

**THE RELATIONSHIP BETWEEN PSYCHOPATHIC
TRAITS AND ADOLESCENT OFFENDING
TRAJECTORIES**

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Thesis declaration form

I confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Overview

This thesis focuses on the relationship between psychopathy and antisocial behaviour during late childhood and adolescence and comprises three parts.

Part I is a meta-analytic review of studies examining the association between psychopathy and general and violent offending, as well as reoffending, in both adolescence and in later developmental stages of life. Whilst the included studies generally support the notion that there is a relationship between psychopathic traits and offending behaviour, the effect sizes varied and were relatively small, highlighting the need for more high-quality research to elucidate the true predictors of offending.

Part II is an empirical study that uses data from the Systemic Therapy for at Risk Teens study and Semi-Parametric Group-based Modelling analysis to examine the offending and delinquency patterns of adolescents over the course of two years, and how psychopathy, gender, impulsivity, and emotional disturbance predict these patterns. The results suggest that each of the factors play important roles in understanding the offending patterns, and that psychopathy accounts for some of the variance in offending patterns.

Part III is a critical appraisal that discusses some of the dilemmas associated with the construct of psychopathy and highlights some potential ways these can be addressed in future research and clinical practice, with respect to interpreting the findings of Parts I and II.

Impact statement

The information presented in this thesis could have an impact on the research world, the clinical world, and the general population. Firstly, the findings of the meta-analysis further build on previous findings that, as with the adult population, psychopathy is associated with offending in adolescents. This has been found in both cross-sectional and prospective designs. As such, researchers can conclude that simple predictive studies that look at these two variables are no longer needed. Further study of this topic is needed, but with a different emphasis and exploration of moderating variables. This was echoed in the empirical paper, which highlighted the need for greater exploration into patterns of offending and what contributes to persistence or desistance for both male and females with a history of antisocial behaviour.

This thesis can impact clinical work by highlighting the potential difficulties faced in the measurement of psychopathy and the ways this can and has been misused. Clinicians may find this useful in making decisions about managing high-risk offenders, as well as the discussion in the critical appraisal regarding treatment of people who score highly on psychopathy measures. The thesis also highlights the need for the development of better early-interventions for young people at risk of chronic offending. The introduction of Multi-Systemic Therapy is promising in terms of offering new alternatives but may not be sensitive enough to have an effect on the high-risk young people, therefore some revisions of this approach or perhaps a new alternative could come about following the findings presented in the thesis.

Finally, this thesis can have an impact on the general public's perception of people with psychopathic traits and challenge the view that these are the most dangerous individuals who should be "locked up and throw away the key". This might enable greater opportunity for people with offending backgrounds to be

integrated into society and be given a better chance to live a more 'prosocial' life.

Marginalisation of these individuals only serves to perpetuate the cycle of antisocial behaviour, therefore a greater understanding of the nuances of offending behaviour and of the construct of psychopathy would likely enable better inclusion and a more non-judgmental approach. This could be achieved with more mainstream presentations of some of the information included in the thesis, such as through TED Talks, documentaries, or conversations pieces in newspapers.

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Part I: Meta-analytic literature review

The relationship between adolescent psychopathy and (re)offending

1 Abstract

1.1 Aims

This meta-analytic review aimed to explore the relationship between adolescent psychopathy and offending, with a focus on violent offending. This is an extension of previous reviews and included data from 2011 to 2017.

1.2 Method

A systematic search of three databases (PsycInfo, Medline and ERIC) was conducted. Studies were eligible for inclusion if they (i) measured psychopathy before the age of 18 years (ii) reported an outcome of either offending or reoffending, and (iii) used a prospective methodology and follow-up period over six months. If any exclusion criteria were met, studies were excluded. The correlational meta-analysis using a random effects model was conducted using STATA.

1.3 Results

12 papers met eligibility criteria. Results indicated a small effect ($r=0.24$) for the relationship between psychopathy and future (re)offending. Studies reported a variety of measures used for the assessment of psychopathy and included both offender and non-offender samples.

1.4 Conclusions

The current findings support the conclusion that early screening for psychopathy is important, as it can be used to predict future offending. However, the findings suggest that psychopathy can only be used as a partial explanation, and the study of other factors involved is recommended.

2 Introduction

2.1 Adolescent Psychopathy

Psychopathy is a multidimensional construct that consists of a variety of cognitive, affective, and behavioural characteristics. Despite the wealth of research dedicated to understanding this construct, the exact definition of psychopathy, and the diagnostic criteria used to assess the construct, remain subject to debate. The original description by Cleckley (1941) suggested psychopathy was comprised of 16 core characteristics, including superficial charm, irresponsibility, lack of remorse, deficient affect, lack of anxiety, and antisocial behaviour. These characteristics remain amongst the definitions that exist in today, though researchers continue to disagree on what would be the best representation of the factor structure for psychopathy. Hare (1991), who popularised the standardised assessment of psychopathy, defined two factors of psychopathy – personality type, and antisocial behaviour/lifestyle. There have been challenges to this view, with Cooke and Michie (2001) arguing that antisocial behaviour should not be a defining feature of psychopathy as it is a behavioural result of the disorder rather than a definitional antecedent. Following this, however, Hare (2003) proposed a four-factor model reincorporating criminological variables. In recent times it has become commonplace for three dimensions to be distinguished: callous/unemotional traits, narcissism, and impulsiveness. There continues to be debate over which features represent more cardinal aspects of psychopathy. In his original descriptions, Cleckley (1941) detailed unresponsiveness in interpersonal relationships and an impersonal sex life as fundamental features of psychopathy. More recently it has been argued that the psychopathy construct is only distinguishable from general antisocial behaviour by the inclusion of its affective features, i.e. callous-unemotional traits (Asscher, et al., 2011).

Much of the literature has focused on psychopathy in adults, though more recently there has been a growing interest in studying the construct amongst an adolescent population. Some have questioned how reliably one can distinguish psychopathic traits from features of normative adolescent development (Seagrave & Grisso, 2002). However, evidence has gathered to suggest that psychopathy can be reliably assessed in children and adolescents across different populations, ethnicities, and genders (Pechorro, et al., 2013; Vachon, Lynam, Loeber, & Stouthamer-Loeber, 2012);, and is stable from ages seven to seventeen and ages thirteen to twenty-four, respectively (Lynam, et al., 2009; Lynam, Caspi, Moffitt, Loeber, & Stouthamer-Loeber, 2007).

The Psychopathy Checklist: Youth Version (Forth, Kosson, & Hare, 2003) is perhaps the most widely used tool for the assessment of psychopathy in adolescents. Similar to the Psychopathy Checklist-Revised (Hare, 2003), it consists of four factors and 20 items (Jones, Cauffman, Miller, & Mulvey, 2006; Neumann, Kosson, Forth, & Hare, 2006); and has demonstrated similar psychometrics and associations (Book, Clark, Forth, & Hare, 2006; Salekin, Neumann, Leistico, DiCiccio, & Duros, 2004; Vitacco, Neumann, Caldwell, Leistico, & Van Rybroek, 2006). Another instrument used to measure adolescent psychopathy is the Youth Psychopathic Traits Inventory (Andershed, Kerr, Stattin, & Levander, 2002). Modelled after the three-factor model of psychopathic personality (Cooke & Michie, 2001), the YPI was specifically designed to be a self-report tool that taps interpersonal, affective, and behaviour/lifestyle traits in community adolescents (Andershed, Kerr, Stattin, & Levander, 2002).

2.2 Psychopathy and adolescent delinquency

Psychopathy is one of the most researched risk factors for violence (Guy, Douglas, & Hendry, 2010; Harris, Rice, & Cormier, 1991; Salekin, Rogers, & Sewell, 1996; Weiler & Widom, 1996). Within the adult offending literature, psychopathy

receives a lot of attention due to construct being a robust predictor of the imminence, severity, and pervasiveness in patterns of violent recidivism among adult offenders (Hare, 2003; Hart & Hare, 1997). Studies have attempted to determine whether individual factors (using either two, three, or four factor structure) have different predictive power of violence and offending. Neumann and Vitacco (2004) looked at the MacArthur Risk Assessment Study sample and found that Interpersonal facet scores uniquely predicted increases in violence over time. However, other have found that Interpersonal traits are not uniquely predictive of violent or general recidivism (Walters, Knight, Grann, & Dahle, 2008). Furthermore, Walters et al. (2008) found that only Antisocial facet scores demonstrated incremental validity above and beyond the other three PCL–R facet scores in predicting general and violent recidivism in six independent samples.

Psychopathic offenders appear to not benefit from therapeutic interventions in the same way as other offenders (Hemphill, Hare, & Wong, 1998; Ogloff, Wong, & Greenwood, 1990; Salekin, Rogers, & Sewell, 1996); and have shown higher recidivism rates following treatment (Hemphill, Hare, & Wong, 1998). Thus, the early identification and intervention of those with emerging psychopathic traits is crucial to prevent these young people from developing the stable characteristics that often result in significant costs on educational, criminal justice, and mental health systems. For instance, it has been suggested in the USA that preventing a single high-risk adolescent from becoming a career criminal saves society more than \$1.3 million in monetary terms (Cohen, 1998).

There is an increasing body of research examining the link between psychopathy and offending in youth. For example, Vaughn, Howard, and DeLisi (2008) found that psychopathic adolescents had greater delinquency, increased general aggression, and displayed a triad of early-onset antisocial behaviours. Furthermore, Nelson (2016) found that high psychopathic traits are good predictors

of both short- and long-term offending in males; however, they are only able to accurately predict short-term offending in females.

2.3 Previous meta-analyses

Several meta-analyses examining the relationship between psychopathy and violence have been conducted using adult samples (Guy, Edens, Anthony, & Douglas, 2005; Kennealy P. J., Skeem, Walters, & Camp, 2010; Salekin, Rogers, & Sewell, 1996), youth samples (Edens, Campbell, & Weir, 2007; Olver, Stockdale, & Wormith, 2009; Asscher, et al., 2011), or a combination of both (Walters, 2003a; 2003b; 2006). Although many of the studies have used forensic populations, two of the meta-analyses also included high school students (Walters, 2003a; 2003b). The most common outcome measures included general and violent recidivism, delinquency, and institutional misconduct, though a recent review by Blais, Solodukhin, and Forth (2014) differentiated between instrumental and reactive violence.

Meta-analytic findings offer convincing support for the link between adolescent psychopathy antisocial behaviour. Edens et al. (2007) conducted the first meta-analysis examining the association between psychopathy and future offending in a purely youth population. They found that psychopathy was significantly associated with both general and violent recidivism among male youths, and there was a modest association for females and sexual re-offending. Furthermore, in a previous review, Edens and colleagues found a moderate association between various measures of adolescent psychopathy and various forms of aggression (Edens, Skeem, Cruise, & Cauffman, 2001).

Asscher and colleagues (2011) examined 53 studies with over 10,000 individual participants. They found that psychopathy was correlated with delinquent acts as well as both, general and violent forms of recidivism. Beyond what Edens and colleagues (2001) found, however, Asscher et al. (2011) observed the effect of

moderator variables, which influenced the strength of the association between psychopathy, delinquency, and (violent) recidivism. Furthermore, their analysis looked at the relationship between different psychopathic traits (callous/unemotional traits, narcissism, and impulsivity) and (re)offending, finding a moderate effect.

It is worth noting that these reviews often cite considerable variability between effect sizes, along with several significant moderators. For example, Edens et al. (2007) found that more heterogeneous ethnic samples have a smaller relationship between psychopathy and violence. Effect sizes tend to be larger for studies with U.S. and Canadian samples (Kennealy P. J., Skeem, Walters, & Camp, 2010; Olver, Stockdale, & Wormith, 2009), though this finding is not consistent (Edens, Campbell, & Weir, 2007). There have been inconsistent findings when examining the moderating effect of gender, with Edens et al. (2007) finding a weaker association between psychopathy and offending for females than with male samples, whereas Olver and colleagues (2009) reported no significant difference. Finally, several meta-analyses have examined the significance of factorial differences in psychopathy scores and found that the risk of violence is significantly larger for Factor 2 compared with Factor 1 (Kennealy, Skeem, Walters, & Camp, 2010; Walters, 2003a; 2003b). This suggests that a history of antisocial behaviour is more important than the interpersonal aspects of psychopathy in predicting risk of future violence. However, Blais et al. (2014) found that the 'Interpersonal facet' of psychopathy (Factor 1) was more important for instrumental violence, while Factor 2 (social deviance) was more important for reactive violence.

Ultimately, psychopathy has been found to be significantly predictive of antisocial behaviour. Further, this has been true even when the data involved many correlates, including delinquent peers, race, gender, and age (Salekin, 2008). Much of this research is new and ongoing and continues to be an important subject to the field of criminology.

2.4 Aims and Hypotheses

The present study aims to summarise and quantify research on the relationship between adolescent psychopathy and offending and can be seen as an extension of the meta-analysis by Asscher and colleagues (2011), who included studies until the publication year 2010. Between 2010 and 2017 more than twenty new studies appeared, illustrating the rapidly developing research on the relationship between psychopathy and antisocial behaviour and the increasing focus on adolescent psychopathy. As such, it is appropriate and useful to re-examine the evidence by conducting a new meta-analysis. The primary aim of the present meta-analysis was to examine whether there is a relationship between adolescent psychopathy and offending, including first-time offending and recidivism.

Some previous meta-analyses have included only studies using official records of offending (Edens, Campbell, & Weir, 2007; Hemphill, Hare, & Wong, 1998; Walters, 2003a), however the present meta-analysis follows the example of Asscher et al. (2011) and includes studies using both self-report and official records of offending. There is question of the validity of self-report data in offending studies, though it has been argued that the reliance on official records of offending will likely risk the underestimation of the total number of criminal acts. Official records are susceptible to selection bias in the justice system (Edens, Campbell, & Weir, 2007) as they are contingent on the inclination of victims to report, the willingness of police to investigate the report, and the tracing and prosecution policies of the justice system (Blom, Van der Laan, & Huijbregts, 2005).

It remains the case that self-reported data, are, indeed, not completely reliable either. Research has demonstrated that young offenders tend to underreport on their antisocial behaviour (Breuk, Clauser, Stams, Slot, & Doreleijers, 2007). On the whole, self-reported delinquency yields a fairly reliable picture of milder offending, while the more serious offenses remain unknown (Asscher, et al., 2011).

The present study follows the example of Asscher et al. (2011), as both delinquency and recidivism were included, whereas previous analyses have focused only on recidivism (e.g. Edens et al. 2007). Furthermore, this study examines use of multiple forms of psychopathy assessment, whereas previous meta-analyses tended to focus on the Psychopathy Check List Youth Version (PCL:YV) (e.g. Skeem, Edens, Camp, & Colwell, 2004; Edens et al., 2007).

3 Method

3.1 Sample identification/ Search strategy

The search for effect sizes began with a review of abstracts from published peer reviewed academic journals and dissertations/theses circulating post January 1, 2010.

A PRISMA diagram is presented in Figure 1 to illustrate the process of selecting papers for inclusion. The search strategy was applied on 04 to 14 August 2017. The searches included the following terms in varying combinations:

Callous, callous-unemotional, criminal behaviour, criminal conviction, delinquen*, female delinquency, juvenile, juvenile delinquency, adolescent, male delinquency, offend*, psychopath, psychopathic, psychopathy, recidivism, reoffend*, sex offences, traits, unemotional, violence, violent.

The terms were used to search PsycINFO and Medline via Ovid and PubMed databases, and ERIC.

A total of 362 papers were retrieved from this search, but 170 were removed due to duplication. 168 papers were assessed for suitability based on title and abstract. 83 papers were excluded on the basis of title and abstract description. A further 2 papers were identified through recommendation or through ancestry searching. 113 papers were identified as appropriate, and the full texts were retrieved. The papers were assessed in relation to pre-defined eligibility criteria, as outlined below.

