RESEARCH THESIS

Exploring childhood adversity, impulsivity, and cognitive functioning within forensic populations

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Abstract

Empirical research has reported associations between childhood adversity and impulsivity, childhood adversity and cognitive functioning, and cognitive functioning and impulsivity in adults; however, the relationship between these factors is more widely evidenced within the general population, than forensic populations. Further exploration regarding how these factors relate among forensic samples may inform psychological formulation and interventions for individuals who disproportionately experience adversity from a young age. This thesis presents four separate studies. Firstly, a systematic review of 11 studies totalling 7,259 participants, provided evidence of the relationship between childhood adversity and trait impulsivity within forensic populations. Secondly, an applied empirical study showed that self-reported childhood adversity predicted difficulties with inhibitory control and cognitive flexibility on a test of executive functioning, within a small adult forensic mental health sample. Thirdly, a research case study was conducted, involving an in-depth exploration of childhood adversity, impulsivity, and cognitive functioning for an individual undergoing treatment in a forensic mental service, wherein a case formulation was developed using various psychometric assessment outcomes, incident data, and collateral information. Finally, a critique of the Childhood Trauma Questionnaire-Short Form (CTQ-SF) in the context of forensic populations found strong evidence of construct validity and internal consistency, whilst other psychometric properties required examination. This thesis provides preliminary evidence of an association between childhood adversity, impulsivity, and cognitive functioning within forensic populations, which has potential implications for forensic practice and research; however, further investigation is required.

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Chapter 1: Introduction

Childhood adversity is a worldwide phenomenon and public health concern; therein research has demonstrated the high prevalence of adverse experiences during childhood, globally (Carlson et al., 2019; Felitti et al., 1998; Stoltenborgh et al., 2015). A continually expanding body of research has evidenced the association between childhood adversity and numerous challenges in later life, including chronic physical health problems (Heim et al., 2009), mental health difficulties such as psychosis (Misiak et al., 2017), intimate relationship difficulties (Paradis & Boucher, 2010), suicidality (Zatti et al., 2017), self-harm (Maniglio, 2011), substance misuse (Gilbert et al., 2009), trait impulsivity (Lui, 2019), cognitive functioning deficits (Irigaray et al., 2013), and incarceration (Roos et al., 2016). In terms of defining and measuring childhood adversity within empirical literature, some have taken a broad perspective wherein adversity spans different forms of childhood abuse (e.g., physical abuse), in addition to types of 'household dysfunction' (e.g., familial substance misuse; Felitti et al., 1998), whilst others have more specifically focused on childhood abuse and neglect (also known as childhood maltreatment; Bernstein & Fink, 1998; Stoltenberg et al., 2015). Childhood adversity has also been categorised based on individual (e.g., domestic violence) or collective (e.g., war) exposure (Carlson et al., 2019). The present thesis primarily adopts the term 'childhood adversity'.

Individuals entering the criminal justice system have been shown to experience considerable rates of childhood adversity, particularly childhood abuse and neglect, which appears to exceed the general population (Coleman & Stewart,

2010; Dalsklev et al., 2021; Mclachlan et al., 2024; Stinson et al., 2016). Within forensic (or offender) institutions, adversity in childhood has been linked with unintentional re-traumatisation, due to the environment, structures, and relationships within these organisations (Willmott & Jones, 2022). Professionals working with traumatised individuals in forensic settings have also been shown to experience increased rates of vicarious trauma and compassion fatigue (Frost & Scott, 2022; Perilli et al., 2020). This understanding has led to increased implementation of trauma-informed approaches within forensic settings (Procter et al., 2017; Willmott & Jones, 2022), which promote principles of safety, trustworthiness, choice, collaboration, cultural consideration, and empowerment (GOV.UK, 2022a). Trauma-informed care has subsequently been shown to have positive outcomes for forensic service users, such as improved therapeutic relationships (Maguire & Taylor, 2019) and decreased re-offending risks (Miller & Najavits, 2012).

Significant developments have occurred among researchers and practitioners in terms of understanding the impact of childhood adversity, among the general population and forensic (or offender) populations; however, the present thesis identified the need for further investigation regarding the latter. Forensic populations may reside in settings such as secure or forensic mental health hospitals, prisons, therapeutic communities, forensic community services, or probation services.

Childhood adversity within forensic populations is the recurrent characteristic throughout each chapter of this thesis. Within the context of forensic case

formulation, childhood adversity was conceptualised as a predisposing factor for difficulties in adulthood, such as aggression and violence (Stinson et al., 2021), self-harm (Marzano et al., 2011), and substance misuse (Friestad et al., 2014). Such behaviours are often characterised as impulsive (Leung et al., 2017; Shafti et al., 2023) and may therefore be perpetuated by impulsivity, at the trait level. Furthermore, childhood adversity may also be associated with (trait) impulsivity in adult forensic populations, a question which this thesis was primarily concerned with. Trait impulsivity can be defined as "a predisposition toward rapid, unplanned reactions to internal or external stimuli, without regard to the negative consequences of these reactions" (DeYoung & Reuter, 2010, p. 345).

In recognition that impaired cognitive functioning is associated with childhood adversity (Su et al., 2019) and is highly prevalent in forensic populations, particularly forensic mental health settings (Bailie et al., 2012; Flinn et al., 2018), the present thesis also theorised that adverse childhood experiences predispose cognitive functioning deficits within forensic service users. Throughout this thesis, 'cognitive functioning' is used as an umbrella term, encapsulating executive functioning and general intellectual functioning (although these specific terms are also used where relevant). Difficulties with cognitive functioning were considered a possible perpetuator for impulsivity, consequently maintaining risk of harmful impulsive behaviours (e.g., self-harm) among adult forensic populations. The overarching aim of this thesis was therefore to better understand the relationship between childhood adversity, impulsivity, and cognitive functioning within forensic populations. Among this marginalised group, the author envisaged potential

implications for assessment and intervention, case formulation, trauma-informed practice, and advancing empirical knowledge.

Overview of Chapters

The second chapter in this thesis presents a systematic review of research that has statistically examined the relationship between childhood adversity and trait impulsivity in adult forensic populations. A database search was undertaken to retrieve studies that reported quantitative data regarding childhood adversity and impulsivity, were written in the English language, and were published at any time prior to 23rd October 2023. All retrieved studies were screened against pre-defined eligibility criteria. Those included in the final selection were assessed for study quality (including risk of bias), and data pertaining to study characteristics and the relationship between childhood adversity and impulsivity was extracted. The quality assessment outcomes and data synthesis across the included studies informed discussion surrounding the strengths and limitations of the existing research, and to what extent the research question has been addressed within the empirical literature, respectively. The review itself was critically evaluated and its implications outlined.

The third chapter in this thesis concerns the author's primary study, which involved an applied investigation into the relationship between childhood adversity, trait impulsivity, and cognitive inhibitory control within a forensic mental health population. Chapter 2 and Chapter 3 were inextricably linked in their aims to understand the statistical relationship between childhood adversity

and impulsivity among adults in forensic settings; furthermore, the primary study was informed by methodological issues identified following a review of associated research. The author also recognised that previous research in this area had not recruited a forensic mental health sample, and the broader literature had not explored the effect of inhibitory control on the relationship between early life adversity and impulsivity in forensic populations. The primary study was therefore also concerned with the potential mediating effect of inhibitory control on the relationship between childhood adversity and impulsivity. Chapter 3 outlines specific research hypotheses. Following ethical approval from the Health Research Authority (HRA), face-to-face assessments were undertaken with a sample of patients admitted to a forensic mental health service in the South of England. The assessment included psychometric measures of childhood adversity and trait impulsivity, alongside formal neuropsychological tests of cognitive inhibitory control. A range of statistical methods were applied to test research hypotheses, for which the results were outlined in Chapter 3, followed by the conclusions and implications of this study.

The fourth chapter in this thesis reports on a research case study, which aimed to explore the relationship between childhood adversity, impulsivity, and cognitive functioning for a single individual admitted to a forensic mental health service. Whilst the primary study introduced the concept of inhibitory control to the childhood adversity and impulsivity association among forensic populations, its design was limited in its measurement of cognitive functioning; however, the case study permitted examination of broader cognitive processes in relation to the childhood adversity – impulsivity relationship, for a participant initially recruited

to the primary study. To this aim, further cognitive testing was undertaken, and associated file information was sourced. Moreover, further information about adverse experiences within the context of a detailed case history was gathered, and behavioural impulsivity data was retrieved from incident reports. Using the available quantitative and qualitative data, Chapter 4 presents a forensic case formulation, with an emphasis on childhood adversity, impulsivity and cognitive functioning.

Finally, Chapter 5 comprises a psychometric critique of the Childhood Trauma Questionnaire – Short Form (CTQ-SF; Bernstein & Fink, 1998; Bernstein et al., 2003), with respect to forensic populations. The significance of the CTQ-SF to this thesis is that it was used to measure childhood adversity in the primary study and the case study, and it was the most used measure of childhood adversity among studies in the systematic review. The CTQ-SF critique proceeds other chapters because this measure was selected for the primary study and case study prior completing the critique (in recognition of its validation and widespread use), and the systematic review and primary study provide critical reflections about the CTQ-SF in the context of this thesis. The critique chapter subsequently examines the CTQ-SF more closely, using available evidence of psychometric properties reported by validation studies which used forensic samples.

Chapter 2: Systematic Review

Childhood adversity and impulsivity in forensic populations: A systematic review

Abstract

Adversity is commonplace in the childhoods of adult forensic populations and is known to be associated with outcomes such as trait impulsivity; however, no known systematic review or meta-analysis had previously explored the childhood adversity and impulsivity in this group. A systematic review was undertaken to assess the quality of and synthesise findings from research which has investigated the relationship between childhood adversity and impulsivity in adult forensic populations. A range of electronic databases including Medline, Embase, PsychInfo, PsychArticles, the National Criminal Justice Reference Service (NCJRS), and ProQuest Dissertation and Theses were searched. Selected studies were quality assessed and a narrative synthesis of results was provided. 11 studies were reviewed, totalling 7,259 participants. Most studies used cross-sectional designs, although tended to be of at least acceptable quality, and a positive relationship between childhood adversity and impulsivity within forensic samples was evidenced. The empirical literature had only explored the association between these phenomena in prisons, with respect to forensic settings, and further investigation is required. This review has important implications for forensic research and practice.

Introduction

Background

Childhood adversity is recognised as a widespread phenomenon, contributing to negative health and risk outcomes for people in later life. The need to expand empirical understanding within this field was highlighted almost 30 years ago with the Adverse Childhood Experiences (ACE) study (Felitti et al., 1998). Among a sample of 14,394 adults in the US who completed the ACE questionnaire, over 50% reported at least one adverse experience and 25% reported two or more adverse experiences (Felitti et al., 1998). Such experiences comprised emotional, physical, and sexual abuse; and various forms of household dysfunction such as mental illness, domestic violence, parental incarceration, and substance misuse. Moreover, a recent review of global childhood maltreatment reported the following prevalence rates: 22.6% for physical abuse; 11% for sexual abuse (18% in females); 36.4% for emotional abuse; 16.3% for physical neglect; and 18.4 % for emotional neglect (Stoltenborgh et al., 2015).

Childhood adversity has been associated with adverse health outcomes such as self-harm (Maniglio, 2011; Marzano et al., 2011), violence (Duke et al., 2010; Stinson et al., 2021), and substance misuse (Friestad et al., 2014; Gilbert et al., 2009). One mechanism thought to account for the relationship between childhood adversity and adverse health outcomes is impulsivity (Lui, 2019). Impulsivity (or impulsiveness) at the trait level, has be defined as *"a predisposition toward rapid, unplanned reactions to internal or external stimuli, without regard to the negative consequences of these reactions"* (DeYoung & Reuter, 2010, p. 345). Whilst some behaviours commonly described as impulsive have been viewed as adaptive for

functioning individuals, such as those used in employment activities (Everton et al., 2005), impulsive behaviours are often problematic, and they are prevalent within forensic populations. Such behaviours include verbal and physical aggression (Broderick et al., 2015), self-harm (James et al., 2012), and substance misuse (Scott et al., 2004).

A recent review of 55 studies provided evidence for a positive association between childhood adversity and trait impulsivity (Lui, 2019). Emotional abuse was most strongly associated with impulsivity, depicting a medium effect size (odds ratio = 3.10), whilst sexual abuse had the weakest association (odds ratio = 1.59). One argument for the stronger association between emotional abuse and impulsivity, relative to other abuse types, is that it has been shown to be most prevalent (Stoltenborgh et al., 2015). Lui (2019) also postulated that the chronicity of emotional abuse, relative to the often-isolated occurrence of sexual and physical abuse, may explain the stronger association with impulsivity; however, whilst global research has reported lower levels of physical and sexual abuse, the prevalence of these abuse types in forensic and clinical samples is higher (Coleman & Stewart, 2010; Falshaw & Browne, 1997; Hamilton et al., 2002; Johnson et al., 2006). Therein, a study investigating prevalence among incarcerated adolescents reported 23.1% self-disclosed sexual abuse (with females 3-times more likely to disclose) and 42.5% self-disclosed physical abuse (Coleman & Stewart, 2010). Within an adult forensic and clinical sample, 35.8% reported two or more types of childhood abuse or neglect (Dovran et al., 2015).

Adversity is commonplace during the childhood of forensic service users (Malvaso et al., 2016). Impulsive behaviour is also prevalent within this subset of the population (Alford et al., 2020). It seems essential, therefore, to enhance understanding of the relationship between childhood adversity and impulsivity within adult forensic populations, and a review of existing research was one way to address this objective.

Scoping Exercise

Prior to conducting a review on the identified topic, a scoping exercise was undertaken between 26th and 27th November 2020, to locate relevant reviews and meta-analyses. Scoping searches on Prospero identified six on-going reviews. Of these, the most closely related review was exploring the association between attention deficit hyperactivity disorder (ADHD) and child sexual abuse. Importantly, no on-going reviews were exploring the specific topic of interest.

Furthermore, 119 reviews or meta-analyses were identified during scoping searches of Embase, Psychinfo, Psycharticles, and Medline (via OVIDsp). 112 of these were excluded, for reasons such as: not including relevant samples (e.g., children/adolescents); not measuring childhood trauma; having a neurobiological focus; exploring psychosis and offending; investigating functional magnetic resonance imaging (fMRI) and offending; and identifying the characteristics of self-harmers, among others. The remaining reviews focused on: factors associated with impulsivity in forensic populations (Alford et al., 2020); risk factors for non-fatal and fatal suicide attempts (Beghi & Rossenbaum et al., 2010); childhood trauma, repeated stress and substance use disorders (Liffijt et al., 2014); factors

influencing the pathway from trauma to aggression (Rasche et al., 2016); and factors (including sexual abuse) associated with suicide attempts among self-injurers (Victor & Klonsky, 2014). These reviews were closely associated to the topic of interest because they included studies investigating the links between childhood adversity and either trait impulsivity or behaviour often considered impulsive in nature (e.g., self-harm; suicide; aggression/violence; substance misuse). The most relevant article was a meta-analysis of childhood maltreatment and impulsivity (Lui, 2019). This review included studies of diverse adult samples exploring the relationship between childhood adversity (specifically 'maltreatment') and impulsivity. It provided valuable findings for understanding this relationship in adults, although Lui (2019) did not focus on forensic populations.

Rationale, Aims and Objectives

No existing systematic review or meta-analysis had explored childhood adversity and impulsivity in adult forensic populations; however, forensic populations disproportionately experience childhood adversity and engage with impulsive behaviour. Enhancing empirical understanding surrounding the relationship between these factors within forensic populations could have implications for preventative interventions – with respect to childhood adversity, and treatment approaches – targeted at adverse experiences and impulsivity. This rationale is consistent with the expanding trauma-informed care initiative aimed at further understanding the impact of trauma and developing responsive practices within forensic institutions (Procter et al., 2017; Willmott & Jones, 2022). Moreover, impulsive behaviours noted to be prevalent in forensic populations (e.g., self-harm) have been shown to have negative implications including traumatic stress

responses for staff (Walker et al., 2017), and a breakdown in therapeutic staff-service user relationships (Marzano et al., 2012).

Accordingly, a systematic review was undertaken to examine the relationship between childhood adversity and impulsivity in adult forensic populations. The review's objectives were to identify and assess the quality of existing research which has empirically measured childhood adversity and impulsivity within forensic samples, and to summarise the characteristics and findings of these studies. Impulsivity, in the context of this review, and previous reviews (e.g. Lui, 2019), refers to trait impulsivity. It was hypothesised that there would be a significant positive relationship between childhood adversity and impulsivity in forensic populations. Variable strengths of association between childhood adversity and impulsivity, based on the type of adversity (e.g., sexual abuse), was also hypothesised.

Method

The protocol for this review (see Appendix A) was submitted to academic supervisors at the University of Nottingham on 29.11.2020. Following feedback, amendments were made, and the final version was approved on 10.03.2021.

Database Search

The database search aimed to retrieve studies that reported quantitative data (i.e., that measured childhood adversity and impulsivity quantitatively), written in the English language. There was no restriction regarding the date of publication. The database search included Medline, Embase, PsychInfo and PsychArticles (via

OVID interface); the National Criminal Justice Reference Service (NCJRS); and ProQuest Dissertation and Theses. Databases were initially searched on 21.04.2021 and were last searched on 20.10.2023.

Search Strategy

Table 2.1 depicts the search terms that were used to create a syntax for searching each database. Many of the terms were truncated (denoted by *) to allow multiple word endings to be included within searches, and Boolean operators (e.g., AND) were used to link key concepts within the research question. The results of database searches were then exported to the Endnote referencing programme, for screening purposes.

Table 2.1. Search strategy.

childhood trauma*	AND	impuls*	AND	forensic*
childhood maltreat*				inmate*
advers*				prison*
child abuse				custod*
physical abuse				low secur*
emotional abuse				medium secur*
sexual abuse				high secur*
neglect*				secure service*
poverty				incarcerat*
childhood victim*				offen*
bull*				probation
discrimination*				parole

Study Selection

All duplicate records were removed, then the remaining records were screened (phase 1) using titles and abstracts in Endnote. They were then filed for the second screening phase, which involved retrieving study reports and screening them using

the PICOSS (Population; Intervention; Comparator; Outcome; Study design; Setting) inclusion/exclusion method (see Table 2.2). For studies that passed this screening phase, an inclusion/exclusion form (see Appendix B) was completed to ensure all inclusion criteria were met (phase 3). The references of studies included from databases were also screened.

Population:

The review was only concerned with adult samples; therefore, studies with adult samples (i.e., over 18 years) were included and those that recruited adolescents or children (i.e., under 18 years) were excluded.

Intervention/comparator/exposure:

Studies were included if they measured childhood adversity using a quantitative method, such as a self-report measure or file information that was quantified in some way. Childhood adversity could have been measured broadly (e.g., physical, sexual, or emotional abuse; neglect; bullying; witnessing violence; poverty).

Outcome:

Studies were included if the outcome of interest (trait impulsivity) was measured using a psychometric assessment tool. If impulsivity comprised a subscale within a psychometric tool, this could be included providing specific items/questions were used to create the impulsivity scale, which reflected trait impulsivity.

Study design:

Any study using a quantitative observational design (e.g., cross-sectional; cohort; case-control) was appropriate for inclusion, whilst qualitative research (e.g., case studies) was excluded.

Setting:

Studies were required to have been undertaken in a forensic setting, such as a secure hospital, prison, therapeutic community, forensic community service, or probation service (among others deemed to be appropriate). Non-forensic settings (e.g., community or general psychiatric) were excluded.

Table 2.2. Inclusion and exclusion criteria using PICOSS.

	Inclusion criteria	**Exclusion criteria**
Population	Adults (18+)	Children/adolescents (-18)
Intervention/ Comparator/exposure	Childhood adversity measured quantitatively	Childhood adversity measured qualitatively
Outcome	Psychometric measured 'trait impulsivity'	Did not measure 'trait impulsivity'
Study Design	Quantitative observational design	Qualitative design
Setting	Forensic	Non-forensic

Quality Assessment and Risk of Bias

The quality of the included studies was initially assessed using quality assessment forms which were adapted from the Critical Appraisal Skills Programme (CASP, 2004) for each study design (e.g., cross-sectional; see Appendix C). The forms comprised a series of questions/items relating to the aims and objectives, method (e.g., recruitment of participants; statistical analysis), and results and conclusions

of studies. Each item was rated using a three-point Likert scale (yes; unclear; no) and a space for comments was provided alongside each item to justify ratings. An independent rater assessed over 20% (n=3) of the studies, which were selected using a random number generator. The author of this review and the independent rater had an observed agreement rate of 87% overall across the three studies and an 'almost perfect' (McHugh, 2012) inter-rater reliability score (k = 0.84).

Table 2.4 was then created using items from quality assessment forms and risk of bias items (e.g., risk of attrition bias) – the latter acting as summary items for further assessing study quality. In Table 2.4, items rated as 'no' or 'unclear' scored 0, whilst items rated as 'partial' scored .5, and items rated as 'yes' scored 1. The exception was for the item 'non-response rate raised concerns', for which 'no' scored 1, 'partial' scored .5, and 'yes' or 'unclear' scored 0. For risk of bias items, 'high' scored 0, 'moderate' scored .5 and 'low' scored 1. Scores across items were totalled for each study and converted to percentages to indicate overall study quality. Studies were considered excellent quality if they scored ≥80%, good quality if scoring ≥70%, acceptable quality if scoring ≥60%, and poor quality if they scored less than 60%.

Data Extraction

Information was extracted from each study using a pro forma (see Appendix D), which was informed by the eligibility criteria (i.e., PICOSS). The extracted information comprised study characteristics such as type of forensic setting and country, study design, sample size, and measures of childhood adversity and

impulsivity, in addition to statistical information such as type of data analysis and key data associated with the review's research question.

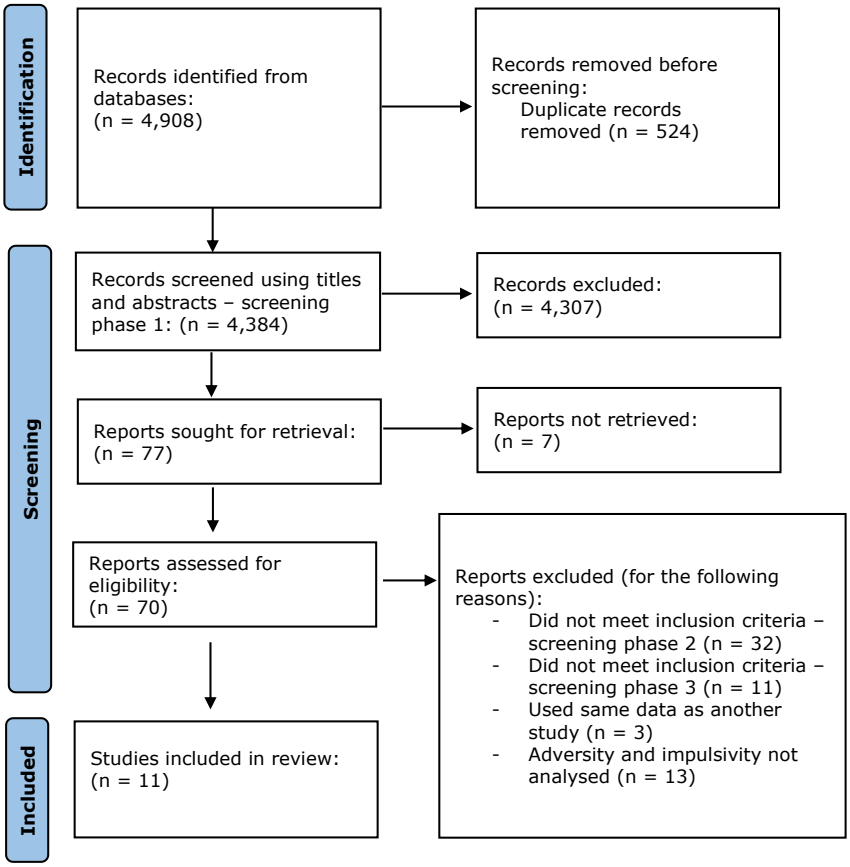
Results

Study Selection

Figure 1 presents a flow diagram showing the study selection process. Records identified from databases totalled almost 5,000, of which 524 were duplicates and therefore removed. A further 4,307 records were excluded when screening titles and abstracts (screening phase 1). Of 77 reports sought, 70 were obtainable and assessed for eligibility. For unobtainable papers, authors were contacted via Research Gate but either did not respond or were unable to provide the full text paper (see Appendix D for request template). Studies were subsequently excluded for the following reasons: not meeting all inclusion criteria (as guided by the PICOSS) on initial report screening (screening phase 2); not meeting all inclusion criteria on completion of inclusion forms (screening phase 3); using the same data as another study; or for not specifically analysing the association between childhood adversity and impulsivity. Regarding the latter, during either the quality assessment or data extraction phase of the review, 13 were identified to have not depicted statistical associations between childhood adversity and impulsivity. For these studies, the authors were contacted via ResearchGate to enquire as to whether data had been analysed (but not reported) or was available for post-hoc analysis (see Appendix E for request template). Most authors did not respond, however authors for two studies (Jansen, 2020; Marzano et al., 2011) sent relevant data in the form of a correlation matrix, therefore these studies were included in the review. In total, 11 studies were included from database searches.

The reference lists of these 11 studies were also checked, although none of the records initially identified were eligible for inclusion (see Figure 2.2 in Appendix F).

Figure 2.1. PRISMA flow diagram showing study selection process via database search.



Study Characteristics

For the 11 studies reviewed, a summary of study characteristics is presented in Table 2.3. All studies were published between 2010 and 2022. They all recruited samples from prisons and the studies were conducted across seven countries: Italy (n=3), China (n=3), Netherlands (n=1), USA (n=2), Greece (n=1) and England and Wales (n=1). Nine studies were cross-sectional, whilst two used a case-control design. A total of 7,250 participants were recruited across the 11 studies. The studies varied in their objectives with regards to childhood adversity and impulsivity, with some primarily focusing on this relationship (e.g., Chen et al., 2022) and others (whilst analysing adversity and impulsivity) being as much or more concerned with the relationship between additional factors, such as genetic predisposition and violence (e.g., Stetler et al., 2014). In terms of measuring childhood adversity, almost all (n=9) studies used a version of the Childhood Trauma Questionnaire (CTQ), with the highest proportion (n=5) opting for the CTQ-SF (Bernstein & Fink, 1998). Finally, to measure impulsivity, 10 studies used the Barratt Impulsiveness Scale (BIS), wherein seven studies used the latest version (BIS-11; Patton et al., 1995).

Quality Assessment Outcomes

None of the studies were excluded based on their quality outcomes/scores, although as indicated in Table 2.4, they varied in their risk of bias (across the four domains) and overall quality scores. Some studies dropped marks because they provided insufficient information relating to a particular item (e.g., inclusion/exclusion criteria), which may have been due to poor reporting rather than methodological flaws. It is noted that cross-sectional designs were used in

most studies (n=9), which meant that associations between variables (e.g., childhood adversity and impulsivity) at a particular time point could be examined, but it was not possible to make inferences about cause-and-effect relationships.

Selection bias:

Six studies were rated as having a moderate risk of selection bias (Bevilacqua et al., 2012; Chen et al. 2022; Jin et al., 2023; Palumbo et al. 2022; Sergentanis et al. 2014; Stetler et al. 2014), which was affected by a lack of information regarding how representative samples were (of target populations) and eligibility criteria for selecting participants, as well as not reporting sample size justifications/calculations. The other five studies (Carli et al. 2010; Carli et al. 2014; Jansen 2020; Marzano et al. 2011; Zhong et al., 2022) showed no apparent risk of selection bias.

Exposure bias:

Almost all studies (n=10) used a validated measure of childhood adversity, such as the CTQ-SF (Bernstein & Fink, 1998). Only one study (Sergentanis et al., 2014) was identified as having a risk of exposure bias and received a high rating for this domain, because childhood adversity was measured using three yes/no questions (e.g., "during childhood, were you subjected to physical abuse?"), which was not a validated measure of adverse childhood experiences.

Outcome/measurement bias:

Two studies were rated as having a moderate risk of outcome bias (Jansen, 2020; Palumbo et al., 2022). This rating was in part due to not controlling for variables which may have affected the relationship between childhood adversity and impulsivity, although it should be acknowledged that the relationship between these two variables was not the primary focus of Jansen's research. Adjusting for control or mediator variables when exploring childhood adversity and impulsivity was evident in five studies (Carli et al., 2010; Carli et al., 2014; Jin et al., 2023; Sergentanis et al., 2014; Zhong et al., 2022). All 11 studies used a validated measure of impulsivity (i.e., the outcome of interest). All studies were rated as at least partially clarifying the data values used to determine statistical significance and six studies were rated 'yes' for this item (Carli et al., 2010; Carli et al., 2014; Chen et al., 2022; Marzano et al. 2011; Sergentanis et al., 2014; Stetler et al., 2014).

Attrition bias:

Six studies (Carli et al., 2010; Jansen 2020; Jin et al., 2023; Palumbo et al., 2022; Marzano et al. 2011; Stetler et al., 2014) were identified as having a moderate risk of attrition bias because they either did not report their non-response rate and/or it was unclear as to whether the non-response rate had an adverse effect on the study's findings. Five studies (Bevilacqua et al., 2012; Carli et al., 2014; Chen et al., 2022; Sergentanis et al., 2014; Zhong et al., 2022) reported their non-response rate and clearly indicated that this likely had no negative impact on their findings.

In terms of overall quality, three studies scored above the 80% cut-off meaning they were considered excellent quality (Carli et al., 2014; Marzano et al., 2011; Zhong et al., 2022); three studies scored above the 70% cut-off and were considered good quality (Chen et al., 2022; Carli et al., 2010; Jansen 2020); and four studies scored 60% or above suggesting that they were of acceptable quality (Bevilacqua et al., 2012; Jin et al., 2023; Sergentanis et al., 2014; Stetler et al., 2014). One study scored less than 60% which was categorized by this review as poor quality (Palumbo et al., 2022). Table 2.4 also indicated that almost all (n=10) studies presented results clearly and effectively used data tables. One study's inclusion of statistics within text looked untidy and was difficult to follow; therefore, it was given a 'partial' rating for this item (e.g., Palumbo et al., 2022). The findings of each study were rated as at least 'partially' supported by other research, as outlined in their discussions.

Data Synthesis

As shown in Table 2.5, most participants were male; the exceptions to this were Marzano et al. (2011) who recruited only female prisoners and Zhong et al. (2022) who recruited a mixture of male (58%) and female (42%) prisoners. The average age of participants within studies tended to be between 30 and 40 years, although two studies had slightly older participants (Bevilacqua et al., 2012; Sergentanis et al., 2014) and Marzano et al.'s (2011) female sample were younger on average.

Table 2.5 indicates that eight studies (Carli et al. 2014; Chen et al. 2022; Jansen, 2020; Jin et al., 2023; Marzano et al., 2011; Palumbo et al., 2022; Sergentanis et al., 2014; Zhong et al., 2022) found at least one statistically significant positive

association between childhood adversity and impulsivity (i.e., when childhood adversity increased, impulsivity also increased). Bevilacqua et al. (2012), Carli et al. (2010), and Stetler et al. (2014) showed no significant relationship between childhood adversity and impulsivity.

Certain studies accounted for control variables when exploring the relationship between childhood adversity and impulsivity, such as Carli et al. (2014) who found that CTQ sexual abuse and physical neglect predicted BIS-11 total scores when controlling for age, substance misuse disorder, and family history of suicide. Furthermore, Chen et al. (2022) found that CTQ total scores significantly predicted attentional, motor, and non-planning impulsiveness scores (subscales of the BIS-11) when controlling for age, marital status, education, and history of drinking alcohol.

Although significant in all cases, Jansen (2020) and Marzano et al. (2011) only produced correlation analysis with respect to childhood adversity and impulsivity (as childhood adversity increased in severity, impulsivity also increased). These findings were interpreted with caution because correlation analysis is less robust than the regression methods used by other studies in this review (Shi & Conrad, 2009), and this data was provided on request, but it was not included in the published papers.

Whilst most studies used a version of the CTQ to measure childhood adversity, one study used the Measure of Parental Style (MOPS) and found that dysfunctional

paternal (but not maternal) parenting styles significantly predicted attentional impulsivity scores, using linear regression (Palumbo et al., 2022). Jin et al. (2023) was the only study to use the UPPS to measure impulsivity (in addition to an abbreviated version of the BIS) and MANOVA tests found that CTQ emotional neglect was significantly associated with UPPS urgency (a tendency to act impulsively when experiencing intense emotions; Cyders & Smith, 2007); however, when other variables were controlled for (e.g., age; education) this relationship was no longer significant. The highest quality study in this review (Zhong et al., 2022), found that all CTQ total and subscales (e.g., emotional abuse) significantly predicted total impulsivity scores, within the direct effects of mediation models; however, further analysis indicated that low levels of self-compassion and cognitive reappraisal mediated the relationship between childhood adversity and impulsivity.

Discussion

A systematic review methodology was used to investigate the relationship between childhood adversity and (trait) impulsivity in adult forensic populations. Of the 11 reviewed studies, totalling 7,259 (predominantly male) participants, eight studies found a significant relationship between childhood adversity and impulsivity. Similarly, the relationship between adversity (specifically childhood maltreatment) and impulsivity was widely supported by studies included in Lui's (2019) meta-analysis. Unlike Lui (2019), who identified the strongest and weakest associations with impulsivity to be shown for emotional abuse and sexual abuse respectively, the current review did not identify a distinctive pattern around type

of adversity. One study, however, revealed that sexual abuse and physical neglect significantly predicted impulsivity, whilst other forms of abuse and neglect did not (Carli et al., 2014). This finding remained significant when controlling for other factors (e.g., substance use disorder). The high prevalence of sexual abuse reported within forensic populations (e.g., Johnson et al., 2006), relative to the general population (e.g., Stoltenberg et al., 2015) may provide a tentative explanation for this finding.

Lui (2019) posited that childhood adversity and impulsivity may interrelate to increase the risk of psychopathology, such as suicide, wherein impulsivity plays a mediating role for the effects of adversity on the capability for suicidal behaviour. It is similarly interesting that both childhood adversity and impulsivity were associated with aggression (Carli et al., 2014; Jin et al., 2023) and 'near lethal' self-harm (Marzano et al., 2011), among prisoners in the reviewed studies. Although statistical mediation was not used to measure the effects of impulsivity on childhood adversity and the aforementioned factors, a mediating effect is plausible.

Strengths and limitations of included studies

A general strength of the studies in this review was that they almost exclusively used a validated measure of childhood adversity, which meant that exposure bias was often rated as low; nevertheless, it should be noted that all studies used retrospective self-report measures to elicit childhood experiences (within cross-sectional or case-control designs). Retrospective accounts of childhood adversity have been shown to suffer recall bias (Colman et al., 2016), for such reasons as

the subject being in a depressed mood state leading them to recall more negative experiences (Whalley et al., 2012). Another potential issue with retrospective measures is the under reporting of adverse childhood experiences, found to be as high as a third in adults (Hardt & Rutter, 2004), and particularly prevalent for males (relative to females) regarding childhood sexual abuse (O'Leary & Barber, 2008). The CTQ-SF (Bernstein & Fink, 1998), which was used in five of the reviewed studies, includes a minimization/denial (MD) validity scale, indicating whether the individual is likely to have under reported their experiences. Unfortunately, none of the studies incorporated the MD scale into their statistical analysis, although this has been recommended for research using the CTQ-SF (Church et al., 2017).

With regards to the outcome of interest, trait impulsivity, all studies used a validated self-report measure, representing a shared strength. A notable limitation for certain studies was the absence of control variables entered into regression models to explore whether other factors were accounting for variance in impulsivity outcomes. As cross-sectional research (i.e., most of the included studies) is limited to identifying relationships between variables (as opposed to cause-and-effect relationships), the inclusion of control variables can mitigate the chance of alternative explanations for those relationships and thus increase the reliability of a study's results (Spector, 2019). Among the included studies which controlled for other factors, adjusting for substance misuse (Carli et al., 2014; Chen et al., 2022; Sergentanis et al., 2014) was prudent as (in addition to traumatic experiences) it was found to be primary risk factor for impulsivity in a recent systematic review (Alford et al., 2020).

Moreover, a moderate risk of selection and attrition bias was identified for six (i.e., over half of) studies. The contributing factors to possible selection bias included a lack of information regarding target populations, eligibility criteria, and sample size justifications. Regarding sample size justifications, it was evident that certain studies (e.g., Bevilacqua et al., 2012; Jin et al., 2023) attempted to recruit an entire prison population but it was not clear whether this approach eliminated the need for other sample justification methods (e.g., an a-priori power analysis) or how it related to statistical power. Clear justifications regarding sample size are a key aspect of empirical research (Lakens et al., 2022). With regards to attrition bias, references to non-response rates and their potential impact on results were assessed because response rates that fall below 70% may have misrepresented the population studied, particularly if sociodemographic data for non-responders was not collected (Prince, 2012). Five studies were credited for reporting this information, four of which had excellent response rates (>80%; Carli et al., 2014; Chen et al., 2022; Sergentanis et al., 2014; Zhong et al., 2022).

Despite the limitations discussed above, only one study was categorized as poor quality within this review, whilst three were considered excellent, and the remainder were deemed acceptable or good quality. The clear presentation of data and discussion of findings within the content of previous evidence among the reviewed studies enhanced quality ratings.

Strengths and limitations of the review

This was the first systematic review to investigate and provide evidence of the relationship between childhood adversity and impulsivity within forensic populations. Although several studies used versions of the CTQ to measure childhood adversity and used the BIS-11 to measure impulsivity, a meta-analysis was not performed due to the heterogeneity between the designs and methods used. For example, of the studies reporting significant associations between childhood adversity and impulsivity, childhood adversity was measured using alternative measures (e.g., Palumbo et al., 2022; Sergentanis et al., 2014), as was impulsivity (e.g., Jin et al., 2023; Marzano et al., 2011). Two subsequent studies used control variables in their statistical analyses (Carli et al., 2014; Chen et al., 2022), whilst two did not (Jansen et al., 2020; Zhong et al., 2022). Furthermore, the inclusion of specific subscales among CTQ measures (e.g., emotional abuse) and the BIS-11 (e.g., motor impulsiveness) during statistical analyses, in addition to which subscale associations were statistically significant, was inconsistent across studies. Finally, the reviewed studies were heterogeneous regarding the centrality of the relationship between childhood adversity and impulsivity to their designs and objectives. Tables 2.3-2.5 reflect these inconsistencies, as do the published papers. The highest level of statistical evidence regarding the relationship between childhood adversity and impulsivity within forensic populations was therefore not produced in the absence of a meta-analysis (Kahn et al., 2019).

The search strategy used in this review involved a broad range of search terms, particularly around childhood adversity – allowing for experiences such as bullying, discrimination and poverty (i.e., not only forms of abuse and neglect) to

have been measured; however, the studies in this review almost exclusively used a version of the Childhood Trauma Questionnaire, indicating that research exploring childhood adversity and impulsivity in forensic populations has been primarily concerned with childhood abuse and neglect (or childhood maltreatment). The search strategy retrieved many studies involving child or adolescent samples, which were excluded due to the review's PICOSS criteria. If database searches were instructed not to retrieve child and adolescent samples or truncated terms such as 'adult*' were included, fewer records may have required screening, saving valuable research time.

This review can be credited for ensuring 20% of studies were quality assessed by an independent rater, which subsequently produced excellent inter-rater reliability. A second rater for the screening process and data extraction would have further increased the robustness of this review (Boland et al., 2017), although screening even a small percentage of studies was time consuming and therefore would have been a considerable undertaking for a second rater. The process of totalling quality items, converting scores to percentages, and categorising study quality seemed like a comprehensible way to indicate study quality; however, the cut-offs for categories (e.g., 60% = acceptable) were arbitrary. It should also be noted that this quality assessment method assumes that the included quality items have equal weighting; rather, it may be possible to argue that certain items (e.g., using a validated measure of childhood adversity) are stronger indicators of study quality than others (e.g., reporting non-response rates).

