



Published in final edited form as:

*J Dev Life Course Criminol.* 2017 September ; 3(3): 326–346. doi:10.1007/s40865-017-0062-9.

## Does Educational Marginalization Mediate the Path from Childhood Cumulative Risk to Criminal Offending?

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### Abstract

**Purpose**—Early exposure to multiple risk factors is known to predict involvement in criminal offending. The purpose of this study was to examine the processes responsible for this association. Specifically, the focus was on the capacity of adolescent educational experience to mediate the effect of childhood cumulative risk (CCR) on criminal offending, net of expected continuity in antisocial propensity and behavior.

**Methods**—Data from the Northern Finland Birth Cohort Study 1986 ( $n = 5,743$ ) were used to estimate a structural equation model to examine the hypothesized pathways. The educational pathway was captured by a latent variable (educational marginalization) consisting of indicators of low academic performance, weak school attachment, and low educational aspirations.

**Results**—CCR had a strong positive relation with educational marginalization, which, in turn, emerged as a statistically significant predictor of having criminal record by age 19. Although continuity in antisocial behavior accounted for most of the total effect of CCR on criminal offending, one third of it was mediated by educational marginalization.

**Conclusions**—The results highlight the adolescent educational experience as a promising target of intervention in efforts to curb criminal careers among children at risk.

## Keywords

Cumulative risk; criminal offending; school effects; Finland

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## 1. Introduction

Tension between continuity and change is a focal theme in life course criminology. Whereas some perspectives emphasize stability in antisocial behaviors, others recognize the possibility of change at each stage of human development. Well-known examples of the former include Gottfredson and Hirschi's (1990) self-control theory and Moffitt's (1993) account of the life course persistent (LCP) offending type. Gottfredson and Hirschi (1990) have famously argued that individual differences in criminality stem from a relatively stable dispositional characteristic (low self-control) acquired in the process of early childhood socialization. In Moffitt's theory of LCP, the intersection between neuropsychological deficits and family adversity constitutes the "perfect storm" for career criminality. Despite clear differences, these theories are similar in that each assigns causal primacy to early childhood processes (Staff et al., 2015). Factors emerging beyond this stage of the life course are understood as downstream effects of the etiological pathway established in early development. These dispositional theories stand in contrast to such perspectives as the age-graded theory of informal social control (Laub and Sampson, 1993; 2003) and the social development model (Catalano and Hawkins, 1996; Hawkins and Weis, 1985), both of which expect processes occurring in adolescence and adulthood to have the capacity to modify criminal trajectories.

Aside from being theoretically important, these contrasting perspectives have clear implications for policy prescriptions. If we assume that the course of criminal trajectories is largely fixed in childhood, prevention efforts should focus on interventions targeting early emerging risk factors. Under this perspective, programs focusing on risk and protective factors occurring in adolescence, let alone adulthood, are deemed relatively ineffectual. By contrast, if it turns out that life course matters, i.e., that persistence in antisocial behavior is contingent on age-specific life circumstances – such as peer context, school failure, or romantic bonding – efforts to reduce crime and violence should pay attention to relevant processes throughout the life course, including adolescence and beyond.

This research is relatively unconcerned about the precise mechanisms that produce individual differences in criminal propensity. Drawing on the *cumulative risk perspective* (Appleyard et al., 2005; Evans, Li, and Whipple, 2013) we take it for granted that, all else equal, individuals exposed to multiple psychosocial risk factors as children will be at increased risk of criminal offending in adulthood. We assume that a combination of heritable and environmental influences are responsible for these effects. Our main research question concerns the capacity of adolescent life circumstances to intervene in the criminogenic processes inherent in early exposure to cumulative risk. Specifically, we focus on adolescent school experience as a potential mediator of the longitudinal association between childhood cumulative risk and criminal behavior in emerging adulthood, net of the stability of antisociality over development. Our interest in the educational domain is motivated by

criminological theory, prior research, and the availability of effective interventions to prevent educational failure (Belfanz, Herzog, and Mac Iver, 2007; Durlak et al., 2011; Wilson and Tanner-Smith, 2013). The practical aim of this research is to assess the potential of such interventions to redirect individual pathways away from crime.

## 2. Cumulative risk perspective

Risk factors refer to individual or environmental antecedents of negative outcomes (Evans, Li, and Whipple, 2013; Farrington, 2000; Jessor et al., 1995; Loeber and Farrington, 1998; Sprott, Jenkins, and Doob, 2005). Note that this definition leaves open the question whether risk factors exert *causal influence* on the outcome or whether it is merely a *marker* of such effects (Wikström, 2007). The core assumption of the *cumulative* risk framework is that exposure to multiple risk factors is expected to predict negative outcomes over and above the effects of singular factors (Evans, Li, and Whipple, 2013). Thus, it is not the intensity of a particular risk factor (or set of factors) but the accumulation of many that is expected to identify the most vulnerable individuals.

The standard way to measure cumulative risk is to dichotomize salient risk factors and combine those into an index of cumulative risk (a summary score). The cumulative approach to measuring risk is empirically advantageous because it yields parsimonious statistical models, avoids problems of collinearity among risk factors, and does not require making assumptions about the importance of singular risk factors (Evans, Li, and Whipple, 2013). As a notable limitation, this framework (purposefully) ignores the mechanisms responsible for the association between cumulative risk and the outcome of interest. Additional perspectives are thus needed to elucidate the processes producing the observed associations. This limitation is not unique to the cumulative risk perspective, but applies to the risk factor approach more generally (Wikström, 2007).

