

Childhood Trauma and Suicide Behaviour: Investigating the Role of Impulsivity

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The candidate confirms that the work submitted is her own and that appropriate credit has been given where reference has been made to the work of others.

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Abstract

Background: It is well established that childhood trauma is associated with suicide behaviour, however, less is known about how trauma interacts with other suicide risk factors. The current study investigated the role of impulsivity as a moderator in the trauma-suicide relationship and explored the relationship between impulsivity and stress over 7 days in people who have experienced childhood trauma.

Methods: An online daily diary design was used. 481 participants completed the Childhood Trauma Questionnaire-Short Form (CTQ-SF), the Barratt Impulsiveness Scale 11 (BIS-11), and 2 questions assessing experiences of suicide ideation and attempt. 272 participants completed a seven-day online daily diary study, which used the Momentary Impulsivity Scale (MIS) and the Perceived Stress Scale Short Form (PSS-4) daily for 7 days. Binomial logistic regression, hierarchical linear regression, and multilevel modelling were used to analyse the data.

Results: All subtypes of childhood trauma significantly predicted suicide ideation and attempt. Attentional impulsivity significantly predicted suicide ideation and attempt. Neither trait impulsivity nor its subtypes moderated the relationship between childhood trauma and suicide behaviour. All subtypes of childhood trauma except sexual abuse predicted trait impulsivity and its subtypes. Emotional abuse was positively associated with daily impulsivity. Neither childhood trauma nor its subtypes moderated the daily stress-impulsivity relationship.

Discussion: The results are considered within the context of the Integrated Motivational Volitional Model and Interpersonal Theory of suicide behaviour. Clinical implications and directions for future research are considered.

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List of Abbreviations

Abbreviation	Meaning
ACE	Adverse childhood experience
ADHD	Attention deficit hyperactivity disorder
APMS	Adult psychiatric morbidity survey
BIS-11	Barratt impulsiveness scale
BPD	Borderline personality disorder
CAR	Cortisol awakening response
CTQ	Childhood trauma questionnaire
CTQ-SF	Childhood trauma questionnaire, short form
DSM	Diagnostic and statistical manual of mental disorders
EA	Emotional abuse
EF	Executive function
EMA	Ecological momentary assessment
EN	Emotional neglect
EUPD	Emotionally unstable personality disorder
HPA	Hypothalamic-pituitary-adrenal
IMV	Integrated motivational-volitional model (of suicide)
IPT	Interpersonal Theory (of suicide)
LL	Lower limit
M	Mean
MIS	Momentary impulsivity scale
MLM	Multilevel modelling
MM	Motivational moderator
NSSI	Non-suicidal self-injury
OR	Odds ratio
PA	Physical abuse
PN	Physical neglect
PSS-4	Perceived stress scale, short form
PTSD	Post-traumatic stress disorder
SA	Sexual abuse
SD	Standard deviation
TSM	Threat to self-moderator
UL	Upper limit
UPPS	(Negative) Urgency, (lack of) premeditation, (lack of) perseverance, sensation-seeking
VM	Volitional moderator

1. Introduction

1.1 Overview

In this introductory chapter I will describe the issue and prevalence of suicide behaviour, before discussing risk factors for suicide behaviour, including childhood trauma. I will then outline some key models and research that can be used to explain suicide behaviour. I will also discuss how childhood trauma may result in an impaired stress response. I will also discuss impulsivity as a construct known to be associated with childhood trauma and as a risk factor for suicide behaviour. Finally, I will propose a way in which these constructs may interact, before summarising the key aims of the thesis and outlining the proposed research questions and hypotheses.

1.2 Suicide Behaviour

Across the world it is estimated that 800,000 lives are lost to fatal suicide attempts every year (World Health Organization, 2019), and it is an ever-growing public health problem. Suicide can be defined as “death caused by self-directed injurious behaviour with an intent to die as a result of the behaviour” (Klonsky et al., 2016, p. 3), with a suicide attempt defined as self-injurious behaviour with the same intent but not resulting in death. This can be differentiated from non-suicidal self-injury (NSSI), where although there is behaviour with deliberate intent to harm the self, death is not intended. Suicidal ideation is a broader term, defined as “thinking about, considering, or planning suicide” (Klonsky et al., 2016, p. 3). Throughout this thesis, I will refer to suicide attempts and ideation separately, and use ‘suicide behaviour’ as a broader term inclusive of ideations, communications (conveying to another person a suicide threat or plan), and behaviours (nonfatal and fatal attempts to end life; Silverman et al., 2007).

The 2014 Adult Psychiatric Morbidity Survey (APMS) found that since 2000 there has been increased reporting of suicide attempts and suicidal thoughts, with the most pronounced increase seen in older adults (McManus et al., 2016). In a large study with over 84,000 adults across 17 countries, lifetime prevalence of suicide ideation and suicide attempts were found to be 9.2% and 2.7% respectively (Nock et al., 2008). However, data from the most recent APMS in England found that around 20% of adults had experienced thoughts of ending their own life, and 6.7% had reported a historical suicide attempt (McManus et al., 2016).

Suicide behaviour is often thought to go in hand with mental health difficulties. Although the vast majority of people who die by suicide have been diagnosed with mental health conditions, most people with mental health conditions will not die by suicide (Joiner, 2005). There are many other factors associated with an increased risk of attempting suicide; suicidal ideation, family history of suicide, previous suicide attempts or psychiatric hospitalisation, early adversity, and physical health conditions to name just a small selection (Brown et al., 2000; Turecki et al., 2019). Socioeconomic factors are also associated with increased risk of suicide. A systematic review found that having a low ranked occupation, lower educational achievement, and a history of unemployment was associated with greater risk of suicide (Li et al., 2011). Furthermore, the AMPS reported that two thirds of people receiving unemployment benefits had considered suicide, and almost half had made a previous suicide attempt (McManus et al., 2016). Men are also more likely to die by suicide than women, despite women more frequently reporting suicide ideation and attempts (McManus et al., 2016), suggesting that men's suicide behaviour is more lethal. Recent global events have also impacted the prevalence of suicide behaviour; both the Covid-19 pandemic and efforts to slow the spread of it have been linked to increased suicide ideation and attempts, particularly in women and younger people (Dubé et al., 2021). It is possible

that the pandemic has exacerbated social and economic factors known to be associated with suicide, such as unemployment and social isolation (O'Connor & Kirtley, 2018).

Personality traits and psychological factors can also contribute to and increase risk of suicide; a systematic review found that hopelessness, neuroticism, and extroversion reliably predict fatal and nonfatal suicide attempts and suicidal ideation (Brezo et al., 2006).

Impulsivity is another personality trait that has been found to be associated with suicide behaviour when assessed with both self-report (Apter et al., 1993; Brodsky et al., 2001) and behavioural measures (Dougherty et al., 2004). However, research findings into the association between impulsivity and suicide behaviour have been inconclusive. Carli et al. found impulsivity to be positively associated with suicidal behaviour, but this association ceased when other psychological variables such as resilience and aggression were accounted for (Carli et al., 2010). Others argue that rather than having a direct relationship with suicide behaviour, impulsivity is associated with a greater likelihood of engaging in other behaviours that increase risk for suicide (Bender et al., 2011). These research findings will be explored in more detail later in the literature review.

Certain life experiences can also increase risk of suicide behaviour, such as 'Adverse Childhood Experiences' (ACEs). The ACE Study was one of the first large scale research projects to investigate the relationship between adult health risk behaviour and disease with exposure to several types of childhood trauma and household dysfunction including childhood abuse, witnessing violence, or living with people who went to prison (Felitti et al., 1998). It was found that exposure to ACEs had a cumulative effect on the likelihood of developing health-risk behaviours (e.g., smoking, obesity, substance misuse), mental and physical health conditions, and suicide behaviour. Exposure to more than six ACEs is associated with a 3000% increase in attempted suicide compared to those with no ACEs; an alarming statistic (Felitti et al., 1998). These findings illustrate the lasting impact of early

childhood experiences on adult health outcomes, both physical and psychological. Since then, an abundance of further research has consolidated these findings (De Bellis & Zisk, 2014; Van der Kolk, 2005; Zarse et al., 2019), however, *how* ACEs and childhood trauma interact with other risk factors to increase suicide risk remains unclear.

1.3 Models and Theories Used to Explain Suicide Behaviour

Throughout this thesis, as outlined earlier, the term ‘suicide behaviour’ will be used to describe ideations, communications, and behaviours unless specified. Self-harming behaviours where no suicidal intent is present (non-suicidal self-injury; NSSI) will not be reviewed here. It is important to note that no single model can explain all suicide behaviour. The current section does not provide a comprehensive overview of all existing theories and models to explain suicide behaviour but will review two models that are relevant within the context of the current thesis.

1.3.1 The integrated motivational-volitional model of suicidal behaviour

The Integrated Motivational-Volitional (IMV) model uses a biopsychosocial framework to explain suicide behaviour (O’Connor & Kirtley, 2018). It also uses the ideation-to-action framework which views the development of suicidal ideation and carrying out a suicide attempt as distinct processes with unique predictors (Klonsky et al., 2017).

The IMV model (see Figure 1), first proposed in 2011 by Rory O’Connor, proposes that there are three stages to suicidal behaviour. One, the pre-motivational phase; background factors and triggering events, two, the motivational phase; where suicidal ideation is experienced and intent is formed, and three, the volitional phase; where attempts are made to end life (O’Connor & Kirtley, 2018).

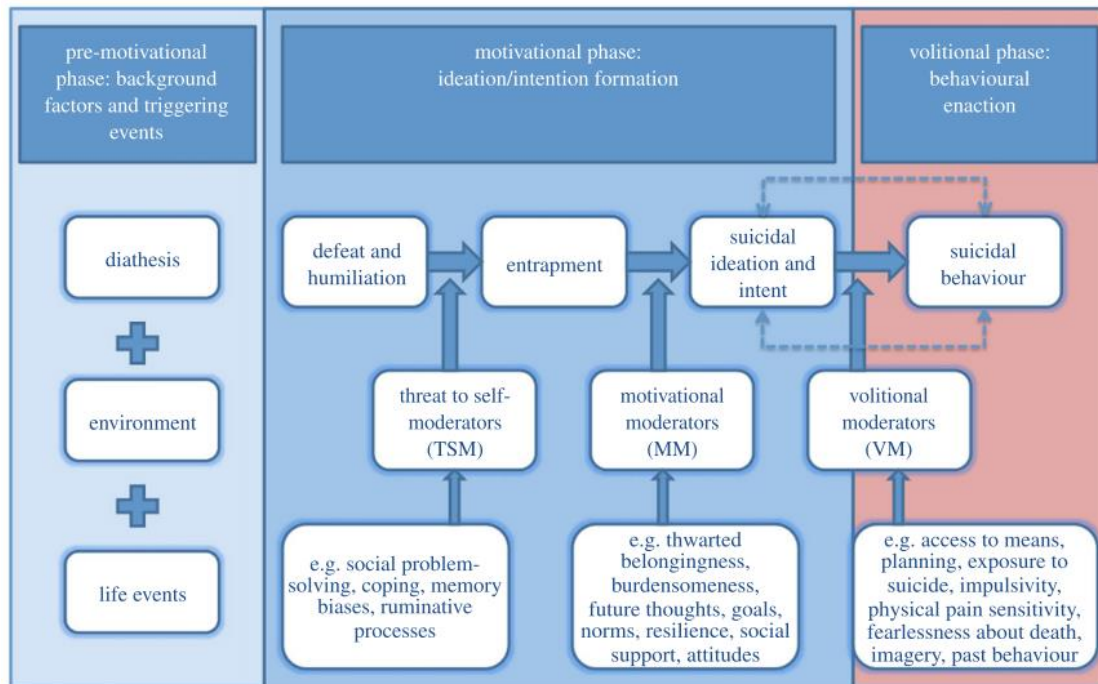


Figure 1. *The IMV Model of Suicidal Behaviour. Taken from O'Connor and Kirtley (2018, p. 2)*

During the pre-motivational phase, individual vulnerability factors together with stressful life events increase risk of suicide through their influence in the following motivational and volitional phases. These individual vulnerability factors include (but are not limited to) childhood trauma/early adversity, socially prescribed perfectionism, and socioeconomic inequality (O'Connor & Kirtley, 2018).

The pre-motivational factors cause or increase sensitivity to feelings of defeat and entrapment; feeling down, and as if there is no prospect of escape or rescue from these feelings. The presence or absence of threat to self-moderators (TSM) influence the likelihood of whether defeat leads to entrapment and include social problem-solving and rumination. The IMV model posits that motivational moderators (MMs) facilitate the transition from entrapment to suicidal ideation as 'the only perceived escape route' (O'Connor & Kirtley, 2018, p. 2). MMs include lack of social support, perceived burdensomeness, and thwarted belongingness among others, which cause the individual to enter the motivational phase where they will experience suicidal ideation. Alternatively, if an individual feeling trapped

has social support or a sense of belonging, for example, this may allow them to see the possibility of a positive future and can therefore act as a protective factor against suicidal ideation.

Finally, the individual progresses from the motivational phase to the volitional phase due to volitional moderators (VMs), which the IMV model argues are crucial for an individual to transition from suicidal ideation to making a suicide attempt. VMs include access to a means of suicide (e.g. a gun, sufficient medication for overdose), exposure, impulsivity, and past suicidal behaviour (O'Connor & Kirtley, 2018). A further VM is acquired capability for suicide, drawn from the Interpersonal Theory of Suicide (Joiner, 2005) which will be reviewed subsequently. Therefore, the IMV model is essentially a diathesis-stress model that recognises that both individual vulnerabilities and environmental stressors interact in complex processes over time for suicidal behaviour to arise. For example, the IMV model would argue that childhood trauma would act as an individual risk factor as a life event in the pre-motivation phase.

The IMV model also incorporates the differential activation hypothesis (Teasdale & Dent, 1987), which posits that when someone experiences distress and subsequent suicidal ideation, an association is formed between the two which is strengthened over time, so each time distress is experienced in future, the pathway between distress and suicidal cognitions is more easily activated. This means that even when suicide behaviour is nonfatal or ideation does not result in a suicide attempt, the association between distress and suicide behaviour will still be strengthened, and may explain why having previously attempted suicide increases risk of future suicide attempts (Probert-Lindström et al., 2020).

The IMV model has been empirically tested. A study utilising multivariate modelling found in a large sample of adults ($n = 1288$) that people who had experienced suicidal ideation differed from controls on four of the MMs; entrapment, rumination, burdensomeness

and (lack of) belongingness, even after controlling for mood and demographics, supporting that these factors are associated with suicide ideation (Dhingra et al., 2015). They also found that the suicide attempt group differed from the suicide ideation group only on volitional factors (impulsivity, fearlessness about death, friend and family imitation), but they did not differ on motivational factors (Dhingra et al., 2015), therefore providing support for all stages of the IMV model. The IMV model also supports trait impulsivity as a risk factor for suicide behaviour as a volitional moderator. Branley-Bell et al. (2019) found that participants who had experienced suicidal ideation and those who had attempted suicide had similar scores on motivational factors, but differed in volitional factors, with the suicide attempt group reporting higher acquired capability, higher impulsivity, and were more likely to have a family member or friend who had attempted suicide (Branley-Bell et al., 2019).

The authors have acknowledged some weaknesses with the IMV model; it does not address whether particular combinations of pre-motivational, motivational, and volitional factors lead to a particularly high-risk trajectory for suicide behaviour, and being a linear model, does not explain the risk factors for repeat suicide attempts (O'Connor & Kirtley, 2018). However, the authors do recognise that the pathways are likely shortened for repeat suicide behaviour (consistent with the differential activation hypothesis discussed earlier), with higher levels of motivational and volitional phase variables, which are reflected in the dotted arrows around 'suicidal ideation and intent' and 'suicide behaviour' boxes (see Figure 1).

1.3.2 The interpersonal theory of suicide

The Interpersonal Theory of Suicide (IPT), also known as the Interpersonal-Psychological Theory of Suicide, was first presented by Joiner (2005) and further developed by Van Orden et al. (2010). Like the IMV model, the IPT utilises an ideation-to-action framework whereby it argues that suicidal ideation, *capability* to engage in suicidal behaviour, and *actually* engaging in suicide behaviour are distinct processes. The IPT posits that the most dangerous suicidal intent is caused by an individual simultaneously experiencing ‘thwarted belongingness’ and ‘perceived burdensomeness’ (Van Orden et al., 2010, p. 2). Suicidal behaviour will then occur if or when the individual develops ‘acquired capability’ for suicide (see Figure 2).

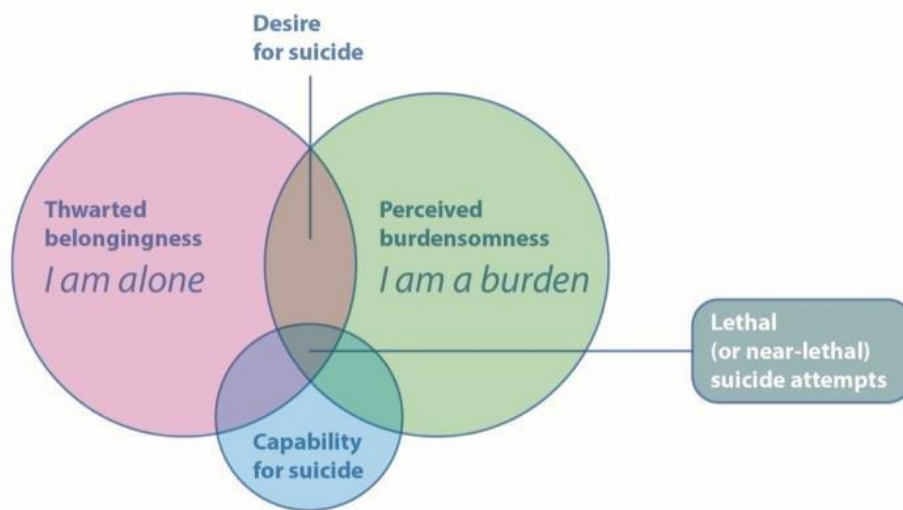


Figure 2. Assumptions of the Interpersonal Theory of Suicide, taken from Van Orden et al., 2010, p.42

Thwarted belongingness refers to when the fundamental human psychological need of social connectedness is not met. This is two-dimensional, consisting of loneliness, and the absence of reciprocally-caring relationships (Van Orden et al., 2010). The authors propose

that when thwarted belongingness is prolonged and occurs in conjunction with perceived burdensomeness, the individual is more likely to experience suicidal ideation. Perceived burdensomeness comprises two further dimensions of interpersonal functioning; cognitions of self-hatred, and beliefs that the self is so bad that they are a liability to others. The authors argue that perceived burdensomeness is the common thread between three risk factors that have robust associations with suicide; family conflict, unemployment, and physical illness. Perceiving the self to be a burden on others has been found to be associated with desire for suicide, making an attempt, and lethality of the attempt (Van Orden et al., 2010). In the IPT, thwarted belongingness and perceived burdensomeness are considered to be dynamic states which are influenced by environments, personal schemas, and emotional states, and therefore both can vary over time, relationships, and in severity. The theory is specifically developed to better understand risk factors associated with lethal suicide attempts.

The IPT differs from other models of suicide behaviour in its argument that wanting to die by suicide is insufficient alone to end one's own life because dying by suicide is not easy. The model argues that to die by suicide, individuals have to lose the fear associated with suicide behaviours which is naturally present due to its evolutionarily adaptiveness (Van Orden et al., 2010). The IPT describes losing the fear associated with suicide behaviour as 'acquired capability for suicide behaviour', which comprises of increased physical pain tolerance and reduced fear of death. Increased pain tolerance is related to both habituation to physical pain (e.g. from repeat NSSI), and expectations and cognitive appraisals regarding pain, with the key factor being that the individual believes that the pain involved in their suicide method will be tolerable. Therefore, the IPT posits that several well-established risk factors for suicide including childhood trauma, combat exposure, impulsivity, and previous suicide attempts act to increase risk because they are either physically painful or frightening and act to create acquired capability for suicide.

Chu et al. (2017) conducted a systematic review and meta-analysis of research investigating the IPT model. They found that thwarted belongingness and perceived burdensomeness were significantly related to suicidal ideation and suicide attempt, and there was a significant interaction between thwarted belongingness, perceived burdensomeness, and suicide ideation. Furthermore, consistent with the model, capability for suicide was not related to suicide risk. However, the effect sizes found were weak-moderate, and though the IPT was developed to explain lethal or near-lethal suicide behaviours there is still limited research on this so the review had limited literature to draw upon in support of this (Chu et al., 2017).

It should be noted that there are many other theories to explain suicide behaviour, such as the Schematic Appraisal Model of Suicide (Johnson et al., 2008), and the Three-Step Theory (Klonsky & May, 2015). They each have relative strengths and weaknesses, and none can explain all suicidal behaviour. For this thesis, the IMV model will be the primary model of reference as it has been recently updated, and incorporates newer research as well as well-established theory (O'Connor & Kirtley, 2018). It also provides a useful distinction between factors that increase the risk of an individual experiencing suicidal ideation vs attempting suicide, which is important because only a small subset of those who think about suicide go on to attempt, and even fewer will die by suicide (McManus et al., 2016).

1.4 Childhood Trauma and Suicide Behaviour

As discussed previously, there is a well-established link between adult suicidality and childhood trauma, which has been found in both clinical (Kim et al., 2013) and non-clinical populations (Bahk et al., 2017), and in longitudinal research (Zatti et al., 2017). Childhood trauma can be defined as any event experienced by a child that is emotionally painful or distressing, which often results in lasting mental and physical effects (Blue Knot Foundation, n.d.). This includes the witnessing of events such as abuse of other people, as well as things

directly happening to the child. Van der Kolk (1988) argues that a stressor becomes traumatic when “it overwhelms both psychological and biological coping mechanisms” (p. 274). The difficulty with retrospectively assessing childhood trauma is that it is hard to determine how a child coped with a stressor at the time and relies on self-report which limits accuracy.

Although ACEs are often used as a proxy for trauma, the ACE scale is used to assess a breadth of adverse or traumatic experiences including, for example, parental substance abuse or incarceration (Felitti et al., 1998). Nevertheless, the current thesis will focus on direct experiences of trauma to the child; namely abuse and neglect.

Different types of traumatic childhood experience may vary in their effect on increasing risk of suicide behaviour. Some research findings suggest physical abuse to be most strongly associated with suicide behaviour (Jardim et al., 2018; Zatti et al., 2017), whereas other research has found that sexual abuse increases risk of suicide the most (Angelakis et al., 2019; Fuller-Thomson et al., 2016). The latter study found that these differences persist even when data is adjusted for sex, education, ethnicity, and other possible contributing factors (Fuller-Thomson et al., 2016), illustrating that the relationship between the different types of childhood trauma and suicide behaviour is complex, and requires further research to understand the mechanisms underlying these associations.