Despite the review's search strategy permitting identification of studies across a range of forensic settings (e.g., secure hospital; probation; prison), only studies conducted within prisons were selected; therefore, this review usefully indicated that most (if not all) research exploring the relationship between childhood adversity and impulsivity within forensic populations has been undertaken within prisons. This is an important finding with respect to the primary study presented in the next chapter of this thesis. It should also be acknowledged that three of the most recent studies included in this review (Chen et al., 2022; Jin et al., 2023; Zhong et al., 2022) were undertaken in Chinese prisons, and accounted for almost half of the total participants. Zhong et al. (2022) highlighted that cultural values such as "filial piety" and "collectivism" are commonly reinforced by teachers and parents to elicit honour and respect from children in China. Whilst forms of discipline, such as corporal punishment or emotional abuse may be perceived to constitute maltreatment within modern western society, these disciplinary strategies have often been considered acceptable within the context of cultivating virtues in Chinese children (Wang & Lui, 2014). Forms of abuse, therefore, may have been interpreted as discipline as opposed to abuse within Chinese prison samples, possibly leading to lower levels of self-reported abuse. These cultural differences limit the global generalizability of this review's findings.

Furthermore, it was not possible to draw conclusions regarding the strength of association between different types of childhood adversity (e.g., sexual abuse) and total impulsivity and/or sub-traits of impulsivity (e.g., attentional) within forensic populations. This was likely due to the small number of studies included in the review. Lui (2019) demonstrated that it was possible to evidence the most

and least predictive forms of childhood adversity when applying a meta-analysis to a far greater sample of studies.

Implications and Conclusions

The present systematic review provides evidence of the relationship between childhood adversity and trait impulsivity within forensic populations, more specifically among a substantial number of prisoners across several countries. Whether other factors (e.g., historical substance misuse) accounted for variance in impulsivity to cause a non-significant relationship between childhood adversity and impulsivity or whether the relationship remained significant after controlling for other factors, was inconsistent between the reviewed studies. Some studies did not include control variables within statistical models.

It would be useful for future research to investigate whether the childhood adversity and impulsivity relationship exists within other forensic settings, such as secure hospitals, wherein rates of early adversity (Stinson et al., 2021), impulsivity (Kamphuis et al., 2014), and impulsive aggression (Karsten et al., 2019) are similarly high. In the case of future cross-sectional research, studies should ensure they account for control variables when exploring this relationship, to increase accuracy of their findings; however, longitudinal research designs would likely permit more reliable measurement of adverse childhood experiences and allow the causational effects of childhood adversity on impulsivity to be examined. When using self-report measures with validity scales, such as the CTQ-SF (Bernstein & Fink, 1998), these scales should be incorporated into statistical analysis to strengthen the reliability of outcomes. Future research in this area

should also clearly describe their target populations, justification for sample sizes, eligibility criteria, and non-response rates, to reduce risks of selection and attrition biases. When further research has investigated the relationship between childhood adversity and impulsivity, a meta-analysis could be undertaken to more accurately establish the strength of association between these phenomena in forensic populations, providing there is homogeneity between the designs and methods used.

The findings of this review, alongside related existing reviews/meta-analyses (e.g., Alford et al., 2020; Lui, 2019), may have implications for the development and implementation of interventions aimed at addressing adversity in childhood, globally. A recent UK-based investigation into interventions aimed at addressing childhood adversity identified the need for a 'whole system approach' (i.e., individual, family, and community) requiring multiple sectors (health, education, social care, policing etc.; Di Lemma et al., 2019). Adverse health outcomes, such as high trait impulsivity, could be improved with the early detection and management of childhood adversity, which may in turn reduce rates of offending and forensic institutionalisation (Malvaso et al., 2016). Finally, the findings of this review reinforce the trauma-informed care movement within forensic populations, which is expanding internationally.

Table 2.3. Study characteristics of the 11 studies included in review.

Study	Forensic setting (country)	Design	Sample size	Primary aims / focus of study	Childhood adversity measure/s	Impulsivity measure/s
Bevilacqua et al., 2012	Prison (Italy)	Cross-sectional	411	To determine whether there was an interaction between genetic variation and childhood trauma in predicting aggressive behavior.	Childhood Trauma Questionnaire-34 item (CTQ-34)	Barratt Impulsiveness Scale (BIS-11)
Carli et al. 2010	Prison (Italy)	Cross-sectional	1265	To explore the role of impulsivity in prisoners' suicidal behaviour.	Childhood Trauma Questionnaire-70 Item (CTQ-70)	Barratt Impulsiveness Scale-7B Version (BIS-7B)
Carli et al. 2014	Prison (Italy)	Cross-sectional	1356	To deter\mine whether trait aggressiveness and impulsivity were associated with socio-demographic, clinical and crime history variables in male prisoners.	Childhood Trauma Questionnaire-34 item (CTQ-34)	Barratt Impulsiveness Scale-7B Version (BIS-7B)
Chen et al. 2022	Prison (China)	Cross-sectional	412	To compare individuals with and without antisocial personality features with regards to childhood maltreatment and impulsiveness prevalence.	Childhood Trauma Questionnaire-Short Form (CTQ-SF)	Barratt Impulsiveness Scale (BIS-11)
Jansen 2020	Prison (Netherlands)	Cross-sectional	283	To assess if detainees with traumatic brain injury (TBI) have higher rates of aggressive behavior, deficits in emotion regulation, impulsivity etc. compared to those without TBI.	Childhood Trauma Questionnaire-Short Form (CTQ-SF)	Barratt Impulsiveness Scale (BIS-11)
Jin et al., 2023	Prison (China)	Cross-sectional	282	To examine the relationships between childhood maltreatment, borderline personality disorder, impulsivity, and crimes of passion.	Childhood Trauma Questionnaire-Short Form (CTQ-SF)	Abbreviated Version of the Barratt Impulsiveness Scale (ABIS) UPPS Impulsive Behaviour scale

Marzano et al. 2011	Prison (England and Wales)	Case-control	120 (60 cases; 60 controls)	To identify socio-demographic, criminological and psychological variables associated with near-lethal self-harm to provide further understanding of this behaviour and inform preventive initiatives.	Childhood Trauma Questionnaire-Short Form (CTQ-SF) Life Events and Prison Experiences Questionnaire (LEPEQ)	Plutchik Impulsivity Scale.
Palumbo et al. 2022	Prison (USA)	Cross-sectional	216 (= subsample used for second aim. Total sample = 655)	To investigate whether genes that modulate dopaminergic neurotransmission affect impulsivity and criminal behavior; and to investigate the interaction between genes and the effect of parental behavior on impulsivity in a subsample of the same group of criminals.	Measure of Parental Style (MOPS)	Barratt Impulsiveness Scale (BIS-11)
Sergentanis et al. 2014	Prison (Greece)	Cross-sectional	173	To assess childhood maltreatment in prison through a hierarchical approach. A variety of parameters were hierarchically evaluated with respect to maltreatment, to evaluate the role of the latter in the network of interconnected risk factors and personality traits of prisoners.	Yes/no questions about childhood adversity (x3): e.g., "During childhood, were you subjected to physical abuse?	Barratt Impulsiveness Scale (BIS-11)
Stetler et al. 2014	Prison (USA)	Case-control	89 (40 cases and 49 controls)	To investigate the effect of MAOA gene presence and maltreatment on violence.	Childhood Trauma Questionnaire (version not specified)	Barratt Impulsiveness Scale (BIS-11)
Zhong et al., 2022	Prison (China)	Cross-sectional	2643	To explore whether there were indirect pathways through cognitive reappraisal and self-compassion to attenuate the effects of childhood maltreatment on impulsivity in offenders.	Childhood Trauma Questionnaire-Short Form (CTQ-SF)	Barratt Impulsiveness Scale (BIS-11)

Table 2.4. Quality assessment of the 11 studies included in review.

	Study Type	Clear aims/objectives	Sample size justified?	Target population defined?	Eligibility criteria?	Representative sample?	Controls recruited acceptably?	Risk of selection bias	Cases and controls treated equally?	Childhood adversity/ exposure validated?	Risk of exposure / performance bias	Impulsivity/outcome validated?	Statistical significance	Other variables measured?	Other variables applied to adversity & impulsivity	Risk of measurement bias	Non-response rate reported?	Non-response rate raised concerns?	Risk of attrition/ non-response bias	Results/data presented clearly?	Results/conclusions supported?	Risk of bias in different domains	Score (%)
Bevilacqua et al., 2012	CS	P	N	P	P	P	NA	**M**	NA	Y	**L**	Y	P	Y	U	**M**	Y	N	**L**	Y	P	Selection	11.5 (63.8%)
Carli et al., 2010	CS	Y	N	Y	Y	Y	NA	**L**	NA	Y	**L**	Y	Y	Y	Y	**L**	N	U	**M**	Y	P	Attrition	14 (77.7%)
Carli et al., 2014	CS	Y	N	Y	Y	Y	NA	**L**	NA	Y	**L**	Y	Y	Y	Y	**L**	Y	N	**L**	Y	Y		16 (88.8%)
Chen et al., 2022	CS	Y	N	Y	Y	P	NA	**M**	NA	Y	**L**	Y	Y	Y	N	**L**	Y	N	**L**	Y	P	Selection	14 (77.7%)
Jansen 2020	CS	Y	Y	Y	Y	Y	NA	**L**	NA	Y	**L**	Y	P	Y	N	**M**	N	U	**M**	Y	Y	Outcome Attrition	13.5 (75%)

Jin et al., 2023	CS	Y	N	Y	P	P	NA	**M**	NA	Y	**L**	Y	P	Y	Y	**L**	N	U	**M**	Y	Y	Selection Attrition	12.5 (69.4%)
Marzano et al. 2011	CC	Y	N	Y	Y	Y	Y	**L**	Y	Y	**L**	Y	Y	Y	N	**L**	Y	N	**M**	Y	Y	Attrition	17.5/20 (87.5%)
Palumbo et al., 2022	CS	Y	N	Y	N	U	NA	**M**	NA	Y	**L**	Y	P	Y	N	**L**	N	U	**M**	P	Y	Outcome Selection Attrition	10 (55.5%)
Sergentanis et al., 2014	CS	Y	N	Y	U	U	NA	**M**	NA	N	**H**	Y	Y	Y	Y	**L**	Y	N	**L**	Y	Y	Selection Exposure	12.5 (69.4%)
Stetler et al., 2014	CC	Y	N	Y	P	U	Y	**M**	U	Y	**L**	Y	Y	Y	N	**L**	N	U	**M**	Y	Y	Selection Attrition	12.5/20 (62.5%)
Zhong et al., 2022	CS	Y	N	Y	Y	Y	NA	**L**	NA	Y	**L**	Y	P	Y	Y	**L**	Y	N	**L**	Y	Y		16.5 (91.6%)

Note. CS = Cross-sectional. CC = case-control. Quality ratings for items: Y (Yes: item adequately addressed); P (Partially: item partially addressed); U (Unclear or not stated); N (No: item not adequately addressed; NA (Not applicable). Risk of bias ratings: H (Yes); M (Moderate); L (Low).

Table 2.5. Data outcomes of the 11 studies included in review.

Study	Age*	Gender	Statistical analysis	Predictor & outcome variables	Findings		Comments
					Test statistic	p value	
Bevilacqua et al., 2012	40.6 (SD=11.0)	M	Linear regression	CTQ total & BIS total	NR	0.29	Childhood adversity and impulsivity showed no significant relationship.
Carli et al., 2010	39.61 (SD = 10.53)	M	Binary logistic regression	CTQ_Eab & BIS high CTQ_Pab & BIS high CTQ_Sab & BIS high CTQ_Eng & BIS high CTQ_Png & BIS high	0.97 (OR) 0.97 (OR) 1.06 (OR) 1.03 (OR) 0.99 (OR)	0.66 0.45 0.11 0.09 0.76	None of the CTQ scales were statistically significant in predicting high impulsivity scores relative to low impulsivity scores.
Carli et al., 2014	39.6 (SD = 10.7)	M	Logistic regression	CTQ_Eab & BIS total CTQ_Sab & BIS total CTQ_Png & BIS total	0.04 (χ^2) 15.44 (χ^2) 15.83 (χ^2)	0.83 0.0007 0.0007	Sexual abuse and physical neglect predicted BIS-11 total scores, when other variables were controlled for (e.g., age, substance use disorder, suicide family history).
Chen et al., 2022	Under 35 = 72.1% Above 35 = 27.9%	M	Multiple regression	CTQ total & BIS attentional CTQ total & BIS motor CTQ total & BIS non-planning	0.05 (β) 0.85 (β) 0.93 (β)	< 0.001 < 0.001 < 0.001	Childhood adversity was a significant predictor of attentional impulsiveness, motor impulsiveness, and non-planning impulsiveness. Control variables included: age, marital status, education, and years of smoking and drinking. Other regression statistics were not reported. Paper also reported significant correlations between CTQ and BIS scales.
Jansen, 2020	38.29 (SD = 12.39)	M	Pearson's correlation	CTQ_Eab & BIS motor CTQ_Eab & BIS total	.47 (r) .42 (r)	< 0.001 < 0.001	Correlations reported for all CTQ-SR subscales and BIS-11 subscales, and others were

				CTQ_total & BIS motor	.45 (r)	< 0.001	statistically significant – included in this table are the strongest correlations.
Jin et al., 2023	36.4 (SD = 9.04)	M	Multivariate analysis of variance (MANOVA)	CTQ_Eng & UPPS urgency	55.26 (F)	.028	Five significant Pearson's correlations were reported between CTQ and impulsivity scales, but only MANOVA and hierarchical regression analysis outcomes are provided. MANOVA reported a significant relationship between emotional abuse and UPPS urgency scale. Hierarchical regression indicates that the relationship between CTQ total and impulsivity (UPPS total) was not significant when controlling for age, education, profession, and income.
			Hierarchical regression	CTQ total & UPPS total.	-.02 (β)	.766	
Marzano et al., 2011	Cases = 25.5 (Mdn); Controls = 26 (Mdn)	F	Spearman's Rho correlation	CTQ total & Plutch impulsivity	.45 (rs)	p < .001	Only Spearman's Rho correlations were conducted, and this data was requested as it was not reported in the original paper, therefore this data is interpreted with caution.
				CTQ_Eba & Plutch impulsivity	.47 (rs)	p < .001	
				CTQ_Pab & Plutch impulsivity	.43 (rs)	p < .001	
				CTQ_Sab & Plutch impulsivity	.29 (rs)	p < .001	
				CTQ_Eng & Plutch impulsivity	.46 (rs)	p < .001	
				CTQ_Png & Plutch impulsivity	.33 (rs)	p < .001	
Palumbo et al., 2022	34.5 (SD = 10.6)	M	Stepwise linear regression	MOPS_Pat & BIS attentional	.15 (β)	p = .039	Reported that Paternal MOPS scores produced a significant model which explained approximately 1.8% of the variance in BIS-11 attentional scores, but Maternal MOPS scores did not produce a significant model (statistics were not reported). Paternal MOPS & BIS attentional also reported to be significantly correlated, but the type of correlation (e.g., Pearson) used was not indicated and the coefficient statistics were not provided.
				MOPS_Mat & BIS attentional	NR	NR	
Sergentanis et al., 2014	41.97 (SD = 12.7)	M	Hierarchical regression	Maltreatment score & BIS total – unadjusted model.	3.44 (OR)	P = .003	Adjustment model involved controlling for younger age, parental divorce, parental

				Maltreatment score & BIS total – adjusted model.	2.01 (OR)	P = .146	alcoholism, and psychiatric condition in the family. Childhood adversity predicted impulsivity in the unadjusted model, but not the adjusted model.
Stetler et al., 2014	31.81 (SD = 10.27)	M	Correlation (type unspecified)	CTQ total & BIS total	.15 (β)	P>0.0002*	(* Bonferroni correction applied for multiple testing).
				CTQ_Png & BIS non-planning	.32 (β)	P>0.0002	All correlation coefficients were provided for CTQ and BIS-11 subscales, but none were significant. CTQ physical neglect and BIS non-planning showed the strongest (non-significant) relationship.
Zhong et al., 2022	38.19 (SD = 10.18)	M = 58% F= 42%	Direct effects: mediation*	CTQ total & BIS total	.18 (β)	<.001	(*Direct effects between each CTQ scale and BIS-11 scale as predictor and outcome variables, respectively, within mediation analysis).
				CTQ_Eab & BIS total	.11 (β)	<.001	
				CTQ_Pab & BIS total	.08 (β)	<.001	
				CTQ_Sab & BIS total	.04 (β)	<.01	
				CTQ_Eng & BIS total	.18 (β)	<.001	
				CTQ_Png & BIS total	.12 (β)	<.001	All direct effects were statistically significant.
			Indirect effects: mediation	CTQ total & BIS total via self-compassion.	0.178	<.001	CTQ total and BIS total were mediated by self-compassion and cognitive reappraisal.
				CTQ total & BIS total via cognitive reappraisal	0.032	<.001	

Note. Age* = mean values given unless otherwise indicated; Mdn = Median; NR = Not reported; OR = Odds ratio; χ2 = Wald test statistic; r = Pearson's correlation coefficient; rs = Spearman's Rho correlation coefficient; F = F-value.

CTQ = Childhood Trauma Questionnaire (versions specified in Table 2.3); CTQ_Eba = emotional abuse; CTQ_Pab = physical abuse; CTQ_Sab = sexual abuse; CTQ_Eng = emotional neglect; CTQ_Png = physical neglect; MOPS = Measure of Parental Style; BIS = Barratt Impulsivity Scale (versions specified in Table 2.3); Plutch = Plutchik Impulsivity Scale; UPPS = UPPS impulsivity scale.

Chapter 3: Primary Study

Childhood adversity, impulsivity, and inhibitory control in a forensic mental health population: An empirical study

Abstract

Existing research demonstrates a relationship between childhood adversity and trait impulsivity in adult forensic populations. This study sought to investigate the relationship between childhood adversity, impulsivity, and inhibitory control among adults in a forensic mental health service. A cross-sectional study design was used in which 45 participants were recruited from a forensic mental health setting. A series of formal psychological assessment measures were completed. Variables relating to childhood adversity, impulsivity, and inhibitory control were analysed using correlation and regression methods. Childhood adversity was found to significantly predict poorer performance on an assessment measuring inhibitory control and cognitive flexibility; however, childhood adversity was not significantly associated with trait impulsivity and inhibitory control was not found to mediate the relationship between childhood adversity and impulsivity. This is the first known study to examine the relationship between childhood adversity, impulsivity, and inhibitory control in an adult forensic mental health sample. Further research, involving larger samples in the UK and internationally are needed to better understand the relationship between these phenomena in this subset of the population.

Introduction

As shown by the systematic review presented in the previous chapter, research has identified a relationship between childhood adversity and impulsivity in forensic populations (Carli et al. 2014; Chen et al. 2022; Jansen, 2020; Jin et al., 2023; Marzano et al., 2011; Palumbo et al., 2022; Sergentanis et al., 2014; Zhong et al., 2022); however, the evidence base concerns prison populations and most research has been conducted outside the UK. Forensic mental health services, of which England alone has more than 4000 high and medium secure beds (Hare-Duke et al., 2018), remain poorly understood with respect to the relationship between childhood adversity and impulsivity. Applied clinical research within forensic mental health services could begin to address the research gap and some of the methodological recommendations from the previous chapter. The author of this thesis was also interested in understanding how cognitive processes, such as inhibitory control, may relate to childhood adversity and impulsivity. From the perspective of psychological formulation (e.g., the Multiperspective model; Weerasekera, 1996), it is possible that within adult forensic populations, childhood adversity predisposes increased trait impulsivity, whilst difficulties with cognitive inhibition perpetuate impulsivity.

Childhood Adversity and Brain Development

A complex neurochemical feedback system in human brains is designed to manage threats against safety at times of stress, but when a stressor is acutely traumatic or chronic in nature, the developing brain may be particularly sensitive to long-lasting dysregulation in neurochemistry (Wilson et al., 2011). Therein, research has explored the impact of childhood adversity on brain development, within which

the hypothalamic–pituitary–adrenal axis (HPA-axis) system, and associated brain regions (e.g., prefrontal cortex and limbic system) have shown vulnerability to repeated traumatic stress (Bremner et al., 2003; Twardosz & Lutzker, 2010; Wilson et al., 2011). The HPA-axis is central to initiating behavioural responses in the context of perceived threat via cortisol production (Bevans et al., 2005), and the prefrontal cortex regulates inhibitory control and other cognitive processes in response to traumatic stress (Weber & Reynolds, 2004); it is therefore conceivable that adverse childhood experiences may increase the likelihood of impulsivity and inhibitory control difficulties during adulthood following changes at the neurochemical level.

Inhibitory Control and Impulsivity

Inhibitory control is a broad construct that has gained recognition as a fundamental executive function (Bari & Robbins, 2013). Originating within scientific literature to describe primitive physiological reflexes in the nervous system, contemporary neuropsychology conceptualises inhibitory control at a higher-order cognitive and behavioural level. Inhibitory control as an executive function, therefore, can be understood as a form of cognitive control involving a higher-order supervisory process which regulates lower-order functions, such as physiological reflexes (Bari & Robbins, 2013; Miller & Cohen, 2001).

As trait impulsivity can be defined as *"a predisposition toward rapid, unplanned reactions to internal or external stimuli…"* (DeYoung & Reuter, 2010, p. 345), it is reasonable to anticipate that impulsivity may be a consequence of impaired

inhibitory control. Therein, researchers have sought to understand the relationship between these two seemingly distinct and opposing constructs (Enticott et al., 2006; 2008; Keilp et al., 2005; Spinella 2004; 2005; Weidacker et al., 2017). Spinella (2005), found that of five subscales measuring executive functioning, the inhibitory control subscale depicted the strongest (negative) correlation with the Barratt Impulsiveness Scale's (BIS-11; Patton et al., 1995) motor impulsiveness subscale. In other words, inhibitory control decreased, whilst self-reported motor impulsiveness increased. Another study reported that inhibitory control, measured using the Spatial Stroop task (Lu & Proctor, 1995), was negatively correlated with motor, non-planning, attentional, and total impulsiveness, on the BIS-11 (Enticott et al., 2006). Where Go/No-Go tasks were used, failure to inhibit responses was associated with impulsivity on the BIS-11 total and motor scales in one study (Spinella, 2004), and BIS-11 total, attentional and motor scales in another study (Keilp et al., 2005). Whilst shown within community adult samples, evidence of the relationship between impaired inhibitory control and impulsivity in forensic populations remains sparse.

Childhood Adversity and Inhibitory Control

Empirical research has also demonstrated a relationship between childhood adversity and inhibitory control within adolescent samples (Cowell et al., 2015; Katembu et al., 2023; Mueller et al., 2012) and adult samples (Bounoua & Sadeh, 2022; Demers et al., 2022; Elton et al., 2014; Marshall et al., 2016; Navalta et al., 2006). For instance, Marshall and colleagues explored the relationship between childhood adversity (specifically abuse and neglect), attention, and inhibitory control among adult patients with bipolar disorder (BD) and healthy controls

(Marshall et al., 2016). After completing the Childhood Trauma Questionnaire-Short Form (CTQ-SF; Bernstein & Fink, 1998) and the Parametric Go/No-Go task (Garavan et al., 1999), both BD patients and healthy controls with a history of childhood adversity exhibited deficits in inhibitory control. As healthy controls with adversity showed greater inhibitory control dysfunction than healthy controls without adversity, the authors suggested that adversity may impede the development of neural circuits responsible for inhibitory control.

Present Study: Rationale, Aims and Objectives

Whilst existing research provides evidence for associations between childhood adversity and impulsivity, childhood adversity and inhibitory control, and inhibitory control and impulsivity, forensic mental health settings have seldom been investigated. Moreover, the relationship between childhood adversity, impulsivity, and inhibitory control within a forensic mental health setting has not been explored by a single study.

The aim of this study was to better understand the relationship between childhood adversity, impulsivity, and inhibitory control among adults who use forensic mental health services. Childhood adversity and inhibitory control may have a predisposing and perpetuating effect on impulsivity respectively, and by extension, high impulsivity may maintain an increased risk of harmful impulsive behaviours for these individuals.

Using a cross-sectional design, the primary objective was to explore the relationship between childhood adversity and impulsivity within a forensic mental health population. The secondary objective was to explore whether the relationship between childhood adversity and impulsivity was mediated by inhibitory control within this population. It was hypothesized that positive associations would be found between childhood adversity and impulsivity. Negative associations between childhood adversity and inhibitory control, and inhibitory control and impulsivity, were also anticipated (i.e., as childhood adversity or impulsivity increase, inhibitory control ability would decrease). Finally, inhibitory control was hypothesized to mediate the relationship between childhood adversity and impulsivity.

Method

Participants

Participants were recruited from a suburban forensic mental health service in the South of England, comprising three separate secure units: male low-security, male medium-security and female low and medium-security. Non-probability sampling was undertaken, as this method allowed the researcher to approach all patients identified as suitable by clinical teams based on pre-defined inclusion and exclusion criteria, displayed in Table 3.1 below.

Table 3.1. Inclusion and exclusion criteria for empirical study.

Inclusion criteria	**Exclusion criteria**

• Men and women admitted to the service. • Aged between 18 and 65 years • Proficient in English language (as the assessment measures were not adapted to other languages). • Capacity to give informed consent.	• Diagnosed with a learning disability or neurodegenerative disease. • Presented with acute symptoms of mental illness (i.e., symptoms of mental illness that caused the individual frequent distress or significantly impacted their daily functioning).

Of 232 occupied beds, (180 men; 52 women), 90 (64 men; 26 women) patients were deemed suitable by clinical teams, and a total sample of 45 (28 men; 17 women) provided written consent and completed the assessment. Of the remaining 45 identified as suitable, most declined, either immediately when approached, after reviewing the participant information sheet, or following a study briefing meeting. Three patients were undergoing extended periods of leave from hospital and despite attempts, it was not possible to approach these patients directly. In terms of non-responders, it was not possible to obtain the data of any patients who declined participation because written consent was required to access their files and collect data; therefore, no comparable characteristics (aside from gender) were identified. Recruitment was discontinued when the minimum sample for statistical power (n=45; power calculation outlined later in report) was recruited.

Procedure

One forensic trainee researcher conducted all recruitment and assessment procedures. The first stage of the recruitment process involved the researcher

writing to multi-disciplinary teams (MDTs) within male and female secure wards at the study site, to arrange a time to present the research at clinical team meetings. Female wards were approached first, followed by male wards. An overview of the study's aims, ethical considerations, and procedures (including the process for approaching potential participants) was circulated *via* email to MDTs (see Appendix G). Subsequently, ward rounds were attended, wherein the study was presented, and potential participants were identified.

Once identified, potential participants were approached to schedule initial appointments on their wards. Initial contact was made (with a potential participant) by a member of the usual clinical team regarding the researcher's request to make contact. With permission from the team and potential participants, the researcher approached potential participants and arranged initial study briefing appointments. At the briefing, potential participants were provided copies of the participant information sheet (PIS) and consent form (see Appendices H and I), and key information was communicated verbally. Written (signed) consent was provided at briefing appointments or later (the PIS requested decisions be made within 48 hours to assist study time management).

Once consent was provided, the researcher accessed a participant's medical records, for the purpose of obtaining file data, *via* the RiO records system. All contact between the researcher and participants was also recorded within RiO file notes.

Data Collection

Following recruitment, participants were asked to complete a series of formal assessment measures (see Appendices J to N for copies of measures outlined in the next section). The researcher's intention was to collect data on effort, childhood adversity, inhibitory control, and impulsivity. To achieve this, the following measures were used (all of which the researcher had practiced using):

Test of Memory Malingering (TOMM; Tombaugh, 1996)

The TOMM (see Appendix J) is used clinically by neuropsychologists to discriminate between memory-impaired patients and those who may intentionally fake or exaggerate memory impairment. In the present research, however, the TOMM was used as a test of effort, to ensure that assessment scores reflected test performance and to assess an individual's ability engage with the entire assessment. It is a 50-item recognition test, comprising two learning trials and a retention trial. During the learning trials the individual is shown 50 line-drawings (target pictures) of common objects for 3 seconds each, at 1 second intervals. The examinee is then shown 50 recognition panels, one at a time. Each panel contains one of the previously presented target pictures and a new picture. The examinee is required to select the correct picture.

Barratt Impulsiveness Scale-Version 11 (BIS-11; Patton et al., 1995)

The BIS-11 (see Appendix K) is a 30-item self-report instrument designed to assess the personality construct of impulsiveness/impulsivity (*i.e.,* 'trait impulsivity'). The items on the BIS-11 describe common impulsive and non-

impulsive (for reverse scored items) behaviours and preferences (*e.g.,* "I do things without thinking"). Each item is scored by selecting one of four possible responses: rarely/never, occasionally, often, or almost always/always. The BIS-II was used in the present research to measure impulsivity, and at a theoretical level it was used to make inferences about impulsive behaviour. It provided scores on total impulsiveness and three sub-traits of impulsiveness (attentional, motor, and non-planning).

Delis–Kaplan Executive Function System (D-KEFS) Trail Making Test (TMT; Delis et al., 2001)

The Trail Making Test (see Appendix L) assesses flexibility of thinking and inhibitory control. It involves a series of five conditions: visual scanning, number sequencing, letter sequencing, number-letter switching and motor speed. In the present research, the Number-Letter Sequencing condition scores were primarily used as a measure of (motor) inhibitory control. Examinees were instructed to switch between connecting numbers and letters in sequence (i.e., 1 A 2 B) whilst suppressing an instinctive urge to ascend numbers (i.e., 1 2 3) or letters (i.e., A B C) without switching. This task was timed, and the completion times (in seconds) were converted to scaled scores for each participant.

Delis–Kaplan Executive Function System (D-KEFS) Colour-Word Interference Test (CWIT; Delis et al., 2001)

The Colour-Word Interference Test (see Appendix M) primarily measures an individual's ability to inhibit an overlearned verbal response. It is based on the

Stroop (1935) procedure. There are two baseline conditions that measure key component skills of higher-level tasks: basic *naming* of colour patches (Condition 1) and basic *reading* of colour-words printed in black ink (Condition 2). Condition 3 (referred to in the results section as CWI3) reflects the traditional Stroop task – examinees must inhibit reading the words and instead name the ink colours in which the words are printed. In doing so, the ability to inhibit an overlearned verbal response (i.e., reading the printed words) is measured. The present research used scores on this condition to measure (verbal) inhibitory control. Condition 4 (referred to in the results section as CWI4) involved the examinee being asked to switch back and forth between naming the ink colours and reading the words. This condition also measures verbal inhibition, but additionally requires the skill of cognitive flexibility. For both conditions, completion times (in seconds) were converted to scaled scores for each participant.

Childhood Trauma Questionnaire-Short Form (Bernstein & Fink, 1998)

The CTQ-SF (see Appendix N) is a 28-item self-report tool concerning histories of abuse and neglect. The CTQ-SF is appropriate for adolescents (aged 12 and over) and adults. It is designed to assess five types (i.e., subscales) of negative childhood experiences including emotional neglect, emotional abuse, physical neglect, physical abuse, and sexual abuse. It also includes a 3-item minimization/denial scale for detecting false-negative trauma reports. The questionnaire takes about 5 minutes to complete. Individuals are asked to respond to a series of statements about childhood events (*e.g.,* When growing up… "I had to wear dirty clothes"). Each item is rated on a 1–5 scale, ranging from never true to very often true. Scores range from 5 - 25 for each subscale score and 25 - 125

for the total score. The CTQ-SF was used in the present research to measure severity of childhood adversity.

The researcher aimed to complete the assessment in one session with each participant. Assessment sessions lasted approximately 50 minutes. The order of tests was as presented above: 1) TOMM, 2) BIS-II, 3) TMT, 4) CWIT, 5) CTQ-SF. Each assessment was subsequently scored, and scores were entered into a database.

Additional file data were collected from each patient's RiO records, using the following psychometric assessment (previously completed by clinical teams):

Historical Clinical Risk Management-Version 3 (HCR-20-V3; Douglas et al., 2013):

The HCR-20-V3 is a comprehensive set of professional guidelines for the assessment and management of violence risk. It is applicable to adults aged 18 and above who may pose a risk for future violence. The HCR-20-V3 assesses the presence and relevance (to future violence risk) of 20 key violence risk factors. Each patient at the study site was required to have an HCR-20-V3 assessment on their electronic file, updated every six months. In the present research, the following items/factors: H5 (historical problems with substance misuse), H6 (historical problems with major mental disorder) and H8 (historical problems with traumatic experiences) were used to collect data. These related to the study's control variables: substance misuse, schizophrenia diagnosis and brain injury (acquired or traumatic), respectively. The aforementioned items from the HCR-20-

V3 assessment reports were reviewed and the associated control variables were rated in the following way: substance misuse (1: Present or 2: Partial/Not Present), schizophrenia diagnosis (1: Present or 2: Not Present), and brain injury (1: Present or 2: Not Present). Ratings were entered into the database.

Ethics

Ethical review process

The present research involved direct assessment with patients in an NHS setting. It therefore required ethical approval from the Health Research Authority (HRA). The University of Nottingham (research sponsor) reviewed the ethics application before it was submitted through the Integrated Research Application System (IRAS). The research was then reviewed and given favourable opinion by the East of Scotland Research Ethics Service REC 1 (reference: 20/ES/0063), and ethical approval was issued by the Health Research Authority (HRA) on 10th August 2020 (see Appendix O). Finally, local NHS Trust Research and Governance approval was provided on 20th August 2020.

Consent

All participants were required to provide written consent. Consent forms were signed and dated by participants before they entered the study. During this process, the researcher described the study, provided a copy of the PIS, and answered any questions from participants concerning the study.

Participant withdrawal

Participants were informed (*via* the PIS and consent form) that they could withdraw from the study at any time without giving any reason and without their legal rights being affected. They were informed that any personal data would be destroyed; however, any research data provided up to the point of withdrawal could not be erased and may have been used in data analysis.

Risk of Harm

The CTQ-SF included statements relating to childhood abuse and neglect, which had the potential to be distressing to participants. However, the CTQ-SF required participants to read each statement and rate it on a scale from 1-5 and they were not asked to disclose details of their experiences. This information was outlined in the PIS. The risk of harm was judged to be low, which was supported by the ethics committee.

Anonymity

Research data, such as assessment scores and demographic information (from electronic files) was entered into a computer database. Anonymity was ensured by assigning a study identity number (*e.g.,* P1 for participant 1) to each participant. This was written on raw assessment forms and recorded in the database. A separate database included each participant's study identity number and their initials, for safety purposes (i.e., if data raised any health or other risk which needed to be communicated to clinical teams).

COVID-19 Measures

As recruitment was undertaken between November 2020 and July 2022, COVID-19 safety measures were implemented (*e.g.,* wearing facemasks; scoring assessment forms 72 hours post administration). These measures were agreed with the psychology department's research lead prior to beginning recruitment. Recruitment was suspended between December 2020 and April 2021 due to COVID-19 restrictions. The were subsequent periods during the recruitment process where access to certain wards was prohibited due to COVID-19 outbreaks.

Statistical Methods

Sample Size

Similar studies in other populations indicated large effect sizes for the relationship between adversity and executive functioning, and adversity and impulsivity (*e.g.,* Narvaez et al., 2012). An a-priori power calculation, using G*Power (Faul, et al., 2007) assuming a large effect (f2 = 0.35), suggested that for a multiple regression model (R2 deviation from zero) with three predictors (CTQ-SF total score, D-KEFS Color-Word Interference Test score, and Trail Making test score), to achieve 90% power at a 0.05 significance level, 45 participants were needed (see Appendix P for G*Power output).

Analyses

In terms of univariate analysis, distribution plots were produced for each data variable to assess normality, as well as mean and median values – which were reported according to the nature of distribution (e.g., means reported for normally distributed data).

Regarding bivariate analyses, parametric (independent t-test) and non-parametric (Mann-Whitney U test) tests were used to check whether the five core variables could be grouped by gender (male vs. female) for further analysis, after applying a Bonferroni correction (adjusted *p* value = 0.01) due to potential type 1 error for multiple means testing. Spearman's Rho correlations were then used to analyse associations between CTQ-SF minimization/denial (MD) scores and CTQ-SF total scores. Spearman's Rho correlations were also used to initially analyse associations between CTQ-SF total, BIS-11 total, and D-KEFS test scores, for which a Bonferroni correction (adjusted *p* value = 0.01) was also applied.

Based on the results of Spearman's Rho correlations, binary logistic regression was used to explore whether statistical relationships were evident after re-coding predictor (CTQ-SF total scores) and outcome (CWI4 scores) variables into categories. This model also permitted inclusion of control variables (age, gender, substance misuse history, and schizophrenia diagnosis), and the assumption of multicollinearity was assessed using the tolerance statistic. For logistic regression, statistical significance was determined at $p<0.05$.

The current study intended to use Process Macro Version 4.2 (Hayes, 2022) to undertake mediation analysis, as per the study's objectives. The reason for not using this analysis is outlined in the results section. All analyses were conducted using SPSS (Statistical Package for the Social Sciences) Version 29.

Results

Descriptive Statistics

The final sample for statistical analysis comprised 44 participants (27 males; 17 females), following the exclusion of one male participant due to below threshold scores on the TOMM retention trial (<40). As shown in Table 3.2, mean and standard deviation (SD) statistics were reported for normally distributed continuous data (see Appendix P for distribution plots), such as age and BIS-11 scales. The mean age of the total sample was 38.30 years (SD = 10.27). The mean BIS-11 score for the total sample was 63.18 (SD = 12.56) for total impulsiveness – defined as 'within the normal limits' (Stanford et al., 2009); 15.93 (SD = 4.03) for attentional impulsiveness; 23.34 (SD = 5.56) for motor impulsiveness; and 23.93 (SD = 5.37) for non-planning impulsiveness. BIS-11 scores were similar between males and females.

As shown in Table 3.3, the median (*Mdn*) and interquartile range (*IQR*) statistics were reported for non-normally distributed (see Appendix Q for distribution plots) continuous data (e.g., DKEFS scores; CTQ-SF scales). For the total sample, CTQ-SF scores for emotional abuse (*Mdn* = 10.00, *IQR* = 8.75) and emotional neglect (*Mdn* = 11.00, *IQR* = 7.75) were highest, whilst sexual abuse was lowest (*Mdn* =

5.00, *IQR* = 20.00). The sexual abuse scores (*Mdn* = 9.00, *IQR* = 17.00) and physical abuse scores (*Mdn* = 10.00, *IQR* = 11.00) for females were in the 'moderate to severe' range. Of note, the interquartile ranges (IQR) across CTQ-SF total and subscales showed considerable variation in self-reported abuse and neglect among participants.

The total sample yielded low-average scores on D-KEFS tests: Trail Making Test (TMT; *Mdn* = 6.50, *IQR* = 7.00); Colour-Word Interference Condition 3 (CWI3; *Mdn* = 7.00, *IQR* = 7.00); and Colour-Word Interference Condition 4 (CWI4; *Mdn* = 7.00, *IQR* = 7.00). Similar to CTQ-SF scores, the D-KEFS scores showed considerable variation, as indicated by the IQR values.

Table 3.2. Mean (standard deviation) values for age and BIS-11 scores by total sample and gender.

Variable	Total Sample (n = 44)	Male (n = 27)	Female (n = 17)
Age	38.30 (10.27)	39.07 (8.95)	37.06 (12.28)
BIS-11			
Total	63.18 (12.56)	63.44 (12.77)	62.76 (12.61)
Attentional	15.93 (4.03)	15.85 (4.26)	16.05 (3.74)
Motor	23.34 (5.56)	23.37 (5.76)	23.29 (5.40)
Non-planning	23.93 (5.37)	24.22 (4.83)	23.47 (6.27)

Note. BIS-11 = Barratt Impulsiveness Scale-Version 11.

Table 3.3. Median (IQR) values for CTQ-SF and D-KEFS scores by total sample and gender.

