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“Insecure Attachment, Emotion Dysregulation and Reflective Functioning in Adolescent Substance Use Involvement” and “An Initial Meta-Analysis of the Effectiveness of Third Wave Cognitive-Behavioural Therapies in the Treatment of Substance Use Outcomes”

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March 2022
DClinPsychol Declaration of Own Work

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“Insecure Attachment, Emotion Dysregulation and Reflective Functioning in Adolescent Substance Use Involvement”, and “An Initial Meta-Analysis of the Effectiveness of Third Wave Cognitive-Behavioural Therapies in the Treatment of Substance-Use Outcomes”

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Acknowledgments

I would like to start by thanking all the young people who took time to participate in this study, and the third-sector organisations who supported me in advertising and recruiting participants throughout the COVID-19 pandemic. Without your support this thesis would not have been possible. I would like to further thank my academic supervisor, Dr Matthias Schwannauer, for his guidance throughout. To my husband and best friend, Calum. You have been an endless source of love, patience, support (and cups of tea...) throughout my career so far. I’ll forever be grateful.

***

I would like to dedicate this thesis to my primary attachment figures, my parents Yvonne and Brian. Thank you for providing a safe base for me to explore, learn and grow. I hope that I have made you proud.
Research Portfolio Abstract

Problematic substance use presents as a complex and costly challenge to society. Literature in the field of substance use is scarce, particularly within the developmental context of adolescence. Emerging research suggests that insecure attachment predicts substance use. However, the mechanisms underlying this relationship are poorly understood. Traditional treatment approaches for substance misuse predominantly focus on behavioural outcomes such as abstinence and relapse, however, high rates of relapse and patient drop-out have been observed across studies. There is a need for further research in establishing mechanisms underlying substance use and the development of substance use disorders to identify treatment targets and develop effective evidence-based psychological interventions.

The first chapter of this portfolio presents findings from a cross-sectional empirical study investigating the role of insecure attachment (i.e., anxious and avoidant attachment), emotion dysregulation and reflective functioning in adolescent substance use involvement. The primary objective of the study was to test a proposed serial theoretical model: insecure attachment would predict greater emotion dysregulation, this would lead to lower levels of reflective functioning, and subsequently greater levels of substance use involvement. A secondary objective was to explore variations in effects across relationship domains (i.e., maternal-figure, paternal-figure, romantic relationship, and friendship). Emotion dysregulation and reflective functioning were found to mediate the effects of insecure attachment and substance use involvement for both anxious and avoidant attachment styles. This effect varied across relationship domains, with magnitude of effect strongest for friendship anxious attachment, closely followed by romantic anxious attachment. Weaker effects were observed for maternal anxious attachment and for both anxious and avoidant paternal attachment. Chapter one concluded that emotion dysregulation and reflective functioning may be important mechanisms in the relationship between insecure attachment and substance use outcomes, and that the strength of the influence of these variables vary across relationship domains during this developmental period.
The second chapter of this portfolio reports findings from an initial meta-analysis reviewing the evidence of third wave psychological therapies in the treatment of substance use outcomes (i.e., severity, frequency, and cravings). Systematic searches of databases yielded 31 studies that met criteria for inclusion in the review, with 25 studies included for meta-analysis. Results highlighted that third wave interventions were effective in reducing substance use cravings relative to control groups. No significant effects were observed for frequency or severity outcomes relative to controls. Post-hoc analysis for the effectiveness of third wave interventions on negative affect was non-significant. Poor methodological quality and high risk of publication bias across studies limited the ability to draw firm conclusions. Methodological issues are highlighted and future recommendations considering such shortcomings are provided.

Taken together, the findings from this portfolio contribute to the current evidence-base for potential transdiagnostic mechanisms involved in the development and maintenance of substance use, and the use of third wave interventions in treating substance use outcomes.
Lay Summary

The chances of developing a substance use disorder is highest for young people, making it an important time for helping those who have problems with substance misuse. Factors involved in the development and maintenance of substance use disorders are not well understood. It is thought that difficult early child-caregiver relationship experiences (known as attachment) can lead to people having trouble managing difficult feelings. This may lead to people using substances (e.g., smoking, drugs, alcohol) to help them cope better. Trouble managing difficult feelings (known as emotion dysregulation) and difficulty understanding our own and other’s thoughts and feelings (known as reflective functioning), may influence the relationship between attachment and substance use.

Chapter one presents a study exploring the role of emotion dysregulation and reflective functioning in influencing attachment and substance use involvement in young people. The study explored these factors across different types of relationships (i.e., mother-figure, father-figure, romantic partner, best friend). Young people who may have tried smoking, drugs or alcohol took part in an online survey. Results from the survey found that emotion dysregulation and reflective functioning influence the relationship between attachment and substance use involvement. This effect was found to be strongest for anxious attachment to romantic partners and best friends compared to parental figures, suggesting that the influence of attachment and the explored factors on substance use involvement may vary across different types of relationships. Understanding factors that influence substance use outcomes could help identify targets for treatment.

Chapter two looks at how well a group of psychological therapies, called “third wave” acceptance and mindfulness-based therapies, work in reducing frequency and severity of substance use and substance use cravings. Findings from this project found that third wave therapies may be useful in the treatment of substance use cravings. Results did not find evidence to suggest they are better at improving substance use frequency or severity compared to other treatments commonly used for substance use. However, more work is needed in improving the quality of the studies.
evaluating these treatments before we can know for sure. The findings from chapter one and two contribute to research exploring factors influencing substance use and possible treatments.
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Chapter One

Insecure Attachment, Emotion Dysregulation and Reflective Functioning in Adolescent Substance Use Involvement
Insecure Attachment, Emotion Dysregulation and Reflective Functioning in Adolescent Substance Use Involvement

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Abstract

Background
Adolescence is a critical stage of development where the risk of developing a substance use disorder is higher than any other period. Emerging research has focused on attachment theory in understanding substance use disorders, with research suggesting that insecure attachment predicts substance use. However, despite extensive theoretical considerations, mechanisms underlying insecure attachment and substance use outcomes are poorly understood. The present study aimed to explore attachment-based processes, namely emotion dysregulation and reflective functioning, as potential mediators in the relationship between insecure attachment and substance use involvement.

Methods
Using a quantitative, cross-sectional design 150 adolescents (aged 16-24) completed a battery of online self-report questionnaires assessing insecure attachment, emotion dysregulation, reflective functioning, negative affect, and substance use involvement. A serial mediation model, whereby emotion dysregulation and reflective functioning mediate the relationship between insecure attachment (i.e., anxious and avoidant attachment) and substance use involvement, was tested across different relationship domains (i.e., maternal-figure, paternal-figure, romantic relationship and friendship).

Results
Results from the mediation analysis revealed significant indirect effects of emotion dysregulation and reflective functioning on insecure attachment and substance use involvement across anxious and avoidant attachment for each relationship domain. The effect varied across relationships: magnitude of indirect effect was strongest for friendship anxious attachment, closely followed by romantic anxious attachment, and weakest for parental anxious attachment. For avoidant attachment the effect was strongest for maternal avoidant attachment, and weakest for parental
avoidant attachment. A significant, direct effect was observed for romantic avoidant attachment alone.

**Conclusion**

Results contribute to the current evidence-base for the influence of insecure attachment on substance use outcomes, and potential mechanisms that may underlie this relationship. Variation in magnitude of effect across relationship domains highlights the need for future research to study these mechanisms across varying attachment figures. Findings suggest that interventions targeting attachment-based processes such as emotion dysregulation and reflective functioning may be useful in treating substance use involvement in adolescents.

*Key words: Insecure Attachment, Emotion Dysregulation, Reflective Functioning, Adolescent* 

*Substance Use*

Word count (excl. tables and figures): 10,288
Introduction

Adolescence is a sensitive developmental period often associated with heightened sensation seeking and risk-taking (Jensen et al., 2017; Steinberg, 2008). It is unsurprising that substance use is typically initiated during this stage (Johnston et al., 2019). Adolescent substance use is heterogeneous, ranging from experimental use to heavier substance dependency (Gray & Squeglia, 2018). Most adolescents who engage in experimental substance use do not develop substance use disorders (SUDs) or long-term problems (Chaplin et al., 2018), however, experimentation places adolescents at an elevated risk for developing SUDs (Jackson & Sartor, 2016; Jordan & Andersen, 2017). Adolescents who initiate substance use prior to the age of 17 are at greater risk of psychiatric co-morbidity and psychosocial impairments in peer and family relationships, leisure and recreation, and in work adjustment (Poudel & Gautam, 2017). Moreover, substance use is associated with poorer mental and physical health, delinquency, violence, and engagement in high-risk behaviours such as unsafe driving and unprotected sex (Brownlie et al., 2019; Chawla & Sarkar, 2019; Feinstein et al., 2012; White et al., 2020). Given the heightened risk for the development of SUDs, and the adverse outcomes associated with adolescent substance use, adolescence is a critical period for substance use prevention (LaSpada et al., 2020). Despite this, addiction research within this developmental context is scarce.

Several risk factors have been established in relation to adolescent substance use that can be influenced by developmental-related and sociodemographic differences (Cleveland et al., 2008). Risk factors can be largely divided into social, familial, and individual factors. Social factors may include bullying and deviant peer relationships; these factors are often simultaneously present with familial risk factors such as childhood maltreatment (i.e., neglect, physical, sexual, and emotional abuse; Whitesell et al., 2013) and parental substance misuse (Kilpatrick et al., 2000), creating a complex system of risk factors that predict adolescent substance use (Whitesell et al., 2013). Individual risk factors such as early behavioural difficulties (Cleveland et al., 2008) and having a
diagnosis of a childhood psychiatric disorder (Groenman et al., 2017) place adolescents at a substantial risk of developing SUDs.

Including all risk factors identified in adolescent substance use in a single study has been identified by scholars as a formidable task, it has therefore been recommended that theory-driven models are used as a means of directly studying adolescent risk behaviour (Bursick Jr & Grasmik, 1996; Cleveland et al., 2008). Recent conceptualizations of addictions posit that SUDs can be understood in the context of attachment trauma and should be considered as developmental disorders (McCrory & Mayes, 2015; Padykula & Conklin, 2010). Given research establishing a link between attachment insecurity and risk factors associated with adolescent substance use (Wambua et al., 2018), viewing substance use through the lens of attachment may contribute to understanding empirical findings that suggest that adolescents who present with early behaviour, emotion regulation and mental health difficulties and that have difficulties in their interpersonal relationships are at increased risk of misusing substances. The following study therefore seeks to investigate adolescent substance use within the developmental context of attachment. Specifically, this study aims to expand on affect regulatory theories of substance use through investigating potential attachment-based processes that may act as mechanisms in the relationship between attachment and substance use during this developmental period.

**Attachment Theory**

Attachment theory provides a conceptual framework for understanding the influence of early child-caregiver experiences on interpersonal functioning, psychopathology, and illness behaviour (Hunter & Maunder, 2001; Mikulincer & Shaver, 2012) that can be applied to the development and maintenance of SUDs. Attachment can be defined as an innate biological motivational system through which emotional bonds are established between key attachment figures as a means of seeking proximity, protection, and care (Bowlby, 1969). This attachment behavioural system is thought to be a product of evolution that serves regulatory functions such as protection from threat and alleviation of emotional distress across the lifespan (Bowlby, 1969;
Mikulincer & Shaver, 2007). According to attachment theory this system is developed in early childhood; infants are biologically predisposed to seek proximity and close relationships with others, with early child-caregiver interactions contributing to internalized working models, shaping how the individual views themselves and others (Bowlby, 1969). These models influence patterns of behaviour and feelings towards close relationships later in life through processes such as emotion regulation and information processing (Zimmermann, 1999). The individual differences arising from varying early attachment experiences, known as attachment styles, are predictive of infant developmental outcomes (Cassidy & Shaver, 2016).

Early theories of attachment regard attachment styles as categorical in nature, however, recent conceptualizations and empirical evidence suggest that attachment should be viewed as a dimensional construct (Fraley et al., 2015). Amongst other developments in this area (e.g., Mikulincer & Shaver, 2007), Bartholomew (1990) proposed an attachment typology consisting of four types of attachment: secure, anxious-preoccupied, dismissive-avoidant and fearful-avoidant, with the latter dimensions classified as insecure attachment. Secure attachment, developed through positive early attachment experiences, is considered a protective buffer for adverse psychological outcomes (Sroufe et al., 1999), characterized by more positive views of the self and others, increased resilience to perceived stress and less reactive responding (Karreman & Vingerhoets, 2012; Tops et al., 2014). Insecure attachment styles (i.e., anxious and avoidant attachment) are secondary attachment strategies for affect regulation that are developed through adverse early attachment experiences and are associated with greater symptoms of psychopathology (e.g., Alhusen et al., 2013; Pascuzzo et al., 2015; Venta & Abate, 2021).

Prevailing models of adult attachment are rooted in the assumption that attachment styles are trait-like constructs that remain influential and stable throughout relationship experiences across the lifespan (Bowlby, 1969; Chen et al., 2019). However, emerging research suggests that attachment styles can also vary and temporarily change depending on situational and contextual factors (Bosmans et al., 2014; Gillath & Shaver, 2007). Defined as state attachment, state anxious
and avoidant attachment arising through varying life events are thought to over-ride trait attachment dispositions in stressful interpersonal contexts (Bosmans et al., 2014; Gillath & Shaver, 2007). Individuals scoring highly in activated state anxious attachment typically display hyperactivating strategies in response to distress, involving hypersensitive emotional and proximity-seeking responses, whereas those scoring highly on state avoidant attachment display reliance on deactivating strategies such as down-regulation of emotional responses, distancing and avoiding closeness with others (Mikulincer & Shaver, 2007).

**Attachment and Substance Use**

Emerging literature has supported the idea of a developmental pathway between insecure attachment styles and problematic substance use (e.g., Schindler & Bröning, 2015). Many substance users have difficulties in their intrapersonal and interpersonal relationships; it has been suggested that this may predispose them to using substances (Fairbairn & Cranford, 2016; Fairbairn & Sayette, 2014). An inverse pathway for insecure attachment and substance use has been proposed: whilst attachment style may influence substance use, substance use may further impact attachment security (Schindler, 2019). Findings from recent reviews support the link between insecure attachment and substance use (Fairbairn et al., 2018; Schindler, 2019). However, literature has largely focused on adult populations, and has yielded inconsistent results (e.g., Borhani, 2013; Caspers et al., 2006; Thorberg & Lyvers, 2010).

Discrepancies in findings have similarly been observed in studies exploring adolescent substance use (e.g., Danielsson et al., 2011; Letcher & Slesnick, 2013; Liese et al., 2020; Olsson et al., 2013). In a study exploring risk behaviours in adolescents between 15-18 years old, Letcher & Slesnick (2013) found that for romantic attachments higher levels of anxious attachment were related to more frequent substance use. No significant relationship was found for avoidant attachment and substance use. A further study found that higher levels of anxious attachment, but not avoidant attachment, were significantly associated with alcohol use and cannabis use (Liese et al., 2020). A similar finding was highlighted by Kassel et al. (2007), who found that high scores on
anxious attachment were associated with more frequent cigarette, cannabis, and alcohol use in young adults. However, in a sample of 839 adolescents, Olsson et al. (2013) found that alcohol use was positively associated with secure attachments, whereas insecure attachment was associated with higher levels of tobacco and cannabis use. Tobacco use was only associated with anxious attachment, whereas both anxious and avoidant attachment were associated with cannabis use. Contrary to this, Danielsson et al. (2010) did not find significant differences in substance use between adolescents with secure and insecure attachment for heavy episodic drinking.

The inconsistency in findings highlights the complexity of substance use in adolescence and methodological challenges in this field. Discrepancy between findings may be explained by variation in measurement techniques and other methodological differences (Becoña Iglesias et al., 2014; Serra et al., 2019). Operationalisation and measurement of attachment and substance use variables differ across studies which may introduce methodological bias (Danielsson et al., 2011; Jones et al., 2015; Letcher & Slesnick, 2013; Liese et al., 2020; Nakhoul et al., 2020; Olsson et al., 2013). For example, some studies report insecure attachment as a whole construct versus others that distinguish between attachment dimensions (i.e., anxious and avoidant attachment). Further, studies do not differentiate between state and trait attachment. Differences in operationalization and measurement may produce mixed findings: attachment interviews assess attachment representations (operationalised as a state of mind), whereas self-reported measures assess attachment styles (operationalised as subjective experiences of close relationships) (Schindler, 2019).

Moreover, variation in relationship domains and substance measured make it difficult to compare findings and could partly explain differences observed across study outcomes. Attachment security may fluctuate across different relationships (Crittenden & Landini, 2011). Several studies have focused on attachment to a single relational figure, with focus largely on parental attachment (e.g., Danielsson et al., 2010; Jones et al., 2015) or romantic attachment (e.g., Letcher & Slesnick, 2013), neglecting friendships. During adolescence, individuals become less reliant on parental
attachments and shift towards friendships and romantic relationships (Allen et al., 2007; Venta et al., 2014). Further studies have assessed attachment security in adolescence without differentiating types of relationship (e.g., Liese et al., 2020; Nakhoul et al., 2020; Olsson et al., 2013).

With regards to substances, many studies explored different types of substances collectively (e.g., Borhani, 2013; Letcher & Slesnick, 2013) making it difficult to compare findings and draw firm conclusions. Those who have observed discrepancies in findings between substances used in adult populations have postulated that different substances serve different attachment-related functions (Schindler et al., 2009). Conversely, a recent longitudinal meta-analysis of 34 studies (n = 56,721) exploring early attachment and later substance use found a small, but significant, effect for insecure attachment and increased substance use; this result was found regardless of types of substances used or relationship domains for both anxious and avoidant attachment subtypes (Fairbairn et al., 2018).

**Emotion Regulation and Substance Use**

Attachment theory is widely considered a theory of self-regulation, with processes such as emotion regulation being developed through early attachment experiences (Padykula & Conklin, 2010; Pascuzzo et al., 2015). Though debate surrounds the definition and operationalisation (Cole et al., 2004), *emotion regulation* is widely regarded as “strategic control of one or more components of emotional responding” (Gross, 2014). Insecure avoidant and anxious attachment are associated with greater difficulties in emotion regulation (Morel & Papouchis, 2015; Pallini et al., 2018). Emotion regulation has been implicated as a transdiagnostic mechanism in the etiology of several psychiatric disorders (Aldao et al., 2010; Ibraheim et al., 2017). Though little is known about the mechanisms underpinning insecure attachment and substance use, emotion regulation has garnered interest as a potential mechanism in the development and maintenance of SUDs (Siegel, 2015; Wills et al., 2017).

Several theories of addiction argue that difficulties in emotion regulation are central in the development and maintenance of SUDs (e.g., Baker et al., 2004; Khantzian, 1997; Padykula & Conklin, 2010). The self-medication hypothesis (SMH; Khantzian, 2003; Khantzian, 1997) posits that
inability to cope with negative affect is the primary motivator for substance use, with substance use acting as a means of compensating for lack of internal ability to regulate emotions and self-soothe (Schindler, 2019). Theories such as the SMH are controversial as evidence does not consistently demonstrate that negative affect predicts substance use (Hall & Queener, 2011; McCarthy et al., 2010). However, a study by Johnson & McLeish (2016) found that the relationship between negative affect and cigarette cessation was mediated by difficulties with emotion regulation; the inability to effectively manage distressing emotions may be influenced indirectly via emotion regulation processes. As the operationalisation and definition of emotion regulation has varied, it is difficult to draw firm conclusions (Tull & Aldao, 2015).

Although no agreed definition exists difficulties in emotion regulation, otherwise known as emotion dysregulation, refers to the inability to employ emotion regulation strategies in managing negative affect. Emotion dysregulation is denoted by “decreased emotional awareness, inadequate emotional reactivity, intense experience and expression of emotions, emotional rigidity, and difficulty with cognitive reappraisal” (D’Agostino et al., 2017). Literature exploring emotion dysregulation in substance use is limited (Thorberg & Lyvers, 2010); emerging evidence suggests that emotion dysregulation is associated with substance use outcomes (Estévez et al., 2017; Goldstein et al., 2018; Schreiber et al., 2012). In a study of 427 adolescents, Estévez et al. (2017) found that emotion dysregulation was predictive of substance misuse, whereas poor attachment was not found to be a predictor. Goldstein et al.’s (2018) study of adolescents between the ages of 18-24 found that emotion dysregulation mediated the relationship between anxious attachment and alcohol use. This effect, however, was not observed for avoidant attachments. Similarly, a study by Liese et al. (2020) exploring the role of emotion dysregulation in substance use (cannabis, alcohol) found that anxious attachment and emotion dysregulation was associated with substance use, but not avoidant attachment. Emotion dysregulation was found to mediate the relationship between both anxious and avoidant attachment and self-reported substance use.
A recent meta-analysis of 95 studies (n = 156,025) supported these findings, Weiss et al. (2022) found significant large effects for the relationship between emotion dysregulation and substances use across a variety of substances. Emotion dysregulation mediated the relationship between both anxious and avoidant attachment and alcohol and cannabis use. Despite preliminary evidence that emotion dysregulation mediates the relationship between insecure attachment and substance use, it has been argued that theories of attachment and self-regulation do not fully account for the complex processes underpinning SUDs (Lembke, 2012). The pathways to SUDs are unarguably complex with the potential for several factors to be involved in the development and maintenance (Kassel et al., 2005). Emerging research suggests that another attachment-based process, reflective functioning, may be implicated in the etiology of SUDs (e.g., Handeland et al., 2019; Imperatori et al., 2020; Teles, 2019).

Reflective Functioning and Substance Use

Mentalization theory, an extension of attachment theory, proposes that difficulties in interpersonal relationships develop from insecure attachment to a caregiver and deficits in reflective functioning (Cooper et al., 2021). Reflective functioning, an operationalisation of mentalization, may therefore be influential in the development and maintenance of SUDs. Reflective functioning refers to a complex form of self-regulation involved in understanding and attribution of meaning to one's own internal thoughts, feelings and behaviour, and the thoughts, feelings, and intentions of others (Fonagy et al., 2016; Savov & Atanassov, 2013). Like emotion regulation, reflective functioning is thought to develop within the context of secure attachments (Fonagy et al., 2016, 2018; Savov & Atanassov, 2013), with acquisition of reflective functioning capacity dependent on opportunities to observe and learn how to mentalize from a primary caregiver (Ghossain, 2014). Activation of the attachment behavioural system is further thought to inhibit capacity for reflective functioning (Fonagy et al., 2018; Jurist & Meehan, 2009). Consistent with this, evidence suggests that individuals with higher levels of reflective functioning are more likely to have secure attachment styles (Ensink
et al., 2014; Fonagy & Bateman, 2016), and individuals with insecure attachment are more likely to display deficits in reflective functioning (Raikes & Thompson, 2006).

Reflective functioning has been associated with emotion regulation, with reflective functioning theorized to play a modulating role in this relationship (Schwarzer et al., 2021). Hill (2015) argues that reflective functioning is a secondary affect-regulating system, dependent on emotion regulation, the primary system. This conceptualization is consistent with developmental literature indicating that the capacity for affect regulation precedes the capacity for mentalization (Jurist & Meehan, 2009). Available research has highlighted that emotion dysregulation and high levels of distress can inhibit capacity for reflective functioning (Arntz et al., 2009; Hill, 2015). Given this, it is unsurprising that emotion dysregulation and deficits in reflective functioning have been implicated in the etiology of different psychopathologies, such as borderline personality disorder (BPD; Euler et al., 2021), eating disorders (Monell et al., 2018; Simonsen et al., 2020) and depression (Belvederi Murri et al., 2017; Marganska et al., 2013). Given the high rates of co-morbidity with SUDs in BPD (Trull et al., 2018), and other psychopathology (e.g., Bahji et al., 2019; Hunt et al., 2018, 2020), it is possible that low capacity for reflective functioning is associated with SUDs.

From a theoretical perspective, intense emotional experiences arising from attachment insecurity to an attachment figure, and subsequent emotion dysregulation may inhibit reflective functioning, leading to substance use as a means of self-medication to regulate negative affect (Philips et al., 2012). Substance misuse may further inversely impair reflective functioning, leading to deficits in the ability to cope with negative affect and conflicts within interpersonal relationships (Allen et al., 2008). Preliminary evidence suggests that SUDs are indeed associated with deficits in reflective functioning, however, literature in this area is scarce (Handeland et al., 2019; Imperatori et al., 2020; Teles, 2019). A recent cross-sectional study of 271 adolescents with problematic alcohol use found that alcohol use severity was negatively associated with reflective functioning (Imperatori et al., 2020), suggesting that deficits in reflective functioning led to increased substance use severity. Findings are consistent with a recent study exploring emotion dysregulation and reflective
functioning in food addiction and risk of alcohol abuse in adults (Innamorati et al., 2016). Innamorati et al. (2016) found that emotion dysregulation and deficits in reflective functioning were significantly associated with greater symptomatology for food addiction and elated alcohol abuse risk. To date, only one study has explored the influence of reflective functioning in substance use (Teles, 2019). In an exploratory analysis, Teles (2019) found that adults who scored lower on self-reported reflective functioning displayed higher levels of attachment insecurity, greater emotional dysregulation, and increased substance use consequences. Although in its infancy, such findings provide initial support for the potential role of reflective functioning on substance use outcomes.

**Rationale**

The etiology of substance use is unarguably complex with several risk factors involved in the development of problematic SUDs (e.g., child maltreatment, bullying, parental substance use). A common factor identified across risk factors is attachment. Recent conceptualizations of addictions propose that SUDs are a form of developmental attachment trauma. Current affect regulatory theories of addictions such as the SMH posit that substance use is a means of coping with negative affect, however, such accounts have been criticized for being oversimplistic. As a theory of affect regulation, viewing substance use from the lens of attachment could provide a more comprehensive and thorough account for the etiology of SUDs. Despite extensive theoretical considerations and emerging empirical support for the relationship between attachment and substance use, the underlying mechanisms remain poorly understood (Fairbairn et al., 2018; Liese et al., 2020).