Research informed by the cumulative risk perspective has found consistent support for the assumption that the accumulation of risk factors is strongly related to the risk of a wide variety of detrimental outcomes (Evans, Li, and Whipple, 2013). In a foundational study, Rutter (1979) observed that children exposed to environmental risk factors (such as marital discord and low social status) were four times more likely to develop psychological disorders than those exposed to only one such factor, and that the presence of four risk factors was associated with a tenfold increase in the prevalence of disorders. In a series of studies, Sameroff and colleagues (1987a; 1987b; 1993) have reported evidence that increases in the number of childhood risk factors predict a wide range of maladaptive outcomes among children and adolescents. Additional studies have linked cumulative risk exposure to internalizing problems, externalizing problems, juvenile delinquency, and drug use (Adelmann, 2005; Dekovic, 1999; Farrell, Danish, and Howard, 1992; Gerard and Buhler, 2004a; Gerard and Buhler, 2004b; Jessor et al., 1995; Mason et al., 2016; Morales and Guerra, 2006; Stouthamer-Loeber et al., 2002), as well as reduced academic performance, educational attainment, and cognitive functioning (Dubow and Luster, 1990; Gassman-Pines and Yoshikawa, 2006; January et al., 2017; Luster and McAdoo, 1994).

Despite the popularity of the general risk factor approach in criminology (Loeber and Farrington, 1998; Farrington, 2000), few studies of crime have employed the *cumulative* risk perspective as an explicit framework. The literature is nevertheless consistent with the assumption that as the number of risk factors accumulate within individuals, so does the risk of criminal or delinquent offending. Loeber and Farrington (1998) report that the higher the number of risk factors, the greater the likelihood it is for a child to become a serious and violent juvenile offender. Thornberry and colleagues (2003) examined antecedents of gang membership and observed a linear association between the number of risk factors and the likelihood of joining a juvenile gang. Thus, cumulative risk in early childhood is expected to predict criminal offending, although additional prospective research is needed to test this hypothesis as well as to examine potential mechanisms generating this long-term effect.

### 3. School Failure and Crime

This research considers adolescent educational marginalization as an etiological pathway in the association between childhood cumulative risk and criminal behavior. We operationalized this construct as a latent variable consisting of low academic performance, weak attachment, and truncated educational aspirations. A number of criminological theories are consistent with the expectation that negative school experiences contribute to criminal behavior. From the perspective of social bonding theory (Hirschi, 1969; Sampson and Laub, 1993), adolescents who are *committed* to educational goals, such as going to college, and who are *involved* in school activities, such as extracurricular clubs, are less likely to drift into crime and delinquency than those who are disengaged from school. Strain theory (Agnew, 2006) assigns criminogenic effects to the educational experiences that are frustrating or otherwise aversive due to such factors as the stigma associated with low academic performance, social isolation, or harsh discipline. Differential association (Warr, 2002) and routine activities (Felson, 2002) theories draw attention to the fact that adolescents who are disengaged from school are more likely to spend time with antisocial peers in settings conducive to criminal offending.

Tempering these assumptions, criminological literature also recognizes sources of spuriousness in the association between poor educational outcomes and crime. For example, psychological characteristics related to self-regulation (e.g. lack of control, inattention, and hyperactivity) have been implicated as etiological sources of the negative association between academic performance and criminal offending (Felson and Staff, 2006; Maguin and Loeber, 1996). Given that low intelligence predicts both educational failure (Neisser et al., 1996) and criminal behavior (Mears and Cochran, 2013; Schwartz et al., 2015), this individual characteristic is also likely to contribute to the association. Subcultural explanations of crime might propose that individuals growing up in disadvantaged or working-class families are less likely to pursue educational goals and are more likely to become involved in the criminal justice system because of their position in the social structure (Carter, 2003; Willis, 1977).

Evidence on school effects on crime remains mixed. Some of the studies reporting strong effects can be criticized for failure to properly adjust for the influence of selection processes. A systematic review of the literature on academic performance and crime found that the

association tends to disappear in studies that include controls for individual differences in shared psychological risk factors (Maguin and Loeber, 1996). In direct challenge to this conclusion, more recent longitudinal studies report significant school effects on crime in the presence of rigorous controls for these characteristics (Herrenkohl et al., 2001; Hirschfield and Gaspar, 2011; Savolainen et al., 2012).

We are not aware of any randomized controlled trials linking reductions in school failure to reductions in criminal offending. However, Hawkins and associates (1999) reported results from a quasi-experimental study where the treatment group was exposed to a comprehensive intervention with school bonding as a focal target. This program was effective in reducing educational disengagement, and the subjects in the treatment group were found to be significantly less delinquent at age 18. Exploiting data from natural experiments in the context of educational reforms, econometric studies have used instrumental variable estimation to estimate the causal effect of educational participation on criminal activity (Hjalmarsson, Holmlund, and Lindquist, 2015; Lochner and Moretti, 2004; Machin, Marie, and Vujić, 2011). Evidence from this body of research tends to support the hypothesis that participation in schooling reduces crime and criminal justice involvement. Using randomized data from lottery-based school enrollment, Deming (2011) found that high-risk children accepted in schools that are more desirable commit 50% less crime than their counterparts who were denied entry to their school of choice. In sum, although the evidence is mixed, several sophisticated studies sustain the assumption that adolescent educational experience has the potential to influence criminal offending.

While negative educational outcomes have been linked to criminal offending, studies have yet to explore the long-term association between childhood exposure to cumulative risks and criminal behavior in late adolescence and beyond. Scholars have, however, examined the associations between childhood cumulative risk and academic difficulties. Longitudinal studies of childhood cumulative risk find that children exposed to multiple risk factors have lower grade point averages throughout elementary and high school (e.g., January et al., 2017), and also experience more absences from school (Gutman, Sameroff, and Cole, 2003). Additionally, studies exploring the accumulation of family risk factors in early childhood find that exposure to multiple risk factors is associated with lower grades in middle school (Buehler and Gerard, 2013). Further, children with academic and behavioral difficulties in early childhood were more likely to obtain poor reading and math scores, and experience high school dropout (Darney, Reinke, Herman, Stormont, and Ialongo, 2013). Although cumulative risk is linked to educational difficulties, it is unclear whether educational difficulties mediate the relationship between childhood cumulative risk and criminal behavior in late adolescence and mature adulthood. As some studies have linked childhood cumulative risk to violent offending (e.g., Andershed, Gibson, and Andershed, 2016; Jennings et al., 2016), there is a need to elaborate the mechanisms linking cumulative risk, educational failure, and criminal behavior. The current study seeks to fill this gap in the literature by examining whether mid-adolescent educational marginalization mediates the effects of childhood cumulative risk exposure on criminal offending in late adolescence.