Although there is not one agreed definition of complex trauma, it is broadly considered to be when one experiences multiple or prolonged traumatic events, particularly in early life or if the perpetrator was a caregiver or other trusted adult (NHS, 2018). For example, suffering repeated sexual or physical abuse from a parent or family member. Van der Kolk (2005) compares the difference in impact of a child experiencing complex trauma versus an isolated traumatic event, with the latter tending to produce conditioned responses to reminders of the trauma (e.g. the fear responses seen in those with PTSD in response to

‘triggers’), and the former having a pervasive negative effect on development (Van der Kolk, 2005).

A systematic review and meta-analysis of 68 studies found that complex childhood trauma (defined by the authors as repetitive traumatic incidents during childhood) is particularly strongly associated with increased risk of suicide attempt, suggesting its effect as a risk factor is cumulative (Angelakis et al., 2019). Whilst experiencing any type of childhood trauma was associated with around two to three times increased likelihood of attempting suicide, people who had experienced complex trauma were more than five times more likely to have attempted suicide than those who had experienced no trauma.

However, it is important to acknowledge that not everyone who experiences trauma goes on to experience mental distress or suicide behaviour, in fact most do not. A nationally representative sample in the UK found that in almost 4000 respondents, almost half had experienced at least one ACE (Bellis et al., 2014), however, APMS data found that around 20% of adults in the UK had experienced thoughts of ending their own life, and 6.7% had reported a historical suicide attempt (McManus et al., 2016), therefore suggesting that childhood trauma alone is insufficient to determine suicide risk. Further evidence for this comes from prospective studies; in a prospective study of teenagers and young adults aged 14-26, prevalence of moderate-severe childhood trauma was between 16.8% and 45.2% depending on the type of trauma, however, over 12 years the suicide attempt rate was 5.3% (Hadland et al., 2015).

Research evidence has also consistently shown the prolonged negative effects of trauma on the mind and body (De Bellis, 2001; De Bellis & Zisk, 2014; Felitti et al., 1998; Jardim et al., 2018), some of which will be summarised in the following section.

1.5 Stress: Associations with Childhood Trauma and Suicide Behaviour

1.5.1 Childhood trauma and the stress response

There is evidence for a distinct neuropsychological profile in people who have experienced maltreatment or trauma as a child. Teicher and Samson (2013) reviewed literature on childhood maltreatment and psychopathology. They reported that individuals with diagnosed mental health disorders who reported traumatic childhood experiences were more likely to have reduced hippocampal volume and amygdala hyperactivity than people with diagnosed mental illness who did not experience childhood trauma. These areas of the brain have key roles in the body's stress and fear responses (De Bellis & Zisk, 2014). When the brain interprets an experience as threatening, an acute stress response takes place and multiple neurotransmitter systems and neuroendocrine axes are activated (De Bellis, 2001), colloquially referred to as the "fight or flight" response. Traumatic childhood experiences can cause this stress response to be chronically activated and overused (De Bellis & Zisk, 2014). This overuse of the stress response has several effects; it has been found to effectively reset or disrupt the biological stress system, whereby adults who report experiencing childhood trauma show lower cortisol levels (De Bellis & Zisk, 2014; O'Connor et al., 2020). These effects are thought to be more pronounced the younger the child was when the trauma or chronic stress occurred, which is thought to be an adaptive response to prevent physical harm to the body (De Bellis & Zisk, 2014).

There is a large body of research on how childhood trauma can damage the hypothalamic-pituitary-adrenal (HPA) axis and stress regulation. The HPA axis has a central role in regulating the body's response to stress, and when activated it triggers other key stress responses in the body, eventually leading to release of the hormone cortisol (De Bellis & Zisk, 2014). For instance, Lovallo (2013) found that adults who had experienced high levels

of childhood adversity had reduced cortisol responses and heart rate reactivity, reduced cognitive capacity, and poorer emotional regulation in response to psychosocial stress.

Steptoe and Serwinski (2016) theorise that these differences in physiological stress response occur because the cortisol awakening response (CAR) is larger in response to acute stressors, but not in response to prolonged stressors that cannot be immediately addressed. In further support of this, O'Connor et al., (2018) examined experiences of childhood trauma and cortisol response following a laboratory-based stress task, and found that childhood trauma significantly predicted a blunted cortisol response to stress as well as lower resting cortisol level. McLaughlin et al. (2014) report on the neurodevelopmental effects of different types of childhood trauma. They propose that childhood deprivation has a different effect on neurodevelopment than childhood threats (e.g., abuse), and that attempts to attribute the impact of childhood trauma to changes to the stress pathway are oversimplified. They summarise evidence across both animal and human research, and argue that although experiences of threat or abuse lead to HPA axis dysfunction, early deprivation leads to different neurobiological changes including overall decreases in grey matter volume and thickness and generally poorer cognitive performance (McLaughlin et al., 2014). Further longitudinal research is needed to determine the effects of different traumatic experiences on neurodevelopment and the stress response. Research has also shown that adults who experienced sexual or physical abuse before the age of 12 self-reported more current stressful events, with this association stronger in those who had experienced physical abuse (Kim et al., 2013). However, it is unclear whether these individuals did experience more stressful events or whether they may have lowered the threshold for what is perceived to be stressful. The latter has been supported in research, where adolescents with a history of child sexual abuse had a lower threshold of what was perceived as a stressful event (Harkness et al., 2006). Alternatively, it is possible that childhood trauma indirectly causes stress through an

influence on personality traits, which could predispose an individual to engage in behaviour that increases the likelihood of experiencing stressful events, consistent with the IPT model (Van Orden et al., 2010).

1.5.2 Stress and suicide behaviour

In addition to the association with childhood trauma, impaired stress response has also been found to be associated with suicide behaviour. Rizk et al., (2018) compared the stress response of people with chronic and brief suicidal ideation with healthy controls, and found that participants with brief suicidal ideation had greater cortisol response during a laboratory stress task than participants experiencing chronic suicidal ideation and healthy volunteers (Rizk et al., 2018). The relationship between trauma, suicide, and the stress response has also been studied at a daily level. O'Connor et al. (2020) investigated whether childhood trauma and daily stressors were associated with variations in CAR over a seven-day period. They found that participants who had attempted or considered suicide had significantly lower CAR than controls, and reported childhood trauma was also associated with a lower CAR (O'Connor et al., 2020). It can therefore be postulated that childhood trauma may have an indirect effect on suicide risk in adulthood due to HPA axis dysregulation. This is further supported by research examining cortisol activity after completing a laboratory based stress task in individuals who had attempted suicide, thought about suicide, and controls (O'Connor et al., 2017a). One-hundred-and-sixty participants completed a stress test in a laboratory and had cortisol measured throughout along with an assessment of suicide behaviour which was repeated at one and six month follow up. It was found that those who had made a previous suicide attempt had the lowest cortisol activity during the stress task, followed by the suicide ideation group and then controls. It was also found that having lower levels of cortisol during the stress task was associated with reporting higher levels of suicidal ideation at one month follow-up, providing more direct evidence for an impaired stress response and suicide

behaviour (O'Connor et al., 2017). However, longitudinal prospective research capturing these risk factors is needed to further ascertain a causal relationship. A recent systematic review and meta-analysis found stressful life events were prospectively associated with a 45% increase in suicidal ideation (Howarth et al., 2020). However, only one study at the time the review was written had measured suicide attempt as an outcome, therefore further research is needed to ascertain a relationship between stressful events and suicide attempt.

1.6 Trait and State Impulsivity

Impulsivity can be broadly summarized as the “tendency to act spontaneously and without deliberation” (Carver, 2005, p. 13), but has also been defined as an inability to wait, insensitivity to consequences, and inability to inhibit inappropriate behaviours (Reynolds et al., 2006). The most commonly used self-report measure of impulsivity is the Barratt Impulsivity Scale (BIS-11; Patton et al., 1995), which conceptualises impulsivity as having three subcomponents: motor impulsivity; acting without thinking, cognitive impulsivity; making decisions quickly, and non-planning impulsivity; a lack of thinking about the future or forethought (Barratt, 1985). Reise et al. (2013) believe impulsivity to be made of fewer facets, and argue that impulsivity has a two factor structure comprising of cognitive and behavioural elements. Alternatively, Whiteside et al. (2005) provide evidence for a four factor structure consisting of negative urgency, lack of premeditation, lack of perseverance, and sensation seeking, which they used to form the UPPS impulsive behaviour scale. The scale was later updated to include positive urgency, which refers to the tendency to act impulsively in response to positive emotions (Lynam et al., 2006).

Impulsivity can also be assessed using behavioural tasks such as delay discounting and response inhibition. When behavioural and self-report measures of impulsivity are compared, disinhibition is most strongly associated with motor impulsivity (Stanford et al., 2009), however, self-report and behavioural measures of impulsivity are not strongly

associated and therefore may be measuring different things (Reynolds et al., 2006), making it difficult to compare findings. It is possible that people's own perception of the extent to which their personality is impulsive is inconsistent with the amount of impulsive behaviour they display, which could explain the differences found between behavioural and self-report measures of impulsivity within individuals.

There is support for impulsivity being a temporally stable trait, with a review study finding test-retest reliability of BIS-11 score at one month to be .83 (Stanford et al., 2009). However, impulsivity at a trait level may measure a different construct than impulsive behaviour on a day-to-day basis, and not capture intra-individual variation. Sharma et al. (2014) explain that there are less frequently occurring behaviours associated with impulsivity such as receiving a speeding ticket or risky sexual behaviour, versus ones that may occur on a daily basis such as not reading instructions before starting something (Sharma et al., 2014). To address this, Tomko et al. (2014) developed the Momentary Impulsivity Scale (MIS), which was designed to measure impulsivity in daily life and capture both intra and inter-individual variability. Initial testing of the MIS found it to be only moderately positively associated with trait measures of impulsivity including the BIS-11 and UPPS, suggesting that state or daily impulsivity are different concepts (Tomko et al., 2014). This may have particular relevance within the context of suicide behaviour, which will be discussed in the subsequent section.

1.7 Impulsivity: Associations with Suicide Behaviour

1.7.1 Trait impulsivity and suicide behaviour

Research studies have found higher levels of self-report trait impulsivity in those who have attempted suicide compared with healthy controls in both the general population (Mann et al., 1999; Wetherall et al., 2018), and in clinical samples such as disorders of psychosis

(Nanda et al., 2016) and Borderline Personality Disorder (BPD; Brodsky et al., 1997).

Behavioural measures of impulsivity such as tasks of immediate and delayed memory have also been found to correlate with number of previous suicide attempts in adults in the general population (Dougherty et al., 2004), and severity of previous suicide attempts in people with a diagnosis of bipolar disorder (Swann et al., 2005). Other behavioural measures of impulsivity have also been found to be positively associated with suicide behaviour; Allen et al. (2021) found that response inhibition in a stop-signal task was positively associated with both previous suicide history and prospective suicide behaviour, and impulsive aggression measured via a computer task was positively associated with suicide attempts in people who were not being treated with antidepressants (Bridge et al., 2015). Impulsivity is also noted as a volitional moderator in O'Connor and Kirtley's (2018) IMV model, and as a contributing factor to the development of acquired capability for suicide in the IPT theory for suicide (Van Orden et al., 2010). Taken together, existing research suggests that impulsivity is an important factor to consider in the risk assessment of suicide behaviour.

1.7.2 Impulsive suicide attempts

Despite support for impulsivity as a relatively stable personality trait (Stanford et al., 2009), as discussed previously, how this presents daily may vary. Therefore, impulsivity is a concept that should be considered at both trait and state level in the context of suicide; the individual may have impulsive personality traits, and/or the suicide attempt may be impulsive, e.g., not planned or prepared for in advance (May & Klonsky, 2016). Consistent with this, research has shown that trait impulsivity is not a good predictor of how impulsive a suicide attempt was, when classified by amount of active preparation and the degree of premeditation (Baca-Garcia et al., 2005). Chalker et al. (2015) examined seven core constructs from the literature on impulsiveness in suicidal behaviour and examined to what extent they could predict suicidal intent, lethality of attempt, and the likelihood of a future

attempt in the following six months. The seven constructs were ‘resisting the urge/delaying’, planning, trait impulsivity, communication to others, leaving a suicide note, the ability to be rescued, and intoxication (Chalker et al., 2015). It was found that these seven constructs were weakly associated and varied in their predictability of suicide intent, lethality, and repeated attempt. Suicidal intent was predicted only by planning and ability to be rescued, lethality only by ability to be rescued, and likelihood of making another attempt in six-month follow-up was predicted by trait impulsivity (Chalker et al., 2015). Therefore, this suggests that certain components of trait impulsivity may be predictive of specific aspects of suicide behaviour. The authors highlight that previous literature has reported varying findings on the impulsivity-suicide relationship due to using a variety of measures of impulsivity which examine different constructs, which therefore may explain the differences in findings between studies (Chalker et al., 2015).

Similarly, May and Klonsky (2016) examined three indicators of whether a suicide attempt was impulsive (preparation, time contemplating the attempt, and self-report that the attempt was impulsive) alongside trait impulsivity and characteristics of the attempt. In 205 individuals with a history of suicide attempt, no correlation was found between any of the three indicators of attempt impulsivity and trait impulsivity, or with other features of the suicide attempt including lethality, motivation, or pre-attempt communication (May & Klonsky, 2016). Taken together, these findings suggest that there may be two impulsivity-related pathways to suicide behaviour: one related to impulsive suicide attempts, or a ‘state’ level of impulsivity that may fluctuate, and the other related to impulsive traits.

1.7.3 Impulsivity and acquired capability for suicide

As summarised earlier when reviewing the IPT for suicide, Joiner (2005) argues that impulsive people have greater ‘acquired capability’ for suicide due to the association between impulsivity and risky behaviours such as taking drugs, gambling, and risky sexual behaviour.

Over time, the consequences of these behaviours result in emotional pain which the individual habituates to, which Joiner (2005) argues results in acquired capability for suicide. This therefore increases the likelihood of them attempting suicide if they experience suicidal ideation. They argued that there are two general categories of individuals at risk of suicide; 1) people with dysregulated impulse control, and 2) those with a propensity to intense psychological pain (Joiner et al., 2005). This hypothesis was later tested in a sample of 516 outpatients from a community health centre in Florida. The participants completed self-report measures of impulsivity, frequency of 'painful and provocative events' (e.g. being involved in a physical fight, intentionally hurting animals, playing contact sport), and acquired capability for suicide, in addition to having their physical pain tolerance tested (Bender et al., 2011). They found that impulsivity was indeed indirectly associated with acquired capability for suicide behaviour (both self-report and pain tolerance measures), with painful and provocative events mediating this relationship, supporting Joiner's (2005) argument.

Anestis et al. (2014) conducted a meta-analysis of studies examining the association between trait impulsivity and suicide behaviour, and a critical review of studies examining the impulsiveness of suicide attempts. They reported a small but significant association between trait impulsivity and suicide behaviour; however, across studies that dichotomised suicide attempts as either impulsive or not, they found that the prevalence of impulsive attempts varied between 13% and 97% (Anestis et al., 2014). They suggest the reason for this wide range is that researchers have not been able to sufficiently measure the impulsiveness of attempts, and that further research is needed. Anestis et al. (2014) also acknowledge that even if a suicide attempt appears to be carried out impulsively, it is possible that the individual may have been experiencing suicidal ideation for a significant amount of time before acting, which most research designs do not account for.

In summary, impulsivity may act as a risk factor for suicide in both a proximal and distal way; the former if an individual makes a suicide attempt impulsively in response to stress, a situation, or self-awareness, and the latter by facilitating other risky behaviours which then result in acquired capability for suicide. There is evidently a distinction between impulsive people who attempt suicide, and those who make impulsive attempts. The current study will focus on impulsivity as a personality trait, and how this can influence suicide behaviour at both a trait and daily level. Prospectively examining trait impulsivity alongside impulsivity of suicide attempts would require a longitudinal design and is beyond the scope of the current study.

1.7.4 Facets of impulsivity and suicide behaviour

In addition to the broad associations found between trait impulsivity and suicide behaviour, some research has also found different facets or subtypes of impulsivity to have differing strengths of association with suicide behaviour. Klonsky and May (2015) used their UPPS model to propose a theory of impulsivity and suicide, whereby trait impulsivity would distinguish between people experience suicide ideation, and those who attempt to end their own life. When this hypothesis was tested in a large sample of students, it was found that previous suicide ideation and attempt were both positively associated with negative urgency, however only participants who had attempted suicide showed poor premeditation. Neither group showed high sensation seeking or a lack of perseverance. This suggests that different facets of impulsivity may be associated with different types of suicide behaviour and/or risks (Klonsky & May, 2015). Therefore, different types of impulsivity may have utility in distinguishing between people who experience suicidal ideation and those who will go on to attempt suicide. Using the BIS-11, other research found motor impulsivity to positively correlate with number of previous suicide attempts (Dougherty et al., 2004).

Yen et al. (2009) examined the ability of sub-components of impulsivity to predict suicide attempts in 701 participants in the Collaborative Longitudinal Personality Disorders Study. They found that when using multivariate models the only component of impulsivity to predict suicide attempt was (lack of) premeditation (Yen et al., 2009). However, they used items from the NEO-personality inventory (Costa & McCrae, 1992) to correspond with aspects of impulsivity (Yen et al., 2009), which although is a well validated measure of personality (McCrae & Costa, 1987), is not a tested and validated measure of impulsivity.

In Anestis et al. (2014) review, of the 70 studies examining trait impulsivity and suicide behaviour, just nine reported on subtypes of impulsivity. Of these, three reported findings of higher attentional impulsivity (BIS-11) in people who had made suicide attempts, two reported higher negative urgency (UPPS) in people who had made suicide attempts, whereas others reported differences in motor impulsivity, lack of planning, or ability to delay rewards (Anestis et al., 2014). Several of these studies had a small sample size, and several more used participants from specific clinical populations such as adolescent psychiatric inpatients or people with a diagnosis of bipolar disorder, therefore further research is needed to determine which components of impulsivity are associated with suicide behaviour, and in what context(s).

1.8 Childhood Trauma, Stress, Impulsivity, and Suicide Behaviour

The preceding sections have summarised research on the associations between childhood trauma, stress, impulsivity, and suicide behaviour. The current section will highlight links between these areas, exploring the possibility of impulsivity acting as a moderating factor in the trauma-suicide relationship, and how this may present at a daily level during conditions of stress.

Brodsky et al. (2001) conducted some of the earliest research investigating the relationship between trauma, impulsivity, and suicide behaviour together. They found that

participants with a history of childhood abuse were more likely to have attempted suicide, scored higher on impulsivity measures, and that participants with a history of at least one suicide attempt scored higher on impulsivity measures than those who had not attempted suicide. Yildirim and Kesebir (2015) provide stronger evidence for an interactive relationship between childhood trauma, impulsivity, and suicide behaviour. They examined the relationship between suicidal intent, childhood trauma, and impulsivity in 150 people with bipolar disorder. Participants who had experienced childhood trauma had higher suicidal intent and impulsivity than those who had not. Furthermore, they also found that impulsivity and suicidal intent were only positively associated in participants with a history of sexual abuse. However, due to the specific clinical sample of individuals with bipolar disorder, results may not be generalisable to the general population. Evidently, further research is needed that examines the subtypes of both impulsivity and trauma to unpick where and why the effect on suicide behaviour occurs.

Behavioural disinhibition in a computer task was found to be associated with a greater likelihood of suicide attempt and more previous suicide attempts in adolescents with a history of childhood sexual abuse, but not among those without (Stewart et al., 2015). This effect remained when controlling for frequency of suicidal ideation and plans, depressive symptom severity, and other co-occurring forms of abuse, therefore suggesting an interaction effect between childhood sexual abuse and impulsive behaviour.

Lovallo et al. (2013) found childhood adversity to be associated with behavioural impulsivity and 'antisocial tendencies' (Lovallo et al., 2013, p. 4). From this, they proposed a model where early adversity negatively impacts stress reactivity through long-term allostatic load resulting in physiological and cognitive changes that would "reduce internal cues associated with danger when an individual confronts risky choices" (Lovallo, 2013, p. 4), therefore fostering more impulsive and risky behaviours. Essentially, they propose that the

neurobiological changes associated with early trauma may make an individual more likely to act impulsively in response to stress, which could in turn increase the risk of suicidal behaviour in response to emotional distress due to the consequences of the behaviours they engaged in (Lovallo et al., 2013). This is consistent with findings that historical suicide attempts were associated with physical and sexual abuse and difficulties controlling impulsive behaviour when distressed (Lynam et al., 2011).

It is possible that impulsivity has a moderating role in the relationship between trauma and suicide behaviour. A moderation effect is an interaction, where X and Y are consistently associated, but if M is present, it will affect the strength of the relationship between X and Y (Baron & Kenny, 1986). For example, if this hypothesis was correct in this instance, then the association between childhood trauma and suicide behaviour would be strengthened in individuals who are also impulsive. Although impulsivity has been recognised as an important risk factor in understanding suicide risk, to the authors knowledge, no research to date has investigated impulsivity as a moderator in the childhood trauma and suicide association.

1.9 Summary and Rationale for the Current Study

In summary, there is a growing body of research to support the association between childhood trauma, impulsivity, and suicidal behaviour (Stewart et al., 2015; Yen et al., 2009; Yildirim & Kesebir, 2015), but impulsivity as a moderating factor in this relationship has not been investigated. There is also limited research into which specific facets of impulsivity are associated with childhood trauma and/or suicide behaviour, and whether this occurs at a trait or daily level, or both. Further research examining the subcomponents of impulsivity is important, as they may have different neurobiological underpinnings. Studying impulsivity as a unidimensional concept may cloud results, which could explain some of the mixed findings with regards to impulsivity and suicide. Much of the existing research in these areas does not

differentiate between types of traumatic experience either (e.g., sexual abuse vs emotional neglect), which may have different effects on the stress response/impulsivity (McLaughlin et al., 2014), therefore the current study will differentiate between types of traumatic childhood experience. Furthermore, some of the strongest research for the relationship between childhood trauma, impulsivity and suicide behaviour has utilised populations on which it is difficult to generalise findings, so further research within the general population is needed.