Variable	Total (n = 44)		Male (n = 27)		Female (n = 17)	
CTQ-SF		*CTQ-SF classification*		*CTQ-SF classification*		*CTQ-SF classification*
Total	45.00 (26.50)		40.00 (22.00)		54.00 (37.00)	
Emotional abuse	10.00 (8.75)	Low-Mod	9.00 (8.00)	Low-Mod	12.00 (10.00)	Low-Mod
Physical abuse	8.00 (8.75)	Low-Mod	8.00 (8.00)	Low-Mod	10.00 (11.00)	Mod-Sev
Sexual abuse	5.00 (7.75)	None-Min	5.00 (4.00)	None-Min	9.00 (17.00)	Mod-Sev
Emotional neglect	11.00 (7.50)	Low-Mod	8.00 (8.00)	Low-Mod	14.00 (8.50)	Low-Mod
Physical neglect	8.00 (5.00)	Low-Mod	7.00 (5.00)	None-Min	9.00 (4.00)	Low-Mod
D-KEFS						
TMT	6.50 (7.00)		5.00 (6.00)		8.00 (6.50)	
CWI3	7.00 (7.00)		7.00 (6.00)		7.00 (8.00)	
CWI4	7.00 (7.00)		7.00 (6.00)		6.00 (8.00)	

Note. CTQ-SF = Childhood Trauma Questionnaire-Short Form. D-KEFS = Delis–Kaplan Executive Function System. IQR = Interquartile range. CTQ-SF subscale scores range = 5-25. CTQ-SF total score range = 25-125. CTQ-SF classification (Bernstein & Fink, 1998) = 'None-Min' (None or Minimal); 'Low-Mod' (Low to Moderate); 'Mod-Sev' (Moderate to Severe). TMT = Trail Making Test. CWI3 = Colour-Word Interference Test Condition 3. CWI4 = Colour-Word Interference Test Condition 4. D-KEFS tests scaled scores range 1-19 (lower score indicates poorer performance).

Bivariate and Multivariate Analyses

Due to the small sample size in this study, CTQ-SF subscales and BIS-11 subscales were only used in descriptive statistics, whilst CTQ-SF total and BIS-11 total scores were retained for bivariate and multivariate analyses for the purpose of testing the study's hypotheses.

Gender and Minimization/Denial

As shown in Table 3.4, Mann-Whitney U tests for CTQ-SF and inhibition variables and independent t-test for BIS-11 total scores by gender (male vs. female) were not statistically significant, after applying a Bonferroni correction to five variable comparisons (adjusted *p* value = 0.01). Male and female data could therefore be grouped for further analysis. As almost half of the sample (n=17; 38.6%) scored 1-3 on the CTQ-SF MD scale (a validity scale indicating possible underreporting of childhood abuse and neglect), the relationship between MD scores and CTQ-SF total scores was analysed using Spearman's Rho correlations to measure the potential effect of MD scores. For the total sample (n=44), a significant negative correlation was shown for CTQ-SF MD and CTQ-SF total (r = -.63, p = <.001), therefore, participants who scored 3 (n=7; 15.9%) and 2-3 (n=9; 20.4%) were removed systematically to explore the impact of these participants' MD scores on MD and CTQ-SF scale correlations (see Table 3.5). When removing participants with an MD score of 3, the resulting sample (n=37) continued to show a significant negative correlation between MD and CTQ-SF total (r = .44, p = .006). Conversely, when removing participants who scored 2-3 on the MD scale, the resulting sample (n=35) showed a small but non-significant negative correlation for CTQ-SF MD and CTQ-SF total (r = -.344, p = .080). The CTQ-SF MD and CTQ-SF total

correlation analysis indicated that MD scores of 2-3 were influencing self-reported experiences of adversity, whilst CTQ-SF MD scores of 0-1 were having a small non-significant effect. A decision was made therefore, to exclude nine participants from further analysis, providing a final sample of 35 participants.

Table 3.4. Gender (male *vs.* female) differences for all variables (n = 44).

Variable	*z*	p
CTQ-SF		
Total	-2.09	.036
D-KEFS		
Trail Making	-1.56	.118
Colour Word Interference 3	-0.75	.453
Colour Word Interference 4	0.36	.715
	t	
BIS-11		
Total	-0.17	.864

Note. BIS-11 = Barratt Impulsiveness Scale-Version 11. CTQ-SF = Childhood Trauma Questionnaire-Short Form. D-KEFS = Delis–Kaplan Executive Function System. *z* = Mann-Whitney U test statistic. *t* = independent t-test statistic. p = p value (Bonferroni correction: adjusted p value = 0.003).

Table 3.5. CTQ-SF minimization/denial scale and CTQ-SF total correlations.

Variable	*r*	p	95% CI
CTQ-SF MD *vs.*			
CTQ-SF total (n = 44)	-.634	<.001	-787, -.408
CTQ-SF total (n = 37)	-.444	.006	-.677, -.131
CTQ-SF total (n = 35)	-.344	.080	-.569, .048

Note. CTQ-SF = Childhood Trauma Questionnaire-Short Form. MD = minimization/denial scale. *r* = Spearman's Rho correlation. p = p value (2-tailed: < 0.05 = significance level). CI = confidence intervals.

Correlation Analysis: CTQ-SF, BIS-11 and D-KEFS variables

For correlation analysis between key variables, a Bonferroni correction was calculated based on the five Spearman's Rho correlations presented in Table 3.6 (adjusted p value = 0.01). One statistically significant negative correlation was shown, for CTQ-SF total and CWI4 (r = -.50, p = .002), depicting that as CTQ-SF total scores increased, CWI4 test performance decreased. CTQ-SF total and BIS-11 total was positively correlated and shown to be approaching significance after applying the Bonferroni correction (r = .33, p = .046). As shown in Table 3.6, the remaining correlations were not statistically significant. CWI4 was selected to correlate with BIS-11 total because of the significant association between CTQ-SF total and CWI4, with a view to using the variable CWI4 to represent inhibitory control in mediation analysis.

Table 3.6. Spearman's Rho Correlations for CTQ-SF total, BIS-11 total, and D-KEFS scores (n = 35).

Variable	*r*	p	95% CI
CTQ-SF total &			
BIS-11 total	.339	.046*	-.004, .610
TMT	-.182	.295	-.494, .171
CWI3	-.272	.114	-.562, .078
CWI4	-.504	.002**	-.722, -.196
BIS-11 total &			
CWI4	-.191	.272	-.500, .162

Note. CTQ-SF = Childhood Trauma Questionnaire-Short Form. BIS-11 = Barratt Impulsiveness Scale-Version 11. D-KEFS = Delis–Kaplan Executive Function System. TMT = Trail-Making Test score. CWI3 = Colour-Word Interference Test condition 3 score. CWI4 = Colour-Word Interference Test condition 4 score. **p < .01. (Bonferroni correction: adjusted p value = 0.01). *p < .05. (denotes 'approaching' significance).

Binary Logistic Regression

Binary logistic regression was used to further explore the relationship between CTQ-SF total and CWI4 scores. Using this approach, it was possible to examine whether a higher category of adversity (e.g., moderate to severe) increased the likelihood of low scores on the CWI4 test. CWI4 scores were dichotomised into two groups: high (7-14) and low (1-6) scaled scores, reflecting above or below average performance respectively on the CWI4 test. CTQ-SF scores were recoded into categorical variables to improve the interpretation of odds ratio statistics. CTQ-SF total used two levels (1 = minimal to low; 2 = moderate to severe).

CTQ-SF total and CWI4:

For CTQ-SF total (predictor variable) and CWI4 scores (outcome variable), with control variables (included as predictors), a preliminary analysis indicated that the assumption of multicollinearity was met (tolerance = .68). The model explained between 25.3% (Cox & Snell R square) and 35.8% (Nagelkerke R square) of the variance in the dependent variable, and correctly classified 54.3% of cases. With all predictor/control variables included, the model was not statistically significant, X^2 (5, n=35) = 10.19, p = .070; however, as shown in Table 3.7, CTQ-SF total scores significantly contributed to the model. The odds ratio of 9.2 suggests that the likelihood of participants who had reported moderate to severe levels of childhood adversity (total abuse and neglect) were 9.2 times more likely than those reporting minimal to low levels of childhood adversity to perform poorly on

the CWI4 test. This effect remained significant when controlling for substance misuse, schizophrenia, age, and gender.

Table 3.7. Logistic regression for CTQ-SF total predicting low CWI4 test scores (1-6).

	B	*SE*	Wald	*df*	p	*OR*	95% CI *OR*	
							LL	*UL*
CTQ-SF mod-sev	2.22	0.95	5.31	1	.021	9.18	1.38	60.48
Age	-.04	0.04	0.97	1	.323	0.96	0.87	1.04
Gender	0.53	0.83	0.41	1	.522	1.70	0.33	8.71
SMU	-.07	0.95	0.01	1	.929	0.92	0.14	5.92
Sz	0.04	0.86	0.00	1	.966	1.04	0.19	5.64
Constant	-.01	2.22	0.00	1	.996	0.98		

Note. CTQ-SF = Childhood Trauma Questionnaire-Short Form. CWI4 = Colour-Word Interference Test condition 4. CTQ-SF mod-sev = CTQ-SF (total) moderate to severe scores. SMU = substance misuse history. Sz = schizophrenia diagnosis. *B* = unstandardized regression coefficient. *SE* = standard error. Wald = Wald test statistic. *df* = degree of freedom. p = p value. *OR* = odds ratio. CI = confidence interval. *LL* = lower limit. *UL* = upper limit.

Mediation Analysis

The second objective of this study was to explore whether inhibitory control mediated the relationship between childhood adversity and impulsivity. The mediation model would have comprised CTQ-SF total as predictor (i.e., adversity), BIS-11 total as outcome (i.e., impulsivity), and CWI4 scores as mediator (i.e., inhibitory control); however, no statistically significant relationship (at $p<0.01$) existed between CTQ total and BIS-11 total, nor BIS-11 and CWI4 (as indicated by Spearman's Rho correlations; see Table 3.6), which violated assumptions of mediation analysis.

Summary of Key Findings

Data from only 35 participants were retained for bivariate and multivariate analyses due to the observed effect of minimization/denial scores on CTQ-SF total scores. Correlation analysis showed a significant negative association between CTQ-SF total and CWI4 scores, whilst CTQ-SF total and BIS-11 total were positively correlated but only approaching statistical significance. Logistic regression indicated that participants who reported moderate to severe levels of childhood adversity (i.e., CTQ-SF total) were significantly more likely than those reporting minimal to low adversity to perform below average on a test measuring verbal inhibitory control (CWI4). This regression model was significant after controlling for age, gender, substance misuse, and schizophrenia. It was not possible to perform mediation analysis as statistical assumptions were violated.

Discussion

This is the first study within an adult forensic mental health population to examine the relationship between childhood adversity, (trait) impulsivity, and inhibitory control. Childhood adversity and impulsivity were shown to be positively correlated, although with adjusted parameters surrounding statistical significance this relationship was not statistically significant, and therefore regression models were not applied. Conversely, previous research in forensic populations reported that childhood adversity was significantly associated with impulsivity, as noted by the systematic review in Chapter 2, and two studies have evidenced this relationship whilst statistically controlling for other factors such as substance misuse (Carli et al., 2014; Chen et al., 2022). It is possible that eliciting a larger sample in the current research may have produced significant results with respect to childhood adversity and trait impulsivity.

The present study did not demonstrate a mediating effect of cognitive inhibitory control on the relationship between childhood adversity and impulsivity; however, logistic regression found that total adversity (abuse and neglect) and emotional abuse predicted low scores on one (CWI4) of two test conditions on the Colour Word Interference Test. The difference between the two conditions was that CWI4 required cognitive flexibility (i.e., switching between different mental tasks) in addition to verbal inhibitory control, and was arguably more difficult than the preceding condition (CWI3) due to increased cognitive demands (Eglit et al., 2020; Lippa & Davies, 2010). One possible explanation for emotional abuse predicting difficulties with tasks involving cognitive flexibility in this sample, is that early abuse and neglect, particularly the chronic and unpredictable nature of emotional abuse, may have impeded ability to develop flexible cognition. Research has

demonstrated the link between adverse childhood experiences and decreased cognitive flexibility (Beccara-Garcia, 2014; Kalia & Knauft, 2020; Nikulina and Widom, 2013). Therein, Kalia & Knauft (2020) found that self-reported experiences of stress mediated this relationship and suggested that those reporting greater adversity may have inflexibly appraised environmental demands as threatening, as opposed to challenging. In contrast, inhibitory control may be an adaptive skill developed by some individuals to cope with adverse experiences. For instance, a child who is physically abused by an intoxicated parent may learn to inhibit emotions and behaviours (e.g., crying; arguing) which may otherwise increase likelihood of further abuse; therefore, for participants in the present study, childhood abuse may not have impaired development of inhibitory control skills, whilst it may have impaired the development of cognitive flexibility skills. It is, however, important to note that childhood adversity was not significantly associated with Trail Making Test scores, an additional measure of inhibitory control and cognitive flexibility in this study; therefore, the interpretation above is tentative. Moreover, there are other aspects of cognitive functioning (e.g., planning and problems solving) that may be impacted by adverse childhood experiences and subsequently relate to problems with impulsivity among forensic patients, which would benefit from further exploration.

Strengths and limitations

Research had not previously investigated the relationship between childhood adversity, impulsivity, and inhibitory control within forensic mental health services, and with respect to childhood adversity and impulsivity, prison samples had been recruited; therefore, this study was unique. This study was also unique because it

incorporated CTQ-SF MD scale scores within preliminary data analysis, to increase the reliability of self-reported experiences of abuse and neglect – a methodological shortfall of previous research noted in Chapter 2. Control variables were also entered into the logistic regression, increasing the robustness of the cross-sectional design used in this study. Another strength of this study was its use of the TOMM to measure effort, which increased the internal validity of neuropsychological assessment measures (Wisdom et al., 2012), and indicated a participant's ability to engage with the whole assessment process, which also enhanced the ethical integrity of this study.

Several limitations should be acknowledged, including the study's small sample size and high non-response rate. Efforts were made to recruit a mixture of male and female forensic patients, with previous research in this area often recruiting males only; however, 50% of individuals identified as potentially suitable by clinical teams declined to participate. Despite recruiting the minimum sample determined by an a-priori power calculation (n=45), multivariate analyses only included 35 participants. Participants were also recruited from only one forensic mental health service in the South of England, which limits the generalizability of the present findings.

Moreover, due to this study's small sample, it was not possible to address Lui's (2019) recommendation that the strength of association between the subtypes of childhood adversity (e.g., emotional abuse) and impulsivity should be measured (as opposed to just total adversity). This relates to the position that subtypes of adversity co-occur (Finkelhor et al. 2007). For example, emotional abuse is likely

to co-occur with sexual and physical abuse, but may also occur alone, whilst sexual and physical abuse are less likely to occur by themselves (Lui, 2019).

Furthermore, whilst the research design was made more robust by, for example, incorporating control variables, using a cross-sectional design meant that cause-and-effect relationships could not be established; therein, the evidence base has widely acknowledged the importance of longitudinal study designs to provide more clarity around the psychological impact of childhood adversity (Bevilacqua et al., 2012; Chen et al., 2022; Lui, 2019; Nikulina & Widom, 2013). With respect to the present study and previous research involving retrospective recall of adverse childhood experiences and cross-sectional assessment of impulsivity, it is potentially unwise to assume that adverse experiences lead to greater impulsivity (i.e., that this relationship is unidirectional). Research has found parents' own impulsive tendencies to be associated with increased neglect (Schumacher et al., 2001) and physical abuse (Fréchette et al. 2015) of children. It is also possible that children displaying (possibly inherited; Bevilacqua & Goldman, 2013) impulsive tendencies receive increasingly harsh discipline which may eventually lead to forms of abuse, exacerbated by factors such as parental stress (Lui, 2019).

Implications and Conclusions

This study provides empirical evidence of a relationship between childhood adversity and poorer performance on a neuropsychological test of verbal inhibitory control and cognitive flexibility within a small adult forensic mental health sample. A statistically significant relationship between childhood adversity and trait

impulsivity was not found. As the first study exploring the relationship between childhood adversity, impulsivity, and cognitive functioning within forensic mental health services, the present findings indicate that this topic requires further exploration using larger samples, both in the UK and globally. Examining the associations between subtypes of childhood adversity and impulsivity (e.g., subscales of CTQ-SF and BIS-11) would also be possible with larger samples and would provide valuable information about the relationship between these factors. Future research should also explore cognitive functioning more broadly (i.e., beyond inhibitory control and cognitive flexibility) with respect to childhood adversity and impulsivity. Given that this research was conceptualised in the context of psychological formulation, wherein childhood adversity was hypothesised to have a predisposing effect on impulsivity and cognitive inhibitory control was anticipated to maintain difficulties with impulsivity, future research would further inform these hypotheses. Prospective longitudinal designs are likely to provide more robust conclusions about the directional effects of childhood adversity, impulsivity, and cognitive functioning deficits.

The practice implications of this study are largely consistent with systematic review in the previous chapter. This study contributes to the rapidly expanding evidence base supporting the importance of early detection and intervention for individuals experiencing adversity during childhood, because childhood adversity represents a widely reported risk factor for later psychological difficulties, behavioural challenges, and forensic institutionalisation (Malvaso et al., 2016; Rasche et al., 2016; Stinson et al., 2021; Fitton et al., 2020). For those detained in forensic services, the evolving evidence base regarding the harmful impact of

childhood adversity may also inform initiatives aimed at alleviating repeated trauma, such as trauma-informed care (Jones, 2017).

Chapter 4: Research Case Study

Childhood adversity, impulsivity, and cognitive functioning: A forensic research case study

Abstract

Childhood adversity has been shown to impact various cognitive functioning abilities in later life. The way in which cognitive functioning deficits relate to childhood adversity and impulsivity in forensic populations is complex, although a research case study was one way of assessing and formulating the relationship between these factors. A case study was undertaken with the aim of examining the relationship between childhood adversity, impulsivity, and cognitive functioning for an individual admitted to a forensic mental health service. Information regarding the aforementioned factors was gathered using case reports, face-to-face assessments, and behavioural incident data, with which an evidence-based narrative and formulation were derived. Childhood adversity may have predisposed high trait impulsivity, as well as cognitive deficits in inhibitory control, planning, and problem solving, for the recruited participant. The latter may have also maintained difficulties with impulsivity. Simultaneously, dynamic factors such as the acquisition of adaptive coping strategies may have reduced incidents of impulsive behaviour. This case study demonstrates the value of eliciting an in-depth understanding of a forensic mental health patient's cognitive functioning profile, adverse childhood experiences, and propensity for impulsivity when developing case formulations.

Introduction and Rationale for Case Study

The primary study, reported in Chapter 3 of this thesis, provided a quantitative exploration of the relationship between adverse childhood experiences, inhibitory control, and impulsivity within a forensic sample. When exploring the data on an individual level, several participants' assessment profiles depicted variable results with respect to inhibitory control, childhood adversity, and impulsivity. Of particular interest were profiles depicting above average levels of trait impulsivity on at least one scale (e.g., attentional impulsiveness), below average verbal and/or motor inhibition scores, and self-reported childhood abuse or neglect. The primary study's data alone could not be used to understand the complex relationship between these variables on an individual level; nevertheless, it was conceptualised that a case study design may achieve this.

Furthermore, the primary study's design was limited in its measurement of cognitive functioning, as it focused primarily on inhibitory control (an executive function); however, inhibitory control comprises only one aspect of executive functioning. Other 'core' executive functions, including working memory and cognitive flexibility, and higher-order skills such as planning, problem-solving, reasoning, and organisation, constitute a complex cognitive network within the prefrontal cortex (Op den Kelder et al., 2018). By exploring this cognitive network in greater depth, it may have been possible to hypothesise why an individual using forensic mental health services was experiencing difficulties with impulsive behaviour.

Research has shown that executive functioning emerges in early childhood and develops throughout adolescence with influence from genetics and environmental factors (Halse et al., 2019). Regarding the latter, childhood adversity is shown to be associated with cognitive functioning deficits, among a multitude of studies, involving both child and adolescent samples (Dileo et al., 2017; Irigaray et al., 2013; Kavanaugh, et al., 2015; Kirke-Smith et al., 2015; Spann et al., 2012; Vasilevski & Tucker, 2016; Su et al., 2019) and adult samples (Beccara-Garcia, 2014; Irigaray et al., 2013; Majer et al., 2010; Marshall et al., 2016; Navalta et al., 2006; Narvaez et al., 2012; Nikulina & Widom, 2013). Duration, timing, severity, and type of maltreatment (e.g., physical abuse; neglect), has been shown to moderate the risk of executive functioning impairment (Op den Kelder et al., 2018; Kavanaugh et al., 2015; Letkiewicz et al., 2020).

Majer et al. (2010) found childhood abuse and neglect to be associated with impaired working memory (as defined and conceptualised within executive functioning) in adulthood. Nikulina and Widom (2013), in their prospective cohort study which followed children into middle adulthood, reported impaired attention, cognitive flexibility (i.e., switching between different mental tasks), and problem-solving for those who had experienced neglect. Whilst most research to date has recruited non-forensic (i.e., community and clinical) samples, Beccara-Garcia (2014) found that offenders with a history of childhood abuse showed poorer performance than non-offenders and controls on tests of processing speed and cognitive flexibility. Executive functioning deficits were shown for offenders who had experienced physical abuse, whereas non-offender samples (e.g., Majer et

al., 2010; Nikulina & Widom, 2013) indicated that more passive forms of maltreatment (e.g., neglect) had a greater effect on adult executive functioning.

A case study design provided an opportunity to assess cognitive functioning broadly, by obtaining data from a variety of validated tests (completed during the primary study and the case study). It also permitted collection of a comprehensive case history, with particular attention to adverse experiences, and data pertaining to characteristically impulsive behaviours. A detailed narrative could then be developed within which it was possible to understand the complex relationship between variables of interest (adversity, cognitive functioning, and impulsivity) for a single case (Crowe et al., 2011).

Method

Aims and Objectives

The aim of the research case study was to provide an in-depth understanding of the relationship between childhood adversity, cognitive functioning, and impulsivity for an individual admitted to a forensic mental health service.

The first objective was to gather additional information surrounding childhood adversity, cognitive functioning (including general intellectual functioning and executive functioning), and impulsivity, using case reports, face-to-face assessments, and behavioural incident data. The second objective was to utilise

this information to develop a narrative and formulation regarding the recruited participant.

Rationale and Procedure for Recruiting Participant

The participant in this case study had participated in the thesis' primary study and continued to receive treatment in the same forensic mental health service. There were additional inclusion criteria for participation, as shown in Table 4.1. All eligibility criteria applied to the primary study were also relevant to the case study. It was essential to re-apply these criteria because each person's circumstances may have changed since participating in the primary study. Potential participants were also selected based on psychometric assessment outcomes from the primary study. Assessment data was explored by the student researcher and their academic supervisors to ascertain which profiles depicted self-reported childhood adversity, above average impulsivity (on at least one scale), and difficulties with (motor and/or verbal) inhibition. Consideration was also given to the time gap between participation in the primary study and case study assessments (i.e., a smaller time gap was likely to increase reliability of combined assessment outcomes; therefore, these individuals were prioritised).

Before approaching potential participants, their electronic files were re-accessed to ensure that the executive functioning assessment chosen for use in this case study (Behavioural Assessment of the Dysexecutive Syndrome; BADS; Wilson et al., 1996) had not been completed within one year due to the possibility of improved performance *via* practice effects. This was an additional exclusion

criterion (see Table 4.1). The authors of the BADS did not provide specific guidance around this matter but within a small sample (of normal control subjects) they had found that retesting after 6-12 months had led to a (non-significant) improvement in performance (Wilson et al., 1998); therefore, one year was considered a suitable cut-off to mitigate the risk of practice effects.

Table 4.1. Inclusion and exclusion criteria for case study

Inclusion criteria	Exclusion criteria
• Male or female admission. • Aged between 18 and 65 years (≤65 years due to possible effects of ageing and neurodegenerative disease on assessment outcomes). • Proficient in English language (as the assessment measures were not adapted to other languages). • Capacity to give consent. **Additional inclusion criteria:** • Participated in primary study. • Receiving continued treatment in forensic mental health service. • Primary study assessment outcomes depicted childhood adversity, moderate to high impulsiveness, and deficits in inhibitory control.	• Diagnosed with a learning disability or neurodegenerative disease. • Presented with acute symptoms of mental illness (i.e., symptoms of mental illness that caused the individual frequent distress or significantly impacted their daily functioning). • Prior completion of the BADS within the previous year.

Note. BADS = Behavioural Assessment of Dysexecutive Syndrome (Wilson et al., 1996).

The recruitment procedure involved providing an overview of the study's aims, ethical considerations, and procedures *via* email to the selected participant's clinical team (see Appendix U). An initial briefing meeting was subsequently arranged with the identified individual (up to 30 minutes) in which they were given

copies of the participant information sheet (PIS) and consent form (see Appendices S and T), and key information was communicated verbally. Written consent was provided at the briefing appointment or at a later time. The intention was to repeat this process until one individual was successfully recruited.

Once consent was provided, the researcher arranged a face-to-face assessment appointment with the participant and gathered file data from their electronic records (*via* the RiO records system). All contact between the researcher and participant was also recorded in the participant's electronic progress notes, and handovers were provided to the treating team.

Data Collection

The following data collection methods are outlined in the order they were used to gather information for this case study.

Primary Study Assessment Outcomes

The outcomes of assessments used in the primary study were obtained and presented (later in this report) for the recruited participant. These assessments comprised the Childhood Trauma Questionnaire-Short Form (CTQ-SF; Bernstein & Fink, 1998), Barratt Impulsiveness Scale Version 11 (BIS-11; Patton et al., 1995), Delis–Kaplan Executive Function System (D-KEFS) Trail Making Test (TMT; Delis et al., 2001), and D-KEFS Colour-Word Interference Test (CWIT; Delis et al., 2001). A full description of these measures is provided in Chapter 3 of this thesis.

File Review

Case History:

The electronic records (RiO) of the individual participant recruited were accessed to gather a detailed case history. This involved reviewing psychological and psychiatric case reports and selecting pertinent information regarding childhood (including adverse experiences) and family background, relationship (non-intimate and intimate) history, education and employment history, physical and mental health history, forensic history, treatment received and current circumstances (at time of assessment).

Behavioural Data:

Incident data relating to types of impulsive behaviour (e.g., physical aggression) was obtained by reviewing incident reports from the participant's electronic file records (RiO). The number of incidents relating to each behaviour type was logged and each were summarised qualitatively.

Wechsler Adult Intelligence Scale Fourth Edition (WAIS-IV; Wechsler, 2008):

The WAIS-IV is used to measure general intellectual functioning in individuals aged 16–90 years. It produces an overall (Full-Scale) IQ score and four index scores pertaining to specific areas of functioning: Verbal Comprehension Index (VCI; a measure of verbal skills such as vocabulary and verbal reasoning);

Perceptual Reasoning Index (PRI; a measure of ability to organise, interpret and think using visual information); Working Memory Index (WMI; measuring ability to hold information temporarily in mind for the purpose of a specific task); and Processing Speed Index (PSI; a measure of ability to process information in simple tasks at speed). Index scores are summary scores generated from the combined scores of specific subtests, whilst the Full-Scale IQ score is generated using all subtests. The recruited participant's pre-existing WAIS-IV scores, from an assessment completed in 2019, were obtained from their file and used to indicate their general intellectual functioning.

Face-to-Face Assessment and Rationale for Test Selection

Following recruitment, the participant was asked to complete two formal assessment measures *via* face-to-face assessment. The researcher's intention was to collect data on cognitive functioning (to supplement data collected in the primary study and from file review) for the recruited participant. To achieve this, the following assessments were used:

Test of Pre-Morbid Functioning-UK Edition (ToPF-UK; Wechsler, 2011):

The ToPF-UK is a word reading test, used to provide an estimate of previous intellectual functioning (e.g., existing prior to the onset of mental illness). It is co-normed with the WAIS-IV. The ToPF-UK involves the examinee reading and pronouncing words that have irregular grapheme-to-phoneme translation. It consists of 70 words printed on the front and back of a card in two columns, which

is presented to the examinee. The ToPF-UK was used in this case study (completed in August 2022) to provide an estimate of the participant's previous cognitive functioning, because the pre-existing WAIS-IV assessment (2019) did not measure previous functioning estimates.

Behavioural Assessment of Dysexecutive Syndrome (BADS; Wilson et al., 1996):

The BADS is a test battery aimed at predicting everyday problems arising from the Dysexecutive Syndrome (DES), an area of cognitive functioning (see Appendix V for sample assessment page). It measures executive functioning skills, such as attention, planning, problem-solving, setting priorities, and organisation. It consists of six subtests and a 20-item questionnaire. The subtests include the Rule Shift Cards Test, Action Program Test, Key Search Test, Temporal Judgment Test, Zoo Map Test, and Modified Six Elements Test. The Dysexecutive Questionnaire (DEX) comprises a self-rated questionnaire (completed by the participant) and an independent rated questionnaire (completed by a professional in the clinical team).

The BADS assessment was selected for this case study because its subtests are somewhat reflective of routine/everyday tasks and thus have been shown to have high ecological validity (e.g., Bennett et al., 2005). For instance, the key search task involves the individual imagining a key has been lost in a field and therefore must plan an effective search strategy to give themselves a good chance of retrieving the key. Moreover, it was important to observe the way the recruited participant completed these subtests, to provide an insight into certain difficulties they may experience with routine/everyday tasks (and the associated executive

functioning skills), which may be associated with their risk of engaging in harmful impulsive behaviour. The observations and data provided by the BADS assessment, in conjunction with additional assessments and case history, could then contribute to a formulation seeking to explain the behaviour of an individual using forensic mental health services.

Results

Participant Overview

Participant 25 (P25) was identified using the eligibility criteria in Table 1. P25 participated in the primary study in December 2021. He remained in the service, provided consent to participate in the case study and completed the case study assessment in August 2022.

P25 was a 33-year-old black West African male, detained under a notional Section 37 of the Mental Health Act (1983) on a pre-discharge low-secure ward. He served four years of a seven-year prison sentence from 2011 – 2015. Following release from prison in 2015, he breached licence conditions in 2016 and was remanded to custody. He was subsequently admitted to a secure inpatient service in 2017 following a deterioration in his mental state.

Case History

Sources of information

P25's case history was sourced from electronic documentation, including psychiatric assessment, mental health tribunal, and hospital managers hearing reports; psychological assessment, care programme approach (CPA) review, and intervention reports (including drug and alcohol service reports); social circumstances reports; and P25's most up-to-date Historical Clinical Risk Management-Version 3 (HCR-20-V3; Douglas et al., 2013) assessment report.

Childhood, family, and schooling (including early adverse experiences)

P25 was born in West Africa. He described his childhood as difficult as his family were poor, and he was unable to go to school. He was taught how to read and write, to a limited extent, by his stepmother. Aged nine, he witnessed the "necklacing" of a neighbour (a tyre filled with petrol was placed around his neighbour's neck and set alight). He reported that at the age of 10 or 11 he witnessed his two brothers, his stepmother and father die in a bomb blast. He recalled going to the house and seeing body parts everywhere. He said that the bomb was planted to kill his father because he was a preacher and had enemies. At that time, he also witnessed two thieves being doused with petrol and then set alight and die in front of him on the street. The late 1990s, when the aforementioned events occurred in P25's life, was a time of major ethnic and religious conflict among militia groups in parts of West Africa, which led to considerable violence, loss of life and population displacement (McGowan, 2005). It appears as though P25 and his family were directly impacted by these issues.

He reported that at the age of 11 or 12 he was put on a plane by his uncle, and he came to the UK where he met his mother at the airport. Prior to arriving in the UK, he never had contact with his mother. His half-sister stayed in Africa with her uncle, then eventually moved to America.

His mother remarried and had two children – P25's half-brother and half-sister. He stated that initially he found it strange to be home with his mother. He felt that his mother never had a connection with him, and she used to beat him with a stick or broom.

When P25 started secondary education, he could not speak English and described finding it difficult to learn at school, having never attended school before. He was bullied about his accent. He said that on one occasion the teacher called his mother because P25 was shouting in class. When asked about this incident, P25 explained that he saw people being burned to death and he had shouted in an attempt to stop the experience. According to P25, when his mother attended the school, she slapped him in front of the teacher and although the teacher reported this to social services, he never heard from them. He said that following the incident in school his mother believed he was possessed by a devil and took him to an African church, where he was exorcised on several occasions. This reportedly involved him being beaten and having holy water thrown on him. He reported that one of his aunts suggested to his mother that he needed to see a doctor as he seemed disturbed and was difficult to manage. His mother reportedly refused, telling the aunt that he was a devil and involving the doctor would bring shame

to the family. He said he had one fight at school with a boy who used to bully him, causing him to be expelled and moved to another school.

When asked how he found school he reported "just school". He reported liking maths but not many other subjects and at the age of 16 he left having completed a GCSE in maths, which although uncertain, he thought may have been a C grade.

It was documented that P25 went to college to study plumbing but did not complete the course.

Employment

After leaving college, P25 spent time at home. He frequently got into fights in public, particularly if people were (or he perceived them to be) staring or looking at him. He reported that aged 21 he worked in a trainer shop where he stayed for over a year. He reportedly punched a customer because he believed that the customer said he wanted to kill him. His manager advised him to see a doctor. It was also documented that he helped a friend with deliveries and was paid for this. At the time of the assessment, he had been doing paid work in the hospital café with food and fruit delivery three mornings per week for the past four months.

Significant Relationships

It was documented that P25 married a female fitness instructor aged 20 but the marriage broke down after a year as his mental health was deteriorating. He

reported that she was telling him to see a doctor as the experiences he described to her made no sense to her. She reportedly left him whilst he was in prison. He recalled having 1-2 previous intimate partners which lasted a short time because of his problems with shouting and being suspicious of people. He said they had lots of arguments but denied any physical violence. He denied having children. He stated that he had a single sexual experience with a man and that he was bisexual, although when asked about his sexuality during the present hospital admission he indicated that he was only interested in women.

As previously mentioned, several of P25's family members died when he was a child. He had no contact with his mother for several years prior to the present assessment and he did not wish her to be involved in his care. During his admission he reported believing that his mother engaged in witchcraft. When admitted to hospital his half-brother was interviewed and he was considered by professionals to be caring and supportive. During the admission he only had occasional contact with his half-brother over the phone, and at the time of the assessment he had seen him once in two years. He was not in contact with his half-sister. It was documented that he spoke with friends outside of the hospital, though the nature of these relationships was poorly understood.

Substance Use

When interviewed about substance use P25 denied misusing alcohol. He reported receiving an urban African remedy by his mother aged 21-22 because she believed

him to be a witch. He described this as a "liquid cocktail"; although he was unsure of the content, he consumed it daily for about a year.

Following release from prison in 2015, P25 lived with his mother for a short period. He left home due to difficulties in their relationship. He was homeless and sleeping on other people's sofas and began using crack cocaine daily (spending between £15 and £50). He reported occasionally using heroin (approx. £10), particularly to manage come downs from crack cocaine. He reported that he had smoked both crack cocaine and heroin. He would fund his drug use *via* occasional paid work (e.g., cleaning) or borrowing money from friends or his half-brother. When assessed by the drug and alcohol team in 2017 he reported having used crack cocaine in prison and last used in early 2017. There was no documented illicit substance use during the present hospital admission, however when first admitted he reported experiencing cravings for crack cocaine around four times per week. At this time, he reported having used the drug "to give me more powers because of the evil people who are after me".

Physical Health History

There were no documented difficulties surrounding P25's mother's pregnancy or his birth. His medical records indicated that in 2002 he presented to A&E with difficulty breathing and in 2003 he presented to A&E with swelling of the eyelid. In 2004 (aged 16) he was noted to have been hit by a car and fallen to the ground, losing consciousness. He had a head scan (no indicated brain damage) and was admitted for three days due to a tibial/lower leg fracture. In 2016, he was

documented to have fractured a metacarpal bone (requiring surgery), an injury sustained whilst boxing (discussed later in this report).

P25's physical health records indicated no issues which are likely to have caused long term changes to his neuropsychological functioning between 2005 and 2022. Therein, he was documented to have had perennial rhinitis; episodes of gastroenteritis; treatment for tuberculosis; an ankle injury (requiring uncomplicated surgery); and hypertension, hypercholesterolemia and pre-diabetes in recent years associated with being overweight.

Mental Health History

As indicated by events at school, P25 appeared to have been experiencing mental health difficulties in his early teenage years. He had a longstanding diagnosis of F43.1 Post-Traumatic Stress Disorder (PTSD), as specified in the International Classification of Diseases (ICD) 10 (ICD, 2019). His symptoms appeared to have emerged from adverse childhood experiences, although he was diagnosed after he found his cellmate hanging in prison in 2014. At this time, he reported symptoms such as recurrent intrusive thoughts, flashbacks and nightmares and he avoided situations which remind him of adverse experiences. He was referred for trauma therapy in 2015 (Eye Movement Desensitisation and Reprocessing; EMDR), although he was documented to have responded poorly to this.

During an outpatient appointment in 2016, he described ongoing flashbacks, nightmares, intermittent insomnia, and suicidal ideation. A couple of months later,

he was remanded in custody for breaching probation (see forensic history below). In early 2017 he reported hearing voices instructing him to assault others which made him reluctant to leave his cell. He expressed beliefs about the government trying kill him due to things he knew.

He began refusing prescribed medication because he believed it was poison. He believed that people were conspiring to read his thoughts and take away his powers. In the context of such beliefs, he became hostile when approached by prison staff. He also started engaging in deliberate self-harm. His mental state was deemed to have deteriorated to a degree requiring admission to forensic mental health services following assessment in 2017. He was described as acutely psychotic.

During his forensic hospital admission, he presented with the following symptoms/behaviours: hostility, verbal abuse, physical aggression, self-harm, pressured speech, paranoia, grandiosity, delusions of reference and various perceptual abnormalities including auditory, visual, olfactory, and tactile hallucinations. The principal differential diagnosis established in hospital was F29 unspecified non-organic psychosis (World Health Organisation, 2016) symptoms of which were said to include auditory hallucinations of 'demons' and beliefs that he was being persecuted by them. The PTSD diagnosis was also upheld throughout his admission as he continued to exhibit the experiences cited earlier in this report. P25's cultural and spiritual beliefs (e.g., jinns and witchcraft) and

explanations for his experiences were considered culturally appropriate and not to be confused with psychotic experiences underpinned by his mental illness.

P25 was admitted to a medium-secure admissions ward in 2017, for approximately 18 months. He was then transferred to a medium dependency ward in 2018, where he stayed for approximately 10 months.

It was documented that during his treatment on a medium secure rehabilitation ward (2019 to 2022) he gradually developed insight into his mental health difficulties, and he became less inclined to express a wish to act on auditory hallucinations. Positive engagement with hospital treatment, including psychological assessments and therapies (outlined below), was reported to have aided his progress to a pre-discharge low secure ward, where he completed the present assessment.

Forensic History

His first criminal conviction was in 2005 (aged 16) for robbery and he was sentenced at Juvenile Court to a nine-month referral order. He was walking to a friend's home with two other males when one of these acquaintances told him that a man walking in front of them had the phone that he wanted. P25 reported that he decided to commit the offence as he had never done anything similar before and he wanted to see what would happen. In 2011, he received a seven-year sentence for four counts of robbery and one count of possessing an imitation firearm (handgun). Following release from prison in 2015, he was recalled to

custody in 2016, having breached licence conditions and charged with intent to supply Class A drugs.

