Predictors and Moderators of the Continuity between Childhood Aggression and Adult

Criminality: A 35-year Longitudinal Investigation

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Abstract

Predictors and Moderators of the Continuity between Childhood Aggression and Adult

Criminality: A 35-year Longitudinal Study

Joanna Rosciszewska

The aim of the current project is to examine the extent to which two aspects of
adolescents' social functioning with peers (i.e., aggression and likeability) will predict
two forms of adult criminal behavior (property and violent crimes). A second purpose is
to determine whether these predictive associations vary as a function of neighborhood-
level factors (socio-ecological disadvantage).

The sample was drawn from the Concordia Longitudinal Risk Project, first
initiated in 1976. The current sample included 2,497 fourth- and seventh-graders drawn
from mixed-sex classrooms in schools located in working class neighborhoods in
Montreal, Quebec, Canada. Those students were first screened on measures of aggression
and likeability via the Pupil Evaluation Inventory (PEI; Pekarik et al., 1976). Adult
criminality information was obtained from the open access database of arrest and
conviction records in Montreal. These measures have been coded according to whether
the acts were perpetrated against property (e.g., breaking and entering, theft) or against
people (e.g., murder, assault, kidnapping). A weighted neighborhood score was created
based on four school neighborhood conditions (e.g., proportion of unemployed people,
number of single parents, number of people with less than grade 9 education, and number
of people in the neighborhood earning less than 10K/year).

Main effects of aggression were observed on both property ($\beta = .12$, *SE* = .05, *t* = 2.50, *p* = .01) and violence against people ($\beta = .07$, *SE* = .02, *t* = 2.47, *p* = .01) outcomes, with stronger effect for boys than for girls. Also, a negative association was observed between likeability and adult criminal convictions. This finding was moderated by grade, with stronger negative effect for 4th graders than 7th graders. Moreover, peer status was found to moderate the association between aggression and adult criminality. That is, aggressive youth with higher peer status were found to commit less adult criminal acts than aggressive youth with low status. There were no observed neighborhood effects on the association between childhood aggression and adult criminality.

Dedication

Dla Taty
W Dniu Urodzin.

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Adult Criminality: A 35-year Longitudinal Investigation

Early patterns of aggressive behavior in both boys and girls have been shown to

be predictive of a variety of adverse outcomes, including adult aggressive, antisocial, and

criminal acts, including violent offending (Farrington, 1994; Huesmann et al., 2002). In

fact, early childhood aggression has been shown to predict more of the variation in adult

antisocial and criminal behavior than any other childhood factor—be it cognitive,

physiological, social, or familial. Moreover, the more aggressive a child is, the more

likely that he/she will become both a more aggressive adult and a more antisocial and

criminal adult (Huesmann & Eron, 1992).

Although childhood aggression remains one of the strongest risk factors

associated with adult criminality, it often interacts with the child's contextual or

environmental circumstances. For instance, living in disadvantaged neighborhoods and

in a family with lower socio-economic status (SES) have often been associated with an

increase in stressful life events, and may place the child in a setting more conducive to

violence and antisocial acts. Indeed, evidence suggests that neighborhoods not only

influence the occurrence of violent behaviour in adults but also have an impact on

aggression in children (Kupersmidt et al., 1995; Vaillancourt et al., 2007).

The association between childhood aggression and adult criminality may be

further moderated by children's early interactions with their peers, which usually help set

the foundation for more habitual styles of social behavior over time. Whereas poor peer

relations have been found to stimulate childhood aggressive and adult antisocial and

criminal acts (Huesmann et al., 2002), being well-liked within a peer group may help set

the stage for interactions more amenable to positive developmental experiences (Rubin, Bukowski, & Parker, 2006). This, in turn, may decrease the risk for delinquency and adult criminality.

The purpose of the present investigation is to extend the current body of knowledge regarding the predictive strength of children's peer-rated aggression and likeability on later adult criminal offending. Given the general lack of attention to the factors that moderate the association between childhood aggression and adult functioning, especially with older school-age children, the present study will also examine the moderating effects of both individual and neighborhood factors on the continuity between childhood aggression and criminality.

Continuity of Aggression from Childhood to Adulthood

The construct of aggression can be viewed as a category of behaviors that share the quality of intention to injure or irritate another person (Huesmann & Eron, 1992). Aggression encompasses a broad mix of acts, from disruptiveness, impulsivity and attention-getting behaviors, to physical, verbal and relational aggression, physical fighting, bullying, and different forms of violence, such as rape, robbery and homicide (Loeber & Hay, 1997). Individual differences in temperament related to aggression have been identified in infants as young as two years of age (Kagan, 1988), with a number of children clearly demonstrating aggressiveness in their interactions with others by age six (Parke & Slaby, 1983). Furthermore, aggression is thought to become a stable characteristic of a child by age eight where children become characteristically more or less aggressive over a variety of different situations (Huesmann et al., 1984; Olweus, 1979). For example, average correlations between early aggression in childhood or

adolescence and later aggression are moderately high (e.g., .63 to .79 when corrected for attenuation; (Olweus, 1979). Furthermore, the more extreme the aggression, as when it takes the form of antisocial behavior, the more stable it is thought to be over time (Loeber, 1982; Huesmann et al., 2002).

Many subsequent longitudinal studies based on different forms of aggression have replicated these findings, pointing to high stability of aggression over time (e.g., Caspi et al., 1987; Farrington, 1991; Pulkkinen, 1992), with slightly higher stability for males than for females (Huesmann, Dubrow, & Boxer, 2009). For example, Farrington (1978) showed that approximately 7 out of 10 men charged with violent crime by age 21 had been rated as highly aggressive between ages 12 and 14. Additionally, the results of a 22-year longitudinal study revealed that peer-nominated aggression at age 8 was predictive of being convicted of a crime by age 30, as well as of the seriousness of the crime (Huesmann & Moise, 1998). Similar continuities from childhood aggression to conduct problems and/or adult criminality have been observed in a number of longitudinal samples, regardless of place, time, sample characteristics or specific measures of outcomes (Robins, 1978; Pulkkinen, 1992; Tremblay et al., 2003).

Gender Differences in Aggressive Behavior

Owing to the fact that the size of gender differences varies depending on the method of measurement (e.g., self-report, peer-report, teacher report or parent report), the literature regarding gender differences in aggressive behavior over time is mixed. However, there is a general agreement that males are the more confrontational gender, with differences first emerging during the preschool period (Loeber & Hay, 1997). Within the early school period, boys are more overtly aggressive, including physical as

well as direct verbal aggression and are observed to have more frequent conflict among themselves than girls. Additionally, they have been found to engage more in kicking, hitting, pushing, teasing, and insulting behaviors, as well as with attacking someone else's property than girls (Martin & Fabes, 2001; Maccoby, 2004). Findings from the Duneden longitudinal study (Moffitt et al., 2002), which followed 1, 000 children from birth to adulthood, confirm the previously observed gender differences in levels of aggression in the two sexes. For example, boys were found to display much higher rates in physical aggression and violence at every age studied, compared to girls. Early aggressive behavior as an antecedent of later criminal activity has also been found to be lower for girls (Huesmann et al., 1984). However, despite differences in rates, females have been found to engage in many of the same types of aggressive and disruptive behaviors as males, albeit to a much lesser extent.

Life-Course Persistent vs. Adolescence-Limited Antisocial Behaviors

Not all aggressive children will become criminal adults. Nevertheless, early aggressive and antisocial behaviour has been consistently associated with a greater risk for becoming a criminal later in life. Moffitt (1993) has constructed a well-known theory regarding antisocial pathways from childhood through adolescence by making a distinction between life-course-persistent and adolescence-limited antisocial behaviors with different patterns of onset and outcomes.

According to Moffitt's theory (1993), adolescence-onset offenders have no history of antisocial behavior in childhood. Rather, the onset occurs in adolescence and is perceived as almost normative in nature. The antisocial behavior of this subtype of individuals is thought to be more transient, less severe and usually stops before

adulthood. On the other hand, life-course-persistent pattern of antisocial behavior is thought to have its roots in childhood and the antisocial behavior is often more stable, troublesome, violent and persists into adulthood. The pattern of this subgroup of individuals is characterized by a lack of control, difficult temperament, behavioural impulsivity, attentional problems, and hyperactivity, among others (Moffitt, 1993; Pulkkinen et al., 2009). Recently, in one of the first studies to extend the Moffitt framework out to middle adulthood, Huesmann and colleagues (2009) observed that those who remained high in aggression from age 8 through 30 (e.g., life-course persistent high aggressives) fared most poorly in comparison with other individuals (e.g., life-course persistent low aggressives) on a mix of psychosocial and criminal outcomes.

Developmental Pathways to Boys' Aggressive and Disruptive Behavior

Although not all individuals who become violent have a history of early aggression (Kratzer & Hodgins, 1996), longitudinal data have shown that the onset of aggressive behaviors is gradual and takes place in an orderly rather than in random fashion. For instance, in the Pittsburgh Youth Study (Loeber et al., 1993) it has been shown that the onset of minor aggression, such as bullying or annoying others, usually precedes the onset of physical fighting, which in turn precedes the onset of violence (e.g., rape, aggravated assault). Loeber and his colleagues (1993; 1997b) used data from a cohort of over 500 students from 4th and 7th grades to identify three developmental trajectories for males during childhood and adolescence: Authority Conflict, Covert, and Overt pathways.

The Authority Conflict pathway is thought to be the earliest forming pathway, which begins with stubborn behavior and can be followed by defiance, refusal, and

disobedience, as well as conflict with and avoidance of authority figures (e.g., truancy, staying out late). This pathway was found to fit best for boys engaging in those behaviors prior to age 12. The second pathways is the Covert pathway and it is characterized by minor covert behaviors (e.g., shoplifting, lying), followed by property damage (e.g., vandalism, fire-setting) and escalating to moderate to serious forms of delinquency (e.g., fraud, burglary, theft). The third pathway is the Overt pathway, which is characterized by increasingly aggressive acts beginning with minor aggression (e.g., annoying others), followed by physical fighting (e.g., fighting, gang fighting), followed by violence, such as attacking someone, strong-arming, and rape (Loeber et al., 1993; 1997b).

As a rule, overt problem behavior such as aggression and violence involves direct confrontation with victims and infliction of threat or physical harm. Cover acts, on the other hand, do not usually involve direct confrontation but are more concealed and sneaky in nature; disobedience is thought to fall in the middle of the overt-covert dimensions (Loeber & Stouthamer-Loeber, 1998). It should be noted that behaviors within the Overt and Covert pathways are often correlated and it is likely that some youth may manifest aggression only, while others may show mostly covert acts, while others still may show both (Loeber & Stouthamer-Loeber, 1998).

Although it is useful to make the distinction between overt and covert problem behaviors, they are, as stated earlier, often correlated, which may compromise the specificity in predicting later criminal outcomes (e.g., violence, property, traffic, drug violations). However, many longitudinal studies still demonstrate that physical aggression in childhood and early adolescence is predictive of different manifestations of

later violence, including frequent fighting by age 18, partner or a cohabitee assault, and convictions for violent offenses by age 32 (Farrington, 1994; Stattin & Magnusson, 1989). Researchers also contend that early aggression predicts convictions for violent crimes often better than property crimes (Loeber & Dishion, 1983; Loeber & Stouthamer-Loeber, 1987). Individuals who display more hyperactive/impulsive and disruptive behaviors in childhood in the absence of physical aspect of aggression are thought to be at a higher risk for less serious crimes such as public disorder and property crimes (Babinski, Hartsough, & Lambert, 1999).