Again, there is evidence for an association between childhood trauma and an impaired stress response (De Bellis & Zisk, 2014; O'Connor et al., 2020; Teicher & Samson, 2013) and evidence supporting an association between stressful life events and suicide behaviour (Howarth et al., 2020; O'Connor et al., 2017), but it is not yet known whether individuals who have experienced trauma are more likely to respond impulsively to stressful situations on a day-to-day basis. Relatively few studies, if any, have explored the effects of childhood trauma on impulsivity and stress at a daily level. This is a neglected area of research which may reveal key information for how people who have experienced childhood trauma may behave on a daily basis, and further elucidate how known risk factors for suicide including childhood trauma, impulsivity, and stress may interact and influence one another. Previous research has examined the relationship between childhood trauma and daily stress (e.g., O'Connor et al., 2020), but no research to date has investigated whether childhood trauma may moderate the relationship between daily stress and daily impulsivity. A “daily diary approach” (see O'Connor & Ferguson, 2008) will be utilised in this study because it will allow exploration of between-participant factors; in this case, childhood trauma, alongside within-participant processes occurring over a week; impulsivity and stress. The daily diary method will also help to reduce retrospective self-report bias, and accounts for the daily variations that can be expected in behavioural expressions of impulsivity (Tomko et al., 2014).

Knowing whether impulsivity and childhood trauma interact to amplify the risk of suicidality as opposed to when either is present alone, in addition to knowing which type of trauma and/or impulsivity is most strongly associated with suicide behaviour is crucial in understanding the suicide risk of different populations and detecting people who may be at higher risk, which could help inform public health interventions and campaigns and target mental health resources to those who need it the most.

1.10 Research Questions and Hypotheses

Taken together, and illustrated in Figures 2 and 3, the current study had six specific research questions and hypotheses:

1.10.1 Research questions

1. Which subtypes of childhood trauma are associated with suicide behaviour?
2. Are subtypes of impulsivity, as well as general trait impulsivity more broadly associated with suicide behaviour?
3. Does trait impulsivity or subtypes of trait impulsivity moderate the relationship between childhood trauma and suicide behaviour?
4. Is childhood trauma or subtypes of childhood trauma associated with higher levels of trait impulsivity, and subtypes of impulsivity?
5. Is childhood trauma, or subtypes of childhood trauma associated with higher levels of daily impulsivity?
6. Does childhood trauma or subtypes of childhood trauma moderate the relationship between daily stress and daily impulsivity?

1.10.2 Hypotheses

1. All subtypes of childhood trauma will be positively associated with suicide behaviour.
2. Trait impulsivity and its subtypes will be positively associated with suicide behaviour.

3. Trait impulsivity and its subtypes will moderate the relationship between childhood trauma and suicide behaviour.
4. Childhood trauma and its subtypes will be positively associated with higher levels of trait impulsivity.
5. Childhood trauma and its subtypes will be positively associated with higher levels of daily impulsivity.
6. Childhood trauma and its subtypes will moderate the relationship between daily stress and daily impulsivity.

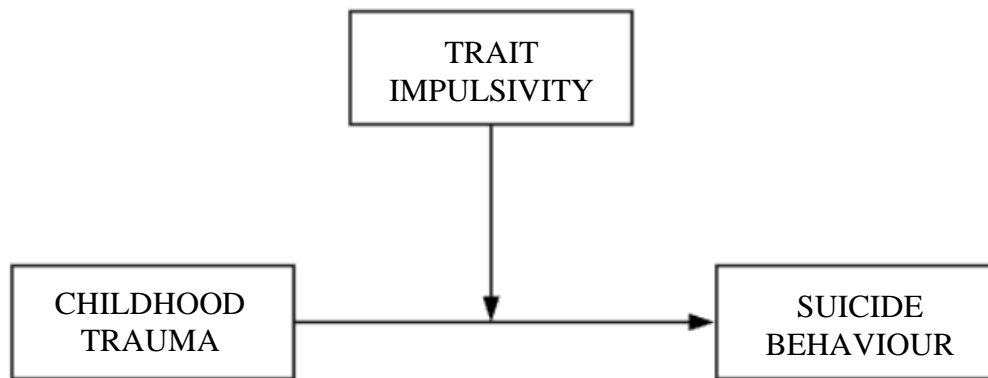


Figure 3. *Model of the Proposed Interaction Between Childhood Trauma, Trait Impulsivity, and Suicide Behaviour*

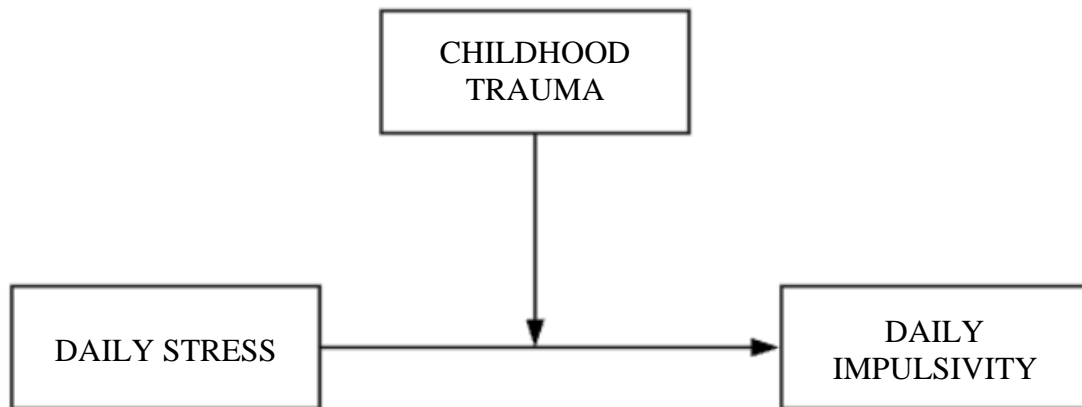


Figure 4. *Model of the Proposed Interaction Between Stress, Childhood Trauma, and Impulsivity*

2. Method

2.1 Design

An interval contingent daily diary design was utilised whereby participants completed an initial battery of baseline questionnaires followed by an online daily diary for 7 days.

The required sample size for the chosen method of analysis was determined using a summary-statistics-based power analysis to detect a cross-level effect informed by a previous unpublished study dataset (Murayama et al., 2022). The power analysis showed that a minimum sample of 265 would be required to achieve 80% power ($t = 1.98$, $df = 130$). To allow for attrition between completing the baseline measures and the diaries, and to capture sufficient variation in suicide behaviour, the current study aimed to recruit 300 participants.

2.2 Ethics

The study received ethical approval from the University of Leeds, School of Psychology Ethics Committee on 18/05/2021, ethics number PSYC-270.

2.2.1 Protecting vulnerable participants

The study procedure included completion of measures that ask for sensitive and personal information regarding experiences of childhood abuse and neglect, and previous experiences of suicide behaviour. Participants who had previously experienced suicidal ideation or attempts were considered vulnerable to experiencing distress when completing the study. Several steps were taken to safeguard these potentially vulnerable participants. Firstly, a screening for very vulnerable individuals was used at the beginning of the study, which asked whether participants had experienced suicidal ideation or behaviour within the last 4 weeks. If participants responded 'yes' to this, they were prevented from taking part, and presented with an explanation for this along with information about how to seek support (Appendix A). In addition to this, after completing each set of daily measures, participants were provided with a debrief with information about how to seek extra support if needed and signposted to relevant national services (Appendix B). Furthermore, it is worth noting that a meta-analysis found that asking research participants about suicide does not increase risk of suicide behaviour (Blades et al., 2018); these protective measures were precautionary. The participant information sheet (Appendix C) also encouraged participants to withdraw from the study if they found the questions to be causing distress or experienced deterioration in their mental health.

2.2.2 Sensitive participant information

As aforementioned, some of the data collected was of a sensitive nature. Accordingly, participants and all data remained anonymous throughout the study. All information collected was stored initially on Online Surveys before being downloaded, stored, and encrypted within secure University Cloud drives. Participants' telephone number and email were required to commence the daily diary part of the study; however, these were not linked with their response data and were permanently deleted after inputting into an automatic text

message generator. During the first phase of the study when baseline questionnaires were completed, participants were asked to generate a unique ID code comprising of numbers and characters corresponding to information such as year of birth, mother's maiden name, etc. This ID code was used to link the baseline questionnaires with the daily diary data for analysis without identifying the individual and could also be used if participants wished to later withdraw their data.

2.3 Participants

Participants were recruited by convenience sampling using a variety of methods including poster advertisements around the local area, online (Twitter, Reddit, Gumtree, Facebook, and Instagram), on MQ Mental Health Research, by passing out flyers in the city and on the University of Leeds campus, and advertising on the University of Leeds Psychology Research Portal. Two different poster designs were used to recruit participants with and without history of suicide behaviour. Wording of "Have you been feeling down or depressed recently?" was previously used successfully to recruit participants who had previously experienced suicide behaviour (O'Connor et al., 2020). The other poster advertised for participation in a research study on 'Childhood Experiences, Relationships, and Personality'. See Appendix D for all recruitment materials.

Inclusion criteria for participation was being over the age of 18, understanding English sufficiently to answer the questionnaires, and being able to complete the daily diary questionnaires electronically using a mobile phone. In addition to those under 18 years of age and unable to read English, participants who had attempted suicide or experienced suicidal ideation within the last four weeks were excluded from participating due to the potential increased risk of this population experiencing distress when completing the study. Eligibility screening questions were presented immediately after participants gave informed consent. One participant was not eligible to participate due to insufficient understanding of English,

and seven participants were not eligible due to experiencing suicide behaviour within the last four weeks.

Participants read an information sheet presented online and consented to participation by indicating agreement to statements by ticking a box, without which they were unable to proceed. Again, they were reminded of their right to stop their participation in the study at any time. See Appendix E for full consent form.

2.4 Measures

Demographic information was collected, comprising of age, gender, occupation, and ethnicity. Please note that data collection for this project was shared with another DCLinPsy thesis and so some measures were administered that are not relevant to the current thesis and therefore will not be discussed here. See Appendix F for the additional measures administered.

2.4.1 Childhood Trauma Questionnaire-Short Form (CTQ-SF).

The CTQ-SF (Bernstein et al., 2003) is a 28 item version of the full Childhood Trauma Questionnaire, which contains 70 items (Bernstein et al., 1998). It was administered once during phase one of the study. It consists of 25 items which assess five types of trauma: physical, sexual, and emotional abuse, and physical and emotional neglect. Items ask about childhood and adolescent experience, e.g. “I had to wear dirty clothes”, and are answered Likert-style, with response options ranging from ‘Never True’ to ‘Very Often True’. They are subsequently scored from zero to five, with a higher score indicating more frequent occurrences of the experience described in that item. Therefore, the possible score range is 0-125 for the full scale, and 0-25 for each specific type of trauma. Cronbach’s α for the full scale was reported to be .95 (Bernstein et al., 1998). In the current sample, Cronbach’s α was .88 for the full scale, .80 for physical neglect, .84 for physical abuse, .95 for sexual abuse, .90

for emotional abuse, and .92 for emotional neglect, indicating a good level of internal consistency. The CTQ-SF was chosen over the original version because it takes no more than five minutes to complete compared with 10-15 minutes for the original version, and we endeavoured to reduce participant burden and respondent fatigue where possible, particularly given the nature of the questionnaire. See Appendix G for full measure.

2.4.2 Barratt Impulsiveness Scale 11 (BIS-11)

The BIS-11 (Patton et al., 1995) is a 30 item self-report scale designed to measure trait impulsivity. The BIS-11 will be used once as a baseline measure of trait impulsivity, chosen because it has been extensively validated in a variety of populations (Stanford et al., 2009). The BIS-11 aims to capture the theoretical sub-components of impulsivity; cognitive/attentional, motor, and non-planning, with different items mapping onto these sub-components, and therefore allowing for assessment of different domains of impulsivity. For example, one item reads “I plan tasks carefully”, which corresponds to the non-planning component of impulsivity. Eight items map onto attentional impulsivity, 11 items to motor impulsivity, and 11 items to non-planning impulsivity. Participants respond using a four-point Likert-style (1 = Rarely/Never, 2 = Occasionally, 3 = Often, 4 = Almost Always/Always), giving a possible score range of 30-120 for the full scale, 8-32 for attention, 11-44 for motor, and 11-44 for non-planning. Some items are negatively scored. Higher scores indicate greater trait impulsivity. Research has found psychometric properties to be very good, with Cronbach’s α reported as .83 overall, and test-retest reliability had a Pearson’s r of .83 (Stanford et al., 2009). In the current sample, the Cronbach α was .85 for the full sample, .80 for attentional, .64 for motor, and .73 for non-planning. The BIS-11 was used once at baseline. See Appendix H for full measure.

2.4.3 Adult Psychiatric Morbidity Surveys (APMS)

The APMS (McManus et al., 2016) are a set of surveys which are used to capture a range of information related to mental health difficulties and suicidal thoughts in adults living in England, Scotland and Wales (NHS Digital, 2021). Two items from the section relating to suicidal thoughts and attempts were chosen to measure previous experience of suicidal ideation and/or attempt:

1. “Have you ever seriously thought of taking your life, but not actually attempted to do so?”
2. “Have you ever made an attempt to take your life, by taking an overdose of tablets or in some other way?”

The APMS questions were chosen due to their brief nature and effectiveness in capturing the information that was needed and will allow direct comparison of suicide behaviour in our sample with adults living in the UK. These items have been used to assess suicidal behaviour extensively in past research (O’Connor et al., 2021; Wetherall et al., 2018). They were administered once at baseline.

2.4.4 Momentary Impulsivity Scale (MIS)

The MIS (Tomko et al., 2014) is a four-item self-report scale that is designed to capture daily variability in impulsivity. Participants indicate the extent to which each statement describes their experience ‘since the last prompt’ (referring to the last completed set of questionnaires), e.g. “I said things without thinking”. Participants respond using a 5-point Likert-scale (1 = very slightly or not at all, 2 = a little; 3 = moderately; 4 = quite a bit, 5 = extremely), with total score ranging from 4-20. This scale was completed daily at 18:00 for seven days. The scale has shown to be reliable and valid (Tomko et al., 2014). In the current study, Cronbach’s α was .69. The MIS was chosen for the daily measure of impulsivity firstly because it was specifically designed to capture within-person variation in impulsivity, and secondly, because the brief version has only four items and reduces participant burden.

The MIS was administered once each evening for seven days. See Appendix I for the full measure.

2.4.5 Perceived stress scale; four-item version (PSS-4).

The PSS-4 (Cohen et al., 1983) is brief, four-item version of the perceived stress scale found to have comparable reliability and validity to the full version which was developed at the same time. The authors reported the PSS-4 to have Cronbach's α of .72 demonstrating good internal reliability (Cohen et al., 1983). We have adapted this scale to correspond to daily stress rather than monthly, and to be answered in written format, which has been previously validated, with Omega reliability co-efficient found to be .62 for within-person and .73 for between-person (O'Connor et al., 2020). Cronbach's α for the current study was .82. Participants respond using a five-point Likert style ('never' = 0, 'almost never' = 1, 'sometimes' = 2, 'fairly often' = 3, to 'very often' = 4). For example, "In the last day, how often have you felt that you were unable to control the important things in your life?". This scale was completed each evening for seven days. Total scores ranged from 0-16. See Appendix J for the full measure.

2.5 Procedure

Participants were approached for participation in the study in a variety of ways; by reading posts online, seeing the study in the University of Leeds Participant Pool, scanning a QR code on a poster, or being passed a flyer with the study information and QR code. All methods of advertising the study directed participants to Online Surveys (www.onlinesurveys.ac.uk), where they were presented with an information sheet and consent form. See Appendices C and E for further detail. The entirety of data collection was completed using Online Surveys in two phases.

2.5.1 Phase one

In phase one, participants completed baseline measures including the CTQ-SF, BIS-11, APMS suicide behaviour questions, and demographic measures. Participants were also directed to generate a unique ID code which would be used to link their phase one and two datasets anonymously and could also be used if they later wished to withdraw their data from the study. Following completion of the baseline measures, participants were asked if they were willing to participate in phase two. If so, they were instructed to contact the study email address with a phone number on which they could be contacted daily for seven days with a link to the daily diary measures, with the subject heading 'Start study tomorrow'. The research team monitored the study inbox daily.

2.5.2 Phase two

In phase two, participants completed the MIS and PSS-4 daily on Online Surveys for seven days, which took around five minutes to complete each day before going to bed. This used an interval-contingent protocol (O'Connor & Ferguson, 2008), where participants were sent a link by text at 18:00 GMT each evening and asked to reflect on the previous 24 hours. We used an online automated text generating service 'Voodoo' (www.voodoosms.com) to minimise the risk of errors and burden on the research team, and to avoid storing sensitive participant data. On days one to six, participants were sent a link to the daily questionnaire measures, and on day seven the participants were sent a link to the same questionnaires measures with an additional debrief page at the end (see Appendix B). Upon completion of the seventh day of the study, all participants had the opportunity to be entered into a prize draw to win one of ten £20 online shopping vouchers. Undergraduate students who signed up to the study via the University of Leeds Participant Pool were granted seven credits following completion of the daily diary questionnaires.

2.6 Data Extraction and Preregistration

Data was exported from Online Surveys into SPSS Version 26. Demographics and baseline between-participants measures are hereon referred to as the level two data, and the daily diary within-participant measures as the level one data set. Prior to analysis, data and planned analyses were preregistered on AsPredicted.org, study number 82394.

2.7 Data Cleaning and Preparation

Data cleaning involves preparing data for analysis by removing or modifying data that is incorrect, incomplete, duplicated or improperly formatted (Pallant, 2020). The steps taken to do so with level one and two data will be described subsequently.

2.7.1 Level one data

Level one data were cleaned in SPSS according to the following pre-determined rules:

1. If the participant completed less than two diary entries, they would be excluded from the analysis.
2. Diary entries completed after 9am (for the previous day) were deleted.
3. If two diary entries were completed after 9am on the same day (for example at 10am and 7pm), the former entry would be deleted.
4. If multiple diary entries were made within quick succession, the first diary entry made would be kept and later entries deleted.
5. Additional diary entries completed outside of the 7-day study window would be deleted.
6. If the participant's response behaviour suggests that they are not adhering to the study protocol (e.g., completing the daily diary multiple times per day), all their entries would be deleted from the analysis.

After cleaning the data in accordance with these rules, 228 diary entries and 32 participants were removed from the data. This left 272 participants with sufficient level one data, with an average of 5.4 daily entries each.

2.7.2 Level two data

Four-hundred-and-eighty-one participants completed level two measures.

Mean imputation was performed for data missing within individual items for numerical values. Mean-centred values were computed for any variables which were going to form part of an interaction in later analyses, which included CTQ-SF total and subtypes, and BIS-11 and sub-domains.

Level two data was examined for normality of distribution using histograms, skewness, and kurtosis. BIS-11 score was normally distributed, with skewness of .56, and kurtosis of .04. BIS-11 subscales of attentional, motor, and non-planning impulsivity were also normally distributed with respective skewness of .52, .55, and .52, and kurtosis of -.16, .40, and -.16. CTQ-SF score was not normally distributed, with skewness of 1.16 and kurtosis of .87, indicating that the distribution was right-skewed. Subscales of childhood trauma were also examined for normality of distribution. Emotional abuse and emotional neglect subscales were found to be normally distributed with skewness values of .80 and .58, and kurtosis values of -.40 and -.77 respectively. Physical neglect, physical abuse, and sexual abuse subscales were not normally distributed, with skewness of 1.35, 1.60, and 2.17, and kurtosis of .72, 1.37, and 3.3 respectively. Therefore, data was transformed using the log10 function in SPSS. After transformation, CTQ-SF total were normally distributed with a skewness of .52 and kurtosis of -.73. Physical neglect was also normally distributed after log10 transformation, with skewness and kurtosis of .92 and -.39. For physical abuse, following log10 transformation skewness and kurtosis were improved at 1.25 and .20, but were still not

normally distributed. Finally, for sexual abuse, following transformation skewness and kurtosis were improved at 1.91 and 2.07, but were still not normally distributed. Log transformed variables were used for all analyses other than for logistic regression. Mean centred values were used for all interaction terms.

2.7.3 Creation of additional variables

Participants were asked if they have experienced suicidal ideation or attempted to end their own life using questions from the APMS (McManus et al., 2016). An additional variable was created named ‘suicide history’ which allowed differentiation between participants who had experienced any history of suicide behaviour (suicidal ideation and/or suicide attempt) and those who had not. Participants who responded ‘yes’ to either of the APMS questions were coded 2, and those who responded ‘no’ or ‘prefer not to say’ to both were coded 1.

An additional binary gender variable was created for use in regression analyses where variables must be continuous or dichotomous. This was created by recoding transgender males (N = 2) and transgender females (N = 2) into male and female, respectively. Non-binary individuals (N = 14) were not included in analyses requiring dichotomous predictor variables.

2.8 Descriptive Statistics

The data were explored using descriptive statistics (means, standard deviations, minimum and maximum values, 5th and 95th confidence intervals), which were calculated for all continuous variables. Dichotomous and categorical variables were summarised using frequency count.

2.9 Statistical Analysis

The statistical analysis used to test each research question and hypothesis will be outlined below, along with the additional exploratory analyses.

All correlation analysis, binomial logistic regressions and hierarchical linear regressions were performed using SPSS Version 26. Multilevel modelling was performed using HLM, Version 7. The multilevel modelling used a two-level hierarchical structure with level 1 as within-person factors that were group mean centred (daily impulsivity, daily stress), and level two as between-person factors that were uncentered or grand mean centred (trait impulsivity, suicide behaviour, childhood trauma) factors.

2.9.1 Which subtypes of childhood trauma are associated with suicide behaviour?

Associations between total childhood trauma and subtypes of childhood trauma and suicide behaviour, ideation and attempt were examined using Spearman's correlation coefficient. Further analysis was performed using binomial logistic regression to examine the proportion of variance in suicide behaviour that could be explained by childhood trauma after age and gender had been controlled for.

Linearity of the continuous variables with respect to the logit of the dependent variable was assessed via the Box-Tidwell procedure. A Bonferroni correction was applied. Based on this assessment, all continuous independent variables were found to be linearly related to the logit of the dependent variable. There were three standardized residuals greater than two standard deviations which were kept in the analysis because removal of these cases resulted in the data no longer meeting the assumption of linearity which was required for the chosen analysis. Variables were entered as Step 1: age and gender, Step 2: CTQ-SF Subscale (physical neglect/physical abuse/sexual abuse/emotional abuse/emotional neglect). A separate analysis was conducted for each subtype of childhood trauma. Mean centred variables were used. This analysis was repeated with suicide ideation and suicide attempt as outcome variables.

2.9.2 Is trait impulsivity and its subtypes associated with suicide behaviour?

Associations between total trait impulsivity and subtypes of trait impulsivity and suicide behaviour, ideation and attempt were examined using Spearman's correlation coefficient. Further analysis was performed using binomial logistic regression to examine the proportion of variance in suicide behaviour that could be explained by trait impulsivity and subtypes after age and gender had been controlled for. Linearity of the continuous variables with respect to the logit of the dependent variable was assessed via the Box-Tidwell procedure. A Bonferroni correction was applied using all ten terms in the model resulting in statistical significance being accepted when $p < .005$. Based on this assessment, all continuous independent variables were found to be linearly related to the logit of the dependent variable. There were two standardized residuals greater than two standard deviations. These cases were excluded from this analysis. Variables were entered as Step 1: age and gender, Step 2: motor impulsivity, Step 3: non-planning impulsivity, Step 4: attentional impulsivity. This analysis was repeated with suicide ideation and suicide attempt as outcome variables.