Psychological Treatment

Whilst in secure hospital P25 engaged with various psychological assessments and interventions. As previously mentioned, he was offered EMDR in prison in 2015 which was ineffective. Prior to his admission to hospital in 2017 he was reported to have attended a psychological group for trauma in prison, but his mental state was deteriorating, and he engaged minimally. There were no other documented psychological interventions offered to him in prison or the community. Psychological treatment comprised:

- 12-week Psychology Admissions Assessment (2017) - limited engagement.
- Drug and Alcohol Assessment (2017) - recommended to complete full drug and alcohol group programme.
- Drug and Alcohol Interventions (2018) - completed two group interventions, focusing on psychoeducation and relapse prevention. His engagement fluctuated, where he was noted to have his eyes closed on several occasions. He appeared to show an understanding of the concepts discussed and could recall some information with prompting.
- Dialectical Behaviour Therapy (DBT) Skills Group (2018 – 2019) – to provide practical skills and techniques to regulate feelings of anger and distress and to reduce self-harm. His engagement in sessions tended to fluctuate depending on his energy levels, but when alert, he demonstrated

an interest in the material and would occasionally provide his own personal examples and contribute to group discussion.

- Individual Psychology Assessment (2019) – completed cognitive, PTSD and anger assessments (unable to complete at 12-Week assessment).
- Cognitive Behavioural Therapy (CBT) based Individual Psychology Sessions (2018 – 2022) – which addressed: challenging harmful beliefs and developing strategies to reduce self-harm behaviour; exploring social anxiety and difficulties trusting others; managing trauma symptoms; aggression management and developing communication skills. He generally engaged well.
- Drugs & Alcohol Refresher Group (2021) – attended seven group sessions and his engagement fluctuated, though he demonstrated some understanding of concepts.
- DASS Review of Needs (2022) – periodic review of needs (approx. one session per three months). Noted to engage well.

Medication

Table 4.2 depicts P25's prescribed medication at the time of face-to-face assessment (no prescription changes between December 2021 and August 2022). On the primary assessment (08.12.21) and case study assessment (18.08.22; 22.08.22) days, his records indicated that he was concordant with prescribed medication, he did not report side-effects, and he did not take PRN (pro re nata/when required) medication. All psychotropic medication dosages are within

the recommended guidelines provided by the British National Formulary (Joint Formulary Committee, 2024).

Table 4.2. P25's inpatient medication chart

Medication	**Dose**	**Route**	**Frequency**
Mirtazapine	45mg	PO	ON
Olanzapine	2.5mg	PO	ON
Aripiprazole	10mg	PO	OM
Cholecalciferol	20,000units	PO	WEEKLY
Losartan	100mg	PO	OM
Atorvastatin	20mg	PO	OM
PRN			
Olanzapine	2.5mg	PO	ON
Paracetamol	1g	PO	4-6 hours
Salbutamol	2 puffs	Inh	As required
Loratidine	10mg	PO	
Sodium Cromoglicate	1 drop	Eyes	
Budesonide nasal spray	2 spray	Nose	

Note. PO = Per Os/orally; OM = Omni Mane/every morning; ON = Omni Nocte/every night.

Behavioural Data

Although P25 was admitted to the forensic service in 2017, incident reports (IR1s) were only available from mid-2018. Incidents were recorded between mid-2018 and early 2021. There were 13 recorded incidents of self-harm involving cutting or scratching (e.g., with staples; sharpened plastic, e-cigarettes, or bottle caps; or wooden sticks). There were seven incidents of verbal aggression towards staff and patients, involving threats of physical aggression; derogatory and discriminatory language; and swearing aggressively. Moreover, there were two recorded incidents of physical aggression comprising fights with other patients, one of which involved P25 repeatedly punching another patient.

Psychometric Assessment

Presentation

P25 was amiable and completed all tasks presented to him during each of the three assessment appointments (one for primary study; two for case study). His mental state appeared stable, developing rapport was straightforward and he appeared relaxed when completing tasks. Observations regarding his participation with specific assessments are included in the following sections of this report.

Psychometric Assessment Outcomes (Primary Study)

Childhood Trauma Questionnaire (CTQ)

P25's scores on the CTQ were all in the severe to extreme range, except sexual abuse (as shown in Table 4.3). The CTQ indicated that his self-reported experience of childhood emotional abuse, physical abuse, emotional neglect, and physical neglect was considerable and emotional abuse received a maximum score (i.e.,

25/25). His minimization/denial score was 1 (out of 3) which ordinarily would suggest some minimization and denial across scales; however, the item producing this score was 'there was nothing I wanted to change about my family' and P25 selected 'very often true'. It is possible that he misread this item as it is inconsistent with his responses to other items reflecting his experiences of abuse and neglect within the family.

Table 4.3. CTQ total and subscale scores (December 2021)

Scale	Score	Classification
CTQ Total	89	
Emotional Abuse	25	Severe-extreme
Physical Abuse	22	Severe-extreme
Sexual Abuse	5	None / minimal
Emotional Neglect	20	Severe-extreme
Physical Neglect	17	Severe-extreme
Minimization/denial	1	

Note. Subscale classification identified from samples of clinical and non-clinical groups (n=2201; Bernstein & Fink, 1998).

Barratt Impulsiveness Scale (BIS-11)

As shown in Table 4.4, P25's total impulsiveness score was in the high impulsiveness range (Stanford et al., 2009). His scores on subscales were subsequently elevated, particularly when compared to adult community norms, indicating that P25 was prone to acting without thinking (motor impulsiveness),

limited forethought (non-planning impulsiveness), and difficulties with focusing attention (attentional impulsiveness).

Table 4.4. BIS-11 total and subscale scores (December 2021)

Scale	P25's scores	Classification	*Community (SD)	*Offender (SD)
Total	80	High	62.8 (9.2)	74.5 (18.9)
Attentional	23		16.8 (3.9)	18.6 (5.6)
Motor	26		22.4 (3.4)	27.8 (7.5)
Non-planning	31		23.6 (4.5)	28.1 (7.5)

Note. *Community male adult sample (Stanford et al., 2009; n=393); *Violent offender male sample (Smith et al., 2006; n=57).

D-KEFS Trail Making Test (TMT)

On the TMT, conditions 1-3 and 5 measure basic underlying skills (described below), whilst the Number-Letter (N-L) Switching condition measures the executive functions of cognitive flexibility and motor inhibition (see Table 4.5).

P25's Visual Scanning score (9) was in the expected range, therefore his attentional/visual scanning skills appeared to be intact. His Number Sequencing score (1) indicated possible deficiency in both numerical processing and motor functioning, because his Motor Speed score (3) was also below the expected range. The low score for this condition may also suggest difficulties inhibiting

responses to distracting stimuli as letters were included alongside numbers on the page. P25's Letter Sequencing score (6) was slightly below the expected range.

Importantly, P25's N-L Switching score (2) indicated difficulties with cognitive flexibility and motor inhibition. The Contrast Measures (see Table 4.6) suggested that the low N-L Switching score was not better explained by deficits in number or letter processing, attention/visual scanning, or motor function. Where Contrast Measures were not in the expected range (i.e., comparably similar), the N-L Switching score was lower than that for the underlying skill (e.g., visual scanning). P25 made two (set-loss) errors on N-L Switching which further evidenced deficits with cognitive flexibility and motor inhibition.

D-KEFS Colour-Word Interference Test (CWIT)

Like the TMT, the first two conditions (Colour Naming and Word Reading) on the CWIT assess basic underlying skills, whilst the Inhibition and Inhibition/Switching conditions measure the executive functions of verbal inhibition, and verbal inhibition and cognitive flexibility respectively (see Table 4.5).

Colour Naming (7) and Inhibition (7) were below the expected range, but just within the standard deviation for the normative sample. However, for the Inhibition condition, P25 made three uncorrected errors which indicated greater difficulty with this task, and he was unable to monitor and modify his behaviour (i.e., a 'corrected error'). This result suggested some difficulty with verbal inhibition. He performed in the expected range on Inhibition/Switching (9) and

although he made one uncorrected error, this condition did not indicate deficits with verbal inhibition and cognitive flexibility. Contrast Measures were all in the expected range (see Table 4.6), suggesting a roughly equivalent level of performance on higher-level tasks (e.g., Inhibition) relative to baseline tasks (e.g., Colour Naming).

Table 4.5. D-KEFS TMT and CWIT Completion Time scores (December 2021)

Subtest	Condition/variable	Scaled score	*Expected range?	Number (& type) of errors
TMT	1: Visual Scanning	9	Y	1 (Om)
	2: Number Sequencing	1	N	1 (Sq)
	3: Letter Sequencing	6	N	0
	4: N-L Switching	2	N	2 (St)
	5: Motor Speed	3	N	0
	6: Combined N & L	3	N	N/A
CWIT	1: Colour Naming	7	Y	1 (Co); 1 (Un)
	2: Word Reading	11	Y	0
	3: Inhibition	7	Y	3 (Un)
	4: Inhibition/Switching	9	Y	1 (Co); 1 (Un)
	5: Combined N & R	9	Y	N/A

Note: Om = Omission error; Sq = Sequencing error; St = Set-Loss error; Co = Corrected error; Un = Uncorrected error; N-L = Number-Letter; Combined N & L = combined number and letter sequencing; Combined N & R = combined naming and reading; *Expected range - Mean = 10 / Standard Deviation = 3.

Table 4.6. D-FEFS TMT and CWIT Contrast Measures

Subtest	Contrast Measure	Scaled Score	Expected range? *
Trail Making Test	N-L switching vs. visual scanning	4	N
	N-L switching vs. number sequencing	11	Y
	N-L switching vs. letter sequencing	6	N
	N-L switching vs. combined number & letter sequencing	9	Y
	N-L switching vs. motor speed	9	Y
Colour-Word Interference Test	Inhibition vs. colour naming	10	Y
	Inhibition/switching vs. combined N & R	10	Y
	Inhibition/switching vs. inhibition	12	Y

Note. Expected range: Mean = 10; Standard Deviation = 3.

Psychometric Assessment Outcomes (Case Study)

General Intellectual Functioning: WAIS-IV and ToPF

As shown in Table 4.7, P25's FSIQ score on the WAIS-IV was in the Borderline range; however, there were significant differences among the Index scores, therefore the FSIQ was unreliable and it was more helpful to use Index scores as a guide to his intellectual functioning. Therein, P25 scored in the Borderline range

for the VCI and PSI. He scored in the Extremely Low range for the PRI, and his score on the WMI was in the Low Average range. These results suggested, that when assessed in 2019, his ability to organise and interpret visual information (i.e., perceptual reasoning) was a relative weakness and his ability to temporarily hold information in mind for a specific task (i.e., working memory) was a relative strength. P25's previous functioning estimates (ToPF scores) were in the Low Average range for verbal comprehension, perceptual reasoning and processing speed, indicating that across these domains there were significant discrepancies in comparison to WAIS-IV scores. There was only a 4-point difference between the estimated previous functioning (ToPF) and obtained/recent functioning (WAIS-IV) scores for working memory, indicating no significant change for this domain.

Table 4.7. WAIS-IV scores (from file – January 2019) and ToPF scores (August 2022)

WAIS-IV Scale	Estimated previous score using ToPF	Obtained Score (CI)	Score discrepancy and direction
Verbal Comprehension Index (VCI)	85	74 (69-81)	Low Average - Borderline
Perceptual Reasoning Index (PRI)	85	65 (61-73)	Low Average - Extremely low
Working Memory Index (WMI)	82	86 (80-94)	Low Average – Low Average
Processing Speed Index (PSI)	86	76 (70-87)	Low Average - Borderline

Full Scale IQ (FSIQ)	81	70 (67-75)	Low Average - Borderline

Note. CI = Confidence Interval.

Behavioural Assessment of Dysexecutive Syndrome (BADS)

P25's BADS scores are provided in Table 4.8. The normative scores from a control group of healthy adults and a sample of brain injured patients were also included, to provide a useful non-clinical and relevant clinical group comparison. His Total Profile score (17) was marginally lower than control group and higher than brain injured patients, although within the standard deviation of both comparative groups. Examining subtest scores was more informative than the total score, and the observed way he completed subtests provided useful additional information when interpreting his executive functioning abilities.

P25 received the maximum score on the Rule Shift Cards (4) test, indicating that he experienced no difficulty with set-shifting (i.e., cognitive flexibility) on this task.

He also performed reasonably well on the Action Programme test, scoring 3. However, when completing the task, he failed to attach the screw top to the container, which was one of the usual steps taken to retrieve the cork from the tube (i.e., the end goal). He was therefore unable to fill the container with water, attempting this three times until he used his thumb to plug one end of the

container. He eventually identified a creative solution to the problem, despite not following all the expected steps.

During the Key Search, P25's score (2) was consistent with controls and brain injured patients. The search strategy he used was a spiral, which was one of the pre-defined search patterns, despite not meeting all conditions for a maximum score. This was likely to be an effective search strategy to find lost keys, and therefore indicated an ability to solve a simple problem where minimal structure or guidance was provided.

The Zoo Map test scores for Version 1 and Version 2 were reported (see Table 4.8), because the two versions comprise important structural differences. His score on Version 1 (V1; -1) indicated that P25 experienced difficulty in developing a plan to solve a more complex problem when structure and guidance was limited; however, his score on Version 2 (V2; 8 = maximum) indicated that his planning and problem solving (during an identical task) improved considerably when a high level of structure (i.e., step-by-step instructions) was provided.

The Temporal Judgement test score (2) indicated that he was able to estimate time taken to complete routine events (such as 'to blow up a party balloon'). Research has shown lower scores on this subtest for both control groups and those with acquired brain injury (e.g., Katz et al., 2007; Norris & Tate, 2000) relative to the other subtests, and it may be influenced by cultural context (Katz et al., 2007);

thus, he may have had less exposure to the events asked about during this test during his childhood in West Africa.

P25's Modified Six Elements score (4) indicated no difficulties with his ability to plan, organise and monitor behaviour and utilise prospective memory (i.e., remembering to carry out an intention in the future) during this task.

Table 4.8. BADS total and subtest scores with comparative norms (August 2022)

Scores	P25	Controls (SD)	Brain injured patients (SD)
Total Profile	17	18.05 (3.05)	14.03 (4.73)
Rule Shift Cards	4	3.56 (.78)	3.01 (1.26)
Action Program	3	3.77 (.52)	3.18 (1.15)
Key Search	2	2.60 (1.32)	2.22 (1.52)
Temporal Judgement	2	2.15 (.91)	1.65 (0.87)
Zoo Map	2	2.44 (1.13)	1.97 (1.41)
Version 1	-1	N/A	N/A
Version 2	8	N/A	N/A
Six Elements	4	3.52 (.80)	1.99 (1.18)

Note. SD = Standard Deviation.

The Dysexecutive Questionnaire (DEX), which asks questions on a range of problems commonly associated with Dysexecutive Syndrome, indicated notable

self-reported difficulties (48) for P25 (see Table 4.9). P25's ratings were significantly higher than the comparison group and on closer inspection he selected 'very often' for items such as 'problems understanding what other people mean unless they keep things straightforward' and 'difficulty thinking ahead or planning for the future'. The professional who rated P25 endorsed few items. It is possible that the professional had had limited opportunity to observe the particular features of P25's presentation associated with DEX questions.

Table 4.9. DEX questionnaire scores with comparison group.

	Independent Rating	**Self-rating**
P25	4	48
Comparison Group	32.5	27.21

Summary of Key Assessment Outcomes (Primary Study and Case Study)

P25 reported severe to extreme levels of emotional abuse, physical abuse, emotional neglect, and physical neglect on the CTQ; and on the BIS-11, his self-report indicated high impulsiveness across all scales (total; motor; non-planning; and attentional). In terms of intellectual functioning, the outcomes on the WAIS-IV indicated that P25's working memory abilities were strongest (similar to estimated previous functioning), and his perceptual reasoning skills were weakest (significantly below estimated previous functioning). P25 exhibited difficulties with cognitive flexibility and motor inhibition according to the TMT, whilst his

performance on the CWIT indicated some difficulty with verbal inhibition on Condition 3, but no difficulty with verbal inhibition and cognitive flexibility skills on Condition 4. The BADS outcomes suggested that he could eventually solve a problem creatively despite not taking all the expected steps (Action Programme); plan an effective strategy to solve a simple problem with minimal structure or guidance (Key Search); and solve a complex problem when a high level of structure was provided (Zoo Map V1). However, when structure was limited during a complex task, P25 experienced considerable difficulty (Zoo Map V2). His ability to estimate time taken to complete routine events was variable (Temporal Judgement) and he demonstrated planning, organisation, monitoring, and prospective memory skills during a time-management task (Mixed Six Elements).

Discussion

Narrative and formulation

The 5Ps / Multiperspective model (Weerasekera, 1996; see Figure 4.1. for a figurative depiction of this model) was used to formulate the relationship between childhood adversity, impulsivity, and cognitive functioning for P25. The primary presenting problem within this formulation was impulsivity, and whilst the influence of various predisposing factors is acknowledged, this Chapter and wider thesis is concerned with the assessment and impact of childhood adversity, therefore relatively greater attention is given to P25's adverse experiences within the following discussion. In addition to childhood adversity, this formulation highlights the relevance of the presented data on cognitive functioning and impulsivity.

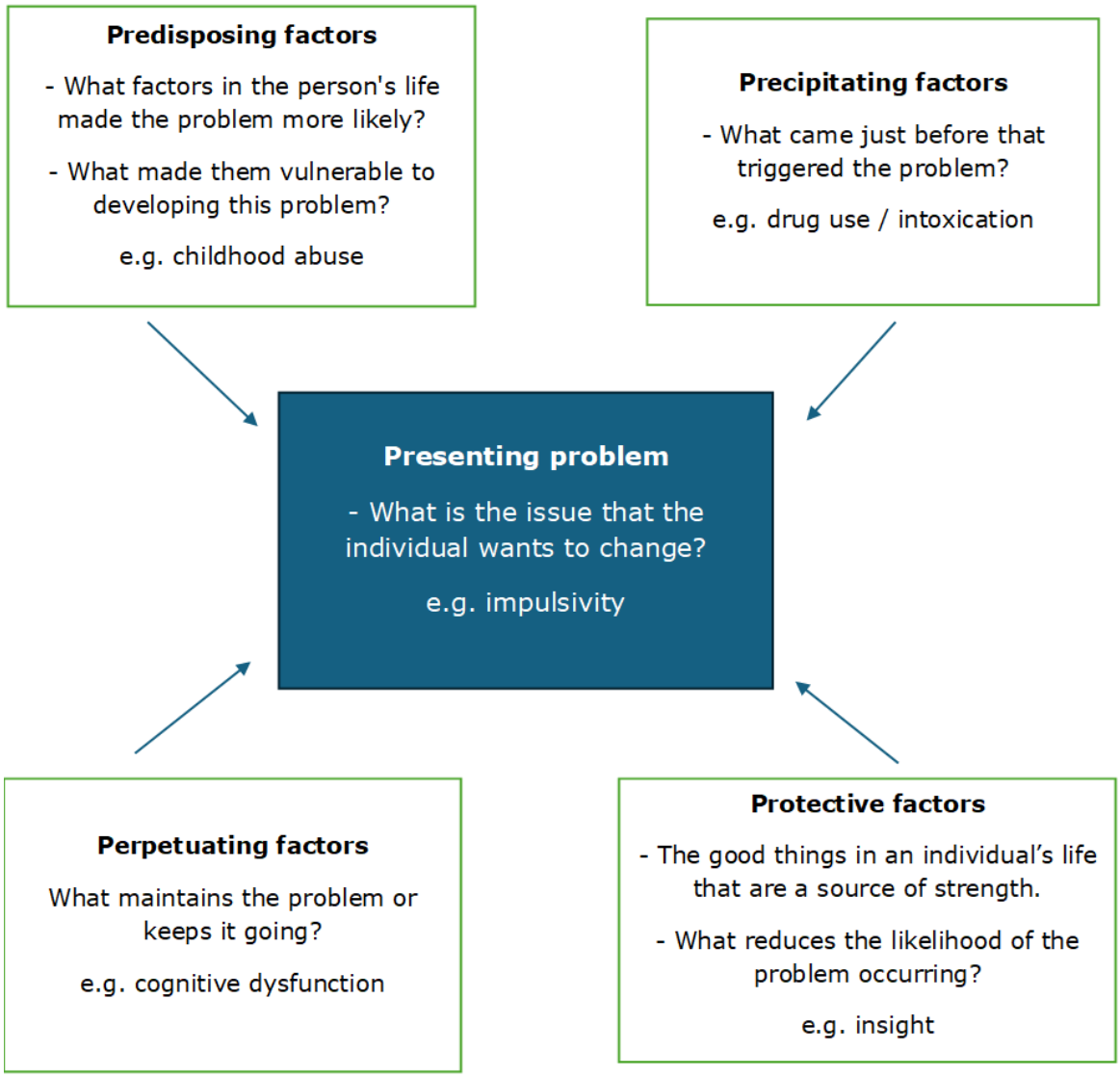


Figure 4.1. 5Ps / Multiperspective formulation model (Weerasekera, 1996).

P25's case history and formal psychological assessment outcomes present an individual whose experience of adversity during childhood and adolescence was considerable; whose cognitive functioning abilities were variable; and whose impulsivity at the trait and behavioural level was significant.

P25 experienced substantial adversity growing up, from witnessing extreme violence (e.g., family members killed in explosion; necklacing) as a young child in West Africa, to physical and emotional abuse primarily inflicted by his mother during adolescence in the UK. To corroborate collateral reports, he reported severe childhood (physical and emotional) abuse and neglect during the case study assessment. He subsequently exhibited symptoms of PTSD in adolescence and adulthood, eventually receiving diagnosis. Empirical literature has shown an association between childhood maltreatment and PTSD symptoms (as independent variables) and trait impulsivity (as a dependent variable; Contractor et al., 2016; Kim & Choi et al., 2020), and Kim and colleagues found that PTSD symptoms mediated the relationship between childhood maltreatment and impulsivity (Kim & Choi et al., 2020). Likewise, P25's case history describes the presence of PTSD symptoms (e.g., flashbacks) in the context of engagement in behaviours (often) characterised as impulsive, such as physical aggression and self-harm. Delusional and hallucinatory experiences (which were linked with a differential psychotic diagnosis), in addition to PTSD symptoms, may have precipitated P25's impulsive behaviour.

It is widely reported that individuals diagnosed with PTSD also experience cognitive functioning deficits (Schultz et al., 2018; Woon et al., 2017); in fact, a recent meta-analysis found that PTSD symptom severity did not moderate rates of executive dysfunction (Woon et al., 2017). Similarly, although P25's PTSD symptomology may have improved during his forensic hospital admission (possibly in response to medication and psychological therapy), some executive functioning deficits may have remained.

Furthermore, childhood adversity is known to be associated with executive functioning deficits during adulthood (Beccara-Garcia, 2014; Majer et al., 2010; Marshall et al., 2016; Navalta et al., 2006; Narvaez et al., 2012; Nikulina & Widom, 2013; Letkiewicz et al., 2018), and may have predisposed P25's apparent deficits with skills such as attention, inhibitory control, perceptual reasoning, planning, and problem-solving. Subsequently, these cognitive deficits may have provided a mechanism by which P25's impulsivity was perpetuated.

P25's adverse experiences and high trait impulsivity indicated an association which is evidenced empirically within the present thesis' systematic review and primary study, as well as published reviews (e.g., Lui, 2019; Alford et al., 2020). Whilst P25 had not been formally diagnosed with brain injury, he had been hit by a car causing loss of consciousness as an adolescent and he had participated in (sport) boxing as an adult. The latter is associated with chronic traumatic encephalopathy (CTE) – a traumatic brain injury (TBI) frequently occurring in individuals exposed to recurrent head trauma (Bernick & Banks, 2013). TBI was an additional factor shown to have strong associations with impulsivity in a review of forensic population research (Alford et al., 2020); therefore, the possible predisposing effect of TBI on impulsiveness during adulthood for P25 should be acknowledged.

Other predisposing factors, such as substance misuse – notably daily crack cocaine use, may have affected P25's brain development during his 20s and propensity for impulsivity. Therein, historical substance misuse was another predictor of

impulsivity within Alford et al.'s (2020) systematic review. When intoxicated, illicit substance use may have also functioned as a precipitator in P25 behaving impulsively (e.g., via the impairment of inhibitory and/or decision-making processes) and higher levels of trait impulsivity may have simultaneously led P25 to misuse drugs (de Wit, 2009).

In terms of general intellectual functioning, certain domains assessed in this case study (e.g., processing speed, working memory and perceptual reasoning) indicated discrepancies between P25's estimated previous functioning (ToPF scores) and current functioning (WAIS-IV scores). His general intellectual functioning also may have improved between completing the WAIS-IV assessment in 2019 and completing the case study assessments (2021-2022), as file information noted improvements in his management of mental health difficulties and engagement with psychological interventions, and he was maintaining a part-time vocational role (Gold et al., 2002). Nevertheless, P25's ability to organise and interpret visual information when solving problems (i.e., perceptual reasoning) was notably impaired during the 2019 assessment. A sustained deficit in this area may have contributed to his difficulties using visual information (e.g., the map and written rules) during the BADS Zoo Map test V1. V1 also provided limited guidance to solve the problem (e.g., to plan a route to visit specified areas of a zoo), wherein several steps were required, and certain rules must be abided by. His ability to problem-solve under these conditions appeared limited. Conversely, when the task or problem was simpler and fewer steps were needed to achieve it (e.g., the Key Search test), he appeared to perform better. Furthermore, his performance on V2 of the Zoo Map test, suggested that providing

he received structure and clear guidance (e.g., a specified order of visiting the zoo), he could complete the task successfully, despite the problem requiring several steps and involving various pieces of visual information.

P25 also appeared to experience difficulty with motor inhibition and cognitive flexibility, as shown by the TMT, and (to a lesser extent) verbal inhibition – as shown by the CWIT. Interestingly, when the task became more complex during the final CWIT (inhibition/switching) condition, he exhibited no difficulties with verbal inhibition or cognitive flexibility. Lippa and Davis (2010) suggested that this pattern of responding may be explained by 'practice effects' and/or the requirement for 100% colour naming during the inhibition condition, relative to the inhibition/switching condition, which requires 50% colour naming and 50% word reading. Coincidentally, P25's colour naming (condition 1) was slower than his word reading (condition 2). On the BADS Rule Shifts Cards test, however, he also demonstrated no deficit in cognitive flexibility. It may be that P25's ability to switch his attention between mental sets was an acquired skill which he could perform providing he was able to sustain attention, albeit the latter he acknowledged as challenging on the BIS-11.

In addition to P25's variable cognitive functioning abilities, his BIS-11 scores indicated high impulsivity. Notwithstanding the absence of recorded impulsive harmful behaviours (e.g., self-harm) since early 2021, P25's BIS-11 outcomes indicated difficulties with impulsivity at the trait level. Consistent with literature (Enticott et al., 2006; Spinella, 2005; Weidhacker et al., 2017), P25's executive inhibitory control deficits seemed to be associated with high impulsivity. At times

when his mental state deteriorated (e.g., 2019 – 2021 in hospital), this association may have been significant to his risk of engaging in self-harm and aggression towards others. This assertion is in keeping with research showing associations between inhibitory control and impulsive behaviours such as aggression (e.g., Becerra-García, 2015) and self-harm (e.g., Allen & Hooley, 2015). To further understand why P25 displayed a reduction in impulsive behaviour in recent years, it is possible that he benefitted significantly from the support of psychological therapies to develop emotional regulation skills (indicated within his case history). Congruently, although their study was limited to college students and laboratory measures of aggression, Hsieh & Chen (2017) found that reactive aggression was significantly associated with inhibitory control deficits for low emotional regulation participants relative to those with high emotional regulation skills.

It is possible to consider P25's high trait impulsivity and variable cognitive functioning deficits as perpetuating factors for harmful impulsive behaviour. The challenges discussed above in relation to planning, problem-solving, and inhibitory control may have been associated with his use of impulsive and maladaptive coping strategies in times of crisis, such as self-harm. A proneness to acting without thinking, limited forethought and inattention – characterising P25's high trait impulsivity, may have further perpetuated impulsive behaviours. Active symptoms of mental illness, such as persecutory delusional beliefs and hallucinations, particularly when less responsive or concordant to antipsychotic medication and when his insight was limited, also seemed to have perpetuated impulsive behaviour, such as self-harm, aggression, and (more historically) substance misuse.

Several factors could nevertheless be protective against future risk of harmful impulsive behaviour for P25. His case history documents a gradual improvement in his capacity for insight and reduced inclination to respond to psychotic symptoms, whilst psychotropic medication may have reduced (the intensity and frequency of) symptoms. Positive engagement with hospital treatment, including structured supportive therapy, was likely to have increased P25's capacity for solving problems and coping with distress adaptively. This seemed particularly beneficial, given the assessment outcomes around planning, problem-solving and goal attainment. Incidents of impulsive self-harm and aggression towards others appeared to have reduced, possibly attributable to developing emotional regulation, distress tolerance, and communication skills within DBT (Frazier & Vela, 2014; Shelton et al., 2017), despite continued difficulties with executive inhibitory control and trait impulsivity. A stable living environment provided by the pre-discharge rehabilitation ward, a caring clinical team, and sustaining a vocational role – contributing to a sense of purpose and achievement, were likely to have also facilitated improvements in P25's mental health and behaviour (Staniszewska et al., 2019; Ward et al., 2007).

Limitations

Although the aim of this case study was not to generalise findings to a wider population, this is a widely recognised disadvantage of the case study design, which was important to acknowledge (Starman, 2013). Accordingly, the assessment outcomes, collateral information and formulation provided in this report were specific to the single recruited individual.

In terms of measuring general intellectual functioning, P25's WAIS-IV outcomes were from an assessment conducted in 2019 – three years prior to the case study assessment. Repeating the WAIS-IV during the case study may have provided a more reliable indication of his general intellectual functioning, particularly as his mental health, behaviour and engagement with treatment appeared to have improved during this time. The ToPF-UK was used to estimate P25's previous intellectual functioning (e.g., prior to onset of mental illness) because it has been standardized against the WAIS-IV (Wechsler, 2011); however, the norms were derived from a UK sample and the words require Anglicized pronunciation. P25 was West African and had experienced disrupted schooling (aged 12-16) following his move to the UK, which limited the validity of the ToPF-UK as an estimate of his previous intellectual functioning.

The other formal assessment measures used to collect data in this case study may be similarly limited with respect to cultural validity and the minimal schooling P25 received. Although the BADS (Wilson et al., 1996) and D-KEFS (Delis et al., 2001) are among the most commonly used assessments of executive functioning for research and practice within clinical populations (Ghawami et al., 2016; Tsatali et al., 2024; Webb et al., 2020), these assessments were initially standardized and more widely validated in 'Western' populations (e.g., Homack et al., 2005), involving relatively few West African participants. It therefore should be acknowledged that P25's assessment scores were compared to normative data primarily derived from populations who may have differed culturally. Neither assessment had an appropriate culturally adapted version, although versions of

the D-KEFS have been developed in other parts of the world, such as Iran (Ghawami et al., 2016).

Regarding the CTQ-SF (Bernstein & Fink, 1998), which is one of the most widely used measures of childhood adversity with numerous versions validated globally (discussed further in next Chapter of this thesis), P25 may have interpreted the language used in the original version (which he completed) in a different way to Western-born (e.g., English and American) individuals. In the context of this case study, however, qualitative information was gathered to consolidate understanding of P25's adverse childhood experiences.

Furthermore, the measurement of impulsivity within this case study is open to scrutiny. As with the aforementioned measures, the BIS-11's (Patton et al., 1995) cross-cultural generalizability has been mostly limited to Western samples (Cross et al., 2011), with some recent attention to Arab populations (Ziada et al., 2020). Like the CTQ-SF, BIS-11 items may have held different meaning for P25, culturally. Though commonly used to measure trait impulsivity in forensic and etiological research, the BIS-11 has also been criticized on account of its subscales lacking internal consistency among forensic psychiatric patients (Haden & Shiva, 2008). Similarly, it is possible that the method used to collect information about impulsive behaviours – extracting electronic incident reports (IR1s), did not reliably capture all relevant incidents. This would have relied on accurate and consistent use of the incident reporting procedure by staff; yet even acts of self-harm and aggression are known to go unreported (Vernham et al., 2016), possibly due to the subjective nature of observing and interpreting risk behaviours. It

would have been time-consuming but likely more effective to have reviewed P25's progress notes during his admission, using a series of relevant, truncated search terms (e.g., 'aggress*').

Lastly, whilst aspects of P25's cognitive functioning were assessed using more than one test in this case study, such as inhibitory control, planning, problem solving and cognitive flexibility, there was less attention to prospective memory. Prospective memory involves remembering to perform a task at a certain occasion in the future (Weinborn et al., 2013), for which deficits have been associated with increased trait impulsivity (Cuttler et al., 2014) and risky (e.g., criminal) behaviours (Wienborn et al., 2013). The BADS Modified Six Elements Test measured prospective memory (among other executive functions) within the case study, but it may have been useful to explore this skill further using an assessment such as the Rivermead Behavioural Memory Test (RBMT; Wilson et al., 1989), which is classified as having high ecological validity (Bolló-Gaso et al., 2014).

Implications and Recommendations

This case study highlights the value of eliciting an in-depth understanding of a forensic mental health patient's cognitive functioning profile, adverse childhood experiences, and propensity for impulsivity when developing case formulations. This is the first known research case study assessing – and describing the relationship between – these factors for a patient using forensic mental health services. Based on the limitations presented, future research case studies in this area should: consider incorporating additional assessment/s of prospective

memory; ensure cognitive functioning assessments are up-to-date and valid for the recruited participant; and use robust methods for collecting behavioural data.

Reflection

Undertaking this work elicited feelings reminiscent of cases I have worked with previously in forensic settings, during doctorate trainee placements, assistant psychologist jobs, and my current team psychologist role. Such feelings include an overwhelming sadness and simultaneous sense of detachment from what individuals such as P25 have experienced. Therein, the adversity suffered in P25's formative years is unimaginable and far removed from my experiences of childhood. It is a stark reminder that, despite having caused varying degrees of harm to others, most individuals using forensic services were at some stage victims of harm earlier in life; therefore, it is conceivable that they develop serious mental health difficulties, misuse substances, offend, and require treatment within institutions. I was fortunate enough, in the case of P25, to interact with a warm, friendly and trusting individual who agreed to participate in this study and engaged in an effortful manner throughout, with no incentive other than to contribute his time and efforts to doctorate research. His engagement style, coupled with learning about P25's progress in all aspects of his treatment, was incredibly rewarding to witness, and one of the more fulfilling aspects of my research thesis.

Chapter 5: Psychometric Critique

Psychometric Critique of the Childhood Trauma Questionnaire – Short Form in forensic populations

Abstract

The Childhood Trauma Questionnaire-Short Form (CTQ-SF) is a psychometric measuring self-reported childhood abuse and neglect. This chapter provides a critique of the CTQ-SF in the context of forensic populations. Validation research examining the psychometric properties of the CTQ-SF among forensic samples has primarily supported its construct validity and internal consistency. The CTQ-SF is one of the most widely validated and frequently used psychometric measures of childhood adversity in the literature, but further examination of its psychometric properties within forensic settings is required.

Introduction

This chapter provides a critique of the Childhood Trauma Questionnaire – Short Form (CTQ-SF; Bernstein & Fink, 1998; Bernstein et al., 2003), in the context of forensic populations. The CTQ-SF has been cited frequently throughout this thesis, as it represented the most used psychometric for measuring childhood adversity in the systematic review (n=5 studies); it was used to measure childhood adversity in the empirical study; and it was used as a measure of childhood adversity in the case study. Previous chapters have made reference to some of the CTQ-SF's strengths and limitations in the context of this thesis; however, there has been considerable research concerning the CTQ-SF's psychometric properties (i.e., reliability and validity) across a variety of populations, such as students (Bernstein & Fink, 1998; Gerdner & Allgulander, 2009; He et al., 2019), individuals with substance misuse difficulties (Bernstein et al., 2003; Dovran et al., 2013; Thombs et al., 2007), adolescents (Aloba et al., 2020; Bernstein et al., 2003; Charak et al., 2017), psychiatric samples (Bernstiein & Fink, 1998; Gerdner & Allgulander, 2009; Kongerslev at al., 2019), and forensic samples (Aizpurua et al., 2024; Dovran et al., 2013; Dudeck et al., 2015). This chapter considers the findings of validation studies and acknowledges previous appraisals (e.g., Georgieva et al., 2021) of the CTQ-SF among the population at large, whilst it is primarily concerned with the CTQ-SF for individuals using forensic services (e.g., prisons; forensic psychiatry).

Forensic populations appear to disproportionately experience (at least certain forms of) childhood abuse and neglect, relative to the general population (Coleman & Stewart, 2010; Dalsklev et al., 2021; Mclachlan et al., 2024). It has

subsequently been argued that for those in the criminal justice system, childhood adversity is being criminalised (Wolff et al., 2022). Accurate measurement of childhood adversity within forensic samples is therefore crucial for implementing preventative and rehabilitative interventions (Aizpurua et al., 2024), and for generating robust data regarding the association between early adversity and a multitude of negative outcomes (e.g., reoffending risk; suicidality; self-harm; substance misuse; psychological distress; insecure attachment styles; aggression; impulsivity), which research within forensic adult populations has investigated (Carli et al., 2010, 2014; Dalsklev et al., 2021; Maccines et al., 2016; Marzano et al., 2011; Zhong et al., 2022). Moreover, recent statistics show a significant disparity between the number of males (79%) compared to females (26%) entering the criminal justice system (GOV.UK, 2022b), and research indicates that males (relative to females) are less likely to disclose abuse, particularly sexual abuse (Azzopardi et al., 2019; O'Leary & Barber, 2008; Coleman & Stewart, 2010). Furthering understanding as to whether instruments such as the CTQ-SF accurately measure childhood abuse and neglect within this subset of the population, seemed necessary.

The aim of this chapter was to provide an overview of the CTQ-SF, a summary of its psychometric properties among the general population, and a critique of its psychometric properties within forensic populations. Recommendations regarding future CTQ-SF examination were also outlined.

Overview of the CTQ-SF

The CTQ-SF is a 28-item self-report measure, which is suitable for adolescents (aged 12 and over) and adults. It assesses five types of childhood adversity, commonly referred to in the literature as childhood maltreatment: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect (Bernstein & Fink, 1998; Bernstein et al., 2003; see Appendix O for CTQ-SF). The five abuse and neglect scales each comprise five items and the combined 25 items can be used to provide a total score of childhood abuse and neglect. Each item is rated on a 5-point Likert scale, ranging from never true to very often true, and scores range from 5-25 for each scale. Higher scores indicate greater adversity. The remaining three items form a minimization/denial (MD) scale. This scale was designed to detect false-negative reports of childhood maltreatment, with higher scores (ranging 0-3) denoting greater minimization or denial.

The CTQ-SF was preceded by the 70-item version of Childhood Trauma Questionnaire (CTQ-70; Bernstein & Fink, 1998; Bernstein et al., 1994), as well as 53 and 34 item versions (Dovran et al., 2013). After demonstrating good psychometric properties for the 70-item version, Bernstein and colleagues aimed to develop and validate a short form (CTQ-SF) that would be quicker to administer (i.e., five versus 15 minutes). The authors hoped that the CTQ-SF would benefit settings with time constraints (e.g., primary care) or make easier the completion of assessments comprising multiple measures alongside the CTQ-SF (Bernstein et al., 2003). Accordingly, it was feasible to include the CTQ-SF in this thesis' empirical study among four other measures because of its short administration time.

Normative Data

The CTQ-SF was initially established by studying seven diverse samples totalling 2,137 participants (Bernstein & Fink, 1998). The authors reported that the samples included men and women with wide-ranging characteristics in terms of age, race/ethnicity, level of income, and diagnoses. Female participants (totalling 1,595) comprised adult substance abusers (n = 53); adult psychiatric outpatients (n = 17); adolescent psychiatric patients (n = 223); undergraduate students (n = 51); housed in multiple occupation (HMO) members (n = 1,187); rheumatoid arthritis patients (n = 32); and fibromyalgia patients (n = 32). Male participants (totalling 546) comprised adult substance abusers (n = 306); adult psychiatric outpatients (n = 29); adolescent psychiatric patients (n = 170); and undergraduate students (n = 41). The mean age for samples (male and female) ranged between 18.8 (students) and 50.5 (rheumatoid arthritis/fibromyalgia patients). In terms of ethnicity, the samples predominantly included white, African American, or Hispanic people. Table 5.1 depicts the mean (standard deviation) data scores for each of the CTQ-SF abuse and neglect subscales for male and female participants (Bernstein & Fink, 1998).