## 4. Hypotheses

This research is premised on the assumption that exposure to multiple psycho-social risk factors in early childhood is positively related to criminal offending in late adolescence (Hypothesis 1). Consistent with dispositional theories of crime, we contend that much of this association is explained by individual differences in antisocial behavior emerging in early development, and that criminal behavior is an expression of continuity in this dispositional characteristic (Hypothesis 2). Complementing these assumptions, we hypothesize that *adolescent educational experience mediates a significant share of the total association between childhood cumulative risk (CCR, henceforth) and criminal offending* (Hypothesis 3). Specifically we assume that CCR contributes to adolescent educational marginalization – a construct indicating low academic performance, weak attachment to school, and low commitment to educational goals – which in turn is expected to influence criminal offending independent of individual differences in antisocial propensity and preexisting involvement in delinquent behavior.

These three hypotheses are described formally in Figure 1, which consists of three pathways from CCR to criminal offending. The middle pathway represents the process associated with educational marginalization. The model assumes that this pathway emerges as positive and statistically significant in the presence of rigorous controls for continuity in antisocial dispositions and behavior, which are represented by the other two pathways. The upper pathway (Low Self-Regulation) represents individual differences in psychological dispositions related to criminal offending. We assume that CCR is related to self-regulation – a psychological characteristic assumed to restrain criminal offending. Consistent with social-environmental theories of crime, the lower pathway assumes that – independently of dispositional factors (i.e., self-regulation) – CCR is positively related to delinquency in early and mid-adolescence, and that the adoption of a delinquent lifestyle facilitates persistence in crime in later development.

## 5. Data and Methods

This research utilized data from the Northern Finland Birth Cohort 1986 (NFBC1986), a population-based study of individuals born between July 1, 1985 and June 30, 1986 in the two northernmost provinces of Finland (see Hurtig et al., 2007). The major data collection waves included a prenatal survey of mothers, hospital records at birth, a health study at age seven (survey of parents), a learning disability study at age 8 (survey of teachers), and an adolescent study of health and well-being at age 15/16 (self-report survey followed by a clinical exam). Survey data were complemented with information from nationwide administrative records (Lyngstad and Skardhamar, 2011), including criminal sanctions. Given our interest in linking childhood cumulative risk to adolescent outcomes, the analysis sample is limited to members of the birth cohort who participated in the adolescent self-report survey and who have valid data on the majority of our cumulative risk indicators, which are discussed below ( $n = 5,743$ ). Prior analyses using these data have tested for selective attrition, finding that the analysis sample has slightly more females, fewer low birth weight babies, and fewer children of mothers who smoked during pregnancy than the

original live-born birth cohort (Mason et al., 2016). The ethical committee of the Northern Ostrobothnia Hospital District approved the study.

## 5.1 Childhood Cumulative Risk

Cumulative exposure to childhood risk factors was measured using 20 items representing four domains of risk: family socioeconomic disadvantage, family/household structure; risky parent characteristics; and psychological risk characteristics of the child. Consistent with the standard approach, each item was coded as a dichotomy so that value 1 indicates the presence of risk and 0 indicates its absence (Evans, Li, and Whipple, 2013). Computing the dichotomous items into a summary score yields a cumulative risk index consistent with the strategy of the cumulative risk approach. Participants were required to have valid data on 16 of the 20 risk items in order to be included in the analysis sample. The highest score observed in these data was 12 ( $n = 1$ ). As the number of individuals with more than six risk factors was very small, we used a truncated version of the index ranging from zero to six or more risk factors. The 20 items contributing to the index are described below.

**5.1.1 Socioeconomic risk**—The socioeconomic domain consists of five factors: labor market exclusion (mother and father), low family income, low maternal education, and material deprivation. Labor market exclusion and material deprivation were assessed with the prenatal survey of mothers. The other items are based on a survey of parents around the time the children were 7 years of age. *Labor market exclusion* refers to a situation where the parent was neither gainfully employed nor enrolled in education/training (including the military) at the time the child was born. *Low family income* was assessed at child age 7 and indicates a situation where neither parent earned income from employment. *Low maternal education* identifies children (at age 7) whose mothers had completed less than nine years of schooling, which implies the mother had dropped out of compulsory school. *Material deprivation* was measured with a single item indicating the child was born to a household with no working telephone.

**5.1.2 Family structure and parent characteristics**—The index of cumulative risk attends to four characteristics of family structure. *Single parent* identifies children born to a mother who was neither married nor cohabiting. *Multiple unions* refers to a situation where the mother had been married (or lived in a registered cohabiting union) at least twice at before childbirth. The other two family structural risk factors were assessed at age seven: *Non-coresident parent* indicates absence of a biological parent from the household; *stepsibling* indicates the presence in the household of at least one stepbrother or sister.

Parental risk characteristics were captured with three indicators assessed with the prenatal questionnaire administered to the expecting mother. *Teenage mother* refers to a situation where the child was born to a mother aged 19 or younger. *Maternal smoking* identifies children whose mothers continued to smoke cigarettes during pregnancy. *Heavy drinking father* was operationalized as having five or more drinks per week. Finland is a “dry” drinking culture where it remains rare to drink alcohol in moderation on a daily basis (Felson et al., 2011). This is especially true in this cohort of fathers from Northern Finland where only eight individuals were reported drinking more than once per week. In this

context, the “five drinks or more” are typically consumed in the course of a single drinking occasion.