More recently, literature has proposed a link between attachment, emotion dysregulation and reflective functioning in relation to the formation and persistence of various psychopathology (Marszał & Jańczak, 2021). However, empirical research exploring this relationship is limited (Tanzili et al., 2021). The processes of emotion regulation and reflective functioning are both thought to develop within the context of secure attachment through modelling of emotion regulation and reflective functioning abilities in early child-caregiver relationships and are activated via the attachment system (Marszał & Jańczak, 2021). Insecure attachment styles through adverse child-
caregiver experiences are associated with difficulties with emotion regulation and deficits in mentalization (Bizzi et al., 2019; Nazzaro et al., 2017). Insecure attachment styles, when activated in the context of interpersonal conflict, may affect ability to effectively regulate emotions and inhibit capacity to mentalize to cope with distress. Relationships between attachment insecurity, emotion dysregulation and deficits in reflective functioning have been observed in research exploring other forms of psychology (e.g., BPD; Trull et al., 2018). Given high levels of comorbidity between other psychopathology and SUDs, it may therefore be that difficulties with substance use are not only associated with emotion dysregulation, but also via deficits in reflective functioning. Theoretically, it is possible that for individuals with insecure attachment to an attachment figure, when faced with associated negative affect, high levels of emotion dysregulation may inhibit the ability to mentalize. This could then lead to coping and self-regulating emotions through substance use as no other effective attachment-based strategies are available. However, to date no known empirical studies have explored the relationship between insecure attachment, emotion dysregulation and reflective functioning in substance use.

The aim of the current study was to contribute to existing research on the relationship between attachment insecurity and substance use outcomes in adolescents and to expand on existing affect regulatory theories of addictions through testing a theoretical model of the role of insecure attachment, emotion dysregulation and reflective functioning in adolescent substance use involvement (SUI). Recent conceptualizations and evidence support attachment insecurity as a two-dimensional, dynamic state-like variable, as such the current study operationalized attachment insecurity (i.e., state anxious attachment and state avoidant attachment) as a subjective, self-reported experiences of close relationships that can be affected by contextual and situational factors. Given the contextual, state-like nature of insecure attachment, emotion dysregulation and reflective functioning, self-report measures were employed to explore the study variables. Based on previous literature it was hypothesized that activated state attachment insecurity, referred to throughout as anxious and avoidant attachment, would predict SUI via emotion dysregulation and
reflective functioning. A serial mediation model was proposed: that state attachment insecurity would increase emotion dysregulation, which in turn would lead to reductions in reflective functioning abilities, consequently leading to an increase in SUI. The hypothesized conceptual diagram of attachment insecurity and SUI are outlined in Figure 1.1 and 1.2. Given the dynamic changes in relationships during adolescence, and discrepancies in findings across relationship domains, the present study sought to explore these processes for maternal and paternal-like figures, romantic relationships and for friendship.

**Figure 1.1.**

*Hypothesised Conceptual Diagram of Avoidant Attachment and SUI.*

[Diagram of Avoidant Attachment and SUI]

**Figure 1.2.**

*Hypothesised Conceptual Diagram of Anxious Attachment and SUI.*

[Diagram of Anxious Attachment and SUI]
Methods

Design

The present study was a non-experimental, quantitative, cross-sectional design. Participants completed anonymous web-based questionnaires measuring insecure attachment (i.e., anxiety and avoidance), emotion dysregulation, reflective functioning, SUI, and negative affect (i.e., depression and anxiety). Full ethical approval was obtained from the University of Edinburgh’s Research Ethics Panel, an NHS Research Ethics Committee (ref: 21/NW/0134; Appendix C), and Research and Development (R&D) committees within NHS Lanarkshire (ref: NRS21/291670) and NHS Lothian (ref. 2021/0078).

Participants

Participants were adolescents between 16-24 years old; 293 participants accessed and responded to the online survey. Of those, 150 completed all questionnaires included within the survey. To maximise sample size and recruit a diverse range of participants, the study aimed to recruit online from the general population and from a help-seeking population within NHS/multi-agency services. For recruitment in the general population, to be included participants had to be 16-24 years old, they may or may not have tried or used substances.

For NHS/multi-agency recruitment, participants were eligible if they met the following criteria:

- Aged between 12 and 24.
- Recreationally used tobacco/nicotine/vapes, alcohol, drugs, or other new psychoactive substances.
- Receiving support from NHS mental health/addiction services or multi-agency substance use services.
- Staff they are working with considered them to have the capacity to understand the nature of the research.
Participants were deemed unsuitable for participation if they met the following exclusion criteria:

- Unwilling or unable to provide informed consent.
- Were non-English speakers.
- For participants under 16 within NHS/multi-agency services, participants were unable to participate if a parent or caregiver ‘opted-out’.

**Recruitment**

**General Population**

Participants were recruited through convenience sampling between March and December 2021. For online recruitment, the study was advertised via social media websites such as Facebook, Linked In and Twitter. Several UK-wide third sector organisations supporting adolescents and adults with substance use (e.g., We Are With You, Turning Point Scotland, Caladh Trust and Drugs, Alcohol and Psychotherapies Limited) advertised the study through social media pages.

**NHS Recruitment**

A targeted recruitment strategy was employed for help-seeking participants via adolescent substance use services, child and adolescent mental health services, adult mental health and addiction services and associated multi-agency services within NHS Lanarkshire and NHS Lothian. Clinicians, referred to as key workers, were asked to identify eligible participants from their caseloads and provide study participation packs including a participant information sheet, consent form, a poster with the link to the online survey and resource sheet. For participants under the age of 16, information sheets were to be provided to caregivers by their key worker including a caregiver ‘opt-out’ form to be returned to the service with the young person’s consent form. Due to restrictions and pressures relating to the COVID-19 pandemic, no participants were recruited directly from NHS services.
Procedure

Participants accessed the study via secure survey platform Qualtrics. All responses were anonymous. Participants were invited to read through an online information sheet and provide informed consent electronically (Appendix D). Contact details for the primary researcher were included to allow opportunity to request further information regarding the study. Participants provided demographic information and completed a battery of six questionnaires relating to insecure attachment, emotion dysregulation, reflective functioning, SUI, and psychological distress (referred to throughout as negative affect, measured by anxiety and depression). Participants were free to withdraw from the survey at any point and were provided with resources on where to seek support for substance use alongside mental health helplines. Participants were granted opportunity to enter an optional raffle for one of four £25 Teen Choice gift vouchers.

Measures

**Demographics.** Demographic information was collected as part of the online survey. Participants reported their age, gender identity, and ethnicity.

**Predictor Variables**

**Insecure Attachment.** Insecure attachment was assessed using the Experiences in Close Relationships – Relationship Structures (ECR-RS; Fraley et al., 2011). The ECR-RS is a 36-item self-report measure assessing insecure attachment across four relationship domains (mother-figure, father-figure, romantic partner, and best friend). Each relationship domain consists of nine items anchored on a 7-point Likert scale. The scale ranges from one (strongly disagree) to seven (strongly agree). The ECR-RS has a neutral midpoint (four = agree/disagree). Items one to six assess attachment-related anxiety; items seven to nine assess attachment-related avoidance. The ECR-RS is comprised of statements such as “I don’t feel comfortable opening up to this person” and “I often worry that this person doesn’t really care for me”. The ECR-RS has adequate psychometric properties in adolescent populations with good validity and high internal reliability estimates across
domains \((\alpha = .80; \text{Donbaek & Elklit, 2014; Pooravari & Ashtiani, 2017})\). The current study used the separate scores for avoidant and anxious attachment for each relationship domain. Higher scores on the ECR-RS indicated higher levels of state anxious or avoidant attachment.

**Emotion Dysregulation.** Emotion dysregulation was measured using the 36-item Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). The DERS yields a total score in addition to six subscale scores: nonacceptance of emotional responses, difficulty engaging in goal-directed behaviour, impulse control difficulties, lack of emotional awareness, limited access to emotion regulation strategies and lack of emotional clarity. Items are measured on a 5-point Likert scale ranging from one \((\text{almost never, 0-10\%})\) to five \((\text{almost always, 91-100\%})\). Items are composed of statements such as “I experience my emotions as overwhelming and out of control” and “When I’m upset, I feel like I am weak”. The DERS has demonstrated good psychometric properties in adolescent populations across cultures (Gómez-Simón et al., 2014; Neumann et al., 2010.; Weinberg & Klonsky, 2004). The DERS has high internal consistency \((\alpha = .93)\) and good test-retest reliability \((\alpha = .88)\) in adolescent samples (Charak et al., 2019). The current study used the DERS total score to measure emotion dysregulation, higher scores indicated greater emotion dysregulation.

**Reflective Functioning.** Reflective functioning was assessed using the 46-item Reflective Functioning Questionnaire for Youth (RFQ-Y; Sharp et al., 2009). Items consist of statements such as “I worry a lot about what people are thinking and feeling” and “I pay attention to my feelings”. Items are rated on a 6-point Likert scale ranging from one \((\text{strongly disagree})\) to six \((\text{strongly agree})\). The RFQ-Y has adequate convergent validity (Duval et al., 2018) and internal consistency \((\alpha = .71; \text{Ha et al., 2013})\) for adolescents. The current study used the total score of the RFQ-Y, lower scores suggested greater impairment in reflective functioning.

**Dependent Variable**

**Substance Use Involvement.** SUI was assessed using the Adolescent Alcohol and Drug Involvement Scale (AADIS; Moberg, 2003). The AADIS consists of two self-reported subscales: Part A is a 12-item scale assessing history of drug use, Part B is a 14-item scale that assesses problems
relating to alcohol and drug use on individual functioning. Part B of the AADIS was used to assess SUI. The AADIS contains items such as “What time of day do you use alcohol or drugs?” and “What effects have you had from drinking or drugs?” Responses are rated on scales ranging from five to eight. A score of 37 or above indicates significant difficulties with substance use. In the following study, a total score for SUI was computed for each participant; higher scores on the AADIS suggested greater SUI. The AADIS has demonstrated strong internal consistency ($\alpha = .94$) and adequate predictive validity in adolescents (Winters et al., 2001).

**Covariates**

Evidence suggests that negative affect is associated with insecure attachment and substance use (Cooper et al., 1998; Kassel et al., 2007). Measures of anxiety and depression were included as potential covariates.

**Depression.** Depression was measured using the Patient Health Questionnaire – 9-Item (PHQ-9; Kroenke et al., 2001). Participants reported depressive symptoms over the past two weeks. Sample items include “Feeling down, depressed, or hopeless” and “Feeling tired or having little energy”. Items are rated between zero (not at all) to three (nearly every day). The current study computed the overall score for the nine items. Higher scores on the PHQ-9 suggested greater symptom severity. The PHQ-9 has adequate internal consistency and construct validity in adolescents (Andreas & Brunborg, 2017; Anum et al., 2019).

**Anxiety.** Anxiety was measured using the Generalized Anxiety Disorder – 7-Item (GAD-7; Spitzer et al., 2006). The GAD-7 includes items such as “Not being able to stop or control worrying” and “Feeling afraid as if something awful might happen”. Responses are rated on a 4-point Likert scale ranging from zero (not at all) to three (nearly always). The GAD-7 is a reliable and valid measure of anxiety in adolescent populations (Tiirikainen et al., 2019), and has demonstrated good internal consistency ($\alpha = .69$; Anum et al., 2019). The present study computed a total score for each participant. Higher scores on the GAD-7 indicated greater anxiety severity.
Statistical Analysis

All statistical analyses were conducted using the IBM Statistical Package for Social Sciences (SPSS, Version 27). Prior to analyses, data was cleaned and analysed to ensure statistical assumptions were met. Data was screened visually for missing values, this indicated that data was missing completely at random (MCAR), corroborated using Little’s MCAR test ($X^2 = 500.793$, $df = 469$, $p = .150$). The Expectation Maximisation (EM) algorithm was used to impute missing data (Kwak & Kim, 2017). Normality was assessed using histograms and the Kolmogorov-Smirnov test. Results indicated that the data was not normally distributed. Outliers were assessed visually using scatterplots and histograms and Winsorized (Kwak & Kim, 2017).

Correlation Analysis

Correlational analysis was conducted to explore the associations between key variables. As data did not meet the assumption of normality, and use of Pearson’s $r$ on non-normally distributed data can lead to inflation of type 1 errors and reduction in power (Bishara & Hittner, 2012), non-parametric correlations were conducted using Spearman’s rho. Cohen’s $d$ benchmark estimates were employed as an estimate of strength of effect: (i.e., small = 0.10, moderate = 0.30 and strong = 0.50; Cohen, 1988).

Mediation Analysis

Mediation analysis was used to test the serial mediation model for insecure avoidant and anxious attachment, emotion dysregulation, reflective functioning, and SUI. All models were tested using Hayes (2017) PROCESS Macro for SPSS Version 27. Based on previous literature and empirical research, serial mediation models were proposed a priori using Model 6. Model 6 was run with bias-corrected, 95% bootstrapped confidence intervals (BCI) for indirect effects, using 10,000 bootstrapped samples as recommended by Hayes (2013). The statistical models for mediation for avoidant and anxious attachment are displayed in Figure 2.1. and Figure 2.2. The statistical models for avoidant and anxious attachment were run for maternal-like figure, paternal-like figure, romantic relationship, and relationship to a best friend (friendship).
Figure 2.1.

*Statistical Model of Mediation for Avoidant Attachment.*

Note: Indirect effect of X on Y through M₁ only = $a_1 b_1$; indirect effect of X on Y through M₁ and M₂ in serial = $a_1 d_{21} b_2$; total effect of X on Y = $c$; direct effect of X on Y = $c'$. 
Figure 2.2.

Statistical Model of Mediation for Anxious Attachment.

Note: Indirect effect of X on Y through M₁ only = a₁ b₁; indirect effect of X on Y through M₁ and M₂ in serial = a₁ d₂₁ b₂; total effect of X on Y = c; direct effect of X on Y = c'.

Power Analysis

Sample size was calculated using G*Power (Faul et al., 2009). Statistical power of 0.80, 3 predictors, f² = 0.15 and alpha level of p < .05 (two-tailed) was used with results indicating a minimum of 77 participants were required for mediation analysis. Available studies using similar methods recruited between 100-472 participants; the present study aimed to recruit an average of 256 participants (e.g., Estevez et al., 2017; Kassel et al., 2007; Teles, 2019; Thorberg & Lyvers, 2010). Indirect effects were tested employing bootstrapped confidence intervals (Schoemann et al., 2017; Zhang, 2014).
**Results**

Descriptive Statistics

**Variable Characteristics**

Descriptive statistics were calculated to provide the range, minimum and maximum scores, mean, and standard deviation (SD) of study variables (see Table 1.1).

**Table 1.1.**

*Descriptive Statistics for Study Variables with Normative Comparison Data.*

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Range</th>
<th>Min</th>
<th>Max</th>
<th>M</th>
<th>SD</th>
<th>Comparative data</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADIS SUI – scale B</td>
<td>95</td>
<td>0</td>
<td>95</td>
<td>45.2</td>
<td>20.8</td>
<td>Not available</td>
</tr>
</tbody>
</table>

**Predictor variables**

<p>| ECR-RS Maternal | 6 | 6 | 42 | 2.9 | 1.5 | 2.7^a | 1.4^a |
| avoidant attachment |   |   |    |     |     |       |       |
| ECR-RS Maternal | 5.5 | 3 | 10 | 1.8 | 1.3 | 1.4^a | 0.9^a |
| anxious attachment |   |   |    |     |     |       |       |
| ECR-RS Paternal | 6 | 6 | 42 | 3.6 | 1.5 | 3.5^a | 1.5^a |
| avoidant attachment |   |   |    |     |     |       |       |
| ECR-RS Paternal | 6 | 3 | 18 | 2.2 | 1.7 | 1.6^a | 1.1^a |
| anxious attachment |   |   |    |     |     |       |       |
| ECR-RS Romantic | 5.5 | 6 | 33 | 2.4 | 1.3 | 1.9^a | 1.0^a |
| avoidant attachment |   |   |    |     |     |       |       |</p>
<table>
<thead>
<tr>
<th>Measure</th>
<th>M1</th>
<th>SD1</th>
<th>M2</th>
<th>SD2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECR-RS Romantic anxious attachment</td>
<td>6</td>
<td>3</td>
<td>21</td>
<td>3.5</td>
</tr>
<tr>
<td>ECR-RS Friendship avoidant attachment</td>
<td>6</td>
<td>1</td>
<td>5.2</td>
<td>2.4</td>
</tr>
<tr>
<td>DERS Emotion Dysregulation</td>
<td>118</td>
<td>39</td>
<td>157</td>
<td>90.0</td>
</tr>
<tr>
<td>RFQ-Y Reflective Functioning</td>
<td>3.4</td>
<td>7.1</td>
<td>10.5</td>
<td>8.9</td>
</tr>
<tr>
<td><strong>Covariates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHQ-9 Depression</td>
<td>27</td>
<td>0</td>
<td>27</td>
<td>8.8</td>
</tr>
<tr>
<td>GAD-7 Anxiety</td>
<td>21</td>
<td>0</td>
<td>21</td>
<td>7.4</td>
</tr>
</tbody>
</table>

*Note. a = Flykt et al. (2021); b = Weinberg & Klonsky (2004); c = Ha (2012); d = Kocalevent et al. (2013); e = Hinz et al. (2017).*

**Reiability**

Cronbach’s alpha (α) values were calculated for each questionnaire to give a measure of internal consistency for the present sample. Cronbach’s alpha of .70 and above is regarded as acceptable (Taber, 2018). Each measure showed acceptable levels of reliability, ranging between .75 and .95 (Table 1.2).
Table 1.2.

Cronbach’s Alpha for Outcome Measures.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Number of items measured</th>
<th>Total scale α coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADIS</td>
<td>14</td>
<td>.86</td>
</tr>
<tr>
<td>ECR-RS</td>
<td>36</td>
<td>.94</td>
</tr>
<tr>
<td>DERS</td>
<td>36</td>
<td>.95</td>
</tr>
<tr>
<td>RFQ-Y</td>
<td>46</td>
<td>.75</td>
</tr>
<tr>
<td>PHQ-9</td>
<td>9</td>
<td>.88</td>
</tr>
<tr>
<td>GAD-7</td>
<td>7</td>
<td>.89</td>
</tr>
</tbody>
</table>

Participant Characteristics

Participant characteristics are described in Table 1.3. Participants were 150 adolescents between 16-24 years old. Participants largely fell within the 20-24 age range (90%). Most participants identified as female (74.7%). Several participants within the sample identified as either White Scottish (28%), White Other (26.7%) or British (21.3%).
Table 1.3.

Participant Characteristics.

<table>
<thead>
<tr>
<th>Sample</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>150</td>
<td>100</td>
</tr>
<tr>
<td>12-15</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16-19</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>20-24</td>
<td>135</td>
<td>90</td>
</tr>
</tbody>
</table>

Gender

- Female (identity corresponds with birth sex) | 112 | 74.7 |
- Male (identity corresponds with birth sex)   | 32  | 21.3 |
- Female-to-male trans                        | 2   | 1.3  |
- Other (Non-binary)                          | 4   | 2.7  |

Ethnicity

- White Scottish                             | 42  | 28   |
- White Irish                                | 3   | 2    |
- White Other                                | 40  | 26.7 |
- British                                    | 32  | 21.3 |
- Mixed                                      | 8   | 5.3  |
- Asian Pakistani                            | 2   | 1.3  |
- Asian Chinese                              | 9   | 6    |
- Other Asian                                | 6   | 4    |
- Black Caribbean                            | 2   | 1.3  |
- Other                                      | 2   | 1.3  |
- Prefer not to say                          | 4   | 2.8  |

Correlation Analysis

Spearman’s rho correlation coefficients are presented in Table 1.4. Insecure attachment did not correlate with SUI across most relationship domains with a small, significant, negative correlation observed for romantic avoidant attachment. Emotion dysregulation was not significantly
associated with SUI. Significant, small-to-moderate, positive correlations were found between emotion dysregulation and avoidant and anxious attachment across all relationship domains. A small negative correlation was observed between emotion dysregulation and reflective functioning. Small negative correlations were observed between reflective functioning and the domains of maternal avoidant and anxious attachment, romantic and friendship avoidant attachment, and paternal anxious attachment; this association was stronger for the maternal domains. A small positive correlation was observed between reflective functioning and SUI.

Negative affect, measured as anxiety and depression, were included as intended covariates. A moderate positive correlation was observed for both depression and anxiety and emotion dysregulation. There were no significant associations observed between anxiety or depression and SUI. No significant associations were observed between reflective functioning and anxiety and depression. Small-to-moderate positive relationships were observed between depression and avoidant and anxious attachment across all relationship domains. Small positive relationships were observed for anxiety across all relationship domains except for paternal avoidant attachment. As there was no significant association observed with SUI, anxiety and depression were excluded from further analysis. This decision was made to improve precision of the mediation model (Fritz et al., 2015).
Table 1.4.

Correlation Matrix Between Predictor Variables and Outcome Variables (n = 150)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. AADIS SUI</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. DERS Emotion Dysregulation</td>
<td>.13</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. RFQ-Y Reflective Functioning</td>
<td>.17*</td>
<td>-.28**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. ECR-RS Maternal Avoidant</td>
<td>.01</td>
<td>.37**</td>
<td>-.21**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. ECR-RS Maternal Anxious</td>
<td>-.03</td>
<td>.36**</td>
<td>-.26**</td>
<td>.63**</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. ECR-RS Paternal Avoidant</td>
<td>-.04</td>
<td>.25**</td>
<td>-.06</td>
<td>.52**</td>
<td>.33**</td>
<td>1</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7. ECR-RS Paternal Anxious</td>
<td>-.10</td>
<td>.41**</td>
<td>-.19*</td>
<td>.35**</td>
<td>.66**</td>
<td>.56**</td>
<td>1</td>
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</tr>
<tr>
<td></td>
<td>ECR-RS</td>
<td>ECR-RS</td>
<td>ECR-RS</td>
<td>ECR-RS</td>
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<td>ECR-RS</td>
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<td>--------</td>
</tr>
<tr>
<td>8.</td>
<td>Romantic</td>
<td>Avoidant</td>
<td>-.19*</td>
<td>.31**</td>
<td>-.17*</td>
<td>.50**</td>
<td>.45**</td>
<td>.35**</td>
<td>.33**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Romantic</td>
<td>Anxious</td>
<td>.05</td>
<td>.46**</td>
<td>-.16</td>
<td>.39**</td>
<td>.49**</td>
<td>.34**</td>
<td>.38**</td>
<td>.49**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Friendship</td>
<td>Avoidant</td>
<td>-.11</td>
<td>.32**</td>
<td>-.19*</td>
<td>.29**</td>
<td>.27**</td>
<td>.22**</td>
<td>.27**</td>
<td>.35**</td>
<td>.28**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Friendship</td>
<td>Anxious</td>
<td>.06</td>
<td>.48**</td>
<td>-.15</td>
<td>.24**</td>
<td>.32**</td>
<td>.21**</td>
<td>.35**</td>
<td>.34**</td>
<td>.43**</td>
<td>.59**</td>
<td>1</td>
</tr>
<tr>
<td>12.</td>
<td>PHQ-9</td>
<td>Depression</td>
<td>.05</td>
<td>.46*</td>
<td>-.15</td>
<td>.37**</td>
<td>.40**</td>
<td>.32**</td>
<td>.42**</td>
<td>.35**</td>
<td>.41**</td>
<td>.20*</td>
<td>.20*</td>
</tr>
<tr>
<td>13.</td>
<td>GAD-7</td>
<td>Anxiety</td>
<td>.07</td>
<td>.48**</td>
<td>-.13</td>
<td>.23**</td>
<td>.28**</td>
<td>.15</td>
<td>.34**</td>
<td>.21*</td>
<td>.30**</td>
<td>.21*</td>
<td>.29**</td>
</tr>
</tbody>
</table>

*Note.*  
*. Correlation is significant at the 0.05 level (2-tailed)  
**. Correlation is significant at the 0.01 level (2-tailed)
Serial Mediation Analysis

Maternal Avoidant Attachment

The overall model predicting SUI from maternal avoidant attachment through emotion dysregulation and reflective functioning accounted for 7% of variance, which was significant ($R^2 = 0.07, p = .013$). Maternal avoidant attachment did not directly predict SUI ($\beta = -0.95, SE = 1.26, 95\% CI [-3.43, 1.54]$). Emotion dysregulation mediated the relationship between maternal avoidant attachment and SUI ($\beta = 1.64, SE = 0.68, 95\% CI [0.39, 3.06]$). Reflective functioning did not mediate the relationship between maternal avoidant attachment and SUI ($\beta = -0.37, SE = 0.30, 95\% CI [-1.09, 0.10]$). Results demonstrated a significant serial mediation path from maternal avoidant attachment to SUI via both emotion dysregulation and reflective functioning ($\beta = -0.26, SE = 0.15, 95\% CI [-0.61, -0.02]$). Outcomes are presented in Figure 3.1 and Table 1.5.

Figure 3.1.

Serial Mediation Model of Maternal Avoidant Attachment and SUI.