2.9.3 Does trait impulsivity or subtypes of trait impulsivity moderate the relationship between childhood trauma and suicide behaviour?

Binomial logistic regression was used to investigate the moderating effects (Baron & Kenny, 1986) of impulsivity on the childhood trauma and suicide behaviour relationship. Variables were entered as Step 1: age and gender, Step 2: total childhood trauma, Step 3: impulsivity, Step 4: childhood trauma x impulsivity. A further binomial logistic regression was performed for attentional impulsivity as a moderator in the childhood trauma and suicide behaviour relationship. Variables were entered as Step 1: age and gender, Step 2: total childhood trauma, Step 3: attentional impulsivity, Step 4: total childhood trauma x attentional impulsivity. Mean centred variables were used. Both analyses were repeated with suicide ideation and suicide attempt as outcome variables.

2.9.4 Is childhood trauma or subtypes of childhood trauma associated with higher levels of trait impulsivity, and subtypes of impulsivity?

Associations between childhood trauma and subtypes and trait impulsivity and subtypes were examined using Spearman's correlation coefficient. Hierarchical linear regression was performed to determine what variance in trait impulsivity could be explained by the addition of childhood trauma over age and gender. There was linearity as assessed by partial regression plots and a plot of studentized residuals against the predicted values. There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.953. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. There were no leverage values greater than 0.2, and no values for Cook's distance above 1. The assumption of normality was met, as assessed by Q-Q Plot. One participant (case 408) had a standardised residual of greater than 3 (3.564). One participant (case 469) had a studentised deleted residual greater than 3 (3.627). Analysis was performed with and without these potential outliers, and the results remained substantively the same therefore they have been retained in the analysis. Variables were entered into the analysis as follows, Step 1: age and gender, Step 2: age, gender, total childhood trauma. Log-transformed childhood trauma data were used.

Further hierarchical linear regressions were performed to ascertain what variance in trait impulsivity could be predicted by subtypes of childhood trauma. Variables were entered into the analysis as Step 1: age and gender, Step 2: CTQ-SF subtype (emotional abuse/emotional neglect/physical neglect/physical abuse/sexual abuse). A separate analysis was conducted for each subtype of childhood trauma. Log-transformed data were used for physical abuse and neglect and sexual abuse. Two further hierarchical linear regressions were

performed to ascertain what variance in attentional and motor trait impulsivity could be predicted by subtypes of childhood trauma. Variables were entered into the analysis as above.

2.9.5 Is childhood trauma, or subtypes of childhood trauma associated with higher levels of daily impulsivity?

Multilevel modelling was used to examine the cross-level association between childhood trauma, subtypes of childhood trauma, and daily impulsivity. Daily impulsivity was entered into level 1 as an outcome variable and group mean centred, childhood trauma or subtype of trauma were entered into level 2 as predictor variables and grand mean centred. Separate analysis was conducted for each subtype of childhood trauma.

2.9.6 Does childhood trauma or subtypes of childhood trauma moderate the relationship between daily stress and daily impulsivity?

Multilevel modelling was used to test this cross-level interaction hypothesis. A separate moderation analysis was conducted for each type of childhood trauma. Daily stress and daily impulsivity were entered into level 1 as outcome variables and group centred, childhood trauma was entered into level 2 as the predictor variable, grand mean centred.

2.9.7 Exploratory analyses

2.9.7.1 Further correlational analyses. Associations between age and gender with suicide behaviour, childhood trauma, and impulsivity were examined using point-biserial correlation for all age-related associations, and Spearman's correlation coefficient for gender-related associations.

2.9.7.2 Is daily stress associated with daily impulsivity? The association between daily stress and daily impulsivity was examined using multilevel modelling. Daily stress was entered into level 1 as a predictor variable and centred around the group mean, daily impulsivity was entered into level 1 as an outcome variable.

2.9.7.3 Is childhood trauma associated with daily stress? The cross-level association between daily stress, childhood trauma, and subtypes of childhood trauma was examined using multilevel modelling. A separate model was created for each subtype of childhood trauma, and total childhood trauma. Childhood trauma (or subtypes of) was entered into level 2 as a predictor variable centred around the grand mean, daily stress was entered into level 1 as an outcome variable.

3. Results

3.1 Demographics

Four-hundred-and-eighty-one participants completed the baseline questionnaires, with 272 completing two or more days of the seven-day daily diary study. Two-hundred-and-forty-nine participants were in the suicide history group, comprising of 241 people who had experienced previous suicide ideation, and 96 people who had previously attempted suicide. The control group contained 232 participants who had not experienced any suicide behaviour.

The demographic characteristics of the participants who completed baseline questionnaires are reported in Table 1. The sample was 77% female, with most participants in paid employment, and on average 32 years old. The sample was 86% White British, which broadly reflects the demographics of Leeds, UK, where the study was conducted (Gov.uk, 2011).

3.2 Descriptive statistics

Descriptive statistics for the main study variables are presented in Table 2. Mean scores for emotional abuse ($M = 11.22$) and emotional neglect ($M = 11.22$) were higher than other types of childhood trauma ($M = 6.56-7.31$). The current sample reported more severe experiences of emotional abuse and emotional neglect than for sexual abuse and physical abuse and neglect, as reflected by the maximum scores reflecting the highest score possible on the subscale (25). In comparison, the highest score reported for physical abuse was 14, with a mean score of 6.7. A normative community sample of adults reported the mean score on the CTQ-SF emotional abuse subscale to be 8.9 (Bernstein et al., 2003), lower than the current mean sample. However, all other subtypes are broadly similar, suggesting the experiences of childhood trauma in our sample are reflective of the general population. See

Figures 5 and 6 for graphs illustrating mean scores of total and subtypes of childhood trauma in suicide attempt, ideation, and control groups.

Stanford et al. (2009) found that across several normative samples, mean total BIS-11 score was 62.3, with subtype means of 16.7 for attention, 22.0 for motor, and 23.6 for non-planning. In comparison, the current sample mean scores were 64.1 for total BIS-11 score, 17.3 for attention, 23.1 for motor, and 23.4 for non-planning, suggesting that trait impulsivity in our sample is representative of the general population.

For the within-participant daily variables, mean daily stress was 10.14, which is considerably higher compared with normative data from a large community sample in the UK, which reported a mean of 6.11 (Warttig et al., 2013). Mean daily impulsivity for the current sample was 7.24, which was slightly higher than community samples of 6.2 for individuals with a diagnosis of BPD, and 5.56 for individuals with a diagnosis of a Depressive Disorder (Tomko et al., 2014).

Table 1. *Demographic Characteristics of Participants at Baseline*

Baseline characteristic	Control group (<i>n</i> = 232)	Ideation (<i>n</i> = 241)	Attempt (<i>n</i> = 96)	Suicide behaviour (<i>n</i> = 249)	Total sample (<i>n</i> = 481)
Mean age	31.3	31.9	34.6	32.4	31.8
Gender					
<i>Female</i>	176	188	76	196	372
<i>Male</i>	52	43	9	43	95
<i>Non-binary</i>	4	10	11	10	14
Occupation					
<i>Paid employment</i>	128	92	33	127	255
<i>Self-employment</i>	18	5	5	10	28
<i>Full time student</i>	73	43	23	68	141
<i>Unemployed</i>	13	23	17	44	57
Ethnicity					
<i>White</i>	202	136	69	212	415
<i>Asian/Asian British</i>	10	10	1	11	21
<i>Black, African, Black British or Caribbean</i>	5	3	3	7	12
<i>Mixed/multiple ethnic groups</i>	8	9	5	14	22
<i>Other</i>	3	3	0	3	6

Note. ‘Control group’ refers to participants with no history of suicide behaviour. Participants were on average 31.8 years old (SD = 12.85, min 18 max 82). Please note that ‘prefer not to say’ responses have not been collated here.

Table 2. *Mean, Standard Deviation, Minimum and Maximum Values for Study Measures.*

Measure	<i>M</i>	<i>SD</i>	Minimum	Maximum
Baseline measures				
CTQ-SF Total	43.52	17.70	25.00	111.00
<i>CTQ - Emotional abuse</i>	11.22	5.62	5.00	25.00
<i>CTQ - Emotional neglect</i>	11.22	5.47	5.00	25.00
<i>CTQ - Physical neglect</i>	7.31	3.03	5.00	15.00
<i>CTQ - Physical abuse</i>	6.70	2.70	5.00	14.00
<i>CTQ - Sexual Abuse</i>	6.56	3.46	5.00	17.00
BIS-11 Total	64.07	12.20	39.00	110.00
<i>BIS Attention</i>	17.29	4.81	8.00	32.00
<i>BIS Motor</i>	23.05	4.57	13.00	39.00
<i>BIS Non-planning</i>	23.41	5.48	11.00	41.00
Daily diary measures				
MIS	7.24	2.96	3.00	20.00
PSS-4	10.14	3.72	4.00	20.00

Note: Values prior to Log10 transformation were used for CTQ Physical neglect, physical abuse, and sexual abuse.

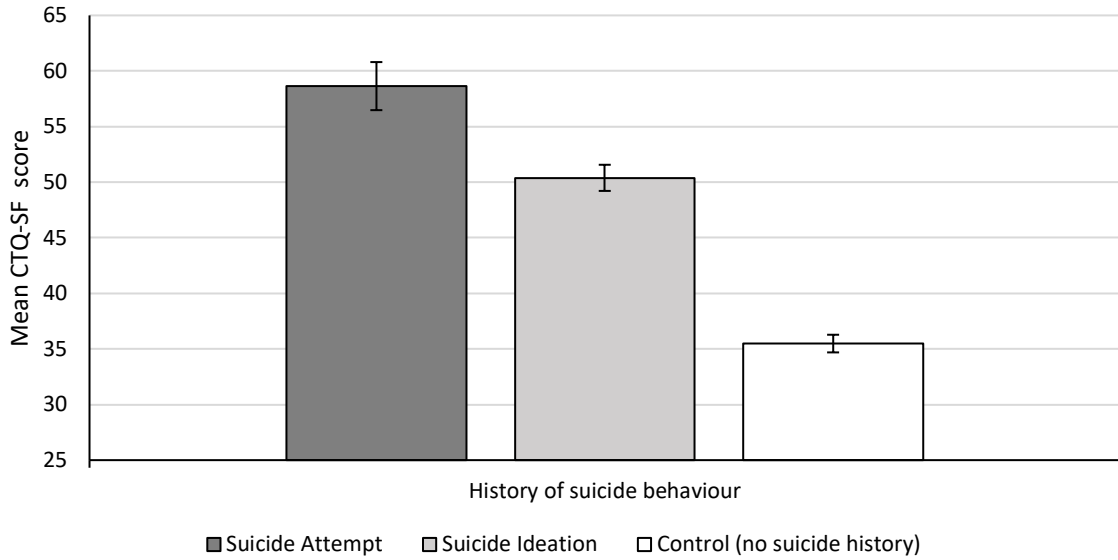


Figure 5. Mean Score on CTQ-SF in Participants with Historical Suicide Attempt, Suicide Ideation, and Controls.

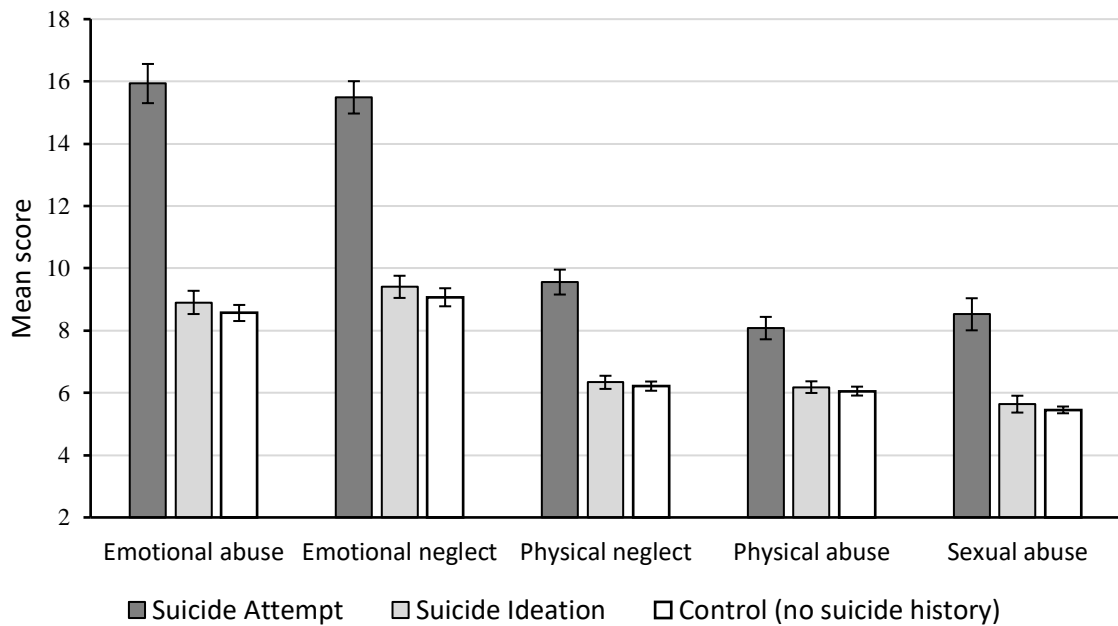


Figure 6. Mean Scores on CTQ-SF Subscales in Participants with Historical Suicide Attempt, Suicide Ideation, and Controls.

Note. Values prior to Log10 transformation were used. Error bars show standard error of the mean.

3.3 Correlation Analyses

The correlations between the main study variables are shown in Table 3.

3.3.1 Age and gender

Age was significantly positively associated with childhood trauma ($r = .17, p < .01$), and of the subtypes of trauma, was most strongly associated with physical abuse ($r = .20, p < .01$). Age was positively associated with all subtypes of childhood trauma other than emotional abuse, where no significant association was found.

Gender was also significantly positively associated with childhood trauma ($r = .17, p < .01$), and was most strongly associated with emotional abuse ($r = .26, p < .01$). Gender was also positively associated with emotional neglect ($r = .13, p < .01$) and physical neglect ($r = .11, p < .05$), therefore indicating that in our sample, female participants scored higher than male participants on measures of emotional abuse, emotional neglect, and physical neglect.

Both age and gender showed a small positive association with attentional impulsivity ($r = .12, p < .01$; $r = .12, p < .05$), but were not significantly associated with other subtypes of impulsivity. Again, age and gender both also showed a small positive association with suicide attempts ($r = .10, p < .05$; $r = .11, p < .05$), but no significant association was found with suicidal ideation.

3.3.2 Trauma and suicide behaviour

Childhood trauma and its subtypes were significantly positively associated with history of suicide behaviour ($r = .24-.46, p < .01$), history of suicide ideation ($r = .21-.42, p < .01$) and history of suicide attempt ($r = .24-.40, p < .01$). Out of the subtypes of childhood trauma, emotional abuse was most strongly associated with suicide behaviour ($r = .46, p < .01$).

3.3.3 Impulsivity and suicide behaviour

A small-moderate positive association was found between trait impulsivity and history of suicide behaviour ($r = .25, p < .01$). All subtypes of impulsivity were significantly positively associated with suicide behaviour. The subtype of impulsivity most strongly associated with suicide history was attention ($r = .31, p < .01$). This is presented graphically in Figure 6.

3.3.4 Trauma and impulsivity

A small-moderate positive association was found between childhood trauma and trait impulsivity ($r = .26, p < .01$). Sexual abuse was not significantly associated with trait impulsivity, or subtypes of impulsivity. Motor impulsivity showed a small positive association with emotional abuse ($r = .14, p < .01$) and physical neglect ($r = .12, p < .05$), but not other types of abuse. The strongest association was found between emotional abuse and attentional impulsivity ($r = .39, p < .01$).

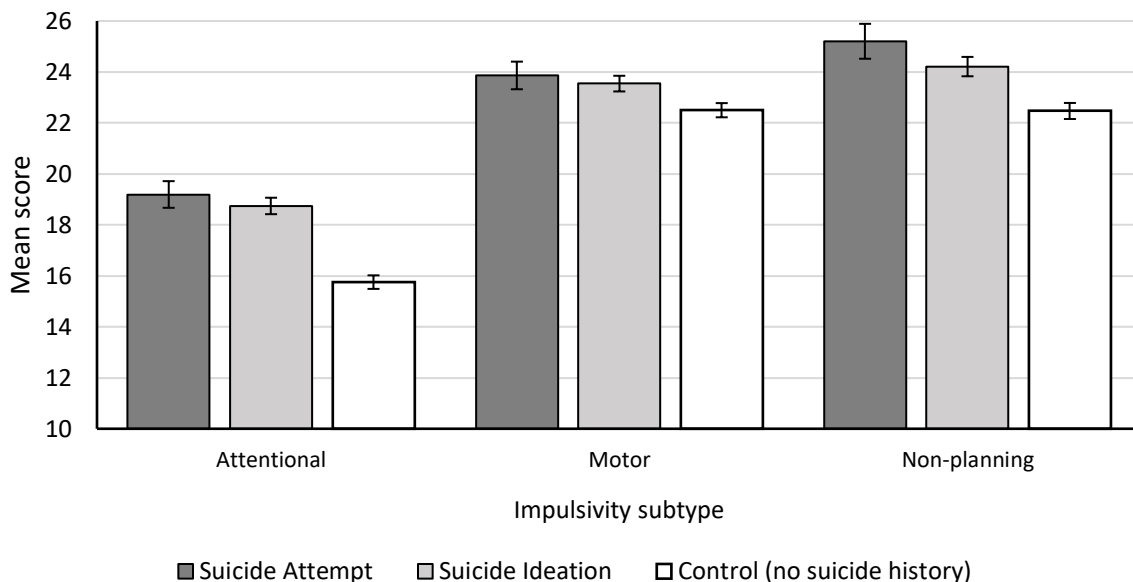


Figure 7. Mean Scores on BIS-11 Subscales in Participants with Historical Suicide Attempt, Suicide Ideation, and Controls.

Note. Error bars show standard error of the mean. 'Impulsivity subtype' refers to the separate facets of trait impulsivity assessed in the BIS-11 (attentional, motor, non-planning).

Table 3. *Correlations Between Baseline Study Variables*

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	-											
2. Gender ^a	-.12*	-										
3. CTQ-SF Total	.17**	.17**	-									
4. CTQ Emotional Abuse	.08	.26**	.87**	-								
5. CTQ Emotional Neglect	.18**	.13**	.85**	.77**	-							
6. CTQ Physical Neglect	.15**	.11*	.79**	.66**	.72**	-						
7. CTQ Physical Abuse	.20**	.07	.73**	.61**	.55**	.57**	-					
8. CTQ Sexual Abuse	.17**	.09	.62**	.45**	.40**	.42**	.45**	-				
9. BIS-11 Total	-.05	.07	.26**	.32**	.23**	.25**	.14**	.06	-			
10. BIS Attention	-.12**	.12*	.30**	.39**	.27**	.28**	.14**	.02	.81**	-		
11. BIS Motor	.01	.02	.11*	.14**	.07	.12*	.07	.05	.77**	.42**	-	
12. BIS Non-planning	.01	.03	.22**	.25**	.20**	.21**	.12**	.06	.87**	.57**	.53**	-
13. History of suicide behaviour	.04	.06	.46**	.46**	.38**	.37**	.24**	.31**	.25**	.31*	.12*	.17**
14. Suicidal ideation	.01	.04	.42**	.41**	.33**	.34**	.21**	.27**	.23**	.30*	.11*	.15**
15. Suicide attempts	.10*	.11*	.39**	.40**	.37**	.34**	.24**	.27**	.18**	.19**	.08	.16**

Note. Point-biserial correlations were used for age associations. Spearman's correlations were used for all other variables. Log10 transformations were applied for CTQ-SF Total, physical neglect, physical abuse, and sexual Abuse. ** $p < .01$. * $p < .05$. ^a Binary gender classification was used; 1 = male, 2 = female.

3.4 Which Subtypes of Childhood Trauma are Associated with Suicide Behaviour?

3.4.1 Suicide ideation

Five separate binomial logistic regression models were conducted for each type of childhood trauma that accounted for age and gender. For physical neglect the regression model was statistically significant, $\chi^2(3) = 51.173, p < .001$. The model explained 13.8% (Nagelkerke R^2) of the variance in suicide ideation. For physical abuse, the regression model was also statistically significant, $\chi^2(3) = 38.163, p < .001$ and explained 10.5% (Nagelkerke R^2) of the variance in suicide ideation. For sexual abuse, the regression model was also statistically significant, $\chi^2(3) = 38.163, p < .001$ and explained 10.5% (Nagelkerke R^2) of the variance in suicide ideation. For emotional abuse, again, the regression model was statistically significant, $\chi^2(3) = 89.961, p < .001$, and explained 23.4% (Nagelkerke R^2) of the variance in suicide ideation. Finally, for emotional neglect, the regression model was also statistically significant, $\chi^2(3) = 56.062, p < .001$. The model explained 15.1% (Nagelkerke R^2) of the variance in suicide ideation. Emotional neglect significantly predicted suicide ideation after age and gender had been accounted for. See Table 4 for full detail on all regression models.

