescence) to adulthood (from peer nomination to self-report) the present findings on the continuity of aggression from school age to adulthood cannot result from shared variance caused by the same informant. As for the shared variance caused by the same informants used within school age and within adulthood, we do not see this as affecting our conclusions on the continuity of child aggression via adolescent aggression to different forms of adult aggression. In adulthood, we combined the two time points of aggression measures (ages 36 and 42 in the JYLS and ages 30 and 48 in the CCLS) in order to capture the variance that was common to them; continuity within adulthood was not our main focus.

Considering the long time span analyzed in the present study, it was not possible to assess aggression using the same instruments and the same informants at different ages and, thus, it is possible that changes in aggression from childhood to adulthood may, in addition to true changes, also reflect changes due to measures. It has been shown that, for example, depending on the informant, varying heritability estimates of aggression have been obtained (Hudziak et al., 2003; Vierikko, Pulkkinen, Kaprio, Viken, & Rose, 2003). Children seem not to be reliable informants of their own behaviors (Pitkänen, 1969), but peer nominations in childhood have shown high validity and reliability, followed by teacher ratings and parental ratings (Henry & The Metropolitan Area Child Study Research Group, 2006; Pulkkinen, Kaprio, & Rose, 1999). In late adolescence, peer nominations of aggression have been found to correlate with self-reports of aggression (Huesmann et al., 1984). In adulthood, comparable measures of self-reported aggression were available in the JYLS and CCLS; adult self-reported aggression has previously been shown to be a reliable and valid measure (Kokko & Pulkkinen, 2005). Another advantage of this study is that sophisticated multiple-group modeling was used for the study of gender and/or cultural differences in the continuity of aggression.

In future studies, it would be interesting to examine whether different forms of child aggression, e.g., physical, verbal, indirect (Lagerspetz et al., 1988), relational (Crick & Grotpeter, 1995), show different magnitudes of continuity into adult physical and verbal aggression, as well as low self-control of anger. It was not possible to investigate this question in the present study because the child and/or adolescent aggression measures were not designed to assess specific subtypes of aggression, although a few items representing various subtypes of aggression indeed were included; the childhood aggression scales in each country were highly internally consistent (alphas > .90). Other research also has shown high correlations among subtypes of aggression (e.g., reactive vs. proactive, physical vs. verbal, Dodge & Coie, 1987; physical vs. relational, Cillessen & Mayeux, 2004) during childhood, so it might be that some subtypes of aggression are not as strongly differentiated in childhood as in adulthood. Nevertheless, future research investigating continuity of specific subtypes of aggression from childhood through adulthood is needed.

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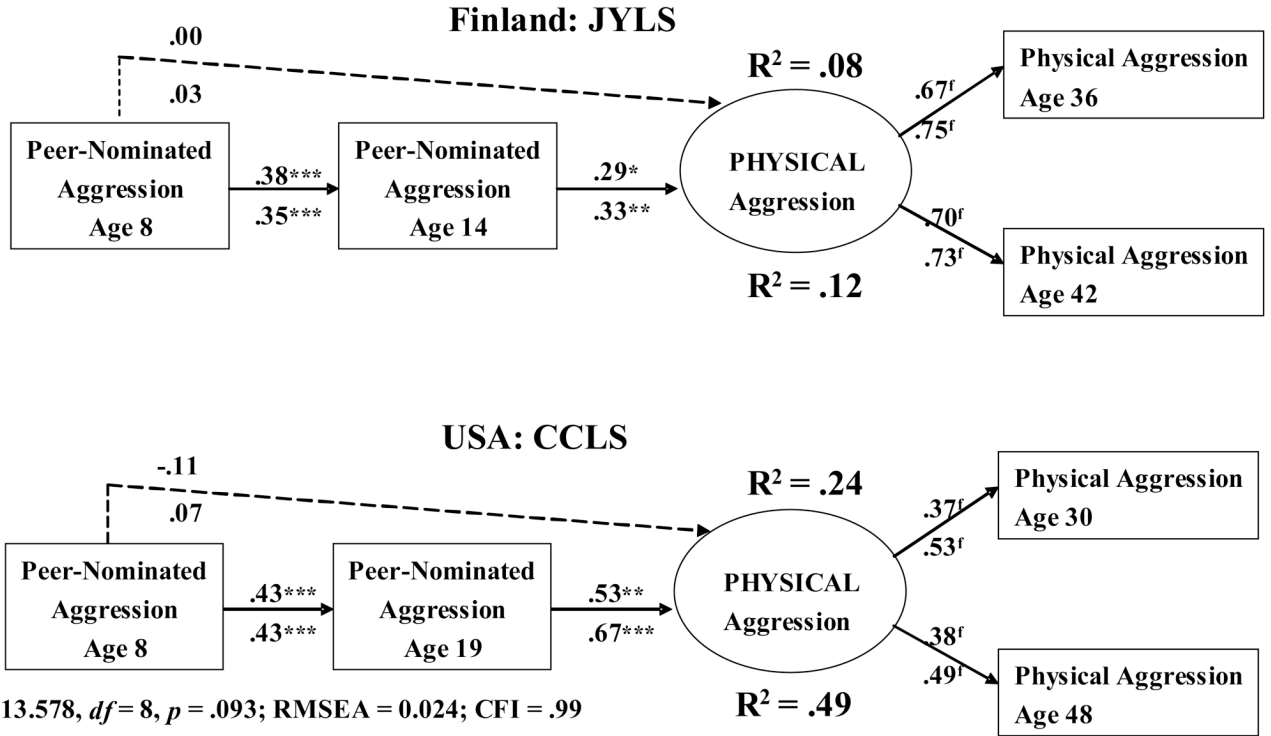
References