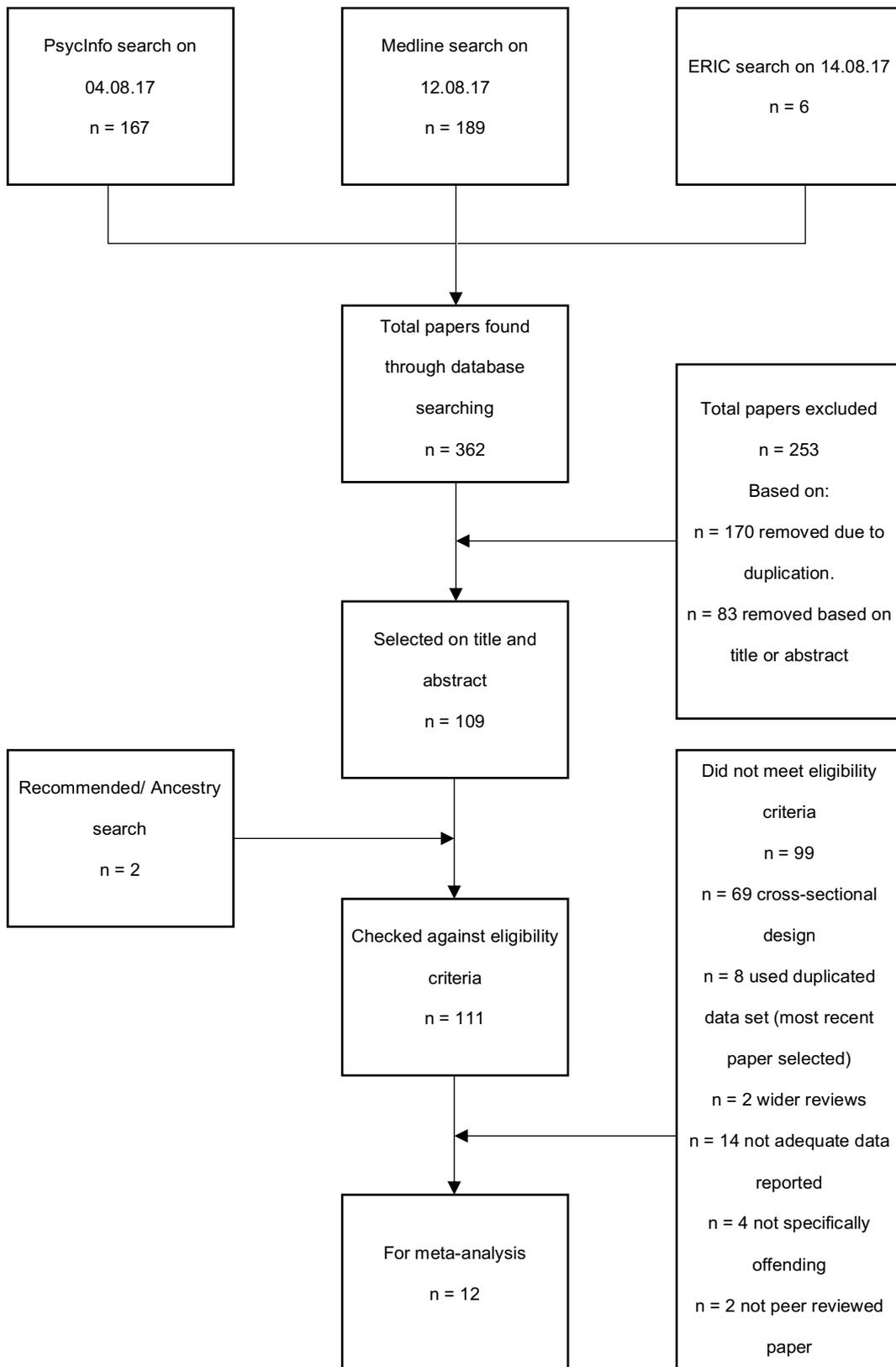


Figure 1 PRISMA diagram

3.2 Eligibility criteria

Studies were inspected and included if they met the following inclusion criteria. First, the studies had to be published between 2010 and 2018 and written in English. Second, the psychopathy measure should have been completed while the participants were under 18 years. Third, studies were included only if delinquency and/or (violent) recidivism were outcome measures. Studies with 'conduct problems', 'aggression', 'externalising behaviour', 'hostility', 'anger', and/or incidents in treatment groups as outcome measures were not included. The reason behind this was in line with recommendations from Asscher et al. (2011) that research shows that aggression and offending are conceptually and empirically distinguishable - they demonstrate different developmental trajectories (aggression decreases throughout adolescence, whereas delinquency increases (Bongers, Koot, Van der Ende, & Verhulst, 2004), and they are differentially concurrently related to risk factors (Dishion & Patterson, 2006). Offending in this case refers to criminal offences committed by participants in a community sample (both self-reported and official records) and criminal offences (both self-reported and official records) committed by convicted offenders. Recidivism is defined as any re-offence or reconviction of offenders. The author was primarily interested in the relationship between psychopathy and violent offending, therefore if both general offending and violent offending were reported, the violent offending statistic was included. However, if studies did not differentiate between violent and general offending this was the statistic included. Fourth, studies were included if they were longitudinal in design. This is different to Asscher et al. (2011), who examined both cross-sectional and longitudinal studies in their meta-analysis. Furthermore, the author did not include retrospective studies where psychopathy scores were used to "postdict" criminal history variables. Fifth, studies required samples sizes of at least 30. Finally, studies were included if they presented sufficient statistical information to

code an effect size. If more than one effect size was reported (i.e. psychopathy or offending measured at different time points) then the baseline psychopathy measure and/or the last measurement in the follow-up period was used. The reason behind this choice was that the author was interested in seeing the longest possible follow-up periods, given that the variable of interest is future offending. Likewise, the variable of interest is youth psychopathy, therefore the earliest possible measurement of the variable was chosen. One study was excluded as it did not report total psychopathy scores, rather it only reported subscales of the measure.

Different sample types, such as offenders, incarcerated adolescents, community samples, treatment groups, and adolescents on probation, were included. To reduce the potential for bias (due to over-representation of particular sets of data), only the most recent paper of studies using the same participant data was included. 100 of the 113 papers were excluded based on these criteria. A total of 12 papers were included in the review. Appendix I outlines the methodology of included papers and studies are presented in chronological order.

3.3 Effect size coding

Correlation coefficients (r) were used as effect size estimates for the relationship between psychopathy and offending. This was used because r is widely understood, the statistical procedures for its aggregation are well established (Hedges & Olkin, 1985; Rosenthal, 1991), and the majority of original studies reported point biserial correlations. When only betas or AUCs from a multivariate regression analysis were reported, the authors were contacted. If authors did not respond, the studies were excluded.

Following the description of Borenstein, Hedges, Higgins, and Rothstein (2009), the correlation coefficient for each effect was converted to the Fisher's z scale (zr) and aggregated using the variance of Fisher's z (all zr values weighted by the inverse of the variance).

A random effects model was used to conduct all meta-analyses. The random-effects model assumes that the observed effect sizes represent a random sample of all possible estimates of the true population effect, allowing for more generalised conclusions to be made (Blais, Solodukhin, & Forth, 2014). For this model, observed effects vary as a function of study methodology (e.g., differences in samples), and this between-study variability is subsequently incorporated into the error term. A random effects model is also better suited to data that violates the assumption of homogeneity and is therefore recommended for use by the National Research Council (1992).

Between-study variability was assessed using both the Q and I^2 statistics. While the Q statistic provides a measure of the significance of between-study variability, the I^2 statistic describes the percentage of variation across studies that is due to heterogeneity rather than chance (Higgins & Thompson, 2002; Higgins et al., 2003), i.e. the magnitude of the variability. The Q statistic is distributed as a chi-square with $k - 1$ degrees of freedom (k being the number of studies; Hedges & Olkin, 1985). I^2 is presented as a percentage with 25, 50, and 75 indicating small, medium, and large proportions of variability, respectively (Huedo-Medina, Sánchez-Meca, Marín-Martínez, & Botella, 2006).

3.4 Publication Bias

Given that unpublished studies were not included in this study, analyses assessing for publication bias were conducted. Researchers are well aware of the 'file drawer problem'; a term coined by Robert Rosenthal (1979). This type of bias suggests that authors are more likely to submit, or editors more likely to accept, studies that have significant findings. This can lead to an inflation of the mean effect size resulting from a meta-analysis (Szucs & Ioannidis, 2017). To assess for publication bias, a funnel plot was created by plotting each study's standard error against its Fisher's Z correlation coefficient. The effect estimates from smaller

studies should scatter more widely at the bottom, with the spread narrowing among larger studies. Due to the large sample sizes of studies included in the meta-analysis, which can make funnel plots difficult to interpret, Orwin's fail safe N was also calculated for each analysis (Orwin, 1983). This method determines the number of studies with an effect size considered to be negligible that would be required to reduce the weighted mean effect size to 0. In line with recommendations, a criterion effect size of $r = .10$ was used for all analysis (Hunter & Schmidt, 1990; Orwin, 1983).

3.5 Quality Assessment

Systematic assessment of the methodological rigour of studies is valuable in reducing author bias and providing clear and replicable statements about evidence quality (Downs & Black, 1998). Potential biases derive from selection of participants, data collection, analysis and selective reporting of study results. As such, quality assessment tools have been designed to systematically collect information about study characteristics that may lead to bias in order to estimate the overall risk of bias (Dreier, 2013). However, the author notes that the use of specified criteria can underestimate the value of particular forms of evidence and produce an over-reliance on scoring criteria to evaluate quality (Gugiu & Gugiu, 2010). With these points in mind, the author adapted an existing tool for the purpose of assessing the quality of studies included in this meta-analysis (Appendix II). Each study was rated as meeting or not meeting the defined criteria, and then rated overall as being good, fair, or poor. The original tool can be found at <https://www.nhlbi.nih.gov/healthpro/guidelines/in-develop/cardiovascular-risk-reduction/tools/cohort>.

4 Results

12 studies were included in the present meta-analysis. In total, data of 6070 participants were analysed. Sample sizes ranged from 73 (Penner, Viljoen, Douglas, & Roesch, 2014) to 1,354 (Hampton, Drabick, & Steinberg, 2014) participants, with an average of 499 participants per study. The mean age of the participants was 15.8 years¹ and the majority of studies used both males and females in their samples (83.3% both; 8.3% male only; 8.3% female only). Approximately 58.4% of the samples were from the general offender population and the other 41.6% were from the general community population. When examining how the outcome was operationalised, the majority of samples used a self-report measure of (re)offending (75%), while the remaining 25%² used a more objective method of measurement (e.g., official police records). Likewise, there was inconsistency in whether studies measured and reported, either self-report or official records of, violent or more general offending, with 50% reporting of studies specifying violent (re)offending and the other 50% reporting on more general (re)offending. A variety of psychopathy measures were used, including the Psychopathy Checklist: Youth Version (PCL:YV; 41.6%), the Antisocial Process Screening Device (APSD; Frick & Hare, 2001); 41.6%), the Inventory of Callous-Unemotional Traits (ICU; 8.3%), and the Youth Psychopathic Traits Inventory (YPI; Kimonis, et al., 2008), 8.3%). Length of follow-up period varied, with an average of 3.06 years and a range of six months to seven years. The null hypothesis, that the weighted average random effects estimate for the relationship between psychopathy and offending would be zero, was rejected (r

¹ McMahon, Witkiewitz, & Kotler (2010) did not report average age of participants

² Two studies (McMahon, Witkiewitz, & Kotler, 2010; Penner, Viljoen, Douglas, & Roesch, 2014) measured offending using both self-report and official data, therefore both sets of data were included in the meta-analysis

= 0.24; 95% CI = 0.18-0.30; $z = 7.84$; $p = 0.000$). This indicates that psychopathy and offending are positively correlated, with higher psychopathy scores being associated with higher offending rates, and vice versa. The effect size of 0.24 is small according to Cohen's convention (Cohen, 1990; Cohen, 1992). If the 95% confidence interval (CI) does not include 0, the effect size is significant at the .05 level.

Though the effect size indicates a relatively small relationship between psychopathy and offending, the result was significant ($p = 0.000$) therefore we can be fairly certain there is some relationship due to the large sample size ($n = 6487$). The estimated correlation coefficients, relative to the overall result, are represented graphically in Figure 2. The null hypothesis of homogeneity between studies was also rejected ($Q = 47.88$, $p = 0.0000$). Variability between studies was substantial ($I^2 = 77$), indicating that 77% of the total variance could be attributed to variability between studies. This figure indicates high heterogeneity (Higgins, Thompson, Deeks, & Altman, 2003). One possible explanation for significant between-study variability is that other variables may moderate the relationship between the variables, though this is not conclusive.

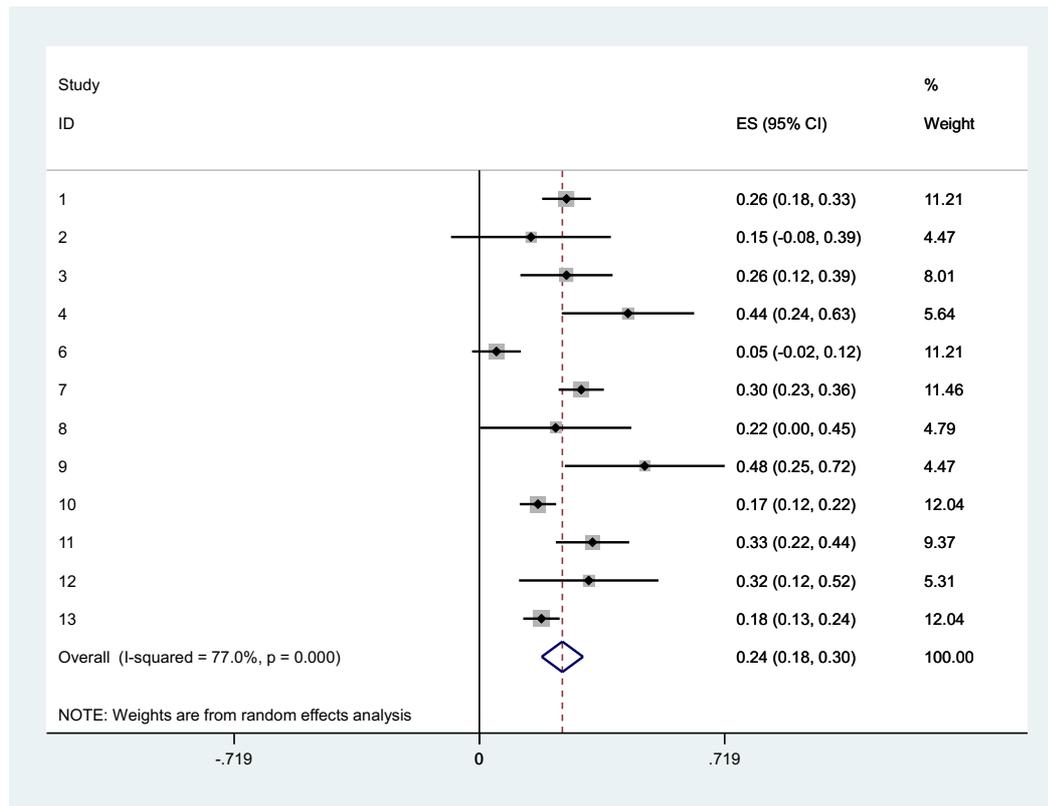


Figure 2 Forest plot from meta-analysis of correlations between adolescent psychopathy and (re)offending

4.1 Publication Bias

Preliminary inspection of funnel plot (see Appendix III) indicated publication bias for the overall results, due to the apparent asymmetry in the scatter and the number of studies falling outside of the triangular region (within which 95% of studies are expected to lie in the absence of bias). Orwin's (1983) fail safe N was also calculated, which would indicate the number of studies with a clinically unimportant finding (set at $r = .10$, for the present study) necessary to negate the present findings. The fail safe N indicated that an additional 17.16 studies with an effect size of 0.1 would be required to negate the overall findings. This number indicates that the weighted mean effect size observed for psychopathic traits is unlikely to be inflated by publication bias, given that this figure (17.16) is more than total amount of studies included ($N=12$).

4.2 Quality Assessment

The overall quality of the included studies was rated as 'fair' (n = 2) or 'good' (n = 8³). The assessment revealed that none of the studies included had considered power, which can increase the chance of Type II error, though this is not uncommon for cohort studies. Most of the studies measured key potential confounding factors (n=8). All studies measured the exposure of interest (psychopathy) prior to the outcome of interest (offending), though this was part of the inclusion criteria, and most had fewer than 20% of participants lost to follow-up, often. The complete table of ratings can be found in Appendix II.

³ Only 10 studies are included in the quality assessment, as data was extracted from McMahon et al. (2010) and Penner et al. (2014) for two variables

5 Discussion

5.1 Summary of findings

This systematic review and meta-analysis is an extension of previous reviews that have examined the relationship between adolescent psychopathy and offending. The review indicated that psychopathy is positively correlated with offending. However, this relationship was found to be small ($r=0.24$), though significant ($p=0.000$). The methodological quality of the studies was generally good, though this might be, at least partly, attributable to the inclusion criteria (i.e. length of follow-up).

5.2 How do the findings relate to the wider literature base?

The findings from this meta-analysis are consistent with those of previous reviews, which have established that psychopathy is related to offending (e.g., Edens et al., 2007; Asscher et al., 2011). Unfortunately, it was not possible to measure whether an interaction with another variable, for example 'offending measure', 'sample type', 'gender', 'psychopathy measure' or 'violent vs. general offending' was responsible for the overall finding. Asscher et al. (2011) found the association between psychopathic traits and (re)offending was somewhat weaker when self-report and official data of offending were used compared to other report of offending. This indicates that official records may produce an underestimation of the association between psychopathy and offending. Thus, caution is needed when interpreting results of studies using a single information source.

5.3 Limitations

Meta-analysis has some inherent limitations. Researchers and academics are well aware of the 'file-drawer problem', whereby studies which produce significant results with larger effect sizes are more likely to be published, and

therefore included in meta-analyses, which can result in a biased sample (Rosenthal, 1979). There were no unpublished sources included in the present study, and only peer-reviewed articles were included. Some consideration should be given to the possible interpretations of the findings, given the indication of potential publication bias (i.e. the funnel plot). Possible explanations for asymmetry in a funnel plot include publication bias, poor methodological quality leading to spuriously inflated effects in smaller studies, chance, or true statistical heterogeneity. Statistical heterogeneity limits the confidence that the findings identified are attributable solely to the 'true' relationship between psychopathy and offending and are not due to unknown confounders. Possible confounders could include individual factors, such as gender (Yang, Knight, Joe, et al., 2015) or executive functioning (Meijers, Harte, Meynen & Cuijpers, 2017), or family factors, such as parental bonding (Gao, Raine, Chan, Venables & Mednick, 2010).

This meta-analysis included studies with varying measurements of both the independent and dependent variables (i.e. psychopathy and offending), which could be argued to limit the analysis. It was not possible to analyse the studies using self-report data and those using official records of offending separately, due to the small number of studies included in the study. As such, it could not be determined whether the use of self-report data versus official records had an impact on the relationship between psychopathy and offending.