Neighborhood Characteristics as Moderators

Bronfenbrenner's ecological theory (1986) proposes that the relation between risk and behavioral outcomes may depend on the context in which those risks are experienced. For example, neighborhood contextual factors such as low SES and family poverty have long been implicated in the prediction of antisocial behavior and frequent arrests (Wolfgang et al., 1987; Gentle-Genitty, 2010). Indeed, researchers have pointed out that physical aggression in both boys and girls is most often evident in large urban areas (Tremblay et al., 1997). This is also in agreement with the contention that the majority of juvenile crime occurs in densely populated urban neighborhoods.

Among neighborhood conditions most conducive to the development of aggression of both boys and girls over time are neighborhood levels of violence, economic disadvantage as well as unstable and/or insufficient family structures in the neighborhood. Indeed, in a study of urban boys and girls between the first and seventh grades, Vanfossen and colleagues (2010) observed that high levels of neighborhood violence as well as high percentage of single-parent households were related to an

increase in aggressive behavior. Furthermore, such adverse neighborhood conditions usually provide lower levels of neighborhood cohesion and less supportive social networks, which allow for greater access to delinquent subculture that may help stimulate and/or maintain antisocial behavior (Sampson, 1997; Ingoldsby & Shaw, 2002).

On the other hand, researchers have identified certain protective neighborhood factors associated with lower levels of aggression, even in the presence of risks (Molnar et al., 2008). Such factors can be viewed as positive resources, which might include organizations and services targeting youth, the presence of prosocial peers and adult role models, among others. Therefore, one might expect that access to positive community resources and social support available in higher SES neighborhoods may help moderate the association between early risk and adult functioning. Indeed, recent findings by Molnar and colleagues (2008) revealed that communities with access to youth organizations and services and the presence of prosocial peers were protective against highly aggressive youth behavior. The results of other research (Scales, 1999; Scales et al., 2005) also indicate that poor minority youth with greater number of available resources engaged in fewer risk behaviors than those with only few or no resources at all.

Peer Status as Moderator

The extent to which aggressive children will evidence aggression as adults may largely depend on their early social interactions with other children. Therefore, the role of peers in normative and non-normative development should not be overlooked. Much research points to the idea that peer rejection is related to both overt and relational aggression by children and adolescents (Underwood, 2003; Rubin, Bukowski, & Parker, 2006). Others have found that the combination of existing aggression with peer rejection

is the strongest predictor of future aggressive behavior (Coie et al., 1995). However, the causal directionality of this relation remains to be clarified. Some studies found that aggression precedes peer rejection (i.e., an "incidental model"; Parker & Asher, 1987) (Coie & Kupersmidt, 1983), while others suggest that peer rejection independently contributes to the development of externalizing problem behaviors, above and beyond aggressive predispositions (i.e., a "causal model"; Parker & Asher, 1987). A third possibility is that peer status may actually strengthen or weaken the relation between childhood aggression and further development of externalizing problems (a "moderator model"; Parker & Asher, 1987). Specifically, a moderating effect may suggest that peer rejection magnifies the association between childhood aggression and later risk behavior and/or that peer acceptance (i.e., the extent to which one is liked by peers, or likeability) may weaken the continuity of problematic behaviors across development.

Indeed, not all aggressive children will be rejected by their peers. Much research has shown that aggressive individuals can actually possess prosocial skills (Hawley, 2003a; 2003b), and can be viewed as socially attractive (Bagwell et al., 2000; Hawley, 2003a). Others have found that aggressors can maintain and improve their social status (Cillessen & Mayeux, 2004) and can enjoy reciprocal friendships (Cairns & Cairns, 1994). What can be gleaned from this is that some youth may actually use aggression in ways that may allow them to achieve their goals effectively via prosocial (i.e., cooperation, reciprocation) rather than coercive (i.e., threats, manipulation) strategies, which may, in turn, afford them positive peer regard. This is in agreement with the Resource Control Theory (RCT; Hawley, 1999), which posits that a subset of aggressive youth may actually be well-liked by their peers due to the use of their

prosocial skills, which may reduce the negative effects of aggressive behavior. As such, likeability may mitigate the continuity of harmful behaviors, and can be conceptualized as having a buffering effect against negative adult outcomes. In terms of future outcomes, researchers agree (e.g., Stouthamer-Loeber et al., 2002) that likeability may reduce or even eliminate the risk of childhood aggression on later outcomes. For instance, aggressive children who encounter positive peer experiences (i.e., those using aggression balanced with prosocial behavior) may be given opportunities to learn and practice more appropriate interpersonal behaviors. Moreover, they may be further afforded opportunities for corrective social feedback that may then help in the development of more appropriate emotion-regulation skills.

The Current Study

The effects will be examined using the prospective Concordia Longitudinal Risk Project (CLRP) sample, which in the school years 1976 to 1978 consisted of children living in low SES urban areas. Additionally, given the nested structure of the data and the desire to examine the concurrent effects of the individual child behaviour and environmental characteristics, multilevel modeling analyses will be used (Bryk & Raudenbush, 1992), providing the most suitable approach to measuring observations, which are inherently embedded within each other.

The overriding aim of the current project is to examine the extent to which two aspects of children's social functioning with peers (i.e., aggression and likeability) will predict two forms of adult criminal behavior (i.e., property crimes and violent crimes over the age of 20). A second purpose is to determine whether these predictive associations vary as a function of neighborhood-level factors (i.e., socio-ecological

disadvantage).   The work in this area is guided by the need to better understand the interrelations among risk and protective risk factors and how they may exacerbate or moderate the association between childhood aggression and later criminality. Although the effects of aggression and aspects of prosocial behavior have already been studied (Hawley, 1999), more research is needed with older school-age children. Additionally, the current project addresses an important limitation in the current database—that of the use of broad-band measures of aggression that do not recognize the variability among the many manifestations of aggressive behavior. Lastly, little has been published thus far about predicting criminality with this longitudinal sample. With presence of longitudinal data, this project will allow for a more nuanced understanding of the factors associated with the maintenance and/or desistance of aggressive tendencies within the peer system, which will also benefit those creating school-based interventions aimed at reducing aggression among youth.

Hypotheses

Four hypotheses were examined. First, it was predicted that childhood aggression scores, especially on measures indicating a tendency to harm others, would be positively related to adult criminal offending. Specifically, it was expected that childhood index of harmful aggression would be more strongly associated with adult criminality than childhood index of disobedience. The second hypothesis was that measures of likeability, specifically a measure of altruism and a measure of competent/positive functioning with peers, would be negatively associated with measures of adult criminal behavior. Third, and most importantly, it was expected that the measures of likeability would moderate the effect of the measures of childhood aggression on the measures of

adult criminal behavior.   Specifically, it was expected that the association between the measures of childhood aggression, especially the measure of disobedience, and the measures of adult criminality, would be weaker among children with high scores on the measures of likeability, especially the measure of peer competence. The fourth hypothesis was concerned with contextual effects. It was expected that neighborhood conditions would moderate the relation between childhood aggression and adult criminality. That is, we expected that this relation would be stronger for youth from the poorest neighborhoods and weaker for those in better-off neighborhoods.

Method

Participants

The sample included 2,486 Francophone fourth- (616 boys and 673 girls) (mean age = 10.23 years, SD = .54) and seventh-graders (605 boys and 592 girls) (mean age = 13.6 years, SD = 62) drawn from mixed-sex classrooms in schools located in working class neighborhoods in Montreal. This sample was drawn from the Concordia Longitudinal Risk Project (CLRP), which in the school years 1976—1977 and 1977—1978 began screening 4,109 French-speaking children in regular Grade 1, 4, and 7 classes on measures of aggression, likeability and withdrawal. At the time of recruitment, those children lived in lower socioeconomic, inner-city areas of Montreal, Quebec, Canada. Participation was voluntary, with over 95% of the students consenting to participate (Schwartzman, Ledingham, & Serbin, 1985).

Procedure

Initiation of study (1976—1978). During the initial testing period between 1976 and 1978, boys and girls were screened in separate administrations on measures of

aggression likeability and withdrawal using the French translation of the Pupil Evaluation Inventory (PEI). The participants were asked to nominate up to four girls and four boys in their class who best matched a given item on the questionnaire. The total number of nominations a child received on each item was calculated and used as the child's score for the item. The number of nominations received by each child was summed separately for each subscale. For a more detailed description of the original sample and methodology, see Schwartzman et al. (1985).

Measures

The Pupil Evaluation Inventory (PEI; Pekarik et al., 1976). The PEI is a peer nomination assessment technique designed to assess the social behavior of children in grades one through nine (see Appendix A). It contains 34 behavioral descriptors and 1 practice item arranged against children's names in a matrix form that allows every child to be selected for each item. Each item was intended to assess one of three broadband dimensions of social behavior (e.g., aggression, likeability and withdrawal). The total number of nominations for each child was calculated separately for each of the three subscales.

Nineteen items in the scale are intended to assess aggression. These refer to different manifestations of aggressive behavior such as disobedience, disruptiveness, immaturity and physical/harmful aggression. The score for each child on this dimension is the mean of their scores on the 19 items included in the scale. Example items are: "Those who try to get other people into trouble", "Those who start a fight over nothing", and "Those who are mean and cruel". Test-retest reliability of this scale over 1-2 week

intervals was observed to be .86 (Pekarik et al., 1976). Additionally, Cronbach's *alpha* was calculated for the scale, revealing a value of .97 (Tessier et al., 1997).

The likeability scale, which measures the degree to which a child is liked/accepted by his or her peers, includes 5 items. The score for each child on this dimension is the mean of their scores on the 5 items included in the scale. Some of the item examples are: "Those who help others", "Those who are liked by everyone" and "Those who are especially nice". The test-retest of this scale revealed correlation of .81 (Pekarik et al., 1976) and the Cronbach's *alpha* for the scale was .90 (Tessier et al., 1997).

The withdrawal scale, measuring social withdrawal, shyness and oversensitivity, includes 9 items. The score for each child on this dimension is the mean of their scores on the 9 items included in the scale. Example items are: "Those who are too shy to make friends easily", "Those who never seem to be having a good time", and "Those who are usually chosen last to join in group activities". Test-retest reliability of this scale revealed retest correlations of .89 (Pekarik et al., 1976).   Internal consistency coefficients for this scale revealed an *alpha* of .86 (Tessier et al., 1997).

For the purpose of this project, only items pertaining to aggression and likeability were used and will be reported here. Given the item heterogeneity comprising the aggression and likeability subscales of the original measure, a Confirmatory Factor Analysis (CFA) using Mplus (version 6; Muthén & Muthén, 2010) was performed in order to establish the underlying factor structure of the two subscales.   Six random item parcels were created for the aggression subscale before conducting the CFA (see Figure 1). Multiple fit indices were used to determine adequate model fit: Comparative fit

index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). Hu and Bentler (1999) recommended that CFI values greater than or equal to .90, RMSEA less than .10, and SRMR less than or equal to .09 are individually indicative of adequate model fit. All of our obtained indices fell within the acceptable range, indicating that a model fit was adequate: X^2 = 204.09, df = 16, (p = 0.00); CFI = .98; RMSEA = .06; SRMR = .019. It should be noted, however, that the Chi-Square test of model fit yielded significant results, which would traditionally indicate a 'lack of fit' (Mulaik et al., 1989). However, the Chi-Square statistic is sensitive to sample size and nearly always rejects the model when large sample size (i.e., N =2486) is used (Joreskog & Sorbom, 1993). The results offered support for a six-indicator, two-factor measurement model of the aggression subscale, with latent constructs relating to a) disruptiveness/disobedience and b) harmful aggression. All of the factor loadings were statistically significant and ranged from .77 to .94 (for fit indices and factor loadings refer to Figure 1). For the present data set, an internal reliability analysis was conducted for both factors, revealing a Chronbach's alpha of .92 and .91, respectively.