Table 5.1. Mean (standard deviation) values across CTQ-SF subscales for males and females (Bernstein & Fink, 1998).

	EA	**PA**	**SA**	**EN**	**PN**
Females (n = 1,595)	10.1 (5.4)	7.4 (4.0)	7.4 (4.9)	11.0 (5.3)	7.0 (3.1)
Males (n = 546)	9.9 (4.9)	8.7 (4.1)	6.6 (3.7)	11.1 (5.1)	7.6 (3.1)

Note. EA = emotional abuse; PA = physical abuse; SA = sexual abuse; EN = emotional neglect; PN = physical neglect.

Psychometric Properties

Psychometric tests should be evaluated using evidence of reliability and validity, to indicate whether the inferences made from a test's scores are supported and to what degree they are supported (British Psychological Society, 2017; Prieto & Delgado, 2010). In broad terms, reliability is concerned with the accuracy or precision of a psychometric score, whilst validity concerns the extent to which the psychometric (or scale within a test) measures the construct/s it was designed to measure (British Psychological Society, 2017).

Psychometric properties in the general population

Since its inception, research has sought to validate translated versions of the CTQ-SF across multiple countries, including the Netherlands (Thombs et al., 2009), Canada (Forde et al., 2012), Norway (Dovran et al., 2013), Spain (Hernández et al., 2013), Sweden (Karos et al., 2014), Germany (Dudeck et al., 2015), Burundi (Charak et al., 2017), Italy (Sacchi et al., 2018), China (He et al., 2019), Denmark (Kongerslev et al., 2019), South Africa (Spies et al., 2019), Nigeria (Aloba et al., 2019), and the United States (Schmidt et al., 2020). As a result, the CTQ-SF has become one of the most widely validated instruments for measuring childhood adversity (Georgieva et al., 2021, 2023; Saini et al., 2019). Georgieva et al. (2023) identified four other instruments for measuring childhood abuse and neglect, which alongside the CTQ-SF, have obtained the strongest psychometric evidence: Child Abuse Potential Inventory (CAP; Milner, 1986); Identification of Parents at Risk for child Abuse and Neglect (IPRAN; Bouwmeester-Landweer,

2006); Maltreatment and Abuse Chronology of Exposure scale (MACE; Teicher & Parigger, 2015); and Psychosocial Screening Tool (PAT; Pai et al., 2008).

In terms of reliability, initial research by the authors of the CTQ-SF demonstrated acceptable to excellent internal consistency for most CTQ-SF abuse and neglect subscales (with more variable results for physical neglect) across various samples, alongside adequate test-retest reliability for each subscale within a small group (n = 40) of adult substance abusers (Bernstein and Fink, 1998). Bernstein and colleagues also provided initial evidence of construct validity; cross-cultural validity/measurement invariance; criterion-related (concurrent and predictive) validity; convergent and discriminant validity (e.g., with the Childhood Trauma Interview; Fink et al., 1995); and sensitivity and specificity, of the CTQ-SF among initial respondents (Bernstein & Fink, 1998; Bernstein et al., 2003).

As the CTQ-SF's global interest evolved over the subsequent 20 years, it appeared as though certain psychometric properties gained more attention than others. In their systematic review and appraisal of the CTQ-SF (sampling studies published between 2010 and 2020), Georgieva et al. (2021) found that studies had mostly examined and found strong evidence for construct validity (i.e., the CTQ-SF's factor structure) and internal consistency; however, for other aspects of reliability (e.g., test-rest reliability), criterion-related validity, and cross-cultural validity, evidence is more limited. It is nevertheless possible to argue that cross-cultural validity has been, in part, exhibited through support for the CTQ-SF's five-factor structure among translated versions in multiple countries. Furthermore, several studies have shown acceptable levels of cross-cultural validity for the CTQ-SF with

respect to gender (Aloba et al., 2020; Cruz, 2023; Forde et al., 2012; He et al., 2019; Thombs et al., 2007). In US samples, validity has been demonstrated across racial groups, including black and Hispanic substance abusers (Thombs et al., 2007), and black and white community adults (Cruz, 2023), although cross-cultural validation among racial or ethnic groups is scarcely reported. This may be because samples have rarely been distinguished based on racial or ethnic diversity in CTQ-SF validation research.

Psychometric properties in forensic populations

Having clearly established that (at least certain) psychometric properties of the CTQ-SF have been evidenced within the general population, this section specifically presents evidence for studies that recruited forensic samples, by type of validity and reliability.

Construct Validity

This refers to the degree to which a test measures the construct it intends to measure (Nickerson, 2023); thus, with regards to the CTQ-SF, empirical evidence should indicate that it measures childhood abuse and neglect.

A method commonly used by researchers to measure construct validity of the CTQ-SF is confirmatory factor analysis (Aizpurua et al., 2024; Dovran et al., 2013; Dudeck et al., 2015; Kongerslev et al., 2019; Thombs et al., 2009). For one of the studies in Table 5.2 (Aizpurua et al., 2024), factor analysis data was reported for

a large Spanish sample of male (n=1118) and female (n=217) prisoners, within which the original five-factor model (emotional, physical and sexual abuse, and emotional and physical neglect) fitted data reasonably well. Dudeck et al. (2015) reported data for their subsample of German male prisoners (n=224), wherein the goodness of fit indices (e.g., CFI and RMSEA) were considered acceptable. The other validation studies included forensic populations, such as Danish youth offenders (n=80; Kongerslev et al., 2019), Norwegian prisoners (n=109; Dovran et al., 2013), and individuals from Dutch forensic clinics and prisons (n=48; Thombs et al., 2009), who were recruited among other samples (mostly clinical populations or those 'at-risk' of childhood adversity). The data from these studies in Table 5.2 was therefore only partially generated from forensic populations, for which statistical tests indicated either a good (Dovran et al., 2013; Thombs et al., 2009) or acceptable (Kongeslev et al., 2019) model of fit. The extent to which these studies reflect construct validity within forensic populations requires a cautionary interpretation.

With regards to specific items on the CTQ-SF, Thombs et al. (2009) removed item 24 (*Someone molested me*) from the sexual abuse scale, due to a significant number of non-responses on this item. This led Thombs and colleagues to conclude that some participants were unclear as to the meaning of the Dutch translation for the word 'molested'. This item was also removed for other translated versions of the CTQ-SF (Charak et al., 2017; Paquette et al., 2004), albeit these studies used entirely non-forensic samples. Each study demonstrated validity of the CTQ-SF's original five-factor structure after removing this item.

The summarised evidence indicated that the Spanish (Aizpurua et al., 2024) and German (Dudeck et al., 2015) translated versions of the CTQ-SF replicated the original five-factor model within forensic samples. Moreover, the Danish (Kongerslev et al., 2019), Norwegian (Dovran et al., 2013), and Dutch (Thombs et al., 2009) versions of the CTQ demonstrated (at least) acceptable levels of construct validity in samples that included individuals in forensic services.

Table 5.2. Confirmatory factor analysis in studies using forensic samples.

Study	χ2	p	RMSEA	90% CI	TLI	CFI
Aizpurua et al. (2024)	NR	NR	0.06	NR	0.93	0.94
Dovran et al. (2013)	746.82	<0.001	NR	NR	0.98	0.98
Dudeck et al. (2015)	667.38	0.07	0.08	0.08, 0.09	0.89	0.90
Kongerslev et al. (2019)	673.44	<0.001	0.06	0.06, 0.07	NR	0.91
Thombs et al. (2009)	163.2	NR	0.06	NR	0.99	0.99

Note. X^2 = Chi-squared statistic; p = p-value; RMSEA = root mean square error of approximation; CI = confidence interval; TLI = Tucker Lewis index; CFI = comparative fit index; NR = not reported or measured by study.

Convergent Validity

Convergent validity is a subtype of construct validity, which examines how closely related different tests measuring the same construct are (Price, 2015).

Examination of convergent validity among validation studies which have incorporated forensic participants is uncommon; however, for their whole sample (including young offenders and psychiatric patients), Kongeslev et al. (2019) found that CTQ-SF scales correlated with items on the Childhood Experiences

Questionnaire-Revised (CEQ-R; Zanarini, 1992). 62 out of 72 significant (p < 0.01) Spearman's Rho (r) correlations between the CTQ-SF scales and CEQ-R items showed medium to large effect sizes (i.e., r = .31 to .81; Kongerslev et al., 2019). Four of the CTQ-SF subscales (emotional abuse, physical abuse, sexual abuse, and physical neglect) showed strong positive correlations (r = .52 to .81) with their corresponding item on the CEQ-R, whilst CTQ-SF emotional neglect did not have a corresponding CEQ-R scale but correlated with other CEQ-R items such as 'malevolent parenting' (r = .63).

Aizpurua et al. (2024) also claimed to have provided evidence for convergent validity for the CTQ-SF in their Spanish prisoner sample, although the correlated measures concerned mental health difficulties (Depression Anxiety and Stress Scale – 21; DASS-21; Lovibond & Lovibond, 1995) and aggression (Buss-Perry Aggression Questionnaire; BPAQ; Bryant & Smith, 2001), as opposed to childhood adversity. Specifically, CTQ-SF emotional and physical abuse subscales showed moderate correlations with depression, anxiety, stress and aggression scales (r = .32 to .38).

Cross-cultural validity

This type of validity (also known as measurement invariance), refers to the degree to which a psychometric measure has the equivalent factor structure and measures the same phenomena across different groups (Beckstead et al., 2008; Georgieva, 2021). Studies examining cross-cultural validity have involved comparison of CTQ-SF scores between gender (e.g., Aizpurua et al., 2024),

ethnicity (Thombs et al., 2007), and groups defined by setting type or behavioural characteristics (e.g., prisoners versus general psychiatric patients; Dovran et al., 2013).

Comparing the CTQ-SF's five-factor structure between forensic populations and other groups could evidence the suitability of the CTQ-SF for those in the criminal justice system. Dovran et al. (2013) showed no significant difference in an adjusted chi-squared test (v2 = 121.807, df = 192, p = 1.0) between groups deemed high risk of trauma exposure (prisoners; substance abusers; general psychiatric patients; those in out-of-home placements) when factor loadings and thresholds were constrained to be equal between groups. Dovran and colleagues also demonstrated measurement invariance between males and females across their samples within an adjusted chi-squared test (v2 = 108.814, df = 90, p = 0.09). Conversely, within their purely forensic sample, Aizpurua et al. (2024) found limited measurement invariance between males and females, indicated by a change in comparative fit index (CFI) greater than 0.005. Factor loadings were therefore not equivalent and CTQ-SF items were shown to potentially have stronger or weaker relationships with latent constructs between males and females. Finally, Kongerslev et al. (2019) examined the factorial similarity of their best fitting model (shown in Table 5.2) with a Brazilian sample of non-clinical and clinical groups (Grassi-Oliveira et al., 2014) and a US sample of substance abusers (derived from the original CTQ-SF manual; Bernstein & Fink, 1998). Tucker Phi congruency coefficients, which ranged from .97 to 1.00 for the CTS-SF's five subscales, showed strong similarity to the US and Brazilian samples. Whilst this provided some evidence of cross-cultural validity between nationalities using the

CTQ-SF, neither of the comparative samples included forensic participants and Kongerslev et al.'s (2019) forensic group was only a quarter of their entire sample.

Internal Consistency

Also known as internal reliability, this concerns the consistency of an individual's response across items on a measure, to assess whether items are measuring the same construct (Price et al., 2015); for example, the five items comprising the CTQ-SF's emotional abuse subscale should be correlated with each other. Cronbach's alpha (coefficient) statistic is commonly used to measure this (Price et al., 2015). Coefficient values of .70 are generally considered acceptable and those approaching .90 indicate good internal consistency (Tavakol & Dennick, 2011).

As shown in Table 5.3, CTQ-SF validation studies involving forensic samples have examined internal consistency for the five abuse and neglect subscales (Aizpurua et al., 2024; Dovran et al., 2013; Dudeck et al., 2015; Kongerslev et al., 2019; Thombs et al., 2009). Kongerslev et al. (2019) provided Cronbach's alpha values for their subgroup of juvenile offenders, which indicated mixed results. Emotional abuse and emotional neglect subscales showed acceptable and good internal consistency respectively, whilst physical abuse and physical neglect subscales were less than acceptable (<.70). Unlike other studies, Kongerslev et al. (2019) also reported a score for total abuse and neglect (i.e., all 25 items), which showed good internal consistency. Dudeck et al. (2015) reported Cronbach's alpha values for their subsample of prisoners, showing good internal consistency for emotional abuse, physical abuse and emotional neglect; however, physical neglect was below

.70. The largest forensic sample from these studies, indicated acceptable levels (>70) of internal consistency for all scales apart from physical neglect, which was below .57 (Aizpurua et al., 2024). Dovran et al. (2013) and Thombs et al. (2009) showed good levels of internal consistency across emotional abuse, physical abuse and emotional neglect subscales, although sub-analyses for their forensic samples were not available.

None of the cited studies raised concerns about the Cronbach's alpha value for sexual abuse, but where values notably exceed .90, which was true in most cases (Dovran et al., 2013; Dudeck et al., 2015; Kongerslev et al., 2019; Thombs et al., 2009), it is possible that some items on the scale are asking the same question and may therefore be redundant (Tavakol & Dennick, 2011). Upon inspection of the items, it seemed plausible that item 24 (*Someone molested me*) and item 27 (*I believe I was sexually abused*) may have been interpreted as asking the same question; however, molestation generally refers to an isolated act of sexual assault, whilst sexual abuse refers to a persistent pattern of abuse (Mathews & Collin-Vézina, 2019).

Table 5.3 Internal consistency (Cronbach's alpha) for CTQ-SF subscales across studies using forensic samples.

Study	EA	PA	SA	EN	PN	Total
Aizpurua et al. (2024)	.72	.80	.83	.76	.57	NR
Dovran et al. (2013)	.86	.90	.96	.90	.79	NR
Dudeck et al. (2015)	.88	.90	.95	.90	.61	NR
Kongerslev et al. (2019)	.79	.50	.97	.85	.47	.85
Thombs et al. (2009)	.89	.91	.95	.91	.61	NR

Note. EA = emotional abuse; PA = physical abuse; SA = sexual abuse; EN = emotional neglect; PN = physical neglect; NR = not reported or measured by study.

Minimization/denial

The CTQ-SF minimization/denial (MD) subscale is an intuitive feature of the measure, which was retained from the 70-item version of the Childhood Trauma Questionnaire (Bernstein & Fink, 1998). As highlighted in the second and third chapters of this thesis, research using the CTQ-SF has rarely reported MD data. Similarly, CTQ-SF validation research has seldom examined the MD scale since Bernstein and Fink (1998) provided initial support for its ability to detect response bias regarding self-reported childhood adversity (Bernstein & Fink, 1998). A few studies in the last decade have, however, specifically evaluated the MD scale (Church et al., 2017; MacDonald et al., 2015, 2016). Acceptable levels of internal consistency (Cronbach's alpha ranged from .75 to .77) were reported for the MD subscale among a multinational sample (n = 19,652; MacDonald et al., 2016) and a US sample of individuals with severe mental health difficulties and healthy controls (n = 920; Church et al., 2017). The MD subscale was furthermore found to differentiate between healthy adults and those with psychiatric illnesses in these studies (Church et al., 2017; MacDonald et al., 2016); therefore, researchers cautioned against removing MD scores from clinical practice or research, as it appeared to reliably detect underreporting of adversity on the CTQ-SF.

Whilst empirical support for the MD subscale exists, it has not been validated in forensic samples. This is significant given the substantial levels of childhood abuse and neglect known to occur for these individuals, the higher rates of males versus

females entering the criminal justice system, and the difficulties experienced among males around abuse disclosure.

Discussion

The present critique acknowledges that multiple translated versions of the CTQ-SF have been validated globally, within which its original five-factor structure has shown acceptable to good levels of construct validity. The results of recent psychometric appraisals (e.g., Georgieva et al., 2021) were corroborated, with respect to validation research in the general population most commonly examining and evidencing the CTQ-SF's construct validity and internal consistency. Narrowing the focus of the CTQ-SF to forensic populations, construct validity and internal consistency have also been assessed more frequently than other psychometric properties, showing respectable data outcomes in both cases; however, few studies have reported evidence of reliability and validity for the CTQ-SF in forensic samples.

The available evidence for forensic samples highlighted concerns around internal consistency for the physical neglect scale (Aizpurua et al., 2024; Dudeck et al., 2015; Kongerslev et al., 2019), consistent with research in the wider population (i.e., clinical and community samples). It may therefore be sensible to modify the items included in this scale upon developing an updated version of the measure. The present critique also identified that the sexual abuse scale had extremely high internal consistency among studies using forensic samples. Taken together with the issues highlighted by some researchers (e.g., Thombs et al., 2009) around

translating the item ‘someone molested me’, there may also be merit in revisiting items on the sexual abuse scale.

Aizpurua et al.’s (2024) finding of limited measurement invariance on the CTQ-SF between males and females, may be reflective of gender differences regarding responses to questions about childhood adversity; thus, males within forensic populations may be less willing than females to identify themselves as victims of abuse. This is consistent with decreased sexual abuse disclosure found in males generally (Azzopardi et al., 2019; O’Leary & Barber, 2008; Coleman & Stewart, 2010), which may be associated with greater risk of stigmatization or shame and differences in help seeking behaviour, relative females. Given the particularly high rates of sexual abuse known to occur in forensic populations, it is paramount that instruments such as the CTQ-SF reliably capture this aspect of maltreatment. Where disclosure is not forthcoming (for sexual abuse and other forms of abuse, and neglect), the CTQ-SF benefits from its innovative MD subscale, which has strong psychometric properties among non-forensic samples (Church et al., 2017; MacDonald et al., 2016), but requires validation within forensic populations.

Moreover, studies using forensic samples have only evidenced the CTQ-SF’s five-factor structure in European countries (Denmark, Germany, Netherlands, Spain, and Norway), where Westernised culture is prevalent; therefore, cultures that may hold significantly different perceptions of what constitutes abuse and neglect are unlikely to have been represented. This issue was noted in the present thesis’ systematic review in relation to Chinese prisoners, who may have perceived

certain childhood experiences as discipline rather than abuse, and consequently may have not endorsed such items on psychometric tests (Zhong et al., 2022).

Limited evidence of convergent validity for the CTQ-SF and other measures of childhood adversity has been found among studies using forensic samples, wherein just one study has demonstrated positive correlations, with the CEQ-R (Kongerslev et al., 2019). The associations reported between CTQ-SF subscales (e.g., emotional abuse) and aggression (BPAQ) and mental health (DASS-21) measures were also encouraging (Aizpurua et al., 2024). Among etiological studies, the CTQ-SF and BPAQ have been shown to correlate within an adolescent forensic sample (Peng et al., 2023), and this thesis has already demonstrated the CTQ-SF's association with psychometric tests of impulsivity, such as the Barratt Impulsiveness Scale Version 11 (BIS-11; Patton et al., 1995) in forensic adult samples (Chen et al., 2022; Jansen et al., 2020).

Conclusion

The CTQ-SF is one of the most well validated psychometric assessments for measuring childhood abuse and neglect, and it is often favoured over other adversity measures within empirical research. Evidence of psychometric properties for the CTQ-SF among forensic populations is limited, although like the wider population, strong evidence exists for its construct validity and internal consistency. Due to the unique characteristics of forensic populations noted in this chapter, future research should aim to examine the CTQ-SF within various forensic settings, using samples from forensic mental health services, prisons, and

community forensic services, among others. Specifically, these studies should incorporate examination of the CTQ-SF's test-retest reliability, criterion-related validity, and cross-cultural validity, and they should aim to validate the CTQ-SF's MD scale.

Chapter 6: Conclusion

This thesis aimed to enhance understanding around the relationship between childhood adversity, impulsivity, and cognitive functioning within forensic populations. To achieve this, four separate research projects were undertaken, comprising a systematic review examining the relationship between childhood adversity and impulsivity in adult forensic populations; an applied study into the relationship between childhood adversity, impulsivity, and cognitive inhibitory control in an adult forensic mental health sample; a case study exploring childhood adversity, impulsivity, and cognitive functioning in the context of psychological assessment and formulation; and a critique of the Childhood Trauma Questionnaire-Short Form (CTQ-SF; Bernstein & Fink, 1998) in forensic populations.

General Discussion

Experiences of childhood adversity among individuals placed in forensic (or offender) settings is the common thread throughout this thesis. Chapter 1 discussed the substantial prevalence of childhood adversity within this subset of the population, alongside the range of negative outcomes for people subjected to adverse experiences, established within empirical literature. One outcome identified as being associated with childhood adversity was trait impulsivity (Lui, 2019). This was of interest because behaviours frequently observed among forensic populations which are often characteristically impulsive, such as physical violence, contribute to prolonged institutionalisation (Broderick et al., 2015). In the context of forensic case formulation, childhood adversity was thought to have

a predisposing effect on difficulties with impulsivity in adulthood. Impairments in cognitive functioning were also known to be associated with childhood adversity within the literature and are pervasive across forensic populations; therefore, it was conceived that adversity during childhood may predispose deficits in cognitive functioning, and such deficits may subsequently maintain problems with impulsivity. The combination of cognitive functioning difficulties and high trait impulsivity were anticipated to have a perpetual effect on maladaptive impulsive behaviours for adults in forensic settings.

A systematic review was undertaken to assess the methodological quality and synthesise the findings of existing research exploring the relationship between childhood adversity and impulsivity in adult forensic populations. As expected, a significant relationship between these phenomena was indicated, and was evidenced among most of the studies. Research had primarily gathered data on experiences of childhood abuse and neglect (otherwise known as childhood maltreatment), although in contrast to the wider population (Lui, 2019), there was no discernible pattern among studies regarding the strength association (with impulsivity) across maltreatment types. Additionally, the predominant use of cross-sectional designs and non-existence of cohort designs meant that the possible cause-and-effect association between childhood adversity and impulsivity has not been established. Importantly however, some of the studies statistically controlled for factors (e.g., substance misuse) which may have influenced impulsivity, showing variable results as to whether a significant relationship between adversity and impulsivity remained. Incorporating control variables

increased the reliability of these results. Almost all the studies were considered acceptable or better in terms quality based on the assessment process used.

In acknowledgement that previous investigations into the relationship between childhood adversity and impulsivity in adult forensic populations had solely recruited prison samples, as shown by the systematic review, the primary study aimed to explore this relationship within an adult forensic mental health setting. This study was also interested in examining the potential mediating effect of cognitive inhibitory control on the relationship between childhood adversity and impulsivity. It was possible to address methodological recommendations identified within the systematic review, such as analysing the effect of response bias on self-reported childhood adversity and incorporating control variables in data analyses. The results of the primary study indicated that childhood adversity was found to predict poorer performance on a test of inhibitory control – which simultaneously measured cognitive flexibility. This finding remained significant after controlling for age, gender, schizophrenia diagnosis, and historical substance misuse. The primary study did not demonstrate a statistically significant relationship between childhood adversity and impulsivity, nor a mediating effect of inhibitory control on the relationship between childhood adversity and impulsivity.

The primary study was limited with respect to measuring cognitive functioning processes broadly and understanding the complex relationship between cognitive functioning, childhood adversity, and impulsivity; however, a case study provided an opportunity to more thoroughly assess the factors of interest and produce an associated forensic case formulation. By obtaining additional information via

formal cognitive assessment, the participant's case history, and incident reports, it was possible to develop a narrative which emphasised the relationship between childhood adversity, impulsivity, and cognitive functioning. Therein, the participant's difficulties with inhibitory control, planning, and problem-solving may have been predisposed by childhood adversity and may have perpetuated risk of impulsive behaviour, such as self-harm. At the same time, dynamic factors such as the presence of psychotic symptoms, insight, emotional regulation and distress tolerance skills, living circumstances, and engagement with occupational and psychological therapies, were noted to be protective against recent and future harmful impulsive behaviour.

The final chapter of this thesis involved a critique of the CTQ-SF as applied to forensic populations, as this psychometric had featured heavily within the three preceding chapters. Moreover, the systematic review and primary study had initially appraised the CTQ-SF in the context of this thesis. It was subsequently appropriate to examine an assessment of childhood adversity as its global prevalence and impact among forensic populations were of primary concern to the author. The critique indicated that validation research using forensic samples was limited, although impressive levels of construct validity had been shown among several studies. Internal consistency was also strongly supported by existing evidence. Similarly, CTQ-SF validation research in the wider population has tended to investigate and corroborate these psychometric properties. Future CTQ-SF research with forensic samples would ideally examine properties such as test-retest reliability, criterion-related validity, and cross-cultural validity, as well as the CTQ-SF's minimization/denial (MD) scale.

By exploring the relationship childhood adversity, impulsivity, and cognitive functioning within forensic populations throughout this research thesis, it is evident that this remains an under researched area. As expected, childhood adversity and impulsivity were hereby shown to be positively associated, although the unidirectional effect of adverse childhood experiences on impulsivity during adulthood has not been established. Emotional abuse and attentional impulsiveness were specifically associated in the primary study, but studies within forensic settings globally did not consistently indicate this or any other pattern of associated maltreatment and impulsivity subtypes. Deficits with cognitive inhibitory control and cognitive flexibility were found to be associated with childhood emotional abuse among a small sample of adult forensic mental health patients. Other cognitive deficits, in addition to trait impulsivity, appeared to be impacted within a single case study who had experienced considerable adversity, although it was acknowledged that a host of dynamic factors likely contributed to the ongoing presence of harmful impulsive behaviours. Lastly, validated measures for assessing self-reported childhood adversity exist, with the CTQ-SF being among the strongest; however, validation evidence within forensic populations is limited.

Limitations

The limitations of this research thesis have been acknowledged throughout its individual chapters, although an overview of its most salient shortfalls is presented below.

This thesis conducted a systematic review regarding the childhood adversity and impulsivity association within adult forensic samples; however, it did not employ a meta-analysis due to its inclusion of heterogeneous studies, meaning that the highest level of statistical evidence regarding this association was not provided. The review showed impressive levels of inter-rater reliability for its quality assessment, although an independent rater was not used for the screening or data extraction processes – which would have strengthened its method. Also, study quality was rated using arbitrary percentage cut-offs (e.g., 60% = acceptable) and equal weighting was applied to items, which was arguably problematic. Whilst the review helpfully identified that investigation into the relationship between childhood adversity and impulsivity was previously confined to prison settings; the global generalisability of its findings (even to prison settings) is limited by the high volume of participants from Chinese prisons. This is due to the potential for distinct perceptions of childhood experiences between Chinese and Western societies. Moreover, the findings of the review did not indicate differing strengths of association between types of childhood adversity (e.g., sexual abuse) and impulsivity (e.g., attentional).

As noted above, the primary study in Chapter 3 addressed methodological recommendations identified by the systematic review; however, consistent with previous research exploring the relationship between childhood adversity and impulsivity in forensic settings, it used a cross-sectional design. In the absence of a longitudinal design, the primary study could not infer causation regarding childhood adversity and impulsivity or performance on tests of inhibitory control and cognitive flexibility. Furthermore, the primary study was limited to a small

sample from one forensic mental health service, and despite recruiting a mixture of male and female forensic patients, only half of the individuals approached chose to participate. This study was therefore limited in terms of the representativeness of its sample and the generalisability of its results. Nevertheless, it should be acknowledged that this was Health Research Authority (HRA) approved research and the trainee researcher conducted all assessments alone, which placed limits on time, resources, and sample size potential. In addition, it was not possible to investigate whether cognitive inhibitory control mediated the relationship between childhood adversity and impulsivity (i.e., one of its key objectives).

A key strength of the case study was that this approach expanded the assessment of cognitive functioning, whereas the primary study was limited to measuring inhibitory control (and cognitive flexibility); nevertheless, the broader cognitive assessment outcomes and associated formulation with respect to childhood adversity and impulsivity were specific to one individual and not generalisable. The case study also collected outdated data from existing reports pertaining to general intellectual functioning and it used a test of premorbid functioning which lacked cross-cultural validity. It was also noted that the executive function of prospective memory, which is associated with impulsivity in the literature (Cuttler et al., 2014), received minimal attention in the case study. Finally, the use of electronic incident reports to indicate the presence of impulsive behaviours and Barratt Impulsiveness Scale Version 11 (BIS-11; Patton et al., 1995) to measure trait impulsivity may have somewhat lacked reliability.

Implications and Future Directions

Having summarised the key findings and limitations of this thesis, it is essential to consider its contribution to forensic research and practice. By exploring the potential consequences of childhood adversity among forensic populations, this thesis was responsive to the identified need for trauma-informed services (Procter et al., 2017; Willmott & Jones, 2022). Therein, increasing empirical knowledge of how childhood adversity, cognitive functioning, and impulsivity relate among individuals using forensic services is important for forensic case formulation, whilst collaborative formulation with service users and multi-disciplinary teams is a key aspect of trauma-informed care (Hiett-Davies, 2022; Willmott & Jones, 2022). Subsequently, the frequency of behaviours such as physical aggression and self-harm among forensic populations may decrease with improved understanding of the factors which contribute to impulsive behaviour, alongside widespread implementation of trauma-informed interventions. The resulting effects are likely to include positive outcomes for forensic service users, such as reducing institutionalisation (Miller & Najavits, 2012; Malvaso et al., 2016), and for professionals, such as alleviating burnout (Walker et al., 2017). Given the multitude of negative outcomes associated with adversity during childhood, of which many are present among offender populations, this thesis also promotes the importance of early detection and intervention for children at risk of adversity exposure. It is hoped that the present thesis and associated research has implications for government policy and funding aimed at preventing childhood adversity and supporting affected children.

One of the primary issues acknowledged throughout this thesis is the limited generalisability of its findings. This thesis identified that relatively few studies have evidenced the relationship between childhood adversity and impulsivity in forensic populations, and no study prior to this thesis had investigated the relationship between these phenomena in forensic mental health settings. In addition, research to date has mostly involved cross-sectional designs and male samples. Conversely, the 'cycle of violence', an associated hypothesis that abuse experienced during childhood increases the risk of perpetrating violence in later life (Heyman & Slep, 2002), has been supported by mixed gender longitudinal research (Mersky & Reynolds, 2007). Investigation into the relationship between childhood adversity and cognitive functioning within forensic populations has received even less attention. This thesis offers preliminary evidence of an association between these variables, and the research case study highlights various cognitive processes and dynamic factors (e.g., emotional regulation skills) which may contribute to the maintenance of harmful impulsive behaviour; however, the relationship between childhood adversity, impulsivity, and cognitive functioning within forensic populations remains poorly understood.

Future research examining the relationship between childhood adversity, impulsivity, and cognitive functioning should recruit forensic mental health samples and greater numbers of female participants. Longitudinal designs would increase the reliability of childhood adversity data and inform the predisposing effects of adversity with respect to impulsivity and cognitive functioning. Where cross-sectional designs are used, variables known to be associated with impulsivity and cognitive functioning (e.g., substance misuse) should be controlled

for. Validated measures should be used to assess a wide range of cognitive functioning abilities. Both case study and observational designs are needed to better understand complex cognitive networks and potential confounding variables with respect to childhood adversity and impulsivity, in forensic populations. Ultimately, these recommendations will strengthen the empirical basis for forensic case formulation.

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Appendices

Appendix A

Childhood adversity and impulsivity in 'forensic' populations: A systematic review protocol.

Authors:

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Background:

Childhood adversity is often labelled 'childhood trauma' (Berkstein & Fink, 1998) and is thought to comprise emotional abuse, physical abuse, sexual abuse and neglect (Cicchetti & Toth, 2005). However, because 'trauma' infers a resulting traumatic experience (e.g. traumatic response to sexual abuse), 'childhood adversity' or 'adverse childhood experiences' (Felitti et al., 1998; Shin et al., 2018) seems a more useful umbrella term for abuse, neglect, and other adverse childhood experiences (e.g., witnessing violence in the household).

Assessments have been developed to measure childhood adversity. One of the most widely cited is the Childhood Trauma Questionnaire (CTQ; Berkstein & Fink, 1998), which comprises three abuse scales (emotional, physical, sexual) and two neglect scales (physical, emotional). Research has tended to measure the aforementioned facets of childhood adversity. In a review of lifetime prevalence, Stoltenborgh et al. (2015) reported 22.6% for physical abuse, 11% for sexual abuse (18% in females), 36.4% for emotional abuse (despite relatively less evidence), 16.3% for physical neglect and 18.4 % for emotional neglect.

Furthermore, childhood adversity has been associated with adverse health outcomes, including self-harm (Maniglio, 2011), violence (Duke et al., 2010) and substance use disorders (Gilbert et al., 2009). One mechanism thought to account for the relationship between childhood maltreatment and adverse health outcomes is 'impulsivity', which has been studied extensively (Lui, 2019). Impulsivity (or impulsiveness) can be defined as *"rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions to the impulsive individuals or to others"* (Moeller et al., 2001 p. 1784). Whilst some impulsive behaviours have been viewed as adaptive for functioning individuals, such as those used in

employment activities (Everton et al., 2005), impulsive behaviours are often problematic, and they are prevalent within forensic mental health services. Such behaviours include verbal and physical aggression (Azizian & Warburton, 2015), self-harm (James et al., 2012), and substance misuse (Scott et al., 2004).

A recent review of 55 studies provided evidence for a positive association between childhood adversity and overall trait impulsivity (Lui, 2019). Interestingly, emotional abuse was most strongly associated with impulsivity, depicting a medium effect size (OR = 3.10), whilst sexual abuse had the weakest association (OR = 1.59). An argument for the stronger association between emotional abuse and impulsivity, relative to other abuse types, is that it is the most prevalent (Stoltenborgh et al., 2015). Lui et al. (2019) also postulated that the chronicity of emotional abuse, relative to the often-isolated occurrence of sexual and physical abuse, may explain the stronger association with impulsivity. However, whilst global research has reported lower levels of physical and sexual abuse, the prevalence of these abuse types in forensic and clinical samples is higher (eg: Falshaw and Browne, 1997; Hamilton, Falshaw and Browne, 2002). Therein, a study investigating prevalence among incarcerated adolescents reported 23.1% self-disclosed sexual abuse (with females 3-times more likely to disclose) and 42.5% self-disclosed physical abuse (Coleman & Stewart, 2010). Moreover, within an adult forensic and clinical sample, 35.8% reported two or more types of childhood adversity (Dovran et al., 2015).

It is widely known that adversity is common during the childhood of forensic service users (Malvaso et al., 2016). Impulsive behaviour is also prevalent within this subset of the population (Alford et al., 2020). Thus, there is a need to better understand the relationship between childhood adversity and impulsivity within forensic populations. Impulsivity, in the context of this review, and previous reviews (e.g. Lui, 2019) refers to trait impulsivity i.e. the personality/behavioural construct of impulsiveness (Patton et al., 1995). Trait impulsivity is a stable construct, thought to underlie continuous problems with impulsive behaviour (e.g. physical aggression). Instruments such as the Barratt Impulsiveness Scale (BIS-11; Patton et al., 1995), measure impulsivity at the trait level. This is distinct from state impulsivity, which can be defined as *"variable, momentary responses to contextual intrinsic and extrinsic triggers"* (Nguyen et al., 2018 p. 67).

Objectives:

The proposed review aims investigate the relationship between childhood maltreatment and impulsivity within adult forensic samples. This review will identify and assess the quality of

existing research which has empirically measured childhood adversity and trait impulsivity within forensic samples, and reported on the relationship between these phenomena.

Hypotheses:

H1. There is a significant positive relationship between childhood adversity and trait impulsivity in forensic populations.

H2. The strength of association between childhood adversity and trait impulsivity, will vary with type of adversity (e.g. sexual abuse).

H0. There will be no significant relationship between childhood adversity and trait impulsivity in a forensic population.

Inclusion/exclusion criteria:

The PICOSS (Population, Intervention, Comparator, Outcomes, Study design, Setting) framework was used to identify eligibility criteria. A summary of inclusion and exclusion criteria is provided below.

Inclusion

Studies will be included if they meet the following criteria:

Population – the sample includes adults (over 18 years).

Intervention/comparator – childhood adversity (e.g. physical, sexual, or emotional abuse, neglect, childhood abuse, bullying, witnessing violence) was explored via self-report or file information/official records.

Outcome – trait impulsivity was measured, using psychometric assessment measures.

Study Design – any quantitative study design (cross-sectional, cohort, case-control, randomised control trail) will be included in this review.

Setting – from a forensic setting (e.g. secure hospital, prison, therapeutic community, forensic community service, probation)

Exclusion

Studies will be excluded on the following basis:

Population – the sample includes adolescents/children (under 18 years).

Intervention/comparator – adversity relates to experiences measured during adulthood (over 18 years).

Outcome – trait impulsivity is not measured using a validated assessment tool.

Study Design – qualitative research or case studies will be excluded.

Setting – the sample is selected from a non-forensic setting (e.g. community or general psychiatric services).

Search Strategy:

The primary strategy will be a search of the following databases:

- Embase
- Medline
- PsychINFO
- PsychArticles
- The NCJRS: National Criminal Justice Reference Service

Reference lists of identified studies will be scanned (by hand) to identify additional studies. In order to reduce the risk of publication bias, grey literature will also be searched, using the following database:

- ProQuest Dissertation and Theses

Search terms:

Search terms will include those related to childhood adversity (e.g. trauma*, child abuse, physical abuse, emotional abuse, sexual abuse, psychological abuse, parental harm, neglect*, trauma*, advers*, maltreat*, bull*, victim*, discrimination, poverty, community violence) and impulsivity

(e.g. impuls*) To ensure that the desired study samples are identified search terms related to forensic settings (e.g. forensic*, inmate*, prison*, custod* inpatient*, secur*, incarcerat* offen*, hospital*, crim*) will be included within childhood adversity and impulsivity searches. The search terms listed here are not exhaustive.

Scoping exercises:

In order to locate relevant reviews and meta-analyses an initial scoping exercise was undertaken between 26th and 27th November 2020.

Scoping searches on Prospero identified six on-going reviews using a truncated version of the above search strategy (i.e. sexual abuse or physical abuse or emotional abuse or childhood trauma and impuls* and review or meta*). Of these, the most closely related review identified was exploring the association between Attention Deficit – Hyperactivity Disorder and Child Sexual Abuse. Thus, no on-going reviews are covering the proposed review question.

Furthermore, 119 reviews or meta-analyses were identified during scoping searches of Embase, Psychinfo, Psycharticles, and Medline (via OVIDsp). 112 of these were excluded, for reasons such as: not including relevant samples (e.g. children/adolescents), not measuring childhood trauma, having a neurobiological focus, exploring psychosis and offending, investigating functional magnetic resonance imaging (fMRI) and offending, and identifying the characteristics of self-harmers, among others. The remaining reviews focused on: factors associated with impulsivity in forensic populations (Alford et al., 2020), risk factors for non-fatal and fatal suicide attempts (Beghi & Rossenbaum et al., 2010), childhood trauma, repeated stress and substance use disorders (Liffijt et al., 2014), factors influencing the pathway from trauma to aggression (Rasche et al., 2016), factors (including sexual abuse) associated with suicide attempts among self-injurers (Victor & Klonsky, 2014) and risk factors for suicide among individuals with substance misuse disorders. These reviews were considered relevant because they included studies investigating the links between childhood adversity and either trait impulsivity or behaviour commonly considered impulsive in nature (e.g. suicide, aggression/violence, substance misuse).

The most relevant article was a meta-analysis of childhood trauma and impulsivity (Lui et al., 2019). This review included studies of diverse adult samples exploring the relationship between childhood adversity and impulsivity. It provided valuable findings in understanding this relationship among the wider adult population. However, the proposed review will focus on

forensic populations, and it has been two years since Lui (2019) identified studies for their review; therefore, new studies may exist.

