

Developmental predictors of offending and persistence in crime: A systematic review of meta-analyses

Miguel Basto-Pereira^{a,*}, David P. Farrington^b

^a William James Center for Research, ISPA-Instituto Universitário, R. Jardim do Tabaco 34, 1100-304 Lisboa, Portugal

^b Institute of Criminology, Cambridge University, Sidgwick Avenue, Cambridge CB3 9DA, United Kingdom

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ABSTRACT

Meta-analyses have provided major findings about developmental predictors of offending. However, there has been little focus on their relative ability to predict offending behaviour. Therefore, we conducted a systematic review of meta-analyses with two aims: 1) to summarize all well-established knowledge about developmental (explanatory) predictors of offending, and 2) to sort those predictors according to their effect size. The strongest predictors of general offending were related to family/parental dimensions. Delinquent peers, school/employment problems, family problems, certain types of mental health problems, and alcohol/substance abuse were the most important predictors of persistence in crime. Our findings suggest the crucial role of family-related developmental predictors in preventing offending. The predictors of persistence in crime highlight the multi-systemic nature of persistent antisocial behaviour.

1. Introduction

A deep understanding of developmental factors that longitudinally predict offending and persistence in crime is particularly relevant in explaining offending and in addressing the causes of criminal behaviour effectively. Because our interest is in explanation rather than pure prediction, we focus on explanatory predictors, defined as those that are measuring an underlying construct that is different from antisocial behaviour. Thus, we exclude behavioural predictors such as previous offending, aggression or conduct disorder.

Over the last 50 years, multiple longitudinal studies have been initiated to advance knowledge about the factors predating or causing criminal behaviour (Farrington, 2013; Jolliffe et al., 2017). Different longitudinal studies have addressed distinct sets of different predictors, and these studies have found a multitude of important risk factors for delinquency and conduct disorder, such as poor parental supervision, impulsiveness, low IQ, family disruption, social inequality, school problems, and antisocial models (Farrington et al., 2017; Murray & Farrington, 2010).

The various longitudinal studies (e.g., Cambridge Study in Delinquent Development; Pittsburgh Youth Study; Dunedin Longitudinal Study) conducted over the years have resulted in a new era of theories on developmental criminology (Farrington, 2006; Loeber, 2019; Moffitt,

2018; Wikstrom et al., 2012), with several practical implications for justice policies (e.g., Zane, 2021), assessment tools (e.g., Wormith, 2011), and more effective interventions (e.g., Tremblay et al., 2003).

These advancements have also led to some scientific consensus across studies and contemporary theoretical approaches. For example, nowadays it is known that juvenile delinquency is an important risk factor for adult criminal behaviour, although it is also known that most youth offenders will cease their criminal behaviour when entering adulthood (e.g., Farrington, 2003; Laub & Sampson, 2001; Moffitt, 1993, 2018). In addition, the most serious and chronic criminal careers are influenced by both environmental (e.g., antisocial peers) and individual/temperamental (e.g., impulsiveness) risk factors during childhood (Cicchetti, 2016; Farrington, 2003; Laub & Sampson, 2001; Moffitt, 1993).

In contrast, there are still many controversial issues about criminal career development. Whereas we know that some of the risk factors that explain or predate delinquency are similar across longitudinal studies (e.g., antisocial models), the relative importance of each of these causes, the interaction of each with age or gender, or the processes explaining how each potential causal mechanism influences the decision to initiate, persist, or desist from a criminal career are still far from achieving scientific consensus (e.g., for a review, see Basto-Pereira & Maia, 2017 and Siegel, 2015). For example, Laub and Sampson (2001) argued that

* Corresponding author.

E-mail address: miguelbastopereira@hotmail.com (M. Basto-Pereira).

youths with delinquent patterns share similar childhood risk factors regardless of the seriousness or chronicity of criminal behaviour, and it is the strengthening of bonds with society later in life (e.g., entering the labor market, marriage) that is the main reason for the cessation of criminal careers. In opposition, for Moffitt (1993, 2018), the factors explaining persistence/desistance from crime during adulthood are mostly dependent on causal mechanisms already present during childhood (e.g., neuropsychological problems, uncontrolled behaviour, inadequate parenting).

To overcome many of these controversial issues, meta-analyses of longitudinal studies appeared as a solution to provide a reliable and replicable strategy of summarizing results and identifying common patterns across studies. Consequently, in recent years, there have been an increasing number of meta-analyses in this field, as a result of the need to summarize the studies from multiple cohorts and provide solid evidence-based knowledge about the mechanisms underlying crime. Different dimensions of general offending have been tested across a set of meta-analyses of longitudinal studies, including child maltreatment (Braga et al., 2017), parental supervision (Flanagan et al., 2019), and individual/temperamental characteristics (e.g., intelligence; Tfofi et al., 2016). In addition, some meta-analyses have also reviewed the predictors of persistence in crime among justice-involved youths.

The main aim of meta-analyses that analyse long-term longitudinal studies is to understand whether different types of social, psychological, or biological factors during development temporally predict offending or persistence in crime. Therefore, the intrinsic question in this type of study is often related to the level of significance: Do scientific studies indicate that factors during development increase the risk of later offending? A significance value below 0.05 is typically interpreted as a “yes”. However, *p*-values do not measure effect size (e.g., Wasserstein & Lazar, 2016). In the case of very small effect sizes, conclusions based on *p*-values might be misleading or deceptive for various reasons. First, predictors with very small effect sizes might be so close to zero that in practice their effect is irrelevant for interventions or public policies (Sullivan & Feinn, 2012; Szucs & Ioannidis, 2017). Second, criminal behaviour, like any other human behaviour, is an extremely complex phenomenon reflecting the interaction of a large and intricate network of societal, familial, and biological factors (Szucs & Ioannidis, 2017; Woods, 1988). In this article, we focus on effect sizes.

1.1. The current study

To advance knowledge about the mechanisms underlying criminal behaviour, there is a need to map the multitude of relationships provided by meta-analytic studies and to refocus on what effect sizes across meta-analyses of longitudinal studies tell us about the causes of criminal behaviour. In other words, a deeper understanding of the most important mechanisms underlying offending reported across meta-analyses has several advantages. It enables us 1) to test the empirical validity of current theories of crime, 2) to know what needs to be tested in future meta-analyses, and maybe most crucially, 3) to identify the most important explanatory predictors of crime; these will contribute to developing more accurate risk assessment tools and more effective interventions to prevent offending and future recidivism.

In addition, previous research (Basto-Pereira et al., 2015) has noted significant differences between developmental predictors of youth offending in the community population when compared with predictors of recidivism among justice-involved youths. From a theoretical and legal point of view, youths previously exposed to the justice system are typically older and affected by a larger number of risk factors (Loeber & Farrington, 2012). In this regard, the first contact with the justice system often causes or aggravates the risks of labeling effects and deviant peer contagion (e.g., Bernburg et al., 2006; Dishion & Tipsord, 2011). Thus, predictors of general offending in community populations, particularly when measured during childhood, are normally more representative of the very early stages of a criminal career, while developmental

predictors of persistence in crime may involve the presence of multiple risk factors developed as a consequence of criminal career progression during adolescence in interplay with the consequences of early justice contact. For this reason, it is particularly relevant to study developmental predictors of offending in both cases, in the general community, and among justice-involved youths.

Therefore, focusing on addressing these concerns, we conducted a systematic review of meta-analyses to address these two main aims: 1) to summarize all the well-established knowledge about developmental predictors of offending and 2) to sort those predictors by their importance (effect size) for predicting offending in the general population or persistence in crime among justice-involved youths.

2. Methods

2.1. Search process and eligibility criteria

Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009), systematic literature searches were conducted in six major databases—*Web of Science*, *Scopus*, *PsychINFO*, *PsychARTICLES*, *Scielo*, and *PubMed*—to identify meta-analyses analysing characteristics that longitudinally predict antisocial behaviour during adolescence and adulthood. In addition, a search was conducted manually in key journals that publish meta-analyses. Meta-analyses were searched from the very beginning of the databases until January 25, 2020. The following search terms and Boolean operators were used: *meta-analysis* AND *delinquen** OR *offend** OR *violen** OR *recid** OR *crim** OR *antisocial* OR *conduct problems* OR *disruptive* OR *rearrest* OR *reoffend** AND *(None)* OR *predict** OR *factors* OR *desist** OR *persist**; this resulted in 50 search combinations.