- Arbuckle, J.L.; Wothke, W. Amos users' guide, Version 4.0. Chicago: SmallWaters Corporation; 1999.
- Brendgen M, Dionne G, Girard A, Boivin M, Vitaro F, Pérusse D. Examining genetic and environmental effects on social aggression: A study of 6-year-old twins. *Child Development* 2005;76:930–946. [PubMed: 16026506]
- Brennan PA, Hall J, Bor W, Najman JM, Williams G. Integrating biological and social processes in relation to early-onset persistent aggression in boys and girls. *Developmental Psychology* 2003;39:309–323. [PubMed: 12661888]
- Buss, AH. The psychology of aggression. New York: Wiley; 1961.
- Buss AH, Perry M. The Aggression Questionnaire. *Journal of Personality and Social Psychology* 1992;63:452–459. [PubMed: 1403624]
- Cairns RB, Cairns BD, Neckerman HJ, Ferguson LL, Gariépy L-L. Growth and aggression: I. Childhood to early adolescence. *Developmental Psychology* 1989;25:320–330.
- Campbell SB, Shaw DS, Gilliom M. Early externalizing behavior problems: Toddlers and preschoolers at risk for later maladjustment. *Development and Psychopathology* 2000;12:467–488. [PubMed: 11014748]
- Cillessen AHN, Mayeux L. From censure to reinforcement: Developmental changes in the association between aggression and social status. *Child Development* 2004;75:147–163. [PubMed: 15015681]
- Coie, J.D.; Dodge, K.A. Aggression and antisocial behavior. In: Damon, W.; Eisenberg, N., editors. *Handbook of child psychology, vol. 3. Social, emotional, and personality development*. New York: Wiley; 1998. p. 779-862.
- Crick NR, Grotpeter JK. Relational aggression, gender, and social-psychological adjustment. *Child Development* 1995;66:710–722. [PubMed: 7789197]
- Derogatis, L.R. BSI: Administration, scoring, and procedures manual-II. Baltimore: Clinical Psychometric Research; 1992.
- Dishion, T.J.; Patterson, G.R. Antisocial behavior: Using a multiple gating strategy. In: Singer, M.I.; Singer, L.T.; Anglin, T.M., editors. *Handbook for screening adolescents at psychosocial risk*. New York, NY: Lexington Books/Macmillan, Inc.; 1993. p. 375-399.
- Dodge KA, Coie JD. Social information-processing factors in reactive and proactive aggression in children's peer groups. *Journal of Personality and Social Psychology* 1987;53:1143–1158.
- Eisenberg N, Fabes RA, Nyman M, Bernzweig J, Pinuelas A. The relations of emotionality and regulation to children's anger-related reactions. *Child Development* 1994;65:109–128. [PubMed: 8131642]
- Eley TC, Lichtenstein P, Moffitt TE. A longitudinal behavioral genetic analysis of the etiology of aggressive and nonaggressive antisocial behavior. *Development and Psychopathology* 2003;15:383–402. [PubMed: 12931834]
- Eron LD, Banta T, Walder LO, Laulicht J. Comparisons of data obtained from mothers and fathers on childrearing practices and their relation to child aggression. *Child Development* 1961;34:849–867. [PubMed: 14082904]
- Eron, L.D.; Walder, L.O.; Lefkowitz, M.M. *Learning of aggression in children*. Boston: Little, Brown; 1971.
- Farrington, D.P. Childhood aggression and adult violence: Early precursors and later-life outcomes. In: Pepler, D.J.; Rubin, K.H., editors. *Development and treatment of childhood aggression*. Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc.; 1991. p. 5-29.
- Farrington, D.P. Childhood, adolescent, and adult features of violent males. In: Huesmann, L.R., editor. *Aggressive behavior: Current perspectives*. New York, NY, US: Plenum Press; 1994. p. 215-240.
- Henry DB. The Metropolitan Area Child Study Research Group. Associations between peer nominations, teacher ratings, self-reports, and observations of malicious and disruptive behavior. *Assessment* 2006;13:241–252. [PubMed: 16880277]
- Hudziak JJ, van Beijsterveldt CEM, Bartels M, Rietveld MJH, Rettew DC, Derks EM, Boomsma DI. Individual differences in aggression: Genetic analyses by age, gender, and informant in 3-, 7-, and 10-year-old Dutch twins. *Behavior Genetics* 2003;33:575–589. [PubMed: 14574134]