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Appendix B

Inclusion / Exclusion Screening Form

Study author/title:		
Inclusion Criteria	**Met?**	**Comments**
Population: • Adults (over 18 years)	Yes/No/Unclear	
Intervention/Exposure: • Childhood adversity measured quantitatively using self-report or file information.	Yes/No/Unclear	
Outcome:		**How measured?**
• Trait impulsivity measured, using psychometric assessment measure/s (e.g., Barratt Impulsiveness Scale; BIS-11).	Yes/No/Unclear	
Study Design		**Comments**
• Cross-sectional	Yes/No/Unclear	
• Case Control	Yes/No/Unclear	
• Cohort (*Retrospective or Prospective)*	Yes/No/Unclear	
Setting		
• Sample from forensic setting (e.g. secure hospital, prison, therapeutic community, forensic community service, probation)	Yes/No/Unclear	

Appendix C

Quality Assessment Form – Cross-Sectional Designs

Adapted from Critical Appraisal Skills Programme (CASP, 2004)

General information

Title and Author	
Reviewer Name	
Date	

Questions	**Outcome**	**Comments**
Introduction/Objectives		
Were the aims/objectives of the study clear?	Yes/Unclear/No	
Methods		
Was the study design appropriate for the stated aim(s)?	Yes/Unclear/No	
Was the sample size justified?	Yes/Unclear/No	
Was the target/reference population clearly defined? (Is it clear who the research was about?)	Yes/Unclear/No	
Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?	Yes/Unclear/No	
Was the sample frame taken from an appropriate population base so that it closely represented the target/reference population under investigation?	Yes/Unclear/No	
Was the selection process likely to select subjects/participants that were representative of the target/reference?	Yes/Unclear/No	
Were measures undertaken to address and categorize non-responders?	Yes/Unclear/No	

Were the risk factor and outcome variables measured appropriate to the aims of the study?	Yes/Unclear/No	
Were the risk factor and outcome variables measured correctly using instruments/ measurements that had been trialed, piloted or published previously?	Yes/Unclear/No	
Is it clear what was used to determine statistical significance and/or precision estimates?	Yes/Unclear/No	
Were the methods (including statistical methods) sufficiently described to enable them to be repeated?	Yes/Unclear/No	
Results		
Were the basic data adequately described/reported?	Yes/Unclear/No	
Does the response rate raise concerns about non-response bias?	Yes/Unclear/No	
If appropriate, was information about non-responders described?	Yes/Unclear/No	
Were the results for the analyses described in the methods, presented?	Yes/Unclear/No	
Is the sample generalizable to the target population?	Yes/Unclear/No	
Were the results and implications of this study supported by other evidence?	Yes/Unclear/No	

Final recommendation

Quality rating	Good / fair / poor
Final Decision for inclusion	Yes / No

Quality Assessment Form – Case-control Designs

Adapted from Critical Appraisal Skills Programme (CASP, 2018)

General information

Title and Author	
Reviewer Name	
Date	

1) **Did the study address a clearly focused issue?**

Yes / unclear / no

Comments:

2) **Did the authors use an appropriate design to answer their question?**

(Is a case control study an appropriate way of answering the question under the circumstances / Did it address the study question?)

Yes / unclear / no

Comments:

3) **Were the cases recruited in an acceptable way?**

Yes / unclear / no

Comments:

4) **Were the controls selected in an acceptable way?**

Yes / unclear / no

Comments:

5) **Was the exposure accurately measured to minimise bias?**

Yes / unclear / no

Comments:

6) **(a) Aside from the experimental intervention, were the groups treated equally?**

Yes / unclear / no

Comments:

6) **(b) Have the authors taken account of the potential confounding factors in the design and/or in their analysis?**

Yes / unclear / no

Comments:

7) **How large was the treatment effect?**

Yes / unclear / no

Comments:

8) **How precise was the estimate of the treatment effect?**

Yes / unclear / no

Comments:

9) **Do you believe the results?**

Yes / unclear / no

Comments:

10) **Can the results be generalised to the target population?**

Yes / unclear / no

Comments:

11) **Do the results of this study fit with other available evidence?**

Yes / unclear / no

Comments:

Final recommendation

Quality	*Comments*
Final Decision for inclusion	Yes / No

Appendix D

Data Extraction Form

Date of extraction	
Author	
Title	
Source (journal/diss), year, vol, pg, country	
Reviewer	
Sample Size	
Age	
Gender	
Ethnicity	
Mental health diagnosis	
Location/country	
Forensic setting type	
Study design	
Aims and HYP of study	
No. of measures (all)	
Measure of impulsivity	
Measure of childhood adversity	
Validated?	
No. of ppts in analysis	
Univariate analysis: Means (SD) or frequency (%)	
Bivariate analysis (e.g., correlations)	
Multivariate analysis (e.g., regression)	
Other analysis	
Conclusions	

Appendix E

ResearchGate Requests

Request for paper – example

Dear …,

I hope this finds you well.

I am conducting a systematic review on childhood adversity and impulsivity in forensic populations (for a doctorate in forensic psychology), and I identified your study in my database search:

Investigating the association of criminal behaviour with childhood traumas, impulsivity, and dominant temperaments in bipolar I disorder.

Would it possible to have a copy of the full text paper to see if your study meets criteria for my review, please?

Kind Regards,
Oliver

Request for data – example

Dear …,

I hope this finds you well.

I am conducting a systematic review on childhood adversity and impulsivity in forensic populations for a Doctorate in Forensic Psychology. I identified a study of yours which obtained data on childhood adversity (CTQ) and impulsivity (BIS):

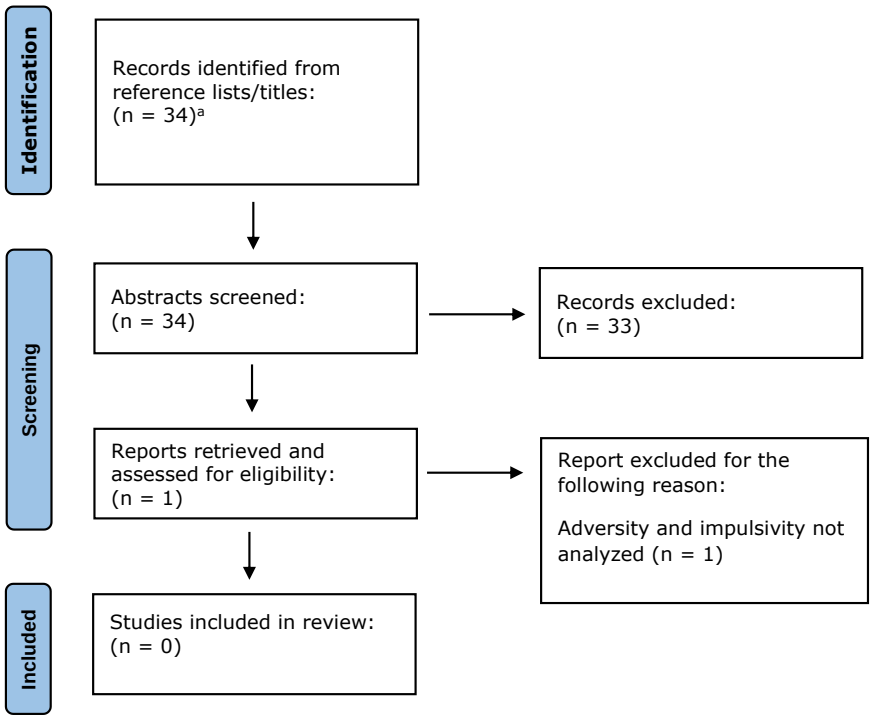
Relations of psychological characteristics to suicide behaviour: Results from a large sample of male prisoners (2009).

I was wondering whether you analysed the association between these variables specifically and if so, would be willing to share the outcomes with me? Alternatively, if you still have the raw data for these measures would you be willing to share it with me for the purpose of the review?

Kind Regards,
Oliver

Appendix F

Figure 2.2 PRISMA flow diagram showing study selection process via reference lists of included studies (n=11).



Note. [a] Reference lists included studies that had previously been screened following the main database search. Records screened at this stage were not duplicates of the main database search shown in Figure 2.1.

Appendix G

Final Version 2.0

23.07.2020

Psychological research information sheet for clinical teams

Study Title: Early experiences, impulsivity, and inhibitory control *(Topic sensitive project title).*

Dear Dr (name of RC) and (name of ward),

I write to you regarding a psychological study that I hope to conduct with patients on your ward. I am a trainee forensic psychologist, completing a doctorate with the University of Nottingham. I have worked as an Assistant/Trainee Psychologist within the Trust for nearly five years at [redacted]

This study aims to explore the relationship between traumatic experiences during childhood and impulsivity in adulthood. It will also investigate whether inhibitory control (an area of cognitive functioning) affects the relationship between trauma and impulsivity.

The study's findings may enhance understanding of the predisposing and perpetuating factors for impulsive behaviour (e.g. physical aggression) among adults who use forensic mental health services. The findings could also have implications for the development of interventions and treatment pathways specifically targeting those at risk of cognitive and behavioural difficulties i.e. individuals who have experienced significant childhood trauma.

Each patient will be briefed on the study during an initial meeting (approx. 30 minutes), following which they will be given 48 hours to consider participation and provide signed consent. Their participation will involve attending an assessment, lasting approximately one hour, wherein a series of practical tasks and questionnaires will be completed. One of the measures will involve rating statements related to childhood trauma. This could cause some discomfort; however, disclosure of traumatic childhood experiences will not be required from patients.

It would be of great benefit to the study if I could attend the ward round to discuss the research with the team and identify suitable patients. I understand how busy these meetings are and would require 5-10 minutes of your time only. Please could you let me know a time and a date that I could attend.

The inclusion and exclusion criteria for participants is listed below. Any potential participants (patients) that could be identified against these criteria would be greatly appreciated:

Inclusion criteria:

- Male and female service users at identified forensic mental health service.
- Aged between 18 and 65 years.
- Proficiency in English language. This is an inclusion criterion as the psychometric measures used are not adaptable for other languages.
- Capacity to give informed consent.

Exclusion criteria:

- Diagnosed learning disability/neurodegenerative disease.
- Acute symptoms of mental illness (i.e. symptoms of mental illness causing the individual significant distress or having a significant impact on their daily functioning).
- Not fluent in English language.

If a potential participant is unable to meet with the researcher (who is male) but willing to complete the assessment with a team psychologist, the team psychologist may be approached for their assistance with administering the assessment.

Please do not hesitate to contact me if you have any questions regarding the study.

Contact details (NHS site)

Oliver Johnson,

[redacted]

Appendix H

Research Team

- Chief Investigator/Supervisor: Dr Kathleen Green, Assistant Professor and Forensic Psychologist, Doctorate in Forensic Psychology, University of Nottingham.
- Principal Investigator/Student Researcher: Oliver Johnson, Trainee Forensic Psychologist, Doctorate in Forensic Psychology, University of Nottingham
- Secondary Supervisor: Dr Donna-Coleston Shields, Principal Research Fellow, University of Nottingham

Study Title: Early experiences, impulsivity and inhibitory control.

PARTICIPANT INFORMATION SHEET

We would like to invite you to take part in a research study. The study is being completed as part of a University Doctorate in Forensic Psychology. Before you decide, it is important for you to understand why the research is being done and what it will involve. The researcher will go through the information sheet with you and answer any questions you have. Please take time to read this carefully and discuss it with others if you wish. Please ask if anything is not clear.

What is the purpose of the research?

This study aims to explore the relationship between difficult childhood experiences and impulsivity in adulthood. It also aims to investigate whether an area of cognitive functioning known as 'inhibitory control' affects the relationship between childhood experiences and impulsivity (i.e. acting without thinking).

Existing research has shown links between childhood experiences and impulsivity in adulthood. However, most research has been conducted in the community, whereas this study is undertaken in secure mental health services.

Developing our knowledge of impulsivity in secure services is important because impulsive behaviour such as physical aggression and self-harm is frequent and difficult to manage within services.

Why have I been invited to take part?

You have been invited to take part in this research because you are receiving treatment within forensic inpatient services at [redacted], you are aged between 18 and 65, you are proficient in English language, and you have capacity to decide whether to take part.

We will be recruiting up to 50 participants in this study.

Do I have to take part?

No. It is up to you to decide if you want to take part in this research. We will describe the study and go through this information sheet with you to answer any questions you may have. If you agree to participate, we will ask you to sign a consent form and will give you a copy to keep. However, you would still be free to withdraw from the study at any time, without giving a reason and without any negative consequences, by informing the researchers. This would not affect your legal rights.

1. What will happen to me if I take part?

The first meeting is an opportunity for you to go over the participant information sheet and ask any questions you may have about the study. If you agree to take part in the study, you will be asked to attend a single visit from the researcher on your ward. This will be scheduled at your convenience once you have provided signed consent to take part. At the beginning of this visit, the study will be explained and you will be given a chance to ask any questions.

The study will involve completing an assessment which includes a series of practical tasks and questionnaires. These will be completed over a one hour meeting with the researcher. The types of task and questionnaire will be similar to those which psychologists often use during assessments. Therefore, you will likely have experience of completing similar assessments. For example, one of the questionnaires involves statements such as "I do things without thinking" and you are asked to give one of four possible responses (rarely/never, occasionally, often, or almost always/always). One of the practical tasks involves drawing lines to connect numbers on a page as quickly as you can.

If, for any reason, you are uncomfortable completing the assessment measures with the researcher (who is male), but you would be interested in completing the assessment with your team/ward psychologist, please inform us and we will try to arrange this for you. We will inform you if this is possible, before you provide consent to participate.

2. Are there any risks in taking part?

One of the questionnaires includes statements which have the potential to be distressing because they relate to childhood experiences. However, participants will only be required to read or listen to each statement and rate it on a scale from 1-5 ('never true' to 'very often true'). You will not be asked to provide details of your experiences.

3. Are there any benefits in taking part?

Taking part in this research will have no direct impact on your care pathway, mental health section or sentence (if this applies to you). However, by participating in this research you will provide data which may improve the services available to you and your peers. For this reason, it is hoped that taking part would be experienced as rewarding. The findings of this study may support the development of treatments for people who have had difficult childhood experiences and need support with their thoughts, feelings and behaviours.

4. Will my time/travel costs be reimbursed?

Participants will not receive any time/travel costs to participate in the study.

5. What happens to the data provided?

Research data is information that you provide on assessment forms (e.g. scores) and information collected from your medical records (e.g. mental health diagnosis) which will be entered into an computer database. To ensure your privacy, you will be assigned a study identity number for use on the assessment forms that you complete (e.g. P1 for participant number 1). This will also be used when your data is stored in the computer database. Your initials will also be used in the database, for safety purposes (i.e. if the data you provide raises any health or other risks, as outlined on the consent form). Your name and any information you provide will be kept confidential.

Personal data includes your signed consent forms. This will be stored in a locked filing cabinet at the study site ([redacted]).

The research team (i.e. the researcher, their primary supervisor/Chief Investigator & secondary supervisor) and regulatory authorities will have access to personal and research data.

6. What will happen if I don't want to carry on with the study?

Even after you have signed the consent form, you are free to withdraw from the study at any time without giving any reason and without your legal rights being affected. Any personal data will be destroyed. However, the information you have provided up to the point of withdrawal cannot be erased and this information may still be used as research data.

7. Will my taking part in the study be kept confidential?

We will follow ethical and legal practice and all information about you will be handled in confidence. Furthermore, any information gathered will not be linked to any individuals.

We will follow ethical and legal practice and all information about you will be handled in confidence.

If you join the study, we will use information collected from you and your medical records during the course of the research. This information will be kept strictly confidential, stored in a secure and locked office, and on a password protected database at the University of Nottingham. Under UK Data Protection laws the University is the Data Controller (legally responsible for the data security) and the Chief Investigator of this study (named above) is the Data Custodian (manages access to the data). This means we are responsible for looking after your information and using it properly. Your rights to access, change or move your information are limited as we need to manage your information in specific ways to comply with certain laws and for the research to be reliable and accurate. To safeguard your rights we will use the minimum personally – identifiable information possible.

You can find out more about how we use your information and to read our privacy notice at:

https://www.nottingham.ac.uk/utilities/privacy.aspx.

The data collected for the study will be looked at and stored by authorised persons from the University of Nottingham who are organising the research. They may also be looked at by authorised people from regulatory organisations to check that the study is being carried out correctly. All will have a duty of confidentiality to you as a research participant and we will do our best to meet this duty.

Your contact information will be kept by the University of Nottingham for 12 months after the end of the study so that we are able to contact you about the findings of the study and possible follow-up studies (unless you advise us that you do not wish to be contacted). This information will be kept separately from the research data collected and only those who need to will have access to it. All other data (research data) will be kept securely for 7 years. After this time your data will be disposed of securely. During this time all precautions will be taken by all those involved to maintain your confidentiality, only members of the research team given permission by the data custodian will have access to your personal data.

In accordance with the University of Nottingham's, the Government's and our funders' policies we may share our research data with researchers in other Universities and organisations, including those in other countries, for research in

health and social care. Sharing research data is important to allow peer scrutiny, re-use (and therefore avoiding duplication of research) and to understand the bigger picture in particular areas of research. Data sharing in this way is usually anonymised (so that you could not be identified) but if we need to share identifiable information we will seek your consent for this and ensure it is secure.

8. What will happen to the results of the research?

The research will be written up as a thesis. On successful submission of the thesis, it will be saved both in print and online in the University archives, to facilitate its use in future research. The research may also be published in a peer reviewed journal.

If you wish to receive a summary sheet of the study's findings, you will be provided with this at the end of the study (please indicate this on the consent form).

9. Who has reviewed this study?

The East of Scotland Research Ethics Service REC 1, which has responsibility for scrutinising all proposals for medical research on humans, has examined the proposal and has raised no objections from the point of view of research ethics. It is a requirement that your records in this research, together with any relevant medical records, be made available for scrutiny by monitors from the University of Nottingham and [redacted], whose role is to check that research is properly conducted and the interests of those taking part are adequately protected.

10.Who is organising and sponsoring the research?

The research team (the researcher, their primary supervisor/Chief Investigator & secondary supervisor) is responsible for organising the research and University of Nottingham is sponsoring the research.

11.What if something goes wrong?

If you have a concern about any aspect of this project, please speak to the lead researcher (Oliver Johnson), who will do their best to answer your query. The researcher should acknowledge your concern within 10 working days and inform you how he intends to deal with it. If you remain unhappy and wish to complain formally, you can do this by contacting the FMHS Research Ethics Committee Administrator [redacted].

12.Contact Details

If you would like to discuss the research with someone beforehand (or if you have questions afterwards), please contact:

Oliver Johnson,
[redacted]

Appendix I

CONSENT FORM

(Final Version 2.0: 23.07.20)

Title of Study: Early experiences, impulsivity and inhibitory control.

IRAS Project ID: 257761 **CTA ref:** 20/ES/0063

Name of Researcher: Oliver Johnson

Study ID: initial box

1. I confirm that I have read the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. I understand that should I withdraw then the information collected so far cannot be erased and that this information may still be used in the project analysis. ☐
3. I understand that relevant sections of my medical notes and data collected during the study, may be looked at by individuals from the University of Nottingham, the research team and regulatory authorities where it is relevant to my taking part in this research. ☐
4. I give permission for individuals named in point 3 to have access to my data, and to collect, store, analyse and publish information obtained from my participation in this study. ☐
5. I understand that my personal details will be kept confidential. ☐
6. I understand that if information related to risk (i.e. physical or mental health, risk to others, from others, or to self) arises during data collection, the researcher may be required to notify my Responsible Clinician. ☐
7. Please initial this box if you would like a summary sheet of the study's findings. ☐
8. I agree to take part in the above study. ☐

_____	_____	_____
Name of Participant	Date	Signature
_____	_____	_____
Name of Person taking consent	Date	Signature

Appendix J

TOMM Score Sheet: Trial 1

	A	B			A	B	
1.	**spinning wheel**	cookie	❐	26.	T.V.	**light bulb**	❐
2.	tent	**tissue box**	❐	27.	**maple leaf**	boat	❐
3.	dustpan	**mouse**	❐	28.	crutch	**wrench**	❐
4.	**quill pen**	teepee	❐	29.	hoe	**cake**	❐
5.	birdbath	**can**	❐	30.	**key**	sock	❐
6.	**suitcase**	comb	❐	31.	cloud	**rose**	❐
7.	**pennant**	boat	❐	32.	**racket**	pencil	❐
8.	gas pump	**musical notes**	❐	33.	corn	**ladder**	❐
9.	ring	**guitar**	❐	34.	**wheelbarrow**	fire hydrant	❐
10.	**hat**	Christmas tree	❐	35.	**whistle**	grapes	❐
11.	**muffin pan**	train	❐	36.	toilet paper	**birdhouse**	❐
12.	mailbox	**paintbrush**	❐	37.	**shopping cart**	teddy bear	❐
13.	wheat	**axe**	❐	38.	cigarettes	**ice cream**	❐
14.	**jack o' lantern**	coat hanger	❐	39.	**roller skates**	glue	❐
15.	wallet	**scissors**	❐	40.	cherries	**umbrella**	❐
16.	safety pin	**elephant**	❐	41.	**life preserver**	mountains	❐
17.	**saw**	door	❐	42.	wheelchair	**stapler**	❐
18.	**butterfly net**	lawn mower	❐	43.	**swing set**	bunk bed	❐
19.	pullout bed	**candle**	❐	44.	soup ladle	**pail & shovel**	❐
20.	**motorcycle**	knife	❐	45.	dice	**iron**	❐
21.	fishing pole	**sewing machine**	❐	46.	**carrot**	book	❐
22.	**jack-in-the-box**	rocking chair	❐	47.	drum	**dart**	❐
23.	**bench**	fence	❐	48.	**paper clip**	bird cage	❐
24.	screw	**stool**	❐	49.	**vest**	telescope	❐
25.	**toaster**	bow & arrow	❐	50.	end table	**mask**	❐

TOTAL Correct for Trial 1 = ☐

Appendix K

DIRECTIONS: People differ in the ways they act and think in different situations. This is a test to measure some of the ways in which you act and think. Read each statement and put an X on the appropriate circle on the right side of this page. Do not spend too much time on any statement. Answer quickly and honestly.

① Rarely/Never ② Occasionally ③ Often ④ Almost Always/Always

1	I plan tasks carefully.	①	②	③	④
2	I do things without thinking.	①	②	③	④
3	I make-up my mind quickly.	①	②	③	④
4	I am happy-go-lucky.	①	②	③	④
5	I don't "pay attention."	①	②	③	④
6	I have "racing" thoughts.	①	②	③	④
7	I plan trips well ahead of time.	①	②	③	④
8	I am self controlled.	①	②	③	④
9	I concentrate easily.	①	②	③	④
10	I save regularly.	①	②	③	④
11	I "squirm" at plays or lectures.	①	②	③	④
12	I am a careful thinker.	①	②	③	④
13	I plan for job security.	①	②	③	④
14	I say things without thinking.	①	②	③	④
15	I like to think about complex problems.	①	②	③	④
16	I change jobs.	①	②	③	④
17	I act "on impulse."	①	②	③	④
18	I get easily bored when solving thought problems.	①	②	③	④
19	I act on the spur of the moment.	①	②	③	④
20	I am a steady thinker.	①	②	③	④
21	I change residences.	①	②	③	④
22	I buy things on impulse.	①	②	③	④
23	I can only think about one thing at a time.	①	②	③	④
24	I change hobbies.	①	②	③	④
25	I spend or charge more than I earn.	①	②	③	④
26	I often have extraneous thoughts when thinking.	①	②	③	④
27	I am more interested in the present than the future.	①	②	③	④
28	I am restless at the theater or lectures.	①	②	③	④
29	I like puzzles.	①	②	③	④
30	I am future oriented.	①	②	③	④

Appendix L

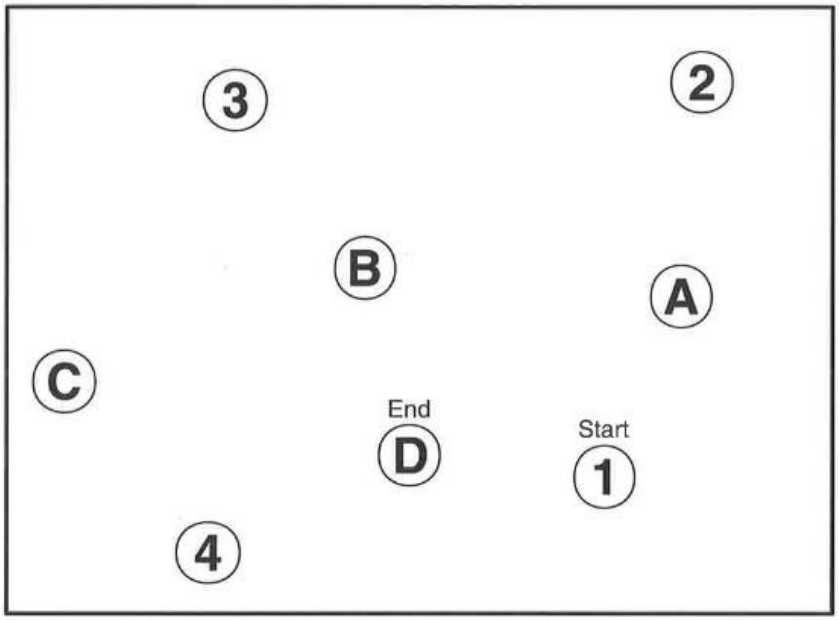
DELIS • KAPLAN
D·KEFS™
Executive Function System™

Name _____ Age _____
ID _____ Date _____
Examiner _____
Notes _____

Trail Making Test

Condition 4
Number–Letter Switching

Practice



20 21 22 23 24 A B C D E

D-KEFS Color-Word Interference Test *(continued)*

Condition 3: Inhibition

Discontinue

Discontinue if the examinee has marked difficulty or requires four corrections on the two practice lines. Otherwise, discontinue the scored task after 180 seconds.

Administration and Recording

Place the stimulus booklet flat on the table in a horizontal (landscape) position directly in front of the examinee, with the rows of words printed in dissonant ink colors facing the examinee. Say,

> **Now look at this page. It's going to be a little harder than the other pages because the color names are printed in a different-colored ink. For example** (point to the first word on the first practice line of five words), **do you see how the word *red* is printed in *green* ink here? This time, you are to name *the color of the ink* that the letters are printed in and *not read the word*. So, what would you say for this one?** (Point again to the first word on the first practice line and allow the examinee to respond. Correct any errors.) **Good. And this one?** (Point to the next two practice items. Correct any errors.) **Good. Now try these first two lines for practice.**

If the examinee has difficulty understanding the task, you may demonstrate it by naming the ink colors on the first practice line, then inviting the examinee to respond to the second line. If the examinee requires four corrections on the two practice lines, discontinue this condition and do not administer Condition 4: Inhibition/Switching.

If the examinee is able to complete the two practice lines, say,

> **Good. Now, when I say begin, I want you to do the same thing for the rest of them. Say the color of the ink the letters are printed in; do not read the words. Begin here** (point to the first word on the first line of 10 words below the practice lines) **and say each ink color, one after the other, without skipping any. Keep saying the ink colors until you reach the end** (point to the last word of the last line)**. Say the ink colors as quickly as you can without making mistakes. Ready? Begin.**

Start timing. Follow the examinee's progress item by item. The single letter (*r* for red, *b* for blue, *g* for green) printed in parentheses next t each correct response represents the error response if the examinee reads the word rather than naming the ink color. Record errors by circling the letter or by writing the initial letter of other incorrect colors beneath the correct response. Also record any nonsense words (e.g., "bleen") verbatim. Indicate self-corrections by drawing a slash through the letter or word. Record total completion time in seconds.

Allow the examinee to use a finger to maintain his or her place on the stimulus page. If the examinee skips a line accidentally, point out the error immediately and redirect the examinee to the correct line. Keep the stopwatch running while pointing out line-skipping errors.

If the examinee makes three consecutive errors of reading the words, prompt him or her to name the ink color. Provide this prompt only once during this condition and keep the stopwatch running.

If the examinee does not complete the task at the end of 180 seconds, say, **Stop.** Indicate the last item attempted and record 180 seconds as the total completion time. Items to which the examinee did not respond because the time limit was reached are not counted as errors. Turn the page in the stimulus booklet to Condition 4: Inhibition/Switching.

green(r) red(b) blue(g) green(b) red(g)

blue(r) red(b) green(r) red(g) green(r)

red(b) blue(g) red(b) green(r) red(b) blue(r) green(b) blue(r) red(b) green(r)

red(b) blue(g) green(b) blue(g) green(r) blue(g) red(b) green(r) red(b) blue(g)

green(r) blue(g) green(r) red(b) blue(g) green(r) red(g) blue(r) green(b) red(g)

green(b) blue(g) red(b) green(r) blue(g) red(b) green(r) blue(g) green(r) red(g)

blue(g) green(b) blue(r) red(b) blue(g) green(r) red(b) blue(g) green(r) red(b)

Condition 3: Inhibition

Total Uncorrected Errors	Total Self-Corrected Errors	Total Time To Complete

10

Color

Appendix N

CHILD TRAUMA QUESTIONAIRE (CTQ) – SHORT FORM

These questions ask about some of your experiences growing up as a child and a teenager. For each question, circle (or select in any other way if completing online) the number that best describes how you feel. Although some of these questions are of a personal nature, please try to answer as honestly as you can. Your answers will be kept confidential.

Q	QUESTION	NEVER TRUE	RARELY TRUE	SOMETIMES TRUE	OFTEN TRUE	VERY OFTEN TRUE
When I was growing up						
1	I didn't have enough to eat.	1	2	3	4	5
2	I knew that there was someone to take care of me and protect me.	1	2	3	4	5
3	People in my family called me things like "stupid", "lazy", or "ugly".	1	2	3	4	5
4	My parents were too drunk or high to take care of the family.	1	2	3	4	5
5	There was someone in my family who helped me feel important or special	1	2	3	4	5
When I was growing up						
6	I had to wear dirty clothes	1	2	3	4	5
7	I felt loved.	1	2	3	4	5
8	I thought that my parents wished I had never been born	1	2	3	4	5
9	I got hit so hard by someone in my family that I had to see a doctor or go to the hospital.	1	2	3	4	5
10	There was nothing I wanted to change about my family.	1	2	3	4	5
When I was growing up						
11	People in my family hit me so hard that it left me with bruises or marks.	1	2	3	4	5
12	I was punished with a belt, a board, a cord (or some other hard object).	1	2	3	4	5
13	People in my family looked out for each other.	1	2	3	4	5
14	People in my family said hurtful or insulting things to me.	1	2	3	4	5
15	I believe that I was physically abused.	1	2	3	4	5
When I was growing up						
16	I had the perfect childhood.	1	2	3	4	5
17	I got hit or beaten so badly that it was noticed by someone like a teacher, neighbour, or doctor.	1	2	3	4	5
18	Someone in my family hated me.	1	2	3	4	5
19	People in my family felt close to each other.	1	2	3	4	5
20	Someone tried to touch me in a sexual way or tried to make me touch them.	1	2	3	4	5
When I was growing up						
21	Someone threatened to hurt me or tell lies about me unless I did something sexual with them.	1	2	3	4	5
22	I had the best family in the world.	1	2	3	4	5
23	Someone tried to make me do sexual things or watch sexual things.	1	2	3	4	5
24	Someone molested me (took advantage of me sexually).	1	2	3	4	5
25	I believe that I was emotionally abused.	1	2	3	4	5
When I was growing up						
26	There was someone to take me to the doctor if I needed it	1	2	3	4	5
27	I believe that I was sexually abused.	1	2	3	4	5
28	My family was a source of strength and support.	1	2	3	4	5

Appendix O

Ymchwil Iechyd a Gofal Cymru
Health and Care Research Wales

NHS
Health Research Authority

Dr Kathleen Green
University of Nottingham
Room B06 Yang Fujia Building
Jubilee Campus
NG8 1BB

Email: approvals@hra.nhs.uk
HCRW.approvals@wales.nhs.uk

10 August 2020

Dear Dr Green

HRA and Health and Care Research Wales (HCRW) Approval Letter

Study title:	**Childhood trauma, impulsivity, and inhibitory control in a forensic mental health population.**
IRAS project ID:	**257761**
Protocol number:	**20015**
REC reference:	**20/ES/0063**
Sponsor	**University of Nottingham**

I am pleased to confirm that **HRA and Health and Care Research Wales (HCRW) Approval** has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications received. You should not expect to receive anything further relating to this application.

Please now work with participating NHS organisations to confirm capacity and capability, in line with the instructions provided in the "Information to support study set up" section towards the end of this letter.

How should I work with participating NHS/HSC organisations in Northern Ireland and Scotland?
HRA and HCRW Approval does not apply to NHS/HSC organisations within Northern Ireland and Scotland.

If you indicated in your IRAS form that you do have participating organisations in either of these devolved administrations, the final document set and the study wide governance report (including this letter) have been sent to the coordinating centre of each participating nation. The relevant national coordinating function/s will contact you as appropriate.

Please see IRAS Help for information on working with NHS/HSC organisations in Northern Ireland and Scotland.

How should I work with participating non-NHS organisations?
HRA and HCRW Approval does not apply to non-NHS organisations. You should work with your non-NHS organisations to obtain local agreement in accordance with their procedures.

What are my notification responsibilities during the study?

The standard conditions document "*After Ethical Review – guidance for sponsors and investigators*", issued with your REC favourable opinion, gives detailed guidance on reporting expectations for studies, including:

- Registration of research
- Notifying amendments
- Notifying the end of the study

The HRA website also provides guidance on these topics, and is updated in the light of changes in reporting expectations or procedures.

Who should I contact for further information?
Please do not hesitate to contact me for assistance with this application. My contact details are below.

Your IRAS project ID is **257761**. Please quote this on all correspondence.

Yours sincerely,
Barbara Cuddon

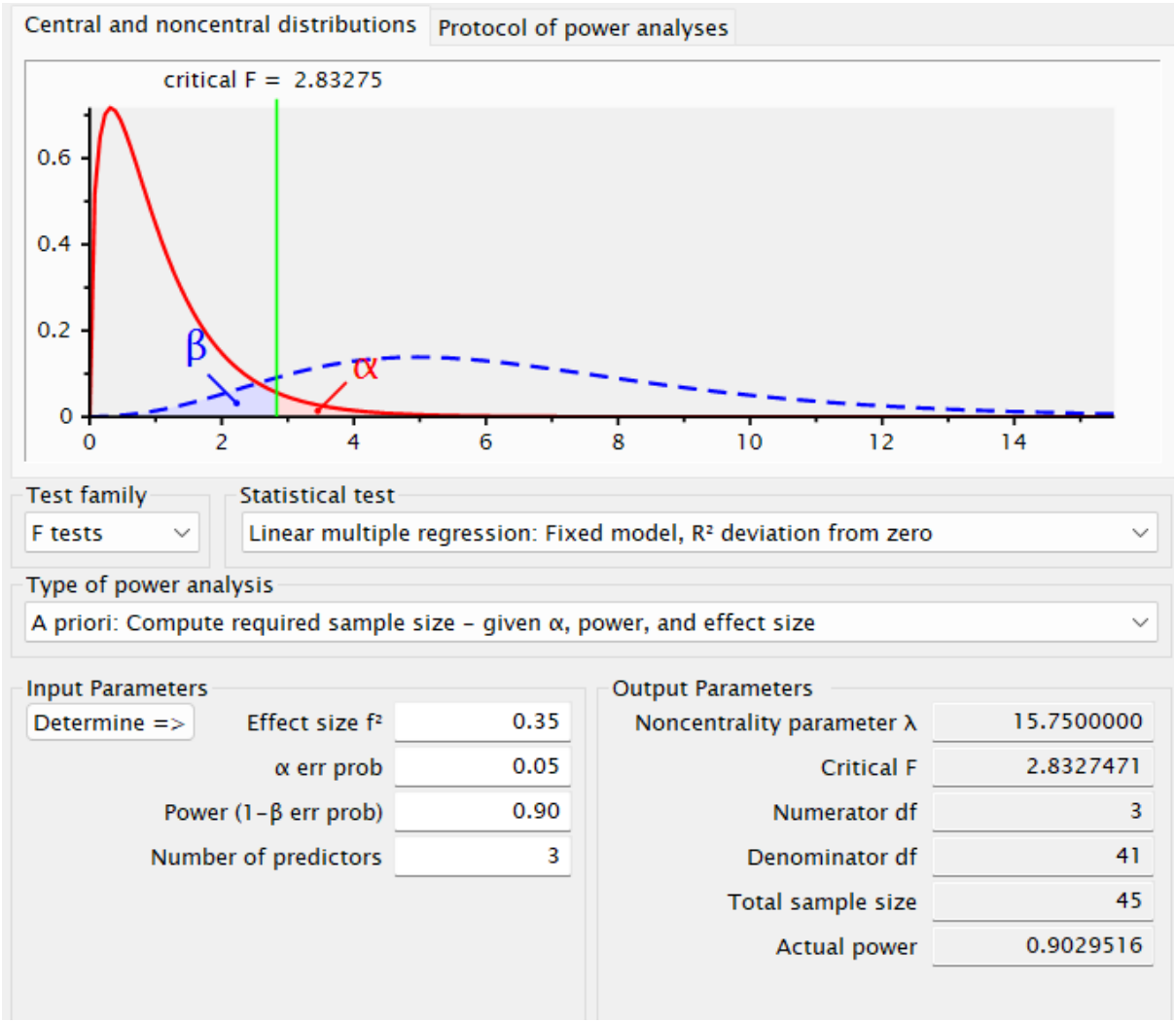
Approvals Specialist

Email: approvals@hra.nhs.uk

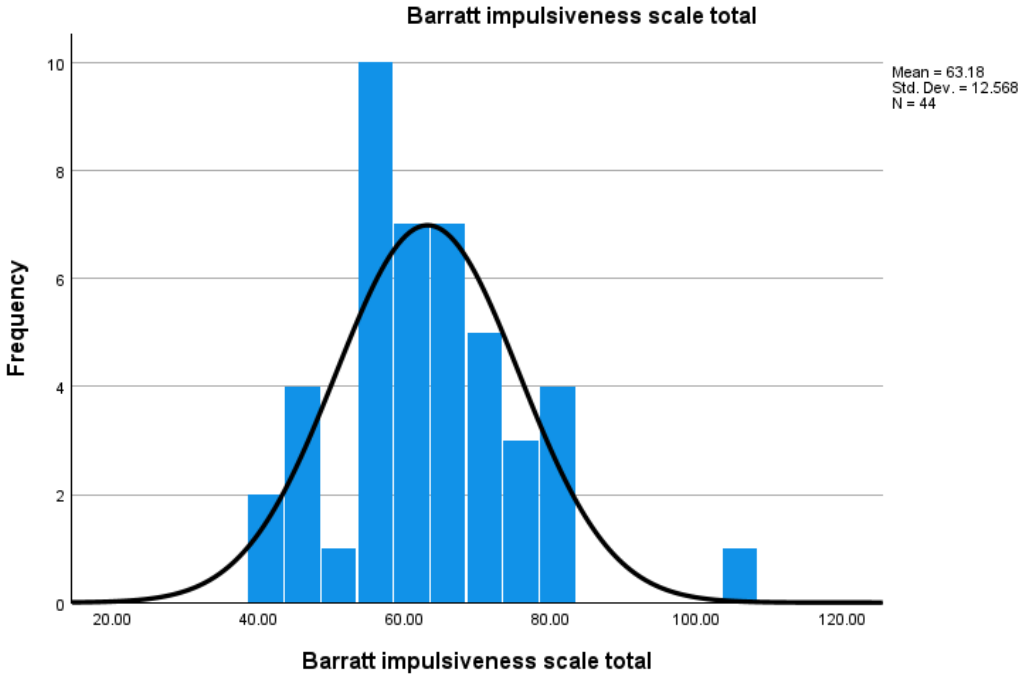
Copy to: *Ms Angela Shone*

Appendix P

Primary Study: G*Power output



Appendix Q


Barratt impulsiveness scale total
Mean = 63.18
Std. Dev. = 12.568
N = 44
Frequency
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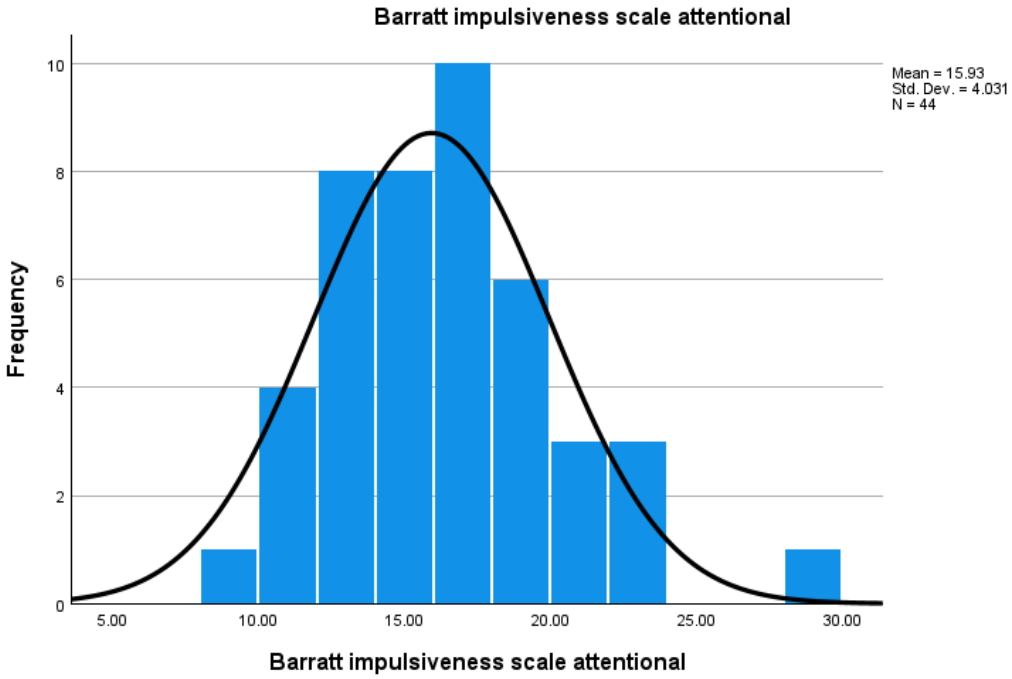
2
4
6
8
10
20.00
40.00
60.00
80.00
100.00
120.00
Barratt impulsiveness scale total