For a study to be considered eligible, it must a) be a meta-analysis, b) analyse psychological, social, or biological characteristics during childhood or adolescence predicting antisocial outcomes (e.g., rearrests, convictions) later in life, c) analyse explanatory predictors of criminal behaviour, d) have diversified samples of offenders or community samples, and e) be published in English, Spanish, or Portuguese in peer-reviewed journals up to January 25, 2020. The following exclusion criteria were adopted: a) the outcome evaluated only a particular type of crime, b) the meta-analysis was conducted in a community or offending sample with specific characteristics (e.g., offenders with mental illness), c) longitudinal effect sizes were not reported, or could not be directly calculated using the data provided, d) the meta-analysis did not provide well defined and rigorous definitions of measures, outcomes, and inclusion/exclusion criteria, e) there was a lack of explanatory predictors of crime tested, f) the meta-analysis did not examine predictors during childhood/adolescence, and g) the predictors of interest for this study were based on fewer than two studies.

2.2. Study selection and data collection

The study selection process was conducted in the following order: 1) removal of duplicates, 2) screening abstracts for exclusion of papers not fulfilling the eligibility criteria, and 3) all the papers that were not excluded after abstract-screening were read through carefully to ensure the exclusion of all studies that were not in compliance with the pre-established criteria.

Information was obtained from the selected meta-analyses on the following topics: a) the source (bibliographic reference), b) the participants' genders, c) the types of predictors, d) the participants' ages when predictors were measured (childhood versus adolescence versus mixed), e) the number of studies analysed by predictors in each meta-analysis, f) the standardized mean effect sizes, g) the *p*-values, h) the types of outcome, and i) the participants' ages when outcomes were measured.

2.3. Synthesis of results and analytic strategy

Detailed information about each predictor, from each meta-analysis included, was collected and described in detail. Mean effect sizes were converted to r metrics. Each predictor was placed in one of two tables: predictors of crime or predictors of persistence in crime during adulthood. The outcome of persistence in crime includes meta-analyses assessing predictors of recidivism during adulthood among justice-involved youths, and meta-analyses assessing predictors of life-course persistent (versus adolescence-limited) trajectories of criminal behaviour. The effect size of each longitudinal predictor of crime is presented separately for males and females if an included meta-analysis reports that effect size separately by gender (e.g., predictor: low-attainment–Females, predictor: low-attainment–Males).

Static predictors (e.g., gender; ethnicity), and behavioural predictors of crime, measuring a similar underlying construct to offending (e.g., previous offending, aggression or conduct disorder), were excluded from our analyses, which focused on explanatory predictors. Subsequently, the developmental predictors were separated into two different categories: predictors of general offending and predictors of recidivism among youths with a history of offending. For reasons of simplicity and clarity, all predictive factors were coded in the risk direction. Information about reversed factors are provided in each table (e.g., Prosocial peer relations reversed to Low prosocial peer relations).

In a subsequent analysis, those predictors were ordered by their effect size, from the larger to the smaller effects. Detailed information about each predictor was provided (e.g., bibliographic reference, number of effect sizes included, etc.). Non-significant predictors, or predictors with an effect size r smaller than 0.10, were excluded from these analyses because we aimed to identify the strongest explanatory predictors of crime. Also, to avoid bias caused by a very small number of independent samples (including an overestimation of the real effect size), in this meta-synthesis of findings, all the predictors tested in less than five samples were excluded. According to Jackson and Turner (2017, p. 290): “5 or more studies are needed to reasonably consistently achieve powers from random-effects meta-analyses that are greater than the studies that contribute to them”. Lastly, predictors were analysed as major dimensions to add comprehensibility and interpretability to our analysis.

We have excluded predictors with small values of r from Tables 3 and 4 in order to highlight the strongest predictors. However, small values of r (e.g., $r = 0.10$) do not necessarily indicate weak relationships. For example, consider a 2×2 table relating a dichotomous risk factor to a dichotomous outcome such as delinquency. Assume that there are 100 people in the risk category out of a total of 400, and that 100 of the total number of people become delinquent. Now, if 33 out of 100 (33 %) in the risk category become delinquent, compared with 67 out of 300 (22.3 %) in the non-risk category, the product-moment correlation r (also called the phi correlation in a 2×2 table) would be 0.107. In general, an r value of 0.10 would correspond to an absolute difference of about 10 % between risk and non-risk categories in a 2×2 table (for all the relevant formulae, see Farrington & Loeber, 1989). However, the relative difference is substantial; almost 50 % more of those in the risk category became delinquent, compared with those in the non-risk category (33 % compared with 22.3 %). This effect therefore cannot be considered insignificant.

3. Results

3.1. Selected meta-analyses

A total of 4095 articles were found. Of the 4095 articles, 3149 were duplicates. Titles and abstracts were screened for the remaining 946, and 869 were excluded from these initial screening, mainly because the articles found were not meta-analyses. Seventy-seven meta-analyses passed the initial screening and were retained for full-text reading.

Sixty-three meta-analyses were excluded for the following reasons: a) 21 meta-analyses did not examine predictors during childhood/adolescence, b) 14 meta-analyses did not test longitudinal predictors of general offending, c) 13 meta-analyses did not test causal, explanatory, dynamic predictors of crime, d) 10 meta-analyses evaluated only a particular type of crime or category of crime, e) two meta-analyses were conducted in a sample with specific characteristics (e.g., only individuals with psychiatric diagnoses), f) in two studies, predictors of general offending were evaluated in samples mixing minors and adults, g) in one meta-analysis, the predictors of interest were tested with fewer than two studies. Fourteen meta-analyses of longitudinal studies assessing developmental predictors of general offending and/or persistence in crime during adulthood were included (see Fig. 1).

3.2. Study characteristics

This systematic review included 14 meta-analyses of longitudinal studies. Eleven meta-analyses tested developmental predictors of general offending (Braga et al., 2017; Braga et al., 2018; Derzon, 2010; Flanagan et al., 2019; Hoeve et al., 2012; Leschied et al., 2008; Portnoy & Farrington, 2015; Reaves et al., 2018; Spruit et al., 2016; Tfofi et al., 2016; Wilson et al., 2009), while three meta-analyses tested developmental predictors of recidivism (Assink et al., 2015; Cottle et al., 2001; Scott & Brown, 2018). The meta-analyses were published between 2001 (Cottle et al., 2001) and 2019 (Flanagan et al., 2019) in peer-reviewed journals. Thirteen meta-analyses examined our predictors of interest using gender-mixed samples, while one of the studies (Scott & Brown, 2018) conducted analyses separately for males and females. Twelve meta-analyses reported mean effect sizes using r or Cohen's d metrics, while two studies used different metrics, namely, the Odds-Ratio or OR (Tfofi et al., 2016) and Fisher's Z , which is similar to r (Cottle et al., 2001). For all the effect sizes provided, a conversion to r metrics was performed.

Eleven meta-analyses included only longitudinal designs, while three meta-analyses included and analysed separately studies with cross-sectional and longitudinal designs (Portnoy & Farrington, 2015; Spruit et al., 2016; Wilson et al., 2009). All the studies testing predictors of recidivism included only studies with longitudinal designs. The number of samples included in those meta-analyses ranged between 13 (Reaves et al., 2018) and 119 (Derzon, 2010); on average each meta-analysis included approximately 44 independent samples. Three longitudinal studies (Braga et al., 2018; Flanagan et al., 2019; Portnoy & Farrington, 2015) evaluated criminal and non-criminal forms of antisocial behaviour together; we recalculated the mean effect size only for criminal behaviour.

Eight meta-analyses did not differentiate childhood from adolescent predictors of offending or recidivism, while six meta-analyses (Braga et al., 2017; Cottle et al., 2001; Leschied et al., 2008; Scott & Brown, 2018; Spruit et al., 2016; Wilson et al., 2009) analysed the impact of predictors on specific phases of life using a longitudinal design (childhood or adolescence). All the meta-analyses testing predictors of offending used outcomes measured during adolescence or adulthood, while outcomes of recidivism among young offenders were always assessed during adulthood. For a detailed description of all the tested developmental predictors of offending and persistence in crime, see Tables 1 and 2.

Generally, the significance tests use two-tailed p -values, but one-tailed tests would be justified in the light of clear directional predictors (based on risk factors). Therefore, the number of significant results is underestimated.