It was also the case that some studies, perhaps due to having very specific research aims, did not report correlation coefficients for the relationship between overall psychopathy scores and the offending outcome. Whilst there may have been good reasons for this decision, one could question whether it is reliable and valid to use individual subscales of a measure. That being said, a limitation of the present study was that the analysis was based on the zero-order correlations presented in the studies, and individual subscales or factors of psychopathy were not observed. Recently, researchers have been interested in whether Factor 1 of psychopathy is

able to add to the prediction of offending outcomes after controlling for the effect of Factor 2 (e.g., Kennealy P. J., Skeem, Walters, & Camp, 2010). This is an important area of research, given that evidence has begun to emerge to suggest that the antisocial facet of psychopathy has incremental validity in predicting recidivism over the other 3 facets (Walters, Knight, Grann, & Dahle, 2008). It has been argued that psychopathy's ability to predict future offending is a result of its measurement of antisocial personality, of which offending is characteristic, and that criminal records are used to score these items, which could be viewed as criterion contamination (Walters, Knight, Grann, & Dahle, 2008). As such, the findings in this study should be interpreted with caution, given that the positive correlation is likely to have been inflated by the inclusion of measurement of antisocial behaviour within the psychopathy measurement, in particular those studies that used the PCL:YV.

A strength of this study was that prospective design, whereby psychopathy was measured at least 6 months before the outcome measure, was part of the inclusion criteria. This will have reduced the chance of contamination as seen in retrospective and cross-sectional designs (Patrick & Zempolich, 1998; Swogger & Kosson, 2007).

6 Conclusions

The findings of this meta-analysis contribute to the ongoing debate on the complex relationship between psychopathy and offending and confirm the importance of studying an adolescent population. However, it remains that psychopathy and offending demonstrate only a small relationship, therefore psychopathy should not be used as predictor on its own. This finding indicates the need for further investigation into the unknown processes that might underpin the relationships between psychopathy and offending. Researchers should seek to understand what other factors might better predict future offending, rather than focusing on this notorious construct.

7 References

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Part II: Empirical paper

The relationship between psychopathic traits and adolescent offending trajectories

1 Abstract

1.1 Aims

There is an emerging body of evidence to support the notion that psychopathic traits assessed in adolescence can predict future offending. Few studies have specifically examined the relationship in terms of long-term patterns of offending. The purpose of this study was to assess the power of psychopathic traits in adolescence to predict long-term patterns of offending. Such knowledge may provide information necessary to determine the timing and method of intervention to interrupt these pathways.

1.2 Method

This study ran a secondary data analysis of the Systemic Therapy for At-Risk Teens study, a randomised controlled trial which compared the effects of Multi-Systemic Therapy (MST) to management-as-usual (MAU) in reducing conduct problems in 684 adolescents (82% male; age 11-18 at baseline) over an 18-month period. The current study used the Inventory of Callous Unemotional Traits (ICU) to examine psychopathic traits and offending trajectories were measured using official and self-reported delinquency data. Semi-parametric group-based modelling (SPGM) was used to identify unique trajectories.

1.3 Results

SPGM found four unique offending and four unique delinquency trajectories. Most adolescents followed a stable trajectory. Whilst almost half of the sample (46.5%) was found to have not offended at all during the trial, a small proportion followed a fairly stable offending trajectory. Psychopathy was found to predict membership of the moderate stable offending trajectory and the high delinquency trajectory groups. Gender, comorbid emotional disturbance, and impulsivity were

found to be significant covariates and important factors for predicting membership of the moderate offending and high delinquency trajectories.

1.4 Conclusion

Psychopathic traits present more frequently amongst adolescents who follow stable versus low offending or delinquency trajectories. This factor remains an important characteristic to consider. However, its relationship to offending is clearly nuanced and influenced by other factors such as gender and comorbid impulsivity and emotional difficulties. Suggestions for early intervention and risk management of offenders are discussed. Future research is needed to further understand factors influencing patterns of offending in young people.

2 Introduction

Offending is a vastly researched field, largely due to the social, psychological, and economic impact it has on society. In the seventies, Wolfgang, Figlio and Sellin (1972) demonstrated that a small group of 'chronic offenders' were responsible for about half of the offences in a birth cohort, leading researchers to try to identify the determinants of offending. Many studies have linked certain personality traits (e.g. antisocial personality) to offending. However, there is a dearth of research examining what might be underpinning these links. Studies have tended to focus on interpersonal characteristics such as antisocial or psychopathic personality, which have yet to show more than a moderate relationship with future offending (e.g. Asscher, et al., 2011). While the empirical literature examining serious offending in adulthood is well-established, more recently there has been increasing interest in understanding offending that begins and occurs in adolescence and its links with psychopathy.

2.1 Offending in adolescence

Often referred to as 'juvenile delinquency' or 'antisocial behaviour', offending in adolescence has garnered an interest of late to develop and research new theories and hypotheses to understand this phenomenon (Moffitt, Caspi, Rutter, & Silva, 2001; Patterson & Yoerger, 2002);. There is a particular emphasis on serious and persistent delinquent youths in order to gain sufficient evidence that could substantiate interventions (Farrington, Loeber, & Kalb, 2001).

Historically, evidence has tended to suggest that serious antisocial behaviours are disproportionately represented in male youths, and that early onset of these behaviours tends to indicate that they will persist throughout the life course (Hawkins, Laub, & Lauritsen, 1998; Lipsey & Derzon, 1998). Such studies have concluded that individual and family characteristics are the best predictors of

antisocial behaviour in children and youth populations (Pechorro, et al., 2014). As with adult populations, the best predictor of future antisocial behaviour is past antisocial behaviour (Tremblay & LeMarquand, 2001; Wasserman & Seracini, 2001). There continues to be debate amongst researchers and clinicians alike as to the importance and utility of other factors in understanding offending risk, such as mental or personality disorder.

The literature has attempted to make distinctions between unique sub-groups of young offenders who differ, for example on their type or severity of antisocial behaviour, the course and trajectory of the delinquency, and any characteristics that could suggest different causal processes underlying their behavioural disturbance (Skardhamar, 2009). Researchers have suggested that there exists a group of offenders who begin to exhibit severe problems prior to adolescence, which progressively increase in rate and severity across youth (Lahey & Loeber, 1994). This group are referred to as the 'Life-course persistent' (LCP) offenders. In contrast, there is a second group whose antisocial behaviour emerges with the onset of puberty, without an earlier history of problem behaviour, and desists as the individual ages, referred to as 'Adolescence-limited' offenders (AL) (Hinshaw, Lahey, & Hart, 1993; Moffitt, 1993). The differences in developmental trajectories and correlates of antisocial behaviour in these two subgroups of adolescents suggest that the LCP subtype may be more of a disturbance of character. That is, a consequence of the co-occurrence of a vulnerable temperament in the child and his/her experience of an inadequate nurturing environment (Frick, 1998; Moffitt, 1993). Moreover, this LCP sub-group seem to be characterised by poor emotional and behavioural regulation; a marker of psychopathy.

2.2 Psychopathy

Psychopathy is generally conceptualised as a chronic clinical condition, characterised by extreme interpersonal, behavioural and lifestyle traits. There exists a wealth of research dedicated to describing the composition of psychopathic traits and the correlates of adult psychopathy. However, the exact definition of psychopathy and the diagnostic criteria used to assess the construct have been subject to debate. Cleckley (1941; 1976) was highly influential in the development of modern definitions of psychopathy, having suggested the disorder encompassed 16 core characteristics, including superficial charm, irresponsibility, lack of remorse, deficient affect, lack of anxiety, and antisocial behaviour. Hare (1991) considered psychopathy to be made up of two factors; where Factor 1 (F1) consisted of primarily personality traits, and Factor 2 (F2) was composed of predominantly behavioural characteristics. There have been challenges to this view, with Cooke and Michie (2001) arguing that antisocial behaviour should not be a defining feature of psychopathy, as it is a behavioural result of the disorder rather than a definitional antecedent. Following this, however, Hare (2003) proposed a four-factor model reincorporating criminological variables. More recently it is common for three dimensions to be distinguished: callous/unemotional traits, narcissism, and impulsiveness.

Psychopathy has been identified as an important risk factor for the development of antisocial behaviour. A problematic aspect of this research is that many of the studies fail to make distinctions between specific psychopathic traits (e.g. behavioural or interpersonal factors, or Factor 1 versus Factor 2). It has been argued that the utility of psychopathy measures as a predictor of future antisocial behaviour can be largely explained by their assessment of social deviance (e.g. previous antisocial behaviour), and that interpersonal and affective traits do not

show better predictive validity when combined with historical antisocial behaviour (Kennealy, Skeem, Walters, & Camp, 2010).

2.3 Psychopathy applied to non-adult populations

The application of the psychopathy construct to adolescents has been somewhat controversial. For example, Seagrave and Grisso (2002) cautioned that it would be difficult to reliably distinguish psychopathic traits from features of normative adolescent development. Another concern that has been raised is that child psychopathy does not closely resemble the adult construct of psychopathy, given developmental differences, though research has concluded that the concept of child psychopathy has a reasonable degree of construct validity and a similar factor structure to that of adult psychopathy (Frick, Bodin, & Barry, 2000; Salekin, Brannen, Zalot, Leistico, & Neumann, 2006; Vincent & Hart, 2002; Salekin, 2008). Evidence has also gathered to suggest that psychopathy can be reliably assessed in children and adolescents (Forth, Hart, & Hare, 1990; Forth, Kosson, & Hare, 2003; Frick & Hare, 2001; Kosson, Cyterski, Steuerwald, Neumann, & Walker-Matthews, 2002) and that the construct has temporal stability (Pardini & Loeber, 2008; Lynam, et al., 2009).

Within the child and adolescent literature, psychopathy has often been measured in terms of callous-unemotional (CU) traits. CU traits refer to a specific affective (e.g., absence of guilt, constricted display of emotion) and interpersonal (e.g., failure to show empathy, use of others for one's own gain) style that is characteristic of a subgroup of children with severe conduct problems (Christian, Frick, Hill, Tyler, & Frazer, 1997; Frick, Barry, & Bodin, 2000; Frick, O'Brien, Wootton, & McBurnett, 1994). CU traits in early adolescence have been found to be positively associated with measures of adult psychopathy even after controlling for a range of common risk factors for antisocial behaviour (Burke, Loeber, & Lahey, 2007; Lynam, Caspi, Moffitt, Loeber, & Stouthamer-Loeber, 2007). Asscher and

colleagues (2011) conducted a recent meta-analysis of 53 studies which found that higher scores of psychopathic traits were moderately associated with higher rates of antisocial behaviour, general reoffending, and violent reoffending. However, they found variation in the magnitude of the effect sizes when they considered the source of information used to measure the variables, i.e. clinical judgment versus self-report, informant versus official data.

Gender differences in psychopathy to date have received little attention, thus warranting further research. In terms of factor structure, it has been suggested that the three-factor model better describes psychopathic personality traits in the general population and better captures psychopathic traits in women than the two-factor model (Jackson, Rogers, Neumann, & Lambert, 2002). Emerging evidence has indicated that the interaction of the interpersonal-affective (i.e. Factor 1) and impulsive-antisocial (i.e. Factor 2) features of psychopathy is associated with borderline personality disorder (BPD) in women (e.g. Sprague, 2013). Furthermore, in adolescents with high psychopathic traits there have been significant differences found when comparing males and females. In a recent empirical study, Nelson (2016) found that adolescent females with high psychopathic traits were three times more likely to have negative affect rather than having impulsive traits or affective disturbance (i.e. shallow affect), whereas no such difference was found in the males. Nelson also found that high psychopathic traits are good predictors of both short- and long-term offending in males. However, they are only able to accurately predict short-term offending in females (Nelson, 2016). These studies suggest that psychopathic traits in females are less reliably related to offending over time and are possibly more associated with emotional disturbance.

Frick et al. (2003) looked at a three-way interaction between CU traits, conduct problems, and gender in predicting general offending. They found that the highest rates of general delinquency for males fell in the group high on CU traits and conduct problems. In contrast, the highest rates of offending for females were found

in the group high on CU traits without conduct problems. Frick et al. (2003) also found that the comorbidity of ADHD and conduct problems in the group with high CU traits and high conduct problems may have accounted for their more severe problems. Evidence suggests that the combination of ADHD and antisocial behaviour is associated with greater amounts of physical aggression, a greater range of persistence of antisocial activity (Hinshaw, 1999), and the persistence of antisocial outcomes in adulthood (Beauchaine, Hinshaw, & Pang, 2010).

2.4 Trajectory research

The term 'trajectories' refers to the patterns and sequences of an outcome over time that can be used to explain the evolution of crime across the life course (Nagin, 2005; Nagin & Tremblay, 2005). The trajectory methodology follows the developmental life course's (DLC) emphasis on person-oriented methodological approaches (Magnusson & Bergman, 1988), which involves a focus on 'persons' as opposed to 'variables' to facilitate the simultaneous examination of within-individual and between-individual differences in antisocial behaviour over time (Moffitt, 1993; Magnusson & Bergman, 1988; Lussier & Davies, 2011). By considering how life conditions and other risk factors can influence the onset, persistence, and desistance of offending, the DLC perspective can help to explain the evolution of crime and deviance at the individual level from childhood to adulthood (Farrington, 2005; Loeber & Le Blanc, 1990; Nagin & Paternoster, 2000).

Trajectory analysis so far has revealed that the number of unique offending trajectories ranges from four to six (McCuish, Corrado, Lussier, & Hart, 2014), though this represents incarcerated samples only. Most commonly the trajectory groups tend to include one chronic trajectory and one adolescent-limited trajectory (Jennings & Reingle, 2012; Piquero, 2008). Recent studies that compared chronic offending trajectories to adolescent-limited and other offending trajectories have struggled to identify developmental risk factors that distinguish these groups (e.g.,

Day et al., 2012; Fergusson et al., 2000; Landsheer & van Dijkum, 2005; Nagin, Farrington, & Moffitt, 1995; Odgers et al., 2007; Piquero, 2008). By contrast, McCuish et al. (2014) examined a group of incarcerated males and females from early adolescence to adulthood and found that psychopathic traits present more commonly amongst individuals who follow chronic versus moderate offending trajectories. However, they did not control for gender.

Researchers have begun to examine criminal trajectories specific to psychopathic versus non-psychopathic cases. Porter, Birt, and Boer (2001) reviewed the criminal records of 317 federally incarcerated offenders and classified cases into low- and high-psychopathy groups based on the Psychopathy Checklist-Revised (PCL-R; Hare, 1991). The authors found that the high psychopathy group had an earlier age of first adult offence and committed approximately twice as many crimes as the low-psychopathy cases.

Studying a youth population, Gretton, Hare, and Catchpole (2004) followed 157 adolescent offenders over a 10-year period. Psychopathic traits were assessed retrospectively with the Psychopathy Checklist: Youth Version (PCL:YV; Forth et al., 2003), using case records. Participants were grouped into three classifications; high, moderate, or low psychopathic trait groups. PCL:YV scores were found to correlate positively with the number of violent offences and a faster rate of reoffending. Furthermore, PCL:YV scores were a better predictor of violence compared to age at first offence, symptoms of conduct disorder, and the number of violent and non-violent pre-assessment offences. Similarly, Dyck and colleagues (2013) studied offending behaviour of 126 adolescent offenders between the ages of 12 and 23. They found total scores on the PCL:YV were positively correlated with a higher number of overall offences. Furthermore, after classifying youths into low, moderate, and high psychopathic trait groups, they found that the moderate- and high-trait groups had consistently higher mean rates of offences throughout the follow-up period than the low-trait group. Contrary to what has been argued previously,

offending decreased over time for all three psychopathic trait groups (Dyck, Campbell, Schmidt, & Wershler, 2013).

Though evidence has begun to emerge to support the link between psychopathic traits and antisocial behaviour patterns in youths, there are some studies that suggest the relationship has been overestimated. Edens and Cahill (2007) followed 75 adolescent offenders over a 10-year period to examine the relationship of psychopathy scores with offending dimensionally by correlating the total and factor scores of the PCL:YV with reoffending rates. They found that neither the PCL:YV total score nor the factor scores were predictive of general or violent reoffending.

In conclusion, there is an emerging body of evidence to support the notion that psychopathic traits assessed in adolescence can predict future offending. However, there have only been a handful of studies that have specifically examined the relationship in terms of long-term patterns of offending and this research is not conclusive, highlighting the need for further investigation in this area. Such knowledge may provide information necessary to determine the timing and method of intervention to interrupt these pathways.

2.5 Research Questions

The purpose of the current study is to address the lack of research that has examined the association between psychopathy and different offence-based trajectories in adolescents. Individuals following chronic offending/delinquency trajectories and individuals following less active offending trajectories were compared in relation to scores on the ICU. The following research questions were devised:

1. Do individuals with higher levels of psychopathic traits differ to those with lower levels of psychopathic traits in terms of their offending behaviour over time?

2. Do males and females differ in terms of their offending trajectories?
3. How does impulsivity and co-morbid emotional disturbance interact with these offending trajectories?

2.6 Hypotheses

- H1. Individuals with higher levels of psychopathic traits will follow the more severe offending trajectory when compared to those with lower levels of psychopathic traits.
- H2. Males will be more likely to follow a more severe offending trajectory.
- H3. Individuals with greater co-morbid emotional disturbance will have offended more than those with lower levels.
- H4. Individuals with greater co-morbid impulsivity will have offended more than those with lower levels.

