

**Correlates of chemsex: Shame, mindfulness, sexual satisfaction, and self-efficacy
beliefs in men who have sex with men**

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I. Lay Summary

This study is split into two sections. Both sections explore the experiences of men who use illegal drugs. It explored the relationship between mindfulness and drug use. Mindfulness can be described as someone's ability to bring attention and awareness to the present moment in an impartial way. For example, when you are paying attention to what you're doing and not getting caught up in thinking about other things. Mindfulness skills can be developed in many ways, including mindful breathing exercises. These are when someone focuses all their attention on the breath. They may notice their thoughts but do not get caught up in them. They then try to focus the attention back on the breath. Research suggests that increasing a drug user's mindfulness can reduce their drug use and cravings and improve their mood and quality of life.

The first part of the thesis looked at previous research on how well mindfulness-based treatments reduced drug use. A detailed search of studies was made. The search included research that was written in English and had been checked by other researchers. We were only interested in seeing how well mindfulness works for male drug users. So, any research with female or mixed male and female participants were ignored. The studies we were interested in randomly split their participants into two groups. One group were given a treatment using mindfulness, and the other group received no treatment at all. After the treatment was finished, the groups were compared. It was thought that the group who received a mindfulness treatment might use fewer drugs or had fewer cravings than those who had not received the treatment. A second researcher checked the list of studies to make sure the search was done correctly. Any differences of opinion were discussed until we agreed on the final list of studies. When we looked through all the studies, we found that all of them showed that the treatments reduced men's drug use and their cravings for the drugs. However, there were lots of differences in how effective the treatments were. This

could be because the studies were done in different ways, which may have led to different findings. For example, different types of mindfulness treatments were used in the studies. Also, the people in the studies used different types of drugs, and some research has shown this can affect the results. The review suggested that more research is needed to better understand how well these treatments work.

The second part of the study was a survey that collected data to explore the relationships between mindfulness, shame, and stress. These are all thought to be important in men who struggle to stop their drug use. Shame is an emotion linked with feelings of low self-esteem. Research has found that feelings of shame and stress are common in men who take drugs. People often struggle with shame and stress because of difficult life experiences. These can include being rejected by others and abuse. Shame is also related to lower levels of sexual satisfaction and is also associated with some people's need to use drugs.

The survey recruited men who have sex with men (MSM). These men also take drugs to enjoy sex better. This type of drug use is called 'chemsex'. Some people have chemsex and it has a positive effect on their life. However, for some people, chemsex can lead to problems. Also, some MSM who enjoy chemsex find it difficult to have sex without drugs.

To improve the study's design, experts by experience were involved in all stages of the process. The experts by experience for this study were men who have had chemsex, or they still do. They helped to get people involved in the project. They also helped to designing and explaining the results.

There is not much research about treatments for chemsex. This section of the thesis explored the relationships between shame, stress, and mindfulness. This is to understand

better what sort of treatment might help people looking for support. Research suggests that increased mindfulness is related to lower levels of drug use. It is also related to higher levels of sexual satisfaction in men. This project hoped to explore the relationships between shame, sexual satisfaction, levels of distress and mindfulness in MSM who engage in chemsex. The experts by experience thought it was important to explore men's confidence in whether they can engage in sober sex. As there has been no research into confidence in MSM to engage in sober sex, it was agreed that this study should also explore this. However, these beliefs are very different for different behaviours, so a new questionnaire had to be designed for this study. This questionnaire measured a person's beliefs in whether they would be able to engage in sober sex.

This project made these predictions:

- 1) People who said that chemsex has a negative effect on their life will have higher levels of shame and stress. They would also say that they have lower levels of sexual satisfaction and confidence in being able to have sober sex.
- 2) People who experience high levels of shame would have higher stress levels. They would also have lower sexual satisfaction and lower confidence in being able to have sober sex.
- 3) People with higher levels of mindfulness would experience higher levels of sexual satisfaction and belief in being able to have sober sex. They would also have lower levels of shame and stress.
- 4) There would be a relationship between shame and sexual satisfaction and shame and self-beliefs. These relationships would change depending on people's levels of mindfulness.

The survey results confirmed these predictions. People who felt that chemsex was having a negative effect on their lives had higher levels of shame and stress. They also had lower levels of mindfulness, sexual satisfaction, and confidence in being able to have sober sex. Higher levels of shame were related to lower levels of sexual satisfaction. They were related to people having lower confidence in having sober sex. Higher levels of shame were also associated with high levels of stress. The research found that higher levels of mindfulness were related to increased sexual satisfaction and people's confidence in having sober sex. However, it also related to lower levels of shame and distress.

The last question looked at the different parts of mindfulness. Mindfulness can be broken down into different parts. In this study mindfulness was broken down into five different types.

- Observing or noticing experiences,
- Describing or being able to talk or write about experiences,
- Acting with awareness or being aware of what you are doing as you do it
- Non-judgmental or not being critical about experiences, and
- Nonreactivity or not getting caught up in experiences.

The results showed that three of the five facets of mindfulness changed the relationship between shame and sexual satisfaction. These were observing, acting with awareness and nonreactivity. However, all the facets of mindfulness were shown to change the relationship between shame and people's confidence in having sober sex. This study suggests that it may be useful to develop mindfulness therapies for people struggling with chemsex. It suggests that some types of mindfulness might be more important than others. However, further research is needed to confirm this.

II. A Systematic Review examining the effectiveness of mindfulness-based interventions in the treatment of problematic illicit substance use in male service users

Abstract

There is an urgent need for effective therapies for men with problematic illicit substance use. This is particularly important amongst male users as prevalence rates are higher and support seeking behaviours are lower. The evidence base for mindfulness interventions in treating substance misuse is growing. Systematic reviews investigating the effectiveness of mindfulness treatments indicate posttreatment reductions in substance cravings and relapse. However, most research has been conducted on alcohol and tobacco using mixed-gendered populations. Thus, this systematic review assessed the methodological characteristics and findings of studies evaluating mindfulness interventions for illegal drug misuse in male-only populations published by 2021. The review also includes the first meta-analysis of randomised controlled trials of mindfulness interventions for illegal substance misuse in male-only populations. A search of three bibliographic databases (i.e., PubMed, PsycInfo, and Web of Science) identified potentially relevant studies. Abstract and full paper reviews of these studies further reduced the number of those meeting the inclusion and exclusion criteria. Meta-analytic results revealed significant small-to-large effects of mindfulness treatments in reducing substance cravings. However, this sample of studies demonstrated highly heterogeneous results. This heterogeneity was theorised to be caused by variations across the studies in methodological quality, the different types of mindfulness treatments being evaluated, and the range of drugs being treated. Despite this heterogeneity, this review supports the evidence base that suggests that mindfulness interventions are appropriate for men undergoing treatment for illegal substance use.

However, more research is needed to explore how mindfulness interventions exert their effects and the effectiveness of mindfulness treatments in diverse treatment settings.

Introduction

Drug use encompasses an increasingly broad range of substances (European Monitoring Centre for Drugs and Drug Addiction, 2018). There has been a 20-year downward trend in the consumption of legal drugs such as alcohol and tobacco, but a growing proportion of people consume illicit drugs (Seitz et al., 2019). Whilst the legal status of a drug does not necessarily directly correspond to the potential harms of the drug (Nutt et al., 2010), it can impact the societal and political responses to illicit drug use. There is a complex interplay between stigma, discrimination, criminalisation and healthcare provision (Global Commission on Drug Policy, 2017), with negative social and political representations of illicit drug users directly influencing clinical care (Schlag, 2020). Research indicates that users of illegal drugs have fewer harm reduction and intervention opportunities made available to them (Schlag, 2020).

Patterns of substance use exist on a continuum from non-problematic to problematic (Global Commission on Drug Policy, 2017). Non-problematic substance use is defined as taking a substance for its intended purpose, including legal or illegal substances. This use could be under medical direction or taken recreationally to get high, with limited adverse consequences. Of those who consume illicit drugs, only a minority of people misuse them or use them in a problematic manner (Schlag, 2020). If a substance is used problematically, there is an increased risk that it may cause long-term physical and mental health difficulties for the user (Global Commission on Drug Policy, 2017).

Substance misuse is costly not only to the individual and their families but also to society and is associated with significant levels of morbidity and mortality (Li et al., 2017). An

estimated 585,000 people globally died due to drug use in 2017 (United Nations Office on Drugs and Crime [UNODC], 2019). Substance misuse is also associated with high levels of mental health problems and increased social adversity, which causes a significant economic burden to society as a whole (Mirza et al., 2020). However, most substance users who want support are unable to access treatment, with only an estimated one in seven people diagnosed with a substance misuse disorder receiving treatment each year (United Nations Office on Drugs and Crime [UNODC], 2019).

Part of the problem facing substance use services is that drug use is a complex and often relapsing, chronic condition (West & Brown, 2013). It requires a multi-faceted and coordinated care and intervention approach, needing co-operation between the criminal justice, social care, physical and mental health services. However, providing targeted and relevant services is challenging as the landscape of substance use is continuously changing. There are also many barriers to individuals accessing services, including the de-prioritisation of their own medical care, preferring to ignore the problem and perceived judgment from clinicians (Miller-Lloyd et al., 2020).

Researchers investigating the development of harm reduction interventions for individuals with substance misuse difficulties are also met with barriers. Substance users, problematic or otherwise, are generally under-represented in surveys, especially those with intensive use patterns (Seitz et al., 2019). Researchers must also navigate the complex and changing political and social context in which their work is conducted (United Nations Office on Drugs and Crime [UNODC], 2019). Also, recent research suggests that the type of substance being used is an important factor to consider in providing interventions. For example, predictors of craving have been shown to vary significantly between alcohol, tobacco and illicit drugs (Enkema et al., 2020), potentially impacting relapse prevention support. With the broadening landscape of substances being used, research needs to keep

pace with the proliferation of novel drugs or new polysubstance use combinations. The barriers to research often prevent access to a sufficiently broad cross-section of the participant population to maximise generalisability. These include ethical considerations (e.g., capacity to consent) while ensuring confidentiality and protection from legal structures.

Due to the relatively high levels of harm to the individual and impact on society, there is an ongoing need to evaluate cost-effective interventions that target substance cravings and prevent relapse. Despite the variety of evidence-based treatments available, long-term outcomes remain relatively poor, with relapse rates up to 60% in the 12 months posttreatment (Witkiewitz & Masyn, 2008). However, research into mindfulness-based interventions (MBIs) has yielded promising results for substance misuse treatment (Chiesa & Serretti, 2014; Li et al., 2017).

Mindfulness-based treatment for substance misuse

Mindfulness is defined as the individual's ability to purposefully bring attention and awareness to the present moment's experiences and relate to them in a non-judgmental way (Chiesa, 2017). Research suggests that people taught mindfulness learn to recognise internal experiences as temporary and subjective rather than permanent and accurate representations of reality (Katz & Toner, 2013). It is theorised that regular (e.g., daily) mindfulness practice translates into enduring changes in an individual's dispositional mindfulness in everyday life (Garland & Howard, 2018). Mindfulness training can help individuals increase insight into their own habitual cognitive and behavioural patterns and begin to respond consciously and deliberately (i.e., mindfully) rather than automatically (i.e., mindlessly) reacting to internal or external triggers (Katz & Toner, 2013).

There is a growing evidence base that operationalising mindfulness into targeted interventions can be applied across various psychological disorders, including problematic

substance use. Examples include Mindfulness-Based Relapse Prevention (MBRP), which integrates mindfulness practice, and relapse prevention cognitive therapy and motivational interviewing (Bowen et al., 2011). An alternative is Mindfulness-Orientated Recovery Enhancement (MORE) which combines mindfulness training with positive psychology principles and cognitive behaviour therapy (CBT) (Garland et al., 2019). Operationalised and manualised mindfulness interventions are positively regarded by clinicians (Forbat et al., 2015). Manualised interventions can also be deployed with higher levels of treatment fidelity, allowing their effectiveness to be evaluated within randomised control trials (RCTs).

Manualised mindfulness-based interventions (MBIs) have been used to address a range of substance use difficulties associated with alcohol, tobacco and illicit drugs (Priddy et al., 2018). The most common MBIs relating to substance use difficulties (i.e., MBRP and MORE) are multi-week interventions, usually delivered in a group format, facilitated by a trained clinician (Katz & Toner, 2013). Sessions comprise psychoeducation and various experiential mindfulness practices such as body scan meditations and breathing exercises. Psychoeducation is usually delivered to address specific substance use experiences such as triggers, craving and affect regulation. Homework assignments often include self-monitoring of symptoms such as craving and mood fluctuations.

Dispositional mindfulness, also known as trait mindfulness, is a theoretically inherent human characteristic (Tomlinson et al., 2018). It is theorised that interventions developing state mindfulness can increase trait mindfulness over time, and raise an individual's awareness of the automatic processes associated with attention to substance-related cues and the presence of cravings (Katz & Toner, 2013). Extensive research has sought to identify the hypothetical mechanisms by which mindfulness is thought to modify the main features of substance use such as triggers, craving and relapse. It is thought that

increased awareness may disrupt the cycle of affect, cognitive and physiological mechanisms that maintain substance use (Katz & Toner, 2013).

Mindfulness practice often involves focusing attention. A variety of practices include focusing on the sensation of breathing, a full-body scan or on specific parts of the body, or visual stimuli, such as a flame or mandala. The practice involves acknowledging but letting go of distractions without judgment. Increasing dispositional mindfulness in this way is positively associated with heightened executive control functioning (Garland, 2011).

Research also suggests small but statistically significant negative correlations between trait mindfulness and craving (Garland, Roberts-Lewis, et al., 2014) and substance use (Karyadi et al., 2014a). As individuals with substance use disorders (SUDs) engage in mindfulness practices, they may learn to develop increased trait mindfulness, which has been theorised to protect against substance use and relapse (Li et al., 2017). Meta-analytic summaries of the effectiveness of MBIs with substance use difficulties reveal effect sizes from small to large on positive outcomes in cravings, affect and substance use (Priddy et al., 2018)

The relationship between stress and substance use is well-established, whereby increased levels of anxiety and depression are associated with an increased risk of substance misuse (Bowen et al., 2014). Different hypotheses have proposed various underlying mechanisms for this relationship. A systematic review suggested that negative emotional states are predictive of levels of substance craving and that developing a tolerance to heightened distress ameliorated this effect (Olsson et al., 2016). MBIs may reduce addiction behaviours through developing alternate stress management strategies, reducing the reliance on substances for relief from distress symptomology.

Finally, it is thought that MBIs may attenuate addictive behaviours by providing an alternative to thought suppression. Conscious suppression of the urges associated with

substance use eventually exhausts the limited resources related to self-control (Stewart, 2008). Ultimately this increases the intensity of cravings (Chiesa & Serretti, 2014). It has been demonstrated that mindfulness does not alter the frequency of these intrusive thoughts. However, after mindfulness training, individuals spend less time avoiding substance-related thoughts and urges, which has resulted in improvements in self-control and relapse rates (Bowen et al., 2007).

Men and mindfulness interventions for problematic illicit substance use

This review's narrower focus is specifically on the experiences of men who engage in problematic illicit substance use for several reasons. Historically men are much more likely than women to use illegal drugs recreationally (Becker et al., 2017). There are likely to be many reasons for this; one of the possible reasons may be related to social roles, with more stigma is attached to substance use and traditional women's roles (i.e., mother and caregiver; Kandall, 1999). Research suggests that whilst men are more likely to use illicit drugs, women are more likely to abuse prescribed drugs (McCellan, 2017).

The overall rate of illicit substance use is higher in men, and the length of time between first substance use and seeking treatment often has a longer trajectory than women. That is, men are more reluctant to seek support (Elmqvist et al., 2017). Being male is a significant but negative predictor of help-seeking behaviours (Gonzalez et al., 2011), with men being shown to be negatively associated with a willingness to actively seek substance use support (Sagar-Ouriaghli et al., 2019). As such, low mental health service use by males is observed across Western countries, where women are 1.6 times more likely to seek mental health treatment than men (Wang et al., 2005).

Men are an understudied but important group to research (Elmqvist et al., 2017). Not only because of their differential rates of illicit substance misuse and support-seeking

compared to women. Men are three times as likely to die from suicide than women (*Key Data*, 2014) and report overall lower life satisfaction (*Personal Well-Being in the UK - Office for National Statistics*, 2018). Men also make up a disproportionate number of the homeless and prison population (*Key Data*, 2014). In addition, it should also be noted that being a substance misusing man is also strongly associated with conviction and incarceration into prison, and reconviction (Light et al., 2013), homelessness and suicide (Lee et al., 2017). Research focussing on a male population would help better understand why some men exhibit such vulnerabilities, and the impact this may have on support provision.

Current Systematic Review and Meta-Analysis

Numerous systematic reviews and meta-analyses have been published that support the positive effects of mindfulness treatment on substance misuse problems (Katz & Toner, 2013; Li et al., 2017; Priddy et al., 2018). However, no meta-analyses were found to have been published that examined the efficacy of mindfulness treatment in reducing substance misuse with a specific focus on men and illicit drugs. The focus on illegal drugs is not driven by their legal status, as the legal status does not necessarily directly correspond to the potential harms of the drug (Nutt et al., 2010). However, a distinction was made against legal drugs (e.g., alcohol and tobacco) as the prevalence of illegal substance users is increasing, and the users are under-represented in research (Seitz et al., 2019).

Thus, a systematic review and meta-analysis were conducted that included published, English-language RCTs of MBIs for treating illegal substance misuse difficulties published by January 2021. This systematic review evaluated the methodological characteristics and substantive findings of studies to assess the effects of mindfulness interventions for men with illicit substance misuse. As substance cravings are a significant predictor of substance use and relapse (Witkiewitz et al., 2013), a meta-analysis was

conducted to estimate the treatment effect sizes of mindfulness interventions on substance cravings. It is hoped that this study's findings will increase understanding of the efficacy and appropriateness of mindfulness treatment in men.

Method

Eligibility Criteria

This review only includes published journal articles describing randomised control trials (RCTs) of mindfulness for men treated for a substance use disorder, specifically illegal drugs. The following inclusion criteria were applied: (1) Published RCTs; (2) participants were aged 18 or over; (3) participants diagnosed with a substance use disorder; (4) studies with male-only participants; and (5) utilised a mindfulness-based intervention. Exclusion criteria were as follows: (1) involved non-randomised trials; (2) the primary focus was the treatment of alcohol and tobacco-related addiction; (3) mixed-gendered or female-only participants; and (4) not published in the English language. No restrictions were set on the type of control group used, the method of delivery of the mindfulness intervention, nor the outcomes assessed, as all outcomes were of interest.

Search Strategy

A systematic search was performed in three online databases (i.e., PsycINFO, PubMed and Web of Science) for articles up to 26th January 2021. The search strings used were "mindfulness" OR "mindfulness intervention" OR "mindfulness meditation" OR "mindfulness treatment" OR "mindfulness-based relapse prevention" OR "MBRP" AND "substance misuse" OR "substance use" OR "drug abuse" OR "*use disorder". Free-text searches of the databases were conducted using Boolean operators and truncations. In addition, the reference lists of selected eligible articles were searched to identify any additional relevant studies. The detailed protocol for this systematic review can be found in Appendix A.

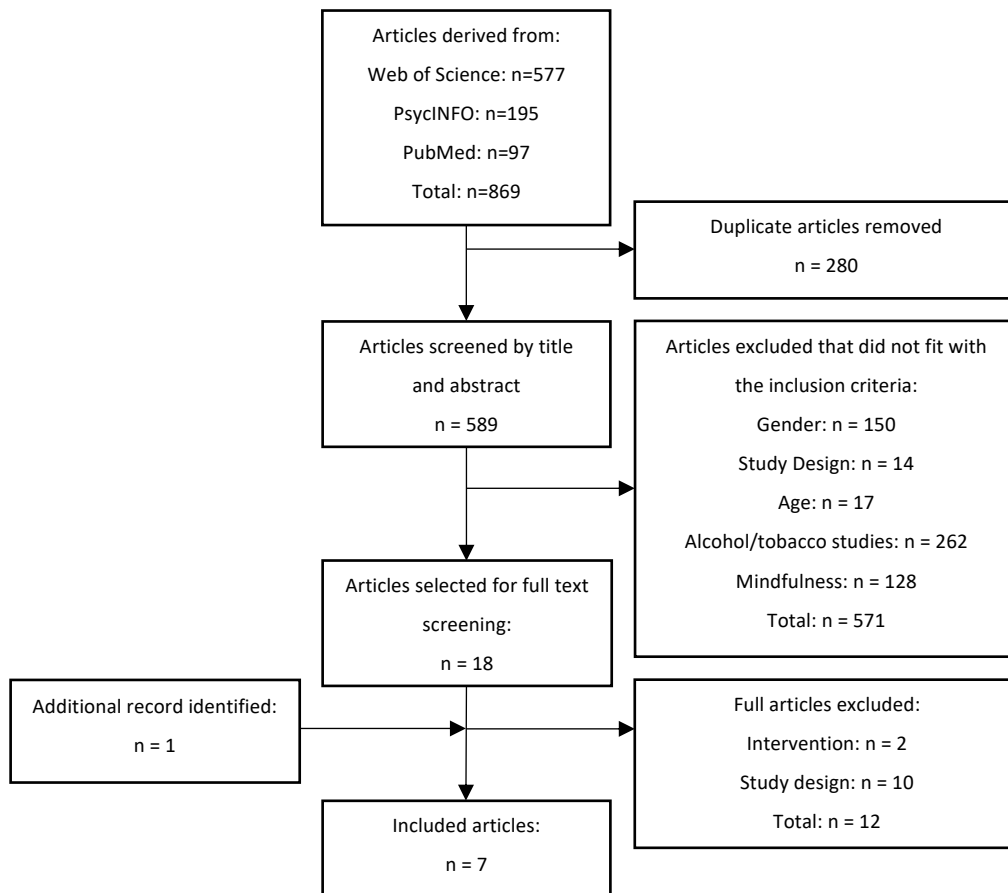
Study selection

The original search returned a total of 869 articles. After de-duplication, 589 articles remained to be screened by title and abstract. The researcher initially screened all the identified abstracts, and a second reviewer assessed a random sample of 70 of the abstracts (12%). There was a very high level of agreement between the raters, Cohen's kappa = 0.84 (McHugh, 2012), and the few disagreements were resolved by discussion. 571 articles were deemed irrelevant to the review because: (1) they did not include mindfulness treatment; (2) did not use a randomised controlled trial design; (3) included female participants; (4) participants were children/adolescents; or (5) the participants were primarily being treated for alcohol or tobacco use.

18 articles were identified as being potentially eligible for inclusion. The full-text versions of the 18 selected articles were retrieved, and the exclusion/inclusion criteria were used to assess whether each study was eligible for inclusion in the review. The eligible studies' reference lists were searched for any other potentially relevant articles. One additional trial was identified for inclusion when reviewing the eligible studies' reference lists (Yaghubi & Zargar, 2018). Full texts from the eligibility screen (19 studies) were reviewed and evaluated for eligibility by the researcher and a second reviewer. A consensus was reached to include a total of seven studies in the analysis. Figure 1. shows a flow diagram of the study selection process for the review.