3.3. Summary of the meta-findings

Tables 3 and 4 summarize all the well-established longitudinal predictors of offending and persistence in crime and sort those predictors by their importance according to effect size. Since the objective was to

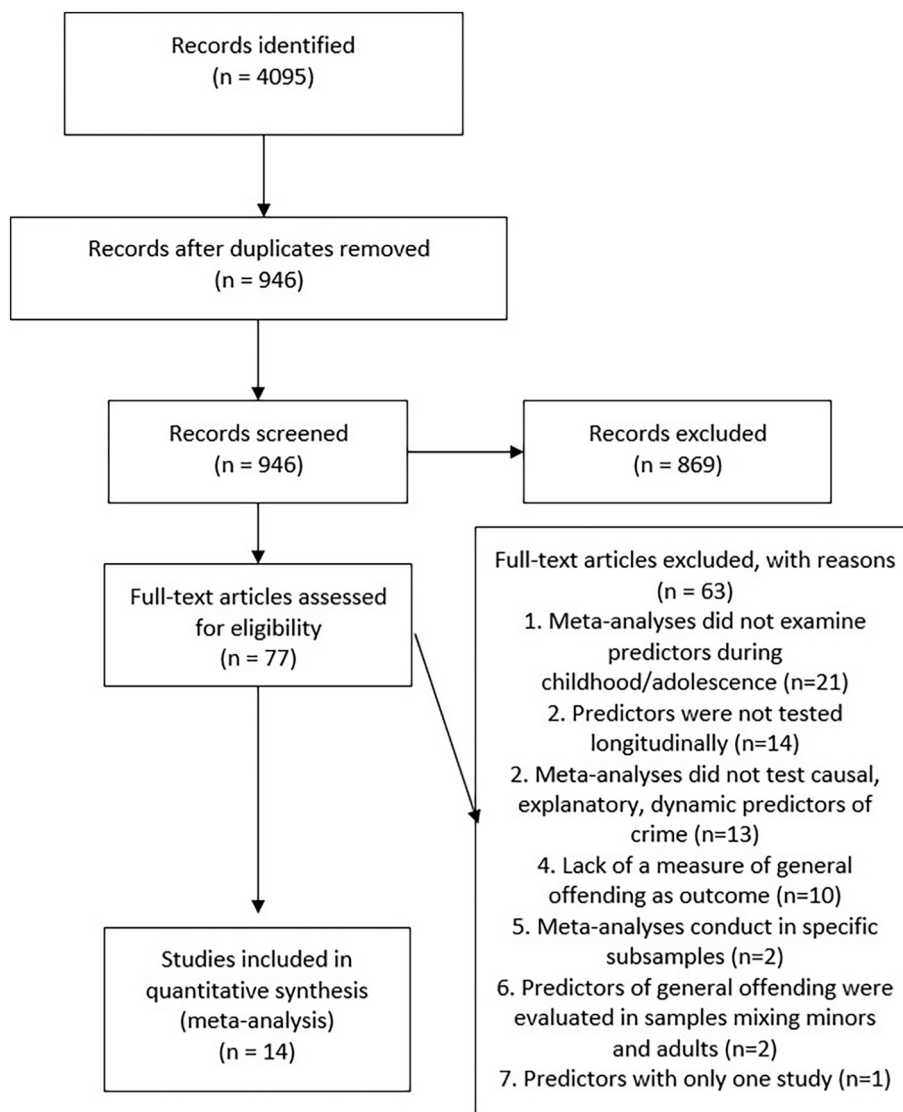


Fig. 1. Flow-diagram.

summarize the most important predictors of antisocial outcomes, non-significant predictors, predictors with relatively small effect sizes ($r < 0.10$) and those tested in fewer than five independent samples were excluded from these tables.

Of the 14 meta-analyses included in this study, 112 longitudinal predictors were identified: 1) 53 predictors of general offending across 11 meta-analyses, and 2) 59 predictors of persistence in crime across three meta-analyses. The largest effect sizes for general offending during childhood and adolescence were the family structure (e.g., child involved in the child welfare system; marital status of the parents) during adolescence ($r = 0.32$; Leschied et al., 2008), lack of child-rearing skills ($r = 0.26$; Derzon, 2010), home discord ($r = 0.26$; Derzon, 2010), family structure during childhood/adolescence ($r = 0.23$; Leschied et al., 2008), and low level of parental knowledge ($r = 0.22$; Flanagan et al., 2019). Lack of parental management was the best predictor of general offending during childhood ($r = 0.20$; Leschied et al., 2008), and family structure was the best predictor of general offending during adolescence ($r = 0.32$; Leschied et al., 2008).

The most important longitudinal predictor of persistence among

juvenile justice youths was non-severe pathology, such as stress or anxiety ($r = 0.30$; Cottle et al., 2001), female education/employment ($r = 0.25$; Scott & Brown, 2018), male-lack of prosocial peer relations ($r = 0.23$; Scott & Brown, 2018), family problems ($r = 0.22$; Cottle et al., 2001), and alcohol/drug abuse ($r = 0.21$; Assink et al., 2015).

Education/employment problems ($r = 0.25$ for females; Scott & Brown, 2018; to $r = 0.15$, Assink et al., 2015), family problems ($r = 0.22$, Cottle et al., 2001; to $r = 0.10$ for males, Scott & Brown, 2018), and (delinquent) Peers ($r = 0.20$, Cottle et al., 2001; to $r = 0.13$ for females, Scott & Brown, 2018), were consistent predictors of persistence in crime across all the meta-analyses, always showing effect sizes $r > 0.10$ across all three meta-analyses.

In addition, dimensions of alcohol or substance abuse and specific dimensions related to mental health were statistically significant predictors of persistence in crime. Specific dimensions of mental health, such as non-severe psychopathology (Cottle et al., 2001) and emotional and behavioural problems (Assink et al., 2015) were statistically significant predictors of crime with $r > 0.15$. The meta-analyses conducted by Scott and Brown (2018) addressing mental health as the presence of a

Table 1
Childhood and adolescent predictors of general offending.

Reference	Predictors	k	r	Age period - Predictor	Age period - Outcome
Braga et al. (2017)	Maltreatment	7	0.11*	Childhood	Adolescence
Braga et al. (2018)**	Maltreatment	8	0.14*	Childhood/adolescence	Adulthood
Derzon (2010)	Parent's education and expectations	3	0.30	Childhood/adolescence	Adolescence/adulthood
	(Lack of) child rearing skills	13	0.26*	Childhood/adolescence	Adolescence/adulthood
	Home discord and instability	11	0.26*	Childhood/adolescence	Adolescence/adulthood
	Family stress	10	0.21*	Childhood/adolescence	Adolescence/adulthood
	Maltreated as child	8	0.21*	Childhood/adolescence	Adolescence/adulthood
	Other family deviance	9	0.19*	Childhood/adolescence	Adolescence/adulthood
	(Lack of) warmth and relationship	22	0.18*	Childhood/adolescence	Adolescence/adulthood
	(Inappropriate) discipline	9	0.17*	Childhood/adolescence	Adolescence/adulthood
	Parent antisocial behaviour	11	0.15*	Childhood/adolescence	Adolescence/adulthood
	Foster care	5	0.14*	Childhood/adolescence	Adolescence/adulthood
	Urban housing	9	0.13*	Childhood/adolescence	Adolescence/adulthood
	Family size	9	0.11*	Childhood/adolescence	Adolescence/adulthood
	Broken home	25	0.10*	Childhood/adolescence	Adolescence/adulthood
	Unwanted pregnancy	5	0.10	Childhood/adolescence	Adolescence/adulthood
	Residential mobility	3	0.08*	Childhood/adolescence	Adolescence/adulthood
	Separated from parents	2	0.08*	Childhood/adolescence	Adolescence/adulthood
	Parent use and tolerate ATOD (alcohol, tobacco, and drug use of adolescents)	1	0.08	Childhood/adolescence	Adolescence/adulthood
	Young parent(s)	4	0.08	Childhood/adolescence	Adolescence/adulthood
	(Lack of) supervision and involvement	10	0.06	Childhood/adolescence	Adolescence/adulthood
	Parental psychopathology	4	0.02*	Childhood/adolescence	Adolescence/adulthood
Flanagan et al. (2019)**	Low level of parental knowledge ^a	8	0.22*	Childhood/adolescence	Adolescence/adulthood
	Low supervision ^a	18	0.18*	Childhood/adolescence	Adolescence/adulthood
	Child closure ^a	6	0.16*	Childhood/adolescence	Adolescence/adulthood
	Lack of parental rule setting ^a	4	0.12*	Childhood/adolescence	Adolescence/adulthood
Hoeve et al. (2012)	Low attachment ^a	17	0.17*	Childhood/adolescence	Adolescence/adulthood
Leschied et al. (2008)	Family structure adolescence	19	0.32*	Adolescence	Adulthood
	Family structure total	36	0.23*	Childhood/adolescence	Adulthood
	Parent management middle childhood	8	0.20*	Childhood	Adulthood
	Adverse family environment adolescence	15	0.19*	Adolescence	Adulthood
	Internalizing concerns adolescence	24	0.14	Adolescence	Adulthood
	Family structure middle childhood	5	0.13	Childhood	Adulthood
	Parent management total	17	0.12*	Childhood/adolescence	Adulthood
	Internalizing concerns - Total	42	0.11*	Childhood/adolescence	Adulthood
	Adverse family environment total	35	0.11*	Childhood/adolescence	Adulthood
	Family structure early childhood	12	0.08*	Childhood	Adulthood
	Adverse family environment early childhood	9	0.08*	Childhood	Adulthood
	Adverse family environment mid childhood	11	0.08*	Childhood	Adulthood
	Parent mental health-Total	36	0.07*	Childhood/adolescence	Adulthood
	Social and interpersonal concerns middle childhood	7	0.07	Childhood	Adulthood
	Parent mental health early childhood	21	0.07	Childhood	Adulthood
	Parent mental health adolescence	15	0.07	Adolescence	Adulthood
	Parent management adolescence	4	0.06	Adolescence	Adulthood
	Internalizing concerns middle childhood	14	0.05	Childhood	Adulthood
	Social and interpersonal concerns total	18	0.04	Childhood/adolescence	Adulthood
	Social and interpersonal concerns early childhood	7	0.01	Childhood	Adulthood
Portnoy and Farrington (2015)**	Low resting heart rate ^a	6	0.07*	Childhood/adolescence	Adolescence/adulthood
Reaves et al. (2018)	Negative school climate - Interpersonal relationships ^a	3	0.21*	Childhood/adolescence	Adolescence
	Negative school climate- Institutional environment ^a	16	0.14*	Childhood/adolescence	Adolescence
Spruit et al. (2016)	Lack of sports participation ^a	8	0.07*	Adolescence	Adolescence
Ttofi et al. (2016)	Low intelligence ^a	4	0.08	Childhood/adolescence	Adolescence/adulthood
Wilson et al. (2009)	Childhood violence exposure	3	0.15*	Childhood	Adolescence