Barratt impulsiveness scale attentional
Mean = 15.93
Std. Dev. = 4.031
N = 44
Frequency
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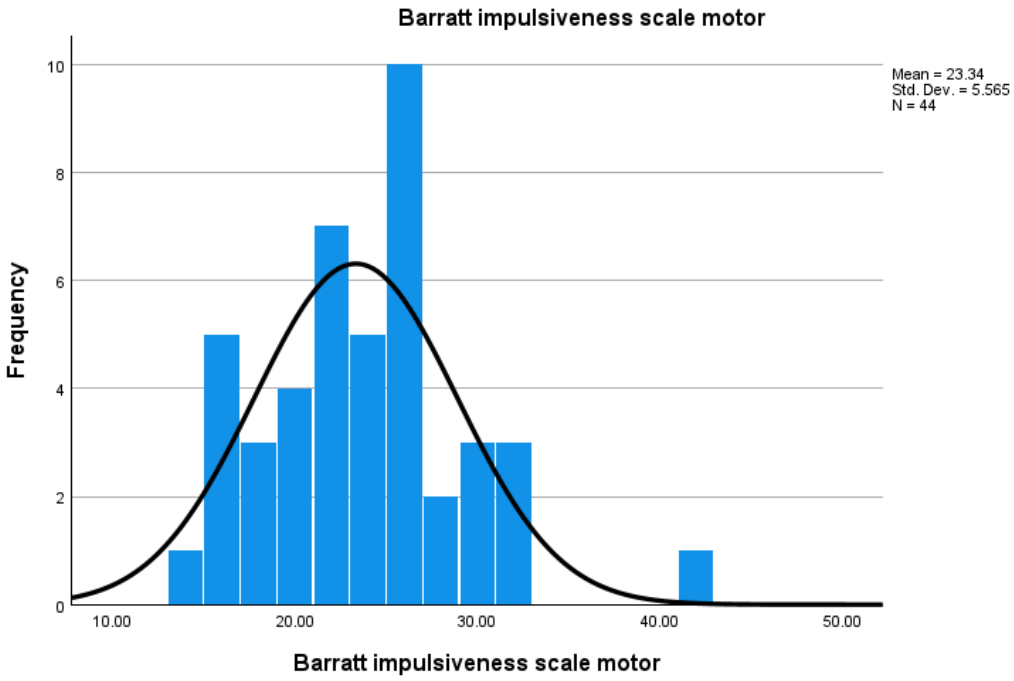
4
6
8
10
5.00
10.00
15.00
20.00
25.00
30.00
Barratt impulsiveness scale attentional


Barratt impulsiveness scale motor
Mean = 23.34
Std. Dev. = 5.565
N = 44
Frequency
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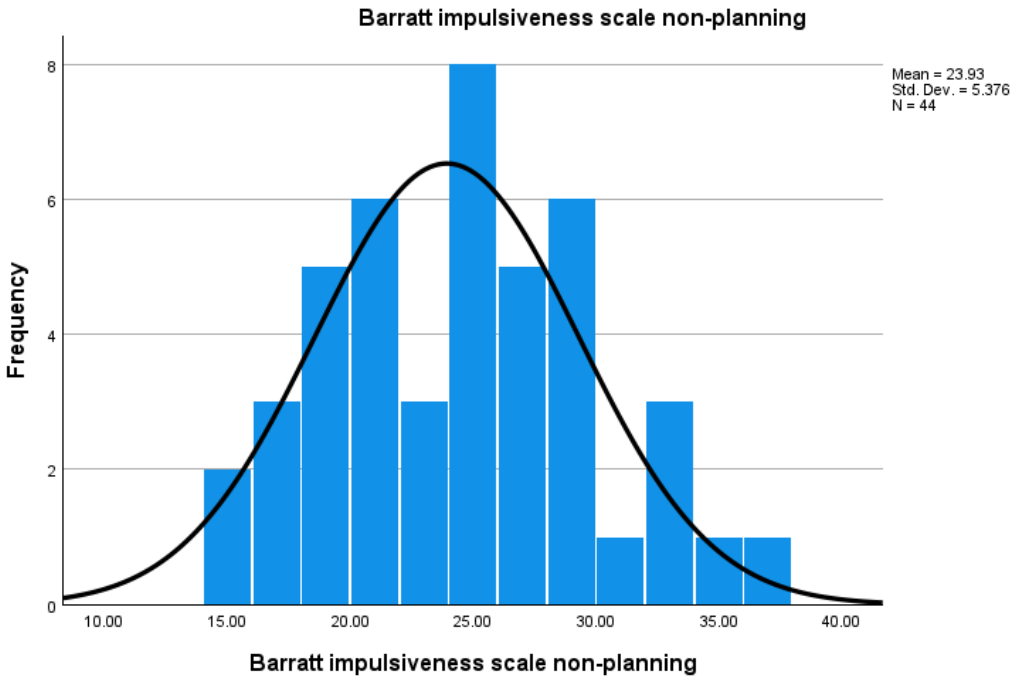
6
8
10
10.00
20.00
30.00
40.00
50.00
Barratt impulsiveness scale motor


Barratt impulsiveness scale non-planning
Mean = 23.93
Std. Dev. = 5.376
N = 44
Frequency
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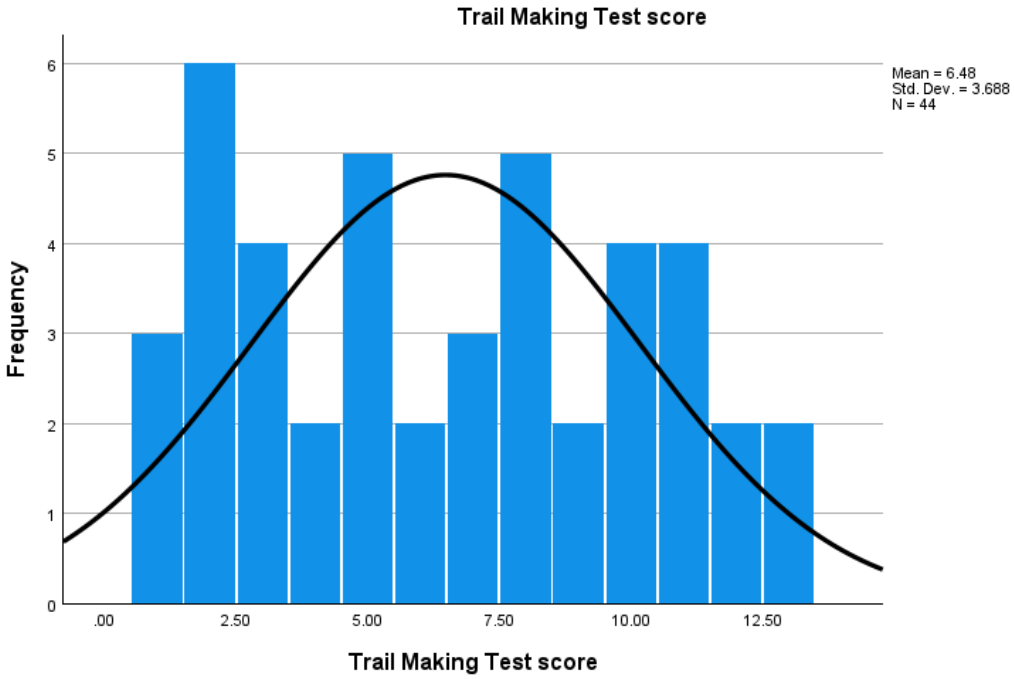
4
6
8
10.00
15.00
20.00
25.00
30.00
35.00
40.00
Barratt impulsiveness scale non-planning


Trail Making Test score
Mean = 6.48
Std. Dev. = 3.688
N = 44
Frequency
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3
4
5
6
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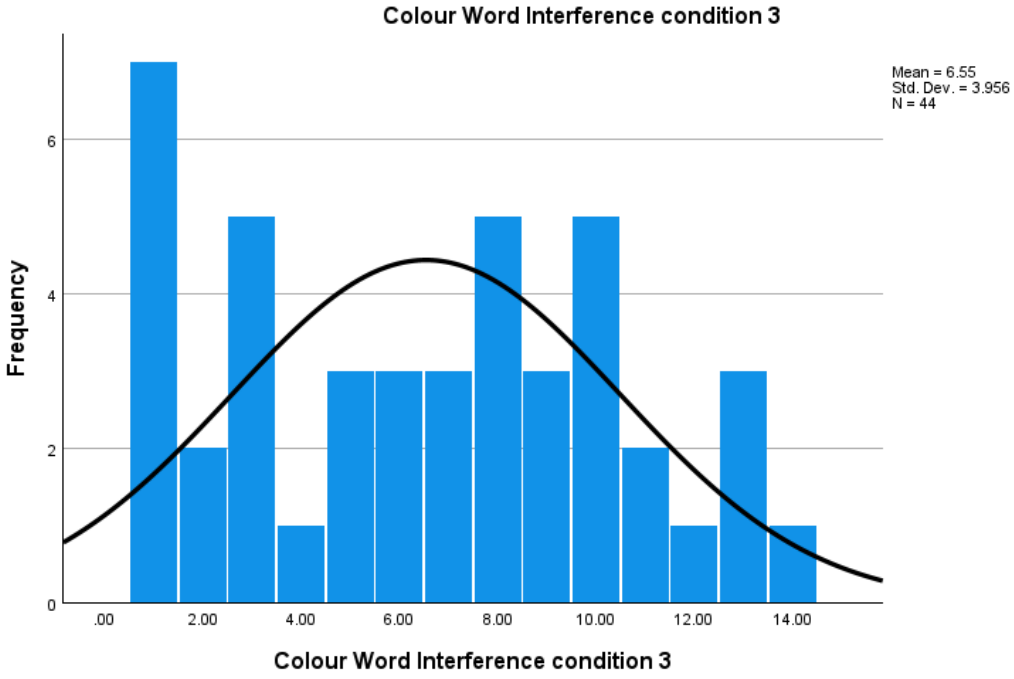
5.00
7.50
10.00
12.50
Trail Making Test score


Colour Word Interference condition 3
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Std. Dev. = 3.956
N = 44
Frequency
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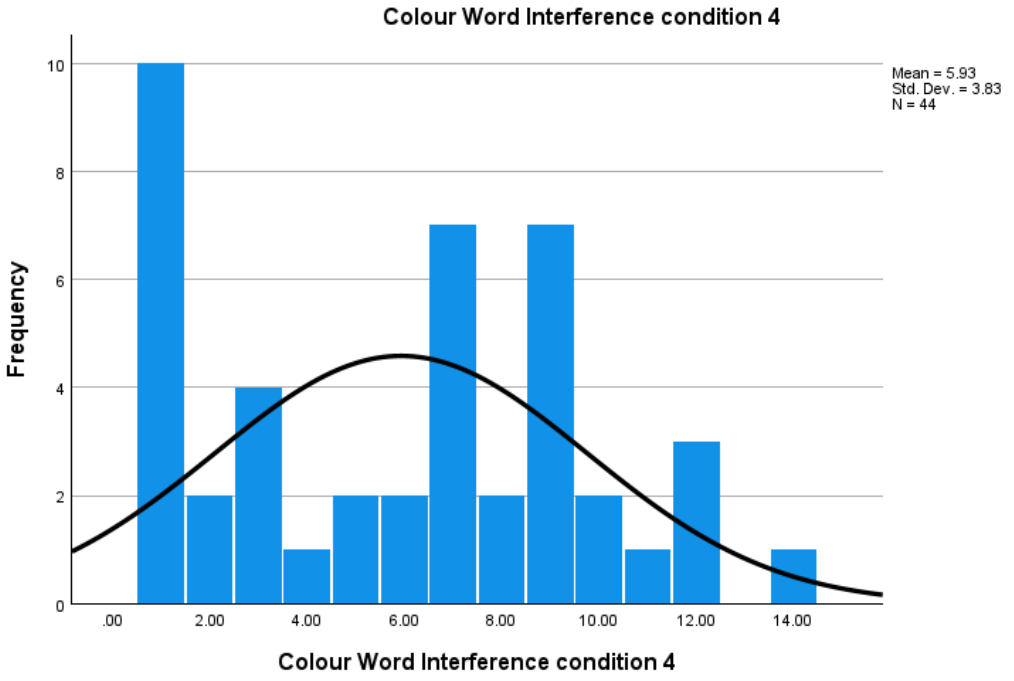
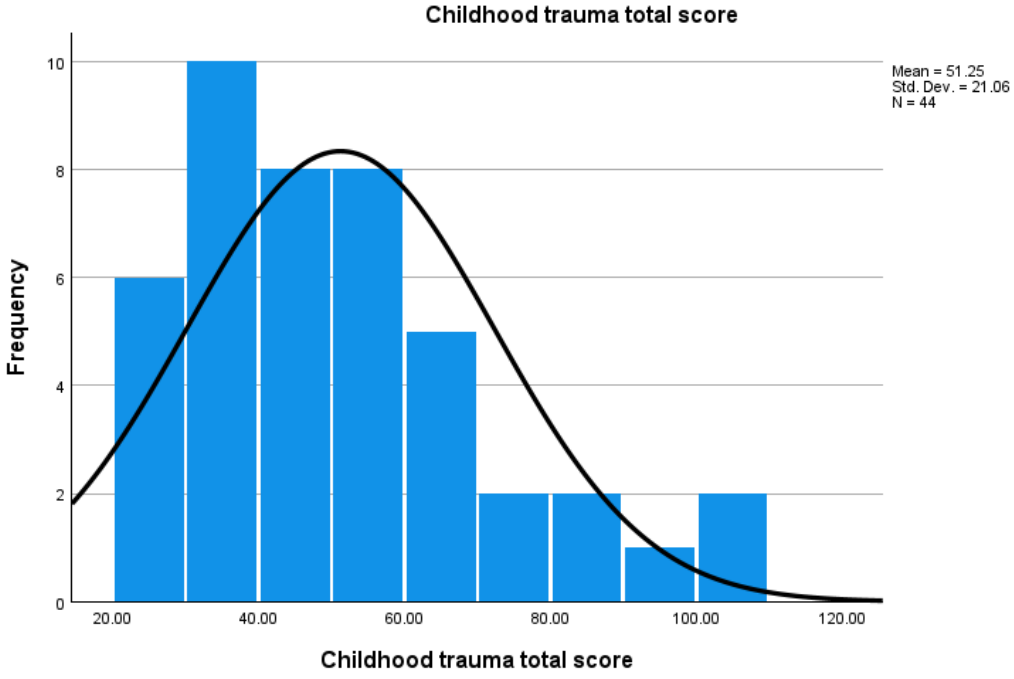
6
.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Colour Word Interference condition 3


Colour Word Interference condition 4
Mean = 5.93
Std. Dev. = 3.83
N = 44
Frequency
0
2
4
6
8
10
.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Colour Word Interference condition 4


Childhood trauma total score
Mean = 51.25
Std. Dev. = 21.06
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Frequency
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6
8
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20.00
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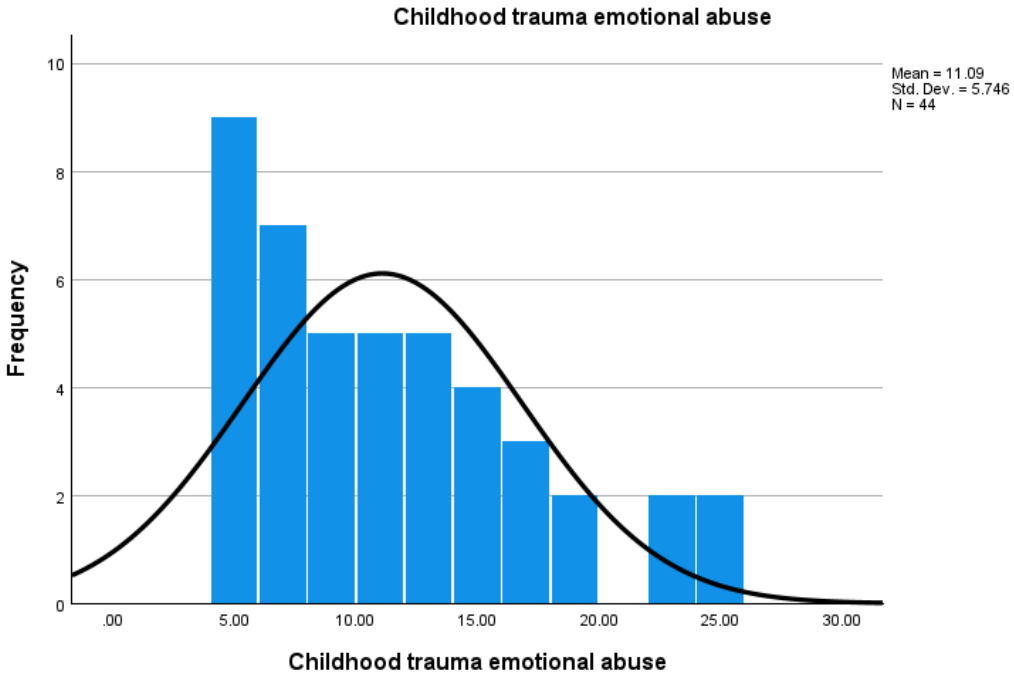
60.00
80.00
100.00
120.00
Childhood trauma total score


Childhood trauma emotional abuse
Mean = 11.09
Std. Dev. = 5.746
N = 44
Frequency
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2
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6
8
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5.00
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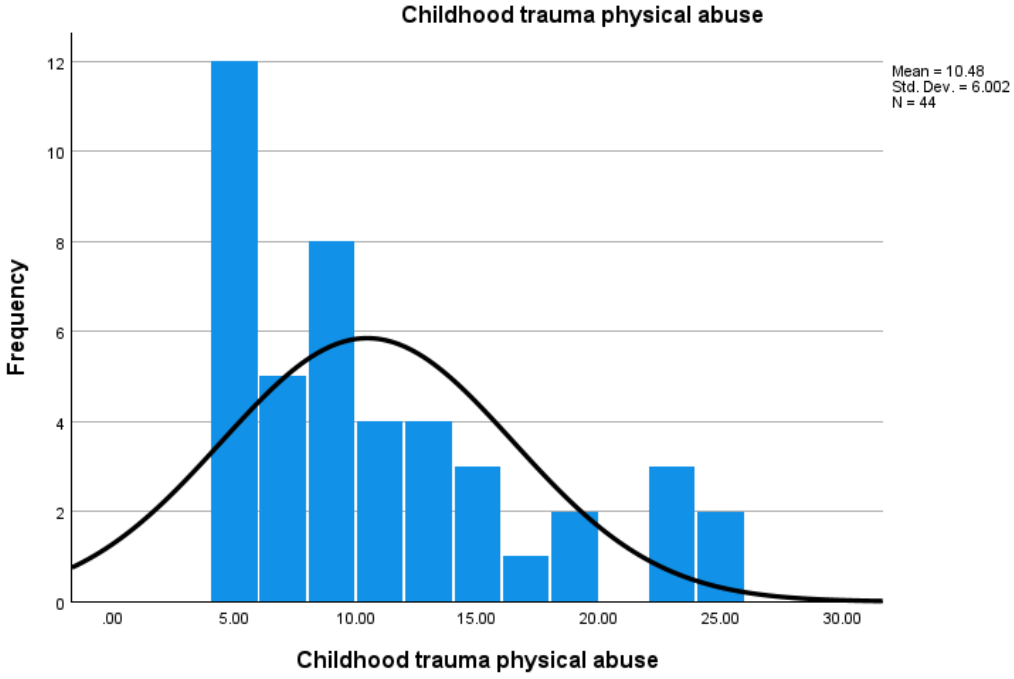
15.00
20.00
25.00
30.00
Childhood trauma emotional abuse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Std. Dev. = 6.002
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Frequency
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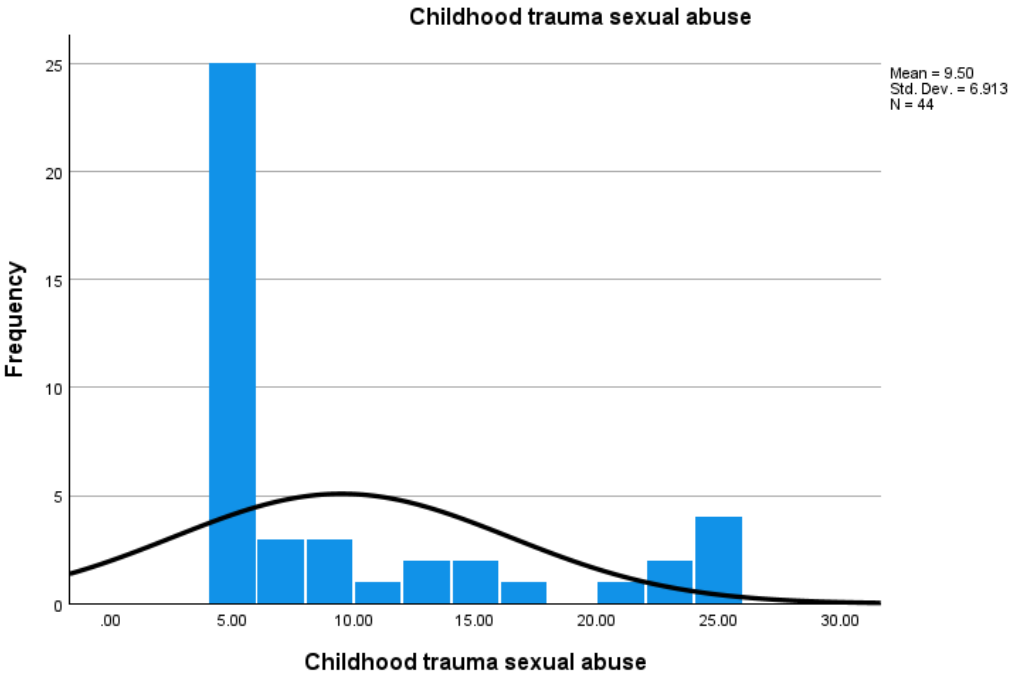
20.00
25.00
30.00
Childhood trauma physical abuse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Std. Dev. = 6.913
N = 44
Frequency
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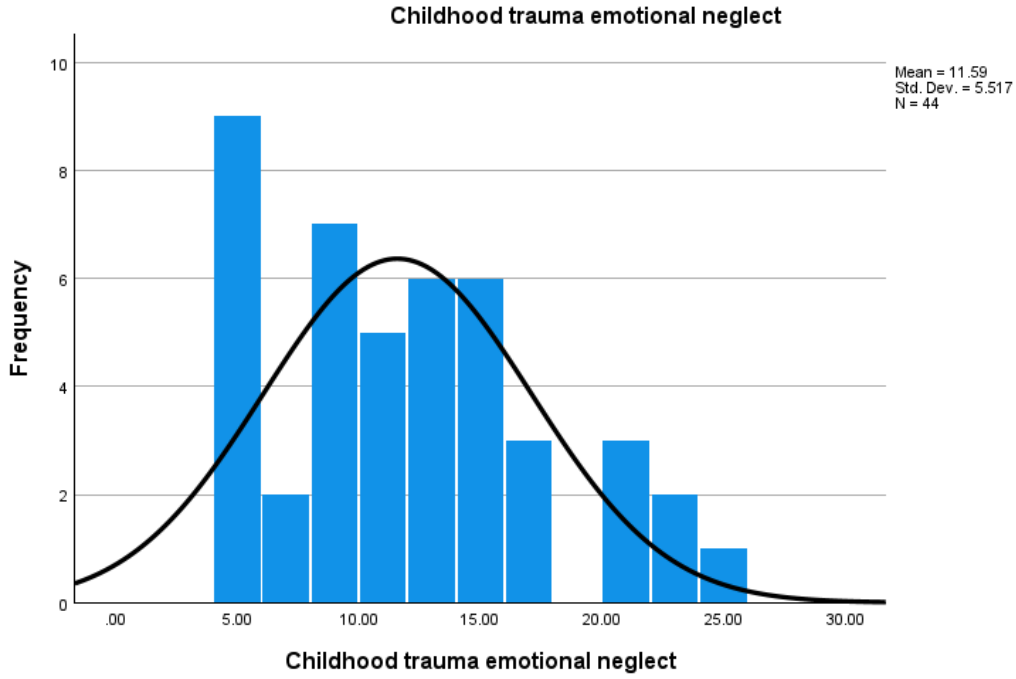
15.00
20.00
25.00
30.00
Childhood trauma sexual abuse


Childhood trauma emotional neglect
Mean = 11.59
Std. Dev. = 5.517
N = 44
Frequency
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4
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5.00
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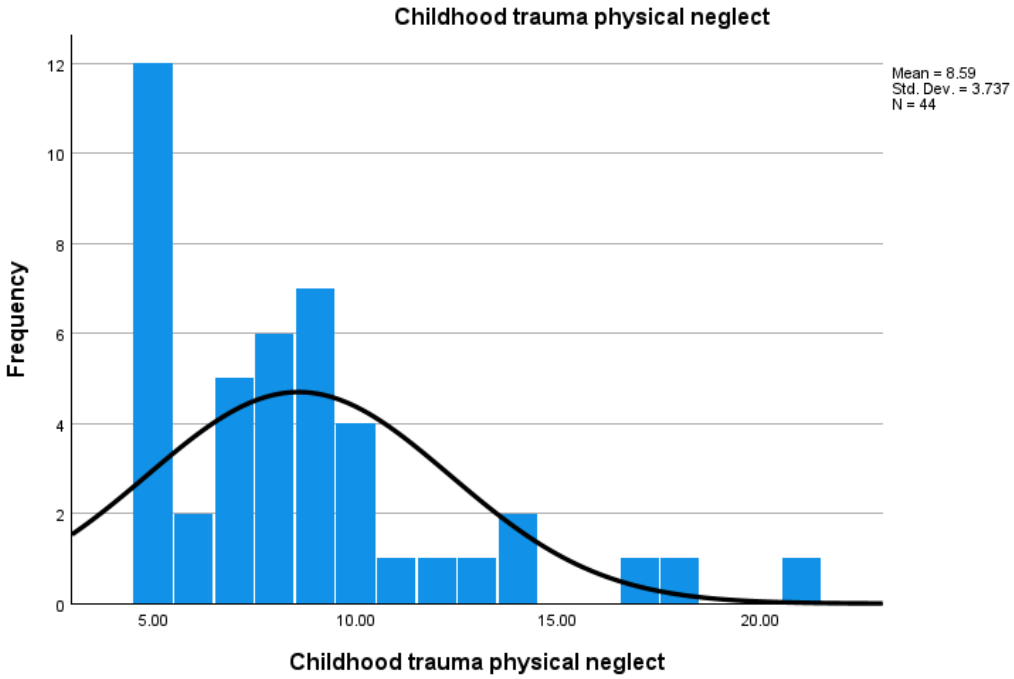
15.00
20.00
25.00
30.00
Childhood trauma emotional neglect


Childhood trauma physical neglect
Mean = 8.59
Std. Dev. = 3.737
N = 44
Frequency
12
10
8
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4
2
0
5.00
10.00
15.00
20.00
Childhood trauma physical neglect

Appendix R

Childhood trauma, impulsivity, and inhibitory control in a forensic mental health population.

Final Version 2.0

23.07.2020

Short title: Childhood trauma, impulsivity and inhibitory control

IRAS Project ID: 257761

Study Sponsor: University of Nottingham

Sponsor reference: 20015

Funding Source:

SYNOPSIS

Title	Childhood trauma, impulsivity, and inhibitory control in a forensic mental health population.
Short title	Childhood trauma, impulsivity, and inhibitory control.
Chief Investigator	
Objectives	The **primary objective** is to explore the relationship between childhood trauma and adult impulsivity within a forensic population. The **secondary objective** is to explore whether the relationship between childhood trauma and adult impulsivity is mediated by inhibitory control.
Study Configuration	The study will be conducted on a single NHS Trust site, comprising three separate secure units (male low secure, male medium secure and female medium secure).
Setting	Secondary care.
Sample size estimate	50
Eligibility criteria	**Inclusion criteria**: 1) male and female service users at identified forensic mental health service; 2) aged between 18 and 65 years; 3) Proficiency in English language; and 4) capacity to give informed consent. **Exclusion criteria:** 1) diagnosed learning disability/neurodegenerative disease; 2) acute symptoms of mental illness; and 3) not proficient in English language.
Description of interventions	Primary data will be collected using an assessment battery comprising the following assessment measures: Childhood Trauma Questionnnaire

	(CTQ), Barratt Impulsivness Scale (BIS-11), Test of Memory Malingering (TOMM), D-KEFS Trail making Test, D-KEFS Color-Word Interference Test.
Duration of study	The study should last ten months.
Methods of analysis	Regression and mediation analyses will be used.

ABBREVIATIONS

ACE	Adverse Childhood Experiences
BD	Bipolar Disorder
BIS-11	Barratt Impulsiveness Scale
CTQ	Childhood Trauma Questionnaire
CWIT	Color-Word Interference Test
D-KEFS	Delis-Kaplan Executive Functioning System
GCP	Good Clinical Practice
HCR-20	Historical Clinical Risk Management Version 3
IRAS	Integrated Research Application System
NHS	National Health Service
PIS	Participant Information Sheet
REC	Research Ethics Committee
R&D	Research and Development department
SPSS	Statistical Package for Social Sciences
TOMM	Test of Memory Malingering
TMT	Trail Making Test
UoN	University of Nottingham

STUDY BACKGROUND INFORMATION AND RATIONALE

Trauma and impulsivity

Impulsive behaviours, including verbal and physical aggression, self-harm, substance misuse and binge eating are commonplace and difficult to manage within forensic mental health services. Behaviours such as physical aggression and self-harm generate fear amongst staff members and overreliance on interventions such as seclusion and physical restraint (Foster, Bowers, & Nijman, 2007). Stress and 'burnout' is another negative consequence for health professionals who manage impulsive behaviour within mental health services (Jenkins, 2004).

Thus, it is important to develop a thorough understanding of the factors which may predispose impulsive behaviour. Assessments of violence, widely used within forensic mental services such as the HCR-20 V3 (Historical Clinical Risk Management Version 3) were developed from evidence that ten historical risk factors predict violent behaviour (Douglas, Hart, Webster & Belfrage, 2013). One of these factors is 'Traumatic experiences' (including childhood trauma). Existing research indicates links between childhood trauma and impulsivity (Beers & De Bellis, 2002; Cicchetti & Curtis, 2005; Narvaez et al., 2012; Pears & Fisher, 2005; Roy, 2005, Shin, McDonald, & Conley, 2018). A recent study explored associations between 'adverse childhood experiences' (ACEs) (which can be thought of as a broader definition of childhood trauma) and impulsivity (Shin et al., 2018). High ACE scores were positively correlated with impulsivity, namely the personality trait 'negative urgency'. Individuals with this trait are likely to interpret ordinary situations as threatening and often respond by engaging with impulsive behaviour. Two earlier studies also found that this personality trait was one most closely linked with childhood adversity (Oshri et al., 2017; Wardell et al., 2016). Moreover, childhood trauma was associated with higher levels of impulsivity in a sample of crack cocaine users in Brazil (Narvaez et al., 2012). In this study, impulsivity was measured using Barratt Impulsiveness Scale (BIS-11). Using the same measures for childhood trauma (CTQ; Childhood Trauma Questionnaire) and impulsivity (BIS-11), Roy (2005) similarly found a relationship between the two factors.

Whilst the cited research provides evidence of links between childhood trauma/adversity and adult impulsivity, no known study has investigated this relationship within a forensic mental health population. Thus, it would be beneficial to explore the relationship between childhood trauma and impulsivity in forensic mental health services. This may help to explain what predisposes impulsive behaviour within a population where such behaviour is prevalent.

Defining and measuring 'impulsivity'

'Impulsiveness' or 'impulsivity' is widely considered a complex construct and has been defined *"as a predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions to the impulsive individuals or to others"* (Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001 p. 1784). The terms 'impulsivity' and 'impulsiveness' are used interchangeably within the present research. Whilst impulsivity

has been viewed as having a function within healthy populations, for instance, in activities associated with employment behaviours (Everton, Mastrangelo, & Jolton, 2005), it is generally viewed as disadvantageous by society. Thus, it is often associated with various socially deviant behaviours such as substance misuse (Swann, Dougherty, Pazzaglia, Pham, & Moeller, 2004) and physical aggression (Houston, Stanford, Villemarette-Pittman, Conklin, & Helfritz, 2003). Such behaviours are considered problematic within forensic mental health services and underpin the present study's rationale. Barratt developed the Barratt Impulsiveness Scale (BIS-11) to measure 3 subtraits of impulsiveness: attentional impulsiveness – inability to focus attention or concentrate, motor impulsiveness – acting without thinking; and non-planning impulsiveness – a lack of futuring or forethought (Barratt, 1985). One might reasonably expect the subtrait of motor impulsiveness to be most strongly associated with impulsive behaviours such as physical aggression, self-harm and substance misuse. However, attentional and non-planning subtraits of impulsiveness may also underlie impulsive behaviour.

The BIS-11 is arguably the most commonly used self-report measure for assessing impulsiveness in both research and clinical settings (Stanford et al., 2009). A number of studies associated with the present research have measured impulsiveness using the BIS-II (Brodsky et al., 2001; Cheung, Mitsis, & Halperin, 2004; Enticott, Ogloff, & Bradshaw, 2006; Narvaez et al., 2012; Spinella, 2005; Whitney, Jameson, & Hinson, 2004). Whilst the present research is primarily concerned with impulsive behaviour it will measure impulsivity at the trait level with a view to better understand what drives impulsive behaviour.

Trauma and executive functioning

Impaired executive functioning among those who have experienced childhood trauma is widely reported within the literature (Dileo et al., 2017; Marshall et al., 2016; Majer et al., 2010; Navalta et al., 2006; Nikulina & Widom, 2013; Kavanaugh, Holler, & Selke; 2015; Spann et al., 2012). Majer et al. (2010) found that childhood abuse and neglect was associated with working memory deficits in adulthood. Nikulina and Widom (2013) reported that cognitive flexibility (i.e. switching between different mental tasks) was impaired within individuals in middle adulthood that experienced neglect, but not sexual or physical abuse. Both physical abuse and neglect were associated with poorer cognitive flexibility in an adolescent sample (Spann et al., 2012). Moreover, Marshall and colleagues identified that two core components of self-regulation: attention and inhibitory control were relatively under researched with regards to the neuropsychological impact of trauma (Marshall et al., 2016). They therefore explored the relationship between childhood trauma, and attention and inhibitory control among adult patients with bipolar disorder (BD) and healthy controls. Interestingly, both BD patients and healthy controls with a history of childhood trauma exhibited deficits in inhibitory control (Marshall et al., 2016). The authors suggested that because healthy controls with

trauma showed greater inhibitory control dysfunction than health controls without trauma, trauma may impede the development of neural circuits responsible for inhibitory control. This finding is salient as the proposed research considers inhibitory control to be a key mechanism in the production of impulsive behaviour among individuals who have a history of childhood trauma.

Inhibitory control and impulsivity

Inhibitory control is a broad construct that has recently become recognised in the neurosciences as a fundamental cognitive function (Bari & Robbins, 2013). Bari and Robbins (2013 p.52) developed a model which theorised the relationship between inhibition and impulsivity. It depicts that when stimuli cause physiological activity in a sense organ (e.g. eyes), an urge to perform a specific act occurs. If inhibitory processes are deficient then impulsive acts or thoughts will result, however when inhibitory processes are functioning properly, they may keep urges under control (Bari & Robbins, 2013).

A study conducted by Spinella (2005) found that of five subscales measuring executive functioning, the impulse control subscale (which addressed self-inhibition) was most significantly correlated with the BIS-11 motor impulsiveness scale. Another study reported that inhibitory control, measured using the spatial Stroop task (Lu & Proctor, 1995), was correlated significantly with overall impulsiveness, and motor, planning and attentional impulsiveness on the BIS-11 (Enticott et al., 2006). Again however, evidence within forensic populations is sparse.

STUDY OBJECTIVES AND PURPOSE

Whilst several studies have investigated associations between childhood trauma, impulsivity and executive functions such as inhibitory control, a paucity of research has been conducted within clinical and forensic settings. The present research has identified a need to conduct research within such settings due to the existing problem of impulsive behaviour.

Using an experimental research design, the **primary objective** is to explore the relationship between childhood trauma and adult impulsivity within a forensic population. The **secondary objective** is to explore whether the relationship between childhood trauma and adult impulsivity is mediated by inhibitory control. The study's findings may enhance understanding of the predisposing and perpetuating factors for impulsive behaviour among adults who use forensic mental health services. The findings could also have implications for the development of interventions and treatment pathways specifically targeting those at risk of cognitive and behavioural difficulties i.e. individuals who have experienced significant childhood trauma.

The findings may support the notion that childhood trauma is positively associated with impulsivity in adulthood within a forensic mental health sample. It may also indicate that deficits in inhibitory control mediate the relationship between childhood trauma and impulsivity, and thus suggest that such deficits are associated with the maintenance of impulsive behaviour among forensic mental health patients.

In the proposed study, the null hypothesis is:

- There will be no statistically significant relationship between childhood trauma, impulsiveness and inhibitory control.

The alternative hypotheses include the following:

1) Childhood trauma will be positively associated with overall impulsiveness.

2) Childhood trauma will be associated with reduced inhibitory control.

3) Reduced inhibitory control will be associated with increased overall impulsiveness.

4) Reduced inhibitory control will be associated with increased motor impulsiveness.

5) Inhibitory control will mediate the relationship between childhood trauma and impulsiveness.

STUDY DESIGN

STUDY CONFIGURATION

The study will be conducted on a single NHS Trust site, comprising three separate secure units (male low secure, male medium secure and female medium secure). Randomization will not be used in this study. Non-probability type sampling will be conducted (described in detail in the 'recruitment' section of this protocol). Data will be collected via formal psychometric assessment measures, including questionnaires.