Figure 1

Adapted PRISMA Flow Diagram (Moher et al., 2009)



Data Extraction

A data form was developed to extract data from the final seven selected studies.

The data extraction protocol was piloted with two randomly chosen studies and refined accordingly. Extraction of the following data was conducted: (1) participant's demographic characteristics; (2) intervention, including format and duration; (3) control group details; (4) treatment adherence; (5) outcomes of interest; and (6) limitations. A reviewer read all the studies independently to ensure the accuracy of the extracted data. Disagreements regarding extracted data were few and resolved via discussion. The author and reviewer assessed the entries in Table 2 to ensure their accuracy.

Quality Assessment

Each study's methodological quality was rated using the Methodological Quality Rating Scale (MQRS; Miller et al., (1995)). The MQRS has been widely used in systematic reviews and meta-analyses examining substance misuse treatments (e.g., Apodaca & Miller, 2003; Vaughn & Howard, 2004; Li et al., 2017). This scale assesses 13 dimensions of methodological attributes. Table 1 shows the 13 dimensions and summary results for the final seven studies.

Table 1

Methodological Quality Rating Scale (MQRS; Miller et al., 1995)

Methodological Attributes	Scores assessed	% (N)
A. Study Design	1 = Single Group pretest posttest	0% (0)
	2 = Quasi-experimental (nonequivalent control)	0% (0)
	3 = Randomization with control group	100% (7)
B. Replicability	0 = Procedures contain insufficient detail	28.6% (2)
	1 = Procedures contain sufficient detail	71.4% (5)
C. Baseline	0 = No baseline scores, characteristics or measures reported	0% (0)
	1 = Baseline scores, characteristics, or measures reported	100% (7)
D. Quality Control	0 = No standardization specified	14.3% (1)
	1 = Intervention standardization by manual, specific training etc.	85.7% (6)
E. Follow-up length	0 = Less than 6 months	57.1 (4)
	1 = 6 to 11 months	14.3% (1)
	2 = 12 months or longer	28.6% (2)
F. Dosage	0 = No discussion of dosage or % of treatment received	71.4% (5)
	1 = Dosage, %treatment enumerated and accounted for	28.6% (2)
G. Collaterals	0 = No collateral verification	100% (7)
	1 = Collaterals interviewed	0% (0)
H. Objective verification	0 = No objective verification	57.1% (4)
	1 = Verification of records (paper records, blood, materials)	42.9% (3)
I. Dropouts / attrition	0 = Dropouts neither discussed nor accounted for	42.9% (3)
	1 = Dropouts enumerated and discussed	57.1% (4)
J. Statistical Power	0 = Inadequate power due to sample size / dropouts	57.1% (4)
	1 = Adequate power with adequate sample size	42.9% (3)
K. Independent	0 = Follow-up nonblind, unspecified	0% (0)
	1 = Follow-up of interventions treatment blind	100% (7)
L. Analyses	0 = No statistical analyses or clearly inappropriate analyses	0% (0)
	1 = Appropriate statistical analyses (group differences)	100% (7)
M. Multisite	0 = Single site or comparison of differing intervention	71.4% (5)
	1 = Parallel replications at two or more sites	28.6% (2)

Total scores range from 0 (lowest quality) to 16 (highest quality). Each study was assessed and scored independently by two raters using the MQRS. An inter-rater reliability

analysis using Cohen's kappa was performed to determine consistency between the two raters. Cohen's kappa was calculated for each study, and the agreements ranged from 0.72 (substantial) to 1.00 (perfect) (McHugh, 2012). This indicates a high level of agreement across all the studies. The individual Cohen's kappa scores for the studies are in Appendix B. Any discrepancies of rating were discussed, and a consensus was agreed upon between the two raters. A summary of the final MQRS ratings for each study is found in Appendix C.

Statistical Analysis

A meta-analysis was performed to estimate the effect size of MBIs on levels of substance cravings at posttreatment compared to control conditions. Substance craving is an important predictor of substance use and may deter individuals from stopping (Sayette, 2016). It was also the only measure to be consistently used in all the studies identified during the systematic review process. Studies were also assessed to ensure that datasets were independent of each other and was not shared between them (i.e., they were not part of a joint clinical trial).

The outcome measures used to quantify levels of craving at posttreatment varied between the studies. The standardised measures, and the studies that employed them are; Heroin Craving Questionnaire (Abed & Shahidi, 2019; Foroushani, 2019), Stimulant Use and Craving (Carrico et al., 2019); Drugs Avoidance Self-Efficacy Scale (Lee et al., 2011); Craving Beliefs Questionnaire (Yaghubi & Zargar, 2018); Penn Alcohol/Drug Craving Scale (Lyons et al., 2019) and the Obsessive-Compulsive Drug Use Scale – Craving (Chen et al., 2019). These standardised measures were all continuous variables. The meta-analysis was performed by computing standardised mean differences in posttreatment values of outcome variables between the mindfulness and control conditions.

Hedge's *g* and associated 95% confidence intervals (CIs) were computed for each study as appropriate and pooled. Hedge's *g* was selected as it has better small sample properties and more suitable when the sample sizes between studies are different (Lac, 2014). The meta-analysis was conducted using The Cochrane Collaboration's Review Manager v5.4 program (Review Manager; RevMan, 2020). The meta-analytic model utilised a random-effects methodology due to the known variation in the study's settings, participant populations and treatment modalities. The random-effects model assumes a more significant underlying heterogeneity between the sample estimates and produces a wider confidence interval for the combined overall effect (Mosteller & Colditz, 1996). The random-effects model also incorporates between-study variation into the study weights and estimated effect size (Harris et al., 2008).

The magnitude of Hedge's *g* was interpreted using Cohen's description of 0.20 as small, 0.50 as medium, and 0.80 as large (Cohen, 1988). Heterogeneity of effect sizes was assessed using Cochran's *Q* statistic (χ^2) to investigate whether there was a significant variation of effect sizes between studies. The I^2 index was used to measure the magnitude of heterogeneity. I^2 measures the degree to which variability of effect sizes between studies is due to heterogeneity rather than chance and is reported as a percentage. The magnitude of heterogeneity ranges from 0% (i.e., homogeneity), 25% equates to small levels of heterogeneity, 50% is moderate levels, and 75% represents high levels of heterogeneity (Higgins, 2003).

Results

Characteristics of the selected studies

A total of seven studies were included in this systematic review, examining the effects of mindfulness interventions on men with illicit drug use problems. A detailed summary of the study characteristics can be found in Table 2.

All the studies employed randomised controlled trial (RCT) designs and were published between 2011 and 2019. Five of the studies (71.4%) did not disclose the dates over which they were conducted (Abed & Shahidi, 2019; Chen et al., 2019; Foroushani, 2019; Lee et al., 2016; Lyons et al., 2019); the other two took place between 2013 and 2017 (Carrico et al., 2019; Yaghubi & Zargar, 2018). The studies were conducted in various countries; three (42.9%) in Iran (Abed & Shahidi, 2019; Foroushani, 2019; Yaghubi & Zargar, 2018), two (28.6%) in the United States (Carrico et al., 2019; Lyons et al., 2019) and one (14.3%) in Taiwan (Lee et al., 2016) and China (Chen et al., 2019). The source of sponsorship was disclosed in only two (28.6%) of the studies. These were the National Institute on Drug Abuse, US (Carrico et al., 2019) and the National Natural Science Foundation of China (Chen et al., 2019).

Most of the studies (71.4%) recruited from community drug treatment centres (Abed & Shahidi, 2019; Carrico et al., 2019; Foroushani, 2019; Lee et al., 2016; Yaghubi & Zargar, 2018), one (14.3%) from a compulsory drug rehabilitation centre (Chen et al., 2019), and one (14.3%) from a court-ordered drug treatment program in a prison (Lyons et al., 2019). Most of the studies (57.1%) evaluated populations being treated for opioid addiction (Abed & Shahidi, 2019; Chen et al., 2019; Foroushani, 2019; Yaghubi & Zargar, 2018), 14.3% methamphetamine addiction (Carrico et al., 2019), with 28.6% treating an undisclosed illicit drug addiction (Lee et al., 2016; Lyons et al., 2019).

Table 2

Characteristics of Included Studies (n=7)

Study	Data collection time points	Treatment condition	Control Condition	Sample	Outcome measures	Results	Limitations	MQRS score
Abed & Ansari Shahidi, 2019	Pre- and posttreatment	Mindfulness-based relapse prevention (MBRP). Conducted by two clinical psychologists. 10-session group intervention (1.5 hours)	Treatment as Usual (TAU). No intervention	Sixty males attending methadone treatment centre, aged between 27 and 50.	Heroin Craving Questionnaire (HCQ) - Pre- and posttreatment. Lapse occurrence (urine) tests - the first, second and third month following the MBRP intervention.	Decreases in three out of the five subscales of HCQ. Urine drug tests indicated fewer lapses in the experimental group.	Small sample size, low power. Limited information on the recruitment process of participants. No description of the control group/ Unknown sponsorship.	10
Carrico et al., 2019	Baseline, 6 Months, 12 Months, 15 Months	Affect Regulation Treatment to Enhance Methamphetamine Intervention Success (ARTEMIS). Five 1-hour sessions delivered.	Neutral Attention-Control Condition. Administration of measures and neutral writing exercises. Five sessions.	110 sexual minority men aged between 24 and 59 (M=432.2). HIV Positive, methamphetamine users. Ethnicity: Black / African American - 16% White - 43% Hispanic - 29% Other - 12%	HIV viral load / CD4 T-cell count - Baseline, 6 Months, 12 Months, 15 Months. Differential Emotions Scale (DES) and Stimulant Use and Craving - Baseline, Session 1, 2 and 3. 3 months, 6 Months, 12 Months, 15 Months.	Significantly lower HIV viral load at six, twelve and fifteen months compared to the control condition. Significant increases in positive affect and decreases in the frequency of stimulant use at six and twelve months.	Small sample size and low generalisability.	13
Chen et al., 2019	The participants were followed up at 1, 3, 6, 12, 24, and 36 month(s) after their discharge	Motivation-Skill-Desensitization-Mental Energy (MSDE). 24 daily sessions, 6 days a week (1.5 - 6hrs)	Treatment as Usual (TAU). No specifics were given.	98 males attending methadone treatment centre, aged between 20 and 50.	Abstinence Rates - participants were followed up at 1, 3, 6, 12, 24, and 36 month(s) after their discharge. Contemplation Ladder (CL) - Readiness to change, Obsessive Compulsive Drug Use Scale (OCDUS) - Craving, Beck Depression Inventory	Significant increase in Contemplation Ladder score and reduction on the OCDUS, BDI, and Aggression Questionnaire. The intervention group reported significantly higher abstinence rates and retention rates at follow-up.	Small sample size. Attrition rates were high. Lack of motivation to change may be related in part to the low retention rates. Abstinence of the participants was self-reported, which may raise a concern about the reliability and validity of the abstinence rates.	12

Study	Data collection time points	Treatment condition	Control Condition	Sample	Outcome measures	Results	Limitations	MQRS score
					(BDI) - Depression and the Aggression Questionnaire (AQ) – Aggression - participants were followed up at 1, 3, 6, 12, 24, and 36 month(s) after their discharge.			
Foroushani, 2019	Pre- and posttreatment, three months follow-up	Mindfulness-based relapse prevention (MBRP). Period of eight weeks, with weekly 2-hour group sessions	Treatment as Usual (TAU). No specifics were given.	60 males attending the methadone treatment centre, mean age 35.	Heroin Craving Questionnaire (HCQ), Five Facets Mindfulness Questionnaire (FFMQ) - Pre- and posttreatment, three months follow-up. Urine tests - The first, second and third month following the intervention.	Three out of the five subscales of HCQ were significantly influenced by MBRP, while this prevention programme significantly influenced all the mindfulness questionnaire's five facets. Urine tests revealed a lower lapse/relapse percentage in the experimental groups.	Study dates are unknown; neither are the inclusion or exclusion criteria disclosed. No description of the control group. Unknown sponsorship.	9
Lee et al., 2016	Pre- and posttreatment	Mindfulness-based relapse prevention (MBRP). 10-session group intervention (1.5 hours)	Treatment as Usual (TAU). No specifics were given.	24 male inmates, mean age = 40.79, Ethnicity: 100% Taiwanese	Drug Use identification Disorders tests (DUDIT-E), Drugs Avoidance Self-Efficacy Scale (DASE), Beck Depression Inventory-II (BDI-II) - Intervention Group completed the BDI weekly. Both groups completed all other measures at pre-and post-treatment.	No between-group differences were found on positive outcome expectancies or self-efficacy. BDI-II scores among MBRP participants showed a downward trend over time. A group x time effect emerged for negative outcome expectancies, with significant differences between groups at post-course assessment.	Small sample size, low power. Unknown method of recruitment. No description of the control group No longer-term follow-up assessment	7
Lyons et al., 2019	Baseline, Follow-up	Mindfulness-based relapse prevention (MBRP). The six-	Neutral Attention-Control	189 male inmates, mean age = 40.79,	Five Facets Mindfulness Questionnaire	The psychosocial measures of anxiety, drug craving, and PTSD at baseline measures	Participants were not able to be followed in the community to assess substance use after release	9

Study	Data collection time points	Treatment condition	Control Condition	Sample	Outcome measures	Results	Limitations	MQRS score
		week program, 75 mins per session.	Condition. Receiving a communications skills curriculum. Unknown frequency.	Ethnicity: African American - 58.9% Hispanic - 18.6%	(FFMQ), Freiburg Mindfulness Inventory (FMI) - Baseline, Follow-up. Beck Anxiety Inventory (BAI), Penn Alcohol/Drug Craving Scale, PTSD Symptom Checklist - Baseline, Follow-up	were significantly positively correlated with one another and negatively correlated with mindfulness, as measured by the FFMQ and FMI. PTSD and craving scores declined while mindfulness scores on the Freiburg scale, though not the FFMQ, increased. There were no significant differences in other psychological outcomes.	from jail. The follow-up rate of 69% was low, primarily because participants were released or transferred. As both the treatment and comparison interventions took place in a therapeutic jail community, the authors cannot distinguish the effects of MBRP from the beneficial effects of other treatment received by participants.	
Yaghubi & Zargar, 2018	Pre- and posttreatment, two months follow-up	Mindfulness-based relapse prevention (MBRP). 8 weekly sessions of 2 hours.	Treatment as Usual (TAU). Methadone therapy and received only general information about substance use.	70 males attending the methadone treatment centre, aged between 20 and 50.	Quality of Life (QOL), Craving Beliefs Questionnaire (CBQ) - Pre- and posttreatment, two-month follow-up.	The results of repeated-measures ANOVA showed no significant difference between intervention and control groups in the pre-test. Still, MBRP in the intervention group significantly increased the scores of QOL and decreased the scores of craving significantly.	Limitations of this study include research sample limitation to men and short duration of follow-up. To raise the generalisability and reliability, further studies with longer follow-up periods and both men	7

Sample sizes ranged from 24 to 189, with most studies (57.1%) reporting adequate power with a sufficient sample size (Carrico et al., 2019; Chen et al., 2019; Lyons et al., 2019; Yaghubi & Zargar, 2018).

The studies evaluated different types of mindfulness intervention, including Mindfulness-based relapse prevention (MBRP; Abed & Shahidi, 2019; Foroushani, 2019; Lee et al., 2016; Lyons et al., 2019; Yaghubi & Zargar, 2018) and Affect Regulation Treatment to Enhance Methamphetamine Intervention Success (ARTEMIS; Carrico et al., 2019). One study included mindfulness training as an adjunct to Eye Movement Desensitisation and Reprocessing (EMDR) in a treatment known as Motivation-Skill-Desensitisation-Mental Energy (MSDE; Chen et al., 2019).

As the studies used different adaptations of mindfulness-based interventions, the intervention's length varied between the studies. Two studies had intervention lengths of four to six weeks (Chen et al., 2019; Lyons et al., 2019), three studies had eight-week interventions (Abed & Shahidi, 2019; Foroushani, 2019; Yaghubi & Zargar, 2018), with two studies having intervention durations of ten to thirteen weeks (Carrico et al., 2019; Lee et al., 2016). Therefore, it is important to consider when comparing studies that the time between the pre-and posttreatment measures varies depending on the study design.

Appendix C presents the seven studies' characteristics and major findings and their methodological attributes as reviewed using the Methodological Quality Rating Scales (MQRS). Each study was evaluated by two raters with high levels of agreement. The average measure Intraclass Correlation Coefficient (ICC) was .99 with a 95% confidence interval from .96 to .99 ($F(12)=88.34, p<.001$). The MQRS scores across the seven studies ranged between seven (Lee et al., 2016; Yaghubi & Zargar, 2018) and thirteen (Carrico et al., 2019). The mean score was 9.60 (SD=2.30). Overall, the methodological qualities of the studies ranged from medium to high.

All studies reported the extent to which randomisation successfully managed group baseline characteristics. When randomisation was not completely successful, the studies disclosed the analytical strategies used to control baseline group differences between participants in the intervention and control conditions (e.g., ANCOVA).

Six out of seven studies (85.7%) reported baseline sample characteristics and outcome measures. All studies were evaluated using appropriate statistical analyses that compared differences in outcomes between the intervention and control groups. The majority of studies provided details of the procedures in sufficient detail to allow for replication (85.7%), employed intervention standardisation of the manual and procedures (71.4%), and enumerated the study attrition rates (85.7%). However, only a minority of studies accounted for treatment dosage (i.e., the proportion of the total number of sessions participants attended; 42.9%), and only 42.9% employed an objective verification of outcome variables (e.g., urine tests). None of the studies used collateral interviews to validate participants' self-reports. Additionally, only a minority of studies followed up participants after six months (42.8%), and only one study conducted follow up by independent interviewers who were blind to group assignment (14.2%).

Effects of mindfulness treatment on substance misuse

Five RCTs compared mindfulness interventions to treatment as usual (TAU) conditions (Abed & Shahidi, 2019; Chen et al., 2019; Foroushani, 2019; Lee et al., 2016; Yaghubi & Zargar, 2018), with two RCTs comparing the intervention against a neutral attention control group (Carrico et al., 2019; Lyons et al., 2019). The majority of the studies found that mindfulness interventions were associated with favourable substance misuse treatment outcomes at posttreatment and follow-up compared to control conditions, except for one study (Lee et al., 2016). Specifically, mindfulness interventions were superior to control conditions, such as

treatment as usual or neutral attention control groups, to reduce the level of craving for substance use (Abed & Shahidi, 2019; Carrico et al., 2019; Chen et al., 2019; Foroushani, 2019; Lyons et al., 2019; Yaghubi & Zargar, 2018) and increased abstinence rates (Abed & Shahidi, 2019; Carrico et al., 2019; Chen et al., 2019; Foroushani, 2019). Mindfulness intervention was demonstrated to be more effective in reducing craving, substance use, and increasing abstinence than TAU alone (Abed & Shahidi, 2019; Carrico et al., 2019; Chen et al., 2019; Foroushani, 2019). Additionally, five RCTs demonstrated that mindfulness intervention was more effective in increasing abstinence rates at posttreatment and follow-up, compared to the control support group (Abed & Shahidi, 2019; Carrico et al., 2019; Chen et al., 2019; Foroushani, 2019; Yaghubi & Zargar, 2018).

Contrary to the positive findings described above, Lee et al. (2016) did not observe significant differences between the MBRP intervention and TAU control condition in increasing drug avoidance at posttreatment. However, this study may have been limited due to significant differences in drug use between the experimental and control conditions at baseline. The study's low statistical power may further reduce the quality of this study due to the small sample size (N = 24).

Effect sizes of mindfulness treatment posttreatment outcomes

All seven studies provided sample sizes for the intervention and comparison conditions. They also provided sufficient information to calculate the effect size, including means and standard deviations for levels of substance cravings posttreatment. Using the Cochrane Collaboration's Review Manager software (*Review Manager; RevMan, 2020*), a meta-analysis was conducted for the seven RCTs comparing the effects of mindfulness intervention to control conditions on posttreatment values of substance craving. Table 3 shows the effect sizes and associated 95% CIs of mindfulness treatments of substance

craving levels at posttreatment relative to a control condition (i.e., TAU or neutral attention).

Table 3

Summary Data and Effect Sizes of Mindfulness Interventions on Substance Craving at Posttreatment Relative to a Control Condition

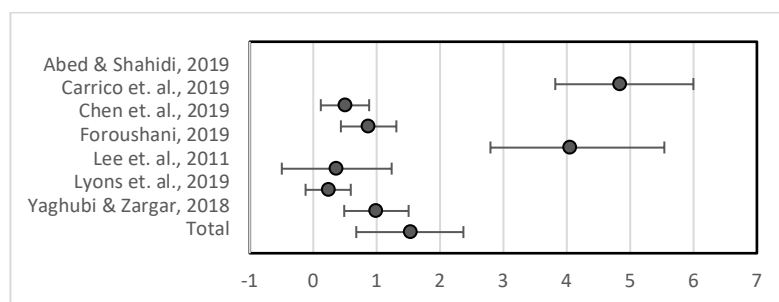
Study	Intervention			Control Group			Weight	Hedge's g	95% CI	
	n	Mean	SD	n	Mean	SD				
Abed & Shahidi, 2019	24	18.93	1.75	29	31.66	3.12	12.65%	4.84	3.82	6.00
Carrico et al., 2019	55	1.79	1.36	55	2.56	1.69	15.64%	0.50	0.12	0.88
Chen et al., 2019	46	30.74	11.83	43	39.58	7.84	15.47%	0.87	0.44	1.31
Foroushani, 2019	12	16.23	1.78	15	32.26	3.71	11.39%	4.04	2.80	5.54
Lee et al., 2011	10	40.40	1.26	12	41.36	3.29	13.91%	0.36	-0.49	1.24
Lyons et al., 2019	54	8.00	3.20	71	8.90	4.20	15.70%	0.24	-0.12	0.59
Yaghubi & Zargar, 2018	35	67.46	11.14	33	82.63	18.57	15.25%	0.99	0.49	1.51
Total	236			258			100.00%	1.53	0.68	2.37

Heterogeneity: Tau² = 1.13, Chi² = 99.84, df = 6 (p < .0001), I² = 94%

The seven studies' sample sizes varied from 24 to 189 (M=87.3, SD=52.9), and the number of participants completing posttreatment assessments ranged from 24 to 126 (M=70.1, SD=32.0). The synthesised effect size for the seven studies was calculated (Hedge's g = 1.53, 95% CI 0.68 to 2.37). The meta-analysis' results showed very high heterogeneity across the studies in the meta-analyses of craving (I² = 0.94). A Forest plot was also generated to display the effect sizes for each of the studies (Figure 2).