Note. Key ——> significant paths ———> non-significant paths

* $p < .05$ ** $p < .01$ *** $p < .001$, $^\text{ns}$ = non-significant
Maternal Avoidant Attachment

For maternal avoidant attachment, the model accounted for 8% of variance in SUI, which was significant ($R^2 = 0.08$, $p = .006$). Results from mediation analysis are presented in Figure 3.2 and Table 1.6. Maternal avoidant attachment did not directly predict SUI ($\beta = -1.96$, $SE = 1.30$, 95% CI [-4.60, 0.69]). Emotion dysregulation mediated the relationship between maternal avoidant attachment and SUI ($\beta = 1.35$, $SE = 0.56$, 95% CI [0.39, 2.58]). Reflective functioning did not mediate the relationship between maternal avoidant attachment and SUI ($\beta = -0.40$, $SE = 0.30$, 95% CI [-1.10, 0.04]). The effect of maternal avoidant attachment on SUI was mediated through emotion dysregulation and reflective functioning ($\beta = -0.21$, $SE = 0.13$, 95% CI [-0.52, -0.01]).
Figure 3.2.

*Serial Mediation Model of Maternal Anxious Attachment and SUI.*

![Diagram of the serial mediation model]

---

**Note.** Key

- **significant paths**
- **non-significant paths**

* * p < .05 ** p < .01 *** p < .001, ns = non-significant

Table 1.6.

*Unstandardized Regression Coefficients, BCI and P-values for Figure 3.2.*

<table>
<thead>
<tr>
<th></th>
<th>β</th>
<th>LL BCI</th>
<th>UL BCI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal anxious attachment</td>
<td>-1.96</td>
<td>-4.60</td>
<td>0.69</td>
<td>.146</td>
</tr>
<tr>
<td>Emotion dysregulation</td>
<td>0.23</td>
<td>0.09</td>
<td>0.37</td>
<td>.001</td>
</tr>
<tr>
<td>Reflective functioning</td>
<td>4.48</td>
<td>-0.23</td>
<td>9.20</td>
<td>.062</td>
</tr>
</tbody>
</table>

*Note. LL = Lower limit; UL = Upper Limit.*

**Paternal Avoidant Attachment**

The overall model predicting SUI from paternal avoidant attachment through emotion dysregulation and reflective functioning accounted for 8% of variance, which was significant ($R^2 =$...
0.08, \( p = .009 \)). Results are presented in Figure 3.3 and Table 1.7. Paternal avoidant attachment did not directly predict SUI (\( \beta = -1.32, SE = 1.13, 95\% CI [ -3.56, 0.92] \)). However, there was an indirect effect via emotion dysregulation (\( \beta = 0.95, SE = 0.45, 95\% CI [0.15, 1.90] \)). Reflective functioning was not found to mediate the relationship between paternal avoidant attachment and SUI (\( \beta = 0.08, SE = 0.25, 95\% CI [ -0.42, 0.63] \)). However, findings demonstrated a serial mediation pathway from paternal avoidant attachment to SUI via emotion dysregulation and reflective functioning (\( \beta = -0.21, SE = 0.13, 95\% CI [ -0.53, -0.03] \)).

**Figure 3.3.**

*Serial Mediation Model of Paternal Avoidant Attachment and SUI.*

Note. Key

- \( * \) \( p < .05 \)
- \( ** \) \( p < .01 \)
- \( *** \) \( p < .001 \)
- ns = non-significant
Table 1.7.

*Unstandardized Regression Coefficients, BCI and P-values for Figure 3.3.*

<table>
<thead>
<tr>
<th></th>
<th>β</th>
<th>LL BCI</th>
<th>UL BCI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paternal avoidant attachment</td>
<td>-1.32</td>
<td>-3.56</td>
<td>0.92</td>
<td>.245</td>
</tr>
<tr>
<td>Emotion dysregulation</td>
<td>0.23</td>
<td>0.09</td>
<td>0.37</td>
<td>.002</td>
</tr>
<tr>
<td>Reflective Functioning</td>
<td>5.13</td>
<td>0.46</td>
<td>9.80</td>
<td>.031</td>
</tr>
</tbody>
</table>

*Note.* LL = Lower limit; UL = Upper Limit.

**Paternal Anxious Attachment**

The findings from paternal anxious attachment are presented in Figure 3.4 and Table 1.8.

The overall model for paternal anxious attachment accounted for 11% variation in SUI, which was significant ($R^2 = 0.11$, $p = .001$). There was a significant, direct effect of paternal anxious attachment on SUI ($β = -2.56$, $SE = 1.04$, 95% CI [-4.60, -0.51], $p = .015$). This result became non-significant when emotion dysregulation and reflective functioning were included in the total model ($β = -1.58$, $SE = 1.01$, 95% CI [-3.58, 0.42], $p = .120$). Emotion dysregulation was found to mediate the relationship between paternal anxious attachment and SUI ($β = 1.34$, $SE = 0.48$, 95% CI [0.47, 2.35]), whereas reflective functioning was not found to mediate this relationship ($β = -0.15$, $SE = 0.18$, 95% CI [-0.58, 0.16]). However, results demonstrated a serial mediation pathway from paternal anxious attachment to SUI via emotion dysregulation and reflective functioning ($β = -0.21$, $SE = 0.12$, 95% CI [-0.49, -0.02]).
Figure 3.4.

*Serial Mediation Model of Paternal Anxious Attachment and SUI.*

![Diagram showing the serial mediation model with specified coefficients]

Note. Key

- **significant paths**
- **non-significant paths**

* p < .05  ** p < .01  *** p < .001, **ns** = non-significant

Table 1.8.

*Unstandardized Regression Coefficients, BCI and P-values for Figure 3.4.*

<table>
<thead>
<tr>
<th></th>
<th>β</th>
<th>LL BCI</th>
<th>UL BCI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paternal anxious attachment</td>
<td>-2.56</td>
<td>-4.60</td>
<td>-0.51</td>
<td>.015</td>
</tr>
<tr>
<td>Emotion dysregulation</td>
<td>0.26</td>
<td>0.12</td>
<td>0.40</td>
<td>.000</td>
</tr>
<tr>
<td>Reflective functioning</td>
<td>4.62</td>
<td>0.02</td>
<td>9.23</td>
<td>.049</td>
</tr>
</tbody>
</table>

Note. LL = Lower limit; UL = Upper Limit.

**Romantic Avoidant Attachment**

The findings from romantic avoidant attachment are presented in Figure 3.5 and Table 1.9.

The overall model for romantic avoidant attachment accounted for 15% of variance ($R^2 = 0.15, p <$...
There was a significant direct effect of romantic avoidant attachment on SUI ($\beta = -5.00$, $SE = 1.31$, 95% CI [-7.58, -2.42], $p < .001$). This effect remained significant when emotion dysregulation and reflective functioning were included in the total model ($\beta = -3.57$, $SE = 1.29$, 95% CI [-6.12, -1.02], $p = .006$). A significant indirect effect of romantic avoidant attachment on SUI via emotion dysregulation was also observed ($\beta = 1.87$, $SE = 0.64$, 95% CI [0.75, 3.25]). The indirect effect of reflective functioning on SUI was non-significant ($\beta = -0.19$, $SE = 0.29$, 95% CI [-0.87, 0.34]). A significant serial mediation was found for romantic avoidant attachment and SUI via emotion dysregulation and reflective functioning ($\beta = -0.25$, $SE = 0.15$, 95% CI [-0.60, -0.02]).

Figure 3.5.
Serial Mediation Model of Romantic Avoidant Attachment and SUI.
Table 1.9.

Unstandardized Regression Coefficients, BCI and P-values for Figure 3.5.

<table>
<thead>
<tr>
<th></th>
<th>β</th>
<th>LL BCI</th>
<th>UL BCI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Romantic avoidant attachment</td>
<td>-5.00</td>
<td>-7.58</td>
<td>-2.42</td>
<td>.000</td>
</tr>
<tr>
<td>Emotion dysregulation</td>
<td>0.28</td>
<td>0.15</td>
<td>0.42</td>
<td>.000</td>
</tr>
<tr>
<td>Reflective functioning</td>
<td>4.37</td>
<td>-0.11</td>
<td>8.86</td>
<td>.056</td>
</tr>
</tbody>
</table>

Note. LL = Lower limit; UL = Upper Limit.

Romantic Anxious Attachment

Results indicated that romantic anxious attachment was not a significant direct predictor of SUI (β = -0.68, SE = 1.03, 95% CI [ -2.72, 1.37]). However, a significant indirect effect was observed for the emotion dysregulation path (β = 1.51, SE = 0.65, 95% CI [0.33, 2.88]). Results did not indicate a significant indirect effect of romantic anxious attachment on SUI via reflective functioning (β = -0.11, SE = 0.21, 95% CI [ -0.61, 0.28]). Results indicated that romantic anxious attachment was a significant predictor of SUI indirectly via emotion dysregulation and reflective functioning (β = -0.29, SE = 0.15, 95% CI [ -0.63, -0.04]). Approximately 7% of the variance in SUI was accounted for by the predictors ($R^2 = 0.07$, $p = .014$). Findings for romantic anxious attachment are presented in Figure 3.6 and Table 1.10.
**Figure 3.6.**

*Serial Mediation Model of Romantic Anxious Attachment and SUI.*

![Diagram of the model](image)

*Note. Key*  
arrow: significant paths  
broken arrow: non-significant paths

*p < .05  ** p < .01  *** p < .001, ns = non-significant

**Table 1.10.**

*Unstandardized Regression Coefficients, BCI and P-values for Figure 3.6.*

<table>
<thead>
<tr>
<th></th>
<th>$\beta$</th>
<th>LL BCI</th>
<th>UL BCI</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Romantic anxious attachment</td>
<td>-0.68</td>
<td>-2.72</td>
<td>1.37</td>
<td>.514</td>
</tr>
<tr>
<td>Emotion dysregulation</td>
<td>0.23</td>
<td>0.08</td>
<td>0.38</td>
<td>.003</td>
</tr>
<tr>
<td>Reflective functioning</td>
<td>4.97</td>
<td>0.28</td>
<td>9.65</td>
<td>.038</td>
</tr>
</tbody>
</table>

*Note. LL = Lower limit; UL = Upper Limit.*

**Friendship Avoidant Attachment**

The overall model for friendship avoidant attachment accounted for 9% of variation in SUI, which was significant ($R^2 = 0.09, p = .003$). Results for friendship avoidant attachment are presented
in Figure 3.7 and Table 1.11. Friendship avoidant attachment was not found to significantly predict SUI directly ($\beta = -2.70, SE = 1.45$, 95% CI [-5.57, 0.16]). A significant effect was observed via the indirect emotion dysregulation pathway between friendship avoidant attachment and SUI ($\beta = 1.44, SE = 0.71$, 95% CI [0.34, 3.09]). Reflective functioning was not found to mediate the relationship between friendship avoidant attachment and SUI ($\beta = -0.41, SE = 0.37$, 95% CI [-1.21, 0.21]). Friendship avoidant attachment was a significant predictor of SUI indirectly via emotion dysregulation and reflective functioning ($\beta = -0.22, SE = 0.17$, 95% CI [-0.64, -0.01]).

**Figure 3.7.**

*Serial Mediation Model of Friendship Avoidant Attachment.*

---

**Note.** Key

*significant paths  non-significant paths

$* p < .05  ** p < .01  *** p < .001, ns = non-significant$
Table 1.11.

*Unstandardized Regression Coefficients, BCI and P-values for Figure 3.7.*

<table>
<thead>
<tr>
<th></th>
<th>$\beta$</th>
<th>LL BCI</th>
<th>UL BCI</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friendship avoidant attachment</td>
<td>-2.70</td>
<td>-5.57</td>
<td>0.16</td>
<td>.064</td>
</tr>
<tr>
<td>Emotion dysregulation</td>
<td>0.24</td>
<td>0.10</td>
<td>0.37</td>
<td>.001</td>
</tr>
<tr>
<td>Reflective Functioning</td>
<td>4.35</td>
<td>-0.34</td>
<td>9.04</td>
<td>.069</td>
</tr>
</tbody>
</table>

*Note.* LL = Lower limit; UL = Upper Limit.

**Friendship Anxious Attachment**

Findings from friendship anxious attachment are presented in Figure 3.8 and Table 1.12. The overall model predicting SUI from friendship anxious attachment through emotion dysregulation and reflective functioning accounted for 7% of variance, which was significant ($R^2 = 0.07$, $p = .013$).

Friendship anxious attachment did not directly predict SUI ($\beta = -0.93$, $SE = 1.18$, 95% CI [-3.27, 1.40]). Emotion dysregulation was found to indirectly mediate the relationship between friendship anxious attachment and SUI ($\beta = 1.60$, $SE = 0.69$, 95% CI [0.36, 3.07]). Reflective functioning did not significantly mediate the relationship between friendship anxious attachment and SUI ($\beta = -0.07$, $SE = 0.24$, 95% CI [-0.64, 0.34]). Mediation analysis demonstrated a significant serial effect of emotion dysregulation and reflective functioning in mediating the relationship between friendship anxious attachment and SUI ($\beta = -0.31$, $SE = 0.17$, 95% CI [-0.70, -0.05]).
Figure 3.8.

Serial Mediation Model of Friendship Anxious Attachment.

![Diagram of Serial Mediation Model]

Note. Key → significant paths ——— non-significant paths

* * p < .05 ** p < .01 *** p < .001, ns = non-significant

Table 1.12.

Unstandardized Regression Coefficients, BCIs and P-values for Figure 3.8.

<table>
<thead>
<tr>
<th></th>
<th>β</th>
<th>LL BCI</th>
<th>UL BCI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friendship avoidant attachment</td>
<td>-0.93</td>
<td>-3.27</td>
<td>1.40</td>
<td>.430</td>
</tr>
<tr>
<td>Emotion dysregulation</td>
<td>0.23</td>
<td>0.08</td>
<td>0.38</td>
<td>.002</td>
</tr>
<tr>
<td>Reflective Functioning</td>
<td>4.99</td>
<td>0.30</td>
<td>9.67</td>
<td>.037</td>
</tr>
</tbody>
</table>

Note. LL = Lower limit; UL = Upper Limit.

Discussion

The purpose of this study was to test a sequential theoretical model for the effects of insecure attachment (anxious and avoidant attachment), emotion dysregulation and reflective
functioning on adolescent SUI. To the researcher’s knowledge, the present study is the first to explore mechanisms through which insecure attachment influences SUI in adolescents. As predicted, emotion dysregulation and reflective functioning mediated the relationship between both anxious and avoidant attachment across relationship domains. The indirect path for emotion dysregulation consistently mediated the relationship between insecure attachment and SUI. Reflective functioning was not found to mediate insecure attachment and SUI unless via emotion dysregulation. These findings highlight a more complex relationship than what has been described in available literature. Higher attachment insecurity may cause an increase in emotion dysregulation, which in turn inhibits reflective functioning, thus increasing SUI.

This study aimed to address limitations of previous research by exploring attachment across relationship domains. Findings demonstrated variation in the magnitude of effect across relationship domains. The strength of effect between insecure attachment and SUI via emotion dysregulation and reflective functioning was strongest for friendship anxious attachment, closely followed by romantic anxious attachment, and weakest for maternal and paternal anxious attachment. The magnitude of effect was weaker for avoidant attachment relative to anxious attachment across domains. For avoidant attachment, the strength of effect was strongest for maternal-figures followed by romantic relationship, relative to paternal-figures and friendship.

For the emotion dysregulation pathway without reflective functioning, the magnitude of effect was strongest for romantic avoidant attachment and weakest for paternal avoidant attachment. Although insecure attachment was found to indirectly predict SUI via emotion dysregulation and reflective functioning, insecure attachment failed to directly predict SUI for most relationship domains. This is with the exception of paternal anxious attachment and romantic avoidant attachment. However, the effect observed for paternal anxious attachment became non-significant when emotion dysregulation and reflective functioning were accounted for. Romantic avoidant attachment remained a significant direct predictor of SUI.
Attachment literature in the field of substance use has yielded inconsistent findings, with some studies observing a significant relationship between insecure attachment and substance use outcomes (for review see Fairbairn et al., 2018; Schindler, 2019) and others not (Ahrens et al., 2012; Kassel et al., 2007; Reis et al., 2012; Serra et al., 2019). The findings of the present study provide support for the indirect relationship between insecure attachment and substance use across relationship domains, however, a direct effect was only observed for romantic avoidant attachment. Findings may be explained by the participant demographics in the present study; most participants were between the ages of 20 to 24. Studies have shown that influence of parental attachment weakens as adolescents get older (Danielsson et al., 2011; Henry et al., 2009) as relationships shift towards romantic relationships and friendships. The differences in predictive ability of attachment and variation in magnitude of indirect effects across relationship domains highlights the need for research to assess attachment across different types of attachment figures.

Findings are partially consistent with recent studies exploring emotion dysregulation in substance use outcomes. Estévez et al. (2017) found that emotion dysregulation was predictive of substance misuse, whereas poor attachment was not found to be a predictor. Goldstein et al. (2018) found that emotion dysregulation mediated the effect of insecure attachment only via anxious attachment, whereas the present study found that the effect of insecure attachment across both anxious and avoidant dimensions were mediated through emotion dysregulation. This is in line with a recent meta-analysis by Weiss et al. (2022) who did not find significant differences between anxious and avoidant attachment with regards to emotion dysregulation and substance use outcomes. There is a paucity of research exploring reflective functioning in this area, however, what research is available is consistent with the present findings (Innamorati et al., 2016; Teles, 2019).

Theoretical and Clinical Implications

The present study found support for a proposed serial model of insecure attachment and SUI, namely that insecure attachment would lead to difficulties in emotion regulation, this in turn would inhibit reflective functioning capacity, and subsequently increase SUI. Findings provide
support for a developmental pathway between insecure attachment and substance use (Schindler & Bröning, 2015). Results further support self-regulation models that suggest that substance use is a means of coping with negative affect in absence of other attachment-based strategies (Baker et al., 2004; Bowlby, 1969; Khantzian, 2003; Padykula & Conklin, 2010). Critics of attachment and self-medication theories of substance use argue that self-medication conceptualizations do not fully account for the processes underlying substance use (Lembke, 2012). The findings from the present study build on existing theories of attachment and substance use through contributing to evidence of potential attachment-based transdiagnostic mechanisms. However, although findings are promising it is likely that a more multi-dimensional and dynamic relationship exists than that described.

Findings may contribute to literature supporting theoretical propositions regarding the association between emotion dysregulation and reflective functioning, and the potential implications of low reflective functioning on psychological outcomes (Hill, 2015; Jurist & Meehan, 2009). Hill (2015) argued that reflective functioning is a secondary affect-regulating system to primary emotion regulation, and that emotion dysregulation may compromise or deactivate reflective functioning abilities. The serial order tested in the present study suggests emotion dysregulation may inhibit reflective functioning, thus influencing SUI. Evidence suggests that in BPD, emotion dysregulation indirectly mediates reflective functioning and BPD symptoms such as difficulties in interpersonal relationships (Euler et al., 2021; Kahya & Munguldar, 2022), suggesting that lower reflective functioning leads to higher propensity for emotion dysregulation. With the present study testing a temporal order of emotion dysregulation in inhibiting reflective functioning, it is unclear as to whether significant findings would be observed for insecure attachment and SUI via reflective functioning and emotion dysregulation. Further research is required in elucidating the dynamic interplay between attachment, emotion regulation and reflective functioning in substance use outcomes.
Establishing the roles of attachment-based processes in the etiology and maintenance of SUDs will allow clinicians and researchers to identify treatment targets and aid the development of effective interventions. Traditional treatment approaches for substance use have largely focused on achieving abstinence, followed by relapse prevention (Bagot & Kaminer, 2018). However, only one-third of adolescents achieve abstinence following treatment (Passetti et al., 2016). Relapse rates following adolescent substance use treatment are high, with up to 79% of adolescents relapsing within one year of treatment (Brown et al., 2000; Cornelius et al., 2003). There is a clear need for alternative and adjunctive treatment options to improve outcomes. Findings from this study suggest that insecure attachment, emotion dysregulation and reflective functioning may be promising treatment targets for adolescent substance use.

Treatment models focused on targeting such constructs may therefore hold potential in improving treatment outcomes, for example, attachment-focused family therapy (AFFT; Hughes, 2007) and mentalization-based treatment (MBT; Bateman & Fonagy, 2013). However, there is limited research exploring the effectiveness of attachment-based approaches in substance use populations (Fletcher et al., 2015). MBT, an approach that focuses on stabilizing emotional expression and internal representations to strengthen the patient’s capacity for mentalization (Bateman & Fonagy, 2013), has been employed in the treatment of concurrent BPD and SUDs. Studies have shown that MBT is effective in the treatment of BPD and SUDs (Morken et al., 2014; Morken et al., 2017; Philips et al., 2018). As MBT focuses on reflective functioning, a potential shared mechanism in BPD and SUDs, MBT may hold promise for the treatment of SUDs independently.

Transdiagnostic, modifiable mechanisms such as emotion regulation and reflective functioning have garnered interest from researchers and clinicians alike (e.g., Ballespi et al., 2018; Chu et al., 2017; Luyten et al., 2020; Sloan et al., 2017). Third wave, process-oriented approaches targeting transdiagnostic mechanisms may also be promising for substance use treatment. Dialectical behaviour therapy (DBT; Linehan et al., 1991), a multi-pronged cognitive-behavioural therapy, aims to modify emotions and behaviour through use of mindfulness and acceptance-based
change strategies. Like MBT, the use of DBT in the treatment of SUDs has primarily been researched in samples of participants with concurrent BPD and SUDs (Linehan et al., 1999). However, given the high rates of comorbidity observed in psychopathology with SUDs, Dimeff & Linehan (2008) developed a modified DBT-SUDs intervention for the treatment of substance use. The use of DBT-SUDs is in its infancy, however, a recent meta-analysis of 6 studies (n = 278) provided support for the use of DBT-SUDs in the reduction of substance use at post-treatment and follow-up assessment (Haktanir & Callender, 2020).

**Limitations**

The findings of this study must be viewed considering several limitations. A cross-sectional design was employed to measure insecure attachment, emotion dysregulation, reflective functioning, and SUI; casual inferences regarding the study variables cannot be inferred (Kesmodel & Kesmodel, 2018). Furthermore, due to restrictions relating to the COVID-19 pandemic, participants were recruited online from the general population. The study was therefore unable to draw comparisons between clinical and non-clinical samples. Experimental substance use is not uncommon in adolescence and is understood as an exploratory behaviour (Becoña Iglesias et al., 2014) that has been associated with a secure attachment style (Cooper et al., 1998). Secure attachment has also been found to be a protective factor against substance use in adolescents (Becoña Iglesias et al., 2014); Nakhoul et al. (2020) found that secure attachment was significantly associated with lower alcohol use. Findings may have differed for adolescents with diagnosed SUDs. Analysis of the study variables across both clinical and non-clinical populations would have allowed for deeper understanding of attachment and SUI in adolescents.

Another limitation is that self-report measures were used to collect study data. Although responses were anonymous, outcomes may have been affected by social desirability and other motivational and cognitive biases (Shaver & Mikulincer, 2004), which may threaten the validity of the study. Some theorists argue that purely self-report studies, in which variables are assessed using the same method, may be at risk of common method bias, artificially inflating (or deflating) effects
Furthermore, self-reported substance use may influence underreporting bias compared to more objective measures (Ashrafi et al., 2018; Harrison et al., 2007). In a longitudinal study of 13,568 adolescents, Dornbusch et al. (2001) found that a significant association between attachment and frequency of substance use disappeared when measures of attachment to parents and school were self-reported by adolescents themselves. However, the validity of self-reported substance use has been shown to be dependent on study population; female adolescents have been found to demonstrate a fair level of agreement between self-reported substance use and objective urine tests relative to male counterparts (Khalili et al., 2021).

Self-reported attachment questionnaires have been described as “surface indicators” of attachment (Shaver & Mikulincer, 2002), and criticized as not wholly reliable as they focus on attachment at a single timepoint (Becoña Iglesias et al., 2014). Moreover, it has been argued that as the influence of attachment style is automatic and unconscious, self-reported attachment instruments may not be an appropriate measure of attachment (Gillath et al., 2006; Serra et al., 2019). Similar criticisms can be applied to the measurements of emotion dysregulation and reflective functioning utilised in the current study. Attachment, emotion regulation and reflective functioning are not static constructs, self-reported, static measurements may have obscured true differences (Bateman & Fonagy, 2013; Weems & Pina, 2010).

As participants in the current study were largely females between 20-24 years old, the generalisability of the findings is unknown. The influence of sociodemographic variables such as age and gender identity are important to consider when investigating attachment and substance use in adolescents (Becoña Iglesias et al., 2014). A recent review has stressed that the influence of attachment on substance use may change as attachment evolves across the lifespan (Becoña Iglesias et al., 2014). The influence of parental attachment on adolescent substance use has been suggested to weaken as adolescents age (Danielsson et al. 2010, Miller & Volk, 2002); findings by Miller & Volk (2002) suggested that parental attachment only predicted substance use in participants who were under 18 years old. However, this effect was not reflected in the findings from the present study. As
the participants of this study were older adolescents, it is unclear whether effects or the magnitude of effects would be similar for younger adolescents. Substance use prior to the age of 15 is predictive of later substance use dependency (Lopez-Quintero et al., 2011) highlighting that younger age of substance use onset is an important factor in the development and maintenance of SUDs. Further exploration of attachment and substance use in younger adolescents is therefore required.