**5.1.3 Child psychological risk factors**—This domain covers items based on either parent or teacher assessments of the children at 7-8 years of age. Following McGee et al. (1985), a *hyperactivity* scale ( $\alpha = .88$ ) was created using three items from the Rutter B2 scale for teachers (restless, squirmy, poor concentration). The scale was dichotomized so that children scoring in the top 10% of the distribution were coded as “hyperactive.” Childhood *antisociality* was also created from the Rutter scale for teachers ( $\alpha = .83$ ). Six items assessed childhood antisocial behavior: the degree to which children destroyed their own or others' belongings, fought with other children, disobeyed, lied, stole (took things that did not belong to them), or bullied other children. As with hyperactivity, children scoring in the top 10% of the distribution were coded as “antisocial.” To reduce problems associated with common methods variance, parental assessments of children were also included. Because these items did not perform well as scales, four items were selected to represent separate risk factors. These items identify children described as at least “somewhat” *disobedient*, prone to *teasing* other children, *short-tempered*, and *inattentive* (trouble focusing) by their parents. Finally, risks related to childhood cognitive ability were indexed with two dichotomous measures: “below average” *learning aptitude* and “difficulties” in *learning how to read*. Each measure of cognitive ability reflects the assessment of the first-grade teacher.

## 5.2 Adolescent mediators

This research considered four empirical mediators of the longitudinal association between childhood cumulative risk and criminal behavior (see Figure 2), three of which are based on adolescent self-reports administered during the final (9<sup>th</sup>) grade of comprehensive school when most respondents were turning 15 years old. The variable Low Self-Regulation is based on parent assessments of their children during the same period. The empirical model features more pathways than the theoretical one (Figure 1) because Delinquent Behavior was measured using two complementary latent variables (Substance Misuse and Externalizing Behavior).

**5.2.1 Educational Marginalization**—This latent variable consists of seven indicators of *educational marginalization* ( $\alpha = .77$ ). Four of them are subject specific, indicating performance in Finnish (mother tongue), social studies, mathematics, and science. Respondents rated their performance in these subjects on a four-point scale (1 = better than average, 2 = about average, 3 = worse than average, and 4 = very bad). The fifth indicator reflects agreement with the statement “my school work is poor” (1 = do not agree, 2 = agree somewhat, and 3 = agree completely). The sixth indicator is a dichotomous item that identifies youth who opt out of the general track of upper-secondary education. Completing the general track is the required path for tertiary (college-level) education (Savolainen et al. 2013). The final indicator is a dichotomous measure indicating that respondents dislike school “very much.” Thus, higher values on this construct indicate increased educational marginalization.



**5.2.2 Measures of delinquent behavior**—Mid-adolescent participation in delinquency was measured using two latent variables: substance misuse and externalizing behavior. *Substance Misuse* consists of seven indicators ( $\alpha = .86$ ): lifetime frequency of any alcohol consumption, lifetime frequency of alcohol intoxications, frequency of intoxications in the past 12 months, frequency of alcohol intoxications in the past 30 days, frequency of binge drinking (consuming five or more alcoholic beverages during a single drinking occasion) in the past 30 days, lifetime frequency of marijuana use, and regular smoking. All the alcohol items were assessed on a seven-point scale, with higher scores indicating more frequent behavior. Marijuana use was measured on a six-point scale. Participants were coded as regular smokers if they smoked cigarettes daily. The *Externalizing Behavior* latent variable was created using 11 items ( $\alpha = .75$ ) from Achenbach's (1991) Youth Self-Report questionnaire. Respondents scored high on this construct if they reported that they are mean to others, destroy their own property, destroy others' property, fight with others; spend time with kids who get in trouble; lie or cheat, physically attack others, run away from home, steal from home, steal from other places, and threaten others. Each item was measured on a three point scale (1 = not true, 2 = sometimes true, 3 = often true).

**5.2.3 Low self-regulation**—This latent variable is based on five items asking parents to rate their 15-year-old child's capacity to (1) avoid dangerous activities, considering their consequences; (2) follow through and finish tasks; (3) persist in projects or activities; (4) think before acting; and (5) control his/her impulses and excitement. Parents were asked to compare their child to other children of similar age (and gender) and rate how well (s)he performs on a scale ranging from (7 = a lot *worse* to 1 = a lot *better*). This scale of low self-regulation achieved a very high reliability score ( $\alpha = .90$ ). In the data, the items were coded so that the middle score ("average") was assigned the value zero, with the extreme values coded as +3 and -3. Thus, individuals scored high on this scale if they engaged in impulsive behavior and dangerous activities with little concern about consequences, failed to finish tasks, and did not think before they acted.

### 5.3 Measure of crime

Official data obtained from the Finnish Central Register for Criminal Records were used as the source of information about criminal behavior. This source captures all offenses – misdemeanors as well as felonies – resulting in a criminal sanction, excluding fixed amount penal fees for minor traffic offenses. We had access to data through December 31, 2005 allowing us to track officially sanctioned offending from age 15 (the age of criminal liability in Finland) through 19-20 years in this birth cohort. Note that because there is no juvenile justice system in Finland, it is not possible to acquire a criminal record before turning 15. Crime was measured as simple dichotomy indicating the presence of criminal record by age 20.

### 5.4 Method of estimation

The hypothesized pathways depicted in the conceptual model of Figure 1 were estimated with structural equation modeling (SEM) in Mplus 7.1 (Muthén and Muthén, 1998-2012). Parameter estimates were generated with the weighted least squares means variance estimator (WLSMV). WLSMV estimation is appropriate for latent variables with binary or

ordinal latent variable indicators and dichotomous outcomes (Muthén and Muthén, 1998-2012). In Mplus, WLSMV implements pairwise missing data procedures to maximize the use of available data from the sample, retaining 5,743 cases. Model fit was evaluated with the chi-square statistic ( $\chi^2$ ), the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). The chi-square value, which provides an indication of the degree of model misfit with the data in SEM, is sensitive to sample size and is often statistically significant in large samples. Therefore, recommended guidelines suggest that CFI values close to 0.95 or greater and RMSEA values close to 0.05 or less to indicate acceptable model fit (Hu and Bentler, 1999). For the mediation tests, bias-corrected, bootstrapped 95% confidence intervals were computed to determine the statistical significance of the indirect effect from 1,000 bootstrapped samples (MacKinnon, Lockwood, and Williams, 2004).