Figure 2

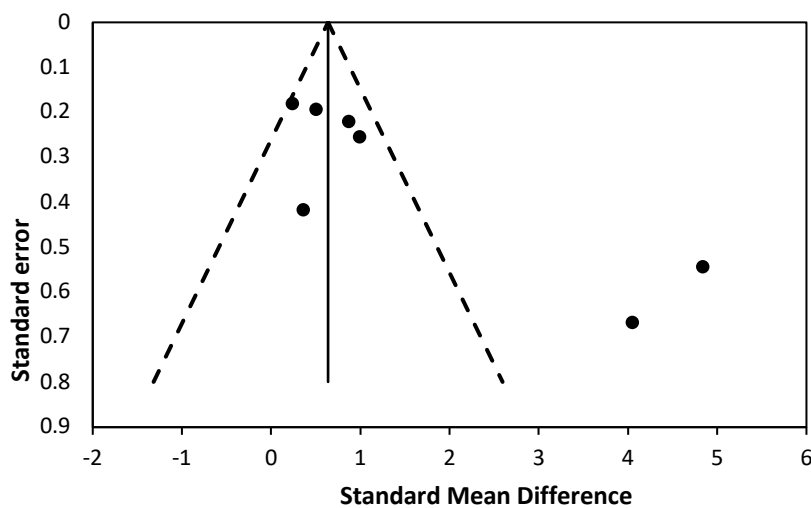
Forest Plot Displaying Random-Effects Meta-Analysis for the Effect of a Mindfulness Intervention on Substance Craving at Posttreatment Relative to a Control Condition



The presence of publication bias was evaluated by analysing funnel plot asymmetry (Figure 3) and using Egger's test (Egger et al., 1997) and Begg and Mazumdar's test (Begg & Mazumdar, 1994). Both Egger's regression ($p = 0.023$) and Begg and Mazumdar's test ($p=0.024$) suggest the presence of publication bias of funnel plots for craving. The outer dashed lines indicate the triangular region within which 95% of studies are expected to lie in the absence of both biases and heterogeneity.

Figure 3

Funnel Plot to Evaluate Publication Bias among Studies Included in the Meta-Analysis for the Effect of a Mindfulness Intervention on Craving.



The funnel plot of substance craving showed some asymmetry, suggesting that studies with small sample sizes showing the nonsignificant effect of mindfulness treatment were missing from the meta-analyses. The asymmetry of the funnel plot may also be attributable to the large between-study heterogeneity.

With the potential exclusion of studies with nonsignificant findings, synthesised effect sizes of mindfulness treatment on cravings may be overestimated. The trim and fill method to impute missing studies and compute a resultant adjusted mean effect size (Duval

& Tweedie, 2000) was considered. However, this was not used due to the potential bias introduced by the heterogeneity found between the studies, high levels of heterogeneity having been found to affect the validity of this method (Peters et al., 2007).

Overall, the results from the funnel plots, Egger's and Begg and Mazumdar's tests, suggested that the meta-analyses' results were likely to be affected by publication bias. However, the funnel plots need to be interpreted cautiously due to the small number of studies included within this meta-analysis, and the high levels of heterogeneity between the studies.

Discussion

This systematic review and meta-analysis evaluated seven randomised control trials (RCTs), published between December 2011 and November 2019. The therapeutic benefits of mindfulness-based interventions (MBIs) were examined in male populations of illicit substance users across various treatment settings. This review supports the promising effects of MBIs in treating men with substance use difficulties within community treatment programs and prison settings. Furthermore, the results of the meta-analyses revealed that individual studies demonstrated small-to-large effect sizes for the mindfulness interventions on reducing craving for substance use, compared with control conditions.

In the systematic review, most studies reported that mindfulness-based interventions effectively reduced substance use and increased abstinence at posttreatment and follow-ups ranging from 1-month to 36-months posttreatment. The RCTs indicate that mindfulness-based interventions produced more positive outcomes when compared with treatment as usual (TAU) or neutral attention control groups. However, one study failed to find any statistically significant different results between intervention and control groups

posttreatment (Lee et al., 2016), although this could be partially explained by the study's significantly different baseline group measures.

Where positive treatment outcomes were found, most of the gains were reported to be maintained in the longer term. However, overall, the results at follow-up were mixed. Some studies reported sustained positive outcomes after posttreatment (Abed & Shahidi, 2019; Chen et al., 2019; Foroushani, 2019; Yaghubi & Zargar, 2018). However, other studies reported that the differences between the MBI and TAU groups were no longer statistically significant (Carrico et al., 2019) or were only reported on narratively (Foroushani, 2019). Two studies had not incorporated follow-ups into their study design (Lee et al., 2011; Lyons et al., 2019). The most extended follow-up period of the included studies was 36 months (Chen et al., 2019). This study suggests that the long-term effectiveness of MBIs on abstinence rates appears to diminish with time. However, with high participant attrition levels in this study, these results should be interpreted with caution and may be circumstantial to the characteristics of this study. Further research should explore to what extent continuous mindfulness practise is required to maintain the short-term increase in abstinence rates over time.

In contrast to the others, one RCT in this review did not support an effect of mindfulness treatment in decreasing drug avoidance self-efficacy and frequency of drug use measures at posttreatment compared to a treatment as usual control group (Lee et al., 2011). Although comparing posttreatment outcomes between the treatment and control groups elicits a positive effect, the differences became nonsignificant when controlling for the two groups' baseline characteristics. It should be noted that this study scored the lowest in the quality assessment using the MQRS. Methodological design characteristics that potentially affected this study's interpretability include the small sample size, leading to low statistical power to detect significant effects. In addition, the study did not have a

description of the control group conditions nor details of the randomisation process.

Furthermore, the study's measures were locally translated and adapted by the author, and the psychometrics for the adapted scales were not reported in the article.

The reviewed studies' retention rates were generally high, with several studies reporting that retention in the treatment groups was higher than the control groups (Chen et al., 2019; Yaghubi & Zargar, 2018). As the treatment did not adversely impact retention rates for MBIs, this supports the premise that MBIs are suitable for treating people with substance use difficulties.

The RCTs in this review provided detailed sufficient statistical information - means and standard deviations - on the outcome variable of interest (i.e., craving) measured at posttreatment. As such, it was possible to obtain accurate effect sizes of the interventions for a meta-analysis. Overall, the meta-analysis of the RCTs supported the positive findings from the systematic review.

The meta-analysis indicated that mindfulness interventions could alter underlying risk mechanisms for cravings for substance use. These findings are potentially significant because craving and substance use as a coping response for distress are established as predictors of relapse (Hartz et al., 2001). Mindfulness treatments may reduce cravings by facilitating people's metacognitive awareness of their craving experience and the presence of urges (Elmquist et al., 2017). Increasing awareness of these triggers may enable people to disengage their attention from distressing experiences and substance-related urges that could trigger substance use and reorient their attention to health-promoting stimuli (Garland et al., 2014). Studies also suggest that mindfulness training could reduce craving through cultivating awareness and acceptance of, and nonreactivity to, craving without engaging in addictive responses (Enkema et al., 2020; Garland et al., 2014). Mindfulness is

also thought to be a metacognitive coping strategy by enhancing awareness of relapse risk triggers (Marlatt & Donovan, 2005).

The overall strength of the relationship between MBIs and substance craving was quantified by synthesising the studies' empirical results through meta-analysis. However, due to the degree of heterogeneity between studies, these results should be interpreted cautiously. A random-effects model was employed in the meta-analysis, due to the known differences in treatment modality and participant populations, even though this results in a less accurate assessment of the impact of the intervention (Sedgwick, 2015). However, despite all the studies included within the meta-analysis measuring the same theoretical hypothesis that MBIs reduce cravings in men with substance use difficulties, synthesising the findings across studies was problematic due to the high degree of heterogeneity. Although the studies had the same outcome direction of mindfulness having a positive outcome effect on substance use craving, the meta-analysis' heterogeneity revealed effect sizes of different magnitudes. The effect sizes of the individual studies ranged from 0.24 to 4.84. However, from the forest plot (Figure 2) and the funnel plot (Figure 3), the effect sizes of two of the studies are potential outliers (Abed & Shahidi, 2019; Foroushani, 2019), having markedly different findings compared to the other five. The effect sizes for the two outlier studies were 4.84 and 4.04, compared with the range for the other five being 0.24 to 0.99. It is not uncommon for outliers to occur in meta-analyses and could be the results of chance alone (Viechtbauer & Cheung, 2010). However, as it is very difficult to distinguish between large sampling errors and actual erroneous data, some researchers recommend against examining the influence of outliers in meta-analyses (Hunter & Schmidt, 2004).

This degree of variability in effect sizes was unexpected, and no theory-driven explanation was considered a priori and may reflect underlying study variations. For example, differences in the research setting (i.e., community treatment and prison settings),

demographics (i.e., ethnicity, primary language), or methodological alterations due to cultural or contextual differences (i.e., whether culturally sensitive adaptations were used) (Lac, 2014). A diagnostic quantitative, post-hoc subgroup analysis to examine study characteristics that could explain the heterogeneity was not conducted. Conducting multiple analyses without an a priori theoretical basis increases the risk of a Type I error (Higgins, 2003). Type 1 errors are finding an apparent but false explanation for the heterogeneity by considering many different characteristics). However, future research may consider scrutinising the identified outliers in terms of their study design, as this may lead to new insights about characteristics that may act as potential moderators (Viechtbauer & Cheung, 2010). For example, the studies with large effect sizes may indicate study parameters that produce these types of effects (Mosteller & Colditz, 1996).

However, in the absence of a quantitative sub-group analysis, a post-hoc narrative explanation could be associated with both outlier studies having very small sample sizes and reported low statistical power. Other factors may have been introduced by the systematic review's study criteria or comparing the different mindfulness-based interventions (e.g., MBRP, ARTEMIS and MSDE). Although, a recent meta-analysis of a range of mindfulness treatment for substance misuse found that virtually all treatments were associated with positive outcomes despite the methodological heterogeneity (Li et al., 2017).

It is also important to note that the seven studies used different measures to assess substance craving, including the Heroin Craving Questionnaire – HCQ (n=2), Drugs Avoidance Self-Efficacy Scale – DASE (n=1), Stimulant Use and Craving (n =1), the Craving Beliefs Questionnaire – CBQ (n=1), the Obsessive-Compulsive Drug Use Scale - OCDUS – Craving (n=1), and the Penn Alcohol/Drug Craving Scale (n = 1). As these measures may demonstrate differential temporal sensitivities, this may introduce further bias into the analysis.

Another source of variance between the studies is the different types of illicit drugs being treated (e.g., opiates, methamphetamine etc.). Drug type has been hypothesised to be an important factor in differences in substance craving outcomes in intervention studies (Enkema et al., 2020). Research suggests that the associations between affect and cravings may differ according to substance type, with different mood states triggering cravings depending on the substance type (Serre, 2018). While this meta-analysis' findings are exploratory and data-driven, the high degree of heterogeneity means that the results should be interpreted with caution (Viechtbauer & Cheung, 2010). However, further investigation may reveal potentially interesting avenues for future research.

In addition to measuring abstinence and substance cravings, most studies in this review examined changes in other psychological functions associated with substance misuse (Carrico et al., 2019; Chen et al., 2019; Foroushani, 2019; Lee et al., 2016; Lyons et al., 2019; Yaghubi & Zargar, 2018). Findings from these studies indicate that MBIs were associated with posttreatment increases in positive affect (Carrico et al., 2019; Chen et al., 2019; Lee et al., 2016), reductions in aggression (Chen et al., 2019), improvements in trait mindfulness (Lyons et al., 2019) and quality of life (Yaghubi & Zargar, 2018). These reports reinforce findings that MBIs can facilitate a range of positive health outcomes amongst substance users thought to be influential in cravings and relapse.

The current review focused on sample populations of males with problematic illicit substance use, excluding any mixed gendered or female-focused research, and studies primarily focused on legal drug misuse, particularly alcohol and tobacco use. This study broadly supports a recent systematic review and meta-analysis that focused on a broader population of participants, including legal and illegal substance use (Li et al., 2017). The authors evaluated 42 mixed gendered, or female only, studies and evaluated treatments for mixed substance misuse presentations (i.e., alcohol, alcohol and illicit drugs or illicit drugs

only). This review also revealed small to large effects of MBIs, with an overall synthesised effect size of 0.62, reporting similar positive outcomes of mindfulness treatments at posttreatment relative to a comparison condition. A further systematic review evaluating gender differences in the effectiveness of MBIs for substance use disorders found that whilst MBIs show positive outcomes for substance use behaviours, it demonstrated mixed results for gender differences. It recommended further research, including gender as an independent variable (Katz & Toner, 2013).

Strengths and Limitations

The overall strength of the systematic review process was improved by having the study selection process assessed by two independent raters. The second rater evaluated 12% of the abstracts and all the full papers. In doing so, the decision-making process was less susceptible to personal biases. Inter-rater reliability was high, and any disagreements were resolved between the raters through discussion. Similarly, the quality assessment of the included studies was made more reliable by employing a second rater to independently assess all the studies (Appendix B). Although the MQRS has been used in systematic reviews of RCTs for substance use, most recently (Li et al., 2017), one of the assessment domains (i.e., "Collaterals") did not apply to any of the studies in this review, which artificially increased their overall risk of bias.

This review restricted the search parameters to randomised controlled trials (RCTs), which offer one of the highest levels of quality for research evidence (Boland et al., 2017). However, the results of this systematic review should be interpreted with caution due to potential biases introduced by the inclusion and exclusion criteria used to select the studies. The validity of the current review may have been limited by restricting searches to English language, published, peer-reviewed articles, and excluding grey literature. This approach

may have resulted in a reporting bias due to the potential for significant findings to be more likely published and translated into English (Boland et al., 2017). The search could have been extended to Latin American and Caribbean Health Sciences Literature (LILACS) to potentially minimise some of this risk. This database regularly publishes articles written in non-English languages. However, due to the time constraints of this study, and the researcher not able to read them without translation, this option was not taken up.

In addition, the methodological limitations as identified in the quality assessment using the MQRS may also increase the risk of bias (Appendix C). Most of the studies had small samples, limiting the statistical power to detect treatment effects. Furthermore, methodological limitations such as nonprobability sampling might have led to limited generalisability, and self-report measures may bias results towards social desirability. Although two of the studies followed treatment participants for 12-month posttreatment or longer (Carrico et al., 2019; Chen et al., 2019), most studies only assessed treatment outcomes at posttreatment or 3 months after treatment completion. Notably, most mindfulness interventions adapted manualised protocols, with some not reporting treatment fidelity assessment (Foroushani, 2019; Yaghubi & Zargar, 2018). Failure to implement a protocol as planned increases the risk of a Type III error, whereby the observed findings are attributed to the methodological underpinnings of the intervention, ignoring the impact of the deviations from the protocol (Dusenbury et al., 2003). An evaluation of fidelity is important as it enables researchers to identify the changes made to the protocol and how those changes may have impacted the outcomes.

Another limitation of the study is that different instruments were used to measure levels of substance craving for the meta-analysis. The studies included in the meta-analysis reported using empirically supported valid and reliable measures, all measuring the same underlying construct, substance craving. However, pooling the results from trials using

different instruments should be treated cautiously, as the measures may have different degrees of responsiveness, which can generate substantial heterogeneity (Puhan et al., 2006).

Despite its limitations, this review suggests that mindfulness-based treatments are a promising intervention for illicit substance misuse and relapse prevention in men. MBIs were also shown to improve other psychological outcomes associated with substance use. Meta-analytic results reveal small-to-large effects sizes of mindfulness treatment in reducing levels of substance craving compared to treatment as usual or neutral attention control conditions. Future research would need to address the methodological concerns to further the empirical evidence for mindfulness-based interventions for substance misuse problems in men. This would require RCTs with larger sample sizes, evaluating treatments across a range of diverse populations and settings. Future studies should provide more detailed descriptions of the adapted protocols, randomisation protocols, and treatment fidelity and adherence due to variations in the interventions evaluated. Although some methodological limitations have been reported, it appears that further research into MBIs as an intervention for substance misuse difficulties is warranted. Future studies should involve longitudinal and experimental designs with longer-term follow-up assessments to explore efficacy and effectiveness and assess potential mechanisms of change more fully.

III. Correlates of chemsex: Shame, mindfulness, sexual satisfaction, and self-efficacy beliefs in men who have sex with men

Abstract

Men who have sex with men (MSM) often experience high levels of shame and stress and low levels of sexual satisfaction. MSM are also at higher risk of maladaptive sexual behaviours such as risky and unprotected sex and polysubstance drug use (Evers, 2020). In recent years services have reported an increase in the demand for support with a form of sexualised drug use, known as chemsex. Although chemsex is highly prevalent in MSM, the majority report that it positively impacts their lives. However, some MSM struggle to re-engage with 'sober sex'. Sober sex is defined as the ability to have and enjoy sex without alcohol or drugs. The demand for support for problematic chemsex use has increased in recent years, but there are currently no specific theory or data-driven interventions. The potential mechanisms resulting in chemsex use or barriers to re-engaging in sober sex are not fully understood. There is growing evidence for mindfulness-based interventions in sexual problems and substance use, but this research has not been extended to those who engage in chemsex. Here, we explore possible mechanisms behind the associations between shame, stress, sexual satisfaction, self-efficacy beliefs in engaging in sober sex and mindfulness. Cross-sectional survey data (n = 213) gathered in the study was collected from participants primarily through geospatial dating apps. Tests of difference found that MSM who report that chemsex has a negative impact on their life had significantly higher levels of shame and stress and lower levels of mindfulness, sexual satisfaction, and self-efficacy. Correlational analyses confirmed that shame and stress were strongly associated with each other, but both were negatively related to mindfulness, sexual satisfaction, and self-efficacy. Mindfulness was positively correlated with both sexual satisfaction and self-efficacy.

Mediation analyses were employed to address whether mindfulness statistically mediated the relationships between shame and sexual satisfaction and shame and self-efficacy. As measured by the Five-Facet Mindfulness Questionnaire, three facets of mindfulness had an association to the relationship between shame and sexual satisfaction (i.e., describe, acting with awareness and nonreactivity). It was also found that all five facets of mindfulness statistically partially mediated the association between shame and self-efficacy for initiating sober sex. These findings suggested a potential direction for future research targeting specific mindfulness facets in developing interventions for chemsex.

Keywords: men who have sex with men, shame, stress, sexual satisfaction, self-efficacy, mindfulness

Introduction

Sexualised drug use (SDU) refers to drug use before or during sex to enhance and prolong the sexual experience (Rosińska et al., 2018). A subset of SDU, chemsex, is a relatively recent phenomenon and is considered distinct from traditional sexual and substance misuse difficulties due to the drugs' specificity and the context of its use. There is no global consensus on the definition of chemsex (Torres et al., 2020). It is subject to the availability of illicit drugs among subcultures within countries (Maxwell et al., 2019). However, in the UK, the drugs most commonly associated with chemsex are methamphetamine, γ -hydroxybutyrate (GHB) and mephedrone (Bourne et al., 2014). The drugs, often taken in combination, facilitate the sexual experience by increasing arousal and lowering inhibitions whilst inducing an immediate sense of connection and intimacy with sexual partners (Smith & Tasker, 2018). Chemsex events, also known as "chill out parties", may last several days involving multiple partners (Platteau et al., 2020)

Chemsex is predominately associated with men who have sex with men (MSM). In the UK, chemsex amongst MSM is more prevalent than in the general population, with recent research suggesting that 6.6% of MSM in England had engaged in chemsex in the last four weeks, rising to 21.9% for those living with HIV (Bourne et al., 2014). However, media representations of chemsex are often sensationalist and damaging, focusing on the negative impact of problematic chemsex engagement among MSM (Aldridge, 2020). This has had the effect of problematising substance use, regardless of the level of consumption, generating 'moral panic' (Santoro et al., 2020) and pathologising people who engage in chemsex non-problematically. There is not only a risk of further stigmatising MSM but complicating the development of appropriate public health responses (Pienaar et al., 2018).

However, there is no sophisticated understanding of the prevalence of drivers for chemsex (ACON, 2013b). NHS Trusts do not consistently collect chemsex prevalence data among MSM in any UK national surveillance systems, with most available data being almost exclusively sourced from sexual health and drug clinics in metropolitan areas (Edmundson et al., 2018). Qualitative evidence consistently suggests that MSM engaged in chemsex initially access services when there is an urgent sexual health need, such as testing for sexually transmitted infections (STI) or post-exposure prophylaxis (PEP) following potential exposure to HIV. Most MSM engaged in chemsex do not initially seek support for drug-related difficulties (Hegazi et al., 2017). Some anecdotal reports indicate that engagement in chemsex, alongside an increasing demand for help, is becoming more common across the UK, resulting in calls for a national targeted sexual health response (Moncrief, 2014).

Many MSM who engage in chemsex consider sober sexual intimacy to be 'normal' or more authentic (Aldridge, 2020) and often report dissatisfaction with their reliance on drugs to enjoy sex. Individuals are increasingly seeking support to re-engage in 'sober sex', whereby they be "present" during sex without drugs being involved, and the connection between body and mind is maintained. Still, relapse is common (Kunelaki, 2019). However, the prevalence of chemsex among MSM, and the heightened pleasures associated with it, sexualised drug use can be challenging to disengage from (Moncrief, 2014).

Given the increased demand for support from the chemsex community and high relapse rates, there has been a growing need to understand the factors underlying the behaviours maintaining chemsex engagement and ultimately developing targeted treatments specifically for the chemsex community. This is particularly important as problematic chemsex use has been associated with significant physical and mental health implications (Smith & Tasker, 2018) and is often riskier than "sober sex". For example, there is an increased prevalence of unprotected sex in those who engage in chemsex (Bourne et

al., 2015). However, there is a lack of evidence about good practice in drug treatment for MSM service users, with limited studies measuring outcomes or evaluating service use by sexual orientation or gender identity (Williams et al., 2010). Part of the challenge of understanding chemsex use and ultimately developing treatments is that illicit drug users are often hard-to-reach populations, impacting recruitment into research studies (Cave et al., 2009).

Without specific theory-driven or data-driven interventions for chemsex, many services support those seeking treatment by employing traditional substance misuse interventions to address substance use and sexual risk jointly (e.g., motivational interviewing and brief short-term structured behavioural change interventions; Moncrief, 2014). Some third sector organisations also offer group psychosocial treatments such as mindfulness interventions (e.g., Spectra; Hoff et al., 2020).

With the limited evidence-based research, this study aims to explore possible factors theorised to be implicated in the maintenance of chemsex behaviours. It is hoped that it would provide additional data that could be used to build on the theoretical understandings of chemsex and guide intervention development.

Internalised homophobia amongst men who have sex with men (MSM)

In its report on sexual health, the World Health Organisation defined sexual well-being as requiring a positive approach to sexuality and sexual relationships, not just as the absence of disease or dysfunction (WHO, 2006a). Individuals' sexual health and well-being include sexual function, comfort and satisfaction (Douglas & Fenton, 2013), the ability to have pleasurable and safe sexual experiences, free from discrimination.