A CFA was also conducted on the likeability subscale of the original measure, providing support for a five-indicator, two-factor measurement model with latent constructs relating to a) altruistic behaviors and b) positive peer relations. Following Hu and Bentler's (1999) cut off score recommendations, the results indicated a good model fit: X^2 = 73.26, df = 10; (p = 0.00); CFI = .99; RMSEA = .05; SRMR = .016. All of the factor loadings were statistically significant and ranged from .52 to .92 (see Figure 2). Chronbach's alpha for the two factors were .77 and .78, respectively.
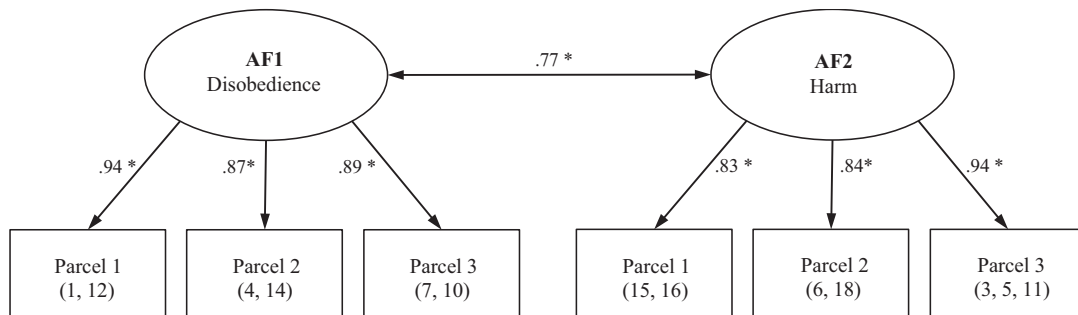
Figure 1. Confirmatory Factor Analysis (CFA) of the Aggression subscale of the Pupil

Evaluation Inventory (PEI). Comparative Fit Index = .98; Root mean square error of

approximation = .06; Standardized root mean square residual = .019; Chi-square =

204.09; degrees of freedom = 16. Significant effects (p < .05) shown as standardized

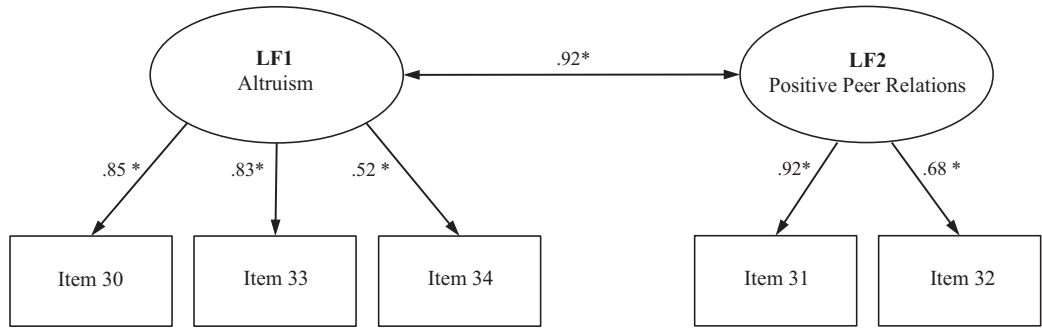coefficients (betas) are noted with the symbol (*).

Figure 2. Confirmatory Factor Analysis (CFA) of the Likeability subscale of the Pupil

Evaluation Inventory (PEI). Comparative Fit Index = .99; Root mean square error of

approximation = .05; Standardized root mean square residual = .016; Chi-square = 73.26;

degrees of freedom = 10. Significant effects (p < .05) shown as standardized coefficients

(betas) are noted with the symbol (*).

Socioecological neighborhood disadvantage. Block-enumerated census tract Statistics Canada data from 1986 provided the following school neighborhood sociodemographic information: Proportion of households within the immediate school neighborhood 1) headed by a single parent; 2) with total household income below the poverty line (poverty level was defined by *Statistics Canada* in 1976 as household income below $10,000 CND); 3) whose head of household had less than grade 10 level of education; and 4) whose head of household was unemployed. It should be noted that the first block-enumerated census tract neighborhood data were recorded only in 1986. As such, the 1986 census tract data relating to the school neighborhoods, which the children attended in 1976, were used as the best approximation of their home neighborhood in 1976 (Alex Schwartzman, personal communication, 2013).

In the current project, all of the scores were converted to standardized Z scores and were used to conduct a principal component Exploratory Factor Analysis (EFA). The result of the EFA supported a one-factor model (the factor loadings ranged from .82 to .98), revealing high correlations between the variables (see Table 1). Accordingly, based on the four neighborhood descriptors, a weighted disadvantage factor score was calculated for the use in the analysis. The higher the score, the greater the level of neighborhood disadvantage.

Adult measures of criminal behavior. Adult criminality data were obtained from the database of arrest and conviction records from the open access terminal at the Palais de Justice in Montreal, Quebec, Canada, in 2010. The name and the birthdate of all of the original participants were first entered in the database to find matching criminal records. Partly based on categorization by Farrington, Loeber and Berg (2012), the

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obtained criminal records were assigned to the following categories: 1) convictions for property offenses at age 20 or beyond ($n = 253$; 10.2 % of the current sample) ($M = .31$, $SD = 1.42$); and 2) convictions for violent offenses at age 20 or beyond ($n = 111$; 4.4% of the current sample) ($M = .12$, $SD = .78$). Examples of property offenses include: burglary, theft of a car, theft from person, larceny, and vandalism. Examples of violent offenses include: aggravated and simple assault, gang fighting, weapon carrying/possession, threat, serious sex offenses and kidnapping. Criminal conviction scores were calculated based on number of convictions for both property offenses (range 0 to 21) and for violence offenses (range 0 to 13).

Data Screening

Before conducting the analysis, all relevant continuous variables were inspected in order to ensure integrity of the data. There were no missing data. The presence of outliers was detected on measures of aggression and likeability after each value was converted to a standard Z score with a mean of 0 and a standard deviation of 1. Although there is no common agreement as to what value exactly specifies an outlier, Kline (2009) recommends that any value that exceeds three standard deviations beyond the mean could be considered as such. Therefore, in the present data set, scores equal to and greater than +/- 3 standard deviations beyond the mean were treated as extreme scores. In order to reduce the influence of the outliers, the value of each score was converted to the next most extreme score that fell within the acceptable three standard deviations of the mean.

Inspection of skew and kurtosis revealed no significant departure form normality for either variable. The peer ratings were standardized within each class to adjust for

Table 1.

Correlation Matrix of the Four Neighborhood Descriptors generated in 1976.

	1.	2.	3.	4.
1. Proportion of unemployed people in the neighborhood	-	.92**	.72**	.93**
2. Proportion of single parents in the neighborhood		-	.68**	.95**
3. Proportion of people with less than grade 10 education			-	.82**
4. Proportion of people in the neighborhood below poverty line				-

Note. ** p < .01.

class size variability (for a detailed description of the regression-based procedure used, see Velasquez, Bukowski, & Saldarriaga, 2012). Additionally, original criminality scores were log-transformed to correct for skewness before conducting the analyses. Given the nested structure of the data (i.e., students within classes, classes within schools, schools within neighborhoods, etc.), we did not make assumptions of data independence. Rather, we opted to use Hierarchical Linear Modeling (HLM; Raudenbush & Bryk, 2002), which provides an ideal analytic strategy for studying observations from a hierarchical data structure. As such, HLM can accommodate non-independence of observations without distorting standard errors and effect size estimates (Woltman et al., 2012).

Statistical Analyses

The analyses were performed using a Hierarchical Linear Modeling Program (HLM; Raudenbush & Bryk, 2002) and the data were organized in such a way as to identify the variance accounted for by each variable at three different levels. All variables were mean centered and the data were organized into separate files, one for each level of analysis. The level 1 file represented the level of the individual (i.e., the child being rated). The variables in this file included each child's score on the two measures of aggression, the two measures of likeability, and the interactions among these scores. The level 2 file represented the level of the same-sex classroom peer group. The variables in this file included an index of the children's gender, their grade at the time of measurement (i.e., 4th or 7th grade) and a sex by grade interaction. The level 3 file represented the level of the neighborhood. (i.e., school neighborhood SES). The variables in this file included the weighted sum of four separate but highly related disadvantage indicators (i.e., proportion of unemployed people, proportion of single

parents, proportion of people with less than grad 10 education, and proportion of people in the neighborhood below line poverty).

Results

Preliminary Analyses

In order to assess the role of childhood aggression on adult criminality outcomes and factors that may moderate this association, three-level Hierarchical Level Modeling (HLM; Raudenbush & Bryk, 2002) analyses were conducted. HLM was used as it accommodated the nested structure of the data (e.g., students clustered within classrooms) and it facilitated the inclusion of variables derived from individual students (level 1), classrooms (level 2) and school neighborhood characteristics (level 3). Associations with the outcome (i.e., property and violent crime convictions over the age of 20) were predicted based on the characteristics of the three different levels. A total of four models were examined, two per crime category, with separate analyses for the two forms of sociability.

The analysis of each the four models began with an assessment of an unconditional model, which examined the extent of the variability in the outcome measure at each of the three levels. These analyses showed that 98% of the variance in property convictions was at the level of the individual, and 2% at the level of the classroom, whereas 99% of the variability in violent crime convictions was at the level of the individual and 1% was at the level of the classroom. Taken together, such coefficients suggest that at the intercept, most of the variability in the outcome can be explained by individual differences. Correlation coefficients for the variables are provided in Table 2.

Table 2.

Correlation Matrix Between Level 1 Variables and Outcome Variables

	1.	2.	3.	4.	5.	6.
1. AF1	-	.70**	-.30**	-.21**	.12**	.09**
2. AF2		-	-.12**	-.08**	.14**	.11**
3. LF1			-	.74**	-.07**	.06**
4. LF2				-	-.05*	-.05**
5. Property Guilty 20+					-	.85**
6. Violence Guilty 20+						-

Note. AF1 = Aggression Factor 1 (Disobedience); AF2 = Aggression Factor 2 (Harm); LF1 = Likeability Factor 1 (Altruism); LF2 = Likeability Factor 2 (Positive Peer Relations); ** $p < .01$; * $p < .05$.

Property Crime Convictions 20+

Model 1.

  The level 1 variables in the first model included aggression factor 1 (AF1; disobedience), aggression factor 2 (AF2; harm), likeability factor 1 (LF1; altruism) and the interactions between the two aggression measures and the likability measure. The level 2 predictors were gender and grade.

  Predictors at the Intercept. The overall value of the intercept was .3093 and it was observed to be significant and random ($t = 13.15$, $SE = .02$, $p = .00$). One level 2 predictor (i.e., gender) accounted for the between-group variation in the intercept ($\beta = -.27$, $SE = .02$, $t = -11.74$, $p = .00$). For boys, the expected value on the outcome when all predictors were equal zero was.583, while for girls the value was .035. In other words, the intercept was higher for boys. This difference was approximately 39% of a standard deviation.

  Predictors of Property Crimes. The aggression measures were entered in the next model. The effect of AF1 was observed to be non-significant but random. The variability of this effect was not associated with any of the level 2 predictors. On the other hand, the effect of AF2 was observed to be significant and random ($\beta = .12$, $SE = .05$, $t = 2.50$, $p = .01$). This effect was observed to be moderated by gender ($\beta = -.10$, $SE = .02$, $t = -3.87$, $p = .00$). The effect was found to be stronger for boys (the value of slope was .236) than for girls (the value of the slope was .018) based on coefficients observed at level 2. These coefficients were used to create predicted scores for four hypothetical children: (a) a boy low on aggression (i.e., the aggression score is 1 standard deviation

below the mean), (b) a boy high on aggression (i.e., the aggression score is 1 standard deviation above the mean), (c) a girl low in aggression, and (d) a girl high in aggression. The observed scores for these four cases were .27, .88, .01 and .05, respectively. These results are illustrated in Figure 3.