Emerging literature has suggested gender identity may influence insecure attachment, substance use and related consequences (e.g. Connolly & Gilchrist, 2020; Kozlowska et al., 2021; Reisner et al., 2015; Tupler et al., 2017). However, this has not been observed across studies. A recent study exploring the mediating effects of emotion dysregulation on attachment and addictions failed to observe a difference between cisgender male and female substance use in relation to avoidant or anxious attachment (Liese et al., 2020). The demographics within the present study were highly disproportionate towards cisgender females (74.7%), relative to 1.3% who identified as female-to-male transexual and 2.7% who identified as non-binary. Gender minority adolescents are twice as likely to use substances relative to cisgender adolescents (Reisner et al., 2015); greatest risk has been shown for transgender adolescents (Watson et al., 2020). Higher cannabis and illicit drug use has been observed in transgender men relative to transgender women (Gonzalez et al., 2017). Similarly, differences in sexual orientation may influence substance use: adolescents who identify as lesbian, gay, or bisexual have been shown to experience elevated rates of substance use relative to those who identify as heterosexual (for meta-analysis see Marshal et al., 2008). It will be important for future studies to consider the influence of variables such as gender identity and sexual identity on substance use and the impact of disparities on underlying attachment-based processes.

Recommendations for Future Research

Future studies should firstly aim to address the limitations highlighted in both the present study and attachment and addiction literature more generally. The varying conceptualizations and operationalisations of insecure attachment, emotion regulation, reflective functioning and substance use may partially explain the inconsistency observed in results across studies and limit comparability
of findings (Becoña Iglesias et al., 2014). This is a particular limitation for studies investigating addictions in the developmental context of adolescence; there is a lack of established, validated measures for these constructs (Bosmans & Kerns, 2015; Kahya & Munguldar, 2022; Müller et al., 2021; Wilson & Wilkinson, 2012). Furthermore, despite studies suggesting that self-report measures of substance use are concordant with objective measures (e.g., Yacoubian & Urbach, 2002), future studies should aim to corroborate self-reports with objective, biological measures to reduce potential bias in results (Khalili et al., 2021; Reinhard et al., 2007).

Given the dynamic nature of these constructs, the use of cross-sectional data should be used with caution, with an aim to shift towards more accurate measurements longitudinally. Moreover, the use of cross-sectional data in this field has prevented researchers from establishing whether attachment insecurity is a risk factor for substance use, or a resulting consequence (Becoña Iglesias et al., 2014). Although limitations of the present study prevented comparisons to be drawn between clinical and non-clinical populations, future studies should additionally aim to differentiate between experimental and casual use versus clinically diagnosed SUDs, as mechanisms may differ for those with more severe substance use dependency. Further, research suggests that there may be differences in attachment between clinical and non-clinical populations that influence substance use of choice (Schindler et al., 2009). Schindler et al. (2009) found that non-clinical groups were more likely to have secure attachment styles, ecstasy use was related to insecure attachment more generally, individuals addicted to heroin were mostly pre-occupied in attachment style. Cannabis users were most likely to have dismissing-avoidant or secure attachments, whereas opioid abuse was associated with high levels of fearful-avoidant attachment. Different substances may therefore serve different attachment-based functions based on specific attachment styles.

The current study focused on insecure attachment, emotion dysregulation and reflective functioning. Substance misuse is complex, several factors have been found to influence substance use behaviour in adolescents (for review see Nawi et al., 2021). Emotion regulation and reflective functioning may therefore be a small part of a much larger and more complex picture. Future
research may benefit from exploring facets underpinning such constructs. Few studies have examined the association between substance use outcomes and specific emotion regulation facets (e.g., nonacceptance of emotion, impulse control difficulties, lack of emotional awareness) (Garke et al., 2021; Weiss et al., 2022). Goldstein et al. (2019) found that there were different pathways from high levels of avoidant and anxious attachment to problematic alcohol use; nonacceptance of emotion was found to mediate the association between attachment and alcohol use for both attachment domains. Higher anxious attachment was associated with alcohol use through greater use of hyperactivation strategies, whereas high avoidant attachment and alcohol use was associated via strategies associated with suppression. A study by Garke et al. (2021) highlighted that emotion dysregulation facets as measured by the DERS were associated with substance use frequency, this association was strongest for difficulties controlling impulse behaviour. Interestingly, the influence of independent emotion dysregulation facets varied depending on population sampled: difficulties engaging in goal-directed behaviour and low emotional clarity were related to the community sample with substance misuse, whereas difficulties in controlling impulsive behaviours and limited emotional awareness were associated with substance misuse in the residential SUDs treatment group. Similarly, hypo-mentalizing and hyper-mentalizing dimensions of reflective functioning capacity could be studied further. However, limitations in measurements for reflective functioning may limit research in this area (Kahya & Munguldar, 2022; Müller et al., 2021).

Lastly, novel theoretical conceptualizations of emotion regulation have proposed a construct that accounts for the role of reflective functioning in emotion regulation processes: mentalized affectivity (Jurist, 2005). The theory of mentalized affectivity posits that effectively regulating emotional states relies on the capacity for reflective functioning (Jurist, 2005). Namely, emotion regulation relies on the ability to reflect on internal states such as thoughts and feelings and factors that may influence these, such as context and previous childhood experiences, to inform understanding of emotions and how to anticipate future scenarios (Greenberg et al., 2017; Jurist, 2005). The present study assessed emotion dysregulation and reflective functioning as separate
constructs, observing only a small association between the two variables, providing rationale for them to be studied independently. However, future studies may benefit from exploring the construct of mental affectivity in attachment and substance use pathways.

Conclusions

The findings from the present study contribute to the emerging evidence-base for insecure attachment and attachment-related processes in understanding substance use in adolescents. Findings supported the hypothesis that the influence of insecure attachment on SUI is mediated by emotion dysregulation and reflective functioning. High levels of attachment insecurity (avoidance and anxiety) could lead to high emotion dysregulation, this could impair reflective functioning, consequently leading to greater SUI. This effect varied across relationship domains. Limitations of this study highlight the need for future research in establishing accurate and consistent measures of attachment, emotion regulation, reflective functioning and substance use and measuring dimensions and facets of these constructs across relationship domains. There may be several complex factors influencing SUI at different developmental stages or following from different stressful life events. Further research is required to establish an evidence-base for the mechanisms underlying substance use to allow for the identification of treatment targets and development and application of alternative therapeutic interventions.
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Chapter Two

An Initial Meta-Analysis of the Effectiveness of Third Wave Cognitive-Behavioural Therapies in the Treatment of Substance-Use Outcomes
An Initial Meta-Analysis of the Effectiveness of Third Wave Cognitive-Behavioural Therapies in the Treatment of Substance-Use Outcomes

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Abstract

**Introduction**

Substance use disorders (SUDs) are chronically relapsing conditions that are associated with several overlapping psychological, social, medical, and legal difficulties. High rates of relapse and attrition suggest that further treatment options are required. Third wave cognitive-behavioural therapies comprise novel approaches that have the potential to address the complex and varied needs of individuals who have problematic substance use. This initial meta-analysis aimed to evaluate the effectiveness of third wave therapies in the treatment of substance use cravings, severity, and frequency.

**Methods**

This review followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Studies were identified by searching electronic databases: Scopus, PsycINFO, Embase, MEDLINE, CINAHL and ASSIA. The search strategy yielded 9024 studies, of which 149 were subjected to full-text screening. A total of 31 randomized studies with 2,523 participants fulfilled the eligibility criteria for inclusion within the review. Of those, 25 studies were included in the meta-analysis.

**Results**

Overall, results demonstrated that third wave interventions were significantly more effective in reducing cravings relative to control groups. No significant findings were observed for third wave therapies in relation to frequency or severity of substance use at longest follow-up, suggesting that outcomes were comparable to that of control groups. Post-hoc analysis did not reveal significant effects of third wave interventions on measures of negative affect at longest follow-up.

**Conclusions**

Findings suggest that third wave interventions may be promising for the treatment of substance use cravings, a key predictor of substance use misuse and relapse. However, for frequency and severity of use third wave interventions were comparable to controls. High risk of bias of included studies
questions the validity of findings. This initial review is therefore unable to draw certain conclusions.

Limitations of the review, implications and suggestions for future research are discussed.

*Keywords: Mindfulness, Acceptance, Third Wave, Substance Use, Meta-Analysis*

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Introduction

Substance use disorders (SUDs) have been defined as “mental disorders that affect a person’s brain and behaviour, leading to inability to control their use of substances such as legal or illegal drugs, alcohol, or medications” (National Institute of Mental Health, 2021). The Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association [APA], 2013) classifies SUDs based on a pathological pattern of behaviours related to substance-use emphasising quantity, frequency of use, dysfunction in occupational and recreational activities, social and interpersonal impairments, continuation of use despite difficulties in these areas, cravings, tolerance to the substance, and withdrawal symptoms. Problematic substance use presents as a pervasive global health concern that affects every level of society. In the United Kingdom alone, illicit drug use is estimated to cost the economy £19 billion per year (Black, 2020). According to the World Health Organisation (WHO), in 2019 it was estimated that 35 million people were suffering from SUDs worldwide; global estimates for drug-related deaths were 0.5 million with alcohol-related deaths estimated at 3 million yearly.

Described as complex “chronically relapsing” conditions (Witkiewitz & Marlatt, 2004), SUDs are associated with several overlapping social, psychiatric, legal, and medical difficulties (Schulte & Hser, 2014; Stotts & Northrup, 2015). SUDs are commonly observed in individuals with psychiatric diagnoses such as mood disorders (Hunt et al., 2020), schizophrenia (Green, 2005; Hunt et al., 2018), anxiety disorders (McHugh, 2015), attention-deficit-hyperactivity disorder (Crunelle et al., 2018; van Emmerik-van Oortmerssen et al., 2012) and personality disorders (Smith & Cottler, 2020). Referred to as dual diagnosis, individuals with co-occurring SUDs and psychiatric conditions experience greater illness severity (Lagerberg et al., 2010), further relapses (Malla et al., 2008), increased risk of hospitalisation (Hunt et al., 2016), and increased risk of suicide (Rodríguez-Cintas et al., 2018; Szerman et al., 2012). Given the prevalence, severity, and recurrence of SUDs, in addition to associated socioeconomic burden, there has been considerable effort to develop effective interventions (Ramadas et al., 2021). However, traditional treatments for substance use tend to
narrowly focus on reduction of use, independent of comorbid mental health difficulties (Levin et al., 2012). To clarify key terms used in this review the term substance use is broadly defined as taking any of the substances recognised within the DSM-5 that may meet criteria for SUDs: tobacco; alcohol; caffeine; cannabis; stimulants (e.g., cocaine, amphetamine); hallucinogens; inhalants; opioids; sedatives, hypnotics and anxiolytics; and other unknown substances (APA, 2013).

**Traditional Psychosocial Interventions**

Traditional “first wave” psychosocial interventions for SUDs were developed through early learning theories such as classical and operant conditioning (Skinner, 1953; Pavlov, 1927) and social cognitive theory (Bandura, 1977), and cover a broad range of approaches (for overview see Jhanjee, 2014; for review see McHugh et al., 2010). Primary strategies employed in traditional approaches include motivational interviewing (MI), contingency management (CM) and relapse prevention (RP), with focus on substance use reduction, abstinence, and RP. The emergence of the “second wave” of therapies seen the development of cognitive behavioural therapy (CBT), a disorder-specific approach that combines a multitude of cognitive and behavioural strategies, including MI, CM and RP. CBT has been the dominant evidence-based approach for the treatment of SUDs for many years (Stotts & Northrup, 2015). The key focus in CBT for SUDs is challenging dysfunctional thoughts relating to substance use, and behavioural strategies for developing coping skills to help individuals achieve and maintain abstinence (Jhanjee, 2014; Magill et al., 2019; Marlatt & Gordon, 1985).

Evidence suggests that traditional psychosocial interventions are effective in the treatment of substance use (Lussier et al., 2006; Prendergast et al., 2006; Smedslund et al., 2011). However, effect sizes are often small (Magill & Ray, 2009). Dutra et al. (2008) conducted a meta-analysis investigating the effectiveness of psychosocial interventions (CBT, RP, and CM) for illicit substance use across 34 randomized controlled trials (RCTS). Using Cohen’s $d$ as measure of effect, they found that effect sizes varied across substances. For example, a small effect was observed for psychosocial interventions in the treatment of polysubstance use ($d = 0.24$), a small-to-medium effect for opiate use ($d = 0.39$), and a medium-to-large effect observed in studies targeting cocaine and cannabis use
(\(d = 0.62\) and \(d = 0.81\), respectively). Drop-out rates were high across studies with an average attrition rate of 35.4%. Like treatment effects, there was variation in drop-out rates across substances; cocaine and opiate users had a higher mean drop-out rate (42% and 37%, respectively). Such findings suggest that there may be variation in treatment tolerance and effects dependent on type of substance misused.

High attrition rates are not uncommon in substance use treatment. A recent meta-analysis exploring drop-out rates for psychosocial interventions for SUDs (e.g., 12-Steps, MI, CBT) found that the average drop-out rate was approximately 30% (Lappan et al., 2020). In a study exploring predictors of relapse following from CBT/RP in methamphetamine users, 69% had lapsed at least once during treatment, with an attrition rate of 40.5% (Chen et al., 2015). Whilst it is evident that there are treatments that are effective in the management of SUDs, there is a need for alternative or adjunctive therapies to allow for customisation of treatments to address the complex needs of individuals with SUDs.

**Emergence of “Third Wave” Interventions**

Third wave therapies have garnered attention from researchers and clinicians as an alternative approach in treating SUDs. There is debate surrounding which psychological interventions classify as third wave (Kahl et al., 2012). However, it is generally acknowledged that mindfulness-based interventions (MBIs), acceptance and commitment therapy (ACT; Hayes et al., 2004a), dialectical behaviour therapy (DBT; Linehan et al., 1993), and compassion focused therapy (CFT; Gilbert, 2014) fall under this category (Garey et al., 2020; Öst, 2008). Unlike traditional approaches, third wave therapies emphasise mindfulness and acceptance processes, with focus on experiential skill-building in mindful awareness and distress tolerance (Sudhir, 2018). Instead of challenging or modifying thoughts, feelings, and behaviour, third wave therapies focus on identifying and experiencing unpleasant private events in an alternative way (Luoma et al., 2008; Stotts & Northrup, 2015).
Mindfulness has been described as an approach that encourages present-moment awareness and acceptance in place of “rigid avoidance of one’s experiences” (Follette et al., 2006; Kabat-Zinn, 2015). Rooted in traditional Buddhist practices, mindfulness has been integrated into traditional CBT to form the third wave of treatments and has been reputed as an effective means of treating various mental health difficulties. Third wave interventions have shown to be effective in the treatment of post-traumatic stress (e.g., Benfer et al., 2021; Boyd et al., 2018), depression (e.g., Hunot et al., 2013), anxiety (Hofmann et al., 2010), and eating disorders (e.g., Linardon et al., 2017), amongst other psychological and physical conditions (e.g., Carnes et al., 2017; Cillessen et al., 2019). However, despite promising outcomes, third wave therapies have been criticized as “getting ahead of data” (Corrigan, 2001; Ost, 2008) and have been limited by the poor methodological quality of studies (Hunot et al., 2013; Linardon et al., 2018).

Clinical Utility of Third Wave Therapies in SUDs

From a clinical perspective, there is strong rationale for the use of third wave interventions in the treatment of substance misuse. There is a high prevalence of comorbidity between SUDs and various mental health diagnoses (e.g., Crunelle et al., 2018; Hunt et al., 2018, 2020; Smith & Cottler, 2020), with comorbidity associated with increased illness severity (Lagerberg et al., 2010) and relapse (Malla et al., 2008). Individuals who have problematic substance use may additionally experience anxiety relating to recovery such as fear of detox and withdrawal symptoms, and subsequent negative affect, which can lead to treatment drop-out and increased risk of relapse (Balandeh et al., 2021). High rates of comorbidity and complexity of SUDs highlights a need for approaches that treats comorbid mental health difficulties and SUDs concurrently. As third wave interventions are process-oriented, they have been considered inherently transdiagnostic (Narayanan & Naaz, 2018), granting them potential to benefit more complex presentations and dual diagnoses. Indeed, emerging evidence suggests that third wave, mindfulness-based interventions may be beneficial in substance use treatment for independent SUDs in addition to treating comorbidity (Chiesa & Serretti, 2014; Li et al., 2017; Vujanovic et al., 2016; Zgierska et al., 2009).
However, there is debate surrounding how mindfulness and substance-use are related (Bowen & Enkema, 2014) with models being proposed from biological, cognitive, neurocognitive, and affective perspectives (see Garland et al., 2010; Garland, Froeliger, et al., 2014; Witkiewitz et al., 2013).

Affective theories of substance use such as the “self-medication hypothesis” (Khantzian, 1997) and affective processing of negative reinforcement (Baker et al., 2004) conceptualize substance use as a means of experiential avoidance of negative affect. Negative affect has been identified as a predictor of craving, substance misuse and relapse (Selva Kumar et al., 2021; Sinha, 2001; Sinha, 2008). Mindfulness and acceptance-based approaches may target experiential avoidance of unpleasant internal events (e.g., negative affect, cravings) through the cultivation of metacognitive awareness of present-moment experience, increasing capacity for approaching stress non-judgmentally without suppression or distraction (Garland, 2014), and through improving psychological flexibility (Serowik & Orsillo, 2019). Offering an alternative or adjunctive mindfulness-based treatment, in which individuals with SUDs can develop skills in relating to their internal experiences, such as negative affect and cravings, in a different way may therefore decrease the likelihood of treatment drop-out and relapse (Vrana et al., 2017).

Furthermore, it has been proposed that mindfulness may weaken the association between craving and negative affect (Garland, 2014; Witkiewitz et al., 2013), and that mindfulness may disrupt the relapse cycle of craving and use (Enkema & Bowen, 2017; Tapper, 2018). Craving is widely known as the central motivational drive in SUDs (Tiffany & Wray, 2012) and has been established as a robust predictor of substance use and relapse (Breese et al., 2011; Kavanagh & Connor, 2013). A randomized trial by Davis et al. (2018) investigating the effectiveness of mindfulness-based relapse prevention (MBRP) in SUDs found that MBRP significantly reduced craving and substance use at follow-up. They found that this was mediated by a reduction in stress. They further found that craving did not mediate post-treatment substance use in MBRP, contrary to other studies in this area (Witkiewitz & Bowen, 2010).
Mindfulness-Based Relapse Prevention

MBRP is the most widely studied third wave intervention in substance use treatment. Building on traditional RP, MBRP aims to increase awareness of internal and external cues that may trigger relapse, whilst developing alternative mindfulness-based responses and coping strategies (Bowen et al., 2009; Witkiewitz & Bowen, 2010; Witkiewitz et al., 2013). Empirical findings suggest that MBRP is effective in reducing substance use and craving (e.g., Bowen et al., 2009; Bowen et al., 2014; Davis et al., 2018; Glasner et al., 2017). In a randomised trial for MBRP for SUDs, Bowen et al. (2014) found that MBRP was more effective than a 12-Steps treatment-as-usual (TAU) programme on substance use outcomes at six-month follow-up. However, results for MBRP and RP were comparable. At 12-month follow-up MBRP was superior to RP and TAU. A randomized trial by Bowen et al. (2009) reported significant reductions in substance use and cravings versus TAU. Results were shown to diminish post-treatment with effects becoming comparable to controls by four-month follow-up; however, complete data was unavailable for all participants at follow-up due to high attrition. Conversely, a recent meta-analysis by Grant et al. (2017) of RCTs exploring the effectiveness of MBRP on SUDs did not detect significant effects for frequency of use or relapse across RP, CBT, TAU, or health education. A significant effect was found favouring MBRP for craving outcomes relative to comparators, however, the effect size was small ($d = -0.13$), and poor methodological quality of included studies questions the validity of finding.

Dialectical Behaviour Therapy

Developed as a treatment for borderline personality disorder (BPD), DBT has been adapted for the treatment of SUDs (DBT-SUDs). DBT comprises 4 modules which focus on mindfulness, emotion regulation, interpersonal effectiveness, and distress tolerance (Linehan et al., 1999). DBT-SUDs promotes abstinence and aims to reduce severity of relapse through use of self-management strategies such as non-judgmental problem-solving for urges and cravings (Dimeff & Linehan, 2008; Linehan et al., 1999). There are few publications investigating the effectiveness of DBT-SUDs, however, available evidence suggests that it is effective in the treatment of SUDs (e.g., Axelrod et al.,
A recent meta-analysis of six studies exploring the effectiveness of DBT-SUDs found that DBT-SUDs was more effective than alternative treatments and waitlist controls in reducing substance use, with a medium effect size observed. This finding was maintained at follow-up (Haktanir & Callender, 2020). However, despite promising outcomes, research sample sizes in this area have been small, and have largely explored DBT as a treatment for BPD and SUD comorbidity in women, thus the generalisability to other populations is unknown.

**Acceptance and Commitment Therapy**

ACT emphasises six processes: acceptance, cognitive defusion, present-moment awareness, self-as-context, values and committed action (Hayes et al., 2004a). When applied to SUDs, ACT focuses on enhancing psychological flexibility to allow individuals to make room for symptoms of substance misuse (e.g., urges, cravings) and encourage value-based committed action (Osaji et al., 2020). The effectiveness of ACT has been demonstrated in the treatment of smoking (Bricker et al., 2018; Heffner et al., 2020; Jones et al., 2015), cannabis (Twohig et al., 2007), polysubstance misuse (González-Menéndez et al., 2014), and methamphetamine use (Smout et al., 2010). Meta-analyses exploring the effectiveness of ACT in the treatment of substance use have found significant small-to-medium effect sizes favouring ACT for abstinence at post-treatment relative to active treatment conditions (e.g., CBT), with effect sizes comparable for smoking and other substances (Lee et al., 2015). Contrary to this, an RCT by Smout et al. (2010) found that ACT was comparable to CBT on self-reported methamphetamine use and dependency measures. Only the CBT comparator showed significant improvement in objectively assessed use, however, data was only available for one third of ACT participants at post-treatment due to high attrition rates.

**Compassion Focused Therapy**

Self-compassion comprises six facets: self-kindness, self-judgement, mindfulness, over-identification, common humanity, and isolation (Brooks et al., 2012; Neff, 2011). CFT aims to develop self-soothing skills to engage compassionately with difficult emotions (Carlyle et al. 2019).
Self-compassion has been related to risk factors for SUDs (Phelps et al., 2018), such as negative affect and emotion dysregulation (Vettese et al., 2011). Initial evidence for the use of CFT in treating SUDs has been promising with studies demonstrating reductions in smoking (Kelly et al., 2010) and other substances (Agberotimi et al., 2021; Carlyle et al., 2019) relative to TAU. However, evidence for this approach is in its infancy relative to the other interventions discussed.

**Rationale**

SUDs are complex and chronically relapsing conditions, often associated with a number of overlapping psychiatric, medical and legal problems (Schulte & Hser, 2014; Stotts & Northrup, 2015). Although evidence-based interventions exist for treating SUDs, high rates of relapse and patient drop-out suggest that established treatments may not be sufficient for the complex needs of individuals who have difficulties with substance use (Chen et al., 2015; Lappan et al., 2020). Traditional treatment approaches focus largely on behaviour change (i.e., reduction of substance or abstinence; Levin et al., 2012), failing to address additional psychological comorbidities implicated in SUDs. Further, they do not target underlying mechanisms implicated in the etiology of SUDs; there is evidence to suggest that cravings and negative affect are robust predictors of substance use and substance use relapse (Breese et al., 2011; Kavanagh & Connor, 2013; Selva Kumar et al., 2021).

There is a growing interest among clinicians and researchers alike for the use of third-wave, mindfulness- and acceptance-based therapies as an alternative or adjunctive treatment for SUDs. As inherently transdiagnostic, the process-oriented focus of third wave interventions grants potential to address the complex, comorbid emotional difficulties that are common amongst individuals who use substances (Stotts & Northrup, 2015) in addition to targeting theorized mechanisms of change implicated in the etiology of SUDs (i.e., cravings, negative affect). Substance use has been theorized as a means of avoiding or controlling discomfort from internal feelings such as emotional distress (Stotts & Northrup, 2015). Fear of detox and anxiety relating to withdrawal can lead to treatment drop-out and increased risk of relapse (Balandeh et al., 2021). Third-wave interventions may support individuals who use substances in raising non-judgemental awareness of triggers and precipitants of
substance use and provide an alternative way of relating to distressing private events (e.g., through acceptance, mindfulness, and emotion regulation techniques) to disrupt the cycle between distress and substance use behaviour (Stotts & Northrup, 2015). From a clinical perspective, integrating mindfulness- and acceptance-based approaches into traditional SUD or utilising third wave interventions may therefore enhance treatment outcomes, and improve treatment adherence through providing alternative evidence-based approaches when traditional approaches do not meet individual needs.

Initial evidence suggests that third wave interventions are effective in substance use treatment (e.g., Chiesa & Serretti, 2014; Li et al., 2017; Vujanovic et al., 2016; Zgierska et al., 2009). However, to date, there has been insufficient meta-analytic evidence as to the overall effectiveness of third wave approaches in treating substance use outcomes. There is a need for a review in establishing the current evidence-base of the use of third-wave interventions in SUDs treatment. The following review is intended for clinicians and researchers working in the field of substance use with an interest in the application of third wave interventions in the treatment of SUDs. This meta-analysis aims to address gaps in the literature through summarising and systematically reviewing the current evidence-base for third wave therapies employed in the treatment of substance use outcomes.

Historically, the main criterion of effectiveness of a psychological therapy in the treatment of substance use was abstinence (Bowen & Enkema, 2014; Enkema & Bowen, 2017; Jhanjee, 2014). However, researchers have shifted from an ‘abstinence-only’ focus to decreasing cravings, frequency, and severity (Enkema & Bowen, 2017; Hendershot et al., 2011). This review therefore focuses on substance use severity, frequency, and craving outcomes. Approaches included for review include manualised individual and/or group therapies with a mindfulness and/or acceptance component that have been described as a third wave therapy and utilised in the treatment of substance misuse. In line with other meta-analyses exploring the effectiveness of third wave treatments in other psychological presentations (e.g., Kraemer et al., 2020; Linardon et al., 2018;
Louise et al., 2018; Öst, 2008), both mindfulness and acceptance-based approaches were included for shared meta-analysis. Evidence for shared core mechanisms, theoretical underpinnings and therapeutic goals justifies their inclusion for shared analysis (Kraemer et al., 2020). Interventions included MBRP, DBT, ACT and CFT.