- Huesmann, LR. Gender differences in the continuity of aggression from childhood to adulthood: Evidence from some recent longitudinal studies. Paper presented at the 2001 G. Stanley Hall Symposium on Gender and Aggression; Williams, Massachusetts: Williams College; 2001.
- Huesmann, LR.; Dubow, EF.; Eron, LD.; Boxer, P. Middle childhood family-contextual and personal factors as predictors of adult outcomes. In: Huston, AC.; Ripke, MN., editors. *Developmental contexts in middle childhood: Bridges to adolescence and adulthood*. New York: Cambridge University Press; 2006. p. 62-86.
- Huesmann, LR.; Eron, LD. *Television and the aggressive child: A cross-national comparison*. Hillsdale: Erlbaum; 1986.
- Huesmann LR, Eron LD, Dubow EF. Childhood predictors of adult criminality: Are all risk factors reflected in childhood aggressiveness? *Criminal Behavior and Mental Health* 2002;12:185–208.
- Huesmann LR, Eron LD, Lefkowitz MM, Walder LO. Stability of aggression over time and generations. *Developmental Psychology* 1984;20:1120–1134.
- Huesmann LR, Moise-Titus J, Podolski CP, Eron LD. Longitudinal relations between childhood exposure to media violence and adult aggression and violence: 1977–1992. *Developmental Psychology* 2003;39:201–221. [PubMed: 12661882]
- Hyde JS. How large are gender differences in aggression? A developmental meta-analysis. *Developmental Psychology* 1984;20:722–736.
- Knight GP, Fabes RA, Higgins DA. Concerns about drawing causal inferences from meta-analyses: An example in the study of gender differences in aggression. *Psychological Bulletin* 1996;119:410–421. [PubMed: 8668746]
- Kokko K, Pulkkinen L. Stability of aggressive behavior from childhood to middle age in women and men. *Aggressive Behavior* 2005;31:485–497.
- Lagerspetz KM, Björkqvist K, Peltonen T. Is indirect aggression typical of females? Gender differences in aggressiveness in 11- to 12-year-old children. *Aggressive Behavior* 1988;14:403–414.
- Lefkowitz, MM.; Eron, LD.; Walder, LO.; Huesmann, LR. *Growing up to be violent: A longitudinal study of the development of aggression*. New York: Pergamon; 1977.
- Loeber R, Hay D. Key issues in the development of aggression and violence from childhood to early adulthood. *Annual Review of Psychology* 1997;48:371–410.
- Loeber R, Stouthamer-Loeber M. Development of juvenile aggression and violence: Some misconceptions and controversies. *American Psychologist* 1998;53:242–259. [PubMed: 9491750]
- Magnusson, D. *Individual development from an interactional perspective: A longitudinal study*. Hillsdale: Lawrence Erlbaum Associates; 1988.
- Magnusson, D.; Bergman, L. A pattern approach to the study of pathways from childhood to adulthood. In: Robins, LN.; Rutter, M., editors. *Straight and devious pathways from childhood to adulthood*. New York: Cambridge University Press; 1990. p. 101-115.
- Magnusson, D.; Dunér, A.; Zetterblom, G. *Adjustment: A longitudinal study*. Stockholm: Almqvist & Wiksell; 1975.
- Magnusson, D.; af Klinteberg, B.; Stattin, H. Juvenile and persistent offenders: Behavioral and physiological characteristics. In: Ketterlinus, RD.; Lamb, ME., editors. *Adolescent problem behaviors: Issues and research*. Hillsdale: Lawrence Erlbaum Associates, Inc.; 1994. p. 81-91.
- McCord, J. A longitudinal study of aggression and antisocial behavior. In: Van Dusen, KT.; Mednick, SA., editors. *Prospective studies of crime and delinquency*. Boston, MA: Kluwer-Nijhoff Publishing; 1983. p. 269-275.
- McCord, J. Aggression in two generations. In: Huesmann, LR., editor. *Aggressive behavior: Current perspectives*. New York: Plenum; 1994. p. 241-251.
- Moffitt TE. Juvenile delinquency and attention deficit disorder: Boys' developmental trajectories from age 3 to 15. *Child Development* 1990;61:893–910. [PubMed: 2364762]
- Moffitt TE, Caspi A, Dickson N, Silva P, Stanton W. Childhood-onset versus adolescent-onset antisocial conduct problems in males: Natural history from ages 3 to 18 years. *Development and Psychopathology* 1996;8:399–424.
- Moffitt, TE.; Caspi, A.; Rutter, M.; Silva, PA. *Sex differences in antisocial behaviour: Conduct disorder, delinquency, and violence in the Dunedin Longitudinal Study*. New York: Cambridge University Press; 2001.