In this analysis, a statistically significant and random negative association was observed between childhood index of altruism (LF1) and the outcome variable (β = -.06, SE = .02, t = - 2.48, p = .01). This effect was also moderated by gender (β = .06, SE = .02, t = 2.89, p = .00), with a stronger effect for boys (the value of the slope was -.128) than for girls (the value of the slope was .007). We created four predicted scores to assess the variability for boys and girls on the association between LF1 and our outcome. Level 2 coefficients were used to create predicted scores for four hypothetical children: (a) a boy high in liking, (b) a boy low in liking, (c) a girl high in liking, and (d) a girl low in liking. The observed scores for these four cases were .35, .81, .04, and .02, respectively, and are presented in Figure 4.

Effects of Level 2 Variables on Level 1 Effects. To examine the hypothesis that likeability would mitigate the continuity of childhood aggression and adult criminality, we tested interactions between childhood indices of aggression (both factors) and childhood index of LF1. A significant and random interaction effect was observed between the index of harmful aggression and the index of altruism (β = -.03, SE = .02, t = -1.73, p = .08). Some of the randomness in this effect was accounted for by gender (β = .04, SE = .02, t = 2.18, p = .03), with a stronger effect for boys (the value of the slope was -.088) than for girls (the value of the slope was .01). To clarify this interaction, we found
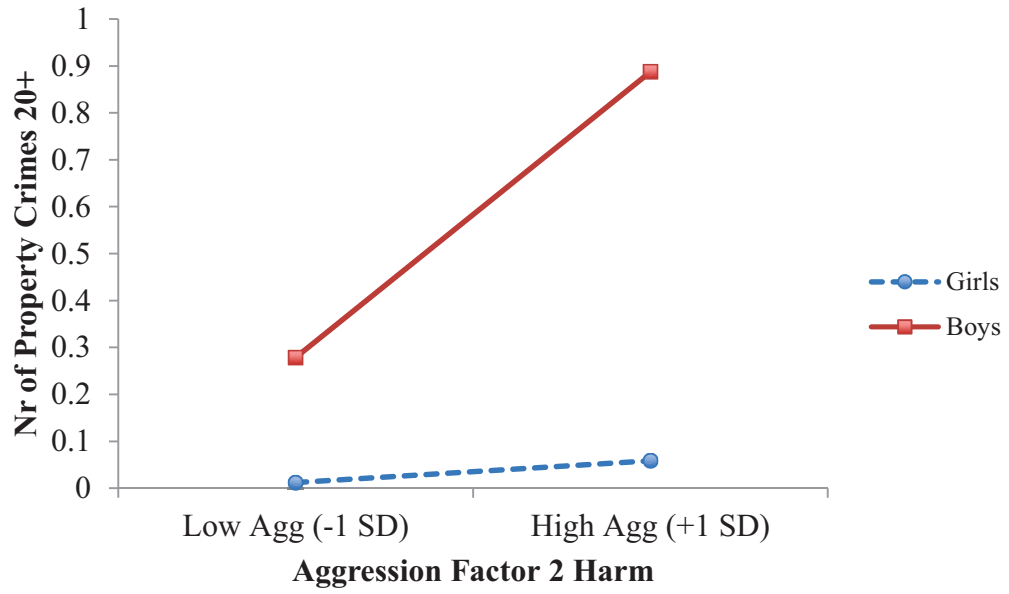
Figure 3. Model 1. Slopes showing the association between childhood index of harmful

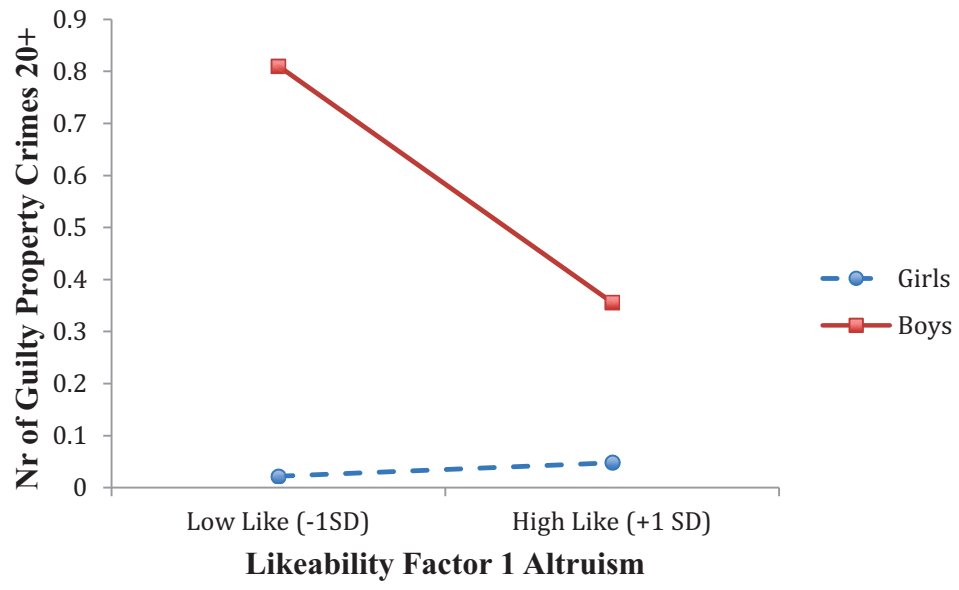aggression and convictions for property crimes for boys and girls.

Figure 4. Model 1. Slopes showing the association between childhood index of altruism

and convictions for property crimes for boys and girls.

that the association between harmful aggression and property crime varied as a function of sex and altruism. That is, boys who were highest on harmful aggression and lowest on altruism were at greatest risk for property crime. Girls appeared unlikely to engage in property crime regardless of their level of harmful aggression or their degree of peer-nominated likeability. These findings are illustrated in Figure 5; summary of all Model 1 effects is presented in Table 3.

Model 2.

The level 1 variables in the second model included the two aggression factors, likeability factor 2 (LF2; Positive Peer Relations) and any interactions between aggression and LF2 scores. The level 2 predictors were gender and grade.

Predictors at the Intercept. The intercept was observed to be significant and random (β = .33, *SE* = .02, *t* = 12.08, *p* = .00) and it was found to vary as a function of gender (β = -.28, *SE* = .02, *t* = -11.37, *p* = .00). For boys, the expected value on the outcome when all predictors were equal zero was .622, while for girls the value was .043. In other words, the intercept was higher for boys, with the difference between boys and girls of around 41% of a standard deviation.

Predictors of Property Crimes. The effect of AF1 (disobedience) on the outcome was non-significant and random. The variability of this effect was not associated with any of the level 2 predictors. The effect of AF2 (harm) was observed to be statistically significant and random (β = .13, *SE* = .04, *t* = 2.87, *p* = .00). Again it was moderated by the level 2 effect of gender (β = -.12, *SE* = .02, *t* = - 4.13, *p* = .00). Specifically, this effect was found to be stronger for boys than for girls with slope values of .256 and .014, respectively. These coefficients were used to create predicted scores for boys low on
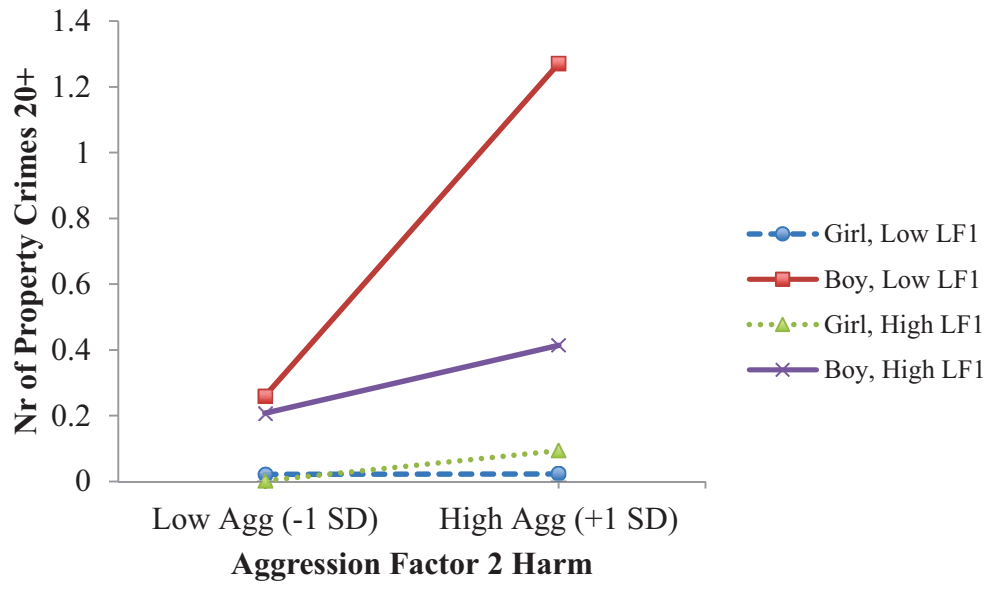
Figure 5. Model 2. Property crimes as a function of gender and harmful aggression by altruism interaction.

Table 3.

Final estimation of fixed effects for Model 1

Variable	Coefficient	Standard Error	t-ratio	df	P-value
Intercept	.30	.02	13.15	180	.00
Sex	-.27	.02	-11.74	180	.00
AF1	.01	.03	0.45	181	.65
AF2	.12	.05	2.50	180	.01
Sex	-.10	.02	-3.87	180	.00
LF1	-.06	.02	-2.48	180	.01
Sex	.06	.02	2.89	180	.00
AF2 by LF1	-.03	.02	-1.73	180	.08
Sex	.04	.02	2.18	180	.03

Note. Rows in bold font correspond to level 2 variables. AF1 = Aggression Factor 1 (Disobedience). AF2 = Aggression Factor 2 (Harm). LF1 = Likeability Factor 1 (Altruism).

aggression, boys high in aggression, girls low in aggression and girls high in aggression. The observed scores for those four cases were .29, .95, .02, and .06, respectively. These results are illustrated in Figure 6.

A statistically significant and random negative association was observed between childhood index of positive peer relations (LF2) and the outcome variable (β = -.03, *SE* = .01,   *t* = -2.35, *p* = .02). Further, some of the randomness was accounted for by gender (β = -.03, *SE* = .01, *t* = -2.35, *p* = .02), with stronger effect for boys (the value of the slope was -.088) than for girls (the value of the slope was .016). Predicted values for boys and girls who were low and high on positive peer relations are presented in Figure 7.