3 Method

3.1 Study design

This study followed a secondary data analysis design, using data from the Systemic Therapy for At Risk Teens (START) trial; a UK evaluation of Multi-Systemic Therapy (MST). The study design and procedures are presented in full in the published trial protocol (Fonagy, et al., 2013). The original study involved 9 MST pilot sites in the UK. Recruitment at each site took place for 18 months, commencing no less than 12 months after the inauguration of the programme at each site (sites began the programme at different time points), to ensure the embedding of MST at each site before randomisation began.

3.2 Participants

3.2.1 Recruitment process

Young people were recruited from social services, youth offending teams, education services, CAMHS (Child and Adolescent Mental Health Services) and a small number from other care services, all of whom were referred to local multi-agency panels set up to standardise the referral process. They identified participants' suitability for MST and invited them for formal assessment.

To be included in the START trial, participants had to be aged 11-17 years and display significant antisocial behaviour manifested as at least one of the following criteria: (1) persistent (weekly) and enduring (≥ 6 months) violent and aggressive interpersonal behaviour; (2) a significant risk of harm to self or to others (e.g., self-harming, substance misuse, sexual exploitation, absconding); (3) at least one conviction and three warnings, reprimands or convictions in the past 18 months; (4) current diagnosis of an externalising disorder and a record of unsuccessful

outpatient treatment; and (5) permanent school exclusion. Exclusion criteria can be viewed in Appendix IV.

Upon giving consent and completion of a baseline assessment, families were randomised to MST or MAU by an equal allocation ratio using stochastic minimisation, balancing for treatment centre, gender, current age (younger or older than 15) and age at onset of Conduct Disorder (CD; under or over 11).

3.2.2 Participant characteristics

Participants in this study were 683 (433 male, 250 female) young persons aged 11-17 years, who underwent baseline assessment in the START study. The average age of participants at baseline was 13.81 years (SD = 1.41), with approximately two thirds (65.3%) aged 11-14 years and just over one third (34.7%) aged 15-17 years. Half (50.1%) of the sample received MST over Management as Usual (MAU). Most of the participants were White British/European (78.3%), with the remainder classified as Black African/Afro-Caribbean (10.4%), Asian (2.3%), and Mixed/Other (7.5%). Socioeconomic status was categorised as follows: low (62.1%), medium (26.1%), and high (9.9%). A total of 1.5% and 1.9% of participants did not provide information about their ethnicity or socioeconomic status, respectively. Just under half (43.5%) of participants were classified as displaying significant early onset antisocial behaviour (i.e., a pattern of antisocial behaviour that included aggression and began before 11 years of age) and 56.5% were classified as late-onset (i.e., antisocial behaviour that began after 11 years of age). Additionally, 78% of participants received a diagnosis of Conduct Disorder based on a semi-structured diagnostic interview and standardised checklists in the START study, while 65% had committed at least one offence prior to randomisation. Analysis of demographic variables (i.e., age, gender, ethnicity, socioeconomic status) using t-test and Chi-square tests revealed no significant differences between treatment groups (i.e., MST vs. MAU; all p's < .05).

3.3 Measures

3.3.1 Offending behaviour

Official police records were used to collect objective data of the offending rates within the sample. This measured all types of offending, including violent offences, non-violent offences, and breach offences. These were measured at six-month intervals at five different time points –six months prior to randomisation, at baseline, and then at follow-ups at six, twelve and eighteen months. Figure 1 displays the mean number of convictions at time point for males and females.

In addition, a self-report measure of delinquency was used (Smith & McVie, 2003), which measures the prevalence and incidence of offending behaviour, such as vandalism, theft, and burglary, as well as violent offending such as robbery and assault. Questions include, 'Have you ever hit, kicked, or punched someone on purpose with the intention of hurting or injuring them?'. If the respondent marked 'yes', they were then given follow-up questions, such as, 'How many times have you ever done this?' and 'Have you ever been caught doing this by an adult or the police?'. Two measures of offending can be derived from these questions; 'volume of offending' (i.e. frequency of offending), and 'variety of offending' (i.e. the number of different types of offending behaviours). Only the volume of offending measure was used in the current study, due to the aims of plotting offending trajectories. Cronbach alpha for this scale was high ($\alpha = .92$). These questionnaires were administered during the initial contact with the young person, with follow-ups made at six, twelve, and eighteen months.

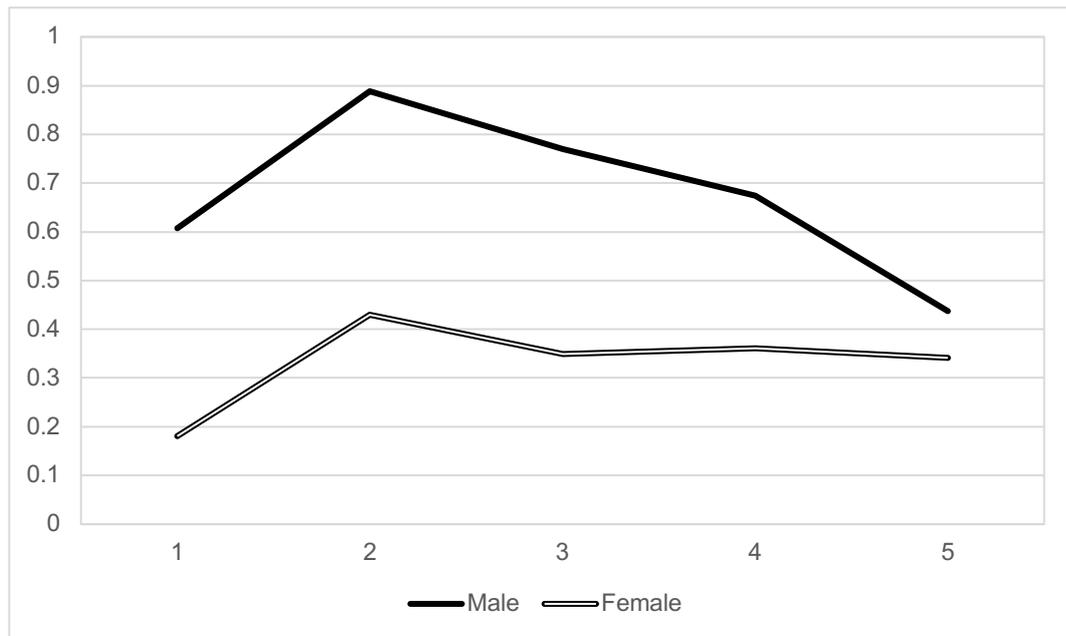


Figure 1 Average conviction rate for males and females at each time point

3.3.2 Psychopathy measure

The Inventory of Callous-Unemotional traits (ICU; (Kimonis, et al., 2008) is a 24-item self-report instrument used to assess CU traits in children and adolescents. The ICU has three subscales: Callousness, Uncaring, and Unemotional. Adolescent participants were asked to indicate how well each statement describes them on a 4-point scale: 0-Not true at all, 1-Somewhat true, 2-Very true, 3-Definitely true. There are five versions of the scale: Youth Self-Report, Parent Report, Teacher Report, Parent Report (Preschool Version), and Teacher Report (Preschool Version). This study used both self-report and parent-report, in order to allow for comparison. Furthermore, a binary measure of psychopathy was developed using an aggregate score of both parent and self-report versions to represent those with high scores ('High') and those with low scores ('Low').

The use of the total score on the ICU has been supported in factor analyses conducted with both detained (Kimonis, et al., 2008) and community (Essau, Sasagawa, & Frick, 2006) samples of adolescents. That is, although factor analyses suggest that the items consistently form three sub-factors (Callousness,

Unemotional, and Uncaring. (Kimonis, et al., 2008), adequate model fit is only obtained by specifying an overarching CU dimension including all items. Furthermore, the total score on the ICU correlates positively with antisocial behaviour and negatively with pro-social behaviour in samples of both community and detained adolescents (Essau, Sasagawa, & Frick, 2006; Kimonis, et al., 2008).

3.3.3 Emotional disturbance

A general assessment of well-being was taken using the Strengths and Difficulties Questionnaire (Goodman, 1997). The SDQ is a brief behavioural screening questionnaire of 3-16-year olds. It consists of 25 items measuring 5 different psychological attributes: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behaviour. The current study used the 'emotional symptoms' subscale (5 items). Both self-report and parent-report measurements were taken during the trial. However, this study opted to use the self-report measure, as adolescent report measures tend to be more sensitive to mental health problems (Waters, Stewart-Brown, & Fitzpatrick, 2003). For this measure, participants are asked to rate for each item whether it is 'Not True', 'Somewhat True', or 'Certainly True' on the basis of the last six months. Emotional items include statements such as 'I am often unhappy, down-hearted or tearful'. The reliability and validity scores of the SDQ suggest it is a useful brief measure of the adjustment and psychopathology of children and adolescents (Goodman, 2001).

3.3.4 Impulsivity

For the purpose of measuring impulsivity, this study used the hyperactivity/inattention subscale of the SDQ (Goodman, 1997). This consists of 5 items rated as either 'Not True', 'Somewhat True', or 'Certainly True', including statements such as 'I am restless, I cannot stay still for long' and 'I think before I do

things'. This measure was chosen as it was the most reliably completed measure included in the trial.

3.4 Ethical considerations

The trial study protocol was approved by the London-South East Research Ethics Committee (reference number 09/ H1102/55). Research and development approval was sought and given for each trial site by the relevant NHS Trust in each geographical area. The ethical approval letter can be viewed in Appendix V: Confirmation of ethical approval.

3.5 Data analysis

Descriptive and correlational statistics were gathered using IBM SPSS Statistics 24. This study used Semi-Parametric Group-based Modelling (SPGM) to answer the research questions. SPGM was developed by Nagin and Land (1993) to facilitate the statistical approximation of offending trajectories. Unlike cluster analysis and other grouping methods that identify groups *ex ante*, the SPGM method allows developmental trajectories to emerge from the data (Nagin, 2005). This type of analysis allows the sample to be divided into discrete groups, who displayed a similar offending pattern over time based on objective statistical criteria. Much in contrast to analytic strategies for event-based conceptualisations of desistance where clear distinctions can be made between 'desisters' and 'persisters', trajectories represent approximations of an unknown continuous distribution (Nagin & Land, 1993; Nagin & Tremblay, 2005). In SPGM, the functional form of the trajectories is specified to estimate the distribution of offenses over time. Quadratic functional form specifies a more parsimonious distribution that captures one major change in the patterning of offending, whereas Cubic functional form specifies a more complex distribution that captures two major changes in the patterning of offending (Bushway, Thornberry, & Krohn, 2003).

Analysis was performed with Stata SE15 using the 'traj' plugin developed by Jones, Nagin, & Roeder (2001). The current study used the Zero-Inflated Poisson (ZIP) model to estimate the distribution of the offending trajectories using official records, and the Censored Normal Model (CNM) for self-report delinquency data. The author considered linear, quadratic, and cubic trends over time, with between 1 and 6 trajectory classes.

The selection of the best model was based on the Schwartz- Bayesian Information Criterion (BIC). By integrating a penalty term depending on the number of independent parameters, BIC tends to favour parsimonious models. Thus, BIC is the most commonly used option for determining model selection (Nagin, 2005). Larger BIC values generally indicate an improvement in model fit. Following Raftery's (1995) approach, a difference of BIC lower than 2 between two models is insignificant, between 2 and 5 is positive, between 5 and 10 is strong, and a difference larger than 10 is very strong.

Once the best-fitting model for the entire sample was identified, participants were classified to the most likely trajectory group and the groups were given a qualitative description (see Figure 2). The association of various baseline characteristics, the treatment group (i.e. MST/MAU), and offence characteristics with the selected trajectory groups were tested using chi-square, ANOVA, and independent t-test analyses. Baseline characteristics included psychopathy score, gender, socioeconomic status, age at randomisation, and the SDQ (emotional and hyperactivity subscales) scores at baseline. The significant covariates from the bivariate analysis (i.e. ANOVA, chi-square, t-test) were included in a series of multinomial logistic regression analyses to examine whether these factors helped to predict offending/delinquency persistence or desistence. This type of analysis allowed for an examination of whether psychopathic traits increased the risk of involvement in one of the offending/delinquency trajectories whilst controlling for important demographic and criminogenic factors. In SPGM, multinomial logistic

regression is used, and the reference group is usually the lowest trajectory (i.e., the least serious) (Nagin, 2005).

4 Results

4.1 Official offending data

4.1.1 Model identification and description

For the official offending data, a four-group quadratic model resulted in a BIC value of -3084.25 (see Appendix VI: Results from model Selection for offences for full results of model selection analysis). This model was retained as the BIC value was higher than both a three-group quadratic model (-3089.76) and a five-group quadratic model (-3086.29). The four-group solution with quadratic functional form was retained over a four-group solution with cubic or linear functional form because the BIC values in the former model were higher. The parameters of the four-group quadratic model are outlined in Table 1. Classification accuracy, based on the average posterior probability of accurately assigning individuals to a particular trajectory, was high (>75%), which supported the use of this model (see Table 1).

Table 1**Model: Zero Inflated Poisson (ZIP) quadratic model with four groups (n = 679)**

	Trajectories			
	NO	LORS	MORS	HORV
N (%)	316 (46.5)	237 (35)	109 (16.1)	17 (2.5)
Estimated model parameters				
Intercept	-3.03414	-0.99859	-0.23791	3.53795
Linear	1.14384	0.84965	0.92272	-1.45937
Quadratic	-0.26198	-0.17329	-0.14644	0.22999
Model characteristics				
Mean probability-1	0.75 (0.08)	0.25 (0.08)	0.01 (0.00)	0.00 (0.00)
Mean probability-2	0.07 (0.13)	0.83 (0.15)	0.10 (0.11)	0.00 (0.00)
Mean probability-3	0.00 (0.00)	0.12 (0.16)	0.86 (0.16)	0.02 (0.05)
Mean probability-4	0.00 (0.00)	0.00 (0.00)	0.15 (0.18)	0.85 (0.18)
BIC= -3084.25 (N=3395) BIC= -3071.38 (N=679) AIC= -3035.21				

Note: NO = Never Offended, LORS = Low Offending Rate Stable, MORS = Moderate Offending Rate Stable, HORV = High Offending Rate Variable

Table 2
Offending trajectory groups and different individual-level characteristics

	NO	LORS	MORS	HORV	ANOVA/Chi sq
n (%)	316 (46.5)	237 (35)	109 (16.1)	17 (2.5)	
<i>Offence Characteristics</i>					
Age at randomisation	13.56 (1.5) ^{BC}	13.96 (1.4) ^A	14.11 (1.3) ^A	14.2 (1.6)	$F(6,676) = 3.46, p = 0.0023$
Total convictions	0.13 (0.3) ^{BCD}	2.33 (1.3) ^{ACD}	8.83 (3.6) ^{ABD}	19.8 (9.8) ^{ABC}	$F(24,654) = 203.21, p = 0.0000$
Violent convictions	0.04 (0.2) ^{BCD}	0.95 (0.9) ^{ACD}	2.72 (2.2) ^{ABD}	4.8 (4.5) ^{ABC}	$F(11,667) = 63.10, p = 0.0000$
Socioeconomic Status - Low	61%	64%	62%	47%	$\chi^2(9, N = 682) = 12.2650, p = 0.199$
<i>Demographic Characteristics</i>					
Gender - Male	55%	65%	82%	73%	$\chi^2(3, N = 683) = 26.8494, p = 0.000$
Ethnicity -White	82%	75%	82%	87%	$\chi^2(3, N = 673) = 5.0019, p = 0.172$
<i>Psychopathy Measures</i>					
Young Person ICU	31.81 (10.1) ^C	33.23 (9.4) ^C	36.52 (8.1) ^{ABD}	32.14 (9.3) ^C	$F(84,596) = 1.32, p = 0.0383$
Parent ICU	42.31 (11.7)	42.14 (11.5)	43.4 (12.2)	43.01 (11.7)	$F(89,588) = 1.28, p = 0.0554$
Binary Psychopathy - High	48%	51%	64%	60%	$\chi^2(3, N = 673) = 7.7614, p = 0.051$
<i>Other</i>					
Impulsivity	7.29 (2.7) ^{BC}	7.78 (2.3) ^A	7.85 (2.1) ^A	7.87 (2.2)	$F(10,669) = 1.84, p = 0.0508$
Emotional Disturbance	4.05 (2.6) ^{BCD}	3.30 (2.5) ^{AC}	2.41 (2.1) ^{AB}	2.60 (2.4) ^A	$F(10,669) = 4.46, p = 0.0000$
Treatment condition - MST	48%	53%	50%	53%	$\chi^2(3, N = 683) = 1.3778, p = 0.711$

Note: NO = Never Offended, LORS = Low Offending Rate Stable, MORS = Moderate Offending Rate Stable, HORV = High Offending Rate Stable, ICU= Inventory of Callous Unemotional Traits, MST= Multi-Systemic Therapy

^A Significantly different to NO, ^B Significantly different to LORS, ^C Significantly different to MORS, ^D Significantly different to HORV

The four offending trajectories presented in Figure 2 were labelled as 'Never Offended' (NO; 46.4%), 'Low Offending Rate, Stable' (LORS; 35%), 'Moderate Offending Rate, Stable' (MORS; 16.1%), and 'High Offending Rate, Variable' (HORV; 2.5%).