- Olweus D. Stability of aggressive reaction patterns in males: A review. *Psychological Bulletin* 1979;86:852–875. [PubMed: 482487]
- Patterson, GR.; Capaldi, D.; Bank, L. An early starter model for predicting delinquency. In: Pepler, DJ.; Rubin, KH., editors. *The development and treatment of childhood aggression*. Hillsdale: Lawrence Erlbaum Associates, Publishers; 1991. p. 139-168.
- Pitkänen, L. *Jyväskylä Studies in Education, Psychology and Social Research, Whole Nr. 19*: University of Jyväskylä, Finland. 1969. A descriptive model of aggression and nonaggression with applications to children's behaviour.
- Pulkkinen, L. Self-control and continuity from childhood to late adolescence. In: Baltes, BP.; Brim, OG., Jr, editors. *Life-span development and behavior*. Vol. vol. 4. Orlando: Academic Press; 1982. p. 63-105.
- Pulkkinen L. Offensive and defensive aggression in humans: A longitudinal perspective. *Aggressive Behavior* 1987;13:197–212.
- Pulkkinen, L. Delinquent development: theoretical and empirical considerations. In: Rutter, M., editor. *The power of longitudinal data: Studies of risk and protective factors for psychosocial disorders*. Cambridge: Cambridge University Press; 1988. p. 184-199.
- Pulkkinen, L. The path to adulthood for aggressively inclined girls. In: Björkqvist, K.; Niemelä, P., editors. *Of mice and women: Aspects of female aggression*. Orlando, FL: Academic Press; 1992. p. 113-121.
- Pulkkinen, L. Levels of longitudinal data differing in complexity and the study of continuity in personality characteristics. In: Cairns, RB.; Bergman, LR.; Kagan, J., editors. *Methods and models for studying the individual*. Thousand Oaks: Sage Publications; 1998. p. 161-184.
- Pulkkinen, L. The Jyväskylä Longitudinal Study of Personality and Social Development. In: Pulkkinen, L.; Kaprio, J.; Rose, RJ., editors. *Socioemotional development and health from adolescence to adulthood*. New York: Cambridge University Press; 2006. p. 29-55.
- Pulkkinen, L.; Fyrstén, S.; Kinnunen, U.; Kinnunen, M-L.; Pitkänen, T.; Kokko, K. 40+ erään ikäluokan selviytymistarina [40+ A story of the resilience of an age cohort group]. *Reports from the Department of Psychology, University of Jyväskylä* 349. 2003.
- Pulkkinen L, Kaprio J, Rose RJ. Peers, teachers and parents as assessors of the behavioural and emotional problems of twins and their adjustment: The Multidimensional Peer Nomination Inventory. *Twin Research* 1999;2:274–285. [PubMed: 10723806]
- Pulkkinen L, Virtanen T, af Klinteberg B, Magnusson D. Child behaviour and adult personality: Comparisons between criminality groups in Finland and Sweden. *Criminal Behaviour and Mental Health* 2000;10:155–169.
- Rutter, M.; Giller, H.; Hagell, A. *Antisocial behavior by young people*. Cambridge: Cambridge University Press; 1998.
- Seventh United Nations Survey on Crime Trends. 2004.
http://www.unodc.org/unodc/crime_cicp_survey_seventh.html
- Tremblay RE. The development of aggressive behaviour during childhood: What have we learned in the past century? *International Journal of Behavioral Development* 2000;24:129–141.
- Tremblay, RE.; Hartup, WW.; Archer, J., editors. *Developmental origins of aggression*. New York: Guilford Press; 2005.
- Vierikko E, Pulkkinen L, Kaprio J, Rose RJ. Genetic and environmental sources of continuity and change in teacher-rated aggression during early adolescence. *Aggressive Behavior* 2006;32:308–320.
- Vierikko E, Pulkkinen L, Kaprio J, Viken R, Rose RJ. Sex differences in genetic and environmental effects on aggression. *Aggressive Behavior* 2003;29:56–68.