Effects of Level 2 Variables on Level 1 Effects. To further examine whether likeability might moderate the association between childhood aggression and adult criminality, we tested interactions between childhood aggression scores (both factors) and childhood index of positive peer relations (LF2). Two non -significant but random interactions emerged. First, we observed a random interaction effect between childhood index of harmful aggression and positive peer relations (β = -.01, *SE* = .02, *t* = -.53, *p* = .59), with some of the randomness accounted for by gender (β = .03, *SE* = .01, *t* = 2.18, *p* = .03). A clarification showed that this interaction was stronger for boys than for girls. Boys who were highest on harmful aggression and lowest on positive peer relations were at greatest risk for property crime. An opposite trend was observed for girls, although this effect appears to be very weak and should be interpreted with caution. These findings are presented in Figure 8.
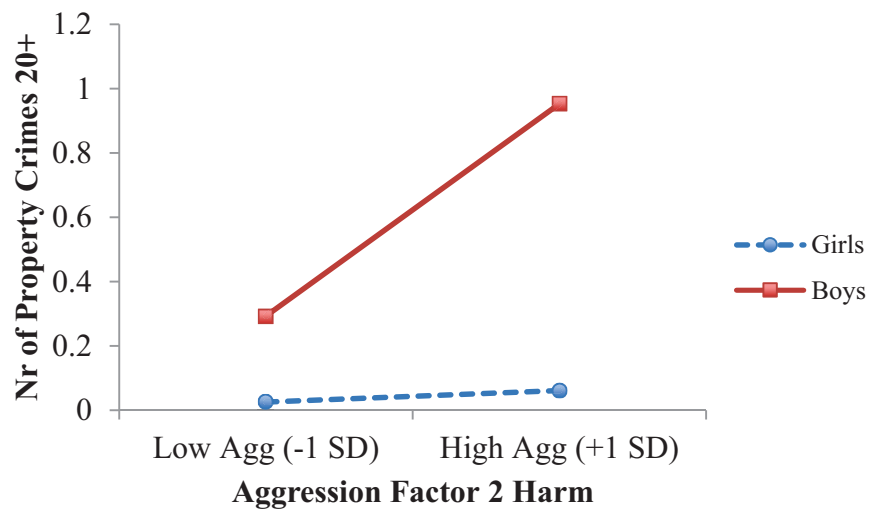
Figure 6. Model 2. Slopes showing the association between childhood index of harmful

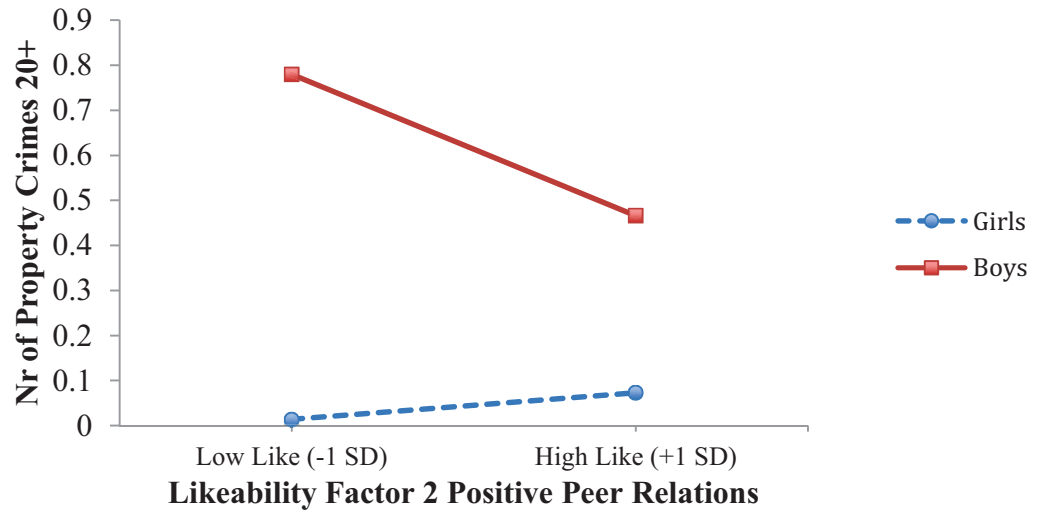aggression and convictions for property crimes for boys and girls.

Figure 7. Model 2. Slopes showing the association between childhood index of positive peer relations and convictions for property crimes for boys and girls.
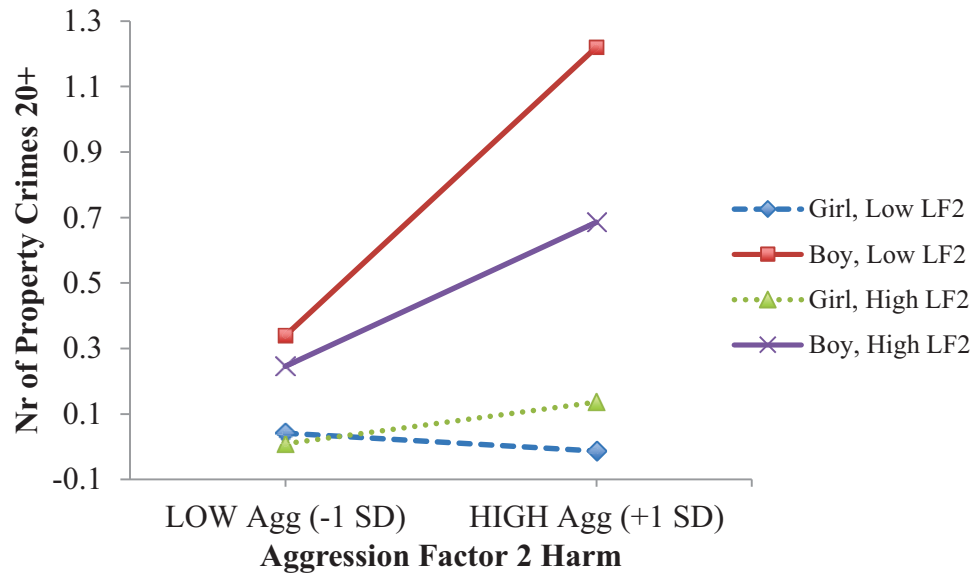
Figure 8. Model 2. Property crimes as a function of gender and harmful aggression by positive peer relations interaction.

A second non-significant but random interaction emerged between childhood index of disobedience (LF1) and the measure of positive peer relations (β = -.00, *SE* = .01, *t* = -.38, *p* = .69). This effect was found to vary as a function of grade (i.e., 4th or 7th grade) (β = -.01, *SE* = .00, *t* = - 2.07, *p* = .03). Although we did not make specific hypotheses regarding the effect a grade, this surprising effect, albeit a small one, merits attention. Specifically for 4th graders, the effect of disobedience was found to be higher in the presence of positive peer experiences, whereas for 7th graders, we observed the opposite effect. That is, among 7th graders, the effect of disobedience on later criminality outcomes was found to be lower for those children with positive peer relations. These results are illustrated in Figure 9. Summary of all Model 2 effects is presented in Table 4.

Violent Crime Convictions 20+

Model 3.

The level 1 variables in the second set of models included the two aggression factors, likeability factor 2 (LF2; Positive Peer Relations) and any interactions between aggression and LF2 scores. Level 2 predictors were entered as moderators (e.g., gender, grade).

Predictors at the Intercept. The intercept was observed to be significant and random (β = .11, *SE* = .01, *t* = 8.36, *p* = .00) and it was found to vary as a function of gender (β = -.09, *SE* = .01, *t* = - 7.37, *p* = .00) and grade (β = -.02, *SE* = .01, *t* = - 2.42, *p* = .01). Specifically, for boys, the expected value on the outcome when all predictors were equal zero was .214, while for girls the value was .014. This difference was equal to approximately 25% of a standard deviation. The effect of grade on the intercept
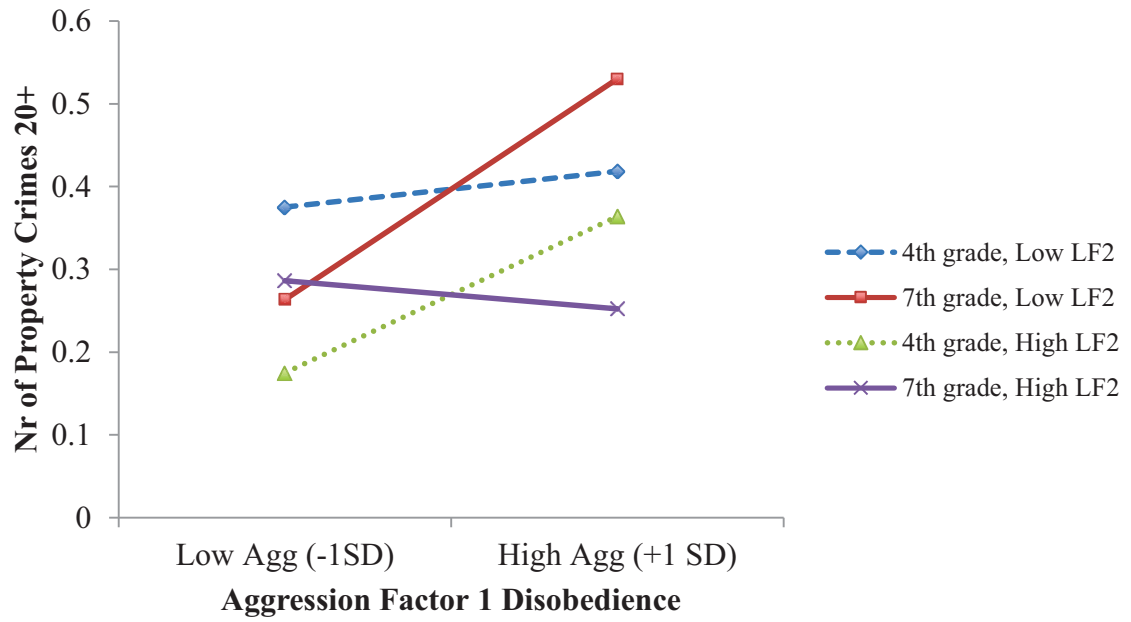
Figure 9. Model 2. Property crimes as a function of grade and disobedience by positive peer relations interaction.

Table 4.

Final estimation of fixed effects for Model 2

| Variable	Coefficient	Standard Error	t-ratio	df	P-value
Intercept	.33	.02	12.08	180	.00
Sex	-.28	.02	-11.37	180	.00
AF1	.03	.03	0.94	181	.34
AF2	.13	.04	2.87	180	.00
Sex	-.12	.02	-4.13	180	.00
LF2	-.03	.01	-2.35	180	.02
Sex	.05	.01	3.79	180	.00
AF1 by LF2	-.00	.01	-0.38	180	.69
Grade	-.01	.00	-2.07	180	.03
AF2 by LF2	-.01	.02	-0.53	180	.59
Sex	.03	.01	2.18	180	.03

Note. Rows in bold font correspond to level 2 variables. AF1 = Aggression Factor 1 (Disobedience). AF2 = Aggression Factor 2 (Harm). LF2 = Likeability Factor 1 (Positive Peer Relations).

indicated that the value on the outcome measure was higher for the 4th than for the 7th graders, with the expected value on the outcome of .145 and .086, respectively. This difference was approximately 7% of a standard deviation.

Predictors of Violent Crimes. As in previous models, the effect of AF1 (disobedience) on the outcome was non-significant and random and the variability of this effect was not associated with any of the level 2 predictors. On the other hand, a statistically significant and random effect was observed for AF2 (harm) (β = .07, *SE* = .02, *t* = 2.47, *p* = .01). This effect was moderated by the level 2 effect of gender (β = -.03, *SE* = .01, *t* = -2.51, *p* = .01). Specifically, this effect was found to be stronger for boys than for girls with slope values of .112 and .036, respectively. When these coefficients were used to create predicted scores for boys low on aggression, boys high in aggression, girls low in aggression and girls high in aggression, the observed scores were .06, .35, -.03, and .06, respectively. These results are illustrated in Figure 10.

A statistically significant and random negative association was observed between childhood index of altruism (LF1) and the outcome variable (β = -.03, *SE* = .01, *t* = -2.68, *p* = .00), with some of the randomness being accounted for by gender (β = .04, *SE* = .01, *t* = 3.00, *p* = .00). A stronger effect was observed for boys (the value of the slope was -.08) than for girls (the value of the slope was .002). Predicted values for boys and girls who were low and high on altruism are presented in Figure 11.