Note. ** Using the data provided in the meta-analyses or direct contact with the author, overall effect sizes were recalculated including only longitudinal studies assessing childhood/adolescent predictors of general offending; k = Number of studies. *, $p < .05$. a = Reversed Protective Factor.

Table 2
Childhood and adolescent predictors of persistence in crime.

Reference	Predictor	k	r	Age period - Predictor	Age period - Outcome
Assink et al. (2015)	Alcohol/drug abuse	57	0.21*	Childhood/adolescence	Adulthood
	Sexual behaviour	7	0.20*	Childhood/adolescence	Adulthood
	Relationship	51	0.19*	Childhood/adolescence	Adulthood
	Emotional and behavioural problems	150	0.18*	Childhood/adolescence	Adulthood
	School/employment	63	0.15*	Childhood/adolescence	Adulthood
	Other	27	0.13*	Childhood/adolescence	Adulthood
	Family (problems)	273	0.12*	Childhood/adolescence	Adulthood
	Attitude	19	0.10*	Childhood/adolescence	Adulthood
	Physical health	14	0.04	Childhood/adolescence	Adulthood
	Neighborhood	16	-0.04	Childhood/adolescence	Adulthood
Cottle et al. (2001)	Nonsevere pathology	7	0.30*	Adolescence	Adulthood
	Ineffective use of leisure time ^a	2	0.23*	Adolescence	Adulthood
	Family problems	5	0.22*	Adolescence	Adulthood
	Delinquent peers	7	0.20*	Adolescence	Adulthood
	Number of out-of-home placements	2	0.18*	Adolescence	Adulthood
	Low standardized achievement score ^a	3	0.15*	Adolescence	Adulthood
	Substance abuse	6	0.15*	Adolescence	Adulthood
	Low full scale IQ ^a	5	0.14*	Adolescence	Adulthood
	History of special education	2	0.13*	Adolescence	Adulthood
	Victim of abuse	5	0.11*	Adolescence	Adulthood
	Low verbal IQ score ^a	4	0.11*	Adolescence	Adulthood
	Single parent	5	0.07*	Adolescence	Adulthood
	Low performance IQ score ^a	2	0.31	Adolescence	Adulthood
	Severe pathology	2	0.07	Adolescence	Adulthood
	Low school attendance ^a	2	0.05	Adolescence	Adulthood
	Parent pathology	3	0.04	Adolescence	Adulthood
	Low school report of achievement ^a	6	0.03	Adolescence	Adulthood
	History of treatment	2	0.02	Adolescence	Adulthood
Substance use	2	0.01	Adolescence	Adulthood	
Scott and Brown (2018)	Female Education/employment	8	0.25*	Adolescence	Adulthood
	Female-Lack of prosocial peer relations (outliers removed) ^a	4	0.15*	Adolescence	Adulthood
	Female problematic family circumstances and parenting	12	0.14*	Adolescence	Adulthood
	Female antisocial peer relations	12	0.13*	Adolescence	Adulthood
	Female education/school concerns (outlier removed)	5	0.10*	Adolescence	Adulthood
	Female substance abuse	16	0.05*	Adolescence	Adulthood
	Female mental health	5	0.04*	Adolescence	Adulthood
	Female-Low level of prosocial values and attitudes ^a	3	0.52	Adolescence	Adulthood
	Female-Low of family relationships and support ^a	4	0.38	Adolescence	Adulthood
	Female-Personality – Low self-efficacy, positive problem solving ^a	3	0.26	Adolescence	Adulthood
	Female-Low of extracurricular activities and community support ^a	6	0.16	Adolescence	Adulthood
	Female Child abuse	4	0.1	Adolescence	Adulthood
	Female-Low of education and employment opportunities ^a	3	0.06	Adolescence	Adulthood
	Female poor use leisure/recreation (outlier removed)	9	0.05	Adolescence	Adulthood
	Male- Low education and employment opportunities ^a	3	0.32*	Adolescence	Adulthood
	Male-Low family relationships and support ^a	4	0.27*	Adolescence	Adulthood
	Male- Lack of rejection or non-absence of substance use ^a	3	0.27*	Adolescence	Adulthood
	Male- Lack of prosocial peer relations ^a	5	0.23*	Adolescence	Adulthood
Male education/employment problems (outlier removed)	7	0.21*	Adolescence	Adulthood	
Male antisocial peer relations (outlier removed)	10	0.20*	Adolescence	Adulthood	
Male poor use leisure/recreation	10	0.16*	Adolescence	Adulthood	
Female - Lack of rejection or non-absence of substance use ^a	3	0.15*	Adolescence	Adulthood	
Male education/school concerns (outlier removed)	5	0.13*	Adolescence	Adulthood	
Male problematic family circumstances and parenting	12	0.10*	Adolescence	Adulthood	
Male substance abuse	16	0.08*	Adolescence	Adulthood	
Male- low extracurricular activities and community support ^a	6	0.2	Adolescence	Adulthood	
Male-low level of prosocial values and attitudes ^a	3	0.14	Adolescence	Adulthood	
Male mental health	5	0.02	Adolescence	Adulthood	
Male child abuse	4	0	Adolescence	Adulthood	
Male-personality – Low self-efficacy, positive problem solving ^a	3	-0.01	Adolescence	Adulthood	

Note. ** Using the data provided in the meta-analyses or direct contact with the author, overall effect sizes were recalculated including only longitudinal studies assessing childhood/adolescent predictors of persistence. k = Number of studies. *, p < .05. a = Reversed Protective Factor.

Table 3
Most important predictors of general offending ordered by overall effect size.