Table 4: *Binomial Logistic Regression: Testing the Effect of Childhood Trauma Subtypes on Suicide Ideation*

	B	SE	Wald	df	p	Odds Ratio	95% CI	
							LL	UL
Age	-.006	.008	.531	1	.466	.994	.979	1.010
Gender ^a	-.013	.244	.003	1	.959	.987	.612	1.593
CTQ PN	.247	.039	40.291	1	< .001***	1.280	1.186	1.382
Constant	-1.598	.348	21.049	1	< .001***	.202		
Age	-.004	.008	.216	1	.642	.996	.982	1.011
Gender	-.134	.237	.317	1	.573	.875	.549	1.393
CTQ PA	.158	.039	16.819	1	< .001***	1.171	1.086	1.263
Constant	-.930	.326	8.150	1	.004**	.394		
Age	-.005	.008	.370	1	.543	.995	.980	1.010
Gender	-.079	.240	.109	1	.741	.924	.576	1.480
CTQ SA	.191	.036	27.953	1	< .001***	1.210	1.128	1.299
Constant	-1.072	.317	11.441	1	.001**	.342		
Age	-.006	.008	.494	1	.482	.994	.979	1.010
Gender	.430	.257	2.811	1	.094	1.538	.930	2.542
CTQ EA	.187	.023	68.855	1	< .001***	1.205	1.153	1.260
Constant	-1.960	.349	31.542	1	< .001***	.141		
Age	-.009	.008	1.189	1	.275	.991	.976	1.007
Gender	.045	.247	.033	1	.855	1.046	.645	1.195
CTQ EN	.139	.020	47.978	1	< .001***	1.149	1.105	1.195
Constant	-1.290	.313	17.024	1	< .001***	.275		

Note. Separate analyses were conducted for each subtype of trauma, but they have been presented in one table for ease of presentation. Mean centred values were used. CI = confidence interval; *LL* = lower limit; *UL* = upper limit. PN = physical neglect, PA = physical abuse, SA = sexual abuse, EA = emotional abuse, EN = emotional neglect. ^a 1 = males, 2 = females. Non-binary participants were not included in this analysis. *** $p < .001$ ** $p < .01$

3.4.2 Suicide attempt

Five separate binomial logistic regression models were conducted for each type of childhood trauma that accounted for age and gender. For physical neglect, the binomial logistic regression model was statistically significant, $\chi^2(3) = 58.598$, $p < .001$. The model explained 19.2% (Nagelkerke R^2) of the variance in suicide attempt. For physical abuse, the regression model was also statistically significant, $\chi^2(3) = 31.804$, $p < .001$. The model explained 10.7% (Nagelkerke R^2) of the variance in suicide attempt. For sexual abuse, the regression model was statistically significant, $\chi^2(3) = 37.952$, $p < .001$. The model explained

12.7% (Nagelkerke R^2) of the variance in suicide attempt. Again, for emotional abuse, the regression model was statistically significant, $\chi^2(3) = 72.815, p < .001$. The model explained 23.6% (Nagelkerke R^2) of the variance in suicide attempt. Finally, for emotional neglect, the regression model was also statistically significant, $\chi^2(3) = 66.403, p < .001$. The model explained 21.6% (Nagelkerke R^2) of the variance in suicide attempt. Emotional neglect significantly predicted suicide attempt after age and gender had been accounted for. See Table 5 for full detail on all regression models.

Table 5: *Binomial Logistic Regression: Testing the Effect of Childhood Trauma Subtypes on Suicide Attempt*

	B	SE	Wald	df	p	Odds Ratio	95% CI	
							LL	UL
Age	.015	.010	2.369	1	.124	1.015	.996	1.035
Gender ^a	-.755	.392	3.713	1	.054	.470	.218	1.013
CTQ PN	.247	.037	43.669	1	< .001***	1.280	1.190	1.377
Constant	-3.850	.455	71.703	1	< .001***	.021		
Age	.015	.009	2.399	1	.121	1.015	.996	1.034
Gender	-.884	.382	5.352	1	.021*	.413	.195	.874
CTQ PA	.177	.041	18.824	1	< .001***	1.193	1.102	1.293
Constant	-3.102	.411	56.883	1	< .001***	.045		
Age	.016	.009	2.762	1	.097	1.016	.997	1.034
Gender	-.857	.386	4.927	1	.026*	.424	.199	.905
CTQ SA	.150	.030	25.318	1	< .001***	1.162	1.096	1.232
Constant	-2.955	.381	60.302	1	< .001***	.052		
Age	.016	.010	2.738	1	.098	1.017	.997	1.037
Gender	-.213	.407	.275	1	.600	.808	.364	1.794
CTQ EA	.171	.024	51.566	1	< .001***	1.186	1.132	1.243
Constant	-4.191	.488	73.671	1	< .001***	.015		
Age	.010	.010	.999	1	.318	1.010	.990	1.030
Gender	-.655	.396	2.734	1	.098	.519	.239	1.129
CTQ EN	.166	.024	46.477	1	< .001***	1.180	1.125	1.238
Constant	-3.835	.455	70.914	1	< .001***	.022		

Note. Separate analysis was conducted for each subtype of trauma, but they have been presented in one table for ease of reading. Mean centred values were used. CI = confidence interval; LL = lower limit; UL = upper limit. Control (no suicide history) = 1, history of suicide behaviour = 2. PN = physical neglect, PA = physical abuse, SA = sexual abuse, EA = emotional abuse, EN = emotional neglect.

^a 1 = males, 2 = females. Non-binary participants were not included in this analysis.

*** $p < .001$ ** $p < .01$ * $p < .05$

3.5 Is Trait Impulsivity and its Subtypes Associated with Suicide Behaviour?

3.5.1 Suicide ideation

The binomial logistic regression model was statistically significant, $\chi^2(5) = 53.086$, $p < .001$. The model explained 17.2% (Nagelkerke R^2) of the variance in suicide behaviour, and correctly classified 63.7% of cases. Again, only attentional impulsivity was associated with an increased likelihood of reporting suicide ideation. See Table 6 for full detail on regression model.

Table 6: Binomial Logistic Regression: Testing the Effect of Impulsivity Subtypes on Suicide Ideation ^a

	B	SE	Wald	df	p	Odds Ratio	95% CI	
							LL	UL
Age	.014	.008	3.152	1	.076	1.014	.999	1.030
Gender ^b	-.084	.247	.116	1	.734	.919	.566	1.492
BIS Motor	.010	.026	.146	1	.702	.990	.940	1.042
BIS Nonplan	-.022	.024	.862	1	.353	.978	.933	1.025
BIS Attention	.172	.028	37.302	1	< .001***	1.188	1.124	1.255
Constant	-2.624	.640	16.834	1	< .001***	.073		

Note. Mean centred values were used. CI = confidence interval; LL = lower limit; UL = upper limit.

^a Control (no suicide ideation) = 1, history of suicide ideation = 2.

^b 1 = males, 2 = females. Non-binary participants were not included in this analysis.

*** $p < .001$.

3.5.2 Suicide attempt

The binomial logistic regression model was statistically significant, $\chi^2(5) = 33.015$, $p < .001$. The model explained 11.2% (Nagelkerke R^2) of the variance in suicide behaviour, and correctly classified 81.9% of cases. Again, only attentional impulsivity was associated with an increased likelihood of previous suicide attempt. See Table 7 for full detail on regression model.

Table 7: *Binomial Logistic Regression: Testing the Effect of Impulsivity Subtypes on Suicide Attempt*^a

	B	SE	Wald	df	p	Odds Ratio	95% CI	
							LL	UL
Age	.029	.009	9.872	1	.002	1.030	1.011	1.049
Gender ^a	-.919	.385	5.693	1	.017	.399	.188	.849
BIS Motor	-.025	.033	.594	1	.441	.975	.915	1.040
BIS Nonplan	.031	.030	1.071	1	.301	1.031	.973	1.093
BIS Attention	.096	.032	8.922	1	.003**	1.100	1.011	1.171
Constant	-4.159	.785	28.101	1	< .001***	.016		

Note. Mean centred values were used. CI = confidence interval; LL = lower limit; UL = upper limit.

^a Control (no suicide attempt) = 1, history of suicide attempt = 2.

^b 1 = males, 2 = females. Non-binary participants were not included in this analysis.

*** $p < .001$.

3.6 Does Impulsivity Moderate the Relationship Between Childhood Trauma and Suicide Behaviour?

3.6.1 Suicide behaviour

The binomial logistic regression model was statistically significant, $\chi^2(5) = 118.102$, $p < .001$. The model explained 29.8% (Nagelkerke R^2) of the variance in suicide behaviour and correctly classified 72.2% of cases. Sensitivity was 66.5%, specificity was 78.1%. Of the five predictor variables, only two were statistically significant: childhood trauma and trait impulsivity. Age and gender were not significant predictors of suicide behaviour. Higher childhood trauma and trait impulsivity scores were associated with an increased likelihood of reporting historical suicide behaviour, however the childhood trauma by trait impulsivity interaction was not statistically significant. See Table 8 for full details. Additional binomial logistic regressions were performed to investigate impulsivity as a moderator on the trauma-suicide ideation and trauma-suicide attempt relationships, neither of which were significant and therefore will not be reported in detail.

Table 8: *Binomial Logistic Regression: Testing the Moderating Effects of Impulsivity on Childhood Trauma and Suicide Behaviour*^a

	B	SE	Wald	df	p	Odds Ratio	95% CI	
							LL	UL
Age	-.006	.009	.430	1	.512	.994	.978	1.011
Gender ^b	.173	.262	.436	1	.509	1.189	.711	1.998
CTQ-SF	.066	.008	63.202	1	< .001***	1.068	1.051	1.085
BIS-11	.028	.009	8.764	1	.003**	1.028	1.010	1.048
CTQ-SF x BIS-11	< .001	.001	.142	1	.706	1.000	.998	1.001
Constant	.325	.290	1.267	1	.263	1.384		

Note. Mean centred values were used. CI = confidence interval; LL = lower limit; UL = upper limit. Regression coefficients shown are standardised.

^aControl (no suicide history) = 1, history of suicide behaviour = 2. ^b1 = males, 2 = females.

Individuals who identified as non-binary were not included in this analysis. *** $p < .001$, ** $p < .01$.

3.6.2 Exploratory analysis: Does attentional impulsivity moderate the relationship between childhood trauma and suicide behaviour?

3.6.2.1 Suicide behaviour. A further binomial logistic regression was performed to investigate whether attentional impulsivity moderated the relationship between childhood trauma and suicide behaviour, given the earlier result that it was a significant predictor of suicide behaviour (Table 5). The binomial logistic regression model was statistically significant, $\chi^2(5) = 129.010$, $p < .001$. The model explained 32.3% (Nagelkerke R^2) of the variance in suicide behaviour and correctly classified 73% of cases. Sensitivity was 77.6%, specificity was 68.6%. Of the five predictor variables, only two were statistically significant: childhood trauma and attentional impulsivity. Higher childhood trauma and trait impulsivity scores were associated with an increased likelihood of reporting suicide behaviour, however the childhood trauma by attentional impulsivity interaction was not statistically significant. See Table 9. Additional binomial logistic regressions were performed to investigate attentional impulsivity as a moderator on the trauma-suicide ideation and trauma-suicide

attempt relationships, neither of which were significant, and therefore will not be reported in detail.

Table 9: *Binomial Logistic Regression: Testing the Moderating Effects of Attentional Impulsivity on Childhood Trauma and Suicide Behaviour*

	B	SE	Wald	df	p	Odds Ratio	95% CI	
							LL	UL
Age	-.002	.009	.047	1	.829	.998	.981	1.015
Gender	-.210	.265	.625	1	.429	.811	.482	1.364
CTQ-SF	.062	.008	56.775	1	< .001***	1.064	1.047	1.082
BIS Attention	.107	.025	18.281	1	< .001***	1.113	1.060	1.170
CTQ-SF x BIS Attention	-.001	.002	.156	1	.692	.999	.996	1.003
Constant	-3.954	.728	29.465	1	< .001***	.019		

Note. Mean centred values were used. CI = confidence interval; LL = lower limit; UL = upper limit. Regression coefficients shown are standardised. *** $p < .001$.

^a Control (no suicide history) = 1, history of suicide behaviour = 2. ^b 1 = males, 2 = females. Individuals who identified as non-binary were not included in this analysis.

3.7 Does Childhood Trauma Predict Trait Impulsivity?

The first step of the hierarchical regression model with age and gender to predict trait impulsivity (Step 1, Table 10) was not statistically significant; $R^2 = .005$, $F(2,464) = 1.109$, $p = .331$. The addition of childhood trauma to the prediction of trait impulsivity (Model 2) led to a statistically significant increase in R^2 of .062, $F(1, 463) = 30.808$, $p < .001$. The full hierarchical regression model of age, gender, and childhood trauma to predict trait impulsivity (Model 2, Table 10) was statistically significant, $R^2 = .067$, $F(3, 463) = 11.056$, $p < .001$. See Table 10 for full details on each regression model.

Further hierarchical regressions were performed to investigate the extent to which childhood trauma can predict variance in separate facets of trait impulsivity. The hierarchical regression model of age, gender, and childhood trauma to predict attentional impulsivity was statistically significant, $R^2 = .109$, $F(3, 463) = 18.90$, $p < .001$. The hierarchical regression model of age, gender, and childhood trauma to predict motor impulsivity was not statistically significant, $R^2 = .008$, $F(3, 463) = 1.242$, $p = .294$. The hierarchical regression model of age,

gender, and childhood trauma to predict non-planning impulsivity was statistically significant, $R^2 = .044$, $F(3, 463) = 7.096$, $p < .001$. See Appendix K for full details on each regression model.

Table 10: *Hierarchical Regression for Childhood Trauma on Trait Impulsivity*

Variable	B	95% CI for B		SE B	β	ΔR^2	R^2
		LL	UL				
Step 1						.005	.005
Constant	61.109	55.153	67.065	3.031			
Age	-.022	-.107	.063	.043	-.024		
Gender ^a	1.842	-.879	4.562	1.384	.062		
Step 2						.062***	.067***
Constant	34.614	23.600	45.628	5.605			
Age	-.070	-.154	.013	.043	-.076		
Gender ^a	.324	-2.367	3.016	1.370	.011		
Childhood trauma	19.163	12.378	25.947	3.452	.258		

Note. $N = 466$. Log transformed CTQ-SF data were used. *** $p < .001$

^a 1 = males, 2 = females. Non-binary participants were not included in this analysis.

B = unstandardised coefficients, β = standardised.

3.7.1 Is childhood trauma or subtypes of childhood trauma associated with higher levels of trait impulsivity?

Further hierarchical multiple regressions were performed to investigate the individual contributions of subtypes of childhood trauma in the prediction of trait impulsivity. The addition of all subtypes of childhood trauma in the second step following age and gender (Model 2, Tables 11-15) led to statistically significant increases in R^2 , other than for sexual abuse. The addition of emotional abuse to the prediction of trait impulsivity (Model 2, Table 11) led to a statistically significant increase in R^2 of .086, $F(3,463) = 15.410$, $p < .001$. The addition of emotional neglect to the prediction of trait impulsivity (Model 2, Table 12) led to a statistically significant increase in R^2 of .043, $F(3,463) = 7.803$, $p < .001$. The addition of

physical neglect to the prediction of trait impulsivity (Model 2, Table 13) led to a statistically significant increase in R^2 of .056, $F(3,463) = 10.029$, $p < .001$. The addition of physical abuse to the prediction of trait impulsivity (Model 2, Table 14) led to a statistically significant increase in R^2 of .017, $F(3,463) = 3.402$, $p = .018$.

Table 11: *Hierarchical Regression Predicting Trait Impulsivity from Age, Gender, Emotional Abuse*

	Trait impulsivity (BIS-11 Total)					
	Model 1			Model 2		
	<i>B</i>	β	<i>SE</i>	<i>B</i>	β	<i>SE</i>
Constant	61.109***		3.031	59.319***		2.912
Age	-.022	-.024	.043	-.055	-.060	.042
Gender	1.842	.062	1.384	-.633	-.021	1.376
Emotional abuse				.656***	.306	.099
R^2	.005			.091		
ΔR^2				.086***		

Note. $N = 467$ *** $p < .001$. *B* = unstandardised coefficient, β = standardised coefficient.

Table 12: *Hierarchical Regression Predicting Trait Impulsivity from Age, Gender, Emotional Neglect*

	Trait impulsivity (BIS-11 Total)					
	Model 1			Model 2		
	<i>B</i>	β	<i>SE</i>	<i>B</i>	β	<i>SE</i>
Constant	61.109***		3.031	58.919***		3.005
Age	-.022	-.024	.043	-.063	-.068	.043
Gender	1.842	.062	1.384	.871	.029	1.372
Emotional neglect				.471***	.215	.102
R^2	.005			.048		
ΔR^2				.043***		

Note. $N = 467$ *** $p < .001$. *B* = unstandardised coefficient, β = standardised coefficient.

Table 13: *Hierarchical Regression Predicting Trait Impulsivity from Age, Gender, Physical Neglect*

	Trait impulsivity (BIS-11 Total)					
	Model 1			Model 2		
	<i>B</i>	β	<i>SE</i>	<i>B</i>	β	<i>SE</i>
Constant	61.109***		3.031	48.452***		3.802
Age	-.022	-.024	.043	-.060	-.064	.042
Gender	1.842	.062	1.384	.907	.031	1.358
Physical neglect				18.960***	.242	3.549
R ²	.005			.061		
ΔR^2				.056***		

Note. $N = 467$ *** $p < .001$. B = unstandardised coefficient, β = standardised coefficient. Log10 transformed values were used for physical neglect.

Table 14: *Hierarchical Regression Predicting Trait Impulsivity from Age, Gender, Physical Abuse*

	Trait impulsivity (BIS-11 Total)					
	Model 1			Model 2		
	<i>B</i>	β	<i>SE</i>	<i>B</i>	β	<i>SE</i>
Constant	61.109***		3.031	53.816***		3.967
Age	-.022	-.024	.043	-.048	-.052	.044
Gender	1.842	.062	1.384	1.459	.049	1.381
Physical abuse				11.045**	.133	3.916
R ²	.005			.022		
ΔR^2				.017**		

Note. $N = 467$ *** $p < .001$ ** $p < .01$ B = unstandardised coefficient, β = standardised coefficient. Log10 transformed values were used for physical abuse.

Table 15: *Hierarchical Regression Predicting Trait Impulsivity from Age, Gender, Sexual Abuse*

	Trait impulsivity (BIS-11 Total)					
	Model 1			Model 2		
	<i>B</i>	β	<i>SE</i>	<i>B</i>	β	<i>SE</i>
Constant	61.109***		3.031	58.161***		3.712
Age	-.022	-.024	.043	-.033	-.035	.044
Gender	1.842	.062	1.384	1.631	.055	1.392
Sexual abuse				4.708	.065	3.431
R ²	.005			.009		
ΔR^2				.004		

Note. $N = 467$ *** $p < .001$ B = unstandardised coefficient, β = standardised coefficient. Log10 transformed values were used for sexual abuse.

3.7.2 Are subtypes of childhood trauma associated with higher levels of attentional and non-planning impulsivity?

Hierarchical linear regressions were performed to investigate the contributions of subtypes of childhood trauma in predicting attentional and non-planning impulsivity. Motor impulsivity was not examined due to the previous findings that total childhood trauma did not significantly account for any variance in motor impulsivity (see Table 5). Sexual abuse was not examined due to the previous findings that it did not significantly predict trait impulsivity (see Table 15).

3.7.2.1 Attentional impulsivity. The addition of emotional abuse to the prediction of attentional impulsivity after age and gender (Model 2, Table 16) led to a statistically significant increase in R^2 of .135, $F(3,463) = 29.069$, $p < .001$. The addition of emotional neglect to the prediction of attentional impulsivity after age and gender (Model 2, Table 17) led to a statistically significant increase in R^2 of .065, $F(3,463) = 14.982$, $p < .001$. The addition of physical neglect to the prediction of attentional impulsivity after age and gender (Model 2, Table 18) led to a statistically significant increase in R^2 of .075, $F(3,463) = 16.701$, $p < .001$. The addition of physical abuse to the prediction of attentional impulsivity after age

and gender (Model 2, Table 19) led to a statistically significant increase in R^2 of .021,

$F(3,463) = 7.182, p = .001$. See tables 16-19 for full regression models.

Table 16: *Hierarchical Regression Predicting Attentional Impulsivity from Age, Gender, Emotional Abuse*

	Attentional impulsivity					
	Model 1			Model 2		
	<i>B</i>	β	<i>SE</i>	<i>B</i>	β	<i>SE</i>
Constant	16.056***		1.198	15.160***		1.118
Age	-.036*	-.097	.017	-.052**	-.142	.016
Gender	1.259*	.106	.547	.020	.002	.528
Emotional abuse				.328***	.384	.038
R^2	.023			.158		
ΔR^2				.135		

Note. $N = 467$ *** $p < .001$, ** $p < .01$, * $p < .05$. *B* = unstandardised coefficient, β = standardised coefficient.

Table 17: *Hierarchical Regression Predicting Attentional Impulsivity from Age, Gender, Emotional Neglect*

	Attentional impulsivity					
	Model 1			Model 2		
	<i>B</i>	β	<i>SE</i>	<i>B</i>	β	<i>SE</i>
Constant	16.056***		1.198	14.984***		1.173
Age	-.036*	-.097	.017	-.056**	-.151	.017
Gender	1.259*	.106	.547	.783	.066	.536
Emotional neglect				.231***	.264	.040
R^2	.023			.088		
ΔR^2				.065***		

Note. $N = 467$ *** $p < .001$, ** $p < .01$, * $p < .05$. *B* = unstandardised coefficient, β = standardised coefficient.

Table 18: *Hierarchical Regression Predicting Attentional Impulsivity from Age, Gender, Physical Neglect*

	Attentional impulsivity					
	Model 1			Model 2		
	<i>B</i>	β	<i>SE</i>	<i>B</i>	β	<i>SE</i>
Constant	16.056***		1.198	10.243***		1.487
Age	-.036*	-.097	.017	-.053**	-.144	.017
Gender	1.259*	.106	.547	.829	.070	.531
Physical neglect				8.584***	.279	1.388
R ²	.023			.098		
ΔR^2				.075***		

Note. $N = 467$ *** $p < .001$, ** $p < .01$, * $p < .05$. *B* = unstandardised coefficient, β = standardised coefficient. Log10 transformed values were used for physical neglect.

Table 19: *Hierarchical Regression Predicting Attentional Impulsivity from Age, Gender, Physical Abuse*

	Attentional impulsivity					
	Model 1			Model 2		
	<i>B</i>	β	<i>SE</i>	<i>B</i>	β	<i>SE</i>
Constant	16.056***		1.198	12.776***		1.564
Age	-.036*	-.097	.017	-.047**	-.129	.017
Gender	1.259*	.106	.547	1.086*	.092	.544
Physical abuse				4.969**	.150	1.544
R ²	.023			.044		
ΔR^2				.021**		

Note. $N = 467$ *** $p < .001$, ** $p < .01$, * $p < .05$. *B* = unstandardised coefficient, β = standardised coefficient. Log10 transformed values were used for physical abuse.

3.7.2.2 Non-planning impulsivity. The addition of emotional abuse to the prediction of non-planning impulsivity after age and gender (Model 2, Table 20) led to a statistically significant increase in R² of .052, $F(3,463) = 8.692$, $p < .001$. The addition of emotional neglect to the prediction of non-planning impulsivity after age and gender (Model 2, Table 21) led to a statistically significant increase in R² of .035, $F(3,463) = 5.761$, $p < .001$. The addition of physical abuse to the prediction of non-planning impulsivity after age and gender (Model 2, Table 22) led to a statistically significant increase in R² of .013, $F(3,463) = 2.309$,

$p = .013$. The addition of physical neglect to the prediction of non-planning impulsivity after age and gender (Model 2, Table 23) led to a statistically significant increase in R^2 of .038, $F(3,463) = 6.380$, $p < .001$. See Tables 20-23 for full regression models.