Effects of Level 2 Variables on Level 1 Effects. To further examine whether likeability might moderate the association between childhood aggression and adult criminality, we tested interactions between childhood aggression scores (both factors)
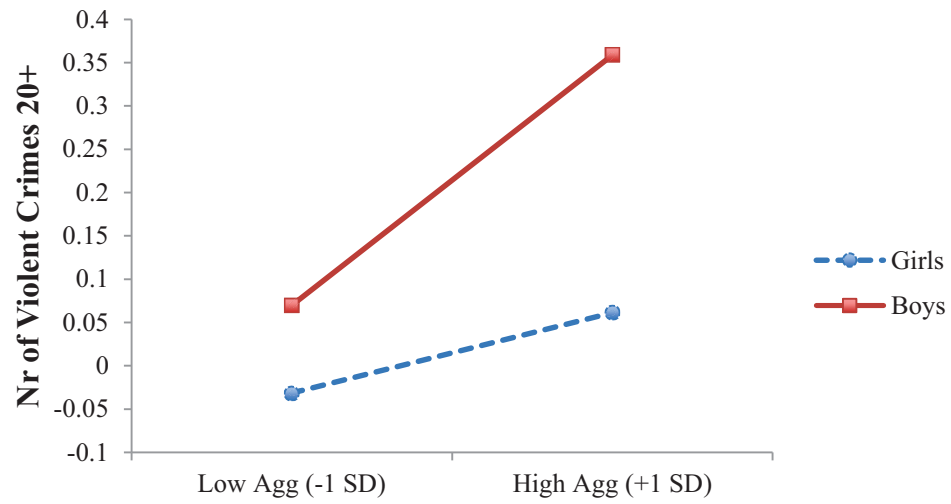
Aggression Factor 2 Harm

Figure 10. Model 3. Slopes showing the association between childhood index of

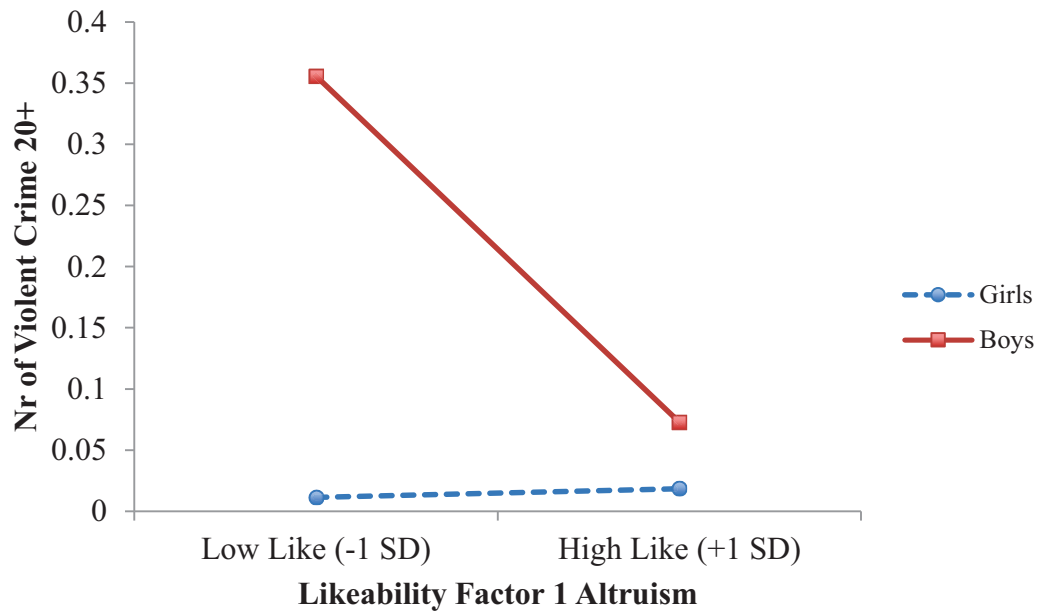harmful aggression and convictions for violent crimes for boys and girls.

Figure 11. Model 3. Slopes showing the association between childhood index of altruism and convictions for violent crimes for boys and girls.

and childhood index of altruism (LF1). One marginally significant but random interaction emerged between childhood index of harmful aggression and altruism (β = -.02, *SE* = .01, *t* = - 1.55, *p* = .06), with some of the randomness accounted for by gender (β = .02, *SE* = .01, *t* = 1.98, *p* = .04). To clarify, we found that the effect of interaction between harmful aggression and altruism on violent crimes varied as a function of gender. That is, boys who were highest on harmful aggression and lowest on altruism were at greatest risk for violent crimes. Girls were unlikely to engage in violent crimes regardless of their level of harmful aggression or their degree of peer-nominated altruism. These findings are presented in Figure 12; Summary of all Model 3 effects is presented in Table 5.

Model 4.

The level 1variables in the fourth model included the two aggression factors, likeability factor 2 (LF2; Positive Peer Relations) and the interactions between aggression scores and the measure of positive peer relations. Level 2 predictors were entered as moderators (e.g., gender, grade).

Predictors at the Intercept. The overall value of the intercept was .124 and it was observed to be significant and random (*t* = 7.48, *SE* = .01, *p* = .00). Two level 2 predictors accounted for the between group variation in the intercept. Those were gender (β = -.10, *SE* = .02, *t* = -6.55, *p* = .00) and grade (β = -.02, *SE* = .01, *t* = -1.94, *p* = .05). The intercept was observed to be higher for boys (.231) than for girls (.017). This difference was approximately 27% of a standard deviation. The intercept was higher the 4th graders than for the 7th graders, with the expected value on the outcome of .15 and .098, respectively.
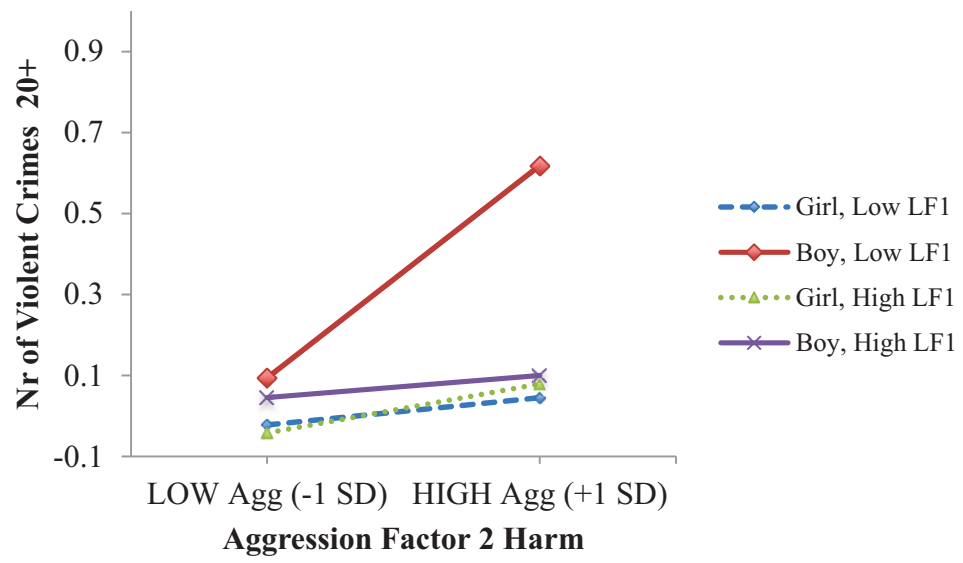
Figure 12. Model 3. Violent crimes as a function of gender and harmful aggression by altruism interaction.

Table 5.

Final estimation of fixed effects for Model 3

Variable	Coefficient	Standard Error	t-ratio	Df	P-value
Intercept	.11	.01	8.36	179	.00
Sex	-.09	.01	-7.37	179	.00
Grade	-.02	.01	-2.42	179	.01
AF1	-.01	.02	-0.73	181	.46
AF2	.07	.02	2.47	180	.01
Sex	.03	.01	-2.51	180	.01
LF1	-.03	.01	-2.68	180	.00
Sex	.04	.01	3.00	180	.00
AF2 by LF1	-.02	.01	-1.55	180	.12
Sex	.02	.01	1.98	180	.04

Note. Rows in bold font correspond to level 2 variables. AF1 = Aggression Factor 1 (Disobedience). AF2 = Aggression Factor 2 (Harm). LF1 = Likeability Factor 1 (Altruism).

Predictors of Violent Crimes. Again, the effect of AF1 on the outcome was non-

significant and random and the variability of this effect was not associated with any of

the level 2 predictors.   A statistically significant and random effect was observed for

AF2 (β = .07, *SE* = .02, *t* = 2.79, *p* = .00), which was further moderated by gender (β = -

.04, *SE* = .01, *t* = -2.69, *p* = .00). Again, this effect was found to be stronger for boys

than for girls with slope values of .12 and .034, respectively. The level 2 coefficients

were used to create predicted scores for boys low on aggression, boys high in aggression,

girls low in aggression and girls high in aggression. The observed scores for those four

cases were .07, .38, -.02, and .06, respectively. These results are illustrated in Figure 13.

A statistically significant and random negative association was observed between

childhood index of positive peer relations (LF2) and the outcome variable (β = -.02, *SE* =

.00, *t* = -3.59, *p* = .00), with some of the randomness accounted for by gender (β = .02, *SE*

= .00, *t* = 4.26, *p* = .00).   A stronger effect emerged for boys (the value of the slope was -

.05) than for girls (the value of the slope was -.007). Predicted values for boys and girls

who were low and high on positive peer relations are presented in Figure 14.

Effects of Level 2 Variables on Level 1 Effects. In Model 4, we did not observe

any significant interactions between either one of the aggression factors and the

childhood index of positive peer relations. Summary of all Model 4 effects is illustrated

in Table 6.

The Association between Aggression and Outcome Measures.

Comparisons of the correlations observed between the two aggression measures

and the outcome variables were performed with Meng's t test for dependent samples