Reference	Predictor	k	r	Type	Age period -Predictor	Age period – Outcome
Leschied et al. (2008)	Family structure - Adolescence	19	0.32*	General offending	Adolescence	Adulthood
Derzon (2010)	(Lack of) child rearing skills	13	0.26*	General offending	Childhood/adolescence	Adolescence/adulthood
Derzon (2010)	Home discord and stability	11	0.26*	General offending	Childhood/adolescence	Adolescence/adulthood
Leschied et al. (2008)	Family structure - Total	36	0.23*	General offending	Childhood/adolescence	Adulthood
Flanagan et al. (2019)	Low level of parental knowledge ^a	8	0.22*	General offending	Childhood/adolescence	Adolescence/adulthood
Derzon (2010)	Family stress	10	0.21*	General offending	Childhood/adolescence	Adolescence/adulthood
Derzon (2010)	Maltreated as child	8	0.21*	General offending	Childhood/adolescence	Adolescence/adulthood
Leschied et al. (2008)	Lack of parent management middle childhood (supervision/discipline)	8	0.20*	General offending	Childhood	Adulthood
Leschied et al. (2008)	Adverse family environment adolescence	15	0.19*	General offending	Adolescence	Adulthood
Derzon (2010)	Other family deviance	9	0.19*	General offending	Childhood/adolescence	Adolescence/adulthood
Derzon (2010)	(Lack of) warmth and relationship	22	0.18*	General offending	Childhood/adolescence	Adolescence/adulthood
Flanagan et al. (2019)	Poor supervision ^a	18	0.18*	General offending	Childhood/adolescence	Adolescence/adulthood
Hoeve et al. (2012)	Low attachment	17	0.17*	General offending	Childhood/adolescence	Adolescence/adulthood
Derzon (2010)	(Inappropriate) discipline	9	0.17*	General offending	Childhood/adolescence	Adolescence/adulthood
Flanagan et al. (2019)	Child closure ^a	6	0.16*	General offending	Childhood/adolescence	Adolescence/adulthood
Derzon (2010)	Parent antisocial behaviour	11	0.15*	General offending	Childhood/adolescence	Adolescence/adulthood
Reaves et al. (2018)	Negative school climate – Institutional environment	16	0.14*	General offending	Childhood/adolescence	Adolescence
Braga et al. (2018)	Maltreatment	8	0.14*	General offending	Childhood/adolescence	Adulthood
Derzon (2010)	Foster care	5	0.14*	General offending	Childhood/adolescence	Adolescence/adulthood
Derzon (2010)	Urban housing	9	0.13*	General offending	Childhood/adolescence	Adolescence/adulthood
Leschied et al. (2008)	Parent management total	17	0.12*	General offending	Childhood/adolescence	Adulthood
Leschied et al. (2008)	Internalizing concerns – Total	42	0.11*	General offending	Childhood/adolescence	Adulthood
Leschied et al. (2008)	Adverse family environment total	35	0.11*	General offending	Childhood/adolescence	Adulthood
Derzon (2010)	Family size	9	0.11*	General offending	Childhood/adolescence	Adolescence/adulthood
Braga et al. (2017)	Maltreatment	7	0.11*	General offending	Childhood	Adolescence
Derzon (2010)	Broken home	25	0.10*	General offending	Childhood/adolescence	Adolescence/adulthood

Notes. Including only dynamic predictors with $k \geq 5$, $r \geq 0.10$ and $p < .05$; k = Number of studies. *, $p < .05$. a = Reversed Protective Factor.

Table 4
Predictors of persistence in crime during adulthood.

Reference	Predictor	k	r	Outcome type	Age period -Predictor	Age period - Outcome
Cottle et al. (2001)	Nonsevere pathology	7	0.30*	Recidivism	Adolescence	Adulthood
Scott and Brown (2018)	Female - Education/employment	8	0.25*	Recidivism	Mostly adolescence	Adulthood
Scott and Brown (2018)	Male-Lack of prosocial peer relations ^a	5	0.23*	Recidivism	Mostly adolescence	Adulthood
Cottle et al., 2001	Family problems	5	0.22*	Recidivism	Adolescence	Adulthood
Assink et al. (2015)	Alcohol/drug abuse	57	0.21*	Persistent Del Behav	Childhood/adolescence	Adulthood
Scott and Brown (2018)	Male-Education/employment problems	7	0.21*	Recidivism	Mostly adolescence	Adulthood
Scott and Brown (2018)	Male-Antisocial peer relations	10	0.20*	Recidivism	Mostly adolescence	Adulthood
Assink et al. (2015)	Sexual behaviour problem	7	0.20*	Persistent Del Behav	Childhood/adolescence	Adulthood
Cottle et al. (2001)	Delinquent peers	7	0.20*	Recidivism	Adolescence	Adulthood
Assink et al. (2015)	Relationship	51	0.19*	Persistent Del Behav	Childhood/adolescence	Adulthood
Assink et al. (2015)	Emotional and Behavioural problems	150	0.18*	Persistent Del Behav	Childhood/adolescence	Adulthood
Scott and Brown (2018)	Male-Poor use leisure/recreation	10	0.16*	Recidivism	Mostly adolescence	Adulthood
Assink et al. (2015)	School/employment	63	0.15*	Persistent Del Behav	Childhood/adolescence	Adulthood
Cottle et al. (2001)	Substance abuse	6	0.15*	Recidivism	Adolescence	Adulthood
Scott and Brown (2018)	Female-Problematic family circumstances/parenting	12	0.14*	Recidivism	Adolescence	Adulthood
Cottle et al. (2001)	Low full scale IQ	5	0.14*	Recidivism	Adolescence	Adulthood
Assink et al. (2015)	Other	27	0.13*	Persistent Del Behav	Childhood/adolescence	Adulthood
Scott and Brown (2018)	Female-Antisocial peer relations	12	0.13*	Recidivism	Adolescence	Adulthood
Scott and Brown (2018)	Male-Education/school concerns	5	0.13*	Recidivism	Adolescence	Adulthood
Assink et al. (2015)	Family (problems)	273	0.12*	Persistent Del Behav	Childhood/adolescence	Adulthood
Cottle et al. (2001)	Victim of abuse	5	0.11*	Recidivism	Adolescence	Adulthood
Assink et al. (2015)	Attitude	19	0.10*	Persistent Del Behav	Childhood/adolescence	Adulthood
Scott and Brown (2018)	Male-Problematic family circumstances/parenting	12	0.10*	Recidivism	Adolescence	Adulthood
Scott and Brown (2018)	Female-Education/school concerns	5	0.10*	Recidivism	Adolescence	Adulthood

Notes. Including only explanatory predictors with $k \geq 5$, $r \geq 0.10$ and $p < .05$. Persistent Del Behav = Persistence in crime was assessed through persistent (versus adolescence limited) trajectories of criminal behaviour during adulthood. Persistent Del Behav = Persistent Delinquent Behaviour. a = Reversed Protective Factor.

mental health problem or diagnosis (Yes/No) showed substantially lower effect sizes. Another important disparity between effect sizes was found for substance abuse. The dimension of alcohol/drug abuse (Assink et al., 2015) was an important longitudinal predictor of persistence in crime ($r = 0.21$), but predictors exclusively addressing substance abuse in the other two meta-analyses showed statistically significant but substantially smaller effect sizes ($r = 0.15$, Cottle et al., 2001; $r = 0.08$ for males, $r = 0.05$ for females, Scott & Brown, 2018).

Finally, Scott and Brown's (2018) meta-analyses provided separate

analyses by gender, and these found education/employment problems as the most important predictors of recidivism among males ($r = 0.21$) and females ($r = 0.25$), followed by masculine antisocial peers ($r = 0.20$) and female problematic family circumstances/parenting ($r = 0.14$). Table 5 summarizes the concepts and effect sizes in each meta-analysis of persistence associated with each one of the five key categories identified.

Table 5
Definitions of the constructs associated with key dimensions predicting persistence in crime during adulthood.

Authors	Family	r	Employment	r	Peer delinquency	r	Alcohol/ Substance Abuse	r	Mental Health Symptoms	r
Assink et al. (2015)	Family (problems) "Factors relating to familial problems, such as having criminal family members, low positive parenting, large family size, having a poor relation with parents, and parental conflict" (Assink et al., 2015, p.50)	0.12*	School/employment "Factors relating to education and employment, such as poor academic achievement, being a frequent truant, having a lack of interest in school, having an unstable job record, and not being employed" (Assink et al., 2015, p.50)	0.15*	Relationship "Factors relating to the nature and quality of relationships with primarily peers, such as having delinquent peers, experiencing peer rejection, being a gang member, having poor relationship with peers, and deviant peer associations". (Assink et al., 2015, p.50)	0.19*	Alcohol/drug abuse "Mainly factors relating to alcohol and drug abuse". (Assink et al., 2015, p.50)	0.21*	Emotional and behavioural problems "Factors relating to internalizing and externalizing problems". (Assink et al., 2015, p.50)	0.18*
Cottle et al. (2001)	Family problems "(e.g., poor relationships within the family)", (Cottle et al., 2001, p.378)	0.22*	Low school report of achievement ^a	0.03 ^{ns}	Having delinquent peers	0.20*	Substance abuse	0.15*	Nonsevere pathology ^b (e.g., stress, anxiety), (Cottle et al., 2001, p.378)	0.30*
Scott and Brown (2018)	Problematic family circumstances and parenting "Inadequate supervision, difficulty controlling behaviour, inappropriate discipline, inconsistent parenting, family substance abuse, family criminal history" (Scott & Brown, 2018, p.936)	0.14* (F) .10* (M)	Education/employment problems "Unemployed/not seeking employment"; (Scott & Brown, 2018, p.936) Education/school concerns ^a "Low (academic) achievement, truancy at school, current school problems" (Scott & Brown, 2018, p.936)	0.25* (F) .21* (M) 0.13* (M) (M) .10* (F)	Antisocial peer relationships "Delinquent influences, gang affiliated/involved" (Scott & Brown, 2018, p.936)	0.13* (F) .20* (M)	Substance abuse "Chronic drug use, chronic alcohol use" (Scott & Brown, 2018, p.936)	0.05* (F) .08* (M)	Mental health "Mental health was coded as mental health problems or diagnoses (yes or no)" (Scott & Brown, 2018, p.936)	0.04* (F) .02 ^{ns} (M)

Note. M = Males; F = Females. ^a = Only school-specific dimensions were assessed in this variable. ^b = Only this variable from this dimension was evaluated across more than five studies (and not excluded for eligibility reasons). * $p < .05$; ns = non-significant predictor.