Table 20: *Hierarchical Regression Predicting Non-planning Impulsivity from Age, Gender, Emotional Abuse*

	Non-planning impulsivity					
	Model 1			Model 2		
	<i>B</i>	β	<i>SE</i>	<i>B</i>	β	<i>SE</i>
Constant	22.209***		1.367	21.583***		1.339
Age	.012	.028	.019	< .001	< .001	.019
Gender	.393	.029	.625	-.472	-.035	.633
Emotional abuse				.229***	.237	.046
R^2	.001			.053		
ΔR^2				.052		

Note. $N = 467$ *** $p < .001$. *B* = unstandardised coefficient, β = standardised coefficient.

Table 21: *Hierarchical Regression Predicting Non-planning Impulsivity from Age, Gender, Emotional Neglect*

	Non-planning impulsivity					
	Model 1			Model 2		
	<i>B</i>	β	<i>SE</i>	<i>B</i>	β	<i>SE</i>
Constant	22.209***		1.367	21.329***		1.362
Age	.012	.028	.019	-.005	-.011	.020
Gender	.393	.029	.625	.003	< .001	.622
Emotional neglect				.189***	.191	.046
R^2	.001			.036		
ΔR^2				.035***		

Note. $N = 467$ *** $p < .001$. *B* = unstandardised coefficient, β = standardised coefficient.

Table 22: *Hierarchical Regression Predicting Non-planning Impulsivity from Age, Gender, Physical Abuse*

	Non-planning impulsivity					
	Model 1			Model 2		
	<i>B</i>	β	<i>SE</i>	<i>B</i>	β	<i>SE</i>
Constant	22.209***		1.367	19.290***		1.793
Age	.012	.028	.019	.001	.003	.020
Gender	.393	.029	.625	.240	.018	.624
Physical abuse				4.422**	.118	1.770
R ²	.001			.015		
ΔR^2				.014**		

Note. $N = 467$ *** $p < .001$, ** $p < .01$ B = unstandardised coefficient, β = standardised coefficient. Log10 transformed values were used for physical abuse.

Table 23: *Hierarchical Regression Predicting Non-planning Impulsivity from Age, Gender, Physical Neglect*

	Non-planning impulsivity					
	Model 1			Model 2		
	<i>B</i>	β	<i>SE</i>	<i>B</i>	β	<i>SE</i>
Constant	22.209***		1.367	17.510***		1.732
Age	.012	.028	.019	-.002	-.005	.019
Gender	.393	.029	.625	.046	.003	.618
Physical neglect				6.940***	.200	1.616
R ²	.001			.040		
ΔR^2				.038***		

Note. $N = 467$ *** $p < .001$, ** $p < .01$ B = unstandardised coefficient, β = standardised coefficient. Log10 transformed values were used for physical neglect.

3.8 Is Childhood Trauma or Subtypes of Trauma Associated with Daily Impulsivity or Daily Stress?

Total childhood trauma was significantly positively associated with daily impulsivity ($\beta = 1.849$, $p = .036$). The association between subtypes of childhood trauma and daily impulsivity were also examined. There was a significant positive association between

emotional abuse and daily impulsivity ($\beta = .083, p = .003$), but no other subtypes of childhood trauma were significantly associated with daily impulsivity. See Table 24.

Table 24: *Summary of Effects of Childhood Trauma and its Subtypes on Daily Impulsivity*

MLM effect	β	B	SE	p
<i>Intercept: daily impulsivity</i>	β_{00}	7.283	.142	< .001***
Total childhood trauma-daily impulsivity	β_{01}	1.849	.874	.036*
Emotional abuse-impulsivity	β_{01}	.083	.027	.003**
Emotional neglect-impulsivity	β_{01}	.036	.028	.198
Physical neglect-impulsivity	β_{01}	1.002	.942	.288
Physical abuse-impulsivity	β_{01}	.040	1.046	.970
Sexual abuse-impulsivity	β_{01}	.520	.859	.545

Note. Each analysis ($\beta_{00}, \beta_{01}, \beta_{10}$) was performed separately, but are summarised here for ease of reading and interpretation.

Level 1 $n = 1386$. Level 2 $n = 243$. β = multilevel modelling symbol. Log transformed data were used where appropriate. B = Coefficient. Total childhood trauma = CTQ-SF total. Impulsivity = MIS total, Stress = PSS-4 total. *** $p < .001$, ** $p < .01$.

3.9 Does Childhood Trauma or Subtypes of Trauma Moderate the Relationship Between Daily Stress and Daily Impulsivity?

The results showed that higher levels of daily stress were associated with higher daily impulsivity ($\beta = .186, p < .001$). Childhood trauma was not a significant moderator of the daily stress-daily impulsivity relationship ($\beta = -.255, p = .211$). No subtypes of childhood trauma were significant moderators of the daily stress-daily impulsivity relationship. See Table 25.

Table 25. *Childhood Trauma and its Subtypes as Moderators in the Daily Stress-impulsivity Relationship*

MLM effect	β	B	SE	<i>p</i>
<i>Intercept: daily impulsivity</i>	β_{00}	7.283	.142	<.001***
Level 1 slope: daily stress-daily impulsivity	β_{10}	.186	.027	<.001***
Cross-level interactions with childhood trauma and subtypes				
Total childhood trauma x stress-impulsivity	β_{11}	-.255	.211	.228
Emotional abuse x stress-impulsivity	β_{11}	-.010	.006	.088
Emotional neglect x stress-impulsivity	β_{11}	-.004	.006	.522
Physical neglect x stress-impulsivity	β_{11}	-.016	.197	.937
Physical abuse x stress-impulsivity	β_{11}	-.163	.207	.434
Sexual abuse x stress-impulsivity	β_{11}	.012	.148	.938

Note. Each analysis ($\beta_{00}, \beta_{10}, \beta_{11}$) was performed separately, but are summarised here for ease of reading and interpretation.

Level 1 $n = 1386$. Level 2 $n = 243$. β = multilevel modelling symbol. Log transformed data were used where appropriate. B = Coefficient. Childhood trauma = CTQ-SF total. Impulsivity = MIS total, Stress = PSS-4 total. *** $p < .001$

4. Discussion

In this section I will revisit the aims of the research and summarise the main findings. I will then discuss the key findings from each main research question in more detail, and consider these within the context of wider literature. I will follow by discussing the strengths and limitations of the current study, before highlighting the clinical implications of the findings. Lastly, I will provide a final closing summary of this study and offer recommendations for further research.

4.1 Aims

In summary, this study had six research questions it aimed to address. First and secondly, it aimed to examine whether childhood trauma and its subtypes, and impulsivity and its subtypes were associated with suicide behaviour. The third aim was to examine the moderating effect of trait impulsivity on the relationship between childhood trauma and suicide behaviour, considering sub-types of both impulsivity and childhood trauma. The fourth and fifth aims were to examine whether childhood trauma was associated with higher levels of trait and daily impulsivity respectively. Finally, it aimed to examine whether childhood trauma moderates the relationship between stress and impulsivity at a daily level. These aims were achieved by conducting a two part study which collected data over a seven-day period. The first part collected data on between-participant variables of childhood trauma, trait impulsivity, and suicide behaviour through a battery of self-report questionnaires completed online. The second part collected data on within-participant variables of self-report impulsivity and stress, every evening for seven days, also completed online.

4.2 Summary of Key Findings

In summary, this study found that in the current sample, all subtypes of childhood trauma were significant predictors of suicide ideation and attempt. Attentional impulsivity

was a significant predictor of both suicide ideation and attempt. This study did not find evidence that impulsivity or any of its subtypes moderated the childhood trauma and suicide behaviour relationship, however both childhood trauma and trait impulsivity accounted for significant variance in suicide behaviour. The highest levels of trait impulsivity were observed in participants with a history of suicide attempt. Reporting a history of childhood emotional abuse was positively associated with higher levels of daily impulsivity, but other types of childhood trauma were not. Neither total childhood trauma or any of its subtypes moderated the relationship between daily stress and daily impulsivity. The key findings will now be discussed in relation to the original research questions within the context of the existing literature.

4.2.1 Research question one: Is childhood trauma and its subtypes associated with suicide behaviour?

In the current sample, both suicidal ideation and attempt were positively associated with all types of childhood trauma, which is consistent with previous research (Angelakis et al., 2019; Barbosa et al., 2014). Emotional abuse was most strongly associated with suicide behaviour, and physical abuse was the least strongly associated. Further analysis revealed that after age and gender were accounted for, all subtypes of childhood trauma significantly predicted variance in suicide ideation and attempt. Emotional abuse could account for over 23% of variance in both suicide ideation and suicide attempt. Therefore, hypothesis one, ‘all subtypes of childhood trauma will be positively associated with suicide behaviour’ can be accepted.

As discussed in the introductory chapter, previous research findings are inconclusive with regards to which types of childhood trauma(s) are significantly associated with suicide behaviour. In a meta-analysis of studies examining the association between childhood trauma and suicidal behaviour, Liu et al. (2017) found childhood trauma to be associated with

suicide attempts but not ideation, which contradicts the current study. However, they reported emotional abuse to have the strongest association with suicide behaviour, which is consistent with our findings. Again, in another meta-analysis, Zatti et al. (2017) found suicide attempt to be associated with experiences of physical, emotional and sexual abuse and physical neglect, which is consistent with our correlational findings though not the regression analyses.

Some researchers have queried whether these inconsistent findings are due to methodological restrictions; for example, Liu et al.'s (2017) meta-analysis only included studies which used the CTQ, and Zatti et al.'s (2017) meta-analysis only included prospective case-control or cohort studies. However, a more comprehensive meta-analysis which included a broader range of studies found that reporting any type of childhood trauma was associated with a 2-3 times increase in risk of suicide attempts and ideation (Angelakis et al., 2019). The same meta-analysis found sexual, physical, and emotional abuse to be associated with the strongest increased odds for suicidal ideation and attempt. This is consistent with the current findings that emotional abuse explained the most variance in suicide attempt and ideation, but contrasts with the findings that physical and sexual abuse explained the least variance.

One explanation for these differences in findings could be differences in the methodology and analysis. This project conceptualised childhood trauma as a continuous variable occurring on a spectrum from low to high scores and so all participants who completed baseline measures of childhood trauma and suicide behaviour were included in analysis. In comparison, other research (Hadland et al., 2015; Marshall et al., 2013) has used cut-off scores to classify occurrence of each type of childhood trauma into severities ranging from "no or minimal" trauma to "severe to extreme" trauma, and then compared the incidence of suicide behaviour between those who have experienced the most and least trauma. Again, research studies use different definitions of childhood trauma. Zatti et al.

(2017) classified childhood trauma as traumatic events occurring between the ages of 0 and 14 using the UN definition, whereas we used the CTQ-SF which asks participants to consider their experiences “growing up as a child and teenager” (Bernstein et al., 2003). Research has established that the earlier the trauma occurred, the more detrimental the effect on neurodevelopment (De Bellis & Zisk, 2014; Van der Kolk et al., 2005). Therefore, the chosen measure and definition of childhood trauma may influence research findings.

Regardless, causality cannot be inferred from the current cross-sectional analysis. The aforementioned research studies which classified trauma into severities studied cohorts of participants over five and eight years and found that severe physical, emotional, and sexual abuse were associated with higher risk of suicide attempt and repeated suicide attempt, but physical and emotional neglect were not (Hadland et al., 2015; Marshall et al., 2013). However, both studies were conducted on substance users, therefore further longitudinal research within both the general population and in individuals with different mental health difficulties is needed.

Nonetheless, the current study makes a valuable contribution to the existing literature. Further research will also be necessary to ascertain *why* particular experiences of abuse are associated with an increased likelihood of suicide behaviour than other types of abuse.

4.2.2 Research question two: Is trait impulsivity and its subtypes associated with suicide behaviour?

Total trait impulsivity and all subtypes of trait impulsivity were positively associated with suicide behaviour, with attentional impulsivity found to be most strongly associated. However, further analysis revealed that only attentional impulsivity was a significant predictor of suicide ideation and suicide attempt. Greater importance will be placed on the findings from regression analysis due to its controlling for age and gender. Therefore,

hypothesis two: ‘trait impulsivity and its subtypes will be positively associated with suicide behaviour’ can be partially accepted.

The BIS-11 defines attentional impulsivity as “an inability to focus attention or concentrate”, motor impulsivity as “acting without thinking”, and non-planning impulsivity as “a lack of futuring or forethought” (Stanford et al., 2009, p. 386). There is limited literature examining subtypes of impulsivity in relation to suicide behaviour, though one study found that individuals who had recently attempted suicide scored higher on measures of attentional impulsivity than healthy controls, but found no difference in motor or non-planning domains (Quednow et al., 2006), which is consistent with the current study, despite using a sample recruited from the general population. In contrast, Dougherty et al. (2004) found significant differences between self-report motor and behavioural impulsiveness between individuals who had made previous suicide attempts, and controls with no history of suicide behaviour. They found that participants who had made multiple previous suicide attempts showed the highest levels of impulsivity, followed by those who had made a single suicide attempt, with the lowest level of impulsivity seen in those who had never previously attempted suicide (Dougherty et al., 2004). This is partially supported by the current study, which found the highest mean trait impulsivity in participants who had attempted suicide; however, we did not find motor or non-planning impulsivity to significantly predict suicide ideation or attempt. McHugh et al. (2019) conducted a systematic review and meta-analysis of studies examining impulsivity and self-harm and/or suicidal behaviour in people under the age of 30. They found that deficits in inhibitory control and impulsive decision making were associated with self-harm and suicide behaviour, however, they did not report on those outcomes individually or distinguish between associations with self-harm vs suicide behaviour, making it impossible to ascertain specific effects.

Our finding that attentional impulsivity was associated with both suicide ideation and attempt contradicts the IMV model of suicide behaviour, which proposes that impulsivity is one of many volitional moderators that enable the transition from suicidal ideation to attempt (O'Connor & Kirtley, 2018). Research has found support for the IMV model's proposition of impulsivity as a volitional moderator, and found that people who attempted suicide could be differentiated from those who ideated about suicide on all but one volitional moderator, including impulsivity (Dhingra et al., 2015). It is possible that the impulsivity referenced in the IMV model is more related to state impulsivity experienced in the moment, as it refers to "Does the individual tend to act impulsively/on spur of moment?" (O'Connor & Kirtley, 2018, p. 5). On the other hand, according to the classifications proposed by Stanford et al. (2009), this could refer to motor impulsivity. Future research is needed to test the contributing role of specific types of impulsivity in the IMV model, and to suicide behaviour more generally.

May and Klonsky (2016) suggest that the impulsivity-suicide relationship could be indirect, by increasing an individual's exposure to chaotic life events and stress which consequently increase the likelihood of suicide ideation, consistent with the Interpersonal Psychological Theory of suicide (Joiner, 2005). In support of this, a study using Ecological Momentary Assessment (EMA) to assess fluctuation in impulsivity and suicide behaviour over six days found that although trait impulsivity was not associated with suicidal ideation, it was positively associated with a measure assessing capability for suicide (Hadzic et al., 2020). It is therefore unclear why the current study found trait impulsivity to be associated with suicide ideation. Evidently, further research is needed to untangle the potential causal relationship between trait impulsiveness, its subtypes, and suicide behaviour.

4.2.3 Research question three: Does trait impulsivity and its subtypes moderate the relationship between childhood trauma and suicide behaviour?

Neither trait impulsivity nor its subtypes were significant moderators of the relationship between childhood trauma and suicide ideation or suicide attempt. Therefore, hypothesis three: ‘Trait impulsivity and its subtypes will moderate the relationship between childhood trauma and suicide behaviour’ cannot be accepted. At the time of writing, the author is unaware of any previous research examining a moderation between subtypes of childhood trauma alongside subtypes of trait impulsivity and suicide behaviour.

The closest comparison to the current research is the work of Arens et al. (2012), who investigated subtypes of the UPPS model impulsivity (Whiteside & Lynam, 2001; urgency, premeditation, perseverance, and sensation seeking) as moderators in the relationship between childhood maltreatment and NSSI in college students. They did not find any significant moderating relationship, but urgency was found to *mediate* the relationship between childhood trauma and self-harm (Arens et al., 2012). Although engaging in NSSI carries different intent to suicide behaviour, the basic premises of the IMV model have also been applied to self-harm, and research has found that volitional factors including impulsivity are greater in adolescents who self-harm than in adolescents who think about self-harm (O’Connor et al., 2012). A very recent systematic review and meta-analysis has provided further support for the possibility that impulsivity mediates rather than moderates the relationship between childhood trauma and suicide (Pérez-Balaguer et al., 2022). However, of the 14 studies reviewed, only three were longitudinal and none have been carried out with a non-clinical sample of adults. Furthermore, given that several of the studies reviewed found that impulsivity is associated with childhood trauma and suicide behaviour independently (Daray et al., 2016; Gvion & Apte, 2011; McHugh et al., 2019) further research is needed to

elucidate whether childhood trauma has a causal effect on suicide risk either partly or wholly through increasing impulsive behaviour, or via some other unknown mechanism.

4.2.4 Research question four: Is childhood trauma associated with higher levels of trait impulsivity?

Generally, participants who reported greater levels of childhood trauma also reported higher trait impulsivity. However, sexual abuse was not significantly associated with trait impulsivity nor its subtypes. Motor impulsivity was positively associated with emotional abuse and physical neglect, but not other subtypes of trauma. Further analysis found childhood trauma to significantly predict variance in trait impulsivity generally as well as in attentional and non-planning impulsivity after age and gender were controlled for.

When subtypes of trauma and impulsivity were examined, all subtypes of childhood trauma except sexual abuse significantly accounted for variance in both attentional and non-planning impulsivity after controlling for age and gender. Emotional abuse was the most powerful predictor, accounting for 5.3% of variance in non-planning impulsivity and 15.8% of variance in attentional impulsivity. Overall, hypothesis four: ‘Childhood trauma and its subtypes will be positively associated with higher levels of trait impulsivity’ can be partially accepted.

These findings provide tentative evidence for specific types of traumatic experience having different effects on facets of attention, but further longitudinal research is needed to determine a causal relationship. Previous research has consistently found positive associations between childhood trauma and impulsivity (Arens et al., 2012; Brodsky et al., 2001; Yildirim & Kesebir, 2015), but there is limited research examining the associations between subtypes of the two. Roy (2005) found significant positive correlations between childhood trauma, risk taking, and self-assessed impulsivity using the BIS-7B. However, it is difficult to draw comparisons with findings using an older version of the BIS, as it has since

been redesigned to measure the theorised subcomponents of cognitive, motor, and non-planning impulsiveness (Stanford et al., 2009).

The different effects of subtypes of trauma on facets of impulsivity may be due to the different ways in which abuse and neglect have been found to effect the brain and development (McLaughlin et al., 2014). In further support of this, Tinajero et al. (2020) found that childhood neglect was positively associated with poorer behavioural control in executive functioning tasks (impulsivity/inhibition is a key component of executive functioning; Diamond, 2013) whereas abuse was positively associated with self-reported executive functioning difficulties and poorer emotional regulation. Turecki and Brent (2016) argue that early adversity may be associated with impulsive behaviour in later life due to the effect it has on developing cortical systems which are known to be key for planning and decision making. What remains unclear is the finding in the current sample that childhood trauma was most strongly associated with attentional impulsivity, as this is thought to be more related to an inability to focus or concentrate (Stanford et al., 2009). However, a causal relationship between trauma and impulsivity cannot be inferred from the current study, and further research is needed to tease apart the specific contributions of experiences of abuse and neglect to facets of impulsivity.

4.2.5 Research question five: Is childhood trauma associated with higher levels of daily impulsivity?

In the current sample, total childhood trauma was positively associated with daily impulsivity; however, emotional abuse was the only subtype of trauma to be significantly associated with daily impulsivity. Therefore, hypothesis five: ‘Childhood trauma and its subtypes will be positively associated with higher levels of daily impulsivity’ can be partially accepted.

To the author's knowledge at the time of writing, this is the first study to examine the relationship between childhood trauma and impulsivity at a daily level. This is an important addition to the existing literature regarding childhood trauma and trait impulsivity and suggests that this relationship holds at a daily level, despite the modest association between daily and trait measures of impulsivity (Tomko et al., 2014).

These findings are consistent with the earlier reported finding that emotional abuse showed the strongest association with trait impulsivity and is also consistent with the findings of Roy (2005), however, it is unclear why other subtypes of trauma are not associated with daily impulsivity. As discussed previously, this finding may be attributed to the possibility of different types of trauma having different effects on the brain and development. Longitudinal research is needed on the specific effects of different traumatic childhood experiences to impulsive behaviour at both a state and trait level to ascertain any possible neurobiological effects.

4.2.6 Research question six: Does childhood trauma moderate the relationship between daily stress and daily impulsivity?

In the current sample, daily stress was positively associated with daily impulsivity, indicating that participants reported more impulsive behaviour on days when they experienced more stress. However, neither childhood trauma nor any subtypes moderated the daily stress-impulsivity relationship. Therefore, hypothesis six: 'childhood trauma and its subtypes will moderate the relationship between daily stress and daily impulsivity' cannot be accepted.

Our finding that daily stress and daily impulsivity were positively associated corroborates the findings of Sharpe et al. (2021) who found that in a 100-day daily diary study of people with diagnoses of personality disorder, within-person increases in daily stress were associated with higher daily impulsivity. Furthermore, daily stress showed a direct

effect on daily impulsive behaviour that remained after both positive and negative affect was accounted for (Sharpe et al., 2021). From these findings, the authors proposed a cascade model where stress is an antecedent leading to affect which in turn leads to impulsivity. However, because their sample comprised entirely of people with a diagnosis of personality disorder (Sharpe et al., 2021) the findings have limited generalisability, therefore the current study has value in showing that the stress-impulsivity relationship is present within the general population, not just in people diagnosed with personality disorder.

The association between childhood trauma and stress has previously been studied at a daily level, where it was found that individuals who had experienced childhood trauma showed a reduced cortisol awakening response over seven days (O'Connor et al., 2020). Other research has also reported similar findings to the current study; Weltz et al. (2016) found that daily self-report stress was positively associated with childhood physical, emotional, and sexual abuse, and overall neglect. Taking into consideration both the impaired stress response in people who have experienced childhood trauma, and previous findings that physical and sexual abuse are associated with difficulties controlling impulsive behaviour when distressed (Lynam et al., 2011) it is perhaps surprising that in the current study, childhood trauma did not moderate the relationship between stress and impulsivity at a daily level.