## 6. Findings

### 6.1 Descriptive statistics

Table 1 reports the prevalence rates for each item used in the cumulative risk score. The lower part of the table presents the distribution of the score. These statistics show that 27.4 % of the children in the sample were not exposed to a single childhood risk factor, and a similar number (27.7 %) were afflicted with only one risk characteristic. In other words, more than 50 % of the individuals in the sample had fewer than 2 childhood risk factors. The highest risk score was capped at 6 or more (5.2 %;  $n = 301$ ). The rate of officially sanctioned criminal offending equals 16.5 % in this sample. As expected, the male crime rate (25.1 %) was substantially higher than the female rate (8.6 %). Consistent with the cumulative risk perspective, Figure 2 demonstrates a strong bivariate association between the level of childhood cumulative risk and the criminal behavior. Slightly more than 10 % of individuals in the no-risk category had acquired a criminal record by age 20. Criminality increases at a steady rate as the number of childhood risk factors gets higher, reaching 30 % among those with six or more risk factors.

Table 2 reports the means and standard deviations of the indicators of latent variables hypothesized to mediate the association between childhood cumulative risk and crime. In the total analysis sample, average levels of externalizing behaviors and low self-regulation were relatively low, whereas average levels of substance involvement, particularly alcohol use, were moderate.

### 6.2 Measurement model

The measurement model displayed acceptable fit ( $\chi^2 (477 \text{ df}, N = 5,743) = 5330.17, p < .05$ , CFI = .97, RMSEA = .04). The CFA analysis included all indicators for adolescent mediators, CCR, criminal record, and male sex. As shown in Table 3, all factor loadings were statistically significant, ranging in standardized values from .54 to .99. Table 4 reports correlations among study variables from the CFA. All the correlation coefficients were statistically significant, ranging in magnitude from .41 (male gender with criminal record) to .04 (male gender with educational marginalization and externalizing behavior). The moderate correlations ( $r < .23$ ) among the latent variables indicates that each factor measures

a distinct construct. Childhood cumulative risk was positively related to the four latent variables and to the measure of criminal offending. As childhood risk exposure increased, so did substance misuse, externalizing behavior, low self-regulation, educational marginalization, and the likelihood of acquiring a criminal record. All latent variables had positive and significant relationships with criminal offending. Finally, male sex was positively related to cumulative risk, externalizing behavior, low self-regulation, and crime; and negatively related to substance misuse.

### 6.3 Structural model

Figure 3 presents standardized path coefficients from the structural model, which displayed acceptable fit:  $\chi^2(477 \text{ df}, N=5,743) = 5007.92, p < .05, CFI = .97, RMSEA = .04$ . Although not depicted in the figure, correlations between the disturbances of the endogenous latent mediator variables were estimated. Additionally, sex was included as a covariate in the estimation of direct effects of childhood cumulative risk on adolescent mediators and adult criminal record. Table 5 reports the estimated direct, indirect, and total effects from the model. Childhood cumulative risk had positive direct effects on all four mid-adolescent mediators. The results show that exposure to childhood cumulative risk was positively related to educational marginalization and substance misuse in adolescence. Childhood cumulative risk was also positively related to externalizing behavior and low self-regulation in adolescence. Importantly, educational marginalization was significantly related to criminal offending ( $\beta = .13, p < .05$ ) net of individual differences in self-regulation, substance misuse, and externalizing behavior. The direct effect of childhood cumulative risk was not statistically significant. Males were at increased risk of acquiring a criminal record compared to females.

The indirect effect of childhood cumulative risk through three of the adolescent mediators was significant, suggesting that the effects of childhood cumulative risk operate through adolescent educational marginalization, substance misuse, and externalizing behavior. Educational marginalization mediated 33 % of the total effect of childhood cumulative risk on criminality, while externalizing behavior and substance misuse (i.e., the delinquent behavior pathway) mediated 47 % of this effect. The indirect effect of childhood cumulative risk through low self-regulation was not statistically significant.

### 6.4 Supplementary analysis

The outcome variable used in this research measured officially sanctioned offending from 15 through 19-20 years of age. Adolescent mediators were assessed at age 15, which means that some adolescents in this sample may have acquired a criminal record prior to the assessments of educational marginalization, self-regulation, substance misuse, and externalizing behavior. In other words, it is possible that, for these individuals, the experience of a criminal label influenced their self- or parent reports on these variables. In an effort to address potential bias caused by this issue, the analyses were repeated without those members of the birth cohort who had acquired a criminal record prior to age 16 ( $n = 24$ ). The CFA displayed acceptable fit,  $\chi^2(477 \text{ df}, N=5,719) = 5262.00, p < .05, CFI = .97, RMSEA = .04$ , and replicated the correlations and factors loadings displayed in Tables 3 and 4. The SEM also displayed acceptable fit,  $\chi^2(477 \text{ df}, N=5,719) = 4947.24, p < .05, CFI = .$

97, RMSEA = .04, and reproduced the findings reported in Table 5 (results available from authors).

## 7. Discussion

Most contemporary theories of crime recognize that childhood is a critically important period in the etiology of criminal offending. However, while dispositional theories pay limited attention to processes occurring at later stages of human development, social-developmental theories maintain that adolescent and later life circumstances play a meaningful role in complete explanations of criminal behavior. Focusing on the adolescent educational experience, the present study was organized around this fundamental tension in life course criminology.