However, 70% of the world's population live under laws that limit freedom of expression of sexual orientation; in over 70 countries globally, same-sex relationships are

still illegal, for which the punishment is death in fourteen (Carroll & Mendos, 2017). Even in Great Britain, a country with laws protecting sexual minority groups, one in five LGBT people has experienced a hate crime because of their sexual orientation, with four in five anti-LGBT incidents estimated to go unreported (Bachmann & Gooch, 2017). Homonegative abuse occurs across the life span, with most sexual minority schoolchildren reporting being bullied through sexual orientation labelling (Stonewall, 2017).

Perceived stigmatisation of one's sexual minority identity can have lasting implications across the life span. As adults, 29% of LGBT people avoid certain streets as they feel unsafe and, more than 58% of men who have sex with men (MSM) feel they cannot hold their partner's hand in public without experiencing homophobic abuse (Bachmann & Gooch, 2017).

The concept of minority stress originates from social and psychological theoretical orientations. It is described as the relationship between minority and dominant societal values and the conflict with the prevailing social-cultural climate experienced by minority group members (Meyer, 2003). Many MSM internalise prevalent negative social attitudes in response to direct and implicit prejudice (Todd, 2016). Referred to as internalised homophobia, many MSM have negative feelings about themselves that originate from experiencing others as critical and rejecting. MSM can become highly critical of themselves, developing feelings of shame. Shame is a multi-faceted emotion associated with feelings of inferiority and defectiveness. Many individuals with high levels of shame desire to escape, hide or conceal perceived deficiencies (Irons & Lad, 2014). High levels of shame are associated with increased distress and other psychopathological symptoms (Gilbert, 1998). MSM can be exposed to many negative life experiences, such as rejection, social isolation and abuse (Morris, 2019), and often present with higher levels of shame and elevated stress due to heightened vigilance related to these expectations (Meyer, 2003; Todd, 2016). Also,

MSM often experience a higher prevalence of depressive symptoms than the general population (Cho & Sohn, 2017). It has been estimated that the prevalence of depressive symptoms among MSM ranges from 29.2–63.9%, while the prevalence in the general population was 5.3–23.0% (Wang et al., 2017). Depressive symptoms, in turn, are also closely associated with increased risk for substance use (Wong et al., 2014) and risky sexual behaviours (Fendrich et al., 2013). Overall, MSM have a greater likelihood than the general population for risk-taking behaviours, including unprotected sex and polysubstance use (Kashubeck-West & Szymanski, 2008).

Shame and related mental health difficulties are thought to be significant risk factors for poor sexual health in MSM for several reasons (Jaspal & Dhairyawan, 2018). Internalised homophobia is significantly and negatively correlated with self-esteem, precluding the desire to engage with safer sex behaviours (Kashubeck-West & Szymanski, 2008). Shame is also associated with maladaptive coping strategies such as alcohol and substance misuse and can negatively impact an individual's desire for intimacy or their ability to connect with others (Jaspal, 2018). Shame also often exacerbates social disconnections, where people withdraw or avoid others and their communities, ultimately generating a sense of loneliness (Hartling et al., 2004). For example, if MSM feel negatively about engaging in sexual activities, because of perceived societal disapproval, they experience lower levels of enjoyment, which is theorised to reduce their desire to seek out same-sex partners (Li et al., 2019). Poor relational factors and low intimacy are a strong predictor of poor overall sexual satisfaction and sexual well-being in heterosexual and homosexual men (Carvalheira & Costa, 2015). Research also suggests that levels of shame and distress levels are particularly high within MSM who engage in chemsex, and these are hypothesised to act as barriers to re-initiating sober sex (Morris, 2019). Extensions in the development of Compassion Focused Therapy (CFT; Gilbert, 2014) in the field of psychosexual difficulties may provide

support for those experiencing high levels of shame, which may play a role in the maintenance of sexual problems (Vosper et al., 2021).

MSM and chemsex / 'sober sex'

Drug consumption amongst gay men in sexual contexts has been a part of queer culture for a long time (Florêncio, 2021). However, when The Chemsex Study (Bourne et al., 2014) was published, a survey commissioned to understand the prevalence of chemsex in the London boroughs of Lambeth, Southwark and Lewisham, many news outlets created a narrative about the gay community in London self-medicating their shame (Florêncio, 2021). The consequences were to further alienate a community already stigmatised by legal and public health responses to drugs and sex (Frederick & Perrone, 2014).

Whilst it is common to view the chemsex experience through a lens of health risks to inform health care planning, it is important to note that many within the chemsex community rarely see themselves as having difficulties with drugs. Many MSM who engage with chemsex do not consider themselves drug users or relate to other drug users' experiences (Evans, 2019). The majority of MSM feel in control of their chemsex engagement and derive pleasure from it with few negative consequences (Platteau et al., 2019).

Previous research has found that there are various motivations why MSM begin engaging in chemsex. Weatherburn et al. (2017) found two distinct clusters of motivations. Firstly, chemsex enables the individual to have the type of sex that they want and, secondly, the drugs enhancing the qualities they want in sex. Additional reasons identified were facilitating a sense of belonging and increasing the ability to cope with everyday problems both thought to facilitate substance use (Milhet et al., 2019). However, this stage in the chemsex journey is under-researched (Platteau et al., 2020), potentially impacting the

development of appropriate care and support for those engaging in non-problematic chemsex.

However, chemsex use can become problematic, although what this means is not consistently defined, and the mechanisms for change are currently unknown (Platteau et al., 2019). The continuum perspective of chemsex has emerged in the last two years, presenting chemsex engagement as a journey from non-problematic towards problematic use for some; a process named spiralling (Platteau et al., 2020). Problematic use is loosely defined as when individuals experience one or more unwanted outcomes (Platteau et al., 2020).

The continuum approach to chemsex suggests that there may be opportunities to support people at earlier stages of drug use to prevent or reduce problems at later stages. It is a potential starting point to build the evidence base and better understand the chemsex journey's mechanisms (Platteau et al., 2019).

Many MSM currently seeking support do so from sexual health services and typically describe the journey from exciting and hedonistic drug use to a high-risk activity (Smith & Tasker, 2018). Users report deteriorating physical and mental health, loss of friends and employment, addiction, overdose, and sexual assault (Hockenull et al., 2017). The increased prevalence of sexual assault amongst those who engage in chemsex primarily occurs when an individual loses their capacity to consent to sex when under the influence of the drugs. Research suggests that problematic chemsex use is strongly correlated with higher-risk sexual behaviour (e.g., unprotected sex) and may facilitate STI transmission (Tomkins et al., 2019). Some MSM inject drugs in the context of chemsex. This is known as “slamming” or “slamsex”. Those who engage in slamming and share needles, also have an increased risk of exposure to blood-borne viruses such as hepatitis, syphilis or HIV (Lafortune et al., 2021). Those who engage with problematic chemsex are reported to access with

sexual health services more frequently and have more regular STI testing than those who do not (Blomquist et al., 2020).

Most research on chemsex has focused on clinical populations and those actively seeking support (Aldridge, 2020). There is, therefore, a gap in the literature exploring the experiences of those who report a positive engagement with chemsex, and not accessing services for support. It is hoped that this study will expand the evidence base to include those with positive and negative chemsex experiences to raise awareness of the different chemsex trajectories. It is hoped that understanding the potential mechanisms underlying the chemsex journey would support the growing evidence base to develop theory-, or data-, driven interventions for those looking to re-engage in sober sex.

Self-Efficacy Beliefs in initiating Sober Sex

Many MSM who engage in chemsex report sober sexual intimacy to be 'more authentic' or a social ideal compared to sex under the influence of drugs. (Aldridge, 2020). Consequently, many MSM report dissatisfaction with their reliance on drugs to enjoy sex, which is experienced as self-stigmatising and undermines their sexual well-being (Milhet et al., 2019).

Whilst research consistently reports that chemsex is associated with an increase in sexual functioning, sexual pleasure and satisfaction (Lafortune et al., 2021), it is also associated with a lower sexual self-efficacy. This relates to people's beliefs in their ability to perform sexually (Hibbert et al., 2019; Voisin et al., 2017). Although these results appear to contradict each other, they could also be interpreted that engaging in chemsex is a mechanism with which to overcome pre-existing difficulties with sexual well-being, such as sexual self-efficacy (Lafortune et al., 2021). The presence of lower sexual self-efficacy is theorised to drive the use of chemsex drugs which may boost an individual's self-confidence to engage in sex (Hibbert et al., 2019; Voisin et al., 2017).

Not only is lower sexual self-efficacy thought to be a potential motivator to engage in chemsex, but research into traditional substance misuse indicates that low self-efficacy beliefs in abstinence are one of the strongest indicators of substance relapse (Nikmanesh et al., 2016). Models of behaviour change often emphasise the importance of self-efficacy in influencing behaviour change (Jaspal, 2018). Specific behaviour models include the Theory of Planned Behaviour (Ajzen, 1985) and the Social Cognitive Theory (Bandura, 1986), and research has found associations between chemsex engagement and constructs from these models (Evers et al., 2020).

Traditional substance misuse theories focus on self-efficacy in its importance in predicting drug use related behaviour (West & Brown, 2013). Theories such as these suggest that personal factors, such as perceived self-efficacy, are highly influential in determining whether a behaviour is likely to be enacted or not. For example, an individual's belief in whether they can engage in sober sex would be theorised to partially determine whether they do engage in sober sex. According to Bandura, personal factors (e.g., self-efficacy) interacting with external social, environmental factors (e.g., social norms) are central to facilitating the behaviour. However, most MSM who engage in chemsex indicate that they have confidence they can refuse drugs before or during sex when they do not want to use them (Evers et al., 2020). As such, enhanced self-efficacy may have a slightly different consequence in MSM who engage in chemsex. Higher self-efficacy beliefs to have sober sex in this context impacts their sexual well-being as they don't feel that they are "trapped" within a cycle of substance use and feel they can choose to have sex without drugs. The self-efficacy beliefs that they can choose to have sex without drugs may be associated with greater sexual well-being. This study investigates chemsex from a positive approach to sexuality and sexual relationships. As such, the primary focus of this study is not considering self-efficacy to engage in sober sex as a predictor of substance relapse. Instead, this study

takes a more nuanced approach, focusing on perceived self-efficacy beliefs as influencing sexual well-being where individuals are “not feeling addicted”, and are able to enjoy sober sex.

Mindfulness, shame, substance use and sex

Previous research suggests that there is a negative association between shame and mindfulness (Sedighimornani et al., 2019). This supports the assumption that shame is an emotional state associated with higher levels of self-conscious thoughts (Bishop et al., 2004), and lower levels of experiential objectivity (Joireman, 2004). Consequently, mindfulness might be related to shame as a strategy in which to offset negative emotional states (Sedighimornani et al., 2019).

Mindfulness-based interventions have been the focus of much research across a range of presentations, including substance use and sexual difficulties (Brem et al., 2017). For this study, dispositional mindfulness is defined as the individual’s ability to purposefully bring attention and awareness to the present moment’s experiences and relate to them in a non-judgmental way (Chiesa, 2017). It has been suggested that having the capacity to engage with thoughts and experiences without reactivity or judgment may contribute to mindfulness’s effectiveness as an intervention for a range of difficulties that involve poor impulse control, such as substance use and sexual behaviours (Brem et al., 2017).

A neurocognitive model developed by (Garland, Froeliger, et al., 2014) hypothesised that individuals with substance use difficulties could not control cognitive and emotional responses to cues and stresses that trigger craving and substance use (Enkema et al., 2020). The authors suggested a potential mechanism by which mindfulness interventions target cognitive, affective, and neurobiological systems that have been affected by repeated drug use, thereby reducing the risk of relapse.

Emerging research suggests that training people to practise mindfulness, even brief interventions, is related to a decreased use of substances and a decreased likelihood of relapse (Enkema et al., 2020). Studies into the efficacy of mindfulness-based relapse prevention (MBRP) interventions have consistently shown a positive effect of mindfulness on craving and substance use (Abed & Shahidi, 2019). A recent meta-analysis (Karyadi et al., 2014b) found evidence for a significant but inverse relationship between overall dispositional mindfulness and substance use. This relationship was more robust for individuals with more problematic substance use. Another recent meta-analysis indicates that increased mindfulness practice has also been shown to reduce anxiety, depression, and experiential avoidance (Vadivale & Sathiyaseelan, 2019).

Mindfulness may also contribute to healthy sexual well-being outcomes. Research amongst heterosexual populations has found mindfulness is also related to problematic sexual behaviours. Increases in dispositional mindfulness were shown to be related to increases in sexual self-control and reductions in relationship and affect disturbance, and sexual preoccupation (Shorey et al., 2016). In addition, research has also found that mindfulness may enable better emotion regulation and more intentional behaviour (Leavitt et al., 2019) and is associated with a reduction in overall sexual difficulties (Brotto et al., 2016). Together, these results suggest that mindfulness may be an important in difficulties relating to sexual well-being.

However, it is not known whether these results are generalisable outside of the heterosexual populations studied. Although no studies to date have extended this research to MSM engaged with chemsex, third sector support organisations (e.g. Spectra - London) have already begun to successfully use mindfulness-based interventions for those who struggle to re-engage with sober sex (Hoff et al., 2020).

In addition to being related to positive substance use and sexual well-being outcomes, previous research on the interaction between mindfulness and self-efficacy in substance misuse populations suggests they both have an important role in coping with stress, promoting positive affect, increased satisfaction with life and self-esteem. However, the results have been mixed and suggest that mindfulness may increase self-efficacy in the short term but not necessarily in the long term (Firth et al., 2019). This supports the need for continued research and development of theory and data-driven models and interventions (Vosper et al., 2021).

As discussed, previous research suggests that a negative association between shame and mindfulness, and that higher levels of shame are associated with lower levels of sexual satisfaction and self-efficacy beliefs. As MBIs have been shown have a positive impact on both sexual wellbeing and self-efficacy beliefs, it is not unreasonable to assume that mindfulness potentially mediates the effect of shame. However, to the author's knowledge, there have been no studies published that explores this potential mediation mechanism in MSM who engage in chemsex.

Current Study

Whilst it is recognised that some people who engage in chemsex report that it has a positive impact on their lives, some people develop problematic drug use. It is hoped that this study will increase the evidence base associated with chemsex, moving away from the sole focus of problematic drug use, and creating a narrative for all those engaged in chemsex.

In healthcare settings, specific support services for people engaging in chemsex are uncommon (Platteau et al., 2020). It has been reported that people engaging in chemsex looking for support are commonly signposted between the current provisions developed for 'traditional' drug services and sexual health care (McCall et al., 2015). However, few of

these services provide empirically supported intervention programs for chemsex (Graf et al., 2018). In the absence of a theory-driven intervention, many MSM who engage in problematic chemsex fall between the cracks in existing services and, most concerning, are not able to access support when they need it (Platteau et al., 2020)

This study hopes to extend previous research by exploring the associations between shame and sexual satisfaction with self-efficacy for initiating sober sex and mindfulness in MSM who engage in chemsex. It is hypothesised that:

- I. those disclosing problematic chemsex use will have higher levels of shame and stress and lower levels of sexual satisfaction and self-efficacy in initiating sober sex
- II. shame is negatively related to sexual satisfaction and self-efficacy for initiating sober sex but positively associated with increased levels of distress
- III. mindfulness is positively related to sexual satisfaction and self-efficacy for initiating sober sex but negatively associated with levels of shame and distress and
- IV. there is a mediation effect of mindfulness between shame and sexual satisfaction and shame and self-efficacy for initiating sober sex.

While most research has been focused on heterosexual populations, the evidence base for MSM is growing. However, as there is currently no evidence about mindfulness in MSM who engage in chemsex, this study is hoped to provide support for the development of future interventions.

Method

Materials and Methods

Collaboration with Experts by Experience (EBEs).

The implementation strategy for this project was created in collaboration with two experts by experience (EBEs) and a specialist clinician. The EBEs were recruited from a club

drug clinic and have had previous experience contributing to focus groups and small-scale service development projects. The EBEs were involved in all stages of the study, shaping its design, including the development of the novel measure, and aiding in interpreting results. The EBEs piloted this study during the first national lockdown that was enacted to reduce the Coronavirus transmission. The experts by experience (EBEs) recommended adding two additional questions in the questionnaire in response to potential changes in chemsex engagement during the lockdown. The first was to add “video platform” to the list of contexts in which chemsex occurs. This was in response to anecdotal reports that chemsex parties were moving online. The second was whether the “Impact of the Coronavirus pandemic on chemsex engagement” had increased, decreased, or remained the same.

Participants and sampling.

Inclusion criteria for the study were men over the age of 18 living in Great Britain who self-reported having sex with other men and who engaged in chemsex within the previous 12 months. Any incomplete answers (i.e., those who completed less than 50% of the survey) were excluded. The study was advertised through the social media accounts of third sector LGBT support organisations and via internet message boards and geospatial dating apps. Geospatial dating apps are a particularly appropriate platform. Some are known to be one of the primary vectors through which chemsex drugs are procured and “chill out parties” are organised (Ahmed et al., 2016). Dating apps allow MSM to quickly and anonymously align their specific desires and practices with others with similar interests (de Sousa et al., 2020). It also provides researchers access to participants of diverse characteristics and backgrounds (Koc, 2016).

Characteristics of the study sample.

A total of 213 participants completed the survey. The mean age (SD) of the sample was 38.55 years (± 10.43 years), with more than 73% of the sample aged 30 years or older.

Almost 89% of the participants identified as White British or White European, with only 11% identifying as non-White or mixed ethnicity. More than 96% identified as male, and most MSM identified as gay or bisexual (95%). 66% of participants reported that they were HIV-Negative (when last tested). Full details of the demographic characteristics of the sample are summarised in Table 4.

Table 4

Socio-demographic Characteristics of the Study Sample

Variable	Category	N	%
Age	18 - 29	56	26.3
	30 – 44	88	41.3
	45 – 59	67	31.5
	60+	1	0.5
Ethnicity	White British	151	70.9
	Other White European	38	17.8
	Mixed	6	2.8
	Asian or Asian British	6	2.8
	Black or Black British	8	3.8
	Other Ethnic groups	4	1.9
Gender	Male	205	96.2
	Non-binary	4	1.9
	Trans	1	0.5
	Other	2	0.9
Sexuality	Gay	176	82.6
	Bisexual	27	12.7
	Straight	2	0.9
	Pansexual	5	2.3
	Other	3	1.4
HIV Status	HIV Positive	69	32.4
	HIV Negative (when last tested)	141	66.2
	Unsure	3	1.4

Procedure

Ethical approval for this research was granted by the London Bromley Research Ethics Committee on 16/10/20 (Appendix D), and approval was received from the HRA and Health Care Research Wales (HCRW) on 21/10/20 (Appendix E). Ethical approval was also obtained from Royal Holloway, University of London, on 10/11/2020 (Appendix F).

The study was an exploratory, cross-sectional survey design with participants recruited between November 2020 and February 2021 throughout the UK. A trainee clinical psychologist was responsible for coordinating the recruitment activity and monitoring the survey data collection. With the help of LGBT support organisations participants were recruited through internet publicity, peer recommendation, and outreach activities. Also, direct recruitment through online sources (e.g., Facebook, Reddit, Instagram, Twitter, Grindr etc.) was facilitated by the researcher. It was hoped recruitment would also include service users under the care of NHS sexual health services. However, due to the nationwide lockdowns necessitated by the Coronavirus pandemic, many services reverted to remote working, and service user contact was significantly reduced. As such, it was not possible to recruit participants from NHS services directly.

Participants recruited directly through social media and geospatial dating apps could access the questionnaires hosted on a commercial survey website through embedded hyperlinks/QR Codes in the study information. To ensure participant anonymity, neither IP addresses nor respondent location data were recorded. After reading the study information and consenting, participants completed online measures and demographic information and information relating to their engagement in chemsex. The entire test battery took approximately fifteen minutes and was piloted by experts by experience to test feasibility before going live.

Participation levels were closely monitored throughout the project, and as soon as the recruitment target was reached, recruitment was ended, accommodating for missing

data. Of the 242 participants who began the survey, 213 met the inclusion criteria and completed at least 50% of the measures (completion rate: 87.6%) and were included in the final analysis.

Power

Power was calculated for the first hypothesis, exploring differences between those engaged in non-problematic versus problematic chemsex, using G*Power 3.1 (Faul et al., 2009). Based on prior research by Luoma et al., (2019) an alpha level of 0.05 and power set at 0.8 (Cohen, 1988), a total sample size of 84 was indicated for a two-tailed t-test model. Power was also calculated for the correlational research hypotheses using a Correlational Sample Size Calculator (Hulley et al., 2013). Šević et al. (2016) indicated that for the associations between shame, mindfulness and sexual satisfaction, a medium correlation coefficient is expected. Based on an alpha level of 0.05 and power set at 0.8 (Cohen, 1988), a total sample size of 30-50 is indicated for a two-tailed correlational model. Finally, power was calculated for the mediation analysis using a Monte Carlo Power Analysis for Indirect Effects (Schoemann et al., 2017). Based on previous research assessing the mediating influence of mindfulness on sexual satisfaction, a medium effect size was expected (Dunkley et al., 2015). Based on an alpha level of 0.05 and power at 0.8 (Cohen, 1988), a total sample size of 200 is indicated for a one-tailed linear multiple regression model.

To be sufficiently powered to conduct the analyses required for the study's hypotheses, a total recruitment target of 250 was set. Survey completion rates were monitored to during the recruitment phase to ensure at least 200 surveys were fully completed.

Measurements

Demographic characteristics.

Demographic variables in the study were: age (in years), ethnicity (white British, other white European, Mixed, Asian or Asian British, Black or Black British, other ethnic groups), gender identification (male, non-binary, trans or other), sexual orientation (gay, bisexual, straight, pansexual, asexual or other) and HIV Status (HIV Positive, HIV Negative or unsure).

Chemsex-related characteristics.

This section of the survey was created in collaboration with the experts by experience and a specialist clinician. The variables were; chemsex drugs used (G [GHB/GBL], T [Tina / Crystal Meth], M [M-cat, Mephedrone] or Other), frequency of chemsex in the last 12 months (none, once, two to five times, six to ten times or eleven or more times), location of chemsex use (chill-out party, home, sex venue, video platform, nightclub/bar, cruising area or other), impact on well-being (positive, negative, no impact or unsure), feeling in control of chemsex use (yes/no/unsure), ever considered support for chemsex? (yes/no/unsure), the impact of coronavirus pandemic on chemsex engagement (increased, decreased, remained the same or unsure).

Depression, Anxiety and Stress Scale – Short Form (DASS-21).