The non-significant moderation finding also contradicts Loyallo et al. (2013) hypothesis that early adversity would result in more impulsive and risky behaviours in response to stress due to physiological and cognitive changes associated with early adversity. There are several possible reasons for this. In the current study, childhood trauma was used as a continuous variable in all analyses to allow the entire sample to be included for greater power within statistical analysis; therefore, it is possible that the effect may only be present with severe experiences of childhood trauma. Consistent with this, in a previous study

examining the effects of childhood trauma on cortisol levels where participants were split into groups that had experienced 'no trauma' 'medium exposure' and 'high exposure', it was found that higher levels of trauma were associated with lower cortisol levels while controlling for age, gender, BMI, time of day, medication, and smoking status (O'Connor et al., 2017). The lowest cortisol levels were seen in the high exposure group, which supports the notion that childhood trauma has a cumulative harmful effect on the stress response, with the impact becoming more pronounced as more ACEs or traumatic experiences are reported.

Other research investigating the trauma-stress relationship found that both people diagnosed with BPD and healthy controls self-reported more impulsive behaviour during stressful conditions, but the BPD group reported higher levels of impulsivity during stress *and* when resting (Cackowski et al., 2014). Furthermore, the increase in impulsivity under stress was larger in the BPD group, even after symptoms of ADHD were accounted for. Given the prevalence of childhood trauma typically reported in individuals diagnosed with BPD (Ball & Links, 2009), this is somewhat inconsistent with the current findings that childhood trauma did not moderate the stress-impulsivity relationship.

Similarly, Sperry et al. (2018) found that both negative and positive urgency moderated the relationship between stress and impulsivity whereby those scoring higher in positive or negative urgency showed a greater increase in impulsive behaviour when stressed. In another relevant study, Weltz et al. (2016) reported that individuals with more severe histories of emotional abuse showed stronger stress-reactivity for anxiety, but not other forms of affect. Interestingly, childhood neglect moderated this association in the opposite direction, whereby more reported childhood neglect was associated with lower anxiety in response to daily stress (Weltz et al., 2016). Although this study examined stress-reactivity to emotions rather than stress more broadly, it shows that the association between trauma and the stress response is likely to be complex and further supports the idea that different types of

trauma may have different effects on the body and brain. Bernanke et al. (2017) propose that suicidal behaviour is not a single construct, but presents a "final common pathway of multiple separate pathological processes", which may account for the inconsistent relationship between stress and suicide behaviour (Bernanke et al., 2017, p. 1080). They hypothesise that there are 'stress responsive' and 'non-stress responsive' subtypes of suicide behaviour, where stress-responsive kind is influenced by childhood trauma and fluctuates, and the non-stress responsive pathway is more related to depressive disorders and tends to be more persistent. Again, this illustrates the complexity of the associations being measured and emphasises the need for further research in the area.

4.3 Strengths and Limitations

4.3.1 Strengths

4.3.1.1 Originality and credibility. This study has several strengths. To the author's knowledge, it is the first research study to investigate the association between subtypes of childhood trauma and sub-facets of impulsivity. It is also the first study to investigate the impact of childhood trauma on impulsivity at a daily level. These findings add important knowledge and understanding to the evidence base and gives direction for further research which will be discussed later. Investigating impulsivity at both a trait and state level is important to elucidate differences in how and when impulsive behaviour may occur, and if and when this may increase risk of suicide behaviour.

The methods, planned analysis, and main predictions of the study were preregistered on AsPredicted.org. This increases the credibility of this study and adheres to best practice in accordance with open science, preventing 'p-hacking' by ensuring that any significant results have not been cherry-picked from the wider set of findings (Logg & Dorison, 2021).

Although additional exploratory analyses were conducted, these are clearly identified as such.

4.3.1.2 Daily diary methodology. This study has added to a growing body of ‘daily diary’ research (see O’Connor et al., 2008; O’Connor et al., 2020; Sharpe et al., 2021) using baseline and daily questionnaires in order to examine within and between person effects, which has been successfully used in the study of suicide behaviour and stress. The daily diary approach allowed us to capture within-person day-to-day fluctuations in stress and impulsivity that trait measures cannot capture, which was crucial in the current study. This methodology also allowed us to examine causality in the stress-impulsivity relationship, which otherwise would not have been possible outside of a laboratory setting. Furthermore, because the daily diary measures were completed online, they were automatically time stamped by the survey programme. This meant that non-compliance was not an issue requiring consideration when interpreting the results because the researchers could see when entries were written, and accordingly remove any multiple or backdated entries. See O’Connor & Ferguson (2008) for a more detailed discussion on the utility of daily diary methods.

4.3.1.3 Sample. The required minimum sample size for 80% power using multilevel modelling (informed by Murayama et al., 2022) was 265 participants, which was achieved; 481 participants completed the initial battery of questionnaires, with 272 continuing to phase two to participate in the daily diary study. Although our sample was predominantly female, analysis of variance of the BIS-11 did not find any significant gender differences for total score or second-order subscales (Stanford et al., 2009), and gender was controlled for in all regression and multi-level analyses, therefore the female-dominant sample is unlikely to have influenced our results. Despite the sample being recruited from the general population, over half reported previously having experienced either suicide ideation or making a suicide attempt (likely due to the recruitment strategy used), giving sufficient sample sizes for meaningful subgroup analysis to be conducted. The current study has also achieved a larger

sample size than previous research investigating childhood trauma, suicide behaviour, and stress using daily diary methodology (e.g. O'Connor et al., 2020), and therefore meaningfully contributes to the existing literature. Finally, the current study's sample was ethnically representative of the city in which it was conducted (Gov.uk, 2011).

4.3.2 Limitations

4.3.2.1 Design. The requirement to complete a lengthy initial survey (it is noteworthy to reiterate here that participation in the study also required completing several other measures which were unrelated to the current study, and part of another research project – see Appendix E for complete list of measures included) followed by seven further days of questions may have caused more impulsive individuals to drop out of the study, possibly resulting in an unrepresentative sample. However, this did not appear to be true given that the mean scores for impulsivity at baseline and daily levels were broadly similar to that in the general population (Stanford et al., 2009; Tomko et al., 2014).

A further limitation is that the entirety of the study was conducted online, which meant relying on self-report online disclosure for sensitive information such as history of suicide behaviour and childhood trauma. Although participants remained entirely anonymous throughout the duration of the study and were regularly reminded that they were free to withdraw at any time without explanation, it is possible that individuals may have felt apprehensive about disclosing experiences with suicide ideation or behaviour on an online platform. Conducting an online study also meant that potential participants without internet access or a mobile device on which they could complete the daily diary measures would not be able to participate, which creates accessibility issues. This also means that the study may not have been accessible to more marginalised groups such as people with lower household income which are over-represented within suicide statistics (NHS Digital, 2021), therefore potentially reducing the generalisability of our findings to relevant populations. However,

these issues must be considered within the context of the Covid-19 pandemic; at the time of planning the study it would not have been possible to conduct the research face to face. Face-to-face recruitment strategies (distribution of posters and leaflets) were used, when possible, to maximise the variation of people participating in the study.

4.3.2.2 Reliance on self-report measures. A further limitation is that the study relied on entirely self-report measures. Retrospective self-report, used for all baseline measures including the BIS-11 and CTQ-SF is subject to issues such as memory bias. Conner and Barrett (2012) summarise these issues, citing an example of retrospective reports of pain being influenced by current pain at the time of recall, which could plausibly happen with regards to trait impulsivity. However, the authors propose that momentary self-report may be less biased than traditional self-report due to evoking a different experience - the self in the moment or ‘experiencing-self’, rather than the ‘remembered-self’ or ‘belief-based self’, and recommend using this where possible to maximise sensitivity of measures (Conner & Barrett, 2012, p. 324). Although the authors report that daily-diary methodology appears to be more sensitive than traditional retrospective self-report methods, they discuss that participants may use episodic memory to recall the details of events during the day or the period since the previous diary, which can introduce episodic memory biases (Conner & Barrett, 2012). However, these weaknesses should be considered alongside the benefits that the daily diary approach added to the study.

The study could also have benefitted from using an additional behavioural measure of impulsivity such as an inhibition or delay discounting task. Behavioural measures of impulsivity have been not been found to be associated with self-report measures of impulsivity (Reynolds et al., 2006), however, they are positively associated with both suicide behaviour (Dougherty et al., 2004) and childhood adversity (Lovallo et al., 2013), and therefore may account for a different type of variance in suicide behaviour. However as

aforementioned, at the time that the study was planned and conducted, the UK remained amid the Covid-19 pandemic and therefore to prevent the research from being held up by uncertainty over future limits and rules on social contact, the entirety of the study was conducted online.

4.3.2.3 Negative urgency. The BIS-11 was selected as an extensively validated measure of trait impulsivity that has frequently been used in relevant past research, however, the BIS-11 does not encapsulate the concept of urgency; a tendency to act impulsively in response to affect, either positive or negative. Lynam et al. (2011) examined the ability of the UPPS model of impulsivity in predicting suicidal behaviour and NSSI (Lynam et al., 2011), and found that higher scores in 3 domains (urgency, lack of premeditation, and lack of perseverance) were associated with suicidal behaviour. An interaction effect was also found, whereby people who scored highly in both negative urgency and lack of premeditation were at particularly high risk of suicidal ideation and behaviour (Lynam et al., 2011). A study using similar daily diary methodology to ours found that high daily levels of negative urgency and sadness predicted the urge to engage in NSSI, but in participants scoring lower in negative urgency, sadness was not related to urge to self-harm (Bresin et al., 2013). Although NSSI is a different behaviour and carries different risk factors to suicide behaviour, these findings are promising and suggest that negative urgency may be related to harmful self-directed behaviours. Therefore, negative urgency may have been a crucial factor that has been missed in this research. Future research should investigate the role of negative urgency as a moderator in the childhood trauma-suicide relationship, and the relationship between daily stress and negative urgency.

Furthermore, within the current sample, Cronbach's α for the Motor subscale of the BIS-11 was slightly below the conventional 0.70 cut-off, which may have influenced the internal reliability of the findings regarding motor impulsivity (Pallant, 2020). The only significant

finding in relation to motor impulsivity was that it showed a small positive association with emotional abuse and physical neglect, however this result should be interpreted with some caution given its Cronbach's α in the current sample.

4.3.2.4 Assessing childhood trauma. The current study chose to focus on experiences of abuse and neglect, and to measure this using the CTQ-SF (Bernstein et al., 2003). However, the CTQ-SF does not account for other types of traumatic experience such as bullying or parental substance abuse. Parental substance abuse is assessed using the ACE questionnaire; however, the ACE questionnaire assesses for a much wider range of adverse experiences and therefore it was more appropriate for the scope of the current study to use a measure that had a more a direct focus on experiences of abuse and neglect.

Although the CTQ-SF has a guide to classify severities of experience of childhood traumas from 'low to no' experience of a type of trauma, through to 'severe to extreme' experience, this is based on adding together scores together from questionnaire items. Due to the design and wording of the CTQ-SF, this therefore assesses how frequent the experience of abuse or neglect was, but not how severe the experience was. This raises broader issues in research relating to childhood trauma around whether it should be considered a dichotomous factor that did or did not happen, or whether it is something that happens on a continuum of severities (Bernstein et al., 2003).

Again, it is also important to consider that an event that is experienced as traumatic by one individual may not be perceived as such by a different person, which cannot be accounted for using traditional measures of early adversity including the CTQ-SF and ACE questionnaire. Protective factors such as coping strategies and social support have been found to act as a buffer and reduce the association between childhood adversity and trauma-related distress (Racine et al., 2020), therefore it may have been useful for the current study to include some assessment of protective factors.

4.3.2.5 Confounding variables. Although the study controlled for some potential confounding variables such as age and gender, the analysis did not control for other possible confounding variables such as mental health diagnosis or consumption of substances (prescribed or otherwise) which may have influenced the findings. Future research should control for mental health diagnoses known to be associated with impulsivity, such as BPD, bipolar disorder, and ADHD (Richard-Lepouriel et al., 2019; Stanford et al., 2009; Tomko et al., 2014) to rule out that any observed effects are related to these mental health diagnoses.

4.4 Impact of Covid-19

This thesis took place during the Covid-19 pandemic, and I will therefore consider the possible impact this may have had on recruitment and findings. As stated previously, the pandemic influenced the choice of methods and measures used in the study; efforts were made to mitigate the impact of the pandemic by conducting the study entirely online. Recruitment also mostly took place online. Although posters and leaflets were distributed around the local area, it is likely that this recruitment strategy was less successful than it may have been outside of a pandemic, but this is impossible to ascertain. This may therefore have influenced who participated in the study and as mentioned earlier, limits the accessibility and generalisability of the research.

The pandemic may also have influenced the results of this study. Early research on the impact of the pandemic has found increased prevalence of suicide ideation and attempt during the pandemic when compared to pre-pandemic rates (Dubé et al., 2021), particularly for women, younger adults, people with pre-existing mental health conditions and from more socially disadvantaged backgrounds (O'Connor et al., 2021). Research has also found that people have reported higher levels of stress during the Covid-19 pandemic (O'Connor et al., 2021), which may explain our finding that mean daily stress using the MIS was higher than

the means reported in a normative UK sample (Warttig et al., 2013). It therefore may be prudent to repeat this study now that the nationally imposed lockdowns have ended.

4.5 Implications for Clinical Practice

4.5.1 Suicide risk assessment

The current findings add weight to earlier research suggesting that specific types of traumatic experience may be more strongly associated with suicide behaviour than others (Angelakis et al., 2019; Zatti et al., 2017), and therefore mental health services may find it useful to note the type of trauma a service user has experienced when considering suicide risk assessment. Again, considering trait impulsivity alongside experiences of childhood trauma is likely to add useful information to suicide risk assessment given that trait impulsivity also predicted a significant amount of variance in suicide behaviour. This information could be gathered at intake to services alongside any other standardised assessments typically conducted.

4.5.2 Disorder specific implications

A psychiatric diagnosis frequently associated with both impulsive and suicidal behaviour is Borderline Personality Disorder (BPD) (otherwise known or referred to as Emotionally Unstable Personality Disorder/EUPD); which has impulsive behaviour as a key diagnostic criterion (World Health Organization, 2020). 75% of individuals with BPD attempt suicide, with 10% of people with BPD making fatal suicide attempts (Black et al., 2004).

Childhood trauma is also, sadly, highly prevalent in this population, with research reporting that as many as 93% of individuals diagnosed with BPD have experienced at least one type of loss or abuse in childhood (Ball & Links, 2009). Indeed, activists and clinicians have long campaigned against the construct of ‘personality disorder’, particularly in the case

of BPD, and argued that instead it reflects a disorder arising from traumatic experiences in childhood – see MacIntosh et al. (2015) for a relevant review.

Interestingly, Brodsky et al. (1997) found that impulsivity was the only characteristic of EUPD associated with a higher number of suicide attempts after controlling for comorbid depression and substance abuse. Other research has found that childhood emotional neglect and/or abuse was positively associated with impulsivity in women with BPD and controls (Krause-Utz et al., 2019), and Cackowski et al., (2014) report that people with BPD diagnosis show weaker response inhibition under conditions of stress than controls. Evidently, diagnosis of BPD (whether a disorder of personality or a response to trauma) is closely related to all the constructs measured in this study, and therefore our reported findings are likely to be particularly clinically relevant to this group.

4.6 Implications for Future Research

4.6.1 Models and theories of suicide behaviour

The findings from the current study have key relevance in models and theories of suicide behaviour including the IMV (O'Connor & Kirtley, 2018). The current study investigated impulsivity as a contributor to suicide behaviour, which according to the IMV model, is one of several volitional moderators that facilitate the transition from suicidal ideation to suicide attempt (O'Connor & Kirtley, 2018). However, the current study found that after age and gender had been accounted for, attentional impulsivity significantly accounted for variance in both suicide ideation and attempt, which is inconsistent with the IMV. As discussed at length throughout this thesis, different facets of impulsivity are likely to have different associations with suicide behaviour. Although some research has provided evidence supporting impulsivity as a volitional moderator in the IMV (O'Connor & Kirtley,

2018), future research could focus on ascertaining which, if any, specific facets of impulsivity act as volitional moderators within the IMV.

The findings from the current study also have relevance for the IPT (Joiner, 2005; Van Orden et al., 2010), which argues that impulsivity contributes to suicide risk indirectly, through increasing the likelihood that someone would engage in painful and provocative behaviours that will increase their acquired capability for suicide over time, therefore increasing the risk of making suicide attempts. The current finding that attentional impulsivity explained variance in suicide ideation contradicts the IPT, which would expect impulsivity to be associated with suicide attempts (Van Orden et al., 2010). It may be useful for future assessment of the role of impulsivity in the IPT model to consider sub types of impulsivity.

4.6.2 Replication of the current study

Although the current study had many merits, it also had several limitations as discussed previously. As such, the current study should be replicated with some amendments. Firstly, it is recommended that a measure of impulsivity that includes negative urgency is used such as the UPPS scale (Whiteside & Lynam, 2001) to further elucidate the associations between this type of impulsive behaviour, childhood trauma, and suicide behaviour. Secondly, the daily diary methodology was a useful way to establish causality between daily stress and daily impulsivity, however suicide behaviour was only assessed at baseline and enquired about historical suicide ideation or attempt. If this study was repeated, it would be useful to include daily questions of suicide ideation and/or attempt to ascertain whether these fluctuate day-to-day the moment in response to stress and/or impulsivity. Thirdly, if replicated, the study should control for potential confounding variables such as diagnoses of mental health conditions such as BPD, bipolar disorder, and ADHD, and known protective factors such as coping skills and social support. Lastly, because the study was conducted

during the unprecedented time of the Covid-19 pandemic which was known to have large impacts on prevalence of stress and suicide behaviour, it would be worthwhile repeating this study outside of a pandemic.

As discussed throughout the current thesis, the current findings and the existing literature remain inconsistent with regards to which specific subtypes of trauma are associated with impulsivity and suicide behaviour, and which facets of trait impulsivity are associated with suicide behaviour. Research using a longitudinal cohort design is likely to be most useful in continuing to unpick these associations.

4.7 Closing Summary

In summary, this study used daily diary methodology to examine the relationship between childhood trauma, impulsivity, and suicide behaviour at a trait level, and the relationship between childhood trauma, impulsivity, and stress at a daily level. It was found that all subtypes of childhood trauma significantly predicted variance in suicide ideation and suicide attempt. It was also found that attentional impulsivity significantly accounted for variance in both suicide ideation and attempt, which is somewhat inconsistent with existing literature and models of suicide behaviour. The study also produced some novel findings, including that neither trait impulsivity nor its subtypes moderated the relationship between childhood trauma and suicide behaviour; childhood trauma nor its subtypes did not moderate the daily stress-impulsivity relationship; and reporting emotional abuse was significantly associated with daily impulsivity. Overall, this study has contributed to the existing knowledge about childhood trauma, impulsivity, stress, and suicide behaviour; supporting some existing findings and adding some novel findings. The implications of these findings have been discussed in relation to existing research literature and clinical practice together with suggestions for future research.

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Appendix A – Screening Questions

Eligibility Screening

Have you made any attempts to end your own life, or experienced thoughts or urges to do so within the last **4 weeks**? * *Required*

- Yes
 No

If participants answered yes to the suicide screening, they were presented with the following text:

Unfortunately, you do not meet the eligibility criteria for this research project.

Thank you for expressing interest in participating in this research project on childhood experiences, relationships, and personality. Unfortunately, due to indicating that you have experienced suicidal ideation within the last 4 weeks, you cannot take part in this project due to the slightly increased risk of distress associated with completing the required measures.

If you are currently experiencing suicidal ideation or thoughts of ending your life, we would recommend that you contact your GP, or ring 999 if you require immediate assistance. You may also find the support services below useful. Thanks again for your time and consideration.

These are just some of the professional and voluntary organisations you can contact to get help in a crisis, or if you have been experiencing periods of low mood, stress or anxiety and wish to seek further support:

You can always contact your GP or another healthcare professional for advice. If a health professional has given you a specific number to call when you are concerned about your condition, continue to use that number

Leeds Survivor-Led Crisis Connect Helpline - 0808 800 1212. Open 18:00 - 22:30pm every evening of the year

Samaritans - 116 123. Confidential, non-judgemental support available 24 hours a day for people who are experiencing feelings of distress or despair, including those which could lead to suicide. www.samaritans.org

Dial House - 0113 260 9328. An out of hours service for people in crisis, open 18:00 - 02:00 Friday to Monday.

NHS 111 - A service available 24 hours a day, every day of the year. Calls are free from landlines and mobile phones. You can call NHS 111 if you think you need to go to A&E or need another urgent care service, if you don't know who to call or don't have a GP, if you need health information, or reassurance about what to do next.

If you are concerned that your life or someone else's life is in immediate danger, you should visit your nearest Accident and Emergency department (A&E) or call for an ambulance by dialling 999.

Eligibility Screening

Are you 18 years of age or older? * *Required*

- Yes
- No

Eligibility Screening

Do you have an excellent understanding of written English? I.e., either a native speaker or acquired fluency. * *Required*

- Yes
- No

If participants responded 'yes' to either of the age or English language screening items above, they were presented with the following text:

Thank you for expressing interest in participating in this research project on childhood experiences, relationships, and personality.

Unfortunately, on this occasion you do not meet the eligibility criteria and therefore will not be able to continue further.

Thank you again for your time and consideration.

Appendix B – Daily Diary Debriefs

Debrief following Phase 1, Baseline Questionnaires

Thank you for completing Part 1 of this research study on childhood experiences, relationships, and personality.

To begin Part 2, please email childhoodexperiences2021@gmail.com with your phone number, and the subject heading 'start study tomorrow'.

If you email before 5pm on a weekday, you will begin the study the next working day. If you email after 5pm on a weekday, or on a weekend, you will begin the study in 2 working days' time. On the first day of the study, you will receive a text message at 6pm containing the link to your first diary. You will receive this link at the same time each day for the 7 days of the study. If you do not receive a text message containing the link to your first diary, please contact the research team on childhoodexperiences2021@gmail.com. The email containing your phone number will be permanently deleted after completion of the study.

Thank you for your participation in this research project so far. We hope that you have found it interesting and have not been upset by any of the topics discussed. If you feel as though you need support, there are also a number of organisations listed below that you can contact.

These are just some of the professional and voluntary organisations you can contact to get help in a crisis, or if you have been experiencing periods of low mood, stress or anxiety and wish to seek further support:

You can always contact your GP or another healthcare professional for advice. If a health professional has given you a specific number to call when you are concerned about your condition, continue to use that number.