4. Discussion

This study addresses one of the major aims of developmental criminology, which is to evaluate the childhood and adolescent factors that precede or explain offending behaviour (Farrington et al., 2017; Loeber & Le Blanc, 1990). To our knowledge, this is the first systematic review of meta-analyses that maps all the well-established knowledge about the developmental predictors of offending and to sort those risk/protective factors according to their relative importance in predicting offending and persistence in crime. In addition, this study is particularly useful because the in-depth knowledge of these factors is crucial in developing better theories and more effective assessment tools, interventions, and justice policies.

We identified 11 meta-analyses addressing longitudinal predictors of general offending, most of them showing statistically significant predictors; however, three meta-analyses did not present longitudinal predictors of offending with effect sizes equal or larger than $r = 0.10$. In addition, for most of the predictors that were assessed across meta-analyses addressing persistence in crime, many effect sizes were also small. These initial findings support the notion that complex events influenced by a variety of factors, such as criminal behaviour, result in a large network of statistically significant factors; however, some of those factors may have low theoretical and practical relevance (Orben & Przybylski, 2019). Therefore, this work is an opportunity to sort each one of the meta-analysed predictors by their effect size and identify major dimensions in criminal behaviour during child/adolescent development.

4.1. Developmental predictors of general offending and persistence in crime

The results of our systematic review of meta-analyses show that early family-related factors had some of the larger effect sizes in predicting general offending. Those family-related variables include family structure, home discord, (lack of) child-rearing skills, family stress (Derzon, 2010), level of parental knowledge (Flanagan et al., 2019), parental management during middle childhood (supervision/discipline), and an adverse family environment during adolescence (Leschied et al., 2008).

Three meta-analyses also highlighted the effect of child (Braga et al., 2017; Derzon, 2010) and adolescent maltreatment (Braga et al., 2018) on later general offending. These findings clearly support previous psychobiological (e.g., Lee & Hoaken, 2007) and psychosocial (e.g., Kerig & Becker, 2015) approaches stressing the detrimental impact of child abuse and neglect on later delinquency. In addition, child maltreatment is exclusively (e.g., neglect) or often (sexual or physical abuse) perpetrated by family members (Langevin et al., 2019; Papalia et al., 2020). Moreover, children from dysfunctional families are particularly at risk of being victims of maltreatment (e.g., Stith et al., 2009).

Contrary to our expectations, dimensions like resting heart rate (Portnoy & Farrington, 2015) or child internalizing concerns (Leschied et al., 2008) showed small and/or non-significant effect sizes in predicting general offending. Whereas family predictors among children and youths appear to be the most important predictors of general offending (Flanagan et al., 2019; Leschied et al., 2008), among adolescents with justice involvement, family problems are only one of the key predictors of persistence during adolescence and adulthood (Assink et al., 2015; Cottle et al., 2001; Scott & Brown, 2018). We identified five key developmental predictors: occupation (education/employment) problems (Assink et al., 2015; Scott & Brown, 2018), delinquent/antisocial peers (Assink et al., 2015; Cottle et al., 2001; Scott & Brown, 2018), specific dimensions related to mental health problems (Cottle et al., 2001), alcohol/drug abuse (Assink et al., 2015; Cottle et al., 2001), and family problems (Assink et al., 2015; Cottle et al., 2001; Scott & Brown, 2018). More primary research is needed comparing predictors of offending versus recidivism (see e.g., Farrington, 2020).

Families have a primary role in socialization and social learning, and most developmental theories of offending have recognized the critical role of families, particularly parents (e.g., child rearing skills, parental supervision, caring families) in preventing versus promoting offending (Farrington, 2006). It is possible that family problems not only predict offending, but also play an important role as a potential cause of later persistence in crime. In this regard, a series of systematic reviews have shown important links between early family risk factors and school dropout (Gubbels et al., 2019), unemployment (Bunting et al., 2018), mental health problems, including addiction (Rasic et al., 2014), and inadequate interactions with peers (Groh et al., 2014).

As the multiple systems of which a youth is part are contaminated by psychosocial problems (e.g., delinquent peers, lack of parental supervision, mental health problems), the risk of recidivism appears to increase. Therefore, while parental training and family support are suggested as key components of interventions that prevent offending in the first place, multisystemic approaches may be a more adequate approach for youths with histories of criminal behaviour.

The predictive ability of mental health dimensions for persistence in crime substantially changes across meta-analyses, which indicates that inside the broader concept of mental health problems, some diagnoses and psychopathological symptoms might be more or less important in predicting persistence in crime. Interestingly, non-severe pathology, which is focused on symptoms of anxiety, stress, and other general psychopathological symptoms, is the most important predictor of persistence in crime found across all meta-analyses (Cottle et al., 2001). In addition, the Assink et al. (2015) meta-analysis found emotional and behavioural problems as one of most important predictors. However, in the opposite direction, the dimension of mental health assessed by Scott and Brown (2018) had small effects for females and did not even reach statistical significance in predicting persistence in crime for males.

Most of the current studies and developmental and life-course theories (DLC) of offending have neglected the role of mental health vulnerabilities as important explanations for criminal career development (for a review of DLC theories, see Farrington, 2006). It would be important to understand, for example, if specific psychopathologies linked to high vulnerability to stress or anxiety are important predictors of relapse among justice-involved youths, and why. For example, is this mediated by emotion regulation deficits? More research is needed. Also, the long-term neurological and psychosocial impact of alcohol and substance abuse on the development of youthful criminal careers is underexplored across developmental theories of offending.

In contrast, most of the DLC theories take into account family dynamics, school/employment problems, and antisocial models as central causes of youth antisocial behaviour (e.g., Farrington, 2006; Laub & Sampson, 2001; Moffitt, 2018; Thornberry & Krohn, 2005). Nonetheless, the way each one of those theories operationalizes each one of these constructs may vary (e.g., informal social control, attachment, social learning). Thus, a deeper understanding of how each one of these risk factors leads to the development of criminal behaviour is an important line for future research.

Only one meta-analysis addressed the gender-specific roles of each of the tested predictors across longitudinal studies addressed our research questions. The way gender (and ethnicity) shapes predictors from crime during development is one of the most underexplored topics across meta-analyses. The important findings from Scott and Brown's (2018) meta-analysis suggest that there are similar effect sizes for males and females in the most important predictors of recidivism, supporting the hypothesis of gender neutrality for global risk factors. More primary research is needed comparing risk factors for males and females in relation to offending and recidivism.

There is also a lack of meta-analyses studying the longitudinal impact of childhood biological and temperamental characteristics on later offending or recidivism. From the few meta-analyses addressing individual characteristics versus offending behaviour, the meta-analysis conducted by Portnoy and Farrington (2015) shows a low resting

heart rate ($r = 0.07$) as a statistically significant predictor of later offending. Also, the meta-analysis conducted by Cottle et al. (2001) showed the role of low verbal IQ and low full-scale IQ as predictors of recidivism across a limited number of longitudinal studies. Some meta-analyses, not specifically addressing longitudinal predictors of crime during the developmental period (and for that reason not included in this systematic review), suggest an important role of other individual characteristics in general offending, such as low self-control (Vazsonyi et al., 2017) or low cognitive and affective empathy (Van Langen et al., 2014). The role of many of these individual characteristics in predicting childhood or adolescence in later offending or persistence in crime is still underexplored.

4.2. Limitations

This systematic review is not free of limitations. First, it includes only meta-analyses addressing explanatory predictors of crime evaluated in the first 18 years of life. This decision allows us to focus our discussion on early predictors of offending, but at the same time adult factors promoting changes in criminal patterns later in life are neglected. Because behavioural predictors such as conduct disorder were excluded from consideration, our focus is on explanation rather than pure prediction. Second, this systematic review includes only meta-analyses addressing longitudinal predictors of crime, excluding overall effect sizes from cross-sectional studies, and our discussion is focused on predictors tested across five or more independent samples. This decision allows us to guarantee that predictors precede offending outcomes and to focus on predictors that are well tested across multiple studies, reducing the risk of bias in our conclusions. Nonetheless, this decision is not free from consequences, since it also substantially reduced the number of studies included.