Levels of emotional distress were measured using the short form Depression, Anxiety and Stress Scale (Lovibond & Lovibond, 1995) (Appendix N). This 21-item shortened version of the long-form Depression, Anxiety and Stress Scale (DASS-42) consists of three subscales measuring depression, anxiety and stress. Participants rated how much each statement applied to them over the past week on a four-point Likert scale 0–3. (0 = Did not apply to me at all, 3 = Applied to me very much or most of the time). Statements include 'I was aware of dryness of my mouth', 'I tended to over-react to situations' and 'I couldn't

seem to experience any positive feeling at all'. Higher scores indicated higher levels of stress, anxiety and depressive symptoms. The DASS-21 subscales have Cronbach's alphas of 0.94 for depression, 0.87 for anxiety and 0.91 for stress (Antony & Bieling, 1998), and moderate levels of concurrent validity (Antony & Bieling, 1998).

This study focused on the stress subscale as prior research suggests this shows the greatest levels of clinically significant change between problematic and non-problematic stages of substance use (Ronk et al., 2013). In addition, research also indicates that in substance-using and risk-taking populations, men's level of stress is significantly different to that of women. In contrast, no gender differences were found in the depression and anxiety subscales (de Haan et al., 2015).

Internalised Shame Scale (ISS).

Levels of Internalised Shame were measured using the Internalised Shame Scale – ISS; Cook, 1987 (Appendix M). The ISS is a 30-item self-report inventory designed to measure trait shame in adolescents and adults. The ISS is a self-report measure that assesses trait shame, composed of an Internal Shame subscale, measuring internalised shame, and a Self-Esteem subscale. The Internal Shame and Self-Esteem subscales present as one-dimensional structures. The subscales present high internal consistency, excellent temporal stability, Cronbach alpha for shame = 0.90, and self-esteem = 0.88 (del Rosario & White, 2006).

This study focused on the shame subscale due to the relatively high levels and temporal stability found within this population. It is a strong predictor of substance use and sexually risky behaviours (Morris, 2019).

Five-Facet Mindfulness Questionnaire-Short Form (FFMQ-SF).

The current study uses the Five Facet Mindfulness Questionnaire (FFMQ-SF; (Bohlmeijer et al., 2011) to measure levels of mindfulness (Appendix P). Mindfulness being defined by the authors as the tendency to be mindful in daily life. The short-form of the instrument has been demonstrated to be sufficiently reliable and valid for research purposes and community samples, with all facets demonstrating Cronbach's alpha greater than 0.70 (Iani et al., 2020).

These five facets consist of observing, describing, acting with awareness, being non-judgmental and nonreactivity to inner experience. The original developers of the FFMQ defined each facet as:

- i) Observing - noticing internal and external experiences, including cognitions, emotions, sights, sounds, and smells
- ii) Describing - being skilled at describing personal experiences with words
- iii) Acting with awareness - being attentive in one's approach to present-moment activities
- iv) Non-judgmental - approaching experiences without judgment, and
- v) Nonreactivity - not getting caught up by thoughts and experiences.

Confirmatory factor analyses of the measure indicate that a hierarchical model, with the five facets loading onto a general factor of mindfulness, have good fit indices for the populations sampled (Christopher et al., 2012). However, most studies suggest that a five-factor structure has better fit indices than a unidimensional general factor of mindfulness (Aguado et al., 2015). For this study, a unidimensional measure of mindfulness will be used in the initial exploratory analyses of this study's constructs of interest. However, as research suggests that deficits in each individual facet of mindfulness may play a contributory role in

substance use and relapse prediction (Levin et al., 2014), the mediation analyses will be conducted at the facet level.

Observing, describing, and acting with awareness, are thought to be important in identifying triggers, which can inform effective coping strategies in the moment and reduce the potential for impulsively using substances in reaction to stimuli (Bowen et al., 2012). Those with a greater capacity to describe and better differentiate one's emotions throughout the day experience a reduced reliance on substance abuse, even when experiencing negative affect (Kashdan & Rottenberg, 2010). The individual facets of acceptance, awareness, and non-judgment were reported to significantly mediate the relationship between MBRP and self-reported substance cravings following the treatment programme (Witkiewitz et al., 2013).

As substance use treatments informed by mindfulness are designed to develop multiple facets of mindfulness (Brem et al., 2017), identifying the most relevant mediating facets of mindfulness in MSM who engage in chemsex may indicate the cost-effective treatment approaches.

Respondents answered questions according to a 5-point Likert scale ranging from 1 "Never or very rarely true" to 5 "Very often or always true." The FFMQ has been shown to display good construct validity (Baer et al., 2008), test/re-test reliability (Isenberg, 2009), and internal consistency in both non-clinical (Baer et al., 2006) and clinical samples (Bohlmeijer et al., 2011). In Levin et al. (2014), each subscale demonstrated adequate internal consistency with the following Cronbach's alphas (Observing 0.81; Describing 0.89; Acting with awareness 0.90; Non-judgmental 0.91; and Nonreactivity 0.81).

New Sexual Satisfaction Scale – Short Form (NSSS-SF).

Sexual satisfaction was assessed using the short New Sexual Satisfaction Scale form (NSSS-SF), consisting of 12 items that indicate various facets of satisfaction with one's sex life (Brouillard et al., 2020) (Appendix O). More specifically, participants are asked to rate their satisfaction with "The balance between what I give and receive in sex," "The variety of my sexual activities," etc. Responses are anchored on a 5-point Likert-type scale. The NSSS-SF has high internal consistency in (Cronbach's $\alpha=0.92$ and 0.93). Higher scores denote greater sexual satisfaction. Convergent validity has been demonstrated by strong and significant associations between a global measure of sexual satisfaction and the NSSS-SF scores (Stulhofer et al., 2011). To assess the participant's beliefs about sexual satisfaction without drugs, this measure specifically requested to answer concerning their satisfaction in sober sex.

Self-efficacy In Initiating Sober Sex (SEISS).

In early discussions with the EBEs, it became clear of the importance they felt that their beliefs in engaging in sober sex influenced whether they actually engaged in sober sex. Both EBEs reported that experiencing low self-efficacy beliefs in their sexual abilities was a barrier to engaging in sober sex. They also described that having low self-confidence in engaging in sober sex affected their sexual well-being, feeling "trapped" as they felt they could not enjoy sex without drugs. It was agreed that this was an important factor to explore, so, based upon their experiences, it was decided to include a self-efficacy measure in the study.

The concept of self-efficacy is well established. It is defined as the belief in one's ability to engage in a behaviour (Bandura, 1986). Self-efficacy beliefs about a behaviour are highly predictive of whether an individual will engage in those behaviours. The higher the level of beliefs, the more likely the behaviour will be enacted. However, there is no all-purpose measure of perceived self-efficacy, as people differ in their efficacy across different

domains. For example, an individual may have firm self-efficacy beliefs that they can drive a car but have lower beliefs to repair it.

As such, it is not unusual for researchers to develop novel scales when investigating self-efficacy beliefs in specific areas. Based upon Bandura's guidelines for designing self-efficacy measures (Bandura, 2006) and working closely with experts by experience, a novel scale was developed to measure self-efficacy beliefs in initiating sober sex. A step-by-step methodological approach to behaviour change was adopted, as suggested by self-efficacy literature (Bandura, 2006). Each step in the process of preparing to initiate sober sex is incremental, which may build confidence for the remaining steps. To create a novel scale to measure self-efficacy in engaging in sober sex, adaptations were made to existing scales developed for two Royal Holloway – University of London theses (Madden, 2018; Smallwood, 2020).

In discussion with the EBEs, the common barriers to engaging in sober sex were identified. The original scale focused on broad barriers for engaging in sober sex (i.e., people's ability to be present and enjoy the experience, their confidence in performing sexually etc.). However, as the scale went through various iterations, the EBEs identified that the most common barriers to overcome were those associated with initiating sex. It was decided that the scale should focus on those barriers to initiating sober sex that needed to be overcome. The new measure was named the "Self-efficacy in Initiating Sober Sex" (SEISS) scale.

As self-efficacy is a complex construct (Schwarzer & Renner, 2000), a multiple-item measure approach was agreed upon, which enabled more information to be captured than can be provided by a single-item measure. This enabled more of the potential facets of the construct of interest to be measured (Baumgartner & Homburg, 1996). The larger diversity

of total scores also makes it possible to make relatively fine distinctions among participants (Churchill, 1979).

Participants were presented with items portraying different levels of task demands, rated based on the strength of their belief in their ability to execute the requisite activities. For this study, they record the strength of their efficacy beliefs on a 100-point scale, ranging in 100-unit intervals from 0 ("Cannot do"); to 100 ("Highly certain can do"). More specifically, participants are asked to rate the confidence with which they could initiate sober sex without necessitating alcohol or drugs (e.g., "I feel confident enough to consider having sexual contact with someone", "I am able to make advances towards an existing sexual partner," etc.). This novel measure has been replicated in Appendix Q.

As this is a novel instrument, it was essential to validate the scale, and appropriate psychometrics are reported in detail within the results section. The psychometric analysis indicated a single-factor solution for this measure. A total score was computed, with higher scores indicating a firmer self-efficacy belief in initiating sober sex.

Data analytic strategy.

The following data analytic strategy was employed to explore the relationship between shame, dispositional mindfulness and sexual satisfaction/self-efficacy beliefs in initiating sober sex. SPSS v25.0 (*IBM SPSS Statistics for Macintosh*, 2017) was used to analyse the data. A missing data analysis was conducted on the outcome measures using Little's test (Little, 1988), which indicated that any data was missing completely at random. To preserve sample size, the discrete missing data values were estimated using an expectation maximisation technique. Comparisons of the outcome measure means before and after imputation were made, and no significant differences found.

Descriptive statistics were used to present the demographic and chemsex associated characteristics of the sample. Descriptive statistics of all the outcome measures (i.e., means and standard deviations) were then calculated. The normalities of the outcome variables were tested by calculating z-scores for skewness and kurtosis (Appendix S). The z-scores were all below the cut off of 3.29 (Kim, 2013), and the outcomes were deemed to be normally distributed.

Whether or not outcomes differed between participants with positive or negative experiences of chemsex was evaluated using independent t-tests and chi-square tests of independence. Bivariate correlations among all study variables were determined using Pearson's correlation analysis to examine the relationships among stigma, levels of distress, the facets of mindfulness, sexual satisfaction and self-efficacy belief scales.

To test the secondary hypotheses, a mediation modelling analysis was conducted using Hayes's PROCESS macro for SPSS (Hayes, 2014) to test the indirect effects of internalised shame on sexual satisfaction and self-efficacy beliefs in initiating sober sex through the facets of mindfulness. Shame was entered into the model as the independent variable. The five facets of mindfulness were entered separately as mediating variables, and the sexual satisfaction and self-efficacy scales were the dependent variables in separate analyses.

Results

Chemsex characteristics of the study sample

Descriptive statistics on the study population's chemsex characteristics are presented in Table 5. Most participants engaged in chemsex more than six times in the last 12 months (82%), mainly at chemsex (chill out) parties (90%), using a combination of G [GHB/GBL] and T [Tina / Crystal Meth] (93%). Most felt that chemsex had a positive or neutral impact on their well-being (74%), felt in control of their substance use (76%), and

had not considered support for their substance use (70%). The recruitment study occurred during the Coronavirus pandemic, and most participants felt their chemsex engagement had increased or remained the same during this period (59%).

Table 5

Chemsex Characteristics of the Study Sample

Variable	Category	N	%
Chemsex drugs used	G [GHB/GBL]	207	97.2
	T [Tina / Crystal Meth]	200	93.9
	M [M-cat, Mephedrone]	69	32.4
	Other	81	38.0
	Once	2	0.9
Frequency of Chemsex (in the last 12 months)	Two to five times	34	16.0
	Six to ten times	73	34.3
	Eleven or more times	102	47.9
	Chemsex (chill out) Party	192	90.1
	Home (alone or with a partner)	126	59.2
Location	Sex Venue	14	6.6
	Video Platform	76	35.7
	Nightclub/bar	8	3.8
	Cruising area	32	15.0
	Other	41	19.2
Impact on Well-being	Positively	136	63.8
	Negatively	46	21.6
	No Impact	21	9.9
	Unsure	9	4.2
Control of chems use	Yes	162	76.1
	No	25	11.7
	Unsure	25	11.7
Considered support for chemsex?	Yes	57	26.8
	No	149	70.0
	Unsure	6	2.8
Impact of Coronavirus pandemic on chemsex engagement	Increased	46	21.6
	Decreased	84	39.4
	Remained the same	80	37.6
	Unsure	2	0.9

Psychometrics of the novel Self Efficacy Beliefs in Initiating Sober Sex Scale (SEISS)

Bivariate correlations were conducted to examine the relationships between the novel SEISS items (see Table 6). All items were significantly correlated in the expected direction (i.e., greater self-efficacy beliefs in initiating sober sex in one item was positively

related to self-efficacy beliefs in another). The correlation coefficients ranged from .50 to .94.

Table 6

Descriptive Statistics and Bivariate Correlations between the SEISS Items (n=213)

Variable	M ± SD	1	2	3	4	5	6
1. Attractive	14.18 (9.34)	-					
2. Contact	10.01 (8.95)	.78***	-				
3. Approach Existing	11.70 (9.05)	.54***	.67***	-			
4. Accept Existing	57.81 (20.95)	.50***	.63***	.94***	-		
5. Approach New	18.67 (5.52)	.64***	.70**	.59***	.51***	-	
6. Accept New	14.34 (3.79)	.64***	.73*	.59**	.58***	.88***	-

*p<0.05 **p<0.01 ***p<0.001

Internal consistency was assessed, the degree to which responses are consistent across items, using Cronbach’s Alpha. Commonly used guidelines suggest that the score of .920 indicated that the measure’s internal consistency was excellent/strong (Tavakol & Dennick, 2011).

The suitability of the data for structure detection was tested using the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett’s test of sphericity. The KMO statistic (.743) indicated that the proportion of variance in the items might be caused by underlying factors, suggesting that a factor analysis may be indicated (Field, 2017). Bartlett’s test of sphericity was significant (<.001), indicating that the item variables are related and suitable for structure detection (Field, 2017).

An exploratory factor analysis was conducted to assess sources of common variation within underlying structures within the data (Carpenter, 2018). As the data was normally distributed, the maximum likelihood extraction method was selected (Fabrigar et al., 1999). A scree plot of the eigenvalues derived from the resulting factors shows that a single factor solution containing all six items was indicated (Appendix R), confirmed by the principal component analysis (Appendix R). The other analyses in this study assume that this instrument measures one underlying construct on a unidimensional scale. Whilst high

internal correlations and the factor analysis suggested evidence that this novel scale demonstrates internal stability, further investigation is recommended to explore construct validity.

Differences between problematic and non-problematic chemsex

Independent t-tests were conducted to explore the differences in shame, stress, mindfulness, sexual satisfaction, and self-efficacy beliefs in initiating sober sex between those who had self-reported positive and negative experiences of chemsex. These tests were all found to be statistically significant. People reporting that chemsex was having a negative impact on their lives described higher levels of shame $t(91.12)=-5.79, p<.001; d=.95$, stress $t(180)=-6.71, p<.001; d=1.15$, whereas people reporting that chemsex was having a positive impact on their lives described higher levels of mindfulness $t(180)=3.86, p<.001; d=.68$, sexual satisfaction $t(180)=3.80, p<.001; d=.66$ and self-efficacy beliefs $t(180)=3.548, p<.001; d=.63$. The effect sizes for mindfulness and sexual satisfaction, and self-efficacy were found to exceed the convention for a medium effect ($d=.50$). In contrast, the effect sizes for shame and stress were found to exceed the convention for a large effect ($d=.80$) (Cohen, 1988).

Chi-square tests of independence were conducted to assess whether there were associations between the impact chemsex had on people's lives and the other categorical chemsex engagement characteristics collected. Detailed results of the post-hoc analyses are reported in Appendix T. A Chi-Square test of independence revealed that, among MSM who engage in chemsex, the impact of chemsex (positive or negative) and whether they felt in control of their drugs use (Yes, no, or unsure) were significantly associated, $\chi^2(4, 212) = 112.96, p < 0.0001$. Post hoc comparisons (with Bonferroni correction) of impact by control revealed that those who thought chemsex had a negative effect on their lives also felt they had no control of their chemsex use ($p<0.0001$) or were unsure of whether they had control

($p < 0.0001$). In comparison, those who felt that chemsex positively impacted their lives also thought they had control over their drugs use ($p < 0.0001$).

A Chi-Square test of independence also revealed that the impact of chemsex (positive or negative) was significantly associated with whether that had ever considered support for their chemsex use, $\chi^2 (4, 212) = 113.781, p < 0.0001$. Post hoc comparisons (with Bonferroni correction) of impact by support revealed that those who felt chemsex had a negative effect on their lives had also considered support for their drugs use ($p < 0.0001$). In comparison, those who felt chemsex positively impacted on their lives had not considered support for their drugs use ($p < 0.0001$).

A Chi-Square test of independence also revealed whether the impact of chemsex (positive or negative) was significantly associated with how frequently they engaged in chemsex in the last twelve months, $\chi^2 (6, 211) = 17.473, p = 0.008$. Post hoc comparisons (with Bonferroni correction) of impact by frequency of chemsex revealed that those who felt chemsex had a negative effect on their lives had also engaged in chemsex eleven or more times in the last twelve months ($p < 0.0001$). In comparison, there was no association of chemsex having a positive impact on their lives with the frequency of chemsex engagement.

A Chi-Square test of independence also revealed that there was no association of the impact of their drugs use (positive or negative) and whether their patterns of drugs use had changed over the lockdown ($p = .494$).

Bivariate correlations

Table 7 presents the means, standard deviations and correlations between the instruments used in this study. Levels of stress were significantly and negatively correlated with mindfulness, sexual satisfaction, and self-efficacy beliefs. Higher stress levels were related to lower levels of the other constructs, with correlation coefficients ranging from .29 to .41. However, stress had a significant and positive correlation with shame, in that higher

levels of stress were associated with higher levels of shame. The correlation coefficient was .73. Shame was significantly and negatively correlated with mindfulness, sexual satisfaction, and self-efficacy beliefs. Higher levels of shame were related to lower levels of the other constructs, with correlation coefficients ranging from .36 to .47. Levels of mindfulness were significantly and positively correlated with sexual satisfaction ($r=.38$) and self-efficacy beliefs ($r=.39$). Higher levels of mindfulness were related to lower levels of the other two constructs. Sexual satisfaction and self-efficacy in initiating sober sex were significantly and positively correlated with each other ($r=.55$).

Table 7

Descriptive Statistics and Bivariate Correlations for the Study Variables (n=213)

Variables	M ± SD	1	2	3	4	5
1. Stress	14.18 (9.34)	-				
2. Shame	57.81 (20.95)	.73***	-			
3. Mindfulness	72.10 (14.33)	-.36***	-.41***	-		
4. Sexual Satisfaction	30.79 (8.69)	-.41***	-.47***	.38***	-	
5. Self-Efficacy	55.07 (17.79)	-.29***	-.28***	.39***	.55***	-

*** $p<0.001$

Hierarchical Linear Regression Analyses

Before conducting the mediation analyses, the assumptions of normality, homoscedasticity, and multicollinearity were tested and met (Appendix U). Two sets of hierarchical linear regression analyses were conducted with shame and each of the five facets of mindfulness as the predictor variables. In the first set of regression analyses, sexual satisfaction was entered as the dependant variable, with SEISS in the second set of analyses.

Sexual Satisfaction - Shame was entered into the first step of the model, which indicated it was significantly and negatively related to sexual satisfaction ($b = -.47, p < .001$). Each of the five facets of mindfulness were then entered into the second block of the model in separate analyses (Table 8 - Models 2a to 2e).

Table 8*Hierarchical Regression Analyses for the Relationships Between Shame, the Facets of Mindfulness and Sexual Satisfaction*

Outcome = Sexual Satisfaction	B	SE	b	t	P	R ²	F	p
Model 1						.22	58.47	<.001
Shame	-.19	.03	-.47	-7.65	<.001			
Model 2a						.23	31.77	<.001
Shame	-.18	.03	-.43	-6.70	<.001			
Nonreactivity	.30	.15	.13	2.05	.04			
Model 2b						.29	42.34	<.001
Shame	-.17	.03	-.41	-6.92	<.001			
Observe	.78	.17	.27	4.55	<.001			
Model 2c						.25	36.71	<.001
Shame	-.16	.03	-.38	-5.79	<.001			
Acting with awareness	.57	.16	.22	3.45	.001			
Model 2d						.23	31.11	<.001
Shame	-.18	.03	-.44	-7.02	<.001			
Describe	.27	.15	.11	1.78	.08			
Model 2e						.22	31.19	<.001
Shame	-.18	.03	-.42	-6.45	<.001			
Non-judgment	.21	.12	.12	1.81	.07			

Results indicated that only the nonreactivity, observe and acting with awareness facets of mindfulness were significantly related to sexual satisfaction. However, it should be noted that although the facets of describe and non-judgment were not significantly related to sexual satisfaction, their p-values were very close to achieving significance.

Self-efficacy in initiating sober sex (SEISS) - The hierarchical regression analyses were repeated with SEISS as the outcome variable. Shame was entered into the first step of the model, which indicated it was significantly and negatively related to sexual satisfaction ($b = -.36, p < .001$). Each of the five facets of mindfulness were then entered into the second block of the model in separate analyses (Table 9 - Models 2a to 2e).

Results indicated that all the facets of mindfulness were significantly related to self-efficacy in initiating sober sex.

Table 9

Hierarchical Regression Analyses for the Relationships Between Shame, the Facets of Mindfulness and SEISS

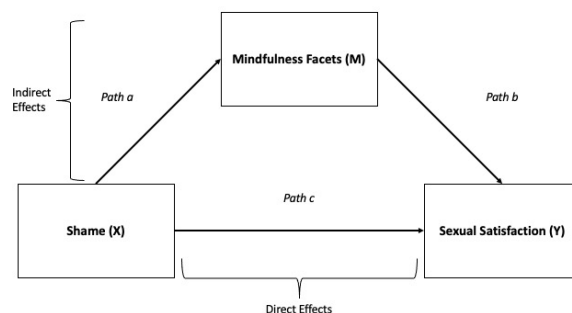
Outcome = SEISS	B	SE	b	t	P	R ²	F	p
Model 1						.13	31.40	p<.001
Shame	-.31	.06	-.36	-5.60	p<.001			
Model 2a						.17	20.80	p<.001
Shame	-.25	.06	-.30	-4.51	p<.001			
Nonreactivity	.93	.31	.20	3.00	p=.003			
Model 2b						.21	27.63	p<.001
Shame	-.28	.05	-.30	-4.83	p<.001			
Observe	1.70	.37	.29	4.57	p<.001			
Model 2c						.15	18.30	p<.001
Shame	-.25	.06	-.30	-4.30	p<.001			
Acting with awareness	.78	.36	.15	2.16	p=.032			
Model 2d						.19	24.87	p<.001
Shame	-.25	.05	-.30	-4.65	p<.001			
Describe	1.26	.32	.26	4.01	p<.001			
Model 2e						.16	19.50	p<.001
Shame	-.25	.06	-.29	-4.30	p<.001			
Non-judgment	.66	.25	.18	2.60	p=.01			

Statistical mediation modelling analysis – Predicting Sexual Satisfaction

Separate modelling analyses were conducted using each facet of mindfulness as statistical mediators between shame and sexual satisfaction (Figure 4). Those facets that did not significantly predict sexual satisfaction in the regression analysis were excluded (i.e., Describe and Non-judgment) from the mediation analysis.