- Leeds Survivor-Led Crisis Service- 'Connect' - 0808 800 1212. Open 18:00 - 02:00 every day.
- Samaritans - 116 123. Confidential, non-judgemental support available 24 hours a day for people who are experiencing feelings of distress or despair, including those which could lead to suicide. www.samaritans.org
- Dial House - 0113 260 9328. An out of hours service for people in crisis, open 18:00 - 02:00 Friday to Monday, and Wednesday.
- NHS 111 - A service available 24 hours a day, every day of the year. Calls are free from landlines and mobile phones. You can call NHS 111 if you think you need to go to A&E or need another urgent care service, if you don't know who to call or don't have a GP, if you need health information, or reassurance about what to do next.

If you are concerned that your life or someone else's life is in immediate danger, you should visit your nearest Accident and Emergency department (A&E) or call for an ambulance by dialling 999.

Debrief following Phase 2, Days 1-6 of Daily Diary

Thank you again for your participation in this project. We will text you the link for tomorrow's diary at the same time tomorrow.

We would like to remind you of the range of support services available to you if you have been experiencing periods of low mood, stress, or anxiety, or require further support.

If you are currently experiencing suicidal ideation or thoughts of ending your life, we would recommend that you contact your GP, or ring 999 if you require immediate assistance.

These are just some of the professional and voluntary organisations you can contact to get help in a crisis, or if you have been experiencing periods of low mood, stress or anxiety and wish to seek further support:

You can always contact your GP or another healthcare professional for advice. If a health professional has given you a specific number to call when you are concerned about your condition, continue to use that number

- Leeds Survivor-Led Crisis Service - 'Connect' - 0808 800 1212. Open 18:00 - 02:00 every day.
- Samaritans - 116 123. Confidential, non-judgemental support available 24 hours a day for people who are experiencing feelings of distress or despair, including those which could lead to suicide. www.samaritans.org
- Dial House - 0113 260 9328. An out of hours service for people in crisis, open 18:00 - 02:00 Friday to Monday, and Wednesday.
- NHS 111 - A service available 24 hours a day, every day of the year. Calls are free from landlines and mobile phones. You can call NHS 111 if you think you need to go to A&E or need another urgent care service, if you don't know who to call or don't have a GP, if you need health information, or reassurance about what to do next.

If you are concerned that your life or someone else's life is in immediate danger, you should visit your nearest Accident and Emergency department (A&E) or call for an ambulance by dialling 999.

Debrief following Phase 2, Day 7 of Daily Diary

We would like to thank you for taking part in this project.

This study aimed to investigate the relationship between childhood experiences, relationships, and personality. Previous research has found that those who have experienced childhood trauma or 'Adverse Childhood Experiences' (ACEs) are more vulnerable to suicidal thoughts and behaviour later in life. We are interested in what other factors contribute to this relationship, such as impulsivity, attachment style, and stress.

How was this tested?

In this study, you were asked to complete several questionnaires about your childhood experiences, suicidal thoughts and behaviours, and daily measures of mood and impulsivity. This data was collected for two Clinical Psychology Doctoral Theses.

Hypotheses and main questions:

We expect to find that:

People who have experienced childhood trauma are more likely to respond impulsively to stress and low mood, and hence be at a higher risk of suicidal thoughts and behaviour. People who have experienced childhood trauma, and who have a less secure attachment styles, may have a greater risk of experiencing thoughts of suicide.

Why is this important?

Suicide is an extremely serious public health problem worldwide, and we aim to further understand the risk factors that contribute to suicidal behaviour. These findings can potentially be used to create better targeted interventions for individuals at risk of suicide.

What if I want to know more?

If you are interested in receiving a summary of the results when analysis is complete, please contact the researchers on childhoodexperiences2021@gmail.com

Thank you for participating in this research project. We hope that you have found it interesting and have not been upset by any of the topics discussed. However, if you have found any part of this experience to be distressing, we have provided support organisations that we advise you to contact.

If you are currently experiencing suicidal ideation or thoughts of ending your life, we would recommend that you contact your GP, or ring 999 if you require immediate assistance.

These are just some of the professional and voluntary organisations you can contact to get help in a crisis, or if you have been experiencing periods of low mood, stress or anxiety and wish to seek further support:

You can always contact your GP or another healthcare professional for advice. If a health professional has given you a specific number to call when you are concerned about your condition, continue to use that number.

- Leeds Survivor-Led Crisis Service - 'Connect' - 0808 800 1212. Open 18:00 - 02:00 every day.
- Samaritans - 116 123. Confidential, non-judgemental support available 24 hours a day for people who are experiencing feelings of distress or despair, including those which could lead to suicide. www.samaritans.org
- Dial House - 0113 260 9328. An out of hours service for people in crisis, open 18:00 - 02:00 Friday to Monday, and Wednesday.
- NHS 111 - A service available 24 hours a day, every day of the year. Calls are free from landlines and mobile phones. You can call NHS 111 if you think you need to go

to A&E or need another urgent care service, if you don't know who to call or don't have a GP, if you need health information, or reassurance about what to do next.

If you are concerned that your life or someone else's life is in immediate danger, you should visit your nearest Accident and Emergency department (A&E) or call for an ambulance by dialling 999.

Appendix C – Participant Information Sheet

Childhood Experiences, Relationships, and Personality

We would like to invite you to take part in a research study on how childhood experiences influence adult relationships and personality. Before you decide whether to participate it is important for you to understand why the research is being done and what it will involve.

Please take time to read the following information carefully and discuss it with others if you wish. Please email the researchers if there is anything that is not clear or if you require more information. Take time to decide whether you wish to take part.

Part 1 tells you the purpose of the study and gives a summary of what will happen if you take part. **Part 2** gives you more detailed information about the conduct of the study.

Part 1

What is the purpose of this project?

The current study aims to understand how past life events affects daily wellbeing, behaviour, and relationships. Individuals who have experienced adverse life events have been found to respond differently to stressful situations compared to those who have not experienced any adverse life events.

Using a daily diary approach, this study will aim to investigate how people respond to stressful events which occur in their daily life. We will also explore how individuals with a history of adverse life experiences, difficulty in relationships and suicidal thoughts or attempts differ in their day-to-day feelings and experiences.

Study summary

The entire study will be carried out by you in your home environment where you will complete a set of baseline questionnaire measures, then an online diary every evening for seven consecutive days.

Why have I been chosen?

Approximately 300 adults will be taking part in this study. You are reading this information sheet because you responded to an advertisement for the research opportunity. Your eligibility to take part will be determined from your initial questionnaire responses if you are aged over 18 years and fluent in English you will be selected to take part in the study.

Will I be able to take part?

To take part, you must be over the age of 18 and have an excellent understanding of written English i.e., either a native speaker or acquired fluency. Within the last 4 weeks, if you have experienced thoughts or urges to end your own life, or made any attempts to end your life, you will not be able to take part in the study. This is due to the slightly increased risk of distress with completing the required measures.

Do I have to take part?

Participation is completely voluntary, and it is entirely your decision whether you wish to take part. You can stop taking part in the study at any time without providing an explanation.

What are the possible disadvantages and risks of taking part?

There is a small risk that due to the personal nature of some of the questions that parts of this study may be upsetting. You are free to stop at any time should you feel upset or distressed and do not have to answer any questions you do not wish to. If you do feel any distress or

negative emotions after the study, we would recommend you contact your GP or one of the confidential services on the list of contacts that you will be provided with on the support sheet.

It may also be inconvenient for you to give up your time and to follow the task guidelines by completing a 3-minute questionnaire every evening for seven days. Therefore, you should think carefully about how you will feel about taking part and if you are able to commit to completing the consecutive seven days. However, it is important to remember that if you agree to take part you can withdraw at any point without having to explain your reasons.

What are the benefits of taking part?

Whilst there are no immediate benefits, the findings from the study will help contribute to our understanding of the factors associated with the health and wellbeing of adults under stress. In addition, the findings might help develop important health interventions in the future. There is a potential benefit of being entered into a prize draw to win a £20 online shopping voucher should you complete the background survey and all seven daily-diary questionnaires. Ten £20 vouchers are available to be won.

What happens to the data collected and is it confidential?

Yes. All personal information will be handled in confidence, and we will strictly adhere to ethical practice. Detailed information is given in part 2.

Will I receive anything for taking part?

As a thank you for your time and participation for completing the entire study, you will be entered into a prize draw to win a £20 online shopping voucher for completing the background questionnaire in addition to the seven consecutive daily diaries.

If the information in Part 1 has interested you and you are considering participation, please read the additional information in Part 2 before making any decision.

Part 2

What will I have to do if I take part?

The entire study will take place in your home environment using a device you can connect to the internet. You will be asked to complete an initial 10-minute background questionnaire, this will help determine if you are eligible to complete the study. This does not need to be completed all at once, you will be able to exit the questionnaire and return to it later if you wish. You will also be asked to complete a brief online diary every night, lasting around 3 minutes, for the following 7 days to reflect on your stress, behaviour, and wellbeing during the day. A link to this diary will be texted to you each evening at 6pm for 7 days.

What happens to the data collected and is it confidential?

All the information collected during the study will be kept strictly confidential. After completing a consent form, you will be guided to create a unique study identity code and all data and samples will be recorded using this code. All personal information, such as your email, will be held separately to your answers. The link between your email and your unique identity code will be securely stored at the School of Psychology and will only be accessible by the research team. Your phone number will only ever be accessed to send you the seven daily diary questionnaires and to inform you if you are successful in winning an online shopping voucher and will not be linked with your responses. The data collected will only be

used for research purposes, and individual participants will not be identifiable in any reports or publications.

What if I find that the study impacts my emotional wellbeing?

We will provide information about who to contact for support should you find that you are struggling with your wellbeing throughout the study. Although experiencing some distress when completing some of the questionnaires required in the study is normal, and to be expected, should you feel overwhelmed or find that your mental health is deteriorating, **we would encourage you to withdraw from the study**. If you should require immediate assistance, we would recommend that you contact your GP.

What will happen if I do not want to continue, or want to withdraw my data?

If at any point during the study you no longer wish to continue, you are free to withdraw without having to give an explanation for your reasons. If you decide not to continue during the course of the study, we ask that you inform a researcher (contact: childhoodexperiences2021@gmail.com)

We may wish to use the data you provide up until the point you drop out.

If you wish for your data to be removed, please contact a researcher, and provide your unique participant code created at the start of the study. You may withdraw your data up to 2 weeks after participating in the study. Additionally, you will not be entered into the prize draw should you not complete the background questionnaire and seven consecutive daily diary entries.

Who is organising and funding the research?

This research is being undertaken at the University of Leeds as part of two theses for a D.Clin.Psychol. There is no external funding for this research.

Who has reviewed this study?

All research is assessed and approved by the School of Psychology Ethics Committee to protect your interests and wellbeing.

Who can I contact for further information?

If you have any remaining questions regarding your participation, you can contact either the principal supervisor Daryl O'Connor or the researchers Jasmine Maydom or Charley Blackwell using the following contact details:

Researchers: childhoodexperiences2021@gmail.com


Supervisor: Daryl O'Connor - d.b.oconnor@leeds.ac.uk / 0113 3435727

If you have any questions or concerns regarding ethical procedures related to this study, please contact the Chair of the Psychology Ethics Committee, by post at School of Psychology, University of Leeds, Leeds, LS2 9JT, by telephone on +44 (0) 113 343 7247.

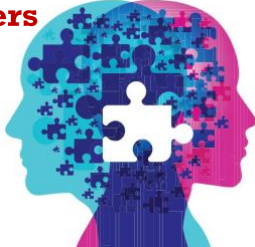
Concluding Remarks

Finally, thank you for taking the time to read this information. If you have any additional questions do not hesitate to ask.

Appendix D - Materials Used for Recruitment


 UNIVERSITY OF LEEDS


Contribute to research and have the chance to win **£20 online shopping vouchers**



Clinical Psychology study interested in:

- 1) Childhood experiences
- 2) Relationships
- 3) Personality

Please scan the QR code click on the link for more information and to enter the study



Link to ppt information sheet in Qualtrics

Figure 8. Recruitment Poster/flyer Aimed to Target Control Participants



Have you recently been feeling low?

Contribute to research and have the chance to win **£20 online shopping vouchers**

Clinical Psychology study interested in:

- 1) Childhood experiences
- 2) Relationships
- 3) Personality

For more information about mental health and where to get help, please visit:
www.mind.org.uk
<https://www.samaritans.org/>

Ethics approval:

Please scan the QR code click on the link for more information and to enter the study



Link to ppt information sheet in Qualtrics

Figure 9. Recruitment Poster/flyer Aimed to Target Participants with a History of Suicide Behaviour

Text of study advertisement posted on Gumtree, Reddit, Facebook

Research Opportunity: Childhood Experiences, Relationships and Personality

Have you felt down recently? Researchers at the University of Leeds are seeking adults (18 years or older) to take part in a confidential study aimed at understanding how childhood experiences influence adult relationships and personality

Participation involves, completing an initial 15-minute questionnaire and completing a daily 5-minute questionnaire, for seven consecutive days.

Participants will be entered into a prize draw to win one of five £10 amazon vouchers.

To find out more, or participate, follow this link: <https://leeds.onlinesurveys.ac.uk/childhood-experiences-relationships-and-personality-cop> or, alternatively, contact the research team on childhoodexperiencesstudy@gmail.com

This project has been approved by the Research Ethics Committee of the School of Psychology at the University of Leeds – Reference number; PSYC-270 Date; 18.05.2021

Tweet/Facebook/Instagram post

Researchers are looking for adults to participate in an online study to understand how childhood experiences influence adult relationships and personality. Consisting of a short questionnaire for seven consecutive evenings. To find out more, or participate, follow this link: <https://leeds.onlinesurveys.ac.uk/childhood-experiences-relationships-and-personality-cop>

[insert poster]

University of Leeds Participant Pool email

Research Opportunity: How childhood experiences influence adult relationships and personality

Have you felt down recently? Researchers at the University of Leeds are seeking adults (18 years or older) to take part in a confidential study aimed at understanding how past life events influence how people respond to daily stressors and how childhood experiences influence adult relationships and personality

To take part you must be:

Aged 18 years and over

Fluent in English Language

The study can be completed in your home environment and involves:

Online completion of an initial 15-minute questionnaire

Online completion of a daily 5-minute questionnaire, for **seven consecutive days**.

Participants who complete all 7 days will receive 7 credits and additionally be entered into a prize draw to win one of five £10 online shopping vouchers.

To find out more, or participate, follow this link: <https://leeds.onlinesurveys.ac.uk/childhood-experiences-relationships-and-personality-cop> or, alternatively, contact the research team on childhoodexperiencesstudy@gmail.com

This project has been approved by the Research Ethics Committee of the School of Psychology at the University of Leeds – Reference number; PSYC-270, Date; 18.05.2021

Appendix E – Participant Consent Form

Consent to take part in a research study on childhood experiences and adult relationships and behaviour

I confirm that I have read and understand the information sheet (version 1) shown previously explaining the research project and I have had the opportunity to ask questions about the project. * *Required*

Yes

I understand that my participation is voluntary and that I am free to withdraw without giving any reason, and without there being any negative consequences. I understand that in order to withdraw, I must be able to give the research team my unique participant code. I understand that I will only be able to withdraw my data up to 14 days following participating in this research project. I understand that if I withdraw from the study, my data will be removed from the data set and permanently destroyed, and will not be included in analysis. * *Required*

Yes

I have read the Research Privacy Notice: <https://iris.leeds.ac.uk/privacy-notice/> * *Required*

Yes

I understand that members of the research team will have access to my pseudonymised responses. I understand that my name or other personal data will not be linked with my questionnaire responses and I will not be identified or identifiable in the report or reports that result from the research. I understand that my responses will be kept strictly confidential. * *Required*

Yes

I understand that the data collected from me may be stored and used in relevant future research in an anonymised form. * *Required*

Yes

I agree to take part in the above research project, and understand that by clicking 'yes' in response to these questions, I am giving consent to participation. * *Required*

Yes

**Appendix F - Measures Used for Other Doctor of Clinical Psychology Thesis Which
Shared Data Collection**

Experiences of Close Relationships – Relationship Structures (ECR-RS) (Fraley et al., 2011)

This questionnaire is designed to assess the way in which you mentally represent important people in your life. You'll be asked to answer questions about your parents, your romantic partners, and your friends. Please indicate the extent to which you agree or disagree with each statement by circling a number for each item.

[Responses to each item are gathered using a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree)]

A. Please answer the following questions about your mother or a mother-like figure.

1. It helps to turn to this person in times of need.
2. I usually discuss my problems and concerns with this person.
3. I talk things over with this person.
4. I find it easy to depend on this person.
5. I don't feel comfortable opening up to this person.
6. I prefer not to show this person how I feel deep down.
7. I often worry that this person doesn't really care for me.
8. I'm afraid that this person may abandon me.
9. I worry that this person won't care about me as much as I care about him or her.

B. Please answer the following questions about your father or a father-like figure.

1. It helps to turn to this person in times of need
2. I usually discuss my problems and concerns with this person.
3. I talk things over with this person.
4. I find it easy to depend on this person.
5. I don't feel comfortable opening up to this person.

6. I prefer not to show this person how I feel deep down.
7. I often worry that this person doesn't really care for me.
8. I'm afraid that this person may abandon me.
9. I worry that this person won't care about me as much as I care about him or her.

C. Please answer the following questions about your dating or marital partner. Note: If you are not currently in a dating or marital relationship with someone, answer these questions with respect to a former partner or a relationship that you would like to have with someone.

1. It helps to turn to this person in times of need
2. I usually discuss my problems and concerns with this person.
3. I talk things over with this person.
4. I find it easy to depend on this person.
5. I don't feel comfortable opening up to this person.
6. I prefer not to show this person how I feel deep down.
7. I often worry that this person doesn't really care for me.
8. I'm afraid that this person may abandon me.
9. I worry that this person won't care about me as much as I care about him or her.

D. Please answer the following questions about your best friend:

1. It helps to turn to this person in times of need
2. I usually discuss my problems and concerns with this person.
3. I talk things over with this person.
4. I find it easy to depend on this person.
5. I don't feel comfortable opening up to this person.
6. I prefer not to show this person how I feel deep down.
7. I often worry that this person doesn't really care for me.

8. I'm afraid that this person may abandon me.
9. I worry that this person won't care about me as much as I care about him or her.

Defeat and entrapment scale (O'Connor et al., 2020)

(Responses to each item are gathered using a five-point Likert scale: Not at all/Very slightly, A little, Moderately, Quite a bit, Extremely).

1. To what extent have you felt defeated today?
2. To what extent have you felt trapped today?

Appendix G - Childhood Trauma Questionnaire-Short Form

Child Trauma Questionnaire

These questions ask about some of your experiences growing up as a child and a teenager. Although these questions are of a personal nature, please try to answer as honestly as you can. For each question, circle the number under the response that best describes your experience.

When I was growing up...	Never True	Rarely True	Sometimes True	Often True	Very Often True
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 that I was important or special.	1	2	3	4	5
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 hospital.	1	2	3	4	5
10. There was nothing I wanted to change about my family.	1	2	3	4	5
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
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. I felt that 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
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.	1	2	3	4	5
25. I believe that I was emotionally abused.	1	2	3	4	5
26. There was someone to take me to the doctor if I needed it.	1	2	3	4	5
27. I believed 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 H - Barratt Impulsiveness Scale 11

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	②	③	④		
Rarely/Never	Occasionally	Often	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 I - Momentary Impulsivity Scale

Since the last prompt...

1. I said things without thinking
2. I spent more money than I meant to
3. I have felt impatient
4. I made a “spur of the moment” decision

Appendix J - Perceived Stress Scale – Four Item Version, Adapted for Daily Use

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

For each question choose from the following alternatives:

0. never

1. almost never

2. sometimes

3. fairly often

4. very often

1. In the last day, how often have you felt that you were unable to control the important things in your life?
2. In the last day, how often have you felt confident about your ability to handle personal problems?
3. In the last day, how often have you felt that things were going your way?
4. In the last day, how often have you felt difficulties were piling up so high that you could not overcome them?

**Appendix K – Additional Hierarchical Regressions for Childhood Trauma on
Attentional, Motor, and Non-Planning Impulsivity**

Table K1: *Hierarchical Multiple Regression for Childhood Trauma on Attentional Impulsivity*

Variable	<i>B</i>	95% CI for <i>B</i>		<i>SE B</i>	β	ΔR^2	R^2
		<i>LL</i>	<i>UL</i>				
Step 1						.023**	.023**
Constant	16.056	13.702	18.411	1.198			
Age	-.036	-.069	-.002	.017	-.097		
Gender ^a	1.259	.183	2.334	.547	.106		
Step 2						.086***	.103***
Constant	3.615	-.679	7.909	2.185			
Age	-.058	-.091	-.026	.017	-.159		
Gender ^a	.546	-.503	1.595	.534	.046		
Childhood trauma	8.999	6.354	11.644	1.346	.304		

Note. *N* = 466. Log transformed CTQ data were used. *** *p* < .001, ** *p* < .01.

^a 1 = males, 2 = females. Non-binary participants were not included in this analysis.

B = unstandardised coefficients, β = standardised.

Table K2: *Hierarchical Multiple Regression for Childhood Trauma on Motor Impulsivity*

Variable	<i>B</i>	95% CI for <i>B</i>		<i>SE B</i>	β	ΔR^2	R^2
		<i>LL</i>	<i>UL</i>				
Step 1						.001	.001
Constant	22.401	20.160	24.641	1.140			
Age	.006	-.026	.038	.016	.018		
Gender ^a	.194	-.830	1.217	.521	.017		
Step 2						.007	.008
Constant	18.959	14.695	23.223	2.170			
Age	-8.406	-.033	.032	.017	< .001		
Gender ^a	-.004	-1.045	1.038	.530	< .001		
Childhood trauma	2.489	-.137	5.116	1.336	.089		

Note. *N* = 466. Log transformed CTQ data were used. ^a 1 = males, 2 = females. Non-binary participants were not included in this analysis. *B* = unstandardised coefficients, β = standardised.

Table K3: *Hierarchical Multiple Regression for Childhood Trauma on Non-planning Impulsivity*

Variable	<i>B</i>	95% CI for <i>B</i>		<i>SE B</i>	β	ΔR^2	R^2
		<i>LL</i>	<i>UL</i>				
Step 1						.001	.001
Constant	22.209	19.523	24.896	1.367			
Age	.012	-.027	.050	.019	.028		
Gender ^a	.393	-.834	1.620	.625	.029		
Step 2							
Constant	12.337	7.316	17.359	2.555		.042*	.044*
Age	-.006	-.045	.032	.019	-.015		
Gender ^a	-.172	-1.399	1.055	.624	-.013		
Childhood trauma	7.140	4.047	10.233	1.574	.214		

Note. $N = 466$. Log transformed CTQ data were used. ^a 1 = males, 2 = females. Non-binary participants were not included in this analysis. * $p < .001$. *B* = unstandardised coefficients, β = standardised.