Methods

This review was conducted in accordance with PRISMA guidelines (Moher et al., 2009). The study protocol was registered on PROSPERO (ref. CRD42022297716).

Search strategy

Studies were identified by searching the electronic databases Scopus, PsycINFO, Embase, MEDLINE, CINAHL and ASSIA. Searches were conducted between October and November 2021 using the following search terms with support from a librarian: (“mindful*” or “mindfulness” or “acceptance and commitment therap*” or “acceptance commitment therapy” or “dialectical behavio* therap*” or “compassion* focus* therap*” “substance* use*” or “substance* abus*” or “substance* dependenc*” or “substance use disorder” or “substance* misuse*” or “drug” or “drug* use*” or “alcohol” or “alcohol use” or “alcohol abus*” or “alcohol dependenc*” or “smoking” or “smoking cessation” or “nicotine” or “cannabis” or “marijuana” or “cocaine” or “opiate” or “opium” or “heroin” or “methamphet*” or “amphetamine” or “illicit”). Given the scarcity and heterogeneity of research in this field, the search strategy was intentionally broad.

Eligibility Criteria

Eligibility criteria were developed considering population, intervention, control, outcome and study design (PICOS) as per PRISMA guidelines. Studies were included for review if they met the following criteria:

- Studied adults who report using substances (e.g., alcohol, drugs, tobacco), have a substance use disorder or are in substance use treatment.
- Employed a “third wave” therapy (e.g., MBRP, ACT, DBT, CFT) delivered in individual and/or group format.
• Included an active (e.g., CBT, RP) or passive (e.g., TAU, waitlist) control condition.
• Included a relevant measure of substance use frequency, cravings, or severity as a primary or secondary outcome.
• Were randomized controlled trials (RCTs) or quasi-randomized studies.

Studies were excluded from review if they were:
• Systematic reviews, meta-analyses, quasi-experimental designs, or case series.
• Not available in English.

Due to heterogeneity in the literature, interventions were of any duration and in any setting (e.g., primary care, community-based settings, and specialist settings) and included combinations of interventions. There was no restriction placed on who delivered the intervention.

**Study Selection**

Study selection was conducted independently by the primary author using Covidence systematic review software (Veritas Health Innovation, 2021). Titles and abstracts were screened independently by the lead review author to identify whether studies meet inclusion criteria. A random sample of titles and abstracts were independently screened against the eligibility criteria by a trainee clinical psychologist. Disagreements were resolved through discussion between the primary and secondary author. Full texts of remaining records were reviewed against the eligibility criteria. Searches of reference lists of included studies and current reviews were conducted to complete the searches. Initial searches yielded 9025 studies; 3263 texts were removed as duplicates. Title and abstracts were screened for 5762 studies against the eligibility criteria. A screening of full text was conducted for 149 records. A request was made to authors for two further texts (Petersen & Zettle, 2009; Schneegans et al., 2021). Both texts were obtained, however, did not meet inclusion criteria. A further 116 papers were excluded leaving a remaining 31 for inclusion within this review. A total of 25 studies were included in the meta-analysis. A flow diagram of the study selection process is outlined in Figure 4.1.
Data Extraction

Data extraction was performed on Microsoft Excel using a tailored proforma by the primary author. The following data was extracted: authors, country, study design, setting, population, participant characteristics (e.g., demographics, age, ethnicity, clinical characteristics, comorbidity), intervention (e.g., description, fidelity, length and format of treatment, providers, control groups,
diagnostic measure used), substance use primary/secondary outcome measures, time points measured, other relevant outcomes and drop-out rates.

Measures of substance use frequency, severity and cravings were used as the primary outcomes for meta-analysis. Means and standard deviations (SD) were extracted for primary outcome variables for both intervention and control groups. If means and SD were unavailable, this was calculated where possible (e.g., from standard error) as recommended in the Cochrane Handbook (Higgins et al., 2021). Authors were contacted for post-test means and SD for inclusion in review. Studies were excluded from meta-analysis where this information could not be obtained (i.e., Courbasson et al., 2012; Hamidi & Kheiran, 2019; Imani et al., 2015; Linehan et al., 1999; Linehan et al., 2002; Stotts et al., 2012).

**Meta-Analytic Model**

Analyses were conducted in RStudio (RStudio, Version 4.1.2) using the statistical package ‘Metafor’ (Viechtbauer, 2010). Standardised mean differences (Cohen’s $d$) were pooled for the substance-use outcomes of interest (Higgins et al., 2021), calculated from extracted means and SD for each intervention and control comparison where data was provided. Effect sizes were interpreted based on benchmarks suggested by Cohen (1988): small ($d = 0.20$), medium ($d = 0.50$), and large ($d = 0.80$). It was assumed a priori that there would be a large level of heterogeneity between studies, a random-effects model was therefore applied.

Multiple effect sizes were reported across studies for substance use outcomes. Methods in handling multiple effect sizes include ignoring data dependency, averaging effect sizes, or using one effect size per study (Card, 2015); however, this may lead to biased results and loss of valuable information (Rioux et al., 2021). A three-level meta-analysis was applied to account for dependency between effect sizes (Aarts et al., 2014). Due to varying lengths of follow-up periods reported all analyses were conducted using the longest available follow-up period (Higgins, 2021). Where follow-up data was unavailable, post-treatment outcomes were used. Summary effects were calculated using restricted maximum likelihood (REML).
Proportion of variance in study estimates due to heterogeneity was assessed using the $I^2$ statistic (Higgins & Thompson, 2002). Sensitivity analysis such as Cook’s distance was applied to explore the impact of outliers that may affect the validity and robustness of results (Viechtbauer & Cheung, 2010). Publication bias was assessed using Egger’s test (Egger et al., 1997). Methods such as funnel plots and trim-and-fill analysis (Duval & Tweedie, 2000) have not been generalized to complex meta-analytic methods that assess clustered effect sizes (Rioux et al., 2021); however, coloured funnel plots were visually inspected to complement Egger’s test. Subgroup analyses were conducted for type of intervention. Insufficient number of studies and uneven covariate distribution limited moderators analysed.

**Study Quality**

Study quality was assessed using the revised Risk of Bias Tool (RoB 2; Sterne et al., 2019). The RoB 2 considers biases across five domains: bias arising from the randomization process, bias due to deviations from intended interventions, bias due to missing outcome data, bias in measurement of the outcome, and bias in selection of the reported result. Studies were provided a classification for each domain of “low”, “some concerns”, or “high”. Domain-level classifications for each study were used to determine overall risk of bias. A random 25% of studies were rated by an independent trainee clinical psychologist to ensure reliability. Inter-rater reliability for risk of bias scoring was assessed using weighted Cohen’s kappa (Warrens, 2013). Guidelines from Landis and Koch (1977) were used for interpreting outcomes: slight agreement (0.0 to 0.2), fair (0.21 to 0.40), moderate (0.41 to 0.60), substantial (0.61 to 0.80) and almost perfect agreement (0.81 to 1.0).

**Results**

**Study Characteristic**

Study characteristics are displayed in Table 2.1. The 31 studies included data from 2,523 participants. Most studies were conducted in United States (n = 14). The remaining studies were conducted in Iran (n = 8), Spain (n = 3), United Kingdom (n = 2), Brazil (n = 1), Australia (n = 1), Netherlands (n = 1) and China (n = 1). Three studies did not report data on age. The average mean
(SD) age of participants was 37.45 (9.64). All but one study reported data on gender. Percentage of males included across the remaining studies varied between 0-100% with a mean of 67.82%. Many studies did not report on ethnicity demographics \((n = 17)\). From papers that provided sufficient data, on average, 69.3% of participants were white.

Interventions included MBRP \((n = 13)\), ACT \((n = 8)\) and DBT \((n = 7)\) as an independent or adjunctive therapy. Two studies reported treatments combining both MBRP and ACT protocols. Only one randomized trial reported the use of CFT. Studies implementing active and/or passive control arms were included for review. Most studies employed TAU \((n = 11)\). Remaining controls varied, studies employed CBT \((n = 5)\), RP \((n = 3)\), 12-Steps variations \((n = 3)\), psychoeducation/self-help \((n = 3)\), waitlist \((n = 2)\), drug counselling \((n = 1)\), social support \((n = 1)\), methadone maintenance therapy \((n = 1)\), relaxation \((n = 1)\), CM \((n = 1)\), and mapped enhanced counselling \((n = 1)\). Two studies did not specify details of their control group. Most studies investigated any form of substance use \((n = 15)\). Others included individuals who use opioids \((n = 9)\), methamphetamine \((n = 3)\), heroin \((n = 2)\), nicotine \((n = 2)\), stimulants \((n = 1)\), marijuana \((n = 1)\) and alcohol \((n = 1)\).
Table 2.1.

Study Characteristics.

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Design</th>
<th>Population</th>
<th>Sample Size</th>
<th>Age</th>
<th>Gender (%male)</th>
<th>Treatment Description</th>
<th>Control</th>
<th>Outcome Measure(s)</th>
<th>Diagnosis</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zgierska et al. (2019)*</td>
<td>United States</td>
<td>RCT</td>
<td>Alcohol dependent adults in early recovery</td>
<td>Total = 112</td>
<td>Overall 41.0(12.2), MBRP 40.5(12.1), TAU 41.9(11.9)</td>
<td>56.2</td>
<td>MBRP + TAU Group 2 hours, 8 sessions weekly</td>
<td>TAU</td>
<td>TLFB; DIC</td>
<td>AUD by DSM-IV</td>
<td>18-weeks</td>
</tr>
<tr>
<td>Bowen et al. (2014)*</td>
<td>United States</td>
<td>RCT</td>
<td>Adults with SUDs</td>
<td>Total = 286</td>
<td>MBRP 39.1(10.9), RP 38.9(10.9), TAU 37.2(10.8)</td>
<td>70.3</td>
<td>MBRP + TAU Group 2 hours, 8 sessions weekly</td>
<td>RP</td>
<td>TAU</td>
<td>TLFB; ASI; SDS</td>
<td>3 months (mo) 6mo 12mo</td>
</tr>
<tr>
<td>Glasner-Edwards et al. (2017)*</td>
<td>United States</td>
<td>RCT</td>
<td>Stimulant dependent adults</td>
<td>Total = 63</td>
<td>Overall 45.3(8.9); MBRP 44.6(9.1), CM+HE 46.1(8.8)</td>
<td>71.4</td>
<td>MBRP Group 2 hours, 8 sessions weekly</td>
<td>CM+HE</td>
<td>ASI; UA</td>
<td>Stimulant dependence – DSM-IV</td>
<td>1mo</td>
</tr>
<tr>
<td>Bowen et al. (2009)*</td>
<td>United States</td>
<td>RCT</td>
<td>Adults with SUDs</td>
<td>Total = 168</td>
<td>Overall 40.5 (10.3)</td>
<td>63.7</td>
<td>MBRP Group 2 hours, 8 sessions weekly</td>
<td>TAU</td>
<td>TLFB, PACS, SIP-AD</td>
<td>NR</td>
<td>2mo 4mo</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Design</td>
<td>Participants</td>
<td>Intervention</td>
<td>Follow-up</td>
<td>Sex</td>
<td>Age</td>
<td>Duration (weekly)</td>
<td>Notes</td>
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<tr>
<td>Davis et al. (2018)*</td>
<td>United States</td>
<td>RCT</td>
<td>Young adults in residential substance use treatment</td>
<td>Total = 79 MBRP = 44 TAU = 35</td>
<td>Overall 25.3(2.7) MBRP 25.3 (2.80) TAU 25.3</td>
<td>65</td>
<td>MBRP+ TAU Group 1.5 hours 16 sessions twice weekly</td>
<td>TAU GAIN NR</td>
<td>Bi-weekly for 6mo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Witkiewitz &amp; Bowen (2010)*</td>
<td>United States</td>
<td>RT</td>
<td>Adults with SUDs</td>
<td>Total = 168 MBRP = 93 TAU = 75</td>
<td>Overall 40.5(10.3)</td>
<td>63.7</td>
<td>MBRP Group 2 hours 8 sessions weekly</td>
<td>TAU TLFB; PACS NR</td>
<td>2mo 4mo</td>
<td></td>
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<tr>
<td>Witkiewitz et al. (2014)*</td>
<td>United States</td>
<td>RCT</td>
<td>Female offenders</td>
<td>Total = 105 MBRP = 55 RP = 50</td>
<td>RP 32.4(8.9); MBRP 35.8(9.5)</td>
<td>0</td>
<td>MBRP Group 16 sessions twice weekly</td>
<td>RP TLFB; SIP; ASI NR</td>
<td>15-weeks</td>
<td></td>
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<tr>
<td>Abed &amp; Shahidi (2019)*</td>
<td>Iran</td>
<td>RCT</td>
<td>Male patients undergoing MMT</td>
<td>Total = 55 MBRP = 26 Control = 29</td>
<td>NR</td>
<td>100</td>
<td>MBRP Group 2 hours 8 sessions weekly</td>
<td>NI HCQ; UA NR</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lyons et al. (2019)*</td>
<td>United States</td>
<td>RT</td>
<td>Male prisoners</td>
<td>Total = 189 MBRP = 88 MEC = 101</td>
<td>Overall 35.8(11.3) MBRP 35.9(11.4) MEC 35.7(11.2)</td>
<td>100</td>
<td>MBRP Group 6 weeks</td>
<td>MEC PACS NR</td>
<td>NA</td>
<td></td>
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</tr>
<tr>
<td>Weiss de Souza et</td>
<td>Brazil</td>
<td>RCT</td>
<td>Adult smokers</td>
<td>Total = 86 MBRP 50.58(9.97)</td>
<td>19.8</td>
<td>MBRP Group</td>
<td>RP QSU, FTND, ECM NR</td>
<td>12-weeks 24-weeks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Design</td>
<td>Treatment Group</td>
<td>Participants</td>
<td>MBRP</td>
<td>ST</td>
<td>NI</td>
<td>NR</td>
<td>Overall</td>
<td>MBRP+ MT or BP Group</td>
<td>Sessions per Week</td>
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<tr>
<td>al. (2020)*</td>
<td>Iran</td>
<td>RT</td>
<td>Adults with methamphetamine dependence</td>
<td>Total = 30</td>
<td>MBRP = 15</td>
<td>NR</td>
<td>NR</td>
<td>MBRP+ MT Group</td>
<td>8 sessions weekly</td>
<td>2 hours</td>
<td></td>
</tr>
<tr>
<td>Hamidi &amp; Kheiran (2019)</td>
<td>Iran</td>
<td>RCT</td>
<td>Adults with diagnosed SUDs</td>
<td>Total = 74</td>
<td>MBRP = 37</td>
<td>Overall</td>
<td>79.7</td>
<td>MBRP Group</td>
<td>2 hours</td>
<td>8 sessions weekly</td>
<td>1.5 hours</td>
</tr>
<tr>
<td>Zemastiani &amp; Ottaviani (2016)*</td>
<td>Iran</td>
<td>RCT</td>
<td>Adults with diagnosed SUDs</td>
<td>Total = 30</td>
<td>MBRP = 15</td>
<td>MBRP</td>
<td>30.1(9.7)</td>
<td>MBRP Group</td>
<td>2 hours</td>
<td>8 sessions weekly</td>
<td></td>
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<tr>
<td>Imani et al. (2015)</td>
<td>Iran</td>
<td>RCT</td>
<td>Adults with diagnosed opioid dependence</td>
<td>Total = 30</td>
<td>MBRP = 15</td>
<td>MBRP</td>
<td>38.69(4.38)</td>
<td>MBRP Group</td>
<td>2 hours</td>
<td>8 sessions weekly</td>
<td></td>
</tr>
<tr>
<td>Yaghubi &amp; Zargar (2018)*</td>
<td>Iran</td>
<td>RCT</td>
<td>Opiate dependent males on MMT</td>
<td>Total = 35</td>
<td>MBRP+ MT = 35</td>
<td>MBRP+ MMT</td>
<td>100</td>
<td>MBRP+ MMT Group</td>
<td>8 sessions</td>
<td>8 hours</td>
<td>2mo</td>
</tr>
<tr>
<td>Shorey et al. (2017)*</td>
<td>United States</td>
<td>RCT</td>
<td>Adults in residential substance use treatment</td>
<td>Total = 117</td>
<td>MBRP = 64</td>
<td>Overall</td>
<td>74.4</td>
<td>MBRP Group</td>
<td>ACT</td>
<td>8 bi-weekly</td>
<td>1.5 hour</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Design</td>
<td>Group Description</td>
<td>Total</td>
<td>ACT</td>
<td>WLI</td>
<td>Overall</td>
<td>ACT</td>
<td>WLI</td>
<td>Overall</td>
<td>ACT</td>
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<tr>
<td>Vowles et al. (2020)</td>
<td>United States</td>
<td>RCT</td>
<td>Veterans with hazardous opioid use and chronic pain</td>
<td>31</td>
<td>18</td>
<td>13</td>
<td>50.5(10.5)</td>
<td>48.3(11.6)</td>
<td>COMM</td>
<td>53.6(8.6)</td>
<td></td>
</tr>
<tr>
<td>Bahrami et al. (2017)*</td>
<td>Iran</td>
<td>RT</td>
<td>Adults methamphetamine users</td>
<td>30</td>
<td>15</td>
<td>15</td>
<td>26.07(3.06)</td>
<td>26.2(3.51)</td>
<td>Overall</td>
<td>33.59(7.5)</td>
<td>ACT</td>
</tr>
<tr>
<td>González-Menéndez et al. (2014)*</td>
<td>Spain</td>
<td>RCT</td>
<td>Female prisoners with SUDs</td>
<td>37</td>
<td>16</td>
<td>31</td>
<td>33.2(7.3)</td>
<td>35.2(8.7)</td>
<td>CBT</td>
<td>31.1 (6.4)</td>
<td></td>
</tr>
<tr>
<td>Villagrá Lanza et al. (2014)*</td>
<td>Spain</td>
<td>RCT</td>
<td>Female prisoners with SUDs</td>
<td>50</td>
<td>18</td>
<td>19</td>
<td>33(6.2)</td>
<td>32(6.2)</td>
<td>Overall</td>
<td>32(6.2)</td>
<td></td>
</tr>
<tr>
<td>Villagrá Lanza et al. (2013)*</td>
<td>Spain</td>
<td>RCT</td>
<td>Female prisoners with SUDs</td>
<td>31</td>
<td>18</td>
<td>13</td>
<td>32(6.2)</td>
<td>32(6.2)</td>
<td>Overall</td>
<td>32(6.2)</td>
<td></td>
</tr>
<tr>
<td>Smout et al. (2010)*</td>
<td>Australia</td>
<td>RCT</td>
<td>Adult methamphetamine users</td>
<td>Total = 104</td>
<td>Overall = 30.9 (6.5)</td>
<td>60</td>
<td>ACT 12 weekly group sessions 60 min</td>
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<tr>
<td>Stotts et al. (2012)</td>
<td>United Kingdom</td>
<td>RCT</td>
<td>Adults with opioid dependence prescribed methadone</td>
<td>Total = 56</td>
<td>ACT = 40.3 (10.7) DC 39.4 (8.7)</td>
<td>62.5</td>
<td>ACT-OD – 24 weekly</td>
<td></td>
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<tr>
<td>Mak et al. (2020)*</td>
<td>China</td>
<td>RCT</td>
<td>Adult smokers</td>
<td>Total = 144</td>
<td>ACT = 47.94 (14.37)</td>
<td>71.5</td>
<td>ACT + self-help Self-help FTND; PPA; ECM; UA</td>
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<tr>
<td>Hayes et al. (2004b)*</td>
<td>United States</td>
<td>RT</td>
<td>Adults methadone users</td>
<td>Total = 138</td>
<td>Overall = 45.99 (12.5).</td>
<td>49</td>
<td>ACT+MMT 16 weekly group sessions + 32 individual 90 mins</td>
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<tr>
<td>Rezaie et al. (2021)*</td>
<td>Iran</td>
<td>RCT</td>
<td>Males under MMT</td>
<td>Total = 50</td>
<td>DBT-34.05 (5.00) MMT 36.02 (4.05).</td>
<td>100</td>
<td>DBT+ MMT 16 group sessions 90 mins</td>
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<tr>
<td>Linehan et al. (2002)</td>
<td>United States</td>
<td>RCT</td>
<td>Heroin dependent females with BPD</td>
<td>Total = 23</td>
<td>Overall = 36.19 (7.3)</td>
<td>0</td>
<td>DBT + OR CVT/12S TLFB; UA SCID 16mo</td>
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<tr>
<td>Study</td>
<td>Location</td>
<td>Design</td>
<td>Participants</td>
<td>Comparison</td>
<td>Outcomes</td>
<td>Assessments</td>
<td>Duration</td>
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<tr>
<td>Linehan et al. (1999)</td>
<td>United States</td>
<td>RCT</td>
<td>Women with BPD and SUDs</td>
<td>Total = 27</td>
<td>Overall 30.4 (6.6)</td>
<td>DBT+RM; TAU; TLFB; SCID</td>
<td>16mo</td>
<td></td>
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<tr>
<td>Davoudi et al. (2020)*</td>
<td>Iran</td>
<td>RCT</td>
<td>Adults with marijuana disorder</td>
<td>Total = 53</td>
<td>NR</td>
<td>DBT; PE; MCQ</td>
<td>2mo</td>
<td></td>
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<tr>
<td>Courbasson et al. (2012)</td>
<td>United States</td>
<td>RCT</td>
<td>Adults with eating disorders and SUDs</td>
<td>Total = 21</td>
<td>Overall 32.53 (10.3)</td>
<td>DBT; TAU; ASI</td>
<td>3mo 6mo</td>
<td></td>
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<tr>
<td>van den Bosch et al (2002)*</td>
<td>Netherlands</td>
<td>RCT</td>
<td>Women with BPD with and without SUDs</td>
<td>Total = 58</td>
<td>Overall 34.9 (7.7)</td>
<td>DBT; TAU; ASI</td>
<td>18mo</td>
<td></td>
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<tr>
<td>Carlyle et al. (2020)*</td>
<td>United Kingdom</td>
<td>RT</td>
<td>Adults with OUD in drug treatment services</td>
<td>Total = 38</td>
<td>Overall 39.95 (10.44); CFT 41.07 (12.70) Relaxation 43.33 (8.27) WL = 34.82 (7.94)</td>
<td>CFT 2 hr for 3 weeks; Relaxation OUDS</td>
<td>NA</td>
<td></td>
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</tr>
</tbody>
</table>

Note. * = Studies included in meta-analysis.
Key. RCT = randomized controlled trial, RT = randomized trial, BP = buprenorphine, OR = opioid replacement, ACT-OD = ACT-based opioid detoxification therapy, AUD = alcohol use disorder, OUD = opioid use dependency, WL = waitlist, CG = control group (no intervention specified), PE = psychoeducation, CVT = comprehensive psychosocial validation therapy, 12S = 12-Steps, CM+HE = contingency management + health education, MEC = mapped enhanced counselling, MMT = methadone maintenance therapy, RM = replacement medication, SS = social support, SH = self-help, DC = drug counselling, DSM-III = Diagnostic and Statistical Manual 3rd Edition, DSM-IV = Diagnostic and Statistical Manual 4th Edition, DSM-5 = Diagnostic and Statistical Manual 5th Edition, SCID = Structured Clinical Interview for DSM Disorders, MINI = Mini-International Neuropsychiatric Interview, TLFB = Timeline Follow Back Method, DIC = Drinker Inventory of Consequences, ASI = Addiction Severity Index, ASI-6 = Addiction Severity Index 6 Item, SDS = Severity of Dependence Scale, GAIN = Global Appraisal of Individual Needs, PACS = Penn Alcohol Craving Scale, SIP = Short Inventory of Problems, SIP-AD = Short Inventory of Problems-Alcohol and Drugs, HQ = Heroin Craving Questionnaire, UA = Urinalysis, QSU = Questionnaire of Smoking Urges, FTND = Fagerström Test for Nicotine Dependence, ECM = Expired Carbon Monoxide, CBQ = Craving Beliefs Questionnaire, OCDUS = Obsessive Compulsive Drug Use Scale, COMM = Current Opioid Misuse Measure, PPA = point prevalence abstinence (self-reported), LDQ = Leeds dependency questionnaire, HA = Hair analysis, ICQ = Drug Desire Questionnaire, MCQ = Marijuana Craving Questionnaire, NR = Not reported, NA = Not applicable.
Meta-Analysis Outcomes

A series of meta-analyses were conducted for frequency of substance use, severity of substance use, and substance use cravings. Total studies for each outcome investigated are as follows: frequency (n = 10), cravings (n = 11), severity (n = 9). A post-hoc analysis was conducted for negative affect (n = 9). A summary of the results for each outcome is displayed in Table 2.2.

Table 2.2.
Results of Meta-Analysis for Frequency, Craving, Severity and Negative Affect for Third Wave Interventions Versus Control Groups.