(Meng, Rosenthal, & Rubin, 1992). This technique allows for the comparison of the
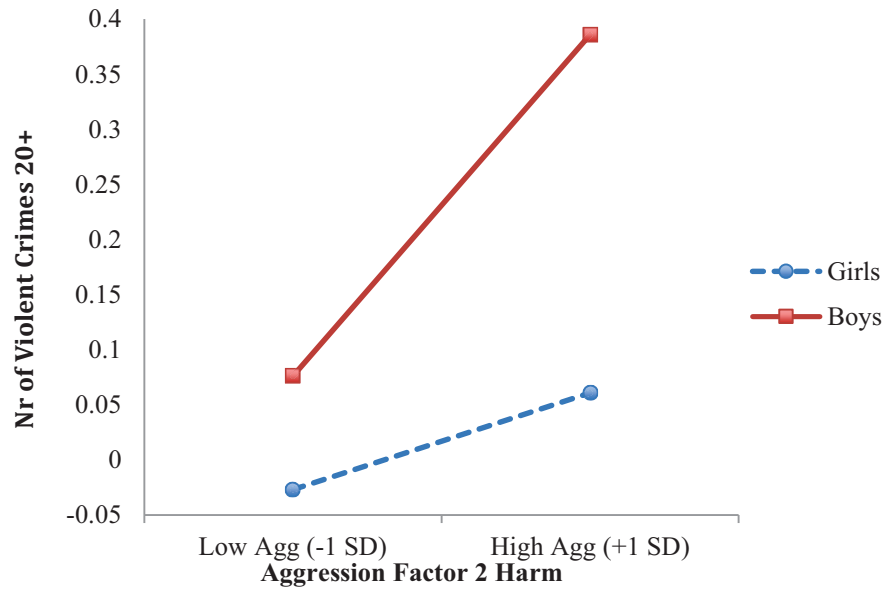
Figure 13. Model 4. Slopes showing the association between childhood index of harmful aggression and convictions for violent crimes for boys and girls.
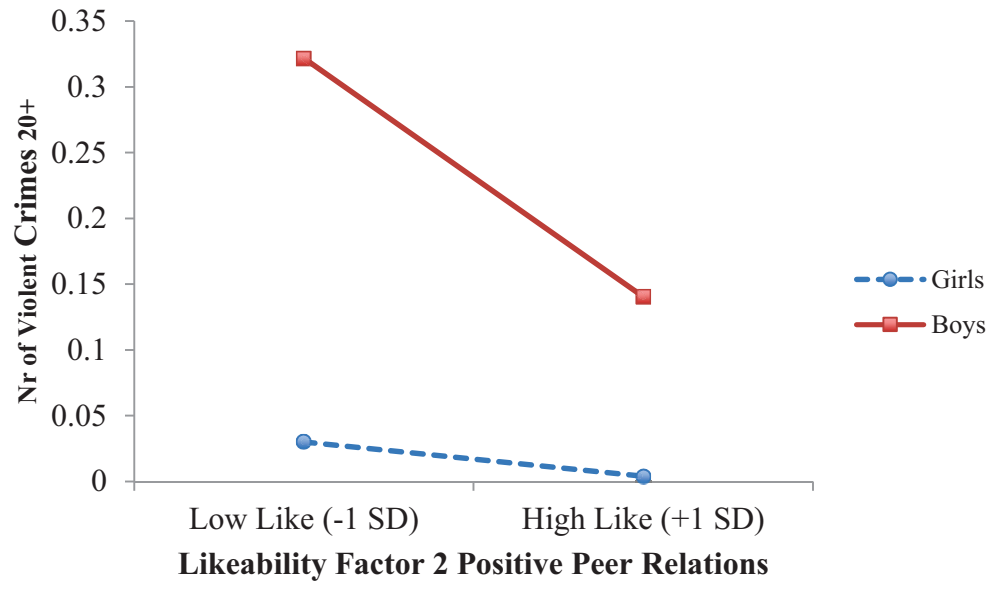
Figure 14. Model 4. Slopes showing the association between childhood index of positive peer relations and convictions for violent crimes for boys and girls.

Table 6.

Final estimation of fixed effects for Model 4

Variable	Coefficient	Standard Error	t-ratio	df	P-value
Intercept	.12	.01	7.48	179	.00
Sex	-.10	.01	-6.55	179	.00
Grade	-.02	.01	-1.94	179	.05
AF1	-.00	.01	-0.49	181	.62
AF2	.07	.02	2.79	180	.00
Sex	-.04	.01	-2.69	180	.00
LF2	-.02	.00	-3.59	180	.00
Sex	.02	.00	4.26	180	.00
AF1 by LF2	-.00	.00	-0.69	181	.49
AF2 by LF2	-.00	.01	-0.51	181	.60

Note. Rows in bold font correspond to level 2 variables. AF1 = Aggression Factor 1 (Disobedience). AF2 = Aggression Factor 2 (Harm). LF2 = Likeability Factor 2 (Positive Peer Relations).

strength of two correlations involving variables measured with the same participants. It calculates a Z score indicating if one correlation is significantly stronger than the other.

Significant differences were observed on two of the four sets of correlations. Specifically, it was observed that the childhood index of disobedience ($z = $ -3.47, $p < $ .001) was more strongly related to adult property crimes ($r = $ .12) than to adult violent crimes ($r = $ .09). Similarly, childhood index of harmful aggression ($z = $ -2.84, $p < $ .001) was found to be more strongly related to adult property crimes ($r = $ .14) than to adult violent crimes ($r = $ .11). In other words, both aggression factors were found to be more strongly related to the prediction of adult property crimes than to violent crimes. Lastly, we did not observe any significant differences in the predictive strength of either aggression factor on the outcome. That is, both were found to be equally predictive of adult property as well as of violent crimes.

On the other hand, when using the HLM approach, harmful aggression was found to be a better predictor of adult property crimes, accounting for around 10.7% of the variance, as compared to 8.7% for disobedience. Harmful aggression was also found to be a better predictor of adult violent crimes, accounting for 9.9% of the variance (compared to 6.5% for disobedience).

Discussion

The objective of the current study was to examine the extent to which childhood aggression comes to be associated with adult criminality and whether this association varies as a function of peer-rated likeability and neighborhood-level factors (i.e., socio-ecological disadvantage). The results obtained generally support the claim childhood

aggression is key in predicting later aggressive, antisocial and criminal behaviors. Partial support was also found for the role of moderating factors.

Main Effects of Childhood Aggression on Adult Criminal Offending

The current results support the hypothesis that childhood index of harmful aggression would be positively related to adult criminal offending. Indeed, the obtained results add to the extensive body of knowledge linking childhood aggressive behaviours to adult criminal acts (Huesmann & Eron, 1992; Loeber et al., 2002). Furthermore, we found striking gender differences in the rate of both property and violent crimes, with a uniformly stronger effect for boys than for girls. This was not a surprising finding as consistent evidence suggests that crime is a gendered phenomenon, with men more frequently engaging in serious delinquency and crime, while women tend to be arrested more for minor crimes and status offenses (e.g., truancy, running away, violating of curfew and underage liquor laws) (Liu & Kaplan, 1999; Sharp et al., 2005).

Additionally, we found partial support for our proposition that childhood index of harmful aggression would be more strongly associated with adult criminality than childhood index of disobedience. On one hand, when assessing the differences between the types of aggression, we observed harmful aggression to explain more of the variance in both adult property (10.7%) and violent crimes (9.9%), than did disobedience (8.7% and 6.5%, respectively). This was not surprising given what is already known about the antecedents of adult crime, especially violent offending. Although individuals who go on to develop criminal profiles as adults may begin by engaging in minor forms of aggression (i.e., disobedient, disruptive behaviors), their antisocial behaviors often escalate into more pathological and serious forms of aggression over time leading to

criminal outcomes, as evidenced by literature examining life-course-persistent offenders (Moffitt, 1993; DeLisi, 2001).

On the other hand, when we assessed differences as a function of the type of crime, we subsequently observed that both of our aggression measures explained property crimes better than violent crimes. This might be explained by the fact that in the current sample there was a much lower base rate of violent crimes, compared to property crimes. Also, it is possible that predicting violent offending is beyond the scope of what our classroom measures are able to "pick up".

General Strain Theory and Gender Differences in Offending

The observed differences in rates of offending by males and females can be explained via the General Strain Theory (GST; Agnew, 1992, 2006), whose tenets have been supported by a number of existing studies (see Hoffmann & Su, 1997; Preston, 2006; Sigfusdottir & Silver, 2009). For instance, the theory focuses on three different categories of strain implicated in deviant acts. Those are: 1) the inability to achieve a goal (e.g., status, respect); 2) the removal of positive stimulus (e.g., broken relationship with a friend); and 3) the presentation of a negative stimulus (e.g., adverse reactions with peers and/or teachers, neighborhood problems, abuse) (Agnew, 1992). The theory postulates that any of the aforementioned categories of strain can lead to negative emotional states (e.g., anger, frustration, rage, depression), which can, in turn, prompt individuals to commit deviant acts. It is thought that the emotional reactions can lead to crime directly or indirectly, depending on other contingencies such as coping mechanisms, peer and familiar support and self-esteem (Piquero & Sealock, 2010). Additionally, different affective states may give rise to different forms of crime. For

instance, one may use delinquency and crime to escape strain (e.g., drug use), retaliate against strain (e.g., violence), or generate monetary gain to overcome strain (e.g., property crime).

While Broidy and Agnew (1997) argue that the process of offending via the GST may occur in similar fashion for both males and females, they also contend that the two genders interpret and react to strains and negative emotions in different ways. For example, males may believe that they are more capable of criminal behavior, while females may rely on social support to address their emotional states (thus resulting in different coping mechanisms). Males may also find themselves to be less monitored by authority figures, leading to more opportunity for deviant behavior. Furthermore, males and females may be socialized to cope with stressors in different ways. For example, parents often encourage sex-typed activities in their children, which may prompt boys to adopt more negative qualities associated with their roles (e.g., aggression/noncompliance), while girls may resort to submission/compliance (Putallaz & Bierman, 2004), or may exhibit more internal forms of deviance such as self-inflicted cutting and disordered eating, among others (Sharp et al., 2001).

The GST may also be used to explain gender differences in the types of crime experienced by both females and males. For instance, females are usually found be more concerned with creating and maintaining close relationships and ties with others, which may lead to lower rates of property and violent crime. On the other hand, males are often found to be concerned with material success, which, might, in turn lead to higher rates of property and violent crime (Broidy & Agnew, 1997). Additionally, due in part to differential socialization practices, females may face negative treatment such as

discrimination or higher demands from friends and family, which may lead to more restrictive behavior. Males, on the other hand, are thought to face more conflict with peers and are more likely to be victims of crime. Lastly, as mentioned, failure to achieve goals may lead to self-destructive behavior in females, while failure to achieve goals in males may lead to property and violent crimes (Agnew & Broidy, 1997).

Agnew and Broidy (1997) have also noted gender differences in the emotional responses to strain. For example, while females are more likely to respond to strain with depression and anger, which might be further accompanied by fear, guilt and shame, males are more likely to respond with anger, which may lead to moral outrage. Furthermore, females are more likely than males to blame themselves and worry about the consequences of their anger while males might be quick to blame others, showing less concern for others. Lastly, depression and guilt in females may lead to self-destructive behaviors, while moral outrage in men may lead to property and violent crime.

It should be noted that the GST is thought to complement other well-regarded theories of crime such as self-control (Gottfredson & Hirschi, 1990) and social learning theories (Akers, 1998). To clarify, Agnew (2006) postulated that strain comes to be related to crime not only because it generates negative emotional states conducive to criminal coping, but that strain also decreases self-control and and/or increases pro-criminal learning, which, may in turn, lead to criminal behavior. Indeed, Agnew (2001) suggested that strain associated with low self- and/or social control and those that create incentive to engage in criminal coping are among the types of strain most likely to result in crime.

Main Effects of Measures of Likeability and Interactions

We found support for the hypothesis that childhood measures of likeability would be negatively associated with measures of adult criminal behavior. Specifically, both childhood measures of altruism and positive peer relations were observed to be negatively related to both property and violent adult crimes. This effect was found to be particularly strong among boys; however, this was not unexpected given the generally low base rate of girls engaging in any criminal activity.

These results are in line with much research, which repeatedly finds that highly likeable children exhibit low levels of adjustment difficulties both concurrently and over the course of development (Kupersmidt, Coie, & Dodge, 1990). Indeed, aggressive adolescents who experience low peer status are thought to be at an increased risk for future aggression, delinquency and other externalizing behaviors, even after controlling for the effects of earlier aggressiveness (Coie, Lochman, Terry & Hyman, 1992; Card, Stucky, Sawalani, & Little, 2008). On the other hand, being liked and accepted by peers provides children and adolescents with opportunities to practice prosocial alternatives to aggression (i.e., joining in ongoing peer activities, resolving conflicts, regulating emotion) (Werner & Crick, 2004). As such, children who are liked and accepted by their peers can be thought of as "low risk" group for future delinquent and criminal acts.