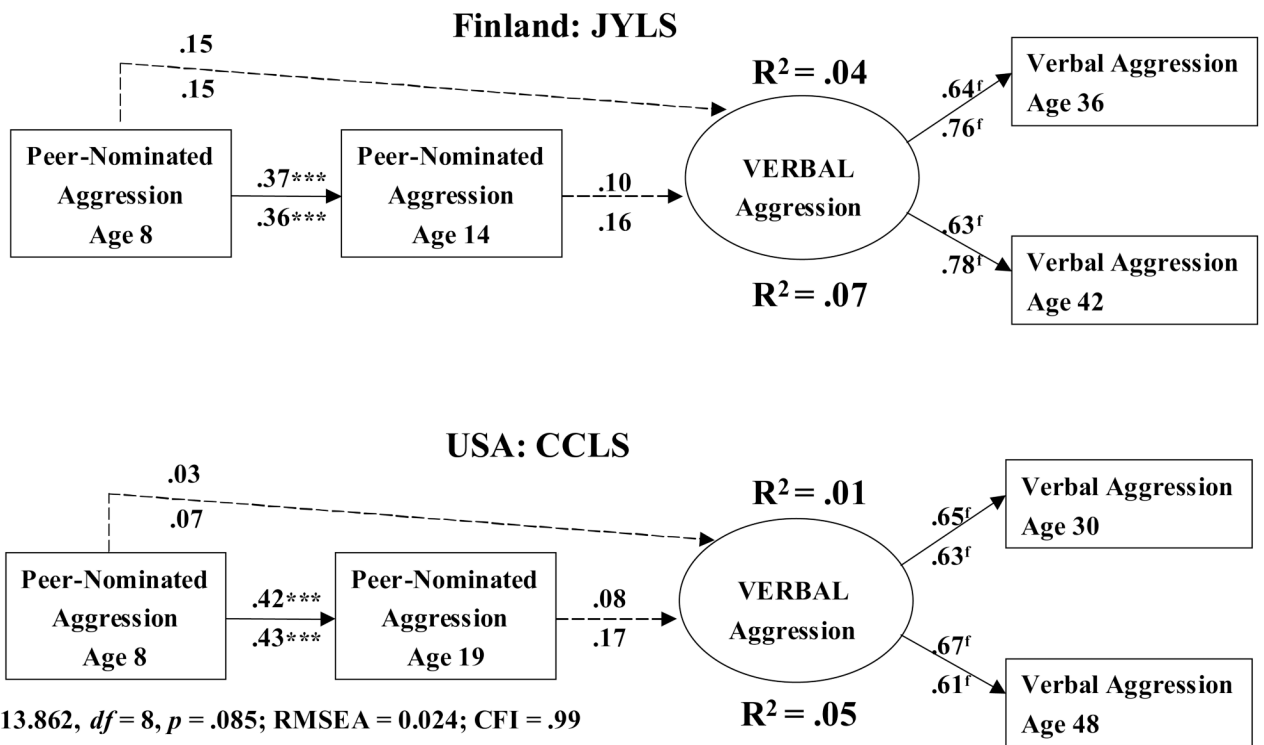
Females' Coefficients Are Above Each Line; Males' Are Below