STUDY MANAGEMENT

The Chief Investigator has overall responsibility for the study and shall oversee all study management. However, the principal investigator/student researcher (under the supervision

of the CI and their co-supervisor) will conduct recruitment, data collection, and data storage at the study site.

The data custodian will be the Chief Investigator.

DURATION OF THE STUDY AND PARTICIPANT INVOLVEMENT

Study duration:

The study is intended to start in August 2020 (once all necessary approvals are in place). The recruitment process (i.e. liaising with clinical teams and recruiting participants) should take approximately two months. Data collection (i.e. conducting assessments and obtaining file information) is intended to begin in October 2020 and should be finished by the end of February 2021 (approximately four months). Scoring assessments and data analysis should take a further two months and finish by the end of April 2021. Write-up and production of a final report should take a further one month. Using this time frame the entire project should last ten months in total (August 2020-May 2021).

Participant duration:

After consent has been provided, each participant will undergo one appointment (approx. 1 hour) to complete assessment measures.

End of the Study:

The end of the study (i.e. end of data collection period) will be the last assessment administered with the last participant, which is estimated to be undertaken by the end of February 2021.

SELECTION AND WITHDRAWAL OF PARTICIPANTS

Recruitment:

The first phase of the study will involve approaching potential participants for recruitment. The first step in this process will involve the researcher emailing all multi-disciplinary teams across male and female secure wards at the study site, to arrange a time to present the research at clinical team meetings. An overview of the study's aims, ethical considerations and procedure (including the process for approaching patients regarding participation) will

also be circulated via email to teams. The meetings will be used to identify potential participants.

Once identified, potential participants will be approached to schedule initial appointments on their wards. Initial contact will be made by a member of the usual care team, to explain that the researcher is hoping to approach them regarding the study. The researcher may then approach the potential participant if permission is granted by the care team member. Upon initial contact by the researcher, a study briefing appointment will be arranged and the potential participant will be asked if they would like a member of the usual care team to be present during this meeting. At briefing appointments, potential participants will be verbally briefed about the research and provided with copies of the Participant Information Sheet (PIS) and consent form. Written informed consent will be required from each participant, within 48 hours of the briefing appointment. This time-frame is considered sufficient for potential participants to make a decision and it allows the researcher to time-manage the study efficiently.

Staff on the ward will be provided a verbal handover following briefing appointments and contact notes will be emailed (via secure Trust email) to clinical teams from the researcher to upload onto each patient's progress notes in their medical records. Once informed consent is provided by participants (within 48 hours) the researcher will be able access a participant's medical records (for data collection) via the RiO records system which they will already use within their employed role. When accessing the record, the researcher will be presented with the following message: *"You are attempting to access the record of a client with whom you do not currently have a legitimate relationship. You must, therefore, provide a valid reason for accessing this record",* and will be asked to select a reason for access. The researcher will select 'Audit/Investigation' from the drop down menu. This will permit access to the record.

This study will not use hospital translators or interpreters, because participants must be proficient in English to complete study assessments (as per eligibility criteria).

It will be explained to the potential participant that entry into the study is entirely voluntary and that their treatment and care will not be affected by their decision. It will also be explained that they can withdraw at any time, but attempts will be made to avoid this occurrence. In the event of their withdrawal it will be explained that their data collected so far cannot be erased and we will seek consent to use the data in the final analyses where appropriate.

Inclusion criteria:

- Male and female service users at identified forensic mental health service.
- Aged between 18 and 65 years.
- Proficiency in English language. This is an inclusion criterion as the psychometric measures used are not adaptable for other languages.
- Capacity to give informed consent.

Male and female patients within medium and low secure forensic mental health wards at the identified NHS Trust site are eligible for participation in this study. Patients will only be approached for participation in this research if they are aged between 18 and 65 years. 65 years has been identified as a cut-off due to the possible effects of ageing and neurodegenerative disease on assessment outcomes.

Exclusion criteria:

- Diagnosed learning disability/neurodegenerative disease.
- Acute symptoms of mental illness (i.e. symptoms of mental illness that cause the individual significant distress or have a significant impact on their daily functioning).
- Not proficient in English language.

Individuals with a diagnosed learning disability or neurodegenerative disease will be excluded from this study. This is because the study aims to examine the impact of childhood trauma on cognitive functioning. Deficits in certain areas of cognitive functioning, such as executive functioning skills, may result from traumatic experiences in childhood. However, diagnosed learning disability, for example, indicates a neurological problem which may have a biological cause (Handler & Fierson, 2011). When clinical teams are approached regarding suitable participants, they will be asked to recommend only patients' who do not have a diagnosed learning disability or neurodegenerative disease.

Additionally, if an individual presents with acute symptoms of mental illness (i.e. at a level causing the individual significant distress) they would be excluded from participation due to the likely impact of their presentation on both their capacity to complete the assessment and their assessment scores. Whether an individual is unsuitable for participation on the basis of

a psychotic presentation will be determined via discussion with clinical teams during the recruitment process.

Expected duration of participant participation:

Study participants will be participating in the study for six months. However, the contact time with each participant is estimated to be 1 hour 30 minutes (as stated above).

Participant Withdrawal:

Participants may be withdrawn from the study either at their own request or at the discretion of the Investigator. The participants will be made aware that this will not affect their future care. Participants will be made aware (via the participant information sheet and consent form) that should they withdraw the data collected to date cannot be erased and may still be used in the final analysis.

Informed consent:

All participants will provide written informed consent. The Consent Form will be signed and dated by the participant before they enter the study. The researcher will explain the details of the study and provide a Participant Information Sheet. The researcher will answer any questions that the participant has concerning study participation. Participants' will then be given 48 hours to consider participation and provide signed consent.

Informed consent will be collected from each participant before they undergo any assessment. One copy of this will be kept by the participant, one will be kept by the researcher, and a third will be retained in the patient's hospital records.

Should there be any subsequent amendment to the final protocol, which might affect a participant's participation in the study, continuing consent will be obtained using an amended Consent form which will be signed by the participant.

STUDY REGIMEN

Measures

The assessment measures described below will be used for data collection in this study.

Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998)

The CTQ is 28-item self-report tool that provides brief, reliable, and valid screening for histories of abuse and neglect. The CTQ is appropriate for adolescents (aged 12 and over) and adults. It is designed to assess five types of negative childhood experiences including emotional neglect, emotional abuse, physical neglect, physical abuse, and sexual abuse. It also includes a 3-item minimization/denial scale for detecting false-negative trauma reports. The questionnaire takes about 5 minutes to complete. Individuals are asked to respond to a series of statements about childhood events (e.g. "I had to wear dirty clothes"). Each item is rated on a 1–5 scale, ranging from never true (when you were growing up) to very often true (when you were growing up). Scores range from 5 to 25 for each type of negative childhood experience.

The CTQ will be used in the present research to measure severity of childhood trauma.

Barrat Impulsiveness Scale (BIS-11; Patton et al., 1995)

The BIS-11 is a 30 item self-report instrument designed to assess the personality/behavioural construct of impulsiveness/impulsivity. It is the most widely cited instrument for the assessment of impulsivity and it has significantly influenced the way that impulsivity is understood in psychology and psychiatry (Stanford et al., 2009). The items on the BIS-11 describe common impulsive and non-impulsive (for reverse scored items) behaviours and preferences (e.g. "I do things without thinking"). Each item is scored by selecting 1 of 4 possible responses: 1 (Rarely/Never), 2 (Occasionally), 3 (Often), 4 (Almost Always/Always).

The BIS-II will be used in the present research to measure impulsivity, and at a theoretical level it will be used to make inferences about impulsive behaviour. It provides scores on overall impulsiveness and three subtraits of impulsiveness (Attentional, Motor and Non-planning), all of which will be of interest during data analysis.

Test of Memory Malingering (TOMM; Tombaugh, 1996)

The TOMM is used clinically by neuropsychologists to discriminate between memory-impaired patients and malingerers (i.e. someone who intentionally fakes or exaggerates symptoms for personal gain). However, in the present research the TOMM is simply used as a test of effort, to ensure that scores on assessment measures reflect test performance.

The TOMM is a 50-item recognition test for adults, including two learning trials and a retention trial. During the learning trials the individual is shown 50 line-drawings (target pictures) of common objects for 3 seconds each, at 1 second intervals. The examinee is then shown 50

recognition panels, one at a time. Each panel contains one of the previously presented target pictures and a new picture. The examinee is required to select the correct picture.

D-KEFS Trail Making Test (TMT; Delis, Kaplan, & Kramer, 2001)

The Trail Making Test involves a series of 5 conditions: visual scanning, number sequencing, letter sequencing, number-letter switching, and motor speed (Delis et al., 2001; Yochim, Baldo, Nelson, & Delis, 2007). In the Visual Scanning condition, examinees cross out all the 3s that appear on the response sheet. In the Number Sequencing condition, examinees draw a line connecting the numbers 1–16 in order; distractor letters appear on the same page. The Letter Sequencing condition requires examinees to connect the letters A through P, with distractor numbers present on the page. In the Number-Letter Switching condition, examinees switch back and forth between connecting numbers and letters (i.e., 1, A, 2, B, etc., to 16, P). Lastly, a Motor Speed condition is administered in which examinees trace over a dotted line connecting circles on the page as quickly as possible, in order to gauge their motor drawing speed. Each condition is preceded by a short practice trial.

In the present research, the Number-Letter Sequencing condition scores will be used as a measure of (motor) inhibitory control – examinees are required to inhibit the logical response of ascending numbers (i.e. 1, 2, 3) and letters (i.e. A, B, C) in order. In doing so, they will switch back and forth between numbers and letters, as stated above. The other four conditions are used to determine whether a deficient score on Number-Letter Sequencing is related to impairment in one or more underlying component skills (e.g. number sequencing) as opposed to inhibitory control.

D-KEFS Color-Word Interference Test (CWIT; Delis, Kaplan, & Kramer, 2001)

The Color-Word Interference test is based on the Stroop (1935) procedure. There are two baseline conditions that measure key component skills of higher-level tasks: basic *naming* of color patches (Condition 1) and basic *reading* of color-words printed in black ink (Condition 2). Condition 3 reflects the traditional Stroop task – examinees must inhibit reading the words in order to name the ink colors in which those words are printed. Thus, the ability to inhibit an overlearned verbal response (i.e. reading the printed words) is measured. The present research will use scores on this condition to measure (verbal) inhibitory control. Condition 4 involves the examinee being asked to switch back and forth between naming the ink colors and reading the words. This condition measures both verbal inhibition and cognitive flexibility.

Historical Clinical Risk Management Version 3 (HCR-20 V3; Douglas, Hart, Webster & Belfrage, 2013).

The HCR-20 V3 (Douglas, Hart, Webster, & Belfrage, 2013) is a comprehensive set of professional guidelines for the assessment and management of violence risk. It is one of the best-validated assessments of violence risk and is widely used within correctional, forensic, and general or civil psychiatric settings, whether in the institution or in the community. It is applicable to adults aged 18 and above who may pose a risk for future violence. The HCR-20 V3 assesses the presence and relevance (to future violence risk) of 20 key violence risk factors.

In the present research, the following items: H5 (History of Problems with Substance Misuse), H6 (History of Problems with Major Mental Disorder) and H8 (History of Problems with Traumatic Experiences) will be used to collect data on control variables.

Procedure

Data collection

Following recruitment, the second phase of the study will involve administering the assessment battery. The assessment battery includes the five measures cited earlier: CTQ, BIS-11, TOMM, D-KEFS Trail making Test, and D-KEFS Color-Word Interference Test. Depending on test effort and cognitive ability, administration times may vary, however the average administration time for the battery is estimated to be one hour. Each assessment will be administered within one session.

The order of administration will be as follows: 1) TOMM, 2) BIS-II, 3) Trail-Making Test, 4) Color-word Interference Test, 5) CTQ. The CTQ is purposely administered last due to the possible affective and cognitive impact of CTQ questions, which may subsequently impact an individual's performance on other measures (i.e. if the CTQ was administered before another measure). CTQ questions may have an affective and/or cognitive impact on individuals as they are related to childhood trauma.

Each measure has specific guidance regarding its administration. The researcher is experienced in administering the assessment battery and will follow administration guidance provided with each measure. It is possible that the researcher will request the assistance of team psychologists' (who will be competent in the administration of the assessment measures/battery) to conduct briefing appointments and administer the assessment battery. This will most likely occur in the female service where a patient may not be comfortable meeting individually with a male staff member (i.e. the researcher). Alternatively, if the patient states that they are comfortable meeting with the researcher, with a member of ward staff present, the researcher will request that a member of ward staff is present during the meeting.

HCR-20 Version 3 assessment reports for each individual will be reviewed in order to collect data on the study's control variables. These are: Substance Misuse (1:Present or 2:Partial/Not

Present); Schizophrenia diagnosis (1:Present or 2:Not Present); and Acquired Brain Injury (1:Present or 2:Not Present).

Criteria for terminating the study

The study (as a whole) may be terminated for reasons such as: if the researcher is significantly harmed (psychologically or physically); if the chief investigator is no longer able to oversee/supervise the project and a suitable replacement is not identified; or if recruitment of participants is poor (i.e. half of specified target sample: <25).

ANALYSES

Methods

Statistical methods will be used for this research as data will be entirely quantitative. The primary statistical method will be regression analysis. Regression will be used to explore the relationship between childhood trauma scores/severity (predictor/independent variable) and impulsiveness scores (dependent variable). Additional variables will be added to the regression model to control for other factors that may be associated with impulsiveness, including schizophrenia diagnosis, historical substance misuse and acquired brain injury. These will be binary variables (i.e. they will all have two categories: Yes or No). SPSS (Statistical Package for Social Sciences) will be used for analysis.

In order to explore the mediating effect of executive functioning test performance on the relationship between childhood trauma and impulsiveness, mediation analysis will be conducted. A significant relationship between childhood trauma and impulsiveness is required in order to explore the potential mediating effect of executive functioning. The PROCESS tool within SPSS will be used to run mediation analysis.

The researcher will undertake statistical analysis under the supervision of the Chief Investigator.

Sample size and justification

Similar studies in other populations have indicated large effect sizes for the relationship between trauma and executive functioning, and trauma and impulsivity (e.g. Narvaez et al., 2012). An a-priori power calculation, using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) assuming a large effect (f2 = 0.35), suggested that for a multiple linear regression model (R2 deviation from zero) with three predictors (total CTQ score, D-KEFS Color-Word Interference Test score and Trail Making test score) to achieve 90% power at a 0.05 significance level, 45 participants would be needed. However, some data may be excluded on the basis of the TOMM scores, so the study aims to recruit 50 participants to account for this.

ADVERSE EVENTS

The occurrence of an adverse event as a result of participation within this study is not expected and no adverse event data will be collected.

ETHICAL AND REGULATORY ASPECTS

ETHICS COMMITTEE AND REGULATORY APPROVALS

The study will not be initiated before the protocol, consent forms and participant information sheets have received approval / favourable opinion from the Research Ethics Committee (REC), the respective National Health Service (NHS) or other healthcare provider's Research & Development (R&D) department, and the Health Research Authority (HRA) if required. Should a protocol amendment be made that requires REC approval, the changes in the protocol will not be instituted until the amendment and revised informed consent forms and participant information sheets have been reviewed and received approval / favourable opinion from the REC and R&D departments. A protocol amendment intended to eliminate an apparent immediate hazard to participants may be implemented immediately providing that the REC are notified as soon as possible and an approval is requested. Minor protocol amendments only for logistical or administrative changes may be implemented immediately; and the REC will be informed.

The study will be conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki, 1996; the principles of Good Clinical Practice and the UK Department of Health Policy Framework for Health and Social Care, 2017.

INFORMED CONSENT AND PARTICIPANT INFORMATION

The process for obtaining participant informed consent will be in accordance with the REC guidance, and Good Clinical Practice (GCP) and any other regulatory requirements that might be introduced. The researcher and the participant shall both sign and date the Consent Form before the person can participate in the study.

The participant will receive a copy of the signed and dated forms and the original will be retained in the Study records. A second copy will be filed in the participant's (electronic) medical records. A note will also be entered on the participant's medical records that informed consent was obtained for the study.

The decision regarding participation in the study is entirely voluntary. The researcher or their nominee (member of clinical team) shall emphasize to them that consent regarding study participation may be withdrawn at any time without penalty or affecting the quality or quantity of their future medical care, or loss of benefits to which the participant is otherwise entitled. No study-specific assessments will be administered before informed consent has been obtained.

The researcher will inform the participant of any relevant information that becomes available during the study, and will discuss with them, whether they wish to continue with the study. If applicable they will be asked to sign revised consent forms.

If the Consent Form is amended during the study, the researcher shall follow all applicable regulatory requirements pertaining to approval of the amended Consent Form by the REC and use of the amended form (including for ongoing participants).

Informed consent will be required from each individual for participation in the study. Information will be requested from clinical teams regarding participant suitability in relation to mental capacity (i.e. likely capacity to understand the research aims and make an informed decision to participate). The researcher will use guidance from the clinical team, alongside their own clinical judgement (upon initial contact) as to whether an individual demonstrates capacity in their decision to participate. The capable person will be able to understand the purpose and nature of the research, the risks and benefits involved, alternatives to taking part, and will be able to make a free choice.

PSYCHOLOGICAL HARM TO PARTICIPANTS

The study will involve the recruitment of vulnerable adults with complex mental health problems. Completing the study's assessment battery could be psychologically demanding for this group and there is a risk of psychological harm caused by the administration of the childhood trauma questionnaire (CTQ) due to the sensitive nature of questions. However, the CTQ uses Likert scales to rate items and therefore does not require an individual to disclose any details regarding traumatic events. The research supervisor and senior staff within the service's psychology department have been consulted regarding the decision to use the CTQ. The CTQ is considered a robust measure of childhood trauma, whilst an alternative method of measuring trauma, such as using file information, is considered more subjective and less valid. The CTQ has been widely used in research pertaining to the development of the present

research questions (e.g. Gould et al., 2012; Marshall et al., 2016; Narvaez et al., 2012; Shin et al, 2018), and is evidenced to be a reliable and valid measure of childhood trauma (Bernstein, Ahluvalia, Pogge, Handelsman, 1997). To address the risk of potential harm caused to participants, information will be provided regarding support available from multi-disciplinary teams following completion of the CTQ. The CTQ will also be administered at the end of the assessment battery to minimize the potential cognitive and emotional effects caused by completing CTQ on additional assessment measures. Also, it will be made clear to participants when they are briefed about the research that the CTQ will not require participants to disclose any details regarding their experiences. Rather, it will involve statements about childhood events (e.g. “I had to wear dirty clothes”) to be rated on a 5-point rating scale ranging from never true ('when you were growing up') to very often true ('when you were growing up').

Following the administration of assessments, the researcher will provide a verbal handover to ward staff regarding their observations of the participant’s mental state during the assessment. If concerns are raised about the participant’s mental state, a note will be made on the progress notes of a participant’s medical record. Writing progress notes would not be standard procedure, as the researcher aims to keep the participants involvement in the research confidential.

RISK OF HARM TO RESEARCHER

The secure ward environment (in which the research will be undertaken) presents several risks. Prospective participants have been admitted to this environment as they pose a risk of harm to themselves, to others, and/or from others. For example, many have a history of violence towards others, which places the researcher at risk of becoming victim to violence. There is a risk of both physical and psychological harm to the researcher if violence were to occur.

The researcher has had over five years’ experience working as a mental health professional within forensic mental health settings and is currently employed as an assistant psychologist within the service identified for this study. They are experienced in assessing and managing aforementioned risks and have completed all mandatory training required to work within the service. The researcher is also up-to-date with relevant Trust policies for working safely within the service including H3- Health and Safety, and V2 -Violence Reduction and Management. They also have two academic supervisors (one of whom is the Chief Investigator) and a clinical supervisor (within their employed role at the study site). Regular supervision will be utilised to manage any potential risks during the study.

If an incident occurred where the researcher was physically harmed by the participant, a verbal handover would be provided to ward staff and the researcher (providing they are physically able) would issue an Incident Report (IR1) on the participant's records.

RECORDS

Study forms

Each participant will be assigned a study identity code number for use on study forms (i.e. assessment record forms), other study documents and the electronic database. The documents and database will also use their initials (of first and last names separated by a hyphen or a middle name initial when available) and date of birth (dd/mm/yy).

Study forms will be treated as confidential documents and held securely in accordance with regulations. The researcher will make a separate confidential record of the participant's name, date of birth, local hospital number or NHS number, and Participant Study Number, to permit identification of all participants enrolled in the study, in case additional follow-up is required.

Study forms shall only be accessed by the Chief Investigator and researcher.

All paper forms shall be filled in using black ballpoint pen. Errors shall be lined out but not obliterated by using correction fluid and the correction inserted, initialled and dated.

The Chief Investigator or researcher shall sign a declaration ensuring accuracy of data recorded in the study forms.

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Source documents

Source documents (e.g. consent forms) shall be filed at the research site in a locked filing cabinet. Only the research team (i.e. chief investigator/primary supervisor, student researcher & secondary supervisor) shall have access to study documentation other than the regulatory requirements listed below.

Direct access to source documents / study forms

All source documents and study forms shall be made available at all times for review by the Chief Investigator, Sponsor's designee and inspection by relevant regulatory authorities.

DATA PROTECTION

All study staff and investigators will endeavour to protect the rights of the study's participants to privacy and informed consent, and will adhere to the Data Protection Act, 2018. The study forms will only collect the minimum required information for the purposes of the study. Study forms will be held securely, in a locked room, or locked cupboard or cabinet. Access to the information will be limited to the study staff and investigators and any relevant regulatory authorities (see above). Computer held data including the study database will be held securely and password protected. All data will be stored on a secure dedicated web server. Access will be restricted by user identifiers and passwords (encrypted using a one-way encryption method).

Information about the study in the participant's medical records / hospital notes will be treated confidentially in the same way as all other confidential medical information.

Electronic data will be backed up every 24 hours to both local and remote media in encrypted format.

QUALITY ASSURANCE & AUDIT

INSURANCE AND INDEMNITY

Insurance and indemnity for clinical study participants and study staff is covered within the NHS Indemnity Arrangements for clinical negligence claims in the NHS, issued under cover of HSG (96)48. There are no special compensation arrangements, but study participants may have recourse through the NHS complaints procedures.

The University of Nottingham as research Sponsor indemnifies its staff, research participants and research protocols with both public liability insurance and clinical trials insurance. These policies include provision for indemnity in the event of a successful litigious claim for proven non-negligent harm.

STUDY CONDUCT

Study conduct may be subject to systems audit for inclusion of essential documents; permissions to conduct the study; CVs of study staff and training received; local document control procedures; consent procedures and recruitment logs; adherence to procedures defined in the protocol (e.g. inclusion / exclusion criteria, timeliness of visits); accountability of study materials and equipment calibration logs.

A nominated designee of the Sponsor shall carry out a site systems audit at least yearly and an audit report shall be made.

STUDY DATA

Monitoring of study data shall include confirmation of informed consent; source data verification; data storage and data transfer procedures; local quality control checks and procedures, back-up and disaster recovery of any local databases and validation of data manipulation. A nominated designee of the Sponsor, shall carry out monitoring of study data as an ongoing activity.

Entries on study forms will be verified by inspection against the source data. A sample of study forms (10% or as per the study risk assessment) will be checked on a regular basis for verification of all entries made. In addition, the subsequent capture of the data on the study database will be checked. Where corrections are required these will carry a full audit trail and justification.

Study data and evidence of monitoring and systems audits will be made available for inspection by the REC as required.

RECORD RETENTION AND ARCHIVING

In compliance with the ICH/GCP guidelines, regulations and in accordance with the University of Nottingham Code of Research Conduct and Research Ethics, the Chief or local Principal Investigator will maintain all records and documents regarding the conduct of the study. These will be retained for at least 7 years or for longer if required. If the responsible investigator is no longer able to maintain the study records, a second person will be nominated to take over this responsibility.

The study documents held by the Chief Investigator on behalf of the Sponsor shall be finally archived at secure archive facilities at the University of Nottingham. This archive shall include all anonymised audio recordings, study databases and associated meta-data encryption codes.

DISCONTINUATION OF THE STUDY BY THE SPONSOR

The Sponsor reserves the right to discontinue this study at any time for failure to meet expected enrolment goals, for safety or any other administrative reasons. The Sponsor shall take advice as appropriate in making this decision.

STATEMENT OF CONFIDENTIALITY

Confidentiality will be upheld in line with the Caldicott Principles (Caldicott Committee, 1997). Thus, all information obtained via data collection will be done so with justification (principle 1), will only be used where necessary (principle 2), information usage will be kept to a minimum (principle 3), access to information will be provided on a need-to-know basis (principle 4), everyone permitted access shall be aware of their responsibilities (principle 5) and all those accessing information will understand and comply with the law (principle 6).

The study will involve accessing personally identifiable information for vulnerable individuals who have been admitted to a secure mental health setting due to risks to themselves and/or others. It is possible that information related to risk (i.e. physical or mental health; risk to others, from others, or to self) will arise during data collection which may require researchers to notify a participant's responsible clinician. If information arises during the study that could pose a risk (in the aforementioned areas) the researcher will discuss this with the Chief Investigator and report to the participant's responsible clinician accordingly. With the exceptions noted above, all participant medical or personal information obtained as a result of this study are considered confidential and disclosure to third parties is prohibited.

An electronic database will be created to store all demographic (e.g. gender) and clinical information (e.g. assessment scores) regarding research participants. During this process, participant confidentiality will be ensured by giving each participant an identity code number, alongside a 'P' to represent the word 'participant' (e.g. P1). As described above, the database will also use participants' initials. However, an anonymised database (without initials) will also be created for the purpose of sending the database (if requested) via nhs.net secure email to the Chief Investigator. The anonymised database will also be used for retaining data after the study has ended (described in the IRAS form).

The database will only be accessible by the researcher and chief investigator. It will be stored on the researcher's personal NHS Trust home drive which is only accessible via personal login details. The chief investigator, who is based at the University of Nottingham, can request access data at any time remotely by the researcher sending the anonymised dataset via the nhs.net secure email service or by visiting the study site in person and gaining access to the researcher's home drive (the researcher will be available to facilitate access).

Data generated as a result of this study will be available for inspection on request by the University of Nottingham representatives, the REC, local R&D Departments and the regulatory authorities.

PUBLICATION AND DISSEMINATION POLICY

On completion of the study, its findings will be shared with participants in the form of a summary sheet, which will be sent by letter to individual participants, on their wards. Participants will be asked to notify the researcher on consent forms if they wish to have a summary sheet sent to them.

The research team intend to publish the study results in a peer reviewed journal following completion of the study.

Participants will not be identified in any publications.

STUDY FINANCES

Funding source 7

A research starter grant was successful in securing 'seed funding' for the assessment measures needed for data collection. No other aspect of the research is funded.

Participant stipends and payments

Participants will not be paid to participate in the study.

SIGNATURE PAGES

Signatories to Protocol:

Chief Investigator/Primary Supervisor:

(name)

Signature

Date:

Secondary Supervisor:

(name)

Signature:

Date:

Principal Investigator/Student Researcher:

Name:

Signature:

Date:

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Appendix S

Study Title: Early experiences, impulsivity, and cognitive functioning – Case Study

PARTICIPANT INFORMATION SHEET

IRAS ID: 257761

Final Version 2.0 Date: 05/07/2022

We would like to invite you for further participation in the present research. We greatly appreciate your previous contribution to the research and we were wondering if you might be willing to complete an additional assessment, described below.

Before you decide, it is important for you to understand why the research is being done and what it will involve. The researcher will go through the information sheet with you and answer any questions you have. Please take time to read this carefully and discuss it with others if you wish. Please ask if anything is not clear.

What is the purpose of the research?

You are being asked to complete the additional assessment so that this information may be used in a case study to understand in greater detail the relationship between difficult childhood experiences, impulsivity and everyday skills, which may be affected by areas of cognitive functioning (e.g. planning, organization, attention, inhibition). Both the data you provided during the original assessment (i.e. the primary study) and new data collected from this additional assessment will be used to address the objectives of the case study.

Why have I been invited to take part?

You have been invited to complete this assessment because you have already participated in the wider research and you continue to receive treatment within forensic inpatient services at [redacted]. You have also been invited because you are aged between 18 and 65, speak English proficiently and you have capacity to decide whether to participate.

Do I have to take part?

No. It is up to you to decide if you want to take part in the additional assessment. We will describe the study and go through this information sheet with you to

answer any questions you may have. If you agree to participate, we will ask you to sign an additional consent form and will give you a copy to keep. However, you would still be free to withdraw from the study at any time, without giving a reason and without any negative consequences, by informing the researchers. This would not affect your legal rights.

1. What will happen to me if I take part?

The first meeting is an opportunity for you to go over the participant information sheet and ask any questions you may have about the study. If you agree to take part in the study, you will be asked to attend a single visit from the researcher on your ward. This will be scheduled at your convenience once you have provided signed consent to take part. At the beginning of this visit, the study will be explained and you will be given a chance to ask any questions.

Your participation will involve completing an assessment which includes a series of tasks and one questionnaire. The types of task and questionnaire will be similar to those psychologists often use during assessments. For example, one of the tasks involves showing how you would visit certain areas of a zoo (shown on a map) whilst following specific rules. The questionnaire asks questions on a range of topics, including planning for the future, and you are asked to give one of five possible responses (i.e. never, occasionally, sometimes, fairly often, very often).

2. Are there any risks in taking part?

The assessment is expected to take around 40 minutes to complete. Some people may find it tiring to complete the entire battery in one session. The assessment can be completed over more than one session if necessary. There are no other risks associated with participating in this study.

3. Are there any benefits in taking part?

Taking part in this research will have no direct impact on your care pathway, mental health section or sentence (if this applies to you). However, by participating in this research you will provide data which may improve the services available to you and your peers. For this reason, it is hoped that taking part would be experienced as rewarding. The findings of this study may support the development of treatments for people who have had difficult childhood experiences and need support with their thoughts, feelings and behaviours.

4. Will my time/travel costs be reimbursed?

Participants will not receive any time/travel costs to participate in the study.

5. What happens to the data provided?

Research data is information that you provide on assessment forms (e.g. scores) and information collected from your medical records (e.g. examples of impulsive behaviour), which will be reported in the case study report. To ensure your privacy, we will continue to use the study identity number already assigned to you on the assessment forms that you complete (e.g. P1 for participant number 1). This will also be used when any additional data is stored in the computer database. Your initials will be linked with your study number in a separate database, for safety purposes (i.e. if the data you provide raises any health or other risks, as outlined on the consent form). Your name and any information you provide will be kept confidential.

Personal data includes your signed consent forms. This will be stored in a locked filing cabinet at the study site ([redacted]).

The research team (i.e. the researcher, their primary supervisor/Chief Investigator & secondary supervisor) and regulatory authorities will have access to personal and research data.

6. What will happen if I don't want to carry on with the study?

Even after you have signed the consent form, you are free to withdraw from the study at any time without giving any reason and without your medical care or legal rights being affected. Any personal data will be destroyed. However, the information you have provided up to the point of withdrawal cannot be erased and this information may still be used as research data.

7. Will my taking part in the study be kept confidential?

We will follow ethical and legal practice and all information about you will be handled in confidence. Furthermore, any information gathered will not be linked to any individuals.

We will follow ethical and legal practice and all information about you will be handled in confidence.

If you join the study, we will use information collected from you and your medical records during the course of the research. This information will be kept strictly confidential, stored in a secure and locked office, and on a password protected database at the University of Nottingham. Under UK Data Protection laws the University is the Data Controller (legally responsible for the data security) and the Chief Investigator of this study (named above) is the Data Custodian (manages access to the data). This means we are responsible for looking after your information and using it properly. Your rights to access, change or move your information are limited as we need to manage your information in specific ways to comply with certain laws and for the research to be reliable and accurate. To

safeguard your rights we will use the minimum personally – identifiable information possible.

You can find out more about how we use your information and to read our privacy notice at:

https://www.nottingham.ac.uk/utilities/privacy.aspx.

The data collected for the study will be looked at and stored by authorised persons from the University of Nottingham who are organising the research. They may also be looked at by authorised people from regulatory organisations to check that the study is being carried out correctly. All will have a duty of confidentiality to you as a research participant and we will do our best to meet this duty.

Your contact information will be kept by the University of Nottingham for 12 months after the end of the study so that we are able to contact you about the findings of the study and possible follow-up studies (unless you advise us that you do not wish to be contacted). This information will be kept separately from the research data collected and only those who need to will have access to it. All other data (research data) will be kept securely for 7 years. After this time your data will be disposed of securely. During this time all precautions will be taken by all those involved to maintain your confidentiality, only members of the research team given permission by the data custodian will have access to your personal data.

In accordance with the University of Nottingham's, the Government's and our funders' policies we may share our research data with researchers in other Universities and organisations, including those in other countries, for research in health and social care. Sharing research data is important to allow peer scrutiny, re-use (and therefore avoiding duplication of research) and to understand the bigger picture in particular areas of research. Data sharing in this way is usually anonymised (so that you could not be identified) but if we need to share identifiable information we will seek your consent for this and ensure it is secure.

8. What will happen to the results of the research?

The research will be written up as a thesis. On successful submission of the thesis, it will be saved both in print and online in the University archives, to facilitate its use in future research. The research may also be published in a peer reviewed journal.

9. Who has reviewed this study?

The East of Scotland Research Ethics Service REC 1, which has responsibility for scrutinising all proposals for medical research on humans, has examined the proposal and has raised no objections from the point of view of research ethics. It

is a requirement that your records in this research, together with any relevant medical records, be made available for scrutiny by monitors from the University of Nottingham and [redacted], whose role is to check that research is properly conducted and the interests of those taking part are adequately protected.

10.Who is organising and sponsoring the research?

The research team (the researcher, their primary supervisor/Chief Investigator & secondary supervisor) is responsible for organising the research and University of Nottingham is sponsoring the research.

11.What if something goes wrong?

If you have a concern about any aspect of this project, please speak to the lead researcher (Oliver Johnson), who will do their best to answer your query. The researcher should acknowledge your concern within 10 working days and inform you how he intends to deal with it. If you remain unhappy and wish to complain formally, you can do this by contacting the Patient Advice and Liaison Service (PALS) at [redacted] – the 24hour helpline is [redacted]

12.Contact Details

If you would like to discuss the research with someone beforehand (or if you have questions afterwards), please contact:

Oliver Johnson
[redacted]

Appendix T

CONSENT FORM

(Final Version 2.0: 05.07.22)

Title of Study: Early experiences, impulsivity, and cognitive functioning – CASE STUDY.

IRAS Project ID: 257761 **CTA ref:** 20/ES/0063

Name of Researcher: Oliver Johnson

Study ID: initial box

1. I confirm that I have read the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. I understand that should I withdraw then the information collected so far cannot be erased and that this information may still be used in the project analysis. ☐
3. I understand that relevant sections of my medical notes and data collected during the study, may be looked at by individuals from the University of Nottingham, the research team and regulatory authorities where it is relevant to my taking part in this research. ☐
4. I give permission for individuals named in point 3 to have access to my data, and to collect, store, analyse and publish information obtained from my participation in this study. ☐
5. I understand that my personal details will be kept confidential. ☐
6. I understand that if information related to risk (i.e. physical or mental health, risk to others, from others, or to self) arises during data collection, the researcher may be required to notify my Responsible Clinician. ☐
7. I agree to take part in this case study. ☐

Name of Participant	Date	Signature
Name of Person taking consent	Date	Signature

Appendix U

Dear (name of RC) and (name of ward)

I previously recruited patients in the [redacted] to participate in my doctorate research, which explores childhood adversity and impulsivity within a forensic population.

I have identified individuals from the original sample whose assessment outcomes are of particular interest and I have gained NHS ethics approval to conduct an in-depth case study with one individual.

The case study will involve administering the Behavioural Assessment of Dysexecutive Syndrome (BADS) to measure executive functioning. I will also undertake a further file review to gather information related to childhood adversity from existing clinical reports and will obtain information on impulsive type behaviours (e.g. self-harm) from electronic incident reports.

To ensure anonymity and confidentiality, I will enter data collected for the individual participant into the database used for the original study, in which a study identity number (e.g. P1) has been assigned to them. The participant's initials are linked with their study number in a separate (password protected) database. The case study will be written only for the purpose of my doctoral thesis and will not be published.

My contact with the potential participant would initially involve a briefing meeting (approx. 15-30 minutes), following which they would be offered up to 48 hours to consider taking part. They would then be required to provide signed consent (which can be given at the initial briefing) and complete the BADS assessment, which would take approximately 1.5 hours (completed across one or two sessions). If the first potential participant declines, I will continue to approach identified individuals until ONE individual decides to participate.

The inclusion/exclusion criteria are identical to the original study.

Would you be happy for me to approach patients on your ward who have previously taken part in the study? If so, please could you let me know whether

the following individual, identified from the original sample, is suitable in relation the criteria (copied below):

Inclusion criteria (to be included on the basis of):

- Male and female service users at identified forensic mental health service.
- Aged between 18 and 65 years.
- Proficiency in English language. This is an inclusion criterion as the psychometric measures used are not adaptable for other languages.
- Capacity to give informed consent.

Exclusion criteria (to be excluded on the basis of):

- Diagnosed learning disability/neurodegenerative disease.
- Acute symptoms of mental illness (i.e. symptoms of mental illness causing the individual significant distress or having a significant impact on their daily functioning).
- Not proficient in English language.

I have attached the consent form and information sheet to this email, which will be provided to potential participants during the initial briefing meeting.

If you have any questions or require further information, do not hesitate to contact me.

Kind Regards,

Ollie

p.s. Please forward this email to any key members of the MDT I have missed (e.g. ward doctors) – thank you.

Appendix V

TVTC
Thames Valley Test Company

BADS
Scoring sheet

Subject and test details

Name

Age

Date of test

Before you start the test battery

- Ensure that you have all the test materials, a stopwatch, a tape recorder, set of coloured pens, a pencil, eraser, spare paper, and water for the action program.

Profile score summary

Test 1: Rule shift cards

Test 2: Action program

Test 3: Key search

Test 4: Temporal judgement

Test 5: Zoo map

Test 6: Modified six elements

Total profile score (max = 24)

Standardised score
(Manual Table 5, p.16)

Age corrected standardised score
(Manual Table 5, p.16)

Overall classification

- ☐ Impaired
- ☐ Borderline
- ☐ Low average
- ☐ Average
- ☐ High Average
- ☐ Superior
- ☐ Very superior

Test 1: Rule shift cards

For full text and procedure see Manual p. 8

Trial 1

- Put the playing card booklet, unopened, between you and the subject and have the rule sheet ready.
- *'This is a booklet of playing cards. I am going to turn over...'*
- Place Rule 1 in front of the subject ('Say 'yes' to red, 'no' to black').
- Remember to omit page 0 for this trial – start with the 2 of ♦.
- Time the trial.

	Correct response	Subject's response
1	Y	
2	N	
3	N	
4	N	
5	Y	
6	Y	
7	Y	
8	Y	
9	N	
10	Y	
11	Y	
12	N	
13	Y	
14	N	
15	N	
16	N	
17	Y	
18	N	
19	Y	
20	N	

Total errors

Time taken

Note that Trial 1 is not used to calculate the profile score

Trial 2

- *'I am going to turn over the set of cards again now...'*
- Place Rule 2 in front of the subject ('Say 'yes' if the card is the same colour as the last one, otherwise say 'no' ').
- Remember to start on page 0 – the 4 of ♥.
- Time the trial.

	Correct response	Subject's response
1	Y	
2	N	
3	Y	
4	Y	
5	N	
6	Y	
7	Y	
8	Y	
9	N	
10	N	
11	Y	
12	N	
13	N	
14	N	
15	Y	
16	Y	
17	N	
18	N	
19	N	
20	N	

Total errors

Total errors	Profile score
0	4
1–3	3
4–6	2
7–9	1
≥10	0

Profile score

Time taken

If time taken is greater than 67 seconds subtract 1 from profile score

Total profile score ☐