In light of the fact that competent functioning with is associated with lower levels of externalizing problems over time (Sandstrom & Cillessen, 2006), it is not surprising that we found support for our third hypothesis. As expected, we found that childhood measure of altruism did moderate the relation between childhood index of harmful aggression and both forms of adult criminal offending. Again, given the girls' low base

rate of any criminal behavior, the effect was found to be particularly strong for boys on both outcomes. To elaborate, boys who were rated highest on harmful aggression and lowest on altruism were found to be at greatest risk for committing adult property and violent crimes, as compared to those who were rated as aggressive but who were *also* rated as likeable. Positive peer relations were also found to moderate the relation between harmful aggression and property crimes, but this result was observed for boys only, with an opposite effect for girls. Specifically, we observed that boys high on aggression *and* high on liking went on to commit less property crimes than boys who were high on aggression but who received a low-liking nomination. Surprisingly, girls who were rated as highly aggressive *and* highly likeable were found to commit *more* property crimes, as compared to boys. However, it should be noted that the latter result yielded a rather small effect and its interpretation should therefore be interpreted with caution.

The findings that highly aggressive *and* highly likeable children fared better on future criminal outcomes than those who were aggressive and not liked, is consistent with a body of literature, which stipulates that those who use aggression in combination with prosocial behavior may be effective for resource control and may actually be linked to positive peer outcomes, including attracting friendships (Cairns & Cairns, 1994; Hawley, 1999; 2003b; Bukowski, 2003). Indeed, these results are in line with Hawley's Resource Control Theory (RCT; Hawley, 1999), which proposes that children can successfully utilize both aggressive and prosocial strategies to control resources in their environments. Hawley (2003b) named this subgroup of individuals as *bistrategic controllers*, and they have been found to be the most successful at resource control, compared to those who use coercive or prosocial strategies only.

In line with the RCT (Hawley, 1999), a subset of aggressive youth may actually be liked by their peers in part because they possess prosocial skills that help diminish the negative effect of their aggressive behavior. It is thought that prosocial strategies such as affiliation, cooperation, helping, and reciprocity, among others, may serve as successful resource acquisition and may help youth create alliances and positive relationships with long-term benefits (Hawley, 2007). Therefore, even in the presence of aggressive behaviors, those individuals who *simultaneously* display prosocial skills not only enjoy high peer status but are also thought to halt trajectories towards future maladaptive behaviors (e.g., criminal acts) (Prinstein & La Greca, 2004), via more opportunity to practice appropriate interpersonal behavior, and via more opportunities for corrective social feedback needed for more appropriate emotion-regulation skills, among others (Bierman & Wargo, 1995). Further, peer acceptance also provides increased access to intimate friendships and support, which could aid aggressive children manage their negative emotional states.

One finding that was not consistent with the literature and RCT in particular, was that girls who were rated as highly aggressive *and* highly likeable were found to commit *more* property crimes, compared to boys. Therefore, it appears that for at least a subgroup of girls, positive peer experiences were not found to buffer or protect them from commission of future aggressive acts. Given what is already known about girls' unique emphasis on forming close bonds, friendships and the importance of social inclusion, this emerged as a surprising finding. Although speculative, one explanation may be that those girls affiliated with other highly aggressive peers, which might have precluded them from acquiring the necessary social skills for future adaptive

relationships and better emotion-regulation skills. Indeed, existing evidence suggests that associating with aggressive peers is a powerful predictor of one's own aggressive behaviors (Adams, Bukowski, & Bagwell, 2005).

The Effect of Grade and Interactions

Although we did not make any specific predictions in regards how children's age may affect the emergence and/or maintenance of aggressive/disruptive behavior, a grade (i.e., age) effect did emerge that merits further attention. Specifically, we did observe the association between aggression and convictions for violent crimes to be stronger for fourth graders than for seventh graders. One explanation is that in those classrooms there might have had higher tolerance level for aggressive behaviors from peers and/or teachers. Indeed, researchers have shown that classroom context greatly influences the developmental course of aggressive behavior. For instance, aggressive and disruptive behaviors have been shown to be influences by other children in the peer group (Battistich et al., 1995) and aggressive children in classes with other aggressive peers have been shown to reinforce aggressive and disruptive behaviors (Spracklen, Andrews, & Patterson, 1996). On the other hand, additional factors in those children's developmental sequale could have contributed to their increased criminal activity over time (e.g., family/interpersonal conflict, poor academic achievement, substance abuse), although the nature of those factors is hard to ascertain given the design of the present study.

Furthermore, an interaction emerged between grade, disobedience and positive peer relations on later adult property crimes. More precisely, for children in 4th grade, the effect of disobedience was found to be higher in the presence of positive peer

experiences, whereas the opposite was observed for 7th graders. That is, 7th grade students who were high on disobedience *and* high on positive peer experiences fared better on criminal outcomes than 4th grade students, suggesting is that the impact of positive peer experiences may vary as function of age. Moreover, this finding may have important implications not only for helping thwart future criminal acts, but for helping reduce the upsurge of delinquent behavior during adolescence as well. To illustrate, it is important to first understand the "maturity gap" hypothesis put forth by Moffitt (1993), which helps explain the increase in youth's delinquent activity as they transition from elementary to secondary school (grade 7 onwards).

According to Moffitt (1993), higher incidence of aggressive behavior in adolescents can be explained via the changes associated with children's social needs that take place during the transition from childhood to early adolescence. Specifically, it has been proposed that as children enter early adolescence period, they enter a "maturity gap", which can be conceptualized as children's biological readiness for adult status without actually having achieved it yet (Moffitt, 1993). At the same time, those adolescents are achieving social development or maturity, which involves all the benefits and responsibilities of adult life, while being denied access to the social milieu of adulthood (Mendez, 2010). In other words, phenomena that were once regarded as normative within a specific age and social environment (e.g., school achievement, obedience to authority) become less desirable. On the other hand, previously non-normative phenomena that were once censured become more desirable as they become more associated with adult status (e.g., aggression and delinquency as reflection of independence) (Bukowski, Sippola, & Newcomb, 2000). As a result, adolescents are

motivated to transcend this gap by using deviance (i.e., aggressive behavior) in order to achieve the privileges of adulthood.

As outlined by Moffitt (1993), the salient biological changes coincide with a shift in children's reference group. That is, a contextual shift or transition takes place from elementary school (i.e., kindergarten to grade 6) to middle or secondary school (i.e., grade 7 onwards) where children's self –perceptions of autonomy and self-reliance become most salient. For example, relative to elementary schools, middle or secondary schools are thought to be typically larger and are less strictly organized and controlled by adult figures (Epstein, 1983). As a result, secondary schools are more representative of peer-structured environments without the controlling and scrutinizing influence of adults. Within the secondary school setting, the group cohesion and friendships are also thought to be more salient and might provide more opportunities for aggressive adolescents to affiliate with each other (Cillessen & Mayeux, 2004). Additionally, as teens enter this new social milieu, they are outnumbered by older youth who had already been enduring the "maturity gap" for 3 to 4 years and who had already engaged in some delinquent behavior to cope with it (Moffitt, 1993). Indeed, the results of past research indicate (e.g., Caspi, Lynam, Moffitt, & Silva, 1993; Simmons & Blyth, 1987) that as adolescents transition into the high school society they are at an elevated risk for developing aggressive and antisocial behaviors, presumably due to the need to re-establish dominance in a new, larger peer environment (Pellegrini & Long, 2002).

Although it is agreed that most youth who begin acting out during the adolescent period usually desist in the use of their aggressive strategies once the maturity gap closes (i.e., adolescent-limited offending) (Moffitt, 1993; Barnes & Beaver 2010), the finding of

the observed interaction might be especially pertinent for high risk youth with an earlier history of delinquent and antisocial acts. Given that maturity gap stimulates an increase of delinquent behavior in general, it may only exacerbate antisocial tendencies in those already on a maladaptive developmental trajectory, leading to the commission of more antisocial acts in the future. Therefore, the current finding that positive peer experiences (and not deviance) may help transcend the maturity gap is a promising one, and may help in designing prevention and/or intervention strategies aimed at reducing delinquency among youth, and hopefully mitigating the continuity of adolescent aggression and adult criminal offenses.

The Effects of Neighborhood Disadvantage on the Outcome

The hypothesis that neighborhood conditions would moderate the relation between childhood aggression and adult criminality was not supported. This stands in contrast to most findings, which link adverse neighborhood conditions (e.g., poverty, poor housing, low SES) with an increased incidence of criminal offending (Wolfgang et al., 1987; Gentle-Genitty, 2010). Many studies point to the notion that densely populated (Tremblay et al., 1997) and non-White urban neighborhoods (Wolfgang et al., 1987) are especially conducive to juvenile and adult crime.

Although we could speculate on the absence of any observed neighborhood effects (i.e., the use of 1986 census tract data as the *approximation* of the 1976 neighborhood disadvantage, a homogeneous sample), there appears to be a more probable explanation. Namely, the lack of neighborhood effects could have resulted from the restricted range of variability in our socio-ecological disadvantage measure. As such, we did not have a middle-class comparison but only low- to lower-class one. Therefore,

future studies should aim to include a more appropriate base of comparison between neighborhoods in order to observe any possible effects.

Limitations and Conclusions

      This study is not without its limitations. As mentioned, future attempts at estimating any possible neighborhood effects should make sure to include comparison groups from more variable and diverse socio-ecological conditions. Additionally, although we had access to a very unique data set, future longitudinal investigations should aim to incorporate several waves of data collection in order to better understand the developmental pathways of aggressive and disruptive behaviors. As such, one could gain a better understanding of the onset, maintenance and possibly desistance from aggressive behaviors over time. Nonetheless, the present study adds insight not only into how childhood aggression comes to be associated with adult criminality, but also how youth's social milieu/peer interactions may help thwart its deleterious effects on future adult outcomes. Not surprisingly, the results have important implications for intervention programs (e.g., social competency and prosocial skills training, among others) aimed at reducing aggression among youth, which may in turn reduce the rate of adult criminal behavior as well.

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Pupil Evaluation Inventory (PEI)

* Items used in Grade 1

Prog. #	PEI #	AGGRESSION ITEMS
1	3.	Those who can't sit still.
2	4.	Those who try get other people into trouble.
3	7.	Those who act stuck-up and think they are better than everyone else.
4	8.	Those who play the clown and get others to laugh.
5 (1)*	9.	Those who start a fight over nothing.
6	12.	Those who tell other children what to do.
7	15.	Those who always mess around and get into trouble.
8 (2)	16.	Those who make fun of people.
9	18.	Those who do strange things.
10 (3)	20.	Those who bother people when they're to work.
11	21.	Those who get mad when they don't get their way.
12 (4)	22.	Those who don't pay attention to the teacher.
13	23.	Those who are rude to the teacher.
14 (5)	26.	Those who act like a baby.
15	27.	Those who are mean and cruel to other children.
16	29.	Those who give dirty looks.
17	30.	Those who want to show off in front of the class.
18 (6)	31.	Those who say they can beat everybody up.
19 (7)	33.	Those who exaggerate and make up stories.

20 (8)	34.	Those who complain nothing seems to make them happy.

Prog.	PEI	WITHDRAWAL ITEMS
#	#	
21 (9)	5.	Those who are too shy to make friends easily.
22 (10)	6.	Those whose feelings are too easily hurt.
23	10.	Those who never seem to be having a good time.
24	11.	Those who are upset when called on to answer questions in class.
25	13.	Those who are usually chosen last to join in group activities.
26 (11)	17.	Those who have very few friends.
27 (12)	24.	Those who are unhappy or sad.
28 (13)	28.	Those who often don't want to play.
29 (14)	32.	Those who aren't noticed much.

LIKEABILITY ITEMS

30	2.	Those who help others.
31 (15)	14.	Those who are liked by everyone.
32	19.	Those who are your best friends.
33	25.	Those who are especially nice.
34 (16)	35.	Those who always seem to understand things.

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