Figure 4

Mediation Model – Sexual Satisfaction



Results from mediation modelling analysis showed that shame was significantly and negatively associated with nonreactivity ($\beta = -0.06$, $t = -4.69$, $p < 0.001$). This, in turn, predicted sexual satisfaction ($\beta = 0.29$, $t = 2.05$, $p = 0.04$). Shame was also negatively correlated with sexual satisfaction ($\beta = -0.18$, $t = 6.70$, $p < 0.001$). Results indicate that nonreactivity statistically partially mediated the association between shame and sexual satisfaction (indirect effect = -0.02 , 95% CI -0.04 , -0.00 , accounting for 8.59% of the total effect).

Results from mediation modelling analysis showed that shame was significantly and negatively associated with observing ($\beta = -0.03$, $t = -2.98$, $p = 0.003$). This, in turn, predicted sexual satisfaction ($\beta = 0.78$, $t = 4.55$, $p < 0.001$). Shame was also negatively correlated with sexual satisfaction ($\beta = -0.17$, $t = -6.92$, $p < 0.001$). Results indicate that observing statistically partially mediated the association between shame and sexual satisfaction (indirect effect = -0.02 , 95% CI -0.04 , -0.01 , accounting for 11.62% of the total effect).

Results from mediation modelling analysis showed that shame was significantly and negatively associated with acting with awareness ($\beta = -0.07$, $t = -6.39$, $p < 0.001$). This, in turn, predicted sexual satisfaction ($\beta = 0.56$, $t = 3.45$, $p < 0.001$). Shame was also negatively correlated with sexual satisfaction ($\beta = -0.16$, $t = -5.79$, $p < 0.001$). Results indicate that acting with awareness statistically partially mediated the association between shame and sexual satisfaction (indirect effect = -0.04 , 95% CI -0.07 , -0.01 , accounting for 19.40% of the total effect).

Statistical mediation modelling analysis – Predicting Self-Efficacy in Initiating Sober Sex (SEISS)

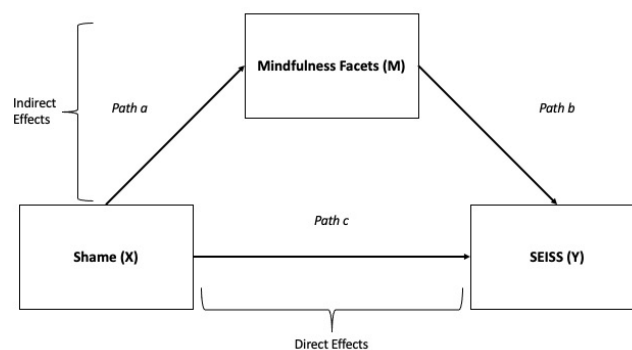
The mediation analysis was repeated with SEISS as the dependant variable, with separate modelling analyses conducted using each facet of mindfulness as statistical mediators between shame and SEISS (Figure 5).

Results from mediation modelling analysis showed that shame was significantly and negatively associated with nonreactivity ($\beta = -0.06$, $t = -4.69$, $p < 0.001$). This, in turn, predicted SEISS ($\beta = 0.93$, $t = 3.00$, $p = 0.03$). Shame was also negatively correlated with SEISS ($\beta = -0.25$, $t = -4.51$, $p < 0.001$). Results indicate that nonreactivity statistically partially mediated the association between shame and SEISS (indirect effect = -0.05 , 95% CI -0.09 , -0.02 , accounting for 16.97% of the total effect).

Results from mediation modelling analysis showed that shame was significantly and negatively associated with observing ($\beta = -0.03$, $t = -2.98$, $p = 0.003$). This, in turn, predicted SEISS ($\beta = 1.70$, $t = 4.57$, $p < 0.001$). Shame was also negatively correlated with SEISS ($\beta = -0.26$, $t = -4.82$, $p < 0.001$). Results indicate that observing statistically partially mediated the association between shame and SEISS (indirect effect = -0.05 , 95% CI -0.09 , -0.01 , accounting for 15.99% of the total effect).

Figure 5

Mediation Model – Self-Efficacy Beliefs in Initiating Sober Sex



Results from mediation modelling analysis showed that shame was significantly and negatively associated with observing ($\beta = -0.03$, $t = -2.98$, $p = 0.003$). This, in turn, predicted SEISS ($\beta = 1.70$, $t = 4.57$, $p < 0.001$). Shame was also negatively correlated with SEISS ($\beta = -0.26$, $t = -4.82$, $p < 0.001$). Results indicate that observing statistically partially mediated the

association between shame and SEISS (indirect effect = -0.05, 95% CI -0.09, -0.01, accounting for 15.99% of the total effect).

Results from mediation modelling analysis showed that shame was significantly and negatively associated with acting with awareness ($\beta = -0.06$, $t = -6.39$, $p < 0.001$). This, in turn, predicted SEISS ($\beta = 0.77$, $t = 2.16$, $p = 0.03$). Shame was also negatively correlated with SEISS ($\beta = -0.25$, $t = -4.30$, $p < 0.001$). Results indicate that acting with awareness statistically partially mediated the association between shame and SEISS (indirect effect = -0.05, 95% CI -0.10, -0.01, accounting for 16.81% of the total effect).

Results from mediation modelling analysis showed that shame was significantly and negatively associated with describing ($\beta = -0.04$, $t = -3.64$, $p < 0.001$). This, in turn, predicted SEISS ($\beta = 1.26$, $t = 4.01$, $p < 0.001$). Shame was also negatively correlated with SEISS ($\beta = -0.25$, $t = -4.65$, $p < 0.001$). Results indicate that describing statistically partially mediated the association between shame and SEISS (indirect effect = -0.05, 95% CI -0.10, -0.02, accounting for 17.33% of the total effect).

Results from mediation modelling analysis showed that shame was significantly and negatively associated with non-judgment ($\beta = -0.09$, $t = -5.86$, $p < 0.001$). This, in turn, predicted SEISS ($\beta = 0.66$, $t = 2.60$, $p = 0.01$). Shame was also negatively correlated with SEISS ($\beta = -0.25$, $t = -4.30$, $p < 0.001$). Results indicate that non-judgment statistically partially mediated the association between shame and SEISS (indirect effect = -0.06, 95% CI -0.11, -0.01, accounting for 18.44% of the total effect).

Discussion

The World Health Organisation (WHO) defines sexual health as “a state of physical, emotional, mental and social well-being in relation to sexuality”, not just the absence of disease (WHO, 2006a). To this end, this study aimed to increase the evidence base about

well-being amongst MSM who engage in chemsex. The present study contributes to the previous literature in two important ways, extending the evidence base to MSM who engage in chemsex whilst understanding those whose chemsex engagement positively or negatively impact their lives. This gives some insight into the relationships between theorised factors influencing the initiation of chemsex use and the barriers to re-engaging in sober sex. Significant gaps remain in understanding the role of shame and mindfulness in behaviours associated with chemsex use. Still, this study confirms several trends that are beginning to emerge in general substance use literature.

Research suggests that most MSM who engage in chemsex report that it positively impacts their lives, with a minority experiencing problematic chemsex and struggling to re-engage in sober sex (Milhet et al., 2019; Schlag, 2020). Those who experience a problematic relationship with chemsex and try to seek help often struggle to find adequately resourced support (Bourne et al., 2014). Supporting previous research, most participants of this study (64%) reported that chemsex was having a positive impact on their lives. MSM who reported that chemsex positively impacted their lives were more likely to have higher levels of mindfulness, sexual satisfaction, and self-efficacy beliefs in initiating sober sex. Those who reported that chemsex was having a negative impact on their lives were more likely to have higher levels of stress, to have considered support and felt less in control of their substance usage and were more likely to have engaged in chemsex more than eleven times in the last twelve months. This supports qualitative evidence that suggests one in four MSM wish to seek support for chemsex-related issues including self-control, and physical and mental health difficulties (Evers, 2020). However, due to this study's design temporal causality cannot be assumed. For example, the study cannot determine whether those reporting higher levels of shame and stress are more likely to engage in chemsex as a coping mechanism for these aversive affective states, or whether problematic chemsex causes

higher levels of shame and stress in an individual. Whilst it is possible that both these mechanisms operate together maintaining a person's difficulties, further research would be required to disentangle them.

This study found strong, negative relationships between shame and sexual satisfaction and self-efficacy for initiating sober sex. This supports previous evidence that individuals with higher levels of shame experience lower levels of sexual satisfaction (Reid et al., 2009) and lower sexual self-efficacy levels (Baldwin et al., 2006). The strongest relationship was shown to be between shame and stress, with higher levels of shame associated with higher stress levels. This study's findings are supported by research over the last two decades that consistently suggests shame has a detrimental effect on mental health symptomology (Tangney & Dearing, 2002). However, due to the relative strength of this relationship in this study, an item-level comparison was made between the ISS and the DASS-21 subscales to investigate if there was any overlap. Whilst there were no items directly equivalent to each other, items such as "I found it hard to wind down" from the DASS-21 and "I replay painful events over and over in my mind until I am overwhelmed" from the ISS may tap into similar experiences. However, the National Survey on Drug Use and Health (NSDUH) recently compared heterosexual and homosexual substance users and found that MSM experienced greater levels of stress and had a higher risk of developing mental health difficulties (Medley et al., 2015). As such, whilst there is potential for item overlap between the ISS and DASS-21 to explain some of the strength of the relationship between shame and stress, the intersectionality of shame relating to substance use and being a sexual minority may also reinforce this relationship.

This study's results also replicate the evidence from heterosexual populations whereby a strong positive relationship exists between mindfulness with sexual satisfaction (Khaddouma et al., 2015) and self-efficacy (Luberto et al., 2014). Similarly, this study found a

strong and negative relationship between mindfulness and levels of distress, confirming previous research findings (Khoury et al., 2015; Schumer et al., 2018).

There is a growing evidence base for the effectiveness of mindfulness-based interventions for both substance use and sexual difficulties (Brem et al., 2017). However, the relationships underpinning these interventions have not been explicitly investigated within the current population. It is important to research potential mechanisms of change for those who require support for chemsex use. The exploration of a possible statistical mediation effect of mindfulness between shame and sexual satisfaction and shame and self-efficacy for initiating sober sex was partially confirmed. The results suggest differences in the statistical mediation effects of individual facets of mindfulness on their relationship to sexual satisfaction compared to their relationship to self-efficacy beliefs in initiating sober sex. Three of the five mindfulness facets had significant statistical mediating relationships between shame and sexual satisfaction, these being nonreactivity, observe and acting with awareness. These results support previous research that suggests that dispositional mindfulness is positively associated with sexual satisfaction through increased attention regulation, body awareness and emotional regulation (Khaddouma et al., 2015). Although a causal relationship cannot be inferred, these results make sense in the context that higher levels of shame have the effect of turning people away from intimate relationships (Black et al., 2013). However, it would be important to explore whether developing interventions to increase mindfulness skills is enough from a clinical perspective. An important research question to explore is whether one would need to reduce shame first to allow mindfulness skills to improve.

Two of the facets within this population did not statistically mediate the relationship between shame and sexual satisfaction (i.e., describe and non-judgment), although their p-values were very close to achieving significance. These results contradict previous research

that suggests individuals who can more effectively articulate affective experiences (i.e., the describing facet) may have a set of communication skills that regulate sexual satisfaction (Brem et al., 2019). Similarly, prior research supports the hypothesis that greater judgment towards internal and external experiences (i.e. the judgment facet) was highly predictive of sexual difficulties in men with high levels of shame (Reid et al., 2009). Furthermore, researchers have found that some individuals temporarily alter or reduce thoughts and experiences such as shame to reduce painful experiences (e.g., depression and anxiety) using maladaptive coping mechanisms such as substance use (Deneke et al., 2015). However, the FFMQ instrument measures levels of mindfulness as applied to general situations. For example, items such as “I tell myself that I shouldn’t be feeling the way I’m feeling” or “I disapprove of myself when I have illogical ideas”. Some research suggests that some aspects of the FFMQ are heavily dependent on the context under investigation (Adam et al., 2015). In their paper on developing a sexual FFMQ (FFMQ-S; Adam et al., 2015), the authors demonstrated that adapting the scale to ask specific questions about mindfulness in sexual situations had stronger correlations with a person’s level of distress. For example, items were rescripted to “I don’t criticise myself when I have sexual fantasies that I consider to be taboo” to reflect the evaluation of one’s experiences relating to sex. As it has been hypothesised that some MSM are highly critical about their sexual performance and experiences (Carvalheira & Costa, 2015), this may suggest the general FFMQ may not be sensitive enough to discern the specific difficulties some have concerning sexual and intimacy difficulties. If the describing and non-judgment questions were specific about sexual experiences, a significant association with levels of sexual satisfaction might have been achieved.

Finally, as measured by the FFMQ, all five facets of mindfulness had a significant statistical mediating relationship between shame and self-efficacy in initiating sober sex.

This is an important finding as beliefs in one's ability to engage in an activity (i.e., engaging in sex without relapsing) have been shown to predict behaviour (Bandura, 1986) but also improvements in self-efficacy influence one's sexual well-being (Milhet et al., 2019)

Although these findings can determine neither the directionality nor causality of the relationships, they may indicate areas to research potential interventions for problematic chemsex. Interventions focused on developing mindfulness may mediate the development of increased self-efficacy in engaging in sober sex, which may establish an improved sense of sexual well-being (Milhet et al., 2019). As self-efficacy beliefs are domain-specific, and beliefs in initiating sober sex have not been previously studied, there is no direct comparison against the evidence base. However, this study's results support previous research that suggests trait mindfulness has a positive relationship with self-efficacy in various domains (Chang et al., 2004; Cusens et al., 2010; Luberto et al., 2014).

Chemsex during the Coronavirus pandemic

The inclusion of additional questions during the piloting phase enabled this study to explore potential changes in chemsex engagement during the national lockdown. To reduce Coronavirus transmission, the social distancing measures reduced an individual's access to social support, increasing a sense of isolation in many MSM (Brennan et al., 2020). Despite restrictive governmental measures, many MSM reported continuing engaging in chemsex during social distancing (de Sousa et al., 2020). The findings of this study supported this with 59% of respondents disclosing that their chemsex engagement remained the same over lockdown or had increased. Chemsex parties are contexts in which participants would have a particularly high chance of infection due to meeting multiple people, for long periods of time, with different histories of exposure to the virus (de Sousa et al., 2020). Despite knowing the risks of acquiring the Coronavirus virus, this was not enough to prevent MSM

from meeting. Findings from this study found no association between changes in chemsex use over lockdown and whether chemsex was having a positive or negative effect on their lives. This supports previous research that suggested that MSM who engage in regular drug use, regardless whether it was problematic or not, have lower risk perceptions (Evers et al., 2020). Examples of lower risk perceptions include a lack of adherence to preventive measures associated with sexually transmitted and other infections (Lea et al., 2019). This study suggests that the risk perceptions of individuals who engage in chemsex use, are not influenced by whether their engagement is problematic or not.

The addition of “video platform” to the list of contexts in which chemsex was engaged was in response to the EBEs, suggesting that this medium was becoming more prevalent, especially in response to the national lockdown. A minority of respondents in this survey, 36%, reported having engaged in chemsex via video platforms. “Digital chemsex” is a relatively new phenomenon comprising of group play activities from exchanging information about other individuals and encounters, filming sex, watching porn collectively whilst under the influence of drugs (Møller, 2020). The increase in the use of video platforms during lockdown has facilitated digital chemsex, where meetings are not easily publicly available or visible and are generally unmoderated (Platteau et al., 2020). As such, this provides a much more private experience and is thought to facilitate the use of these services for non-normative and socially marginalised sex and drug practices (Møller, 2020).

Limitations

This study is subject to some fundamental limitations. The study employed a retrospective, cross-sectional design, and as such, the temporal relationship between shame, the facets of mindfulness, and sexual satisfaction or self-efficacy cannot be confirmed. Research using randomised control trials and longitudinal designs may more clearly determine whether mindfulness facets mediate these relationships.

The cross-sectional design also limits any ability to draw causal conclusions from results. Research suggests that cross-sectional approaches to mediation typically generate biased results compared to analyses derived from longitudinal data (Maxwell & Cole, 2007). However, the authors stated that there might be notable exclusions in a more recent paper. For example, where the independent variable level is relatively fixed over time (Maxwell et al., 2011). Within this study, the independent variable is shame, which is relatively high in MSM who engage in chemsex compared to the general population (Pollard et al., 2018). It has also been shown that MSM with medium to high levels of internalised homophobia and shame demonstrate very little change over time, with the levels remaining remarkably stable (Puckett et al., 2018). Whilst causation cannot be inferred, the presence of a relatively stable independent variable reduces some of the bias prone to using cross-sectional data for mediation analyses.

The study initially planned to recruit from three potential pathways: NHS sexual health services, LGBT support organisations and geospatial dating apps. Due to the national lockdown, whereby services began operating remotely and were unable to engage with the research project, most participants were sourced from the dating apps. This potentially introduced a selection bias, as those accessing support services are more likely to be experiencing a negative impact of chemsex engagement on their life. Most participants for this study (64%) reported that chemsex was positively impacting their lives. Although this reflects research that suggests that most people who engage in chemsex report that it has a positive impact on their lives (Schlag, 2020), future research may want to broaden recruitment to services supporting people with problematic chemsex use.

The use of self-report measures also potentially introduces social desirability biases, even though the key constructs were measured using instruments with good psychometric properties. Their brief format allows for efficient administration. However, future studies

can ameliorate biases by employing objective measures (e.g., urine tests to measure drug use) and mixed-method approaches.

The decision to use the FFMQ limits the interpretation of the results to the five facets of mindfulness as defined by this measure. Using alternate measures with different subscales, such as the Philadelphia Mindfulness Scale (Cardaciotto et al., 2008), may demonstrate other relationships. Future research should include a broader range of mindfulness measures in addition to the related constructs.

Self-efficacy beliefs are highly domain-specific (Bandura, 1986). As there is no instrument currently validated to measure self-efficacy beliefs in engaging in sober sex, a novel measure was developed specifically for this study in collaboration with experts by experience and a specialist clinician. The psychometric properties of this instrument indicate a strong internal validity, measuring a single construct. However, it is recognised that if the new scale is to be used in other research projects, a formal development of this scale is essential. This is particularly important due to this study's cross-sectional design limiting the ability to estimate the temporal stability of the model's parameters (Morgado et al., 2018). Further ratification will be required to evaluate this novel measure's construct validity and reliability. To increase this measure's generalisability would also require a non-convenience recruitment strategy, drawing from a heterogeneous sample population.

This research did not investigate the effect of comorbid symptoms, such as depression and anxiety, that may moderate the relationship between mindfulness and sexual satisfaction and self-efficacy (Brem et al., 2017). This is particularly important as negative affect is one of the main factors hypothesised to predict substance use relapse (Brem et al., 2019) and may be an important consideration in relapse prevention (Levin et al., 2014). Given that there is a hypothesised relationship between affect and relapse, further research may focus on whether affect moderates the influence of mindfulness found in this

study. This study also did not investigate other factors known to be influential in substance use, such as emotional regulation (Gratz & Roemer, 2003), impulsivity (Murphy & MacKillop, 2012) and distress tolerance (Leyro et al., 2010). Extending this research to include these other variables may help understand the potential mechanisms for change in chemsex use and its impact on well-being.

To explore the broadest possible experience of chemsex use, this study included participants with non-problematic versus problematic engagement with substance use. However, neither the correlational nor mediation analyses explored differences between these two groups of participants. While this introduces a known heterogeneity into the sample, previous research empirically supported this approach, which has found minimal value in distinguishing between those who use substances from those with substance dependence (Hasin, 2012). However, it may be fruitful for future research to examine any phenomenological differences between those whose chemsex experience positively impacted those whose experience is negative. This may help target interventions based explicitly upon those who require different types of support for their substance use. These may include harm reduction strategies and relapse prevention.

Conclusion

This research investigated the experiences of MSM who engage with chemsex. It approached this subculture from a destigmatising position, acknowledging the negative consequences of drug use without overlooking the positive value that chemsex can have in the lives of those who engage in it.

The findings add to the evidence base that supports the investigation of mindfulness interventions for this population. The study also supports testing a multi-faceted approach targeting the other psychological constructs identified in this study as potential areas to develop. These include shame, self-efficacy beliefs, and affect. Most people who engage in

chemsex do so non-problematically, with only a minority reporting it negatively impacts their lives and wish to access support. However, the findings suggest that users might benefit from harm reduction approaches, even in the absence of problematic drug use. Despite its limitations, this present study supports the growing evidence that interventions based upon specific facets of mindfulness may support those who engage in substance misuse in sexual contexts (Levin et al., 2014). However, further research is needed to evaluate the facets of mindfulness to identify those involved in maintaining difficulties experienced with chemsex.

V. Integration, impact, and dissemination plan

Integration

The two components of this project are a systematic review, including a meta-analysis and an empirical project. Both investigated different but closely related questions about mindfulness in men who engage in substance use. Problematic illicit drug use is a complex and often relapsing chronic condition, requiring a multi-faceted and coordinated care and intervention approach. However, whilst the evidence base for the usefulness of mindfulness-based interventions (MBIs) in treating substance user difficulties is growing, there is limited research about good practice in drug treatment specifically for male drug users (Williams et al., 2010). Men are an important group to research as, historically, they have relatively higher prevalence rates of illicit substance misuse than women and are more reluctant to seek support (Elmqvist et al., 2017).

The systematic review and meta-analysis focused on randomised-controlled trials (RCTs) evaluating the effectiveness of mindfulness-based interventions (MBIs) on substance use outcomes in men. In the past two decades, research into mindfulness-based interventions (MBIs) has yielded promising results for substance misuse treatment (Chiesa & Serretti, 2014; W. Li et al., 2017b), with a large proportion of the studies focusing on alcohol (Byrne et al., 2019) and tobacco (Maglione et al., 2017) addiction. At the time of writing up, no systematic review could be found that focused on the effectiveness of MBIs on men whose primary treatment was for illicit drugs and not for alcohol or tobacco. It was decided that it was important to evaluate this specific subset of substance use, as research suggests that the predictors of substance use and relapse may vary depending on drug type (Enkema et al., 2020).

The primary outcomes of the interventions selected for the systematic review were frequency of substance use/abstinence and substance cravings. Secondary outcomes varied

from levels of affect/distress to quality of life. The systematic review asked two main questions. First, does the evidence support the hypothesis that MBIs generate positive outcomes in substance-using male populations? Secondly, what is the overall effect size of the impact of MBIs on substance use cravings in men? In answer to the first question, the systematic review found that the included studies consistently found MBIs to be associated with positive health outcomes across various interventions used, the contexts within which the studies took place, and the substances used. The second question was partially answered by the meta-analysis, which found that the included studies demonstrated effects sizes from small to large—still, all indicating reductions in substance craving after posttreatment.