Third, measures of association depend partly on the true association and partly on the methods of measuring the predictor and outcome variables. For example, the product moment correlation r is based on the assumptions that the variables are measured on equal-interval scales (like height and weight), that they are normally distributed, and that they are linearly related. Most variables in the social sciences violate these assumptions. Therefore, differences in r values may reflect differences in measurement methods rather than differences in the true underlying association (unless all variables are measured in the same way to make them comparable). The same problem applies when OR and d values are converted into r values; the conversion formulae are based on assumptions that may be violated by the nature of the variables. Nevertheless, large differences in r values probably reflect real differences in predictive efficiency.

Lastly, this work includes and compares overall effect sizes from meta-analyses that include studies from different years and use different inclusion/exclusion criteria and analytic strategies; this may have introduced some bias in our conclusions. Also, it would be desirable in future meta-analyses to investigate which variables predicted outcomes after controlling for (independently of) other variables. Nevertheless, the most important findings of this work are replicated across different meta-analyses, despite the bias introduced by methodological discrepancies across studies.

4.3. Final conclusions

Family factors (parental supervision/parental warmth, family structure) are the most important childhood and/or adolescent predictors of general offending, followed by child maltreatment. Among adolescents already involved in the justice system, there are five major predictors of persistence in crime across meta-analyses, namely, education/employment problems, delinquent peers, family problems, alcohol/drug abuse, and specific forms of mental health problems.

Our findings support the crucial role of programs working with families, particularly parents, with the aim to prevent offending in the

first place (see e.g. Farrington, 2021). Among juvenile justice youths, there is a constellation of long-term problematic factors explaining persistence in crime. Programs to prevent recidivism should evaluate and intervene in each of the above-identified factors (e.g., school failure, psychopathology, families, relationships with peers, addiction problems) that could cyclically create the perfect conditions to recidivate. Since many of those predictors might be avoided or attenuated by a healthy family environment, programs promoting desirable parenting and strengthening families should be the top policy priority.

Declaration of competing interest

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References

- *Assink, M., van der Put, C., Hoeve, M., de Vries, S., Stams, G., & Oort, F. (2015). Risk factors for persistent delinquent behaviour among juveniles: A meta-analytic review. *Clinical Psychology Review*, 42, 47–61. <https://doi.org/10.1016/j.cpr.2015.08.002>
- Basto-Pereira, M., Começanha, R., Ribeiro, S., & Maia, A. (2015). Long-term predictors of crime desistance in juvenile delinquents: A systematic review of longitudinal studies. *Aggression and Violent Behavior*, 25, 332–342. <https://doi.org/10.1016/j.avb.2015.09.012>
- Basto-Pereira, M., & Maia, A. (2017). *Juvenile delinquency, crime and social marginalization: Social and political implications*. Wagon Lane, UK: Emerald.
- Bernburg, J., Krohn, M., & Rivera, C. (2006). Official labeling, criminal embeddedness, and subsequent delinquency: A longitudinal test of labeling theory. *Journal of Research in Crime & Delinquency*, 43, 67–88. <https://doi.org/10.1177/0022427805280068>
- *Braga, T., Gonçalves, L. C., Basto-Pereira, M., & Maia, A. (2017). Unraveling the link between maltreatment and juvenile antisocial behavior: A meta-analysis of prospective longitudinal studies. *Aggression and Violent Behavior*, 33, 37–50. <https://doi.org/10.1016/j.avb.2017.01.006>
- *Braga, T., Cunha, O., & Maia, A. (2018). The enduring effect of maltreatment on antisocial behaviour: A meta-analysis of longitudinal studies. *Aggression and Violent Behavior*, 40, 91–100. <https://doi.org/10.1016/J.Avb.2018.04.003>
- Bunting, L., Davidson, G., Mccartan, C., Hanratty, J., Bywaters, P., Mason, W., & Steils, N. (2018). The association between child maltreatment and adult poverty - a systematic review of longitudinal research. *Child Abuse and Neglect*, 77, 121–133. <https://doi.org/10.1016/J.Chiabu.2017.12.022>
- Cicchetti, D. (2016). Socioemotional, personality, and biological development: Illustrations from a multilevel developmental psychopathology perspective on child maltreatment. *Annual Review of Psychology*, 67(1), 187–211. <https://doi.org/10.1146/Annurev-Psych-122414-033259>
- *Cottle, C. C., Lee, R. J., & Heilbrun, K. (2001). The prediction of criminal recidivism in juveniles: A meta-analysis. *Criminal Justice and Behaviour*, 28(3), 367–394. <https://doi.org/10.1177/0093854801028003005>
- *Derzon, J. H. (2010). The correspondence of family features with problem, aggressive, criminal, and violent behaviour: A meta-analysis. *Journal of Experimental Criminology*, 6(3), 263–292. <https://doi.org/10.1007/S11292-010-9098-0>
- Dishion, T. J., & Tipsord, J. M. (2011). Peer contagion in child and adolescent social and emotional development. *Annual Review of Psychology*, 62, 189–214. <https://doi.org/10.1016/j.addbeh.2012.06.020>
- Farrington, D. P. (2003). Developmental and life-course criminology: Key theoretical and empirical issues-The 2002 Sutherland award address. *Criminology; An Interdisciplinary Journal*, 41(2), 221–225. <https://doi.org/10.1111/J.1745-9125.2003.Tb00987.X>
- Farrington, D. P. (2006). Building developmental and life-course theories of offending. In F. T. Cullen, J. P. Wright, & K. R. Blevins (Eds.), *Taking stock: The status of criminological theory* (pp. 335–366). Transaction Publishers.
- Farrington, D. P. (2013). Longitudinal and experimental research in criminology. *Crime and Justice*, 42(1), 453–527. <https://doi.org/10.1086/670396>
- Farrington, D. P. (2020). Childhood risk factors for criminal career duration: Comparisons with prevalence, onset, frequency and recidivism. *Criminal Behaviour and Mental Health*, 30, 159–171. <https://doi.org/10.1002/cbm.2155>
- Farrington, D. P. (2021). The developmental evidence base: Prevention. In D. A. Crighton, & G. J. Towl (Eds.), *Forensic psychology* (3rd ed., pp. 263–293). Wiley.
- Farrington, D. P., & Loeber, R. (1989). Relative improvement over chance (RIOC) and phi as measures of predictive efficiency and strength of association in 2 X 2 tables. *Journal of Quantitative Criminology*, 5, 201–213.
- Farrington, D. P., Gaffney, H., & Tfofi, M. M. (2017). Systematic reviews of explanatory risk factors for violence, offending, and delinquency. *Aggression and Violent Behaviour*, 33, 24–36. <https://doi.org/10.1016/J.Avb.2016.11.004>
- *Flanagan, I. M. L., Auty, K. M., & Farrington, D. P. (2019). Parental supervision and later offending: A systematic review of longitudinal studies. *Aggression and Violent Behaviour*, 47, 215–229. <https://doi.org/10.1016/J.Avb.2019.06.003>
- Groh, A. M., Fearon, R. P., Bakermans-Kranenburg, M. J., Ijendoorn, V., Steele, R. D., & Roisman, G. I. (2014). The significance of attachment security for children's social competence with peers: A meta-analytic study. *Attachment & Human Development*, 16(2), 103–136. <https://doi.org/10.1080/14616734.2014.883636>
- Gubbels, J., Van Der Put, C. E., & Assink, M. (2019). Risk factors for school absenteeism and dropout: A meta-analytic review. *Journal of Youth and Adolescence*, 48(9), 1637–1667. <https://doi.org/10.1007/S10964-019-01072-5>
- *Hoeve, M., Stams, G. J. J. M., van der Put, C. E., Dubas, J. S., van der Laan, P. H., & Gerris, J. R. M. (2012). A meta-analysis of attachment to parents and delinquency. *Journal of Abnormal Child Psychology*, 40(5), 771–785. <https://doi.org/10.1007/S10802-011-9608-1>
- Jackson, D., & Turner, R. (2017). Power analysis for random-effects meta-analysis. *Research Synthesis Methods*, 8(3), 290–302. <https://doi.org/10.1002/Jrsm.1240>
- Jolliffe, D., Farrington, D. P., Piquero, A. R., Loeber, R., & Hill, K. G. (2017). Systematic review of early risk factors for life-course-persistent, adolescence-limited, and late-onset offenders in prospective longitudinal studies. *Aggression and Violent Behaviour*, 33, 15–23. <https://doi.org/10.1016/J.Avb.2017.01.009>
- Kerig, P. K., & Becker, S. P. (2015). Early abuse and neglect as risk factors for the development of criminal and antisocial behaviour. In J. Morizot, & L. Kazemian (Eds.), *The Development of Criminal and Antisocial Behaviour: Theoretical Foundations and Practical Applications* (pp. 181–199). Springer.
- Langevin, R., Marshall, C., & Kingsland, E. (2019). Intergenerational cycles of maltreatment: A scoping review of psychosocial risk and protective factors. *Trauma, Violence & Abuse*. <https://doi.org/10.1177/1524838019870917>, 1524838019870917.
- Laub, J. H., & Sampson, R. J. (2001). Understanding desistance from crime. *Crime and Justice*, 28, 1–69.
- Lee, V., & Hoaken, P. N. S. (2007). Cognition, emotion, and neurobiological development: Mediating the relation between maltreatment and aggression. *Child Maltreatment*, 12(3), 281–298. <https://doi.org/10.1177/1077559507303778>
- *Leschied, A. W., Chiodo, D., Nowicki, E., & Rodger, S. (2008). Childhood predictors of adult criminality: A meta-analysis drawn from the prospective longitudinal literature. *Canadian Journal of Criminology and Criminal Justice*, 50(4), 435–467. <https://doi.org/10.3138/Cjccj.50.4.435>
- Loeber, R. (2019). Developmental pathways to conduct problems and serious forms of delinquency. In D. P. Farrington, L. Kazemian, & A. R. Piquero (Eds.), *The Oxford handbook of developmental and life-course criminology* (pp. 159–172). Oxford University Press.
- Loeber, R., & Farrington, D. P. (2012). *From juvenile delinquency to adult crime: Criminal careers, justice policy*. New York, NY: Oxford University Press.
- Loeber, R., & Le Blanc, M. (1990). Toward a developmental criminology. In M. Tonry (Ed.), *Crime and justice: A review of research* (Vol. 12, pp. 375–473). University of Chicago Press.
- Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behaviour: A developmental taxonomy. *Psychological Review*, 100(4), 674–701. <https://doi.org/10.1037/0033-295X.100.4.674>
- Moffitt, T. E. (2018). Male antisocial behaviour in adolescence and beyond. *Nature Human Behaviour*, 2(3), 177–186. <https://doi.org/10.1038/S41562-018-0309-4>
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, 6(7), Article e1000097. <https://doi.org/10.1371/journal.pmed.1000097>
- Murray, J., & Farrington, D. P. (2010). Risk factors for conduct disorder and delinquency: Key findings from longitudinal studies. *Canadian Journal of Psychiatry. Revue Canadienne de Psychiatrie*, 55(10), 633–642. <https://doi.org/10.1177/070674371005501003>
- Orben, A., & Przybylski, A. K. (2019). The association between adolescent well-being and digital technology use. *Nature Human Behaviour*, 3(2), 73–182. <https://doi.org/10.1038/S41562-018-0506-1>
- Papalia, N., Mann, E., & Ogloff, J. R. P. (2020). Child sexual abuse and risk of revictimization: Impact of child demographics, sexual abuse characteristics, and psychiatric disorders. *Child Maltreatment*, 26(1), 74–86. <https://doi.org/10.1177/1077559520932665>
- *Portnoy, J., & Farrington, D. P. (2015). Resting heart rate and antisocial behaviour: An updated systematic review and meta-analysis. *Aggression and Violent Behaviour*, 22, 33–45. <https://doi.org/10.1016/J.Avb.2015.02.004>
- Rasic, D., Hajek, T., Alda, M., & Uher, R. (2014). Risk of mental illness in offspring of parents with schizophrenia, bipolar disorder, and major depressive disorder: A meta-analysis of family high-risk studies. *Schizophrenia Bulletin*, 40(1), 28–38. <https://doi.org/10.1093/Schbul/Sbt114>
- *Reaves, S., McMahon, S. D., Duffy, S. N., & Ruiz, L. (2018). The test of time: A meta-analytic review of the relation between school climate and problem behaviour. *Aggression and Violent Behaviour*, 39, 100–108. <https://doi.org/10.1016/J.Avb.2018.01.006>
- *Scott, T., & Brown, S. L. (2018). Risks, strengths, gender, and recidivism among justice-involved youth: A meta-analysis. *Journal of Consulting and Clinical Psychology*, 86(11), 931–945. <https://doi.org/10.1037/Ccp0000343>
- Siegel, L. J. (2015). *Criminology: Theories, patterns, and typologies* (12th ed.). Cengage Learning.
- *Spruit, A., van Vugt, E., van der Put, C., van der Stouwe, T., & Stams, G. J. (2016). Sports participation and juvenile delinquency: A meta-analytic review. *Journal of Youth and Adolescence*, 45(4), 655–671. <https://doi.org/10.1007/S10964-015-0389-7>
- Stith, S. M., Liu, T., Davies, L. C., Boykin, E. L., Alder, M. C., Harris, J. M., Som, A., Mcpherson, M., & Dees, J. E. M. E. G. (2009). Risk factors in child maltreatment: A