4.1.2 Never Offended

Never Offended group members comprised of 46.4% of the sample. As Figure 2 shows, this group is comprised of individuals that did not have any offences on their record at baseline and this continued throughout the trial. Participants in the NO trajectory had the lowest mean rate of total convictions, which included breach offences, at 0.13 (SD=0.3), as well as violent convictions at 0.04 (SD=0.2). Of all trajectories, the NO trajectory had the lowest ratio of males to females. Half of all female offenders (55%) were in the NO trajectory, indicating that the majority of females who were referred for MST will not offend at all. In contrast, only 39% of male offenders were in the NO trajectory. Furthermore, this group had the lowest average age at the start of the trial (Mean=13.56, SD=1.5). Participants in the NO trajectory averaged the lowest scores on the self-rated psychopathy measure (31.81, SD=10.1), and were a close second lowest mean score on the parent-rated measure (42.31, SD=11.7). They also averaged the lowest scores on the impulsivity measure (7.29, SD=2.7), though this still falls in the 'High' range. This group averaged the highest scores for emotional disturbance at 4.05 (SD=2.6). However, this falls in the average range for this scale, indicating that the overall sample tended to have clinically insignificant self-rated emotional difficulties.

4.1.3 Low Offending Rate, Stable

The Low Offending Rate, Stable (LORS) group comprised of 35% of the sample. For this group, offending was low at baseline and continued to be low throughout the trial. Over the course of the trial, the LORS group averaged 2.3 convictions (SD=1.3) and 0.95 (SD=0.9) violent convictions. This group contained

36% of all females and 38% of all males, which was the most evenly matched proportion of all trajectory groups. They were on average 13.96 years old (SD=1.4) when they began the trial. LORS offenders averaged the lowest score on the parent-rated psychopathy measure, similar to the NO group (42.14, SD=11.5), but had the second-highest average for the self-report measure of psychopathy (33.23, SD=9.4). This group had an average score of 7.78 (SD=2.3) for impulsivity and an average score of 3.3 (SD=2.5) for emotional disturbance, which was significantly different than the moderate offending group (MORS).

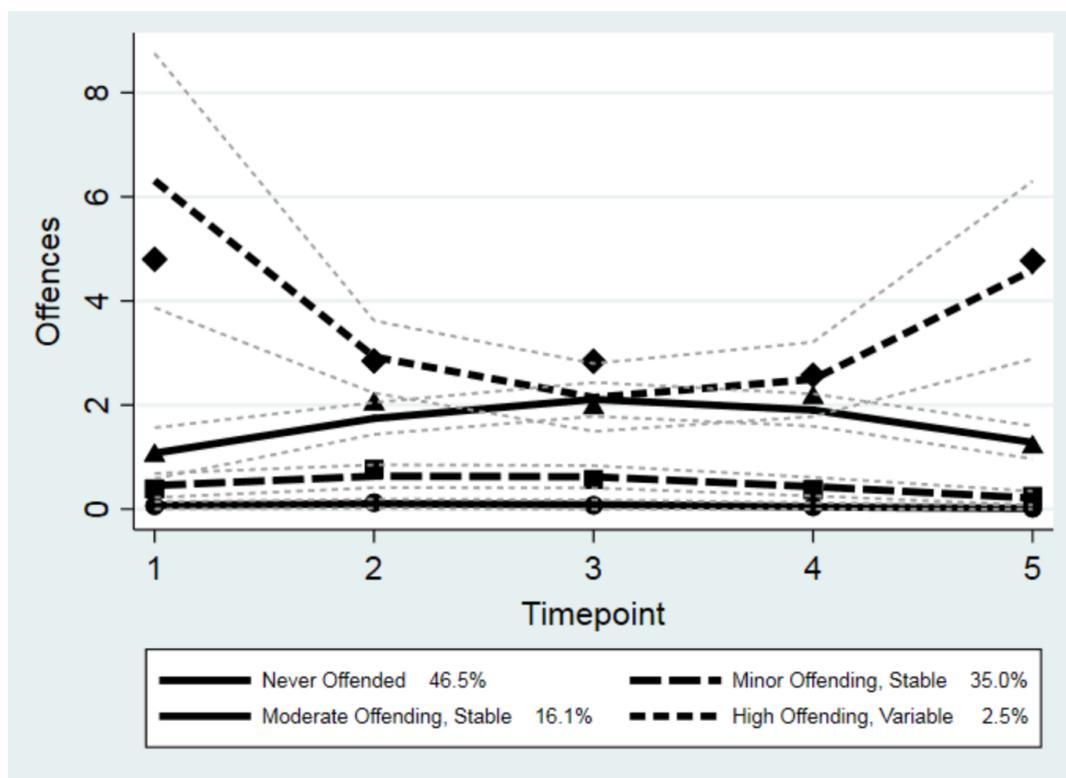


Figure 2 Offending trajectories from six months prior to randomisation to eighteen months follow-up

4.1.4 Moderate Offending Rate, Stable

Moderate Offending Rate, Stable (MORS) offenders comprised of 16.1% of the sample. They were on average 14.11 years old (SD=1.3) when they entered the trial. 20% of all males in the sample were in this trajectory group, as compared to only 8% of females, indicating that significantly larger proportion of males were in the higher offending rate trajectories ($p < 0.000$). MORS offenders averaged 8.83

convictions (SD=3.6) and 2.72 (SD=2.2) violent convictions throughout the trial. This group averaged the highest self-rated psychopathy score (36.52, SD=8.1), as well as the highest parent-rated score (43.4, SD=12.2). This suggests that psychopathic participants were more likely to offend than non-psychopathic participants ($p=0.03$, $p=0.06$). MORS offenders averaged scores of 7.85 (SD=2.1) for impulsivity and had the lowest scores of all trajectory groups for emotional disturbance (2.41, SD=2.1). This indicates participants with higher offending rates were less likely to have co-morbid emotional difficulties.

4.1.5 High Offending Rate, Variable

High Offending Rate, Variable (HORV) offenders comprised of only 2.5% of the sample, yet they represented a proportion of participants with significantly higher conviction rates than any other trajectory group ($p=0.000$). This was the case for both overall convictions (19.8, SD=9.8) and violent convictions (4.8, SD=4.5). As Figure 2 shows, the offending in this group was highly variable across time points. HORV offenders had the highest average age when they entered the trial (14.2, SD=1.6). This group had similar rates of female and male inclusion, with 2% and 3% respectively of the entire sample of females and males. They scored on average 32.14 (SD=9.3) for self-rated and 43.01 (SD=11.7) for parent-rated psychopathy. HORV offenders on average had the highest scores for impulsivity (7.78, SD=2.2) and scored similarly to MORS for emotional disturbance (2.6, SD=2.4).

4.1.6 Psychopathy and Offending Trajectories

There was a significant association between offending trajectory and the psychopathy variable, as measured by self-reported callous-unemotional traits. The parent-report measure produced a near significant association with offending trajectory ($p=0.06$), but, for the sake of brevity, only the self-reported psychopathy variable will be further explored in this section.

Specifically, individuals in the MORS trajectory had significantly higher scores than individuals in the NO, LORS, and HORV categories. This preliminary analysis supports the hypothesis that psychopathic traits are associated with more serious offending trajectories, but not the most severe of offending trajectories. Three separate multinomial logistic regression models were run to test the effects of psychopathic traits on offending trajectories when significant covariates are controlled for (see Table 3). The NO trajectory was the reference group because this group had the lowest rate of offending.

The first model in Table 3 indicates that, controlling for gender, psychopathy was significantly related to the MORS trajectory, as compared to the NO trajectory. This continued to be the case when emotional disturbance and impulsivity were controlled for (Models 2 and 3). Furthermore, for males compared to females, the relative risk for being in the MORS group compared to NO would be expected to increase by a factor of 3.982, given psychopathy scores are held constant. This means that males are more likely than females to be in the MORS group. However, this risk decreases once emotional disturbance and impulsivity are controlled for. Emotional disturbance was found to be significantly associated with both the LORS and the MORS trajectories, even when all other significant factors were controlled for.

Table 3**Relative risk ratios of covariates by trajectory group (NO group is the reference group) (n = 679)**

Variable	Model 1			Model 2			Model 3		
	LORS	MORS	HORV	LORS	MORS	HORV	LORS	MORS	HORV
	RRR (SE)	RRR (SE)	RRR (SE)	RRR (SE)	RRR (SE)	RRR (SE)	RRR (SE)	RRR (SE)	RRR (SE)
YP_ICU	1.017 (0.009)	1.056 (0.013)***	1.004 (0.028)	1.015 (0.009)	1.055 (0.133)***	1.003 (0.029)	1.002 (0.030)	1.049 (0.014)***	1.002 (0.030)
Gender	1.528 (0.268)*	3.982 (1.125)***	2.248 (1.339)	1.298 (0.239)	2.879 (0.846)***	1.638 (1.016)	1.317 (0.244)	2.974 (0.878)***	1.647 (1.022)
Emotional disturbance				0.904 (0.032)*	0.799 (0.043)***	0.809 (0.099)	0.893 (0.033)*	0.780 (0.043)***	0.806 (0.102)
Impulsivity							1.050 (0.206)	1.094 (0.055)	1.018 (0.073)

Note: NO = Never Offended, LORS = Low Offending Rate Stable, MORS = Moderate Offending Rate Stable, HORV = High Offending Rate Variable, YP_ICU= Young Person Inventory of Callous Unemotional Traits

* p < .05, ** p < .01, *** p < .001.

4.2 Self-reported delinquency data

4.2.1 Model identification and description

For the self-reported delinquency data, a four-group cubic model resulted in a BIC value of -8111.97 (see Appendix VII: Results from model selection for delinquency for full results of model selection analysis). This model was retained as the BIC value was higher than both a three-group cubic model (-8171.23) and a five-group cubic model (-8159.94). A six-group cubic model had a higher BIC than the four-group model, though this model output had a warning of being 'highly singular' and contained a group with only 1% of the sample, thus it was felt this model would be less meaningful than the four-group model. The four-group solution with cubic functional form was retained over a four-group solution with quadratic functional form because the BIC values in the former model were higher. The parameters of the four-group cubic model are outlined in Table 4. Classification accuracy, based on the average posterior probability of accurately assigning individuals to a particular trajectory, was high (>82%), which supported the use of this model (see Table 4).

The four offending trajectories presented in Figure 3 were labelled as 'Low Delinquency, Stable' (LDS; 74.5%), 'Moderate Delinquency, Slow Desister' (MDSD; 17%), 'High Delinquency, Slow Desister' (HDSD; 3.2%), and 'High Delinquency, Fast Desister' (HDFD; 5.3%).

Table 4**Model: Censored Normal (cnorm) cubic model with four groups (n = 683)**

	Trajectories			
	LDS	MDSD	HDSD	HDFD
N (%)	508 (74.5)	116.1 (17)	21.8 (3.2)	36.2 (5.3)
Estimated model parameters				
Intercept	20.97511	-41.33182	117.2823	181.97172
Linear	-9.84912	111.87428	-115.3636	-160.6204
Quadratic	2.12075	-48.23336	59.78534	54.30121
Cubic	-0.19713	6.02399	-169.5612	-6.21887
Model characteristics				
Mean probability-1	0.94 (0.1)	0.05 (0.09)	0.00 (0.00)	0.00 (0.01)
Mean probability-2	0.13 (0.14)	0.82 (0.17)	0.03 (0.06)	0.03 (0.06)
Mean probability-3	0.00 (0.02)	0.09 (0.16)	0.82 (0.25)	0.07 (0.12)
Mean probability-4	0.02 (0.07)	0.07 (0.10)	0.05 (0.1)	0.86 (0.16)
BIC= -8111.97 (N=2194) BIC= -8100.30 (N=683) AIC= -8055.03				

Note: LDS= Low Delinquency Stable, MDSD= Moderate Delinquency Slow Desister, HDSD= High Delinquency Slow Desister, HDFD= High Delinquency Fast Desister

4.2.2 Low Delinquency, Stable

The Low Delinquency, Stable (LDS) group comprised of the largest proportion of the sample (74.5%). This indicates that the majority of participants reported low levels of delinquency throughout the trial. For this group, delinquency was low at baseline and continued to be low throughout the trial. Over the course of the trial, the LDS group averaged 2.01 convictions (SD=3.5) and 0.7 (SD=1.3) violent convictions, which is consistent with the self-report. This group contained 80% of all females and 75% of all males. They had the lowest average age upon entering the trial at 13.74 years old (SD=1.4), but this was not a significant difference ($p=0.11$). LDS offenders averaged the lowest score on the parent-rated psychopathy measure (41.73, SD=11.5), and for the self-report measure of psychopathy (32.21, SD=9.6). ANOVA analysis revealed no significant differences across trajectory groups for the parent-rated measure, though there was a significant difference for the self-report measure. However, individual t-test comparisons revealed significant differences between LDS offenders and both of the high delinquency groups on both measures ($p<0.05$). This group had the lowest average score of 7.43 (SD=2.5) for impulsivity. Similarly, ANOVA did not produce a significant result for between group comparisons for this measure. However, t-tests showed that LDS group members had significantly different scores on impulsivity to both high delinquency groups. The LDS group scored the second highest average score of 3.54 (SD=2.6) for emotional disturbance.

Table 5
Delinquency trajectory groups and different individual-level characteristics

	Trajectories				
	LDS	MDS	HDS	HDF	
n (%)	508.8 (74.5)	116.1 (17)	21.8 (3.2)	36.2 (5.3)	
<i>Offence Characteristics</i>					
Age at randomisation	13.74 (1.4) ^D	13.88 (1.3)	14.29 (1.5)	14.28 (1.4) ^A	$F(6,676) = 1.74, p = 0.1097$
Total convictions	2.01 (3.5) ^{BCD}	5.26 (6.4) ^A	6.48 (5.7) ^A	4.08 (5.8) ^A	$F(23,654) = 3.77, p = 0.0000$
Violent convictions	0.70 (1.3) ^{BCD}	1.52 (2.4) ^A	2.05 (2.2) ^A	1.39 (2.4) ^A	$F(11,667) = 3.37, p = 0.0001$
Socioeconomic Status - Low	64%	57%	48%	53%	$X^2(9, N = 682) = 17.9449 p = 0.036$
<i>Demographic Characteristics</i>					
Gender - Male	62%	67%	81%	67%	$X^2(3, N = 683) = 3.9778 p = 0.264$
White British/European	79%	78%	90%	89%	$X^2(3, N = 673) = 3.8487 p = 0.278$
<i>Psychopathy Measures</i>					
Young Person ICU	32.2 (9.6) ^{BCD}	34.99 (9.8) ^A	37.35 (7.7) ^A	38.23 (7.4) ^A	$F(84,596) = 1.39, p = 0.0166$
Parent ICU	41.73 (11.5) ^{BD}	44.33 (12.5) ^A	44.90 (9.1)	45.89 (11.6) ^A	$F(89,588) = 1.10, p = 0.2646$
Binary Psychopathy - High	47%	65%	86%	78%	$X^2(3, N = 683) = 31.9485 p = 0.000$
<i>Other</i>					
Impulsivity (P_SDQ_Hyper)	7.43 (2.5) ^{CD}	7.79 (2.4)	8.66 (1.8) ^A	8.5 (1.6) ^A	$F(10,669) = 1.57, p = 0.1124$
Emotional Disturbance	3.54 (2.6) ^B	3.05 (2.5) ^A	3.38 (2.9)	3.88 (2.9)	$F(10,669) = 4.46, p = 0.0000$
Treatment condition - MST	51%	46%	62%	42%	$X^2(3, N = 683) = 3.0073 p = 0.390$

Note: LDS= Low Delinquency Stable, MDS= Moderate Delinquency Slow Desister, HDS= High Delinquency Slow Desister, HDF= High Delinquency Fast Desister, ICU= Inventory of Callous Unemotional Traits, P_SDQ_Hyper= Parent-rated Strengths and Difficulties Questionnaire – Hyperactivity Subscale, MST= Multi-Systemic Therapy

^A Significantly different to LDS ^B Significantly different to MDS ^C Significantly different to HDS ^D Significantly different to HDF

4.2.3 Moderate Delinquency, Slow Desister

The Moderate Delinquency, Slow Desister (MDSD) group comprised of 17% of the sample. As Figure 3 Delinquency trajectories from baseline to eighteen months follow-up demonstrates, for this group, delinquency was at a moderate level at baseline, which then had a slight increase at time 2, then slowly reduced by the end of the trial. Over the course of the trial, the MDSD group averaged 5.26 convictions (SD=6.4) and 1.52 violent convictions (SD=2.4). This group contained 14% of all females and 16% of all males. MDSD offenders averaged the second lowest score on the parent-rated psychopathy measure (44.33, SD=12.5), as well as for the self-report measure of psychopathy (34.99, SD=9.8). Individual t-test comparisons revealed significant differences between MDSD offenders and the LDS group on both measures ($p<0.05$). This group had an average score of 7.79 (SD=2.4) for impulsivity. The MDSD group scored the lowest average score for emotional disturbance (3.05, SD=2.5) across all trajectory groups.