<table>
<thead>
<tr>
<th>Analysis</th>
<th>No. of Studies</th>
<th>Effect size (d)</th>
<th>Significance (p)</th>
<th>95% CI</th>
<th>I² (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>10</td>
<td>-0.33</td>
<td>.116***</td>
<td>-0.76, 0.09</td>
<td>92.95</td>
</tr>
<tr>
<td>Craving</td>
<td>11</td>
<td>-0.94</td>
<td>.009**</td>
<td>-1.64, -0.23</td>
<td>95.98</td>
</tr>
<tr>
<td>Severity</td>
<td>9</td>
<td>-0.23</td>
<td>.120***</td>
<td>-0.52, 0.06</td>
<td>74.61</td>
</tr>
<tr>
<td>Negative Affect</td>
<td>9</td>
<td>-0.38</td>
<td>.056***</td>
<td>-0.77, 0.01</td>
<td>87.03</td>
</tr>
</tbody>
</table>

Note. Key: ‘****’ p < .001 ‘***’ p < .01, ‘**’ p < .05, ‘*’ p < .05, ‘ns’ = non-significant.

Frequency Outcomes at Longest Follow-up

Results of the meta-analysis for frequency outcomes at longest follow-up period was non-significant (d = -0.33, 95% CI [-0.76, 0.09], p = .116). This suggests that there were no significant differences in treatment effects on substance use frequency between third wave interventions versus control groups at the longest follow-up period. Heterogeneity was estimated at I² = 92.95%, indicating a high degree of between-study variance. Sensitivity analysis using Cook’s distance was used to assess outliers (Davis et al., 2018; Davoudi et al., 2020). Results from the meta-analysis are displayed in Figure 5.1. Visual inspection of a funnel plot did not show obvious evidence of publication bias (Figure 5.2). Egger’s test was non-significant (p = .471).
Figure 5.1.

Forest Plot of Substance Use Frequency Outcomes at Longest Follow-Up.

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>SMD [CI 95%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zgierska et al. 2019 1</td>
<td>0.16 [-0.21, 0.54]</td>
</tr>
<tr>
<td>Zgierska et al. 2019 2</td>
<td>0.00 [-0.37, 0.37]</td>
</tr>
<tr>
<td>Zgierska et al. 2019 3</td>
<td>0.23 [-0.14, 0.60]</td>
</tr>
<tr>
<td>Zgierska et al. 2019 4</td>
<td>0.31 [-0.08, 0.69]</td>
</tr>
<tr>
<td>Zgierska et al. 2019 5</td>
<td>0.31 [-0.07, 0.70]</td>
</tr>
<tr>
<td>Zgierska et al. 2019 6</td>
<td>0.14 [-0.24, 0.53]</td>
</tr>
<tr>
<td>Bowen et al. 2014 1</td>
<td>0.13 [-0.15, 0.42]</td>
</tr>
<tr>
<td>Bowen et al. 2014 2</td>
<td>-0.08 [-0.36, 0.20]</td>
</tr>
<tr>
<td>Bowen et al. 2014 3</td>
<td>0.09 [-0.20, 0.37]</td>
</tr>
<tr>
<td>Bowen et al. 2014 4</td>
<td>-0.19 [-0.47, 0.09]</td>
</tr>
<tr>
<td>Bowen et al. 2014 5</td>
<td>-0.18 [-0.46, 0.11]</td>
</tr>
<tr>
<td>Bowen et al. 2014 6</td>
<td>-0.10 [-0.38, 0.18]</td>
</tr>
<tr>
<td>Bowen et al. 2014 7</td>
<td>-0.02 [-0.30, 0.27]</td>
</tr>
<tr>
<td>Bowen et al. 2014 8</td>
<td>-0.07 [-0.35, 0.21]</td>
</tr>
<tr>
<td>Bowen et al. 2014 9</td>
<td>0.07 [-0.22, 0.35]</td>
</tr>
<tr>
<td>Bowen et al. 2014 10</td>
<td>-0.11 [-0.38, 0.17]</td>
</tr>
<tr>
<td>Bowen et al. 2014 11</td>
<td>-0.24 [-0.53, 0.04]</td>
</tr>
<tr>
<td>Bowen et al. 2014 12</td>
<td>-0.27 [-0.55, 0.01]</td>
</tr>
<tr>
<td>Bowen et al. 2009 1</td>
<td>-0.31 [-0.66, 0.04]</td>
</tr>
<tr>
<td>Bowen et al. 2009 2</td>
<td>0.00 [-0.37, 0.37]</td>
</tr>
<tr>
<td>Bowen et al. 2009 3</td>
<td>-0.42 [-0.77, -0.07]</td>
</tr>
<tr>
<td>Witkiewicz et al. 2010 1</td>
<td>-0.21 [-0.56, 0.13]</td>
</tr>
<tr>
<td>Witkiewicz et al. 2014 1</td>
<td>-0.36 [-0.75, 0.02]</td>
</tr>
<tr>
<td>Davis et al. 2018 1</td>
<td>-1.18 [-1.66, 0.70]</td>
</tr>
<tr>
<td>Davis et al. 2018 2</td>
<td>-1.33 [-1.82, -0.84]</td>
</tr>
<tr>
<td>Van Den Bosch et al. 2002 1</td>
<td>0.26 [-0.34, 0.85]</td>
</tr>
<tr>
<td>Van Den Bosch et al. 2002 2</td>
<td>0.26 [-0.33, 0.86]</td>
</tr>
<tr>
<td>Maik et al. 2020 1</td>
<td>0.01 [-0.32, 0.33]</td>
</tr>
<tr>
<td>Smout et al. 2010 1</td>
<td>-0.04 [-0.43, 0.34]</td>
</tr>
<tr>
<td>Smout et al. 2010 2</td>
<td>0.16 [-0.22, 0.55]</td>
</tr>
<tr>
<td>Davoudi et al. 2020 1</td>
<td>-2.05 [-2.75, -1.35]</td>
</tr>
</tbody>
</table>

RE Model: -0.33 [-0.76, 0.09]
Craving Outcomes at Longest Follow-up

An overall significant, large effect was found for third wave interventions relative to controls for craving outcomes \( (d = -0.94, 95\% \text{ CI } [-1.64, -0.23], p = .009) \). Heterogeneity was high \( (I^2 = 95.98\%) \). Visual inspection of funnel plots revealed that there was possible asymmetry (Figure 5.3). This was not supported by Egger’s test \( (p = 0.55) \). Outliers were assessed and sensitivity analysis performed. Abed et al. (2019) was removed as identified by sensitivity analysis and deemed high risk of bias. When removed the overall effect size reduced from large to medium, however, remained significant \( (d = -0.63 \ [95\% \text{ CI } -1.16, -0.15], p = .014) \). Heterogeneity statistics reduced to \( I^2 = 88\% \). Subgroup analysis was performed for type of intervention to explore heterogeneity and type of
intervention as a moderator; tests of moderators were non-significant ($p = .652$) suggesting that type of third wave intervention did not influence craving outcomes at longest follow-up.

**Figure 5.3.**

*Forest Plot of Substance Use Craving Outcomes at Longest Follow-Up.*
Severity Outcomes at Longest Follow-up

The overall result for severity outcomes was non-significant for third wave interventions versus comparison groups ($d = -0.23$, 95% CI $[-0.52, 0.06]$). Results are displayed in Figure 5.5. Tests of heterogeneity were high ($I^2 = 74.61\%$). Sensitivity analysis using Cook’s distance was conducted to assess for outliers (Bahrami et al, 2017, Villagrá Lanza et al., 2014). Visual inspection of funnel plots did not demonstrate obvious signs of publication bias (Figure 5.6). Egger’s test was non-significant supporting this judgment ($p = .112$).
Figure 5.5.

*Forest Plot of Substance Use Severity Outcomes at Longest Follow-Up.*

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>SMD [CI 95%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Villagrá Lanza et al. 2014 1</td>
<td>-1.07 [-1.76, -0.38]</td>
</tr>
<tr>
<td>Villagrá Lanza et al. 2014 2</td>
<td>-0.16 [-0.81, 0.49]</td>
</tr>
<tr>
<td>Villagrá Lanza et al. 2014 3</td>
<td>-1.24 [-2.01, -0.46]</td>
</tr>
<tr>
<td>Villagrá Lanza et al. 2014 4</td>
<td>-0.84 [-1.59, -0.10]</td>
</tr>
<tr>
<td>Villagrá Lanza et al. 2014 5</td>
<td>-0.11 [-0.75, 0.54]</td>
</tr>
<tr>
<td>Villagrá Lanza et al. 2014 6</td>
<td>0.00 [-0.71, 0.71]</td>
</tr>
<tr>
<td>Villagrá Lanza et al. 2014 7</td>
<td>-0.13 [-0.77, 0.52]</td>
</tr>
<tr>
<td>Villagrá Lanza et al. 2014 8</td>
<td>0.26 [-0.45, 0.98]</td>
</tr>
<tr>
<td>Villagrá Lanza et al. 2014 9</td>
<td>0.71 [0.04, 1.37]</td>
</tr>
<tr>
<td>Villagrá Lanza et al. 2014 10</td>
<td>1.09 [0.86, 2.52]</td>
</tr>
<tr>
<td>Witkiewitz et al. 2014 1</td>
<td>-0.07 [-0.45, 0.31]</td>
</tr>
<tr>
<td>Witkiewitz et al. 2014 2</td>
<td>-1.20 [-1.62, -0.78]</td>
</tr>
<tr>
<td>Witkiewitz et al. 2014 3</td>
<td>-0.65 [-1.04, -0.25]</td>
</tr>
<tr>
<td>Witkiewitz et al. 2014 4</td>
<td>-0.53 [-0.92, -0.14]</td>
</tr>
<tr>
<td>Bahrami et al. 2017 1</td>
<td>-0.26 [-0.98, 0.46]</td>
</tr>
<tr>
<td>Bahrami et al. 2017 2</td>
<td>-0.84 [-1.59, -0.09]</td>
</tr>
<tr>
<td>Bahrami et al. 2017 3</td>
<td>-0.73 [-1.47, 0.01]</td>
</tr>
<tr>
<td>Bahrami et al. 2017 4</td>
<td>-0.90 [-1.65, -0.15]</td>
</tr>
<tr>
<td>Bahrami et al. 2017 5</td>
<td>-0.13 [-0.85, 0.58]</td>
</tr>
<tr>
<td>Bahrami et al. 2017 6</td>
<td>-1.79 [-2.64, -0.94]</td>
</tr>
<tr>
<td>Bahrami et al. 2017 7</td>
<td>-3.26 [-4.35, -2.17]</td>
</tr>
<tr>
<td>Vowles et al. 2020 1</td>
<td>-0.71 [-1.57, 0.16]</td>
</tr>
<tr>
<td>Van Den Bosch et al. 2002 1</td>
<td>0.17 [-0.43, 0.76]</td>
</tr>
<tr>
<td>Van Den Bosch et al. 2002 2</td>
<td>0.25 [-0.35, 0.84]</td>
</tr>
<tr>
<td>Smout et al. 2010 1</td>
<td>0.11 [-0.28, 0.49]</td>
</tr>
<tr>
<td>Villagrá Lanza et al. 2013 2</td>
<td>-0.08 [-0.79, 0.63]</td>
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<td>Villagrá Lanza et al. 2013 3</td>
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</tr>
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</tr>
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<td>Villagrá Lanza et al. 2013 5</td>
<td>0.00 [-0.71, 0.71]</td>
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<tr>
<td>Villagrá Lanza et al. 2013 6</td>
<td>0.29 [-0.42, 1.01]</td>
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<td>González-Menéndez et al. 2014 1</td>
<td>-0.14 [-0.96, 0.67]</td>
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<tr>
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</tr>
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<td>González-Menéndez et al. 2014 4</td>
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</tr>
<tr>
<td>González-Menéndez et al. 2014 5</td>
<td>-0.07 [-0.88, 0.75]</td>
</tr>
<tr>
<td>Hayes et al. 2004 1</td>
<td>-0.20 [-0.79, 0.40]</td>
</tr>
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<td>Hayes et al. 2004 2</td>
<td>-0.13 [-0.72, 0.47]</td>
</tr>
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<td>-0.44 [-1.64, 0.16]</td>
</tr>
<tr>
<td>Hayes et al. 2004 4</td>
<td>-0.10 [-0.69, 0.49]</td>
</tr>
<tr>
<td>Hayes et al. 2004 5</td>
<td>0.09 [-0.50, 0.68]</td>
</tr>
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<td>Hayes et al. 2004 6</td>
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</tr>
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<td>0.05 [-0.54, 0.64]</td>
</tr>
<tr>
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</tr>
<tr>
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<td>0.32 [-0.28, 0.91]</td>
</tr>
<tr>
<td>Hayes et al. 2004 10</td>
<td>0.78 [0.16, 1.39]</td>
</tr>
</tbody>
</table>

RE Model

-0.23 [-0.52, 0.06]
Figure 5.6.

Funnel Plot for Publication Bias for Substance Use Severity Outcomes: Cohen’s $d$ to Standard Error.

Post-hoc Analyses

Negative Affect at Longest Follow-up

Although the focus of the present meta-analysis was substance-use outcomes, several studies included a measure of negative affect ($n = 9$). Third wave interventions have been proposed to be transdiagnostic in nature. Negative affect has been identified to be a robust predictor of substance use craving and relapse (Selva Kumar et al., 2021; Sinha, 2001; Sinha, 2008). A post-hoc analysis was conducted to assess the effect of third wave interventions on measures of negative affect relative to controls. The overall result for severity outcomes was non-significant ($d = -0.38$, 95% CI [-0.77, 0.01], $p = .056$). Results are presented in Figure 5.7. High levels of heterogeneity were
observed ($I^2 = 87.03\%$). Visual inspections of funnel plots did not reveal indication of publication bias (Figure 5.8). Egger’s test was non-significant ($p = .842$).

Figure 5.7.

Forest Plot of Negative Affect Outcomes at Longest Follow-Up.

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>SMD [CI 95%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hayes et al. 2004 1</td>
<td>-0.19 [-0.76, 0.39]</td>
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<tr>
<td>Hayes et al. 2004 2</td>
<td>0.11 [-0.47, 0.70]</td>
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<td>Glasner-Edwards et al. 2017 2</td>
<td>-0.55 [-1.05, -0.04]</td>
</tr>
<tr>
<td>Weiss de Souza et al. 2020 1</td>
<td>0.20 [-0.54, 0.94]</td>
</tr>
<tr>
<td>Weiss de Souza et al. 2020 2</td>
<td>0.20 [-0.54, 0.94]</td>
</tr>
<tr>
<td>Weiss de Souza et al. 2020 3</td>
<td>0.23 [-0.51, 0.97]</td>
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<td>Zemestiani et al. 2016 1</td>
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<td>-0.16 [-0.50, 0.19]</td>
</tr>
<tr>
<td>Rezaie et al. 2021 1</td>
<td>-0.83 [-1.41, -0.25]</td>
</tr>
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<td>Carlyle et al. 2020 1</td>
<td>-0.01 [-0.77, 0.75]</td>
</tr>
<tr>
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<td>0.15 [-0.61, 0.91]</td>
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<td>0.43 [-0.34, 1.19]</td>
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<td>-0.51 [-1.30, 0.28]</td>
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<tr>
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<td>0.06 [-0.72, 0.84]</td>
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<td>-0.04 [-0.82, 0.74]</td>
</tr>
<tr>
<td>Davis et al. 2018 1</td>
<td>-0.74 [-1.20, -0.28]</td>
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</tbody>
</table>

RE Model: $-0.37 [-0.81, 0.08]$
Quality of Included Studies

Assessing methodological quality is integral in evaluating validity of findings; biases may be introduced throughout the study process, raising questions about the estimation of the true intervention effect (Higgins et al., 2021). Risk of bias was evaluated for each study using RoB2 (Sterne et al., 2019) by the first author, 25% of included studies were independently assessed by a trainee clinical psychologist. Disagreements were resolved through discussion. Weighted Cohen’s kappa was deemed moderate ($\kappa = .42, p < .001$; Landis & Koch, 1977). A summary of risk of bias is displayed in Figure 6.1. Quality assessments for individual studies are presented in Appendix E, Table
E1. Overall, most studies were rated as having a high risk of bias (n = 20), nine raised some concerns. Only two studies were rated as being at low risk of bias. “Bias in the measurement of the outcome” was the category that displayed the most risk with 21 studies falling within the high-risk category. This was namely due to insufficient reporting of blinding of assessors, opening risk to detection bias.

Within the “bias arising from the randomization process” domain, most studies (n = 22) did not provide sufficient data relating to the randomization process, such as method used or concealment of randomization, raising some concerns. Two studies were classified as being at high risk of bias in this domain. This was related to lack of randomization concealment. Blinding of participants and research personnel is important in reducing performance bias (Probst et al., 2016). Most studies rated as low risk of bias in the domain of “bias in selection of the reported result” with the remaining seven raising some concerns. “Bias due to deviations from intended interventions” flagged some concerns across nine of the included studies. This was mostly attributed to insufficient reporting. Approximately half of the studies (n = 16) employed intention-to-treat analysis that included all randomized participants. “Bias due to missing outcome data” showed the least risk of bias across all studies.

**Figure 6.1.**

*RoB2 risk of bias summary (%).*

<table>
<thead>
<tr>
<th>Category</th>
<th>Low risk</th>
<th>Some concerns</th>
<th>High risk</th>
</tr>
</thead>
<tbody>
<tr>
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<td>10%</td>
<td>30%</td>
<td>60%</td>
</tr>
<tr>
<td>Selection of the reported result</td>
<td>10%</td>
<td>30%</td>
<td>60%</td>
</tr>
<tr>
<td>Measurement of the outcome</td>
<td>10%</td>
<td>30%</td>
<td>60%</td>
</tr>
<tr>
<td>Mising outcome data</td>
<td>10%</td>
<td>30%</td>
<td>60%</td>
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<tr>
<td>Deviations from intended interventions</td>
<td>10%</td>
<td>30%</td>
<td>60%</td>
</tr>
<tr>
<td>Randomization process</td>
<td>10%</td>
<td>30%</td>
<td>60%</td>
</tr>
</tbody>
</table>
Discussion

This initial meta-analysis examined the effectiveness of third wave psychological interventions on substance use frequency, cravings, and severity outcomes. A systematic search of literature exploring third wave approaches in substance use treatment yielded 31 randomized trials for inclusion. Twenty-five of these studies were included for meta-analysis. Results of the meta-analysis found that third wave interventions were significantly more effective than control conditions in reducing craving outcomes, with a large effect size observed ($d = -0.94$). However, this effect may have been inflated: when an outlier with poor methodological quality, that was at high risk of bias, was removed the effect size reduced to medium ($d = -0.63$). The effect observed for cravings at longest follow-up in favour of third wave interventions are consistent with other studies (e.g., Davis et al., 2018; Witkiewitz & Bowen, 2010). Meta-analyses exploring MBIs in SUDs have reported similar findings (Grant et al., 2017; Li et al., 2017). Craving is a robust predictor of substance use and relapse (Breese et al., 2011; Kavanagh & Connor, 2013). Findings of the present review suggests that third wave interventions are effective in reducing cravings. The interventions studied were protocol-based and largely delivered in the same format by trained therapists/clinical psychologists, making these interventions feasible to deliver in clinical practice. The outcomes for cravings were all reported at short-term follow-up (ranging from post-treatment to three-months). The current review cannot speak to the medium or long-term effects.

Test of subgroup differences indicated that there was no statistically significant subgroup effect for type of intervention on craving outcomes. However, within this subgroup most trials explored MBRP ($n = 8$) relative to DBT ($n = 2$). Uneven covariate distribution paired with high levels of unexplained heterogeneity may have precluded the likelihood of the analysis producing a valid, significant result. Further, variation in assessment measures employed and substance used may have influenced findings. For example, DBT assessed cravings with different assessment measures (i.e., Drug Desire Questionnaire, Franken et al., 2002; Marijuana Craving Questionnaire; Heishman et al., 2001) and assessed different substances (e.g., cannabis, methamphetamine) relative to the Penn
Alcohol Cravings Scale (Flannery et al., 1999) which was employed to explore cravings in SUDs more generally in the majority of the remaining MBRP studies. Uneven covariate distribution hindered opportunity for meaningful analysis of other potential moderators.

Third wave interventions were not found to be significantly more effective than comparison groups at longest follow-up period for frequency outcomes. Findings for frequency outcomes were largely consistent, with exception of identified outliers (i.e., Davis et al., 2018, Davoudi et al., 2020). Findings are consistent with a 2017 meta-analysis, in which no significant differences were observed for MBRP relative to RP, CBT, TAU, and health education for frequency outcomes (Grant et al., 2017). A 2018 meta-analysis of mindfulness practice in SUDs, found that MBIs did not differ compared to first-line interventions such as CBT (Goldberg et al., 2018) at post-intervention and follow-up. However, a recent meta-analysis looking at mindfulness treatments in SUDs found small-to-large effects in reducing frequency and severity of substance use compared to alternative treatments (e.g., TAU, CBT, support groups) (Li et al., 2017). Further exploration of outliers highlighted several factors that may account for the larger effect sizes observed for these studies. Davis et al. (2018) explored MBRP alongside TAU with two sessions weekly in residential adolescent treatment, relative to most other studies included that investigated MBRP alone in adults delivered in a six-to-eight-week weekly format. Davis et al. further assessed frequency using the Global Appraisal of Individual Needs (Dennis et al., 2002) whilst remaining studies used the Timeline Follow-Back Method (Sobell & Sobell, 1992). Davoudi et al. (2020) focused specifically on adults with marijuana disorder and explored DBT relative to psychoeducation in place of an active comparator which may explain the inflated effect size.

Like frequency, no significant effect was observed for severity outcomes relative to comparator groups at longest follow-up. Effects were largely consistent except for identified outliers (i.e., Bahrami et al, 2017, Villagrá Lanza et al., 2014). Both studies employed the Addiction Severity Index (Mclellan et al., 1992) in measuring severity and reported subscale scores. A higher score was observed for Bahrami et al. (2017) for the subscale measuring effects on psychiatric severity and
interpersonal difficulties with family relative to waitlist controls. Witkiewitz et al. (2014) also reported the psychiatric domain with the effects of MBRP comparable to controls, however, this was compared to an active control (RP) which may explain the larger effect observed for Bahrami et al. (2017). Interestingly, Villagrá Lanza et al. (2014) found that the waitlist control was more effective in reducing addiction severity in the familial domain relative to ACT in female prisoners, though the present review cannot attest to why this may have been observed.

A post-hoc analysis exploring the effects of third wave interventions on negative affect did not reveal statistically significant differences between third wave interventions and control groups at longest follow-up period. This was inconsistent with findings from other studies (e.g., Rogojanski et al., 2011; Witkiewitz et al., 2013) and meta-analytic reviews (Li et al., 2017), that have observed significant effects for both negative affect in addition to cravings following treatment. However, operationalisation of negative affect varied across studies (e.g., post-traumatic stress, depression, and anxiety), making it difficult to compare findings. More generally, there were several studies included for meta-analytic review for frequency, severity and negative affect that had small sample sizes. Most studies did not conduct a priori power analysis. Studies with small sample sizes are prone to low statistical power, which may have reduced the likelihood of detecting a true effect (Button et al., 2013). Due to heterogeneity across study follow-up periods, this review looked at effects at longest follow-up period, which may partially explain the non-significant effect observed across these outcomes. Many studies have reported plateau of effects as time passes (e.g., Bowen et al., 2009; Goldberg et al. 2018; Grow et al. 2015), with factors such as home practice potentially influencing the maintenance of effect (e.g., Grow et al., 2015). Further studies are required to establish effects post-treatment relative to follow-up and mediators and moderators of treatment effects.

Furthermore, many studies included for review compared third wave interventions to a TAU control group, however, several of these included elements of psychosocial interventions such as CBT and RP, robust comparators. Given that there are inconsistent findings as to whether one
treatment for SUDs is superior to another, this is an important consideration when interpreting the results of the present review (Goldberg et al., 2018). More research is required to determine whether third wave interventions are more effective than first-line interventions or if effects are comparable. Lastly, effects may vary depending on types of substance use explored. In a review exploring CBT for SUDs, McHugh et al. (2010) found that larger treatment effect sizes were found for cannabis use, followed by cocaine and opioids, with the smallest effect size being observed in polysubstance dependence. Due to insufficient number of studies and uneven covariate distribution, the following review did not perform subgroup analyses for substances used. However, most studies explored a mix of SUDs. It is therefore possible that primary substance used within these populations influenced treatment effects across studies.

**Strengths and Limitations**

The protocol for the following review was pre-registered a priori and followed reporting guidelines to improve transparency. Due to paucity of substance use research, review criteria were intentionally broad to capture a wide range of literature. RCTs and quasi-randomized trials were included, with most studies employing similar, validated outcome measures, and implementing manualised approaches delivered by a trained therapist. A key strength of this review is that a three-level meta-analytic model was applied. Many studies included for review reported several effect sizes for the outcomes of interest. Traditional approaches such as calculating the average between effects may have led to missed opportunities to use available data to address the research question (Cheung, 2019; Van den Noortgate et al., 2013). Failure to consider dependency in relation to multiple reported effects would have posed threat to validity and increased probability of type-1 errors (Aarts et al., 2014).

The current review was exploratory in nature and has several limitations; findings should therefore be interpreted with caution. Firstly, the search strategy and assessment of methodological quality was conducted predominantly by one reviewer. All studies were published in English. There is a risk that important studies were missed from analysis. Two or more reviewers throughout the
entire review process could reduce risk of bias and random errors (McDonagh et al., 2013). Most studies included within this review were classified as being at high risk of bias. This was largely related to insufficient reporting. Insufficient reporting on clinical trials brings into question the validity of findings of this review and makes it difficult for future researchers to replicate findings. Moreover, small sample sizes and poor statistical power may have limited the study in finding significant effects (Button et al., 2013). As inclusion criteria were broadly defined to capture as many studies as possible, there was a large degree of heterogeneity across studies, thus the generalisability of findings is uncertain. This review included several heterogeneous cohorts (i.e., prisoners, veterans, adults from the general population, adults with and without a formal diagnosis, adults in residential treatment) and explored a variety of different substances. Although this may increase generalisability to some degree, the populations studied will have diverse treatment needs that vary in complexity. This is particularly important given that treatment effects may vary depending on substance used (Dutra et al., 2008).