Overall, the systematic review supported the growing evidence base for positive outcomes of MBIs for men being treated for substance misuse. The confirmation of the effectiveness of mindfulness in the treatment of male-only, illicit substance-using populations supported the conceptual basis of the empirical study, which focused on a subset of this population.

The two components of this thesis had different aims; they are rooted within the same context, and both investigate mindfulness in men who engage in problematic illicit drug use. Whilst the purpose of the systematic review to evaluate RCTs and estimate the effectiveness of mindfulness in treating illegal substance use, the empirical study employed a cross-sectional design to explore the associations between psychological constructs theorised to contribute towards maintaining substance use alongside sex.

The empirical study employed a cross-sectional design recruiting a sample of participants who fall within the inclusion criteria of the systematic review, that is substance-using men. However, the study focused on an area with a much more limited research base: men who have sex with men (MSM) who engage in sexualised drug use. More specifically,

chemsex involving three specific drugs (i.e., methamphetamine, g-hydroxybutyrate and mephedrone) used to enhance the sexual experience. An increase in chemsex engagement has been reported in the last ten years (Platteau et al., 2020), along with detrimental physical and mental health outcomes in some users. Recent research suggests that substance use and relapse predictors may vary depending on drug type (Enkema et al., 2020). As there is limited evidence-based research for drugs commonly implicated in chemsex, the empirical study aimed to explore possible factors theorised to be involved in the maintenance of chemsex behaviours, with the hope of suggesting directions for targeted theory-derived interventions.

However, whilst the evidence base for the usefulness of MBIs in treating substance user difficulties is growing, there is a lack of evidence about good practice in drug treatment for MSM service users (Williams et al., 2010). Without specific theory-driven interventions for chemsex, many services support those seeking treatment by employing traditional substance misuse interventions to jointly address substance and sexual risk (Moncrief, 2014). As the landscape of substance use changes, with the emergence of novel drugs continually appearing on the market and new polysubstance combinations, the development of targeted and relevant services is ongoing (van Amsterdam et al., 2010). Supported by the evidence from the systematic review, the empirical study aimed to explore possible factors theorised to be implicated in the maintenance of chemsex behaviours, with the hope of suggesting directions for targeted theory-derived interventions.

Most of the studies included in the systematic review had outcomes that showed reductions in anxiety and depression posttreatment (Carrico et al., 2019; Chen et al., 2019; Lee et al., 2016; Lyons et al., 2019) although this was not typically a primary focus of therapy. The relationship between stress and substance use is well-established, whereby increased levels of anxiety and depression are associated with an increased risk of substance

misuse (Bowen et al., 2014). MBIs may reduce addiction behaviours through developing alternate stress management strategies, reducing the reliance on substances for relief from distress symptomology.

The purpose of the empirical study was to explore the relationships between psychological constructs thoughts to influence MSM's experience of chemsex, namely shame, distress, dispositional mindfulness, sexual satisfaction, and self-efficacy beliefs in initiating sober sex (i.e., sex without needing drugs or alcohol).

The systematic review findings suggest that mindfulness-based interventions generate positive outcomes for men with substance use difficulties, regardless of the mindfulness intervention employed. In particular, the included studies demonstrated reductions in substance cravings and relapse rates posttreatment. These results were in line with existing research for MBIs as substance user treatments. Based upon the existing evidence base, it was broadly anticipated that the results from the empirical study would indicate that there would be a relationship between mindfulness and the constructs known to be associated with chemsex use. The constructs investigated were shame, stress, sexual satisfaction. In addition, a new instrument designed to measure self-efficacy beliefs in initiating sober sex, which may add to the field. In this way, the empirical study corroborated the findings from the systematic review. Shame and distress were found to be negatively associated with mindfulness, sexual satisfaction, and self-efficacy. In turn, mindfulness was positively related to sexual satisfaction and self-efficacy. Statistical mediation analyses confirmed that the mindfulness facets of observing, acting with awareness and nonreactivity have an association with the relationship between shame and sexual satisfaction. The results suggest that all five facets of mindfulness (i.e., observing, describing, acting with awareness, non-judgment and nonreactivity) have an association with the relationship between shame and self-efficacy.

Mindfulness is becoming more widely accepted as an effective treatment for substance use (Enkema et al., 2020) and sexual difficulties (Brotto et al., 2016; Leavitt et al., 2019). The systematic suggests that MBIs are appropriate for reducing substance cravings relapse in male's engaging in problematic illicit drugs use and is an acceptable mode of intervention to this population. The empirical study, whilst linked to the systematic review through its investigation of mindfulness in men, focusing the current evidence base by investigating MSM within the context of chemsex. This study's findings theoretically support the development and possible implementation of MBIs in this group. As this study has confirmed that shame is associated with lower self-efficacy beliefs in initiating sober sex and higher levels of distress, it may be important to consider these when developing MBIs for those who engage in chemsex. Further research would be needed to investigate the specific facets of mindfulness that would be most influential in developing mindfulness-based relapse prevention treatments.

Reflections

Most of this project has taken placement during national lockdowns during the Coronavirus pandemic. Soon after the empirical project proposal was accepted, households and businesses were advised to stay home to control the infection rates and reduce the burden on NHS services. Conducting research within the context of the lockdown in a period of social isolation made me consider the importance of working creatively and flexibly.

As it became clear that the infection trajectory of the virus was difficult to predict, I began to reflect on the impact that this would have on this study. I felt that this would affect several key areas. Most significantly, this would have a direct effect on the recruitment strategy. The original project proposal hoped to recruit service users who accessed the three NHS sexual Health services who had agreed to be recruitment sites and nationwide LGBT

support organisations. However, after the lockdown, most services began to operate remotely, with clinicians working from home and many service users accessing service via digital platforms. Due to the increased demands placed upon clinician and reduced access to service users, all three NHS sexual health services and the majority of LGBT support organisations reported that they did not have the capacity to support the recruitment process.

As the NHS services and third sector support services could not support the study, my attention was focused on direct recruitment on geospatial dating apps. To broaden the study's reach and increase its generalisability, I also worked on advertising it via the social media accounts of several national LGBT support organisations. Profiles on geospatial dating apps and social media advertisement were embedded with the same information and links to the study website (Appendix I). Research has shown that recruiting hard-to-reach populations through social media (Evers et al., 2020) and geospatial dating apps (Iott et al., 2018) can be as effective with similar survey completion rates compared to traditional face-to-face approaches. The dating apps were deemed to be a particularly appropriate platform as some are known to be one of the primary vectors in which chemsex drugs are procured and "chill out parties" are organised (Ahmed et al., 2016). Apps allow MSM to easily and anonymously align their specific desires and practices with those with similar interests (de Sousa et al., 2020). The advertisement on the dating apps was non-person centred, making it clear this was a study-specific profile. The title of the profile was "Researcher", and no sections regarding personal characteristics were completed. None of the participants were contacted directly, and any questions were answered professionally. The language of the study information linked to the profile (Appendix G) was intentionally destigmatising, focusing on the need to understand chemsex, which is of interest to this group.

However, advertising via the apps was very time-consuming, and I had underestimated the amount of time this would take. To reach as many potential participants as possible, I spent a substantial amount of time travelling to various London areas to access users from different locations. Although Covid guidelines and precautions were followed, this placed an additional burden during a time of uncertainty and increased anxiety.

As the purpose of the lockdown was to minimise face-to-face contact to reduce viral transmission. I presumed that the lockdown would impact people's engagement in chemsex. I initially felt that the lockdown would reduce users' abilities to procure chemsex drugs and that people would be less likely to host 'chill out parties', where most participants engaged in chemsex. With a reduction in chemsex engagement, there was the potential that there would be less interest in the study. However, the EBEs were confident that many users continue to engage in chemsex, despite the lockdown, and that this would probably lead to more people using video platforms to host chemsex parties. They also believed that in response to the additional stressors at the time and increased opportunity some chemsex engagement would likely increase during the lockdown. Many individuals were placed on furlough during this time. They continued to be paid a salary, but had reduced day-to-day work responsibilities, and increased free time. To monitor this, two additional questions were added to the survey. The first was to include video platform as an additional context over which chemsex took place, and the second was a question asking whether they had changed their use pattern during the pandemic. Input from the EBE enabled these important additions, which gave an opportunity to understand how this population would respond to the lockdown.

Interestingly, research into chemsex engagement during the lockdown found some of the chemsex behaviours did change during the lockdown as it was reported that chemsex

parties were adapting to video platforms and taking place online (Møller, 2020). This study supports these findings.

Conducting the quality assessment of the systematic review allowed me to look at the design of the empirical study more objectively, albeit in retrospect. In turn, this enabled me to reflect on the study's limitations in more details and articulate these more fully in the discussion chapter. I became more acutely aware of the need for transparency in the study design for researchers to evaluate and replicate the study thoroughly. I also became more acutely aware of the limitations of this study and how this may introduce potential biases (e.g., social desirability bias in self-report measures). Applying a methodological assessment approach to any future research should hopefully inform the study design, raising awareness of biases and potentially ameliorating them.

Impact

This study supports previous research that suggest most individuals who engage in chemsex do so non-problematically, with it having a positive impact on their lives. Those who reported non-problematic usage felt in control of their drugs use and had not considered accessing support. These individuals reported lower levels of shame and stress, and higher levels of mindfulness, sexual satisfaction, and self-efficacy to initiate sober sex. These individuals as less likely to be known to drugs services, although they may access sexual health services if exposed to sexually transmitted diseases. Most respondents in this study appear to experience higher levels of sexual well-being, that is higher levels of sexual satisfaction and self-efficacy beliefs.

In comparison, a minority of respondents reported that chemsex was having a negative impact on their lives, felt they were not in control of their drugs use, was associated with higher frequency drug use, but also associated with considering accessing support for their drugs use. However, most substance users who want support fail to access

treatment and relapse prevention interventions (United Nations Office on Drugs and Crime [UNODC], 2019). Therefore, it is essential to continually research and increase the evidence base of effective and acceptable interventions to treat drug use disorders.

It is hoped that the impact of this project contributes towards both the academic understanding and clinical applications of the constructs investigated. Specifically, adding to the growing evidence base for the effectiveness, and appropriateness, of mindfulness-based interventions (MBIs) for men with substance use difficulties and suggesting potential directions in which MBIs could be developed for men engaging in problematic chemsex. The direct beneficiaries of developing targeted and cost-effective support for men who engage in chemsex include clinicians within sexual health and substance use services, third sector LGBT support organisations, and the service users. Specific support services for people engaging in chemsex are uncommon (Platteau et al., 2020), with few of these services providing empirically supported intervention programs (Graf et al., 2018). It is hoped that increasing awareness of and building confidence in working with chemsex will better equip clinicians to improve service provision and hopefully increase treatment effectiveness. There is also the potential for indirect benefits, such as reducing barriers to individuals accessing services through increased awareness by clinicians (Miller-Lloyd et al., 2020). In summary, the results of both the systematic review and empirical study have implications on the understanding and clinical training of health professionals and broader commissioning of service provision for chemsex support.

From a theoretical perspective, the current project reinforced our understanding of the effectiveness of MBIs on men with substance use difficulties. Previous research has identified the hypothetical mechanisms by which mindfulness is thought to modify the main features of substance use (e.g., triggers, craving and relapse). This study provides additional empirical support for existing research that indicates that MBIs yield promising results for

substance misuse treatment (Chiesa & Serretti, 2014; Li et al., 2017). These results support with theories that suggest increased mindfulness may disrupt the cycle of affection, cognitive and physiological mechanisms that maintain substance use and sexual difficulties (Brem et al., 2017; Katz & Toner, 2013).

Self-efficacy is not only an important predictor in many cognitive behaviour models of behaviour change, such as social learning theory (Møller, 2020), but is also positively related to a person's well-being (Mastro & Zimmer-Gembeck, 2015). However, self-efficacy is behaviour specific, with a person's beliefs in their ability varying depending on the behaviour being actioned. It was appropriate that a novel instrument be developed for this project, the Self-Efficacy in Initiating Sober Sex. Similar scales have been developed for prior research into substance use relapse. For example, the Alcohol Abstinence Self-efficacy Scale (AASE; DiClemente et al., 2015) or the Self-efficacy and Temptation scale for drug users (Hiller et al., 2000). This instrument was developed in collaboration with the EBEs. It was refined over time to focus on the initial barriers in engaging in sober sex. These include the likelihood of feeling sexually attractive or their confidence in making advances to a sexual partner. The findings of this study included an assessment of the internal consistency of this questionnaire. Future work needs to replicate these findings, alongside evaluating its external validity against existing measures and related constructs. There is the potential of using this instrument as a part of the treatment process. Work would involve examining changes in the scores of the SEISS and relating these to therapeutic events, drug use and relapse.

Shame, stress, sexual satisfaction, self-efficacy, and mindfulness have all been shown to have significant relationships with each other within this population. The results suggest that all these factors may be important in guiding the approach for a therapeutic intervention and should be considered when formulating an individual's difficulties. This is

particularly important in MSM who engage in chemsex, as the high levels of shame found can act as a barrier to successful therapy. Research has found that shame is a significant risk factor for developing a poorer therapeutic relationship (Black et al., 2013). Most notably, individuals with high shame often employ a withdrawal style (i.e., shutting down) and are less likely to develop an effective therapeutic alliance. There is also potential practical utility in the findings that those who report that chemsex is having a negative impact on their lives also report higher levels of shame and stress. Whilst this study's results cannot infer any temporal relationship between shame and stress and problematic chemsex use, regular assessment of both constructs, and frequency of chemsex use, may indicate help identify individuals at risk of developing problematic drugs use. Appropriate clinical pathways can be developed based on an individual's changing needs, and position on the chemsex journey.

Given the multi-faceted nature of MSM who engage in chemsex, the findings from this study suggest that developing mindfulness may be a very important skill to build. However, mindfulness by itself may not be enough to shift the other constructs in some people, and a multi-modality approach may be necessary depending on an individual's difficulties. For example, a CBT intervention might specifically be looking at building upon self-efficacy beliefs by developing psychosexual skills building (e.g., managing difficulties during sexual encounters or communications). A CFT intervention might be looking at how to find ways to understand and manage shame. Group work can also function to de-shame and allow MSM to enhance relational skills with one another in a non-sexual context (Hoff et al., 2020). Further work is required to investigate whether other interventions could focus on the other constructs.

The empirical study has already directly impacted the experts' involvement by experience (EBEs). The EBEs have been involved in all stages of the research and have shaped its design and continue to guide its direction. In particular, the EBEs were

instrumental in identifying self-efficacy as an important construct to measure, but also in developing the novel instrument. Creating the measure was an iterative process, which increased the amount of time it took to complete. However, it was felt to be important to get right. The EBEs were able to narrow down the measure's focus from identifying vague beliefs around barriers to sober sex to specific behaviours associated with initiating sober sex.

There is a lack of research about good practice in substance misuse treatment for MSM service users. Only a few studies measure outcomes or evaluate service use by sexual orientation (Williams et al., 2010). The EBEs were able to confirm this anecdotally when recalling their own negative experiences when trying to access appropriate health care or finding clinicians unaware of the complexities of chemsex. The EBEs both stated that more targeted service development was required and felt this study was important to support that. Collaborating with the EBEs created a survey more relevant to their personal experiences.

Dissemination

The findings of this research were presented to a cohort of peers, academic staff and collaborators at Royal Holloway, University of London. The presentation was co-created with the EBEs. Feedback from the presentation was elicited from the audience and incorporated in the write-up as appropriate. The next stage will be creating a summary of the findings for the EBEs and LGBT support organisations. Third sector organisations will be encouraged to share the results with their networks. Also, it will be shared with the NHS sexual health services who agreed to participate but were unable to due to the pandemic. The study summary will be created in collaboration with the EBEs and will include an overview of its results and potential clinical utility. Participants were invited to request a

summary of the results once the project was completed. However, this offer was not taken up by any of the participants. The EBEs felt that as this was an anonymised survey, some felt some participants would not feel comfortable supplying personally identifiable information (i.e., their email address) due to the nature of the study.

It is also planned that the systematic review and empirical study will be submitted for publication in relevant journals to disseminate the findings to academic audiences further. The systematic review is a helpful synthesis of research explicitly focused on the effectiveness of MBIs in males who engage in problematic illicit drug use. It supports the usefulness and appropriateness of this treatment for men. Research into chemsex is relevant across physical and mental health domains and those working with MSM sexual minority groups. It is hoped that this research supports the usefulness of mindfulness-based approaches for chemsex and indicates a direction for further research in developing targeted interventions. The journals which would be most appropriate include the *Psychology of Addictive Behaviors*, *Mindfulness and AIDS and Behaviour*. Also, it is hoped to present the findings at relevant conferences such as the British Psychology Society's HIV and Sexual Health annual conference.

VI. References

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VII. Appendices

Appendix A

Systematic Review Protocol

<p>Research question State a specific research question for the review</p>	<p>What is the evidence that mindfulness-based interventions improve the substance misuse behaviours in men? A systematic literature review</p>
<p>Link with empirical study Clarify and justify link with empirical study</p>	<p>The empirical study will focus on whether mindfulness is associated with the self-efficacy beliefs of MSM who engage in chemsex can initiate sober sex</p>
<p>Eligibility criteria State the characteristics of eligible studies (e.g., designs; participant characteristics; setting; dates; language; methodology)</p>	<p>Methodology/Designs Inclusion Criteria – Published quantitative studies will only be included (RCTs). Exclusion Criteria – Non-RCT studies, qualitative studies, quasi-experimental studies, case reports</p>
	<p>Language Inclusion Criteria - Only studies published in English will be included.</p>
	<p>Participant characteristics Inclusion Criteria – Adults (18+) diagnosed with a substance use disorder</p>
	<p>Gender Inclusion Criteria - Only studies with male participants will be included Exclusion criteria – Studies that are mixed-gendered or female only.</p>
	<p>Dates Inclusion Criteria - There will be no date restriction.</p>
<p>Search terms State the search terms for key variables</p>	<p>The following search terms will be used:</p> <ul style="list-style-type: none"> • Concept 1 – Mindfulness <p>“mindfulness” OR “mindfulness intervention” OR “mindfulness meditation” OR “mindfulness treatment” OR “mindfulness-based relapse prevention” OR “MBRP”</p> <ul style="list-style-type: none"> • Concept 2 – Substance Misuse <p>"substance misuse" OR "substance use" OR "drug abuse" OR “*use disorder”</p>
<p>Number of articles initially located using search terms The following electronic databases will be used:</p>	<ul style="list-style-type: none"> • PsycINFO – approx. 195* • PubMed – approx. 97* • Web of Science – approx. 577* <p>* initially located before de-duplication</p>

Appendix B

SPSS Output – Quality Assessment Interrater Reliability

Study	Valid cases	Cohen's Kappa	Asymptotic Standard Error ^a	Approximate T ^b	Approximate Significance
Lee et al. (2016)	13	1.00	.00	4.38	p<.001
Carrico et al. (2019)	13	1.00	.00	5.21	p<.001
Abed & Shahidi (2019)	13	0.72	.19	3.14	p=.002
Yaghubi & Zargar (2018)	13	0.85	.15	3.79	p<.001
Lyons et al. (2019)	13	0.73	.18	3.15	p=.002
Foroushani (2019)	13	0.73	.17	3.32	p=.001
Chen et al. (2019)	13	0.75	.17	3.81	p<.001

a. Not assuming the null hypothesis

b. Using the asymptotic standard error assuming the null hypothesis

Appendix C

Methodological Quality Rating Scale (MQRS; Miller et al., 1995)

Domain	Study Code	Study ID. ^a						
		1	2	3	4	5	6	7
Study Design	1 = Single Group pre-test post-test 2 = Quasi-experimental (non-equivalent control) 3 = Randomization with control group	3	3	3	3	3	3	3
Replicability	0 = Procedures contain insufficient detail 1 = Procedures contain sufficient detail	1	1	1	0	1	1	1
Baseline	0 = No baseline scores, characteristics or measures reported 1 = Baseline scores, characteristics, or measures reported	1	1	1	1	1	0	1
Quality Control	0 = No standardization specified 1 = Intervention standardization by manual, procedures, specific training etc.	1	1	1	0	1	0	1
Follow-up length	0 = Less than 6 months 1 = 6 to 11 months 2 = 12 months or longer	0	2	0	0	0	0	2
Dosage	0 = No discussion of % of treatment received 1 = % treatment enumerated and accounted for	0	1	1	0	0	1	0
Collaterals	0 = No collateral verification 1 = Collaterals interviewed	0	0	0	0	0	0	0
Objective Verification	0 = No objective verification 1 = Verification of records (paper records, blood, materials)	0	1	1	0	0	1	0
Dropouts / attrition	0 = Dropouts neither discussed nor accounted for 1 = Dropouts enumerated and discussed	0	1	1	1	1	1	1
Statistical Power	0 = Inadequate power due to sample size / dropouts 1 = Adequate power with adequate sample size	0	1	0	1	1	0	1
Independent	0 = Follow-up nonblind, unspecified 1 = Follow-up of interventions treatment blind	0	0	0	0	0	0	1
Analyses	0 = No statistical analyses or clearly inappropriate analyses 1 = Appropriate statistical analyses (group differences, characteristics comparable)	1	1	1	1	1	1	1
Multisite	0 = Single site or comparison of differing intervention 1 = Parallel replications at two or more sites	0	0	0	0	0	1	0
Overall risk of bias		7	13	10	7	9	9	12

Study ID.

1. Lee et al. (2016)
2. Carrico et al. (2019)
3. Abed & Shahidi (2019)
4. Yaghubi & Zargar (2018)
5. Lyons et al. (2019)
6. Foroushani (2019)
7. Chen et al. (2019)

Appendix D
NHS Ethical Approval



London - Bromley Research Ethics Committee
Level 3, Block B
Whitefriars
Lewins Mead
Bristol
BS1 2NT

Telephone: 0207 104 8241

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 October 2020

Dr Michael J Rolt
Trainee Clinical Psychologist
Camden and Islington NHS Foundation Trust
5 Southsea Terrace
4 St Pancras Way
Southsea
PO5 3AU

Dear Dr Rolt

Study title:	Survey study investigating mindfulness traits in MSM who engage in chemsex
REC reference:	20/LO/0986
Protocol number:	N/A
IRAS project ID:	279332

Thank you for your letter of 13 October 2020, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair, Dr Koula Asimakopoulou, along with Committee Member Dr Jackie Tavabie.