- meta-analytic review of the literature. *Aggression and Violent Behaviour*, 14(1), 13–29. <https://doi.org/10.1016/J.Avb.2006.03.006>
- Sullivan, G. M., & Feinn, R. (2012). Using effect size-or why the p value is not enough. *Journal of Graduate Medical Education*, 4(3), 279–282. <https://doi.org/10.4300/Jgme-D-12-00156.1>
- Szucs, D., & Ioannidis, J. P. A. (2017). Empirical assessment of published effect sizes and power in the recent cognitive neuroscience and psychology literature. *PLoS Biology*, 15(3), E2000797. <https://doi.org/10.1371/Journal.Pbio.2000797>
- Thornberry, T. P., & Krohn, M. D. (2005). Applying interactional theory to the explanation of continuity and change in antisocial behaviour. In D. P. Farrington (Ed.), *Integrated developmental and life course theories of offending advances in criminological theory* (pp. 183–209). Transaction.
- Tremblay, R. E., Vitaro, F., Nagin, D., Pagani, L., & Séguin, J. R. (2003). The Montreal longitudinal and experimental study: Rediscovering the power of descriptions. In T. P. Thornberry, & M. D. Krohn (Eds.), *Taking stock of delinquency: An overview of findings from contemporary longitudinal studies* (pp. 205–254). Kluwer Academic/Plenum Publishers.
- *Ttofi, M. M., Farrington, D. P., Piquero, A. R., Lösel, F., Delisi, M., & Murray, J. (2016). Intelligence as a protective factor against offending: A meta-analytic review of prospective longitudinal studies. *Journal of Criminal Justice*, 45, 4–18. <https://doi.org/10.1016/J.Jcrimjus.2016.02.003>
- Van Langen, M. A. M., Wissink, I. B., Van Vugt, E. S., Van Der Stouwe, T., & Stams, G. J. J. M. (2014). The relation between empathy and offending: A meta-analysis. *Aggression and Violent Behaviour*, 19(2), 179–189. <https://doi.org/10.1016/J.Avb.2014.02.003>
- Vazsonyi, A. T., Mikuška, J., & Kelley, E. L. (2017). It's time: A meta-analysis on the self-control-deviance link. *Journal of Criminal Justice*, 48, 48–63. <https://doi.org/10.1016/J.Jcrimjus.2016.10.001>
- Wasserstein, R. L., & Lazar, N. A. (2016). The ASA statement on p-values: Context, process, and purpose. *The American Statistician*, 70(2), 129–133. <https://doi.org/10.1080/00031305.2016.1154108>
- Wikstrom, P., Oberwittler, D., Treiber, K., & Hardie, B. (2012). *Breaking rules: The social and situational dynamics of young people's urban crime*. Oxford University Press.
- *Wilson, H. W., Stover, C. S., & Berkowitz, S. J. (2009). Research review: The relationship between childhood violence exposure and juvenile antisocial behaviour: A meta-analytic review. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 50(7), 769–779. <https://doi.org/10.1111/J.1469-7610.2008.01974.X>
- Woods, D. (1988). Coping with complexity: The psychology of human behaviour in complex systems. In L. P. Goodstein, H. B. Andersen, & S. E. Olsen (Eds.), *Tasks, Errors, and Mental Models* (pp. 129–148). Taylor & Francis Inc.
- Wormith, J. S. (2011). The legacy of D. A. Andrews in the field of criminal justice: How theory and research can change policy and practice. *International Journal of Forensic Mental Health*, 10(2), 78–82. <https://doi.org/10.1080/14999013.2011.577138>
- Zane, S. N. (2021). Have racial and ethnic disparities in juvenile justice declined over time? An empirical assessment of the DMC mandate. *Youth Violence and Juvenile Justice*, 19(2), 163–185. <https://doi.org/10.1177/1541204020962163>