Due to small number of studies with data sufficient for analysis for each outcome and uneven covariate distribution, it was not feasible to conduct meaningful subgroup analysis or meta-regression to explore sources of heterogeneity and further potential moderators. Only one study utilising CFT met criteria for review, with insufficient data for inclusion in meta-analysis. Several moderators may have been important to consider, such as substance used, population, clinical versus non-clinical groups, home practice/treatment adherence, length of follow-up and active versus passive control groups. However, these were not planned a priori or subsequently explored. Interventions varied substantially in length across MBRP, ACT and DBT, with some failing to employ measures of treatment fidelity, and no studies reporting patient adherence to treatment (e.g., homework practice). There remain questions relating to what “dose” of treatment is most effect and for whom, given that effects may vary depending on risk factors and substance of choice (e.g., Dutra et al., 2008). Due to variation in intervention length and length of follow-up periods, it was not possible to determine short, medium, or long-term effects of third wave interventions as
recommended by the Cochrane Handbook (Higgins et al. 2021). Employing longest follow-up period may have missed important differences in post-treatment effects in the short and long-term. Attrition rates, where reported, were largely comparable to that of control interventions. However, the present study did not explore attrition in greater detail.

**Future Directions**

Future research should address the methodological limitations identified within this review. This could include documenting whether concealment was used at randomization, blinding procedures of participants and study assessors, and sufficient reporting of the research methods used to replicate findings and strengthen study validity. Poor methodological quality in substance use research has been limitation of several reviews (e.g., Chiesa & Serretti, 2014; Magwood et al., 2020). Improvement in study quality will be integral for the validity of future reviews within this field. Additionally, further work is required to determine the effectiveness of third wave therapies in comparison to first-line interventions used in the treatment of SUDs, such as CBT and RP across different populations and substances. To reduce heterogeneity, the following review explored individual and group MBRP, ACT, DBT and CFT. However, considering the COVID-19 pandemic (WHO, 2019) with restrictions placed on treatment accessibility (Bojdani et al., 2020), it may be beneficial to explore the effectiveness of third wave interventions in other formats such as telephone or online. Providing options for treatment delivery mode could enhance treatment acceptability for those who may find face-to-face therapies difficult (Campbell et al., 2014).

Despite potential evidence for reductions in craving outcomes much remains unknown about the impact of third wave processes on treatment effects in relation to substance use (Garey et al., 2020) and disorder-specific mechanisms (e.g., stigma and shame, Stotts & Northrup, 2015). A limited number of studies included an outcome measure or data for processes such as mindfulness or psychological flexibility. Future studies should aim to include and report a measure of underlying processes to identify potential mechanisms underlying treatment effects across different populations. This would allow clinicians to administer or adapt their approach based on what works
best for whom in accordance with the evidence-base. Shifting from a purely syndromal approach to processes-based care may enhance patient outcomes (Hayes & Hofmann, 2017). Including measures relating to processes and providing sufficient data will allow further evaluation of the effectiveness of third wave interventions and the underlying mechanisms.

Conclusions

Findings from this initial review provides insight into the current state of evidence for third wave treatments in substance use, lending some support to the idea that they may be a promising option for managing cravings. However, no significant effects were observed for frequency and severity of substance use relative to comparators. Limitations of this review bring into question the certainty of findings, effectiveness of these interventions individually, effects across populations/substance used and the short, medium, and long-term effects relative to active versus passive control groups (e.g., CBT versus waitlist). The small number of studies with data sufficient for analysis for each outcome, alongside substantial heterogeneity and poor methodological quality makes it difficult to draw firm conclusions on effects of third wave interventions. Further research is required to address methodological shortcomings within the literature to allow for a more comprehensive review, and to elucidate the processes underlying such interventions more broadly and in the treatment of substance use.
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Introduction
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Material and methods
Provide sufficient details to allow the work to be reproduced by an independent researcher. Methods that are already published should be summarized, and indicated by a reference. If quoting directly from a previously published method, use quotation marks and also cite the source. Any modifications to existing methods should also be described.

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Results should be clear and concise.

Discussion
This should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature.

Conclusions
The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section.

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If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly for tables and figures: Table A.1; Fig. A.1, etc.
**Essential title page information**

- **Title.** Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.
- **Author names and affiliations.** Please clearly indicate the given name(s) and family name(s) of each author and check that all names are accurately spelled. You can add your name between parentheses in your own script behind the English transliteration. Present the authors’ affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author’s name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name and, if available, the e-mail address of each author.
- **Corresponding author.** Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. This responsibility includes answering any future queries about Methodology and Materials. Ensure that the e-mail address is given and that contact details are kept up to date by the corresponding author.
- **Present/permanent address.** If an author has moved since the work described in the article was done, or was visiting at the time, a 'Present address' (or 'Permanent address') may be indicated as a footnote to that author’s name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

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Highlights are mandatory for this journal as they help increase the discoverability of your article via search engines. They consist of a short collection of bullet points that capture the novel results of your research as well as new methods that were used during the study (if any). Please have a look at the examples here: [example highlights](#).

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**Keywords**

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**Abbreviations**

Define abbreviations that are not standard in this field in a footnote to be placed on the first page of the article. Such abbreviations that are unavoidable in the abstract must be defined at their first mention there, as well as in the footnote. Ensure consistency of abbreviations throughout the article.

**Acknowledgements**

Collate acknowledgements in a separate section at the end of the article before the references and do not, therefore, include them on the title page, as a footnote to the title or otherwise. List here those individuals who provided help during the research (e.g., providing language help, writing assistance or proof reading the article, etc.).
Appendix B

Empirical Project Highlights

- This is the first study to explore attachment-based mechanisms underpinning insecure attachment and substance use involvement in adolescents.

- Emotion dysregulation and reflective functioning were significant mediators of insecure attachment and substance use involvement across relationship domains (i.e., mother-like figure, father-like figure, romantic attachment and best friend).

- Romantic avoidant attachment was the only relationship domain to directly predict substance use involvement.
Appendix C

Ethical Approval

Figure C1.

First page of ethical approval.

North West - Haydock Research Ethics Committee
3rd Floor - Barlow House
4 Minshull Street
Manchester
M1 3DZ

Telephone: 02071046211

Please note: This is the favourable opinion of the REC only and does not allow you to start your study at NHS sites in England until you receive HRA Approval.

16 March 2021 Re-issued 07 May 2021

Dr Matthias Schwannauer
Professor of Clinical Psychology/Head of School, School of Health in Social Science
University of Edinburgh
Room 2.14, Doorway 6, Medical Quad,
Teviot Place
Edinburgh
EH8 9AG

Dear Dr Schwannauer

Study title: Attachment, Reflective Functioning and Emotion Regulation in relation to Substance Use in Adolescents
REC reference: 21/NW/0134 (Initially submitted as 21/PR/0249 before being transferred to a Full REC meeting)
Protocol number: CAHSS2012/05
IRAS project ID: 291670

The Research Ethics Committee (REC) reviewed the above application at the meeting held on 09 March 2021. Thank you for attending to discuss the application.

Ethical opinion

The members of the Committee present gave a favourable ethical opinion of the above research on the basis described in the application form, protocol and supporting documentation, subject to the conditions specified below.
Figure C2.

Last page of ethical approval.

With the Committee’s best wishes for the success of this project.

Yours sincerely

Andrea Bell
Approvals Specialist

On behalf of

Mr Stephen Edgar
Chair

E-mail: haydock.rec@hra.nhs.uk

Enclosures: List of names and professions of members who were present at the meeting and those who submitted written comments

“After ethical review – guidance for researchers”

Copy to: Miss Charlotte Smith
Appendix D

Study Documentation

Figure D1.

Participant Consent Form

Title of Study: Psychological Factors Influencing Substance Use in Young People

Name of Researcher: Ms Adele Donaldson

Contact Address:

1. I confirm that I have read and understood the Participant Information Sheet (Version 1, 30 Jan 2021). I understand that I can contact the researcher with questions relating to the study.

2. I understand that if I choose to take part that I can also withdraw at any time if I do not feel comfortable for any reason.

3. I understand that my answers to the survey will be anonymous and will be treated confidentially.

4. I understand that my anonymous data will be stored for 10 years on the University of Edinburgh file servers and then destroyed securely.

5. I understand that relevant sections of data collected during the study may be looked at by individuals from the regulatory authorities and from the Sponsor University of Edinburgh or from other NHS Boards where it is relevant to taking part of in this research. I give permission for those individuals to have access to my records.

6. I agree to take part in the above study.

I agree with the above statements and would like to proceed.

If you do not wish to proceed, please leave the study by exiting this webpage.

Page 1 of 1
Figure D2.

Part of Participant Information Sheet

**Participant Information Sheet**

**Study title: Psychological Factors Influencing Substance Use in Young People**

**Introduction**

My name is Adele Donaldson. I am a Trainee Clinical Psychologist at the University of Edinburgh. I am undertaking a research study as part of my training, and am doing so under the supervision of Dr Matthias Schwannauer, who is a Professor of Clinical Psychology at the University of Edinburgh, and Dr Andrea Cowley-Gallagher, a Clinical Psychologist in the NHS. I would like to invite you to take part in our research project.

Before you decide if you would like to take part or not, it is important that you understand why this research is being done and what you will be asked to do. Please read this sheet carefully as many times as you like and talk to your family, friends or health professional if you would like to.

**What is this research study about?**

We are asking you to take part in this research to understand what psychological factors influence substance use (e.g. drink, smoking/vaping, drugs) in young people between the ages of 12 and 24 years old. We will be looking at factors such as the ability to manage emotions, how we understand ourselves and others and our relationships with others.

**Who can participate?**

You can participate in the online study if you are **between the ages of 16 and 24**. You may or may not have tried smoking, alcohol, drugs or other substances.

**Do I have to take part?**

No. Your participation in this research is voluntary. This means you do not have to take part in the study if you do not want to. If you would like to take part, you will be asked to give your consent by selecting the agree option on the online survey. You are free to stop taking part at any time during the research without giving a reason.

**What will I have to do?**

If you decide to take part, you will be asked to complete 6 questionnaires online. The questionnaire will ask questions about your mental health, substance use, your
relationships with other people, how you understand yourself and others, and how you manage emotions. You only have to complete these questionnaires one time. If you decide to take part, the study will take approximately 20-30 minutes to do (this is including reading through the resource sheet available at the end of the study). All of the questions are in English so it is important that you have a sufficient level of English language to be able to read and understand the survey.

What are the benefits of taking part?

There are no direct benefits but if you take part you will be helping researchers and health professionals to understand what factors influence substance use in young people. This means they will be better able to understand and improve healthcare services offered in the NHS to young people with difficulties with substance use who are the same age as you.

To thank you for your participation, you have the option to enter a prize draw for a Teen Choice voucher following completing the questionnaires. You can use this voucher across stores such as Costa, ASOS, Spotify, Wagamama, Odeon, Nike, Topshop/Topman and WH Smith. There are 4 x £25 vouchers available to win. To enter the competition, you must complete the survey and provide a valid email address.

Will anyone else know that I am participating?

Any information you give us will be kept without your name on it (you will be given a unique participant number rather than name), so no-one will know what responses you have provided on the questionnaires. Your questionnaire responses will be used only for research purposes and will be stored on secure databases on a password protected laptop. All of the anonymous information collected will be kept safely for ten years on the University of Edinburgh file servers and then destroyed securely. Personal data, such as participant consent forms and email addresses for the prize draw, will be destroyed on completion of the study. The only people who will have access to your data are the principle researchers.

What should I do if completing these questionnaires make me feel upset or worried?

The questionnaires that you will be asked to complete have frequently been used in research so we do not think there are any risks to you taking part. However, if you feel upset or worried by any of the questionnaires that you complete, it’s important that you have the opportunity to talk to someone about this. The best person might be a parent/caregiver or doctor, but they aren’t the only people you can speak to. We have included a list of other resources that are available to support you with this.
Non-CTIMP Study Protocol

Attachment, Reflective Functioning and Emotion Regulation in relation to Substance Use in Adolescents

The University of Edinburgh
College of Arts, Humanities and Social Sciences
55 George Square,
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Protocol authors
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Chief Investigator
Dr Matthias Schwannauer

Sponsor number
CAHSS2012/05

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21/NW/0134

Version Number and Date
Version 2.04 May 2021
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<td>CI</td>
<td>Chief Investigator</td>
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<td>CRF</td>
<td>Case Report Form</td>
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<td>GCP</td>
<td>Good Clinical Practice</td>
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<td>International Conference on Harmonisation</td>
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1 INTRODUCTION

1.1 BACKGROUND

Adolescent Substance Use

Adolescence is the transition between childhood and adulthood characterised by biological, physical, social and cognitive development. The likelihood of the development of problematic alcohol and drug use is higher during adolescence than other developmental periods (Gladwin et al., 2011; Thatcher & Clark, 2008). Adolescent substance use is heterogeneous ranging from experimenting with tobacco, alcohol and more illicit substances, to developing longer-term, high-risk substance use disorders (SUD; Gray & Squeglia, 2018). Whilst drug experimentation is typically common in adolescence, substance use prior to the age of 15 years has been shown to be a robust predictor of substance dependence by late adolescence (Lopez-Quintero et al., 2011). Adolescent substance use is also associated with increased risk of adverse outcomes in mental and physical wellbeing (Feinstein et al., 2012). Several theories and risk factors have been proposed to explain the development and maintenance of substance use. For example, research has suggested that difficulties with interpersonal and family functioning may predispose individuals to using substances (Fairbairn & Cranford, 2016; Fairbairn & Sayette, 2014). Studies exploring adolescent substance use have highlighted that adolescents who use substances have a higher likelihood of problematic relationships with family members (McNally et al., 2003) and fewer close social relationships with peers (Wilsnack et al., 1991).

Attachment Theory

There is an emerging interest in the application of attachment theory in understanding substance use and the development of SUD. Attachment theory (Bowlby, 1988) suggests a developmental pathway between insecure attachment and problematic substance use (Schindler & Bröning, 2019). Emerging empirical research has begun to demonstrate a link between insecure attachment and substance use (e.g. Borhani, 2013; Caspers et al., 2006; Thorberg & Lyvers, 2010). However, results have been mixed; Danielsson et al. (2010) found no significant differences in risk of substance use between adolescents with secure and insecure attachments. Though research relating to substance use and attachment is still in its infancy, studies have been limited by the implementation of a variety of differing methodologies and varying conceptualisations of attachment (Becoña et al., 2013) making it difficult to draw firm conclusions. Despite evidence to suggest that the onset of substance use typically begins in adolescence, empirical research relating to adolescent attachment and substance use is scarce, with available studies focusing on substance use and attachment in adult populations. This may be partly accounted for by the lack of validated measures of attachment in adolescence (Bosmans & Krens, 2015; Wilson & Wilkinson, 2012).
Emotion Regulation

There has been a theoretical link inferred between attachment and emotion regulation (ER) in substance use literature (e.g. Thorberg & Lyver, 2010). ER can be defined as ‘strategic control of one or more components of emotional responding’ (Gross, 2014). ER is thought to play a complex role in substance use (Kober, 2014; Schulte et al., 2010), with ER processes being implicated in the likelihood of the development of occasional substance use into a SUD (Seigel, 2015; Wills et al., 2017). Insecure attachment has been found to be related to ER (e.g. Morel & Papouchis, 2015). Evidence suggests that adolescents with insecure attachments have difficulties regulating their emotions compared to those with secure attachments (Colle & Del Guidice, 2011); ER has been implicated in the development of psychopathology in adolescence (Ibraheim et al., 2017). In relation to substance use, low levels of ER have been associated with increased substance use in adolescents (Estévez et al., 2017; Mullin & Hinshaw, 2007; Schreiber et al., 2012). In a study by Thorberg & Lyvers (2010), they found support for the association and predictive power of attachment in abilities in ER and interpersonal and intrapersonal functioning in a sample of patients with SUD.

Existing research has inferred that ER mediates the relationship between insecure attachment and substance use (e.g. Kassel et al., 2007), however, research exploring this association is limited (Thorberg & Lyvers, 2010). From an attachment perspective, substance use has been conceptualised as an attempt to “self-medicate” and regulate distressing emotional states (Khartanian, 2014; Schindler, 2019). The Self-Medication Hypothesis (SMH; Khantzian, 2003) implies that individuals with insecure attachments have fewer adaptive coping strategies when managing difficult emotional states, therefore a greater likelihood of using substances in order to moderate distress. However, it has been argued that theories such as the SMH do not account for the complex process of substance use (Lembke, 2012). More recently, research has considered the role of another attachment-related variable, reflective functioning, in problematic substance use. Reflective functioning is closely related to ER and attachment security (Fonagy et al., 2018; Jurist, 2008), thus may be implicated in influencing the impact of attachment on substance use. However, to date reflective functioning has predominantly been studied in relation to maternal drug addiction (e.g. Suchman et al., 2017), with research neglecting the potential role of reflective functioning in the development and maintenance of substance use during adolescence.

Reflective Functioning

Reflective functioning (RF), also known as mentalisation, is the ability to understand one’s own thoughts and feelings underlying behaviour, and the thoughts, feelings and intentions of others (e.g. Fonagy et al., 2016; Katznelson, 2014). RF is important in interpersonal relationships, self-awareness and self-regulation (e.g. Allen & Fonagy, 2006), thus, may have implications for individuals who use substances. RF is thought to be a developmentally acquired skill which develops within the context of secure attachments (Fonagy et al. 2018; Fonagy et al., 2016). Research has shown that individuals with higher levels of RF are more likely to have secure attachments.
(Ensink et al., 2014; Fonagy & Bateman, 2016) and that the link between attachment and RF is relationship-specific (Bączkowski & Clerpiątkowska, 2015). The role of RF has been studied in depression (Luyten & Fonagy, 2018), borderline personality disorder (Luyten et al., 2020) and eating disorders (e.g. Robinson et al., 2014). Interestingly, RF has been theorised to act as a transdiagnostic buffer against maladaptive outcomes (e.g. insecure attachment and psychopathology; Fonagy et al., 2018; Luyten et al., 2020). Research suggests that RF acts as a protective factor against insecure attachment and the development of psychopathology among adults who have experienced early abuse and neglect (e.g. Borelli et al., 2015; Fonagy et al., 2000).

Given that RF is developed in the context of secure attachments and is implicated in interpersonal functioning and ER, it may be that increased substance use is associated with lower levels of RF. A recent empirical study found that ER mediates the relationship between attachment and substance use (Teles, 2019). Interestingly, in an exploratory analysis, they highlighted that individuals with insecure attachments had higher levels of emotion dysregulation, and lower levels of RF. This was in turn associated with higher levels of substance use. Although preliminary, findings support the suggestion that substance use is associated with attachment, ER and RF. Furthermore, substance use may reduce the capacity for RF (Phillips et al., 2012; Schindler, 2019). As aforementioned, deficits in RF may prevent individuals from having an adequate buffer to emotional distress (Savov & Atanassov, 2013). As emotional states heighten, deficits in RF become more pronounced (Bateman & Fonagy, 2016), this would then lead to self-regulation through the use of substances (Phillips et al., 2012). This would infer a two-way relationship between RF and substance use: substance use may impair RF of emotional states and those of attachment figures, the reduced capacity for RF may then contribute to substance use following from psychological distress caused by conflicts in attachment (Allen et al., 2008).

1.2 RATIONALE FOR STUDY

Despite theoretical links being drawn between attachment, ER and RF in the development and maintenance of substance use, to the researcher’s knowledge there are no studies that systematically explore these processes in relation to substance use during adolescence. Given the dynamic changes during adolescence in attachment, ER and RF (Brenning & Braet, 2013), and that substance use is typically initiated in adolescence, it seems important to consider these processes within a developmental context. Furthermore, substance use may also have an adverse impact on parent-child relationships during adolescence (Stormshak et al., 2014) for adolescents and their families. Understanding the mechanisms underlying attachment and substance use may consequently have clinical implications for targets for intervention (Yurasek et al., 2018) and alternative attachment-based treatments.
Lastly, adolescent attachment research has predominantly focused on parental attachment. Adolescence is a dynamic developmental period in which attachment out-with the parental relationship becomes increasingly more important to interpersonal and social functioning (Borelli et al., 2015). Moreover, RF has been shown to be lower in adolescents than in adults with regard to parental relationships; this raises the question of the role of RF across peer relationships (Marzal & Jaficzak, 2018). This study will aim to establish the relationship between attachment and substance use, and explore the role of RF and ER in the relationship between attachment and substance use in adolescence in the general population. A further aim of this study is to address limitations of previous studies by exploring these processes across different domains of interpersonal relationships.

The researcher hopes to contribute to attachment-based conceptualisations of substance use in the context of adolescent development. Viewing substance use through the lens of attachment, particularly in adolescence, may have implications in the prevention and treatment of problematic substance use within the NHS. Adolescence is a promising developmental stage for early interventions that can prevent the development of long-term, high-risk SUD (Schindler & Brüning, 2015). Moreover, empirical evidence suggests that there is a 50% drop out rate for adolescent substance use treatment, and a lack of engagement in interventions (e.g. Dakof et al., 2001; Hawke et al., 2005; Waldron et al., 2007). In adult SUD treatment, a strong therapeutic alliance has been associated to greater engagement, retention and early improvements in substance use (e.g. Gibbons et al., 2010; Meier et al., 2005). Conceptualising substance use in the context of attachment theory and understanding the role of processes underlying substance use may support clinicians in enhancing their therapeutic alliance with service users through focusing on attachment-processes, and provide alternative targets for treatment when working with this population.

Furthermore, the following project may have implications for the clinical interventions clinicians employ in working with adolescents who use substances. Alternative attachment-based interventions that work on attachment across multiple domains of relationships, regulating emotions and reflective functioning abilities may be applicable in the treatment of problematic substance use (e.g. Mentalization-Based Therapy; Bateman & Fonagy, 2013). Current treatment models employed in the treatment of SUD within the NHS are predominantly behaviourally focused (e.g. Motivational Interviewing, Cognitive Behavioural Therapy, Contingency Management), though other modalities are employed. Treatment using, for example, CBT interventions have shown to have small to moderate outcomes (e.g. McHugh et al., 2010), however, long-term abstinence remains relatively low amongst adolescent populations (Brower et al., 2017). Incorporating more attachment-based interventions in the treatment of adolescent substance use may enhance outcomes.
2 STUDY OBJECTIVES

2.1 OBJECTIVES

2.1.1 Primary Objective
Detail primary objective(s)

1) Does insecure attachment predict substance use in adolescents?

2) Does reflective functioning and emotion regulation mediate the relationship between attachment and substance use?

2.1.2 Secondary Objectives
Detail secondary objective(s)

3) Does the relationship between insecure attachment and substance use vary across relationship domains (e.g. best friend, mother, father, romantic partner)?

3 STUDY DESIGN

Design
It is proposed that a non-experimental, quantitative, cross-sectional design employing web-based questionnaires is employed in exploring processes underlying substance use in adolescents.

Procedure
Participants are required to complete an online survey. If participants wish to proceed they will be asked to provide demographic information (e.g. age, gender, ethnicity). Participants will be invited to complete 6 further online questionnaires measuring attachment style, reflective functioning, emotion regulation, psychological distress and substance use. Questionnaires only have to be completed once. The survey will take approximately 20-30 minutes. Participants will be thanked for their participation and provided with resources on where to seek support for substance use alongside mental health helplines (e.g. Childline, Samaritans, The Mix). Participants may enter into a separate prize raffle for a Teen Choice gift voucher if they wish to do so.
4 STUDY POPULATION

4.1 NUMBER OF PARTICIPANTS

Participants

The following study will aim to recruit adolescents in the general population who may or may not have used substances (e.g. tobacco, alcohol, marijuana). Studies exploring similar topics have recruited between 100-472 participants (e.g. Estévez et al., 2017; Kassel et al., 2007; Teles, 2019; Thorberg & Lyvers, 2010). The researcher will aim to recruit an average of 256 participants. In order to maximise sample size and recruit a diverse range of participants the researcher will aim to recruit from a variety of settings, with participants completing the study online. Due to the study design, and to ensure participants provide informed consent, participants recruited online will be aged between 16-24 years. A targeted recruitment strategy will be employed to seek participants who have tried/use substances or have difficulties with substance use who are being supported through NHS services who are between the ages of 12 and 24.

The researcher will aim to recruit from NHS Lanarkshire and NHS Lothian Services. This would include the Adolescent Substance Use Service (ASUS), Child and Adolescent Mental Health Services (CAMHS) and Mental Health/Addiction Services and associated multi-agency services (e.g. Young People Substance Use Service; YPSUS). Recruitment will span between 9-12 months.

4.2 INCLUSION CRITERIA

Inclusion criteria for participation in this study is as follows:

For General Population:

- Aged between 16 and 24 years old

For NHS/multi-agency:

- Aged between 12 and 24

- The young person recreationally use tobacco/nicotine/vapes, alcohol, drugs or other new psychoactive substances.

- They are receiving support from NHS mental health/addiction services or multi-agency substance use services (e.g. as part of YPSUS)

- Staff they are working with considers them to have the capacity to understand the nature of the research
4.3 EXCLUSION CRITERIA

Individuals will be deemed unsuitable for participation if:

- They are unwilling or unable to provide informed consent
- They are non-English speakers
- For participants under 16 within the NHS/multi-agency services, will be unable to participate if parent or caregiver ‘opts-out’

5 PARTICIPANT SELECTION AND ENROLMENT

5.1 IDENTIFYING PARTICIPANTS

Non-clinical Population

Participants between the ages of 16 and 24 from the general population will be recruited online. The researcher will aim to advertise the study through information circulated to third sector organisations that support adolescents who use substances, and posters shared through educational establishments (e.g. high schools, colleges and universities) and local authority residential accommodation. Posters will include a QR code that will take participants to an online information sheet (via survey platform Qualtrics). A link to the study information will also be advertised on social media websites such as Facebook and other online platforms used by young people within this age range (e.g. Twitter, Facebook, Instagram, LinkedIn).