Consistent with the cumulative risk perspective, and confirming Hypothesis 1, the results showed that children exposed to multiple risk factors were at increased risk of acquiring a criminal record by age 20. The association was monotonic, such that individuals with six or more risk factors were more than twice as likely to have a registered offense than those with zero or one risk factors. In support of Hypothesis 2, a major share (53.3%) of the longitudinal association between CCR and criminal offending was mediated by factors indicating continuity in antisocial behavior: low self-regulation and prior delinquent behavior (i.e., substance misuse and externalizing behavior). However, the main research goal, as expressed in Hypothesis 3, was to see if a meaningful share of the CCR effect on crime was related to the adolescent educational experience. The results from the SEM showed that as much as one-third (33%) of the total association was mediated by adolescent educational marginalization. This pathway is, if anything, stronger than anticipated, suggesting that exclusion from the educational mainstream is an important mechanism whereby children at risk become involved in criminal behavior in late adolescence, net of preexisting antisocial dispositions

The debate between continuity and change is important not just for theory but also for public policy. The patterns observed in this research suggest that criminal careers may be curbed with interventions targeted at reducing adolescent educational marginalization. This observation is particularly encouraging in light of the increasing availability of effective interventions in schools and other settings. It appears that programs that combine early identification with comprehensive services are the most promising (Belfanz, Herzog, and Mac Iver, 2007; Wilson and Tanner-Smith, 2013)

Although investigating the educational pathway was the focus of this analysis, it is important to note the salience of *substance misuse* as a mediating variable between CCR and criminal offending. Similar to educational marginalization, adolescent involvement in alcohol and drugs can be understood as a modifiable factor with high potential for effective intervention. Using national data spanning 2001-2007, Kumar and colleagues (2013) reported that 64% of 8<sup>th</sup>, 10<sup>th</sup>, and 12<sup>th</sup> grade students received locally developed substance use prevention programming in their schools. There remains a need for schools to increase the use of tested and proven prevention programs (Ringwalt et al., 2009). A growing body of research

indicates that such programs, when implemented with fidelity, can be effective at preventing and reducing substance use (Botvin et al., 2000; Foxcroft et al., 2003; Spoth et al., 2009).

The absence of a statistically significant association between the adolescent measure of low self-regulation and criminal offending in the structural model may require some explanation. This result does not mean that individual differences in self-regulation are inconsequential. As reported in Table 4, the bivariate association between low self-regulation and criminal record equals .22, which is somewhat higher than the correlation between externalizing behavior and crime ( $r = .19$ ) and roughly equal to the correlation between educational marginalization and crime ( $r = .23$ ). These observations suggest that the criminogenic effect of low self-regulation is contained in the other mid-adolescent mediators featured in our parallel mediation model, operating as more proximate determinants of criminal offending.

The current study is not without limitations. First, this research relied on official records as the measure of criminal behavior. Because official statistics are products of the criminal justice system, they may be biased by variation in enforcement practices. For example, it is possible that substance misuse is related to official criminality because intoxicated offenders are more likely to get caught than sober ones. Although we cannot rule out the presence of such bias in the results, the association between substance misuse and offending has been documented in studies using alternative measures, such as self-reports and victim surveys (Felson and Burchfield 2007; Felson et al., 2008). Low academic performance – an important element of the educational marginalization construct – is likely negatively related to cognitive ability and/or family socioeconomic status. Perhaps individuals with lower levels of intelligence are more likely to be apprehended by law enforcement (Cullen et al., 1997). While this remains a concern, an empirical assessment of the differential detection hypothesis found no support for the assumption (Moffitt and Silva, 1988). In general, Finland stands out in international comparisons as a nation with minimal levels of corruption (Treisman, 2007) and an exceptionally high level of trust in the police (Kääriäinen, 2007). Although these characteristics do not preclude bias in criminal justice processing, they suggest the amount of such bias is likely to be low.

Second, although the Finnish context can be viewed as a strength of this study – given the dearth of similar research from this socio-cultural context – the fact that the ethnic background of all participants was the same may limit the external validity of the findings. Another limitation is that the data were drawn from a single source at each developmental period studied and were primarily self-reported (i.e., mothers, adolescents). Findings may differ if data were gathered from multiple raters across domains. However, given the large scope of this birth cohort study, it was not feasible to obtain multiple sources of information for each variable of interest.

In conclusion, the evidence from this research supports the assumption that life course experiences beyond childhood matter to criminal offending. From the perspective of policy and prevention, the main implication of this research is that efforts to curb criminal behavior should not focus exclusively on prenatal and early childhood risk factors, but should also cover factors emerging at adolescent stages of development. During adolescence, educational marginalization appears to operate as an influential pathway to crime. As such,

targeted interventions to prevent educational marginalization and substance misuse may be promising avenues to reduce criminal offending in late-adolescence.