Confirmation of Ethical Opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Appendix E
HRA Approval



Ymchwil Iechyd
a Gofal Cymru
Health and Care
Research Wales



Royal Holloway - University of Lond Michael J Rolt
Trainee Clinical Psychologist
Camden and Islington NHS Foundation Trust
5 Southsea Terrace
4 St Pancras Way
Southsea
PO5 3AU

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

21 October 2020

Dear Michael Rolt

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

Study title: Survey study investigating mindfulness traits in MSM who engage in chemsex
IRAS project ID: 279332
Protocol number: N/A
REC reference: 20/LO/0986
Sponsor: Royal Holloway - University of London

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

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

How should I work with participating NHS/HSC organisations in Northern Ireland and Scotland?

HRA and HCRW Approval does not apply to NHS/HSC organisations within Northern Ireland and Scotland.

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

Appendix F

Royal Holloway, University of London, Ethical Approval

PI: Nuno Nodin

Project title: Survey investigating mindfulness in MSM who engage in chemsex

REC ProjectID: 2257

Your application has been approved by the Research Ethics Committee.

Please report any subsequent changes that affect the ethics of the project to the University Research Ethics Committee ethics@rhul.ac.uk

This email, its contents and any attachments are intended solely for the addressee and may contain confidential information. In certain circumstances, it may also be subject to legal privilege. Any unauthorised use, disclosure, or copying is not permitted. If you have received this email in error, please notify us and immediately and permanently delete it. Any views or opinions expressed in personal emails are solely those of the author and do not necessarily represent those of Royal Holloway, University of London. It is your responsibility to ensure that this email and any attachments are virus free.

Appendix G

Participant Information Sheet

Survey investigating mindfulness in MSM who engage in chemsex

IRAS Project ID: 279332

REC reference: 20/LO/0986

IMPORTANT INFORMATION

Thank you for your interest in this study. My name is Michael Rolt, and I am a Trainee Clinical Psychologist at Royal Holloway, University of London (RHUL). RHUL's Psychology department supports a thriving research culture and, as part of my doctorate, I am carrying out an academic research project to explore people's experiences related to sexualised drug use ('chemsex').

Before you decide whether to take part, it is essential that you fully understand what the study involves. Please take time to read the following information carefully.

Purpose of the research

There is little research about 'chemsex' in men who have sex with men (MSM). This project aims to explore the complex factors that may be associated with MSM's engagement in chemsex, including thoughts you may have about yourself and others. It is hoped that a better understanding of these factors may contribute to improving future support for MSM.

Why have I been asked to take part?

This study is open to anyone aged 18 and over, identifies as a man who has sex with men and was has engaged in chemsex within the last 12 months. You should also be fluent in English.

What will the study involve?

If you decide to take part in this study, you will be asked to complete a set of online questionnaires, taking approximately 15 minutes to complete. You will be asked to enter some demographic information, including your age, gender identity, ethnicity, and chemsex experience. You will then be asked to complete several questionnaires explore beliefs, thoughts, and feelings about yourself and others.

Consent and voluntary participation

Your participation in this study is entirely voluntary, and you can stop at any time, without having to provide a reason. At the start of the questionnaires, you can create a 7-digit code. If at any time before the end of the project (Feb 2021) you decide to withdraw your consent, you can contact me on the email below including the 7-digit code, and I will remove your responses.

Otherwise, it is assumed that you agree that the terms and conditions of this investigation are clear and that you have voluntarily decided to participate in this survey.

What are the incentives in taking part?

Whilst there are no immediate therapeutic benefits to taking part in this study, your participation will help advance knowledge within this area of psychological research.

Are there any risks in taking part?

It is unlikely that taking part in this study will harm your psychological well-being. However, you will be required to briefly describe difficult or negative experiences and answer questions related to potentially difficult thoughts, feelings, and beliefs. If you want to talk to someone about chemsex, please contact the LGBT Foundation: email sexualhealth@lgbt.foundation, or call the helpline on 0345 3303030. Further resources can be found at <http://lgbt.foundation/chemsex>.

Distribution of project results

At the end of this study, a research report will be given to local support providers (including drug and alcohol services). If you would like a copy of the report sent to you directly, you have the option of leaving your email address at the end of the questionnaires. Any email addresses will be stored separately from the questionnaire responses and deleted once the report has been sent.

Confidentiality

This survey is anonymous, and IP addresses are not collected. No identifiable information will be collected so that all questionnaire responses will be anonymous. Only the research team will have access to the anonymous data collected during the study. The findings of this research will be written up as part of my doctoral thesis. It may also be written up and published in a scientific journal and presented at scientific conferences. If the study is published, the anonymised data may be made available to third parties. Your information will not be identifiable when written up, published or presented. Data from this study will be retained for five years following publication in a scientific journal for audit purposes, and subsequently disposed of securely.

General Data Protection Information

Royal Holloway, University of London, is the sponsor for this study and is based in the UK. We will be using information from you to undertake this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. Any data you provide during the completion of the survey will be stored securely on local servers. Royal Holloway is designated as a public authority. Per the Royal Holloway and Bedford New College Act 1985, and the statutes which govern the College, we conduct research for the public benefit and in the public interest. Royal Holloway has put in place appropriate technical and organisational security measures to prevent your data from being accidentally lost, altered, disclosed, accessed or used in an unauthorised way. Royal Holloway also has procedures in place to deal with suspected personal data security breaches. You can find out more about your rights under the GDPR and Data Protection Act 2018 by visiting <https://www.royalholloway.ac.uk/about-us/more/governance-and-strategy/data-protection/>. If you wish to exercise your rights, please contact dataprotection@royalholloway.ac.uk.

Please feel free to ask any questions you may have before you complete the following consent form. Please email your questions to michael.rolt.2018@live.rhul.ac.uk. I will get back to you as soon as possible.

Appendix H

Participant Debrief Information Sheet

Thank you for taking part in the survey. This is an academic research project conducted by Royal Holloway - University of London. The study will result in a research report, which will be given to local support services and providers (including drug and alcohol services). All the data collected in this survey will be stored anonymously.

Background: Chemsex drug use amongst men who have sex with men (MSM) in the UK is more prevalent than in the general population and can sometimes lead to significant health difficulties. Previous research, among heterosexual populations, has found that mindfulness may help improve people's sexual satisfaction by developing better emotion regulation and is associated with a reduction in intimacy difficulties. However, it is not known whether these findings can be applied outside of the heterosexual populations studied.

Hypotheses and main questions: This study hopes to extend previous research by exploring the associations between feelings of shame and sexual satisfaction with self-efficacy initiating sober sex, and levels of mindfulness in MSM who engage in chemsex. Because participants mustn't know the above information before participating, I kindly ask that you do not share this information with anyone that may also participate in this study.

Additional support: Whilst we do not anticipate any adverse effects from having taken part within this study, it is possible that focusing on difficult experiences, beliefs, thoughts, and/or feelings, may have impacted upon your well-being. If you want to talk to someone about chemsex, please contact the LGBT Foundation: email sexualhealth@lgbt.foundation, or call the helpline on 0345 3303030. Further resources can be found at <http://lgbt.foundation/chemsex>.

Further questions? If you have any questions about this study, or you would like to receive a copy of the research findings, please do not hesitate to contact me (michael.rolt.2018@live.rhul.ac.uk) or my research supervisor (nuno.nodin@live.rhul.ac.uk).

Thank you again for your participation, it is greatly appreciated!

Appendix I
Geospatial App Advertisement

 **ROYAL HOLLOWAY UNIVERSITY OF LONDON**

PARTICIPANTS NEEDED

ARE YOU A UK RESIDENT?
ARE YOU OVER 18 YEARS OLD?
ARE YOU A MAN WHO HAS SEX WITH MEN?
HAVE YOU HAD CHEMSEX IN THE LAST 12 MONTHS?

THIS PROJECT AIMS TO EXPLORE PEOPLE'S ENGAGEMENT IN CHEMSEX. IT INVOLVES COMPLETING AN ONLINE QUESTIONNAIRE (APPROX. 15 MINS)

CONFIDENTIAL AND ANONYMOUS

FOR FURTHER INFORMATION,
USE THE FOLLOWING LINK
<https://bit.ly/MSMCHEM>

OR SCAN THE QR CODE

CONTACT ME DIRECTLY;
MICHAEL.ROLT.2018@LIVE.RHUL.AC.UK

THIS PROJECT HAS BEEN APPROVED BY THE NHS ETHICS COMMITTEE, THE HRA AND THE DEPARTMENT OF PSYCHOLOGY ETHICS COMMITTEE AT ROYAL HOLLOWAY, UNIVERSITY OF LONDON - IRAS: 279332

Appendix J
Consent Form

Question	Response
I have read and understood the information sheet about this study	Yes/No
I have had the opportunity to ask questions, and had any questions answered satisfactorily.	Yes/No
I understand that I am free to withdraw from the study at any time, without giving a reason	Yes/No
I agree to participate in this study	Yes/No

Appendix K
Demographic Questionnaire

Question	Responses (select as appropriate)		
What is your ethnicity?	White British Asian or Asian British	Other White European Black or Black British	Mixed Other ethnic Groups
What is your age?			
What is your gender?	Male Other	Non-binary	Trans
I define my sexuality as...	Gay Pansexual	Bisexual Asexual	Straight Other
My HIV status is...	HIV Positive	HIV Negative (negative when last tested)	Unsure

Appendix L

Chemsex Questionnaire

Question	Responses (select as appropriate)		
Which of the following have taken as part of sexualised drug use?	G [GHB/GBL] Other	M [M-cat, Mephedrone]	T [Tina, Crystal Meth]
How often have you engaged in chemsex in the last 12 months?	None Six to ten times	Once Eleven or more times	Two to five times
Where have you engaged in chemsex?	Chemsex (chill out) party Home (alone or with partner)	Cruising area Nightclub or bar	Sex venue (e.g., sauna, sex club, dark room etc.) platform
Chemsex use is impacting my well-being...	Positively Unsure	Negatively	No impact
I feel in control of my chems use?	Yes	No	Unsure
Have you ever considered support related to your chemsex use?	Yes	No	Unsure
During the Coronavirus pandemic my chemsex use has...	Increased Unsure	Decreased	Remained the same

Appendix M
Internalized Shame Scale (ISS; Cook, 1987)

Read each statement carefully and mark the option that indicates the frequency with which you find yourself feeling or experiencing what is described in the statement;	Never	Seldom	Sometimes	Frequently	Almost Always
I feel like I am never quite good enough.					
I feel somehow left out					
I think that people look down on me.					
All in all, I am inclined to feel that I am a success.					
I scold myself and put myself down.					
I feel insecure about other's opinions of me.					
Compared to other people, I feel like I, somehow, never measure up I see myself as being very small and insignificant					
I feel I have much to be proud of.					
I feel intensely inadequate and full of self doubt					
I am somehow defective as a person, like there is something wrong with me. When I compare myself to others, I am not as important.					
I have an overpowering fear that my faults will be revealed in front of others. I feel I have a number of good qualities.					
I see myself striving for perfection only to continually fall short.					
I think others are able to see my defects					
I could beat myself over the head with a club when I make a mistake On the whole, I am satisfied with myself.					
I would like to shrink away when I make a mistake					
I replay painful events over and over in my mind until I am overwhelmed. I feel I am a person of worth, at least on an equal plane with others. At times I feel like I will break into a thousand pieces.					
I feel as if I have lost control over my body functions and my feelings. Sometimes I feel no bigger than a pea.					
At times, I feel so exposed that I wish the earth would open up and swallow me. I have this painful gap within me that I have not been able to fill.					
I feel empty and unfulfilled.					
I take a positive attitude toward myself.					
My loneliness is more like emptiness.					
I always feel like there is something missing					

Appendix N

Depression, Anxiety and Stress Scale (DASS-SF; Lovibond & Lovibond, 1995)

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement. The rating scale is as follows:

- 0 Did not apply to me at all
- 1 Applied to me to some degree, or some of the time
- 2 Applied to me to a considerable degree or a good part of the time
- 3 Applied to me very much or most of the time

Item	Question	Response			
1 (s)	I found it hard to wind down	0	1	2	3
2 (a)	I was aware of dryness of my mouth	0	1	2	3
3 (d)	I couldn't experience any positive feeling at all	0	1	2	3
4 (a)	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5 (d)	I found it hard to work up the initiative to do things	0	1	2	3
6 (s)	I tended to over-react to situations	0	1	2	3
7 (a)	I experienced trembling (e.g. in the hands)	0	1	2	3
8 (s)	I felt that I was using a lot of nervous energy	0	1	2	3
9 (a)	I was worried about situations in which I might panic	0	1	2	3
10 (d)	I felt that I had nothing to look forward to	0	1	2	3
11 (s)	I found myself getting agitated	0	1	2	3
12 (s)	I found it difficult to relax	0	1	2	3
13 (d)	I felt downhearted and blue	0	1	2	3
14 (s)	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15 (a)	I felt I was close to panic	0	1	2	3
16 (d)	I was unable to become enthusiastic about anything	0	1	2	3
17 (d)	I felt I wasn't worth much as a person	0	1	2	3
18 (s)	I felt that I was rather touchy	0	1	2	3
19 (a)	I was aware of the action of my heart in the absence physical exertion (e.g. sense of heart rate increase, heart missing a beat)	0	1	2	3
20 (a)	I felt scared without any good reason	0	1	2	3
21 (d)	I felt that life was meaningless	0	1	2	3

Appendix O

New Sexual Satisfaction Scale-SF (NSSS-SF; Stulhofer et al., 2011)

For each item, select the option that best reflects your satisfaction with a particular aspect of your sex life in the preceding six months, **when not using drugs (i.e. sober sex)**

Responses are anchored on the following scale:

1 = Not at all Satisfied, 2 = A Little Satisfied, 3 = Moderately Satisfied, 4 = Very Satisfied,
5 = Extremely Satisfied.

The quality of my orgasms

My “letting go” and surrender to sexual pleasure during sex

The way I sexually react to my partner

My body’s sexual functioning

My mood after sexual activity

The pleasure I provide to my partner

The balance between what I give and receive in sex

My partner’s emotional opening up during sex

My partner’s ability to orgasm

My partner’s sexual creativity

The variety of my sexual activities

The frequency of my sexual activity

Appendix P

Five Facet Mindfulness Questionnaire-SF (FFMQ-SF; Baer et al., 2008)

Below is a collection of statements about your everyday experience. Using the 1-5 scale below, please indicate, in the box to the right of each statement, how frequently or infrequently you have had each experience in the last month (or other agreed time period). Please answer according to what really reflects your experience rather than what you think your experience should be.

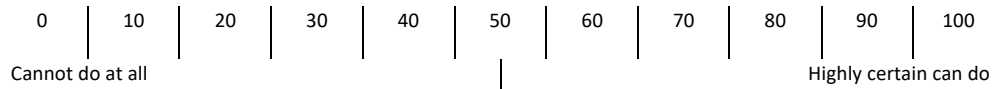
	Never or very rarely	Not often true	Sometimes true or sometimes not true	Often true	Very often or always true
	1	2	3	4	5
I'm good at finding the words to describe my feelings				DS	
I can usually put my beliefs, opinions, and experiences into work				DS	
I watch my feelings without getting carried away by them				NR	
I tell myself that I shouldn't be feeling the way I'm feeling				/NJ	
It's hard for me to find the words to describe what I'm feeling				DS	
I pay attention to physical experiences, such as the wind in my hair or sun on my face				OB	
I make judgments about whether my thoughts are good or bad				/NJ	
I find it difficult to stay focused on what's happening in the present moment				/AA	
When I have distressing thoughts or images, I don't let myself be carried away by them				NR	
Generally, I pay attention to sounds such as clocks ticking, birds chirping, or cars passing				OB	
When I feel something in my body, it's hard for me to find the right words to describe it				/DS	
It seems I am "running automatic" without much awareness of what I'm doing				/AA	
When I have distressing thoughts or images, I feel calm soon after				NR	
I tell myself I shouldn't be thinking the way I'm thinking				/NJ	
I notice the smells and aromas of things				OB	
Even when I'm feeling terribly upset, I can find a way to put it into words				DS	
I rush through activities without being really attentive to them				/AA	
Usually when I have distressing thoughts or images, I can just notice them without reacting				NR	
I think some of my emotions are bad or inappropriate and I shouldn't feel them				/NJ	
I notice visual elements in art or nature, such as colours, shapes, textures, or patterns of light and shadows				OB	
When I have distressing thoughts or images, I just notice them and let them go				NR	
I do jobs or tasks automatically without being aware of what I'm doing				/AA	
I find myself doing things without paying attention				/AA	
I disapprove of myself when I have illogical ideas				/NJ	

Appendix Q

Self-Efficacy to initiate in sober sex (SEISS)

Some people find the following situations difficult without using alcohol or drugs. Please rate how confident you are of doing the following without needing to use alcohol or drugs.

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:



Without needing to use alcohol or drugs, I would...

Believe that some people find me sexually attractive

Feel confident enough to consider having sexual contact with someone

Be able to make advances towards an existing sexual partner

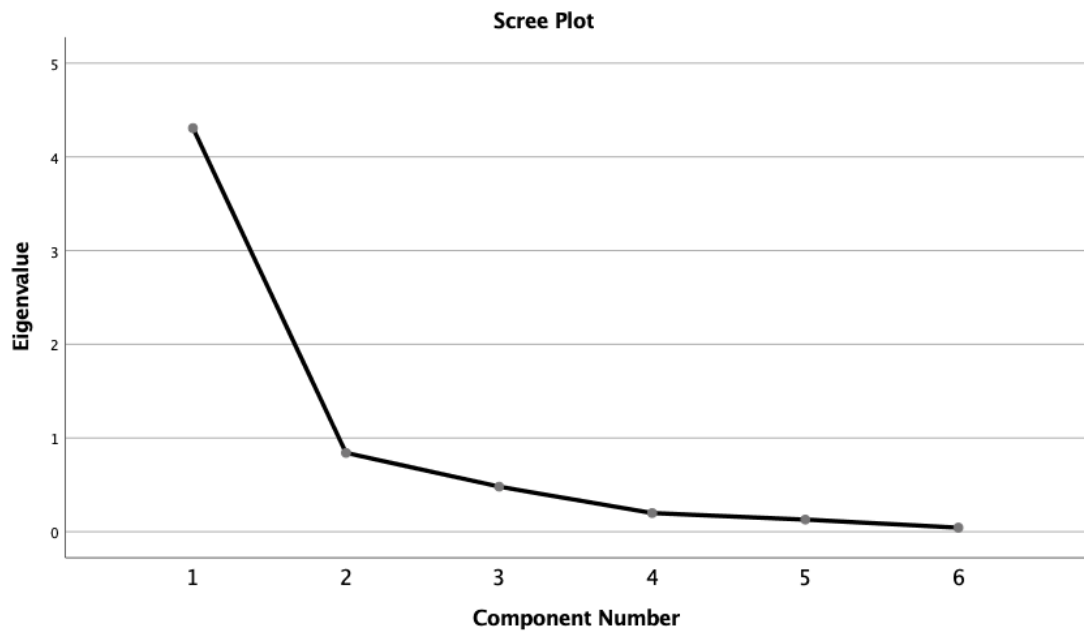
Be able to accept advances from an existing sexual partner

Be able to make advances towards a potentially new sexual partner

Be able to accept advances from a potentially new sexual partner

Appendix R

SPSS Output - SEISS Factor Analysis Scree Plot and Component matrix



SEISS Component Matrix

Component Matrix ^a	
Attractive	.81
Contact	.89
Approach existing	.85
Accept existing	.82
Approach New	.85
Accept New	.87

a.1 component extracted

Extraction Method: Principal Component Analysis

Appendix S

SPSS Output – Tests of normal distribution

Normality	Skewness			Kurtosis		
	Statistic	Std. Error	z-score	Statistic	Std. Error	z-score
Shame	.19	.17	.11	-1.06	.33	-3.20
Nonreactivity	-.25	.17	-1.48	.07	.33	.20
Observe	.17	.17	1.00	.40	.33	1.20
Acting with awareness	-.08	.17	-.48	-.41	.33	-1.24
Describe	.21	.17	1.25	.20	.33	.60
Non-judgment	-.08	.17	-.48	-.24	.33	-1.24
Sexual Satisfaction	.173	.17	1.04	-.42	.33	-1.27
SEISS	-.144	.17	-.86	-.72	.33	-2.17

z-scores <3.29 (Kim, 2013)

Appendix T

SPSS Output – Post-hoc chi-square tests of independence

		I feel in control of my chems use			
		Yes	No	Unsure	
Impact of chemsex on my life	Positive	Count	129.0	3.0	4.0
		Expected Count	103.9	16.0	16.0
		Adjusted Residual	8.5	-5.8	-5.3
		p-value	<.0001	<.0001	<.0001
	Negative	Count	9.0	21.0	16.0
		Expected Count	35.2	5.4	5.4
		Adjusted Residual	-10.3	8.0	5.5
		p-value	<.0001	<.0001	<.0001
	Unsure / No impact	Count	24.0	1.0	5.0
		Expected Count	22.9	3.5	3.5
		Adjusted Residual	0.5	-1.6	0.9
		p-value	0.62	0.11	0.37

Bonferroni correction: p=.0056

		Considered support related to your chemsex use?			
		Yes	No	Unsure	
Impact of chemsex on my life	Positive	Count	13.0	121.0	2.0
		Expected Count	36.6	95.6	3.8
		Adjusted Residual	-7.6	8.0	-1.6
		p-value	<.0001	<.0001	0.11
	Negative	Count	40.0	4.0	2.0
		Expected Count	12.4	32.3	1.3
		Adjusted Residual	10.4	-10.3	0.7
		p-value	<.0001	<.0001	0.48
	Unsure / No impact	Count	40.0	4.0	2.0
		Expected Count	12.4	32.3	1.3
		Adjusted Residual	10.4	-10.3	0.7
		p-value	<.0001	<.0001	0.48

Bonferroni correction: p=.0056

		Considered support related to your chemsex use?				
		Once	Two to five times	Six to ten times	Eleven or more times	
Impact of chemsex on my life	Positive	Count	0.0	24.0	55.0	56.0
		Expected Count	1.3	21.8	46.7	65.3
		Adjusted Residual	-1.9	0.9	2.5	-2.7
		p-value	0.06	0.37	0.01	0.01
	Negative	Count	1.0	3.0	10.0	32.0
		Expected Count	0.4	7.4	15.9	22.2
		Adjusted Residual	1.0	-2.0	-2.1	3.3
		p-value	0.31	0.05	0.04	<.0001
	Unsure / No impact	Count	1.0	7.0	8.0	14.0
		Expected Count	0.3	4.8	10.4	14.5
		Adjusted Residual	1.5	1.2	-1.0	-0.2
		p-value	0.13	0.23	0.32	0.84

Bonferroni correction: p=.0042

Appendix U

SPSS Output – Regression assumptions of multicollinearity

Variable	Sexual Satisfaction		Self-efficacy initiating sober sex	
	Tolerance	VIF	Tolerance	VIF
Shame	.78	1.29	.78	1.29
Nonreactivity	.37	2.67	.37	2.67
Observe	.58	1.72	.58	1.72
Acting with awareness	.74	1.35	.74	1.35
Describe	.58	1.73	.58	1.73
Non-judgment	.38	2.61	.38	2.61