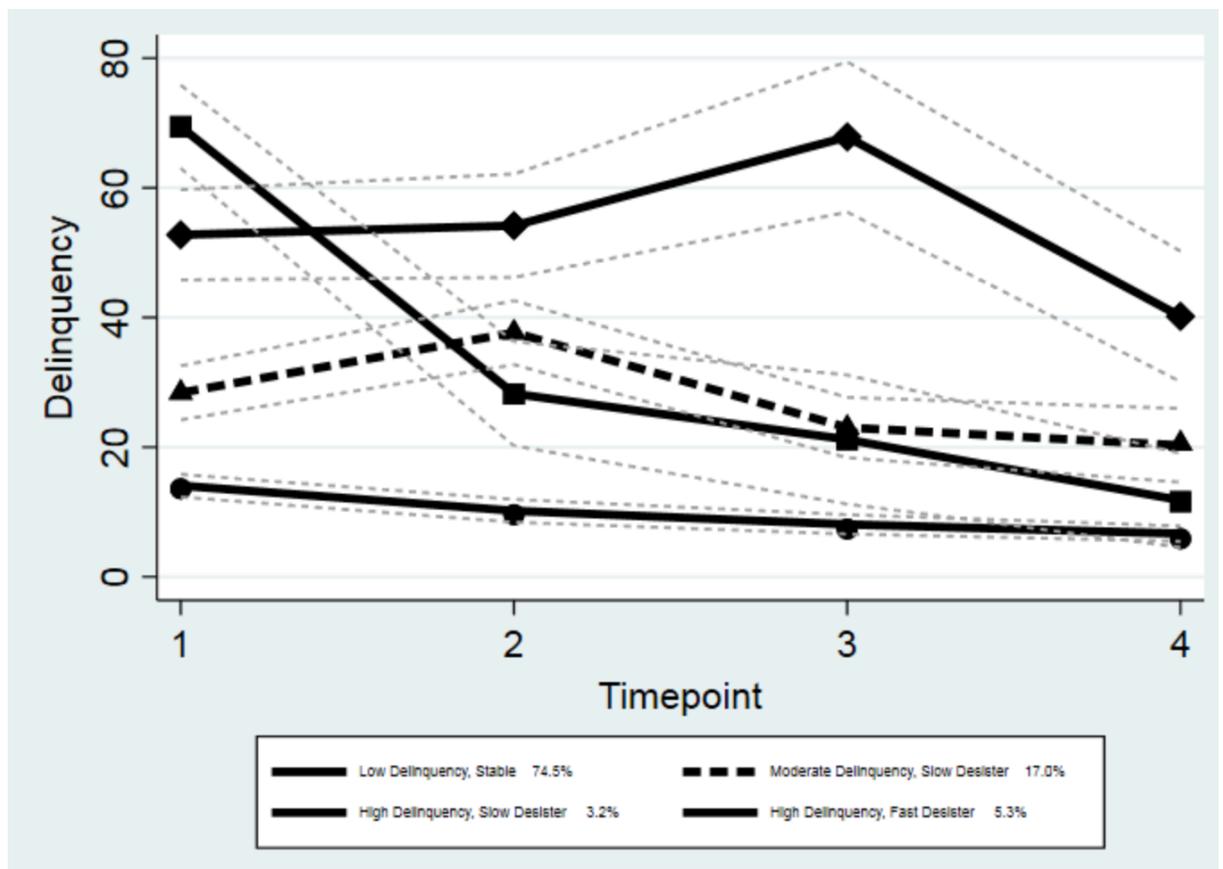


Figure 3 Delinquency trajectories from baseline to eighteen months follow-up

4.2.4 High Delinquency, Slow Desister

The High Delinquency, Slow Desister (HDSD) group comprised of just 3.2% of the sample, yet they represented a highly different trajectory path to other groups. As Figure 3 demonstrates, for this group, delinquency was high at baseline, which then had an increase at time 3, then slowly reduced to below baseline by the end of the trial. The HDSD offenders averaged most convictions (6.48, SD=5.7) and violent convictions (2.05, SD=2.2) across trajectory groups. This group contained 2% of all females and 4% of all males. HDSD offenders averaged a score of 44.9 (SD=9.1) on the parent-rated psychopathy measure and 37.35 (SD=7.7) for the self-report measure of psychopathy, which was significantly higher than the LDS group ($p=0.02$). This group had an average score of 8.66 (SD=1.8) for impulsivity and an average score of 3.38 (SD=2.9) for emotional disturbance.

4.2.5 High Delinquency, Fast Desister

The High Delinquency, Fast Desister (HDFD) group comprised of just 5.3% of the sample, yet they represented a highly different trajectory path to other groups. As Figure 3 demonstrates, for this group, delinquency was the highest at baseline, which then had a dramatic decrease by time 2, and then a more gradual reduction towards end of the trial. The HDFD offenders averaged the second lowest number of convictions (4.08, SD=5.8) and violent convictions (1.39, SD=2.4) across all trajectory groups. This group contained 5% of all females and 6% of all males in the sample. HDFD offenders averaged the highest score on both the parent-rated psychopathy measure (45.89, SD=9.1) and the self-report measure of psychopathy (38.23, SD=7.4), for which both comparisons were significantly higher than the LDS group ($p<0.03$). This group had an average score of 8.5 (SD=1.6) for impulsivity. HDFD offenders scored the highest average across all trajectory groups for emotional disturbance (3.88, SD=2.9).

4.2.6 Psychopathy and Delinquency Trajectories

There was a significant association between delinquency trajectory and the psychopathy variable, as measured by self-reported callous-unemotional traits. The parent-report measure was not significantly associated with delinquency trajectory ($p>0.05$), therefore only the self-reported psychopathy variable will be further explored in this section.

Specifically, individuals in the LDS trajectory had significantly lower scores than individuals in the MDSD, HDSD, and HDSD categories. This preliminary analysis supports the hypothesis that psychopathic traits are associated with more serious delinquency trajectories. Three separate multinomial logistic regression models were run to test the effects of psychopathic traits on delinquency trajectories when significant covariates are controlled for (see Table 5). The LDS trajectory was the reference group because this group had the lowest delinquency rate.

The first model in Table 6 indicates that, controlling for gender, psychopathy was significantly related to the MDSD, HDSD, and HDFD trajectories, as compared to the LDS trajectory. This continued to be the case when emotional disturbance and impulsivity were controlled for (Models 2 and 3). This indicates that those with higher scores of psychopathic traits were more likely to be in the more severe offending trajectories, and that this remained the case when gender, emotional disturbance, and impulsivity were controlled for. However, it is important to note that this was not the case for the HDSD category, where controlling for gender, emotional disturbance, and impulsivity meant that psychopathy was no longer a significant predictor of being in this group as compared to the LDS trajectory. Gender was found to not be as important in predicting trajectory group membership for the delinquency data as it was for offending data. Gender was initially found to not be significantly associated with trajectory group membership. However, once emotional disturbance and impulsivity were also controlled for, gender predicted

membership of the HDSD group, with males being significantly more likely than females to be in this trajectory. Impulsivity was found to be significantly associated with both of the high delinquency trajectories.

Table 6
Relative risk ratios of covariates by trajectory group (LDS group is the reference group) (n = 683)

Variable	Model 1			Model 2			Model 3		
	MDS	HDS	HDF	MDS	HDS	HDF	MDS	HDS	HDF
	RRR (SE)	RRR (SE)	RRR (SE)	RRR (SE)	RRR (SE)	RRR (SE)	RRR (SE)	RRR (SE)	RRR (SE)
YP_ICU	1.032 (0.012)**	1.059 (0.025)*	1.067 (0.019)***	1.031 (0.012)**	1.059 (0.025)*	1.068 (0.019)***	1.026 (0.012)*	1.046 (0.025)	1.051 (0.020)**
Gender	1.290 (0.299)	2.722 (1.540)	1.292 (0.478)	1.170 (0.286)	2.889 (1.692)	1.474 (0.572)	1.195 (0.292)	3.121 (1.833)*	1.619 (0.634)
Emotional disturbance				0.942 (0.044)	1.036 (0.094)	1.082 (0.074)	0.928 (0.044)	0.986 (0.093)	1.025 (0.073)
Impulsivity							1.062 (0.050)	1.279 (0.140)*	1.355 (0.125)***

Note: LDS= Low Delinquency Stable, MDS= Moderate Delinquency Slow Desister, HDS= High Delinquency Slow Desister, HDF= High Delinquency Fast Desister, YP_ICU=Young Person ICU, * p < .05, ** p < .01, *** p < .001.

5 Discussion

This study contributed to a recently formed area of research attempting to understand the link between psychopathic traits and offending trajectories. Semi-Parametric Group-based Modelling (SPGM) was used to examine the offending trajectories of a large group of adolescent males and females with a history of antisocial behaviour across a two-year follow-up period.

The discussion section will provide: (i) an overview of the main findings, (ii) an overview of how the findings relate to the current literature base, (iii) a critical review of the strengths and limitations of the study, (iv) a discussion of the research and theoretical implications, and (v) finally, the implications for clinical practice.

5.1 Summary of main findings

The amount of overall offending in the sample was low, with average conviction rates for males and females across all time points being less than one conviction. This suggests that, despite the sample being a large group of adolescent males and females referred for treatment for antisocial behaviour, the conviction rates of these individuals across a two-year period were surprisingly low. This was further demonstrated by the dominant 'Never Offended' trajectory, which comprised of almost half of the sample. Likewise, delinquency scores were not as high as expected, with the majority of participants reporting very low rates of delinquent behaviour across the trial period. There was variation in psychopathy scores, both parent and self-report versions. Emotional problems and impulsivity scores were low across the sample.

The results of the SPGM analysis revealed four unique offending and four unique delinquency trajectories. For offending, there was a trajectory for individuals who never offended (NO), a trajectory of low offending rates that was stable (LORS), a trajectory of stable moderate offending rates (MORS), and a high

offending rate but variable trajectory (HORV). For the self-reported delinquency, there was a trajectory of low delinquency that remained stable throughout the trial period (LDS), a moderate level of delinquency with some slight variation which slowly desisted over time (MDSD), a high delinquency slow desisting trajectory (HDSD) and a trajectory of high delinquency with fast desistence (HDFD). Whilst there were clear differences between the offending trajectories and the delinquency trajectories, such as the number of participants in each group and their shapes, it is worth considering the notable similarities. Each trajectory analysis revealed trajectories of very low levels of antisocial behaviour that was stable throughout the trial; the NO, the LORS, and the LDS groups. These groups likely represent adolescents that either will never offend or commit very minor acts of delinquency during adolescence but are not likely to continue to offend in adulthood. Similarly, there was a group of stable moderate antisocial behaviour in each trajectory analysis; the MORS and the MDSD groups. Given the small amount of time that these people were studied, it is difficult to tell whether these adolescents would be low-level chronic offenders, similar to those found in McCuish and colleague's (2015) study, or perhaps represent Moffitt's 'Adolescence-limited' (AL) trajectory. Finally, the trajectory analyses both included groups of those with higher levels of offending or delinquency; the HORV, the HDSD, and the HDFD groups. The HORV and the HDSD appear to follow similar paths, and whilst the HDSD was named as a slow desisting group, it is possible they also represent the more chronic, 'life-course-persistent' (LCP) offender. The decision was made to name this group a "desister" group due to end timepoint having lower scores than first timepoint, however further timepoints not measured in this study would reveal whether this group does in fact represent a desisting group or a group of LCP offenders. The HDFD were an interesting finding, as there was not a group found like this in the offending data, though they have been found in previous studies (e.g. McCuish et al, 2014; McCuish et al., 2015).

The finding that the moderate offending trajectory was significantly associated with higher psychopathy scores partially supported H1- that individuals with higher levels of psychopathic traits will follow more severe offending trajectory when compared to those with lower levels of psychopathic traits. However, the HORV was not significantly associated with any of the variables of interest. This was true even after controlling for all covariates. A possible explanation for this could be that, for example, individuals with strong symptoms of psychopathy who commit primarily very serious offenses are unlikely to be associated with chronic offending trajectories. Rather, this type of offender appears more likely to be found in a lower rate trajectory that maintains a stable level of serious offending throughout the life course (Corrado, McCuish, Hart & DeLisi, 2015). Membership of the more severe delinquency trajectories were found to be associated with higher scores on the psychopathy measure, giving further support for H1. This was largely true after controlling for all other variables of interest, though the HDSD trajectory group was no longer significantly associated with psychopathy score after controlling for gender, emotional disturbance, and impulsivity. Interestingly, these findings were the case for the self-reported measure of psychopathy, but not for the parent-rated measure. This has implications for the overall interpretation of the results, given the concerns regarding the accuracy of these measures.

Gender was found to be a highly significant predictor of membership of the MORS group, which gave support for H2 – that males will be more likely to follow a more severe offending trajectory. This finding continued to be true after controlling for emotional disturbance and impulsivity. For the delinquency trajectories, gender was found to be a significant predictor of membership in the most severe group (i.e. the HDSD), giving further support for H2.

The finding that higher scores on the measure of emotional disturbance was significantly associated with the HDSD and HDFD trajectories gave partial support to H3 – that individuals with greater co-morbid emotional disturbance will have

offended more than those with lower levels. This finding was true after controlling for psychopathy, gender, and impulsivity. Interestingly, emotional disturbance was found to differ significantly amongst offending trajectory groups (see ANOVA results). However, this was no longer true after psychopathy, gender, and impulsivity were controlled for in the regression models. Moreover, the direction of this relationship differed, in that lower levels of emotional disturbance were found in the higher offending trajectories. This gives conflicting evidence for whether comorbid emotional difficulties were predictive of further antisocial behaviour in this sample and makes it difficult to make conclusions about the importance of this factor.

ANOVA found that parent-rated impulsivity was significantly associated with offending trajectory, giving support for H4- that individuals with greater co-morbid impulsivity will have offended more than those with lower levels. However, the multinomial logistic regression found impulsivity to not be a significant predictor of group membership once psychopathy, gender, and emotional disturbance were controlled for, suggesting that impulsivity may not be a useful factor for predicting offending patterns. On the other hand, the opposite was true for the delinquency data, where no significant association was found between impulsivity and delinquency trajectory group on its own. Though, once psychopathy, gender, and emotional disturbance were controlled for, impulsivity was a significant predictor of membership in the two high delinquency groups (HDFD and HDSD). This could suggest that impulsivity is more strongly associated with minor acts of delinquency, as opposed to more severe criminal activity for which an adolescent would receive a conviction, and that there are differences in how this affects males and females, those with psychopathic traits, and those with higher emotional disturbance.

5.2 How do the findings compare to existing literature?

The number and shape of trajectories identified in the current study is representative of most previous studies (McCuish, Corrado, Lussier, & Hart, 2014; Jennings & Reingle, 2012; Piquero A. , 2008), though these have tended to use offender samples. Specifically, these studies have frequently identified an early and chronic criminal trajectory (i.e., HORV and HDSD groups in the current study) and a trajectory that peaks in mid-adolescence and reaches a near-zero level by early adulthood (i.e., the HDFD group in the current study) (McCuish, Corrado, Lussier, & Hart, 2014). Similarly, using non-offender samples, Jennings and Reingle (2012) conducted a meta-analysis of 105 empirical studies that examined the number and shape of group-based trajectories of delinquency, violence, and aggression and found that most studies identified three or four groups.

The finding that the higher psychopathy scores were associated with more severe offending/delinquency trajectories is consistent with previous findings (McCuish, Corrado, Lussier, & Hart, 2014). However, in the current study the most severe offending trajectory (HORV) was not found to be significantly associated with psychopathy or any of the other variables of interest, suggesting that the true risk factors associated with this group were not measured in this study. It could also be a reflection of the small sample size in this trajectory group (n=17), thus there being insufficient power to detect a significant effect.

Differences in trajectory shape may reflect differences between individuals with differences in psychopathic traits. That is, more severe offending trajectories might reflect more Factor 2 psychopaths, rather than Factor 1. Cleckley (1941) and Karpman (1948) argued that Factor 1, or primary psychopaths, commit antisocial acts due to an idiopathic lack of empathy and fear. Secondary psychopathy has been found to be related to risky decision-making (Dean, et al., 2013), which could reflect a more variable offending trajectory (i.e. the HORV group).

The finding that males were more likely to be in a higher offending/delinquency trajectory than females was not surprising. Gender differences in the level and duration of criminal behaviour within offending trajectories are commonly identified, including the frequency of offending over time, age of onset, and patterns of desistence and persistence (Piquero, 2000; Murphy, Brecht, Huang, & Herbeck, 2012; Zheng & Cleveland, 2013; Gorman-Smith & Loeber, 2005).

Overall, a number of similarities in the risk and protective factors found in other studies of males and females were identified as important predictors of antisocial behaviour among the participants included in the current study. In particular, the importance of individual-level factors such as emotional disturbance and impulsivity in predicting different patterns of offending/delinquency, particularly in females, is an important finding. This finding is consistent with previous research that has shown that antisocial females to be more vulnerable to mental health, self-identity, and suicidal ideation compared to their male counterparts (Diamantopoulou, Verhulst, & van der Ende, 2011; Kling & Shibley Hyde, 1999; Nolen-Hoeksema & Girgus, 1994). The finding that higher levels of impulsivity were associated with higher offending/delinquency trajectories, and in both genders, was largely consistent with the existing literature. Interestingly, the current study found that those with lower levels of emotional disturbance were more likely to have higher offending rates, which is in contrast to most other studies. In a study of a large group of adolescent females (n=5138), Kruppa and Childs (2014) found that, compared to the higher offending group, the 'stable low/abstainers' reported significantly higher levels of self-control and significantly lower levels of depression. The lower levels of emotional disturbance in the high offenders in the current sample could be explained by previous findings that males with higher levels of anxiety and depression showed a less severe pattern of low-level, chronic offending

relative to those with life-course persistent or adolescence-limited antisocial behaviour (Moffitt, Caspi, Harrington, & Milne, 2002).