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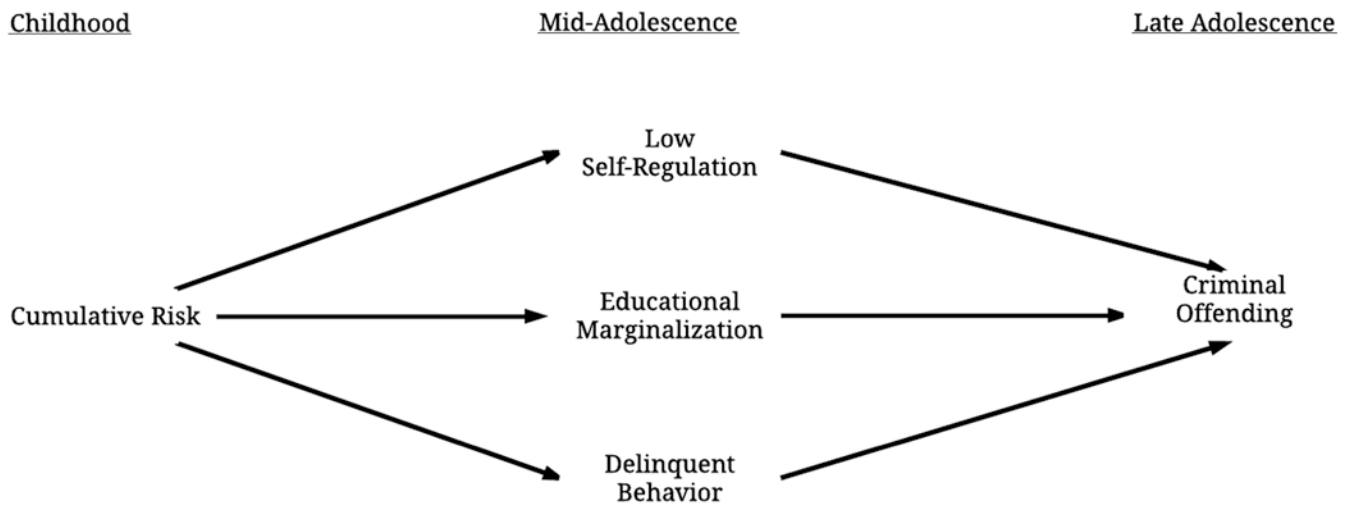
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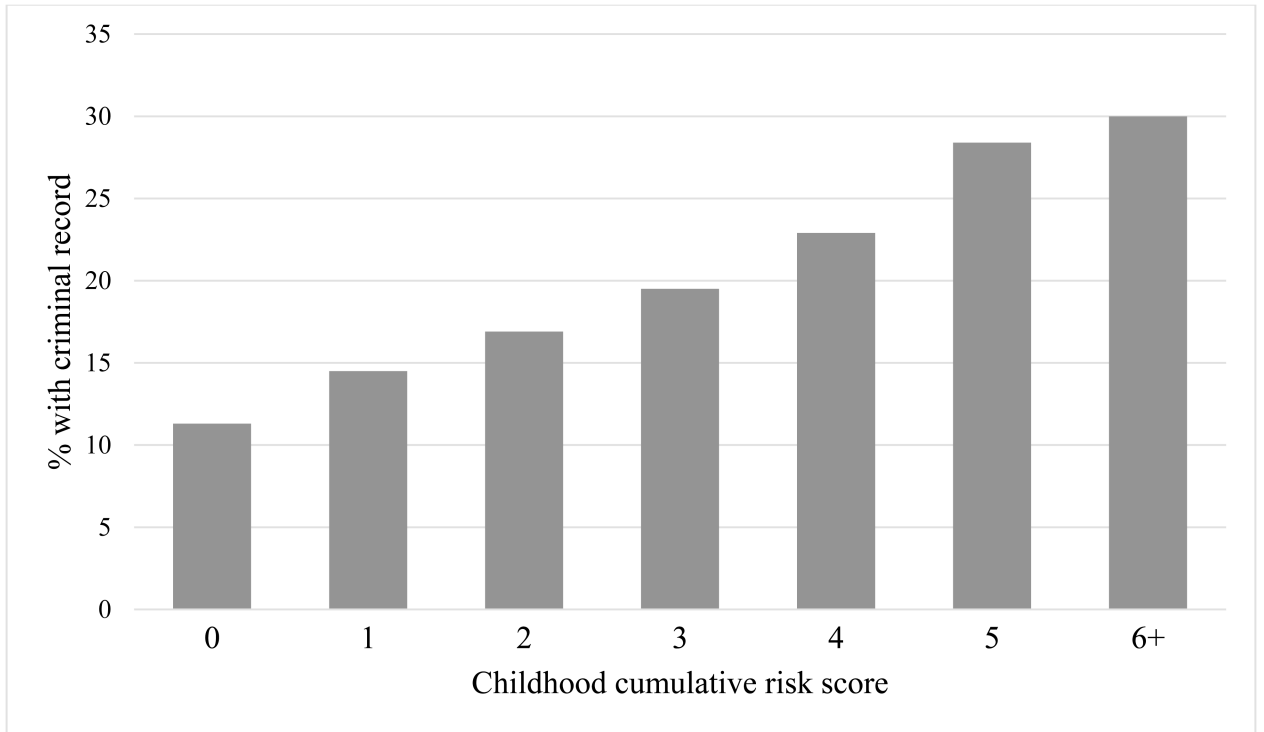
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**Fig 1.**  
Theoretical Model.



**Fig 2. Prevalence of Officially Sanctioned Criminal Offending by Level of Childhood Cumulative Risk**



**Table 1**  
**Prevalence of childhood cumulative risk items and distribution of the risk score**

<b>Risk factor</b>	<b>Percent</b>	<b>N</b>
<i>Socioeconomic</i>		
Labor market exclusion (mother)	6.7	383
Labor market exclusion (father)	5.2	296
Low maternal education	22.2	1,277
Low family income	12.0	692
Material deprivation	14.7	846
<i>Family structure and parent characteristics</i>		
Single parent	3.7	210
Non-coresident parent	10.3	593
Stepsibling	2.2	125
Multiple unions	5.1	292
Maternal smoking	12.6	722
Teenage mother	2.2	129
Heavy drinking father	8.2	471
<i>Child psychological risk</i>		
Antisocial	6.6	377
Hyperactive	6.3	361
Low aptitude	8.1	468
Reading difficulties	11.1	639
Poor concentration	14.8	580
Short-tempered	4.7	271
Teases	20.1	1,156
Disobeys	4.9	281
<i>Childhood cumulative risk score</i>		
0	27.4	1,571
1	27.7	1,558
2	17.7	1,015
3	11.8	676
4	7.2	414
5	3.6	208
6+	5.2	301