$\chi^2 = 13.578, df = 8, p = .093; RMSEA = 0.024; CFI = .99$
 Numbers represent the estimated standardized coefficients.
^fValue of unstandardized coefficient fixed to 1.
 *** $p < .001$; ** $p < .01$; * $p < .05$.

Figure 1. Child and adolescent aggression as antecedents of adult physical aggression: A four-group model.

Females' Coefficients Are Above Each Line; Males' Are Below



$\chi^2 = 13.862, df = 8, p = .085; RMSEA = 0.024; CFI = .99$
 Numbers represent the estimated standardized coefficients.
^fValue of unstandardized coefficient fixed to 1.
 *** $p < .001$; ** $p < .01$; * $p < .05$.

Figure 2. Child and adolescent aggression as antecedents of adult verbal aggression: A four-group model.

Females' Coefficients Are Above Each Line; Males' Are Below

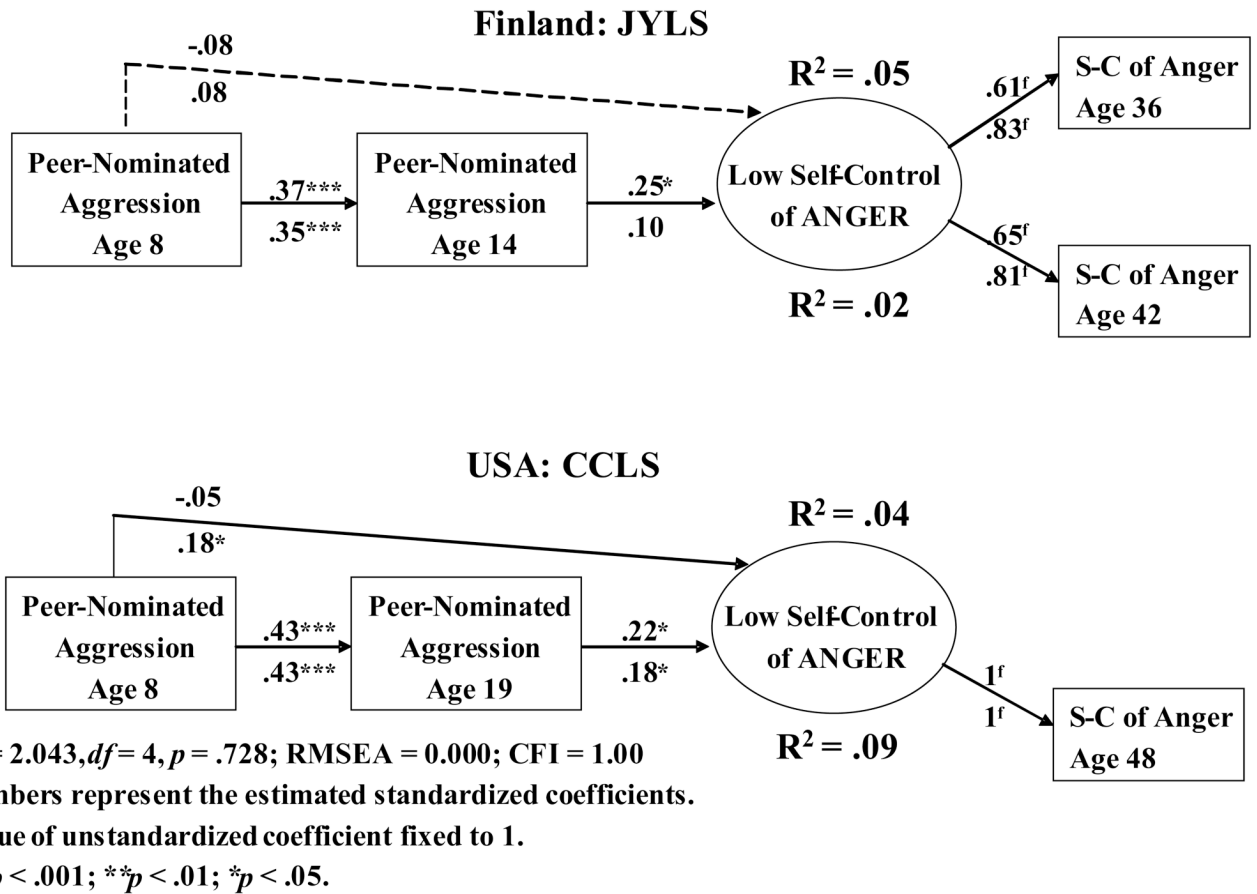


Figure 3. Child and adolescent aggression as antecedents of adult low self-control of anger: A four-group model.

Table 1
Pairwise Correlations of Aggression Measures over Time for Females (above diagonal) and Males (below diagonal) in the JYLS in Finnish Sample

Variable	Aggr8	Aggr14	Phys36	Verb36	Ang36	Phys42	Verb42	Ang42
Age-8 peer nominated aggression (Aggr8)	--	.37***	.03	.05	-.03	.11	.21*	.05
Age-14 peer nominated aggression (Aggr14)	.36***	--	.12	.07	.09	.31**	.13	.18*
Age-36 self-rated physical aggression (Phys36)	.10	.27**	--	.12	.28**	.46***	.17	.08
Age-36 self-rated verbal aggression (Verb36)	.14	.13	.37***	--	.33***	.06	.40***	.13