5.3 Critique

5.3.1 Limitations

There are a number of limitations to the current study. Firstly, the use of any self-report measures brings concerns about accuracy. Particularly in using an adolescent sample, there are concerns about whether people with psychopathic traits are able to accurately report on their own character and impression management biases may undermine the veracity of the responses they give. Similarly, a lack of insight into the severity of symptomology is likely in this population. The use of an additional parent-rated measure of psychopathic traits was used to attempt to overcome this. As for self-reported delinquency, underreporting of crimes is a potential confounder, particularly for individuals who are impulsive (Watkins & Melde, 2007). The use of official offending records was implemented to try to overcome this, though official records are likely to also be an underrepresentation of true criminality, given low conviction rates, lack of police follow-up, and the under-reporting of crimes by the victims. Further, this study measured frequency of offending, but did not look at versatility of offending (i.e. number of different types of offences). The inclusion of this information may provide a more detailed picture of the characteristics of trajectories of criminal behaviour among adolescent males and females.

Although there were four and five different time points to use for the trajectory analysis, the time points represented two years in actual time, which is a relatively short period of time to be assessing someone's offending potential. This could lead to further underestimations of antisocial behaviour in the sample. The mean offending rates in the study were very low, which limits the sensitivity of the analytic procedures. In particular, the participants in the high offending group

represented only a very small proportion of the sample (n=17), thus analysis of this group of individuals lacked sufficient power to detect significant effects. Similarly, levels of emotional disturbance in the sample were generally low, with the average score being below the clinical range. The use of the SDQ 'hyperactivity/inattention' subscale as a measure of impulsivity also has its limitations. It could be argued that a measure with more questions related to the construct of 'impulsivity' would have been more appropriate, for example the Attention Deficit Hyperactivity Disorder (ADHD) subscales from the Conners Comprehensive Behaviour Rating Scale (CBRS, Conners, 2008). In this study, the CBRS was not completed as consistently as the SDQ measure, therefore it was felt this would be more beneficial for the trajectory analysis comparisons.

It should be noted that there are also limitations to the interpretation of the trajectory groups. In SPGM, the groups show individuals following approximately the same developmental course of the outcome variable, thus they are purely estimates. Group membership is a convenient statistical fiction, not a state of being. Furthermore, the empirical relevance of trajectory groups is dependent on the extent to which the nature of each group differs from one another (van der Geest, Blokland, & Bijlev, 2009). Given the small number of studies using male and female samples, as well as the low variability found among the offending data/delinquency items, the findings of this study are preliminary and serve as a basis for future research to replicate and/or expand upon.

5.3.2 Strengths

Despite the noted limitations, there are strengths of the study. Firstly, this is a fairly novel contribution to the literature, given the population, sample size, measures, and analytic techniques included. Of the few offending trajectory studies that have been conducted so far, there is a dearth that have looked at both males and females, as well as including multiple measures of offending and psychopathy.

A number of previous studies have comprised of solely convicted samples, thus they are only able to provide an understanding of offending trajectories among high-risk offenders. The inclusion of the covariates of emotional disturbance and impulsivity adds further unique and vital information to the research knowledge.

5.4 Future research

This study was not able to examine the offending patterns of adolescent males and females past the age of 17, therefore studies that follow its participants further into adulthood would be beneficial. This might allow for differences in offending frequency between the higher offending trajectory groups to be clearer, which would have helped identify which should be of the greatest concern to criminal justice professionals.

This study used the Inventory of Callous-Unemotional Traits (ICU) to assess for psychopathic traits. Future research might consider alternative measurement; in particular the use of a clinician-rated measure, such as the PCL: YV, would be beneficial to reduce the chance of self-report bias. Likewise, alternative measurement of impulsivity and emotional disturbance could also be beneficial, given that these measures are brief and therefore lack specificity. It may also be prudent for future research to look to build on the current study by examining how various risk and protective factors, including developmental and community-level factors, relate to changes in offending at different stages of development.

Finally, the finding that there was a positive but non-linear relationship between psychopathy and offending implies a need for additional research aimed at identifying a threshold level at which psychopathy risk becomes salient as a risk factor for antisocial behaviour. It also implies a need to develop and test measures of assessing psychopathy risk that are sufficiently sensitive for identifying youths who may be truly at risk to develop psychopathic traits.

5.5 Implications for clinical practice

The findings of the current study provide information about risk variables and their association with antisocial behaviour over time. This information can influence the development of more specific assessment procedures and more precisely targeted interventions aimed at preventing offending. Estimated risk trajectory group membership, based on trajectory model results, was related to offending for some well-known risk factors, i.e. psychopathic traits, gender. The findings also began to shed light on some lesser-known factors such as emotional disturbance. Better understanding of the nature of these complex relationships can lead to better procedures for assessing risk and planning interventions.

The findings also highlighted the low offending rates in a large group of adolescents that were referred for an expensive treatment programme (Multi-Systemic Therapy; MST) due to concerns about their antisocial behaviour. This suggests that the screening process for this intervention needs of further development, given that the majority of the sample did not commit any offences at all during the trial period. Rather, the finding that there was a very small proportion of individuals that were responsible for a fairly significant number of violent and non-violent crimes (à la Wolfgang, Figlio & Sellin, 1972), suggests that a more rigorous assessment that can identify such individuals and tailor a treatment programme to prevent such crimes occurring is still needed. In this case, MST did not have a significant effect on offending trajectory, which suggests this programme was not sufficient to target these more chronic offenders/delinquent adolescents. There continues to be the challenge of effectively responding to the small group of offenders who are responsible for the majority of all crime, due to the significant barriers to successful intervention that these individuals tend to present with (i.e. psychopathy and personality disorders). Early childhood intervention programmes offer an alternative to the more reactive-based treatment and incarceration

approaches for which the outcomes with adolescent populations have been less than favourable (e.g., Frick 2009; Frick & Ellis, 1999).

From a policy perspective, there is a concern that the trajectories identified by SPGM will be reified (Nagin, 2005). Although the current study identified four trajectories, this does not imply that four distinct types of offenders exist in the population. However, policy-makers may conclude that these groups are real and that all offenders fit into one of the four trajectories identified. It is important to note that this is not the case, rather this study helps to clarify the different patterns of offending that exist in the adolescent population and that these are not always linear.

6 References

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Part III: Critical appraisal

1 Introduction

The current empirical study contributes to a large body of research examining risk of antisocial behaviour, with a particular focus on psychopathy. This type of research has been criticised in the past for being overly interpretive and uncritical (O'Mahony, 2009). As such, this appraisal will critically discuss the construct of psychopathy, the misuses of diagnosis, and the challenges of measurement; particularly when applied to a youth population. It will make reference to the current study and some of the particular dilemmas faced in conducting research on this notorious topic.

2 What does psychopathy mean and how is it defined?

The term 'psychopathic disorder' has been found to have three separate meanings; a legal classification, a clinical classification, and a term of abuse in the vernacular (Fallon, Bluglass, Edwards, & Daniels, 1999). As a legal classification, psychopathic disorder represents a category of mental disorder defined within the Mental Health Act (2007) and provides the basis for the detention of individuals meeting criteria under the Act. As a clinical classification, a diagnosis of psychopathic disorder is not recognised within the official diagnostic manuals (DSM-V; ICD-10), rather a clinical definition originates largely from Hare Psychopathy Checklist (PCL-R; Hare, 1991) and its derivatives. The Hare measures are the most widely used and well-known measures of psychopathy. As a result, concerns have been expressed by some that the measure has become the construct (Cooke, Michie, Hart, & Clark, 2005). These concerns highlight the importance of revisiting the concept as it was originally conceived and noting any differences in the description as compared to how it is currently measured. It would be prudent to examine whether these differences denote a necessary development and refinement in the definition, or rather signify unsubstantiated and problematic shifts in how psychopathy is now classified; a concept known as "construct drift" (Hare & Neumann, 2008). In his detailed monograph 'The Mask of Sanity', Cleckley (1941) described individuals who appear 'sane' to laypeople but can be defined by a set of shared characteristics. He described 16 separate core characteristics of the psychopath, including superficial charm, irresponsibility, lack of remorse, deficient affect, lack of anxiety, and antisocial behaviour. These characteristics have largely been incorporated into modern assessment measures of psychopathy, such as the PCL-R, though there are some notable absences. Specifically, the PCL-R does not

include any items assessing 'absence of nervousness or psychoneurotic manifestations', nor does it assess for intelligence. Cleckley (1941) had posited that the psychopath does not suffer from any obvious mental disorder and is generally of average or above intelligence. However, contemporary clinicians would largely disregard these two characteristics as being features of the psychopathic personality that we understand in today's world. The literature on the association between psychopathy and anxiety is somewhat mixed, but it has been proposed that one possible advantage of psychopathy might be resiliency against anxiety. The callous and interpersonal emotional detachment traits of psychopathy that are also sometimes linked to the label "primary psychopathy" have rather consistently been shown to be associated with lower levels of anxiety, compared to the impulsive and antisocial traits of psychopathy, which are more positively associated with anxiety (Frick & Ellis, 1999; Lykken, 1957; Skeem, Johansson, Andershed, Kerr, & Loudon, 2007; Skeem, Polaschek, Patrick, & Lilienfeld, 2011). Yet, several studies have found no relationship between PCL-R scores and anxiety (Hale, Goldstein, Abramowitz, Calamari, & Kosson, 2004; Schmitt & Newman, 1999). Likewise, empirical research has fairly consistently shown near zero correlations with various measures of intelligence in British, European American, and African American samples (Hart, Forth, & Hare, 1990). In the current study intelligence was not one of the main variables of interest and was, therefore, not focused on in the main report. However, the data from the sample showed no correlation between the parent-rated psychopathy measure and IQ score. Interestingly, there was a significant negative correlation found between the self-reported psychopathy measure and IQ score, indicating that those with a higher IQ rated themselves as less psychopathic. This perhaps highlights a problem with self-rated measures of psychopathy- as the more savvy individual may be aware of the consequences of being labelled as 'psychopathic'.

Perhaps Cleckley (1941) was simply wrong about intelligence being part of the psychopathic profile, and his judgments should be disregarded in favour of the more recent empirical results. One possible explanation for Cleckley's mistaken inclusion of intelligence as a characteristic of psychopathy is that the basis for his description of the psychopath may have been influenced by a few select cases that were more memorable to him (i.e. due to high intelligence). We know that people tend to judge the vivid, easily recalled examples of a category, or those that are most available in memory, as more frequent than they actually are; known as the "availability heuristic" (Johansson & Kerr, 2005).

On the other hand, perhaps the reason why Cleckley's (1941) assertion that psychopathic individuals are often highly intelligent has not been backed by empirical findings is due to the study of psychopathy being limited to offending populations. Offending research has shown countless times that low socioeconomic status is a strong risk factor for predicting future violence and offending. This, in turn, is associated with other risk factors such as lower education level and childhood trauma, both of which will impact on a person's performance on an IQ test. As such, mean IQ scores in these populations will tend to be below average, therefore making it less likely for so-called "intelligent" psychopaths to emerge. This highlights an area of interest for me; that the "high functioning psychopath", oft discussed in pop culture, has seldom been studied at a clinical level.

3 Problems with the diagnosis

One of the points of contention between clinicians around giving a diagnosis of psychopathy is that it has historically been used as a reason for excluding individuals from treatment. This has arisen due to the claim that psychopathic individuals are untreatable and in fact get worse with treatment (Hare, 1998; Hare, Clark, Grann, & Thornton, 2000). This originated from a study in Canada which analysed outcomes from the Social Therapy Unit (STU) at Penetanguishene (Rice, Harris, & Cormier, 1992). The study had a lot of strengths, including a 10-year follow-up, however there were a number of significant weaknesses that place doubt on the veracity of the findings. For example, PCL-R scores were applied retrospectively through file review. Furthermore, the nature of the therapy undertaken at the STU would generally be seen as out of keeping with current practice, given that it involved use of drug therapies including methamphetamine, LSD, scopolamine and alcohol alongside marathon naked encounter group sessions.

In the UK, the introduction of the Dangerous and Severe Personality Disorder (DSPD) Units in the early 2000s brought promise of a shift in thinking – that psychopathic persons could be treated. However, the introduction of this new term was also met with criticism, given that those who met criteria for DSPD were now subject to indeterminate confinement in a special unit within a prison or NHS hospital (Pickersgill, 2013). Furthermore, in the US, diagnosis of psychopathy was used in a case for giving the death penalty (Edens, 2001). For this reason, I have been concerned and cautious about undertaking research that focuses on such a characteristic. I felt responsible for contributing to unhelpful narratives about individuals who match the criteria for psychopathic disorder. In fact, I had hoped that the results might perhaps demonstrate the nuances involved in offending and how psychopathic traits are not enough to determine whether a person is a risk to

society, and definitely not any more so than any other 'subgroup' of individuals. I was pleased to find that the meta-analysis partially supported this cause, in that the findings showed that psychopathic traits only account for a small proportion of the variance in why adolescents engage in long-term antisocial behaviour. It seemed even more important for this to be emphasised, given that the focus was on young people, thus there was a potential for the findings to be misinterpreted in order to exclude people from an even earlier age.

It is interesting that the idea that psychopathic people are more dangerous and less amenable to treatment than non-psychopaths still prevails, given the overwhelming evidence that this is not the case. (e.g. Kernberg, 1984; 1992; Martens, 1999; 2000; 2002b). On the other hand, the fact that those who score highly on PCL assessments sometimes are found to fare worse than those scoring lower is of itself unsurprising. It does not itself provide support for the conclusion that such individuals are not amenable to, or are made worse by, existing treatments. High scoring individuals are, self-evidently, likely to have more severe difficulties and greater needs than those with lower scores. As David Crighton (2009) explains, the appropriate comparison in terms of addressing questions of response to treatment would be a comparison between randomly allocated treated and untreated psychopathic groups. To date, such studies have not been undertaken and the existing evidence base remains too thin to answer what remains an open question. As such, we should assume the treatment programmes they are being entered into currently are not meeting their needs, not that they are incapable of having their needs met.

4 Problems with measurement

As stated above, the PCL-R is the most widely used measure of psychopathy. Hare has developed some derivations of the PCL-R which include a screening measure (PCL:SV; (Hart, Cox, & Hare, 1995) and an adolescent measure (PCL:YV; (Forth, Kosson, & Hare, 2003) for individuals aged 13–18 years. Other measures include the Antisocial Process Screening Device (APSD; Frick & Hare, 2001), the Youth Psychopathic Traits Inventory (YPI; Andershed, Kerr, Stattin, & Levander, 2002), and the Inventory of Callous-Unemotional traits (ICU; Kimonis, et al., 2008). These measures have accrued validity through empirical research, but there are a number of items included in these measures that are questionable. For example, the item measuring 'glibness and superficial charm' is defined imprecisely, thus assessment is not standardised and leaves room for subjective and unreliable scoring. Likewise, the item 'need for stimulation/proneness to boredom' – one could question how this is distinguishable from a non-clinical population who regularly have this trait. Furthermore, Kahn and colleagues (2002) found no difference between psychopaths and healthy controls on this item. Measures of psychopathy generally include an item measuring "shallow affect", being one of the more notable features of the disorder, however it is rarely considered how difficult it is for assessors to accurately distinguish this from "real emotion". There is an item on the PCL-R that refers to living a "parasitic lifestyle". The description assigned to this item is suggestive of a person who deliberately and harmfully makes plans to misuse other persons, though studies suggest that this tends to not be the case. Research has demonstrated that high scoring individuals may rely on others for accommodation or other things, but this is largely not out of choice, rather it is due to an inability to cope or comorbid dependent traits (Martens, 1999; Kahn, Martens, & Oppenheimer, 2002; Martens, 2002a).

5 Child and Adolescent Psychopathy

There has been both support and opposition for the extension of psychopathy to children and adolescents. Supporters argue that research has demonstrated that the indices of child psychopathy have structural homogeneity, interrater reliability, and a similar factor structure to that of adult psychopathy (Frick, Bodin, & Barry, 2000; Salekin, Brannen, Zalot, Leistico, & Neumann, 2006; Vincent & Hart, 2002). However, concerns have been raised by others (e.g. Seagrave & Grisso, 2002) that several symptoms of psychopathy could be represented by normal adolescent development. For instance, they suggested that egocentricity and impulsivity common traits in adolescents, basing their suppositions on Elkind's early work (1967). Another concern is that child psychopathy does not look the same as adult psychopathy, in that there appears to be greater levels of comorbidity in children. Specifically, studies have found higher than expected levels of anxiety in psychopathic young people (e.g., Kosson et al., 2002; Lynam et al., 2007; Salekin, Leistico, Neumann, DiCicco, Duros, 2004; Vitale et al., 2005), however this relates to my earlier discussion about the accuracy of the assumption that there are low levels of anxiety in adults with psychopathic traits.

Researchers are often most interested in examining the association between psychopathy and offending, in both the adult and adolescent fields, as they seek to identify personality types that are apt to break the law and be violent, which can then serve to protect society from such individuals. The meta-analytic part of my research demonstrated that there is a fairly consistent link found in studies that there is a significant relationship between psychopathy and offending in a youth population. Nonetheless, it is also important to note that there is substantial heterogeneity in the effect sizes found from these studies, thus much more research is needed to determine what accounts for this heterogeneity.

Perhaps one of my stronger points of contention for this body of research is the overemphasis on finding stability of psychopathy and not examining change over time. Instability is important to acknowledge because it informs us of the different trajectories for youth, with key life factors diverting them from a rather destructive personality course (Salekin & Frick, 2005). It is vital that researchers determine what factors account for change (both increases and decreases in psychopathy symptoms) as well as what factors allow for the maintenance of a disorder. There is a suggestion that a dysfunctional communication style between parents and children may contribute to consistently severe levels of callousness, but it is difficult to determine the direction of this relationship based on the findings so far (Salekin, Rosenbaum, & Lee, 2008).