Note: N = 5,743

**Table 2**  
**Means and standard deviations of latent construct indicators**

<b>Factor/Indicator</b>	<b>M(SD)</b>	<b>Range</b>
<i>Educational Marginalization (EM)</i>		
Performance in social studies	1.84 (0.63)	1-4
Performance in mother tongue	1.81 (0.59)	1-4
Performance in mathematics	1.94 (0.78)	1-4
Performance in science	1.93 (0.68)	1-4
Poor school work	1.38 (0.56)	1-3
General track dropout	0.27 (0.44)	0-1
Dislikes school	0.04 (0.20)	0-1
<i>Externalizing behavior (EB)</i>		
Mean	1.23 (0.44)	1-3
Destroys personal property	1.10 (0.31)	1-3
Destroys others' property	1.05 (0.23)	1-3
Fights	1.09 (0.31)	1-3
Spends time with troubled peers	1.20 (0.45)	1-3
Cheats or lies	1.25 (0.45)	1-3
Physically attacks others	1.19 (0.43)	1-3
Runs away	1.05 (0.23)	1-3
Steals from home	1.06 (0.27)	1-3
Steals from other places	1.03 (0.19)	1-3
Threatens others	1.09 (0.31)	1-3
<i>Low Self-Regulation</i>		
Considers consequences	-.88 (1.17)	-3-3
Completes tasks	-.89 (1.23)	-3-3
Persists in activities	-.76 (1.15)	-3-3
Thinks before acts	-.95 (1.19)	-3-3
Controls impulses	-.99 (1.18)	-3-3
<i>Substance Misuse (SM)</i>		
Lifetime frequency of alcohol use	2.60 (1.34)	1-6
Lifetime freq. of intoxicated drinking	3.33 (2.18)	1-7
Annual freq. of intoxicated drinking	2.62 (1.69)	1-7
Monthly freq. of intoxicated drinking	1.50 (0.72)	1-7
Lifetime freq. of marijuana use	1.09 (0.42)	1-5
Regular smoker	0.13 (0.34)	0-1
Freq. of binge drinking (past 30 days)	0.70 (1.05)	0-5

Note: N = 5,743

**Table 3**  
**Factor loadings for latent constructs**

Factor/Indicator	<i>b</i>	$\beta$
<i>Educational Marginalization (EM)</i>		
Performance in social studies	1.00 <sup>f</sup>	0.73
Performance in mother tongue	0.96	0.70
Performance in mathematics	0.98	0.71
Performance in science	1.09	0.79
Poor school work	1.05	0.76
General track dropout	0.80	0.59
Dislikes school	0.74	0.54
<i>Externalizing behavior (EB)</i>		
Mean	1.00 <sup>f</sup>	0.59
Destroys personal property	1.15	0.67
Destroys others' property	1.28	0.75
Fights	1.31	0.76
Spends time with troubled peers	1.24	0.73
Cheats or lies	1.05	0.62
Physically attacks others	1.24	0.72
Runs away	1.23	0.72
Steals from home	1.11	0.65
Steals from other places	1.31	0.77
Threatens others	1.24	0.73
<i>Low Self-Regulation</i>		
Considers consequences	1.00 <sup>f</sup>	0.71
Completes tasks	1.22	0.82
Persists in activities	1.20	0.86
Thinks before acts	1.17	0.82
Controls impulses	1.06	0.75
<i>Substance Misuse (SM)</i>		
Lifetime frequency of alcohol use	1.00 <sup>f</sup>	0.80
Lifetime freq. of intoxicated drinking	1.25	0.99
Annual freq. of intoxicated drinking	1.20	0.95
Monthly freq. of intoxicated drinking	0.65	0.72
Lifetime freq. of marijuana use	0.84	0.67
Regular smoker	0.95	0.78
Freq. of binge drinking (past 30 days)	0.98	0.74

Note. 1.0<sup>f</sup>: reference indicator fixed at unity for scaling and identification purposes. All factor loadings were statistically significant ( $p < 0.001$ ).

$\chi^2$  (477 df,  $N=5,743$ ) = 5330.11,  $p < .05$ , CFI = .97, RMSEA = .04

Table 4

## Correlations among study variables from CFA

	1.	2.	3.	4.	5.	6.	7.
1. Male	---						
2. Childhood cumulative risk	.27*	---					
3. Criminal record	.41*	.32*	---				
4. Educational marginalization	.04*	.41*	.23*	---			
5. Externalizing behavior	.04*	.16*	.19*	.16*	---		
6. Low self-regulation	.12*	.34*	.22*	.18*	.18*	---	
7. Substance misuse	-.06*	.28*	.26*	.22*	.22*	.21*	---

Note: Model fit:  $\chi^2$  (477 df;  $N = 5,743$ ) = 5330.17,  $p < .05$ , CFI = .97, RMSEA = .04



Table 5

## Standardized direct, indirect, and total effects of cumulative risk

	EM	EB	LSR	SM	Criminal Record
<i>Direct Effects</i>					
Cumulative Risk (CCR)	.34 (.31, .36)*	.16 (.13, .19)*	.23 (.20, .25)*	.22 (.19, .25)*	.02 (-.01, .05)
Male	-.01 (-.04, .01)	.04 (.01, .07)*	.08 (.06, .11)*	-.09 (-.12, -.07)*	.32 (.29, .35)*
Educ. marginalization	--	--	--	--	.13 (.10, .18)*
Externalizing behavior	--	--	--	--	.14 (.09, .19)*
Low Self-Regulation	--	--	--	--	.05 (.00, .09)
Substance misuse	--	--	--	--	.21 (.17, .25)*
<i>Indirect Effects</i>					
CCR → EM	--	--	--	--	.05 (.03, .06)*
CCR → EB	--	--	--	--	.02 (.01, .03)*
CCR → LSR	--	--	--	--	.01 (.00, .02)
CCR → SM	--	--	--	--	.05 (.04, .06)*
<i>Total Indirect Effect</i>					
CR → EM, EB, LSR, SM	--	--	--	--	.13 (.11, .14)*
<i>Total Effect</i>	--	--	--	--	.15 (.11, .17)*
<i>Proportion of total effect mediated</i>					
EM					Percent
EB					33.3
LSR					13.3
SM					6.7
<i>Total</i>					33.3
					86.6

Note: Standardized Coefficients. Bootstrapped and bias-corrected 95% confidence intervals in parentheses (1,000 replications).

\*  $p < .05$

Model Fit:  $\chi^2 (477 \text{ df}, N = 5,743) = 5007.92, p < .05, CFI = .97, RMSEA = .04$ .