Clinical Population (NHS Recruitment e.g., CAMHS, Adult Mental Health/Addiction Services and other multi-agency - Adolescent Substance Use Service; ASUS and YPSUS)

Staff (also referred to as key workers) from mental health and community services, specifically CAMHS and Adult Mental Health/Addiction services in NHS Lanarkshire and NHS Lothian (e.g. ASUS) and associated multi-agency organisations (as part of YPSUS), will be approached by the researcher and asked to identify potential participants on their caseload who may be eligible for the study. Key workers will be asked to use their professional judgement alongside the study eligibility criteria to assert whether young people they are working with are appropriate to participate. Key workers may ask the young person if they are interested in participating in the study during their appointment or contact with the service. If the young person expresses interest, key workers will be asked to provide a participant pack (either paper or electronic) which includes a participant information sheet (including researcher details), consent form, a poster with link to survey and resource sheet.
For participants under the age of 16, information sheets will be provided to parent/caregivers by the key worker including a parent/caregiver ‘opt out’ form to be returned to the service along with the young person consent form.

5.2 CONSENTING PARTICIPANTS

General Population – Online Recruitment

Young people will be invited to read through an online information form including researcher’s details. This will allow opportunity for young people to contact the researcher if there are any problems with study and allows them opportunity to request further information relating to the study. Information about the study will be provided in a clear and simple format that is understandable to adolescents within this age range. The information sheet will explain what is involved in the study including potential risks and benefits and right to decline or withdraw from participation, confidentiality and how data will be used and stored. A consent form will be presented electronically if the young person wishes to proceed. As the study will be conducted online, young people will be provided with as much time as needed to consider whether or not they would like to take part in the study, and may contact the researcher at any point if they have further questions.

Clinical Population – NHS/multi-agency

Key workers will be asked to use their professional judgement alongside the study eligibility criteria to assert whether young people are working with are suitable candidates for the study. Key workers may ask the young person if they are interested in participating in the study during their appointment or contact with the service. If a young person over the age of 16 expresses interest in participating, staff will be asked to provide a participant pack (either paper or electronic) which includes a participant information sheet (including researcher details), resource list and consent form to be completed. For candidates under 16 an additional information sheet will be provided for parent/caregivers, including a parent/caregiver ‘opt-out’ form to be returned to staff within one week if they wish for their young person to be excluded from the study. A poster with links to the survey platform may be provided following completion of the consent form, countersigned by the key worker. Participants should be informed by staff to take time reading the information sheet and to discuss with family, friends or other supports, that they do not have to participate, and that if they decide not to participate that this will not impact the care or service that they are receiving. Participant general practitioners will be informed with participant consent. This should be recorded in their notes. As the study will be conducted online, participants will be provided with as much time as needed to consider whether or not they would like to take part in the study, and may contact the researcher if they have further questions.

5.2.1 Withdrawal of Study Participants

Participants are free to withdraw from the study at any point or a participant can be withdrawn by the Investigator. If withdrawal occurs, the primary reason for withdrawal will be documented in the participant’s case report form, if possible. The participant will have the option of withdrawal from:
(i) all aspects of the trial but continued use of data collected up to that point. To safeguard rights, the minimum personally-identifiable information possible will be collected.

Participants will be made aware that they may discontinue or withdraw at any time for any reason. They do not have to provide reason for withdrawal from the study. If recruited within the NHS, participants will be made aware that by withdrawing from the study that this will have no impact on the care or services that they receive.

6 DATA COLLECTION

Data will be collected via online survey platform Qualtrics. Data collection will span between 9-12 months. Online participants will be invited to read through participant information and provide electronic consent. NHS/multi-agency participants will provide consent and will be provided with a poster containing links to the study. They will be reminded of participant information and asked to confirm consent before proceeding. They will only have to complete the survey once.

Demographic Data

Demographic data will be collected at the beginning of the study (e.g. age, gender, and ethnicity).

Attachment

Experiences in Close Relationships – Relationship Structure (ECR-RS; Fraley et al., 2011)

The ECR-RS is a 36-item self-report measure of attachment anxiety and avoidance. The questionnaire is divided into 9-items that assesses attachment across 4 relationship domains (mother-figure, father-figure, romantic partner and best friend). Responses are rated on a 7-point scale ranging from: 1 = strongly disagree to 7 strongly agree, with a neutral midpoint (4 agree/disagree). Items 1 through 6 on the scale assess attachment anxiety. Items 7 through 9 assess attachment avoidance. The ECR-RS contains a series of statements such as “I find it easy to depend on this person” and “I’m afraid that this person may abandon me”. Higher scores on the ECR-RS suggest greater levels of insecure attachment in the studied domain. Fraley et al. (2011) recommend using any one or more relationship domain depending on the research purpose. To date, no ‘gold standard’ measure has been established for measuring attachment in adolescent populations (Bosmans & Kerns, 2015; Wilson & Wilkinson, 2012). Donbaek & Eiklit (2014) note that the ECR-RS is highly applicable to adolescent attachment research. They reported satisfactory construct validity and high internal reliability estimates across relationship domains in adolescents for avoidance and anxiety. Pooravari & Ashiani (2017) further supported the use the ECR-RS in adolescence reporting that the questionnaire demonstrated good validity and reliability ($\alpha = 0.80$).
Emotion Regulation


The DERS is a 36-item self-report measure of emotion dysregulation. The DERS assesses six facets of ER: nonacceptance of emotional responses, difficulty engaging in goal-directed behaviour, impulse control difficulties, lack of emotional awareness, limited access to ER strategies and lack of emotional clarity. Responses on the scale are rated on a 5-point Likert scale where ER difficulties are rated from: 1 = almost never (0-10%) to 5 = almost always (91-100%). The DERS contains a series of statements such as "I have difficulty making sense out of my feelings" and "When I’m upset, I lose control over my behaviour". Higher scores on the DERS suggests greater problems with ER. The psychometric properties of the DERS has been established in adult (Gratz & Roemer, 2004; Hallion et al., 2018) and adolescent (Neumann et al., 2010; Weinberg & Klonsky, 2009) populations. Neumann et al. (2010) demonstrated that the DERS has adequate reliability and validity in community adolescent samples. Weinberg & Klonsky (2009) further reported good internal consistency (α = 0.93) for the overall measure in younger adolescents. Research suggests that the DERS has adequate psychometric properties in measuring emotion dysregulation in adolescent populations across cultures (Gómez-Simón et al., 2014; Santos-Atalar et al., 2015). The DERS will be completed online. The developers suggest that the DERS takes an average time of 8 minutes to complete.

Reflective Functioning

Reflective Functioning Questionnaire for Youth (RFQ-Y; Sharp et al., 2009)

The Reflective Functioning Questionnaire for Youth (RFQ-Y) is a 46-item self-report questionnaire of reflective function in adolescents. The RFQ-Y contains a series of statements such as "I don’t always know why I do what I do" and "I always know what I feel". Participants are requested to rate each item on a 6-point Likert scale, rating from 1 = strongly disagree to 6 = strongly agree. Similar to attachment in adolescent populations, there is a lack of validated measures that assess RF in adolescents (Duval et al., 2018). Moreover, Sharp (2006) reports that many measures developed to assess RF have ceiling effects for adolescents. Other established measures for RF have primarily utilised in adult populations (e.g. Reflective Functioning Questionnaire; Fonagy et al., 2016) or are interview based (e.g. Reflective Function Scale; Fonagy et al., 1998), therefore are not appropriate for the current study. Emerging literature has explored the psychometric properties of the RFQ-Y in adolescents (e.g. Duval et al., 2018; Ha et al., 2013). Ha et al. (2013) reported adequate internal consistency for the RFQ-Y (α = 0.71) and convergent validity. Duval et al. (2018) further reported adequate construct validity of the RFQ-Y for adolescents (ages 12–21).
Adolescent Alcohol and Drug Involvement Scale (AADIS; Moberg, 2003)

The AADIS consists of a 12-item table for history of drug use (Part A), and 14-items measuring problems relating to alcohol and drug use on individual functioning (Part B). The AADIS Part B will be used to assess involvement with drugs and/or alcohol. Part B contains items such as “What time of day do you use alcohol or drugs?”; “What effects have you had from drinking or drugs?”, rated on 5 to 8 point scales. Higher scale scores represent higher levels of alcohol and/or drug involvement. A cut off score of 37 or above indicates significant difficulties with substance use. The AADIS is available in the public domain and has been employed for clinical utility as well as research purposes. It has been reported to have good internal consistency (α = 0.92 to 0.95; Winters et al., 2001). The AADIS takes less than 5 minutes to complete.

Psychological Distress

Patient Health Questionnaire – 9-Item (PHQ-9; Kroenke, Spitzer & Williams, 2001)

The PHQ-9 is a brief, 9-item self-report scale designed to measure severity of depressive symptoms based on criteria from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 2013). The PHQ-9 asks respondents to consider ‘Over the last 2 weeks, how often have you been bothered by any of the following problems?’ Items include statements such as ‘Little interest or pleasure in doing things’ and ‘Feeling tired or having little energy’. Participants are requested to rate each item on a 4-point likert scale of: ‘Not at all’, ‘Several days’, ‘Most than half the days’ and ‘Nearly every day’. The PHQ-9 takes less than 5 minutes to complete. The psychometric properties of the PHQ-9 have been established across various populations including the general adult and adolescent population. The use of the PHQ-9 in adolescent populations has been demonstrated as having acceptable internal consistency and construct validity (e.g. Anum et al., 2019; Andreas & Brunbog, 2017).

Generalised Anxiety Disorder – 7 Item (Spitzer, Kroenke & Williams, 2006)

The GAD-7 is a brief 7-item self-report scale designed to measure symptoms of anxiety. The scale items are rated on a 4-point Likert scale, ranging from 0 (not at all) to 3 (nearly always). Items include ‘Worrying too much about different things?’ and ‘Becoming easily annoyed or irritable?’. The GAD-7 takes less than 5 minutes to complete. The GAD-7 has been demonstrated as reliable and valid in adolescent populations, with similar psychometric properties of that reported among adult populations (Tirkkainen et al., 2019). Internal consistency (Cronbach’s alpha) of the GAD-7 population has been demonstrated as good within adolescent populations (e.g. = 0.69; Anum et al., 2019).
7 DATA MANAGEMENT

7.1.1 Personal Data

Minimal personal data will be collected as part of the main study (e.g. participant name on NHS consent forms, gender and ethnicity). Participants will be offered opportunity to be entered into a prize draw to thank them for participation. Entry into the prize draw will be optional and managed as a separate survey on Qualtrics to ensure that data in the main survey remains anonymous. Data collected for the draw (e.g. email addresses) will be stored in DataStore which will be accessed via a password secured laptop. Devices used to record and store data will be encrypted and stored safely. Any physical copies of consent forms gained prior to accessing the main study will be stored securely in a lockable fireproof filing cabinet in a secure office at the University of Edinburgh. Access to data will be restricted to the primary researcher and academic supervisor. Personal data such as consent forms will be kept for a minimum of 3 years and deleted securely.

7.1.2 Data Information Flow

Any data collected will be processed in accordance with the Data Protection Act (2018) and General Data Protection Regulation (GDPR). Survey platform Qualtrics will be employed to gather participant responses, with survey responses being anonymous. Qualtrics has a higher level of information security and is the preferred platform for research collecting sensitive data within the school. Participants will be provided with a unique, anonymised identifier to ensure confidentiality. As above, entry into the prize draw will be managed as a separate survey on Qualtrics, a separate raffle will ensure participant confidentiality. Data will be stored in DataStore, which will be accessed via a password secured laptop. Devices used to record and store data will be encrypted and stored safely. Access to data will be restricted to the primary researcher and academic supervisor.

7.1.3 Data Controller

A data controller is an organisation that determines the purposes for which, and the manner in which, any personal data are processed.

The University of Edinburgh is the data controller along with any other entities involved in delivering the study that may be a data controller in accordance with applicable laws (e.g. the site).

7.1.4 Data Breaches

Any data breaches will be reported to the University of Edinburgh Data Protection Officer who will onward report to the relevant authority according to the appropriate timelines if required.
8  STATISTICS AND DATA ANALYSIS

8.1  SAMPLE SIZE CALCULATION

A priori estimation of sample sizes were approximated using online statistical calculator G*Power (Faul et al., 2009). Statistical power of 0.80, 3 predictors, \( f^2 = 0.15 \) and alpha level of \( p < .05 \) (two-tailed) was used to calculate sample size estimates. Results indicated that the study would require a minimum of 77 participants in order to achieve adequate statistical power. Unfortunately, due to limited literature exploring these processes in adolescence, effect sizes were unavailable to estimate sample size required for single mediation models using estimate tables by authors such as Fritz and McKinnon (2007), or in order to calculate power analysis via the Monte Carlo method (via MPlus, R) as recommended for parallel mediation analysis (Thoemmes et al., 2010). The researcher was therefore unable to calculate an a priori power analysis for single or multiple mediator models. Based on review of previous literature exploring substance use and attachment, studies have recruited sample sizes ranging from 100-472. The researcher will aim to recruit an average of 256 participants (e.g. Estevez et al., 2017; Kassel et al., 2007; Teles, 2019; Thorberg & Lyvers, 2010).

The researcher intends on utilising popular social media platforms (e.g. Facebook, Twitter and Instagram) to recruit participants. Facebook has been shown to be a successful recruitment tool that can improve selection of young and hard to reach demographics (Whitaker et al., 2017). Similar conclusions have been drawn from research exploring the viability of recruiting via Facebook for assessment of health behaviour (e.g. tobacco and substance use) in young adults (Ramo & Prochaska, 2012) and adolescents between 13-17 years (Rait et al., 2015). In a recent online study exploring substance use amongst adolescents during the Covid-19 crisis, Dumas et al. (2020) advertised the study via Instagram and emailed the survey link to a group of adolescents. In total, 1,504 participants (aged 14-18) completed the online questionnaires. Data collection spanned from 4th April 2020 to 13th April 2020. It is hoped that providing 9 months for recruitment will allow the researcher achieve above the sample size of 256 participants. The researcher hopes to advertise the study across high schools, colleges and universities, local authority residential accommodation and third sector organisations. There are several third sector organisations across Scotland that support youth with problematic substance use (e.g. Barnados, The Beacon, Includem). It is hoped that advertising the study through a broad range of organisations, and developing relationships with facilities who specialise in supporting adolescents who use substances, will optimise recruitment.

Lastly, feasibility of the project has been discussed across meetings with the researcher’s Academic supervisor, NHS field supervisor and line manager. The researcher’s 3rd year specialist placement will be held within the NHS Lanarkshire Addiction service. This will allow the researcher to develop a relationship with health and social care addiction teams, and gain further awareness of potential sources of recruitment where the project may be advertised. The researcher has additionally been establishing links with CAMHs and ASUS, raising awareness of the project to...
allow for consultation and advice surrounding recruitment. An NHS targeted recruitment pathway in addition to general population will support the researcher in optimising recruitment. It is hoped that these steps will mitigate the risk of failing to recruit the required sample size.

8.2 PROPOSED ANALYSES

Data analysis will be conducted using IBM SPSS Statistics. The primary aims of the study is to establish whether insecure attachment predicts substance use in adolescence, and to explore whether factors such as ER and RF mediate this relationship.

Correlation / Regression Analysis

Pearson’s correlations will be conducted to explore the relationships between attachment insecurity, substance use, emotion regulation, reflective functioning and psychological distress. Correlation analyses will additionally be conducted to explore the relationship between attachment insecurity and various relationship domains (e.g. mother-figure, father-figure, best friend) in relation to reflective functioning, emotion regulation and substance use. This method is consistent with empirical research exploring attachment and substance use in adolescent and adult populations (e.g. Estévez et al., 2017; Teles, 2019; Thorberg & Lyvers, 2010). The question of whether insecure attachment predicts substance use will be investigated using multiple regression analysis.

Mediation Analysis

Mediation analysis will be used to explore the question ‘Does reflective functioning and emotion regulation mediate the relationship between attachment and substance use?’ if a relationship is established through regression analysis. PROCESS macro for SPSS (Hayes, 2017) will be applied to address whether RF and ER mediate the relationship between attachment and substance use.

9 RISKS

The study is considered to be low risk to both participants and the researcher. Participants will be asked to complete questionnaires relating to psychological distress, attachment style, reflective function, emotion regulation and substance use. The selected questionnaires will require participants to respond to statements on a numbered scale. The questionnaires have been selected because they are short and do not require participants to go into a lot of detail about sensitive topics. However, it may raise awareness to the participants relating to difficulties they may be having with their interpersonal relationships, substance use or mental health. Following completion of the study, a resource list of support is provided for individuals who find the content of the questionnaires upsetting or feel worried or concerned about their...
substance use. This list encourages participants to speak with someone if they are upset, worried or concerned. The researcher's contact details are also provided. The researcher will make effective use of supervision with their academic and field supervisor to ensure appropriate steps are taken for any other adverse events that may arise that have not been pre-empted.

10 OVERSIGHT ARRANGEMENTS

10.1 INSPECTION OF RECORDS

Investigators and institutions involved in the study will permit trial related monitoring and audits on behalf of the sponsor, REC review, and regulatory inspection(s). In the event of audit or monitoring, the Investigator agrees to allow the representatives of the sponsor direct access to all study records and source documentation. In the event of regulatory inspection, the Investigator agrees to allow inspectors direct access to all study records and source documentation.

10.2 STUDY MONITORING AND AUDIT

The ACCORD Sponsor Representative will assess the study to determine if an independent risk assessment is required. If required, the independent risk assessment will be carried out by the ACCORD Quality Assurance Group to determine if an audit should be performed before/during/after the study and, if so, at what frequency.

Risk assessment, if required, will determine if audit by the ACCORD QA group is required. Should audit be required, details will be captured in an audit plan. Audit of Investigator sites, study management activities and study collaborative units, facilities and 3rd parties may be performed.

11 GOOD CLINICAL PRACTICE

11.1 ETHICAL CONDUCT

The study will be conducted in accordance with the principles of the International Conference on Harmonisation Tripartite Guideline for Good Clinical Practice (ICH GCP).
Before the study can commence, all required approvals will be obtained and any conditions of approvals will be met.

11.2 INVESTIGATOR RESPONSIBILITIES

The Investigator is responsible for the overall conduct of the study at the site and compliance with the protocol and any protocol amendments. In accordance with the principles of ICH GCP, the following areas listed in this section are also the responsibility of the Investigator. Responsibilities may be delegated to an appropriate member of study site staff.

11.2.1 Informed Consent

The Investigator is responsible for ensuring informed consent is obtained before any protocol specific procedures are carried out. The decision of a participant to participate in clinical research is voluntary and should be based on a clear understanding of what is involved.

Participants must receive adequate oral and written information – appropriate Participant Information and Informed Consent Forms will be provided. The oral explanation to the participant will be performed by the Investigator or qualified delegated person, and must cover all the elements specified in the Participant Information Sheet and Consent Form.

The participant must be given every opportunity to clarify any points they do not understand and, if necessary, ask for more information. The participant must be given sufficient time to consider the information provided. It should be emphasised that the participant may withdraw their consent to participate at any time without loss of benefits to which they otherwise would be entitled.

The participant will be informed and agree to their medical records being inspected by representatives of the sponsor(s).

The Investigator or delegated member of the trial team and the participant will sign and date the Informed Consent Form(s) to confirm that consent has been obtained. The participant will receive a copy of this document and a copy filed in the Investigator Site File (ISF) and participant’s medical notes (if applicable).

11.2.2 Study Site Staff

The Investigator must be familiar with the protocol and the study requirements. It is the Investigator’s responsibility to ensure that all staff assisting with the study are adequately informed about the protocol and their trial related duties.

11.2.3 Data Recording

The Principal Investigator is responsible for the quality of the data recorded in the CRF at each Investigator Site.

11.2.4 Investigator Documentation
The Principal Investigator will ensure that the required documentation is available in local Investigator Site files ISFs.

11.2.5 GCP Training

For non-CTIMP (i.e., non-drug) studies all researchers are encouraged to undertake GCP training in order to understand the principles of GCP. However, this is not a mandatory requirement unless deemed so by the sponsor. GCP training status for all investigators should be indicated in their respective CVs.

11.2.6 Confidentiality

All evaluation forms, reports, and other records must be identified in a manner designed to maintain participant confidentiality. All records must be kept in a secure storage area with limited access. Clinical information will not be released without the written permission of the participant. The Investigator and study site staff involved with this study may not disclose or use for any purpose other than performance of the study, any data, record, or other unpublished information, which is confidential or identifiable, and has been disclosed to those individuals for the purpose of the study. Prior written agreement from the sponsor or its designee must be obtained for the disclosure of any said confidential information to other parties.

11.2.7 Data Protection

All Investigators and study site staff involved with this study must comply with the requirements of the appropriate data protection legislation (including the General Data Protection Regulation and Data Protection Act) with regard to the collection, storage, processing and disclosure of personal information.

Computers used to collate the data will have limited access measures via user names and passwords.

Published results will not contain any personal data and be of a form where individuals are not identified and re-identification is not likely to take place.

STUDY CONDUCT RESPONSIBILITIES

11.3 PROTOCOL AMENDMENTS

Any changes in research activity, except those necessary to remove an apparent, immediate hazard to the participant in the case of an urgent safety measure, must be reviewed and approved by the Chief Investigator.

Amendments will be submitted to a sponsor representative for review and authorisation before being submitted in writing to the appropriate REC, and local R&D for approval prior to participants being enrolled into an amended protocol.
11.4 MANAGEMENT OF PROTOCOL NON COMPLIANCE

Prospective protocol deviations, i.e. protocol waivers, will not be approved by the sponsor and therefore will not be implemented, except where necessary to eliminate an immediate hazard to study participants. If this necessitates a subsequent protocol amendment, this should be submitted to the REC, and local R&D for review and approval if appropriate.

Protocol deviations will be recorded in a protocol deviation log and logs will be submitted to the sponsors every 3 months. Each protocol violation will be reported to the sponsor within 3 days of becoming aware of the violation. All protocol deviation logs and violation forms should be emailed to QA@accord.scot

Deviations and violations are non-compliance events discovered after the event has occurred. Deviation logs will be maintained for each site in multi-centre studies. An alternative frequency of deviation log submission to the sponsors may be agreed in writing with the sponsors.

11.5 SERIOUS BREACH REQUIREMENTS

A serious breach is a breach which is likely to effect to a significant degree:
(a) the safety or physical or mental integrity of the participants of the trial; or
(b) the scientific value of the trial.

If a potential serious breach is identified by the Chief investigator, Principal Investigator or delegates, the co-sponsors (seriousbreach@accord.scot) must be notified within 24 hours. It is the responsibility of the co-sponsors to assess the impact of the breach on the scientific value of the trial, to determine whether the incident constitutes a serious breach and report to research ethics committees as necessary.

11.6 STUDY RECORD RETENTION

All study documentation will be kept for a minimum of 10 years from the protocol defined end of study point. When the minimum retention period has elapsed, study documentation will not be destroyed without permission from the sponsor.

11.7 END OF STUDY

The end of study is defined as the last participant’s last visit.

The Investigators or the co-sponsor(s) have the right at any time to terminate the study for clinical or administrative reasons.

The end of the study will be reported to the REC, and R+D Office(s) and sponsor within 90 days, or 15 days if the study is terminated prematurely. The Investigators will inform participants of the premature study closure and ensure that the appropriate follow up is arranged for all participants involved. End of study notification will be reported to the -sponsor via email to resgov@accord.scot
A summary report of the study will be provided to the REC within 1 year of the end of the study.

11.8 INSURANCE AND INDEMNITY

The sponsor is responsible for ensuring proper provision has been made for insurance or indemnity to cover their liability and the liability of the Chief Investigator and staff.

The following arrangements are in place to fulfill the sponsors' responsibilities:

- The Protocol has been designed by the Chief Investigator and researchers employed by the University and collaborators. The University has insurance in place (which includes no-fault compensation) for negligent harm caused by poor protocol design by the Chief Investigator and researchers employed by the University.
- Sites participating in the study will be liable for clinical negligence and other negligent harm to individuals taking part in the study and covered by the duty of care owed to them by the sites concerned. The co-sponsors require individual sites participating in the study to arrange for their own insurance or indemnity in respect of these liabilities.
- Sites which are part of the United Kingdom's National Health Service will have the benefit of NHS Indemnity.
- Sites out with the United Kingdom will be responsible for arranging their own indemnity or insurance for their participation in the study, as well as for compliance with local law applicable to their participation in the study.

12 REPORTING, PUBLICATIONS AND NOTIFICATION OF RESULTS

12.1 AUTHORSHIP POLICY

Ownership of the data arising from this study resides with the study team.

13 REFERENCES


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## Appendix E

### Quality Assessment of Included Studies

**Table E1.**

*Quality Assessment of Included Studies*

<table>
<thead>
<tr>
<th>Research Team</th>
<th>Randomization process</th>
<th>Deviations from Intended Intervention</th>
<th>Missing Outcome Data</th>
<th>Measurement of Outcome</th>
<th>Selection of Reported Results</th>
<th>Overall Bias</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zgierska et al. (2019)</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Some concerns</td>
<td>Some concerns</td>
<td>Some concerns</td>
</tr>
<tr>
<td>Bowen et al. (2014)</td>
<td>Some concerns</td>
<td>Low</td>
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