Age-36 self-rated low self-control of anger (Ang36)	.04	.08	.46***	.38***	--	.04	.22*	.38***
Age-42 self-rated physical aggression (Phys42)	.10	.26**	.53***	.15	.36***	--	.20*	.17
Age-42 self-rated verbal aggression (Verb42)	.17	.21*	.44***	.60***	.42***	.48***	--	.23*
Age-42 self-rated low self-control of anger (Ang42)	.11	.16	.40***	.34***	.63***	.47***	.50***	--

Note. Females ($n = 110 - 165$) above diagonal; males ($n = 109 - 186$) below the diagonal.

 $p < .001$;

**
 $p < .01$;

*
 $p < .05$.

Table 2
 Pairwise Correlations of Aggression Measures over Time for Females (above diagonal) and Males (below diagonal) in the CCLS USA Sample

Variable	Aggr8	Aggr19	Phys30	Verb30	Phys48	Verb48	Ang48
Age-8 peer nominated aggression (Aggr8)	--	.42***	.04	.16*	.03	-.04	.03
Age-19 peer nominated aggression (Aggr14)	.41***	--	.08	.01	.20*	.12	.14
Age-30 self-rated physical aggression (Phys30)	.29***	.45***	--	.36***	.13	.17*	.07
Age-30 self-rated verbal aggression (Verb39)	.05	.14	.11	--	.26***	.42***	.37***
Age-48 self-rated physical aggression (Phys48)	.06	.16*	.24**	.31***	--	.41***	.23***
Age-48 self-rated verbal aggression (Verb48)	.11	.13	.18*	.39***	.56***	--	.33***
Age-48 self-rated low self-control of anger (Ang48)	.24***	.25**	.16	.37***	.43***	.49***	--

Note. Females ($n = 151 - 240$) above diagonal; males ($n = 137 - 245$) below the diagonal.

 $p < .001$;

**
 $p < .01$;

*
 $p < .05$.