6 Conclusion

The above discussion highlights some of the problematic, albeit useful, aspects of the construct of psychopathy. Whilst in mainstream discussions it tends to be used to indicate “evil” in a person, psychopathy in clinical forums has evolved to the point that the focus is and should be on understanding ways of interrupting the developmental path of individuals at risk of adult psychopathy, whilst acknowledging the limitations of measurement and potential misuses of diagnosis. I feel this term represents a group of oft neglected, marginalised, and overly-punished individuals, and hope that research can move beyond retrospective applications of the diagnosis and focus more on early intervention.

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Appendix I: Summary of studies included in analysis

Table i

Summary of studies included in analysis

Study	n	Mean age	Psychopathy measure	Male/Female	Outcome measure	r	SE
McMahon, Witkiewitz, & Kotler (2010)	754	Not reported	APSD	Both	Official records	0.25	0.0342
McMahon, Witkiewitz, & Kotler (2010)	754	Not reported	APSD	Both	SRO	0.05	0.0364
Muñoz, Pakalniskiene, & Frick (2011)	81	14.5	APSD	Both	SRO	0.22	0.1064
Penner, Viljoen, Douglas et al. (2014)	73	15.87	PCL:YV	Both	Official records	0.15	0.1152
Shepherd, Luebbers, Ogloff et al. (2014)	213	16.84	PCL:YV	Both	Official records	0.25	0.0644
Hilterman, Nicholls, & Cniewenhuizen (2014)	105	18.4	PCL:YV	Both	SRO	0.41	0.0816
Penner, Viljoen, Douglas et al. (2014)	73	15.87	PCL:YV	Both	SRO	0.45	0.094
Hampton, Drabick, & Steinberg (2014)	1354	16.54	PCL:YV	Both	SRO	0.17	0.0264
Collins, van Damme, Andershed et al. (2015)	95	16.05	APSD	Female	SRO	0.31	0.0932
Walters (2015)	1354	16.04	YPI	Both	SRO	0.18	0.0263
Shaffer, Gatner, & Gray (2016)	335	13.07	APSD	Both	SRO	0.32	0.0491
Ray, Frick, Thornton et al. (2017)	879	15.29	ICU	Male	SRO	0.29	0.0309

Note. APSD = Anti Social Process Screening Device, PCL:YV = Psychopathy Checklist:Youth Version, YPI = Youth Psychopathic Traits Inventory, ICU = Inventory of Callous-Unemotional Traits, SRO = Self Reported Offending

Appendix II: Table displaying ratings of quality analysis

Table ii

Table displaying ratings of quality analysis

	McMahon, Witkiewitz, Kotler (2010)	Penner, Viljoen, Douglas, & Roesch (2014)	Shepherd, Luebbers, Ogloff, Fullam & Dolan (2014)	Hilberman, Nicholls, and Cniewenhuizen (2014)	Ray, Frick, Thornton, Wall Myers, Steinberg & Cauffman (2017)	Muñoz, Pakalniskiene & Frick (2011)	Hampton, Drabick, & Steinberg (2014)	Shaffer, Gatner, Gray, Douglas, Viljoen, Tweed, Bhatt, Dooley & Gannon (2016)	Collins, van Damme, Andershed, Fantl & DeLisi (2015)	Walters (2015)
1. Was the research question or objective in this paper clearly stated?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Was the study population clearly specified and defined?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Was a sample size justification, power description, or variance and effect estimates provided?	No	No	No	No	No	No	No	No	No	No

	McMahon, Witkiewitz, Kotler (2010)	Penner, Vijioen, Douglas, & Roesch (2014)	Shepherd, Luebbers, Ogloff, Fullam & Dolan (2014)	Hilterman, Nicholls, and Cniewenhuizen (2014)	Ray, Frick, Thornton, Wall Myers, Steinberg & Cauffman (2017)	Muñoz, Pakalniskiene & Frick (2011)	Hampton, Drabick, & Steinberg (2014)	Shaffer, Gatner, Gray, Douglas, Vijioen, Tweed, Bhatt, Dooley & Gannon (2016)	Collins, van Damme, Andershed, Fantini & DeLisi (2015)	Walters (2015)
6. For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7. Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8. For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9. Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	McMahon, Witkiewitz, Kotler (2010)	Penner, Vijioen, Douglas, & Roesch (2014)	Shepherd, Luebbers, Oglloff, Fullam & Dolan (2014)	Hilterman, Nicholls, and Cnieuwenhuizen (2014)	Ray, Frick, Thornton, Wall Myers, Steinberg & Cauffman (2017)	Muñoz, Pakalinskiene & Frick (2011)	Hampton, Drabick, & Steinberg (2014)	Shaffer, Gatner, Gray, Douglas, Vijioen, Tweed, Bhatt, Dooley & Gannon (2016)	Collins, van Damme, Andershed, Fanti & DeLisi (2015)	Walters (2015)
10. Was the exposure(s) assessed more than once over time?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes
11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12. Were the outcome assessors blinded to the exposure status of participants?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes
13. Was loss to follow-up after baseline 20% or less?	Not reported	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes

Appendix III: Funnel plot for effect sizes showing the correlation between psychopathy and adolescent offending

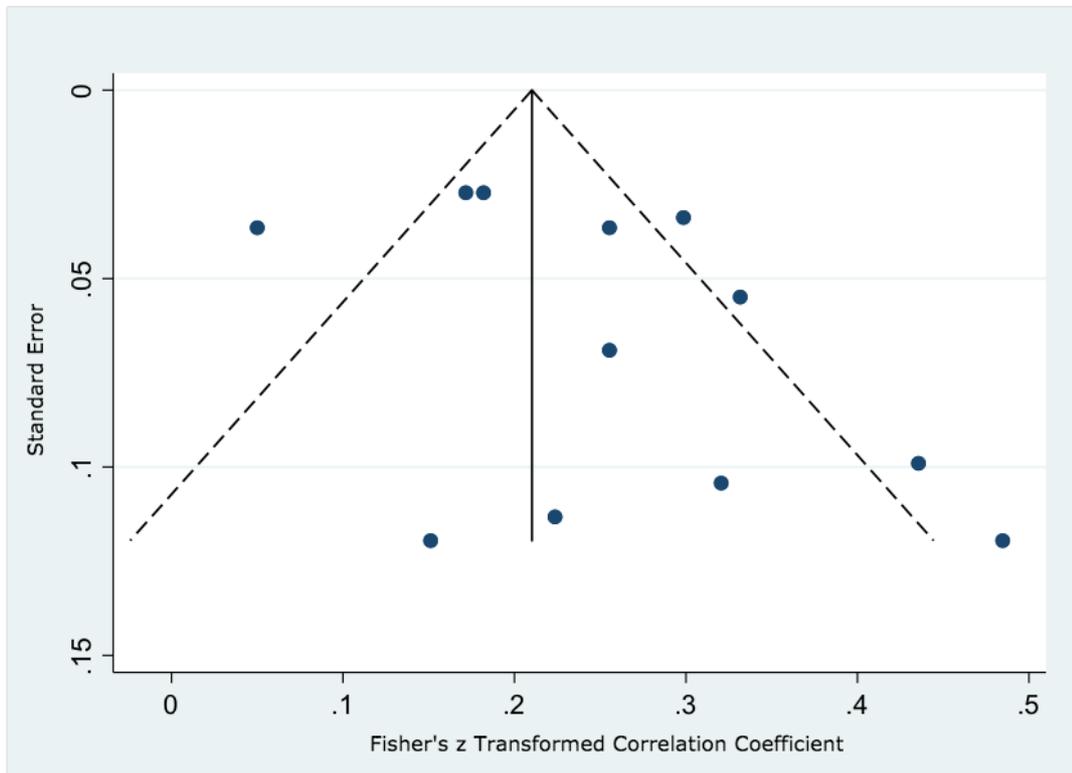


Figure i Funnel plot for effect sizes showing the correlation between psychopathy and adolescent offending

Appendix IV: Exclusion criteria

Exclusion criteria:

- History or current diagnosis of psychosis.
- Generalised learning problems (clinical diagnosis) as indicated by intelligence quotient (IQ) below 65.
- Identified serious risk of injury or harm to a therapist or researcher.
- Presenting issues for which MST has not been empirically validated (i.e., substance abuse in the absence of criminal conduct or sex offending as the sole presenting issue).

Appendix V: Confirmation of ethical approval

South East Research Ethics Committee

South East Coast Strategic Health Authority
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ME20 7NJ

Telephone: 01622 713097
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20 May 2009

Professor Peter Fonagy
Freud Memorial Professor of Psychoanalysis and Head of the Research Department of
Clinical, Educational and Health Psychology, University College London
University College London
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WC1E 7HB

Dear Professor Fonagy

Full title of study: START (Systemic Therapy for At Risk Teens): A National
Randomized Controlled Trial to Evaluate Multisystemic
Therapy in the UK Context
REC reference number: 09/H1102/55

The Research Ethics Committee reviewed the above application at the meeting held on 13 May 2009.

After the Committee's initial deliberations on your application, yourself and Dr Butler kindly joined the meeting to clarify some issues. Thank you for taking the time to do so. The following issues were clarified during the discussion:

- Q Can you deliver this? It is a very intensive process with many contacts with members of families. Do you have enough resources?**
- A** There is clinical provision in place within the ten established sites. A government grant of £10million has been awarded to this project. All staff have already been recruited for the ten sites. Seven sites have staff employed by NHS agencies and three have staff employed by local authorities. Collaboration was demonstrated in order to gain the funding. All systems necessary have already been developed. The study will be monitored very carefully to ensure intervention is properly delivered.
- Q Has risk assessment taken into account that you may not be able to undertake the project exactly as per the proposal?**
- A** One of the outcome variables is to expect site-specific differences and this should be the guiding principle of any government national roll-out.
- Q In the power calculation you have allowed for differences in sites, but vulnerable young people come from different sources. There will be a multifaceted group receiving the intervention. Has this been taken into account?**

- A The power calculation is based on the success rates of the USA and Norway studies primarily recruited from offender centres. There are no figures to inform the power calculation, although most young people will probably be the same regardless of the service they come from. They will all be diligent rejecters from an early age and we have factored in that they may respond less well. Randomisation has been agreed by the funders.

The Committee were very impressed with the thought that had gone into the study, and the helpful attendance of two of the most senior members of the team; and noted that it was very helpful to have received comments from the study reviewers.

Ethical opinion

The members of the Committee present gave a favourable ethical opinion of the above research on the basis described in the application form, protocol and supporting documentation, subject to the conditions specified below.

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission at NHS sites ("R&D approval") should be obtained from the relevant care organisation(s) in accordance with NHS research governance arrangements. Guidance on applying for NHS permission is available in the Integrated Research Application System or at <http://www.rdforum.nhs.uk>.

Approved documents

The documents reviewed and approved at the meeting were:

<i>Document</i>	<i>Version</i>	<i>Date</i>
The Revised Conflict Tactics Scales (CTS2)		
Beliefs and Attitudes Scale		
The Development and Well-Being Assessment - Parent Interview		
The Development and Well-Being Assessment - Interview with 11-17 year olds		
Insurance Certificate		01 July 2008
Participant Consent Form: Young Person	1.1	07 April 2009
Participant Information Sheet: Parent or Carer	1.1	07 April 2009
Participant Information Sheet: Young People aged 15-17	1.1	07 April 2009
Participant Information Sheet: Young People aged 11-14	1.1	07 April 2009
Questionnaire: Strengths and Difficulties Questionnaire		
Questionnaire: The University of New Orleans Alabama Parenting Questionnaire (APQ)		
Questionnaire: Short Mood and Feelings Questionnaire		
Questionnaire: The General Health Questionnaire		
Questionnaire: Young Person's Questionnaire Booklet		
Peer Review		
Letter from Sponsor		04 April 2009

Covering Letter		08 April 2009
Protocol	1.0	30 March 2009
Investigator CV	Professor Peter Fonagy	
Application		07 April 2009
Connors' Teacher Rating Scale - Revised (S)		
ICU (Youth Version)		
ICU (Parent Version)		
LEE scale		
The McMaster Family Assessment Device		
WASI Record Form		
The Child Attachment Interview (CAI) Protocol		
Participant Consent Form: Parent/Carer	1.1	07 April 2009
Participant Consent Form: Optional Additional Qualitative Study - Parent/Carer	1.1	07 April 2009
Participant Information Sheet: Optional Additional Qualitative Study Information for Parents	1.1	07 April 2009
Development and Well-being Assessment (Teacher Version)		

Membership of the Committee

The members of the Ethics Committee who were present at the meeting are listed on the attached sheet.

Professor Katona and Dr Bhiman both declared a non-specific, non-personal interest in the study. Members agreed that Professor Katona and Dr Bhiman could remain in the meeting and contribute to the review of the study.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Now that you have completed the application process please visit the National Research Ethics Website > After Review

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

The attached document "After ethical review – guidance for researchers" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Progress and safety reports
- Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

We would also like to inform you that we consult regularly with stakeholders to improve our service. If you would like to join our Reference Group please email referencegroup@nres.npsa.nhs.uk.

09/H1102/55

Please quote this number on all correspondence

With the Committee's best wishes for the success of this project

Yours sincerely

Dr L. Alan Ruben
Chair

Email: nicki.watts@nhs.net

*Enclosures: List of names and professions of members who were present at the meeting and those who submitted written comments
"After ethical review – guidance for researchers"*

Copy to: Dr O Avwenagha

Appendix VI: Results from model Selection for offences

Table iii
Results from model selection for offences (Zero-Inflated Poisson)

Growth Mixture Model	BIC	AIC	Proportion of individuals in class (%)						
			1	2	3	4	5	6	
Linear 1.1	-3390.86	-3381.67	100						
Linear 1.2	-3157.71	-3139.31	75.3279	24.6721					
Linear 1.3	-3126.98	-3099.39	55.64801	30.56644	13.78556				
Linear 1.4	-3096.06	-3059.28	58.88764	28.02455	7.56339	5.52442			
Linear 1.5	-3100.64	-3054.67	15.28644	52.87296	5.13485	24.30917	2.39659		
Linear 1.6	-3103.23	-3048.06	31.14087	24.47182	24.33661	14.72427	3.96674	1.35969	
Quadratic 2.1	-3392.82	-3380.56	100						
Quadratic 2.2	-3146.62	-3122.1	75.71847	24.28153					
Quadratic 2.3	-3089.76	-3052.98	70.23261	27.03101	2.73638				
Quadratic 2.4	-3084.25	-3035.21	46.45087	35.00792	16.05879	2.48242			
Quadratic 2.5	-3086.29	-3024.99	26.17463	46.71699	13.44579	11.32342	2.33917		
Quadratic 2.6	-3087.4	-3013.84	45.27211	25.68704	12.24733	1.54241	13.48582	1.76529	
Cubic 3.1	-3396.39	-3381.06	100						
Cubic 3.2	-3146.4	-3115.75	76.44374	23.55626					
Cubic 3.3	-3095.1	-3049.12	71.37435	25.87551	2.75014				
Cubic 3.4	-3090.81	-3029.51	18.40286	70.54964	9.39963	1.64787			
Cubic3.5	-3095.89	-3019.26	38.33158	36.37195	15.24013	8.0635	1.99283		
Cubic 3.6	-3095.7	-3003.75	35.66522	34.71985	9.9554	11.19055	7.00979	1.45919	

Appendix VII: Results from model selection for delinquency

Table iv
Results from model selection for delinquency (Censored Normal)

Growth mixture model	BIC	AIC	Proportion of individuals in class (%)					
			1	2	3	4	5	
Linear 1.1	-8376.66	-8368.12	100					
Linear 1.2	-8168.14	-8151.06	82.79256	17.20744				
Linear 1.3	-8125.17	-8099.55	81.6412	10.29033	8.06847			
Linear 1.4	-8102.52	-8068.36	58.87496	28.99295	5.4642	6.66789		
Linear 1.5	-8089.84	-8047.14	37.0069	48.14099	7.57244	6.28149	0.99818	
Linear 1.6	-8090.56	-8039.32	62.41955	4.58342	20.02905	5.40015	6.60173	0.96611
Quadratic 2.1	-8380.49	-8369.1	100					
Quadratic 2.2	-8174.74	-8151.97	82.67036	17.32964				
Quadratic 2.3	-8132.64	-8098.48	81.63124	10.29603	8.07273			
Quadratic 2.4	-8114.06	-8068.52	38.33959	46.98221	7.05179	7.6264		
Quadratic 2.5	-8115.67	-8058.73	4.36699	65.72413	19.00888	5.10273	5.79727	
Quadratic 2.6	-8090.6	-8022.28	6.4169	65.3592	16.5996	4.78249	6.24043	0.60138
Cubic 3.1	-8384.19	-8369.96	100					
Cubic 3.2	-8182.25	-8153.78	82.65863	17.34137				
Cubic 3.3	-8171.23	-8128.53	46.25346	42.83012	10.91642			
Cubic 3.4	-8111.97	-8055.03	74.51369	16.98735	3.2094	5.28957		
Cubic3.5	-8159.94	-8088.77	5.40304	0	77.48352	8.94569	8.16775	
Cubic 3.6	-8085.19	-7999.79	8.06075	70.50526	9.01409	5.12786	5.92238	1.36965

