The development of an online intervention to reduce HIV/STI risk and drug use-related harms among stimulant-using MSM in Malaysia

Report on Findings and Recommendations

For

Malaysian AIDS Council

By

Lim Sin How, Yee Hway Ann @ Anne Yee, Yap Jia Ying, Yap Kok Fei

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1.0 ABBREVIATIONS

ASSIST = Alcohol, Smoking and Substance Involvement Screening Test

BI = Brief Intervention

DASS-21 = Depression, Anxiety and Stress Scale 21

GBL = Gamma butyrolactone

GHB = Gamma hydroxybutyrate

MDMA = 3,4-methylenedioxy-methamphetamine

MOH = Ministry of Health

MSM = Men who have sex with men

NGO = Non-governmental Organization

PrEP = Pre-exposure Prophylaxis

RCT = Randomised Control Trial

STI = Sexually Transmitted Infections

UMCAS = University of Malaya Centre for Addiction Science Studies

UMMC = University of Malaya Medical Center

URICA = University of Rhode Island Change Assessment

WHO = World Health Organization

2.0 EXECUTIVE SUMMARY

The Malaysian AIDS Council (MAC), the recipient of the Global Fund, has allocated a total of USD119,485 for the development of an online intervention to reduce HIV/STI risks among stimulant-using MSM in Malaysia. A randomized control trial (RCT) was conducted to assess the efficacy of an online intervention which includes Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) brief intervention, Chemsex Care Plan and harm reduction information. ASSIST was used to screen psychoactive substance use and related problems while the Chemsex Care Plan served as a self-help tool to reduce chemsex-related harms. An interactive website was developed since March 2021 and eventually went live in October 2021. In addition to intervention components (ASSIST-brief intervention and Chemsex Care Plan), the website consisted of comprehensive resources related to harm reduction including community outreach support, types and effects of chemsex drugs, service linkages to MSM-friendly clinics, PrEP locator, chemsex first aid, an HIV self-testing website (JOMTEST), education videos and frequently asked questions (FAQ) and answers. Two batches of caseworkers with a total of 25 individuals from NGOs, postgraduate students, volunteers, counselling trainees and peers were appointed as caseworkers. The caseworkers were certified to conduct ASSIST brief interventions after completing a 4 weekly online training by University of Adelaide and UMCAS respectively.

An RCT of the online intervention was conducted between November 2021 to May 2022. Participants were recruited via caseworker referrals, word of mouth and social media promotion on Twitter and radio interview. Additionally, podcasts were created to engage with stimulant-using MSM. Men who fulfilled the inclusion criteria were registered on the study website, after completing their informed consent form and participant information sheet. The eligibility criteria include being biological males aged 18 and above, having engaged in 'chemsex' with other men in the past 12 months (defined as taking crystal methamphetamine, GBL/GHB, or ecstasy/MDMA), capable of understanding and reading Malay or English, willing to be contactable for follow-up surveys and able to provide online consent. Upon registration, the participants were given a unique ID and randomized into the control and intervention groups. After completion of baseline questionnaires which consist of demographic information, ASSIST, URICA and DASS-21, participants in the intervention group were asked to schedule a Zoom meeting with a caseworker. During the meeting, the caseworker reviewed the score of ASSIST in the baseline questions and asked participants to reflect on their methamphetamine use using motivational interviewing techniques such as open-ended

questions, decisional balances, trigger identification and craving management. The brief intervention took an average of 30 minutes. After the brief interventions, participants were given the Chemsex Care Plan access to help identifying their harm reduction goal and which subsequently working towards it. On the other hand, participants in the control group were given access to the web version of World Health Organization's *Self-Help Guide on Strategies for Cutting Down or Stopping Substance Use*. Follow-up assessments were carried out at 6-week and 12-week intervals to evaluate the efficacy of the intervention. Important findings from the study can be summarized as follows:

- A total of 154 participants, aged between 18 to 56 years old, from 12 states and territories across Malaysia were recruited and randomised into the control (n = 62) and intervention groups (n = 80) respectively
- In terms of the level of education, 51.3% completed a university degree and above; 66.4% worked on a full-time basis and 10.9% worked part-time jobs
- 77.3% remained single while the majority of participants identified themselves as homosexual (69.7%) and bisexual (16%)
- 88.2% had anal sex with another man in the last 6 months; 90.8% had used stimulant drugs for chemsex, where condoms were occasionally (37.8%) or never (32.8%) used
- 61.3% of participants had a test for a sexually transmitted disease (STI), in the last 12 months, of which 29.4% were diagnosed with an STI
- More than 40% of participants had HIV test in life; about 22% tested positive in the last HIV test while 86% knew about PrEP for HIV prevention
- Stress, depression and anxiety were prevalent among stimulant-using MSM where 60.5%, 66.4% and 46.2% reported moderate to extremely severe levels of depression, anxiety and stress respectively
- 89% of MSM who were involved in chemsex reported moderate to high levels of amphetamine use
- There was no significant difference between groups across time on depression, stress and anxiety, however, the intervention group showed more reduction in the scores
- There was a slight reduction in current amphetamine-type stimulant use and the level of risk of problematic drug use across time. However, the difference between the two groups across time was not statistically significant

HIGH-LEVEL RECOMMENDATIONS

1. Ensure confidentiality and security of data on the website. During the website development, the website must use verified access to the original site, data encryption between personal computers and the website, and encrypted database tables. The individual's information needs to be completely anonymised and no identifiable particular is collected besides obtaining informed consent before accessing the interventions. Doing so can instil trust and confidence among the highly-paranoid stimulant-using MSM to engage the website for harm reduction interventions.
2. The commitment of caseworkers is paramount. Ideally, the individuals who can commit on a full-time basis, without current or past drug use problems, should be recruited as case workers. Caseworkers are required to be proactive and shorten registration to first contact duration to minimize loss to follow-up. In this project, peer-based case workers who were struggling with substance use, were not able to cope with the task. The team-building activities should also be conducted to increase the morale and motivation of the case workers. A long-term plan is needed to re-train the caseworkers in motivational interviewing and other counselling skills and retain them in the project.
3. Leverage on social media that is popular among chem users (e.g. Twitter) for outreach and engagement. In general, this stimulant-using MSM community prefers anonymity and may not interact with the research team. However, information is conveyed to increase awareness of the health issues associated with chemsex and to show support to this hidden community.
4. Evaluate the efficacy of online intervention for a longer term. The evaluation is needed to assess the long-term impacts of interventions and improve the existing services.

This is the first study in Malaysia that developed online chemsex harm reduction intervention by combining ASSIST, which is generally performed by healthcare workers in primary care settings, and Chemsex Care Plan. Our study was confronted with many challenges during the pandemic, including the i) inability to convene face-to-face training and meetings with case workers and among the research team members, ii) questioning of the study's legitimacy due to news reports on police raids at drug-fuelled gay parties and iii) inconsistent participant involvement. The study did not achieve the targeted sample size which may be due to the small population of Twitter users who wish to seek chemsex harm reduction. Future qualitative study is needed to understand the experiences of participants undergoing the intervention and their

motivation and satisfaction with the study. Future studies should focus on recruiting a bigger sample size with a higher participant retention rate and evaluate the efficacy of interventions for a longer term.

3.0 BACKGROUND AND OBJECTIVES

Stimulant drug use may be driving the HIV epidemic among MSM in Asia. The HIV epidemic among MSM is escalating in Asia and the Pacific region, with increasing HIV prevalence among MSM in Thailand, [1] China [2] and Malaysia. [3] Sexualized drug use has become a growing concern in the MSM communities globally [4,5] and southeast Asia. The national HIV prevalence among MSM was 21.6% in Malaysia, among the highest in the region. [6] In a cohort study of 1744 Thai MSM, the increase in HIV prevalence was parallel to the increase in the use of stimulant drugs. [7] Young age, and finding casual sex partners on the internet were associated with both incident methamphetamine use and HIV infection. [7] In an anonymous online survey, 7.6% of Malaysian MSM reported using poppers, crystal methamphetamine, and erectile dysfunction in the past 6 months. [8] Men in the stimulant drug use were 3.9 times more likely to be HIV positive and were more likely to have engaged in group sex and have had more than 6 sexual partners in the past 6 months. [8]

There is a clear association between stimulant drug use among MSM and the risk of HIV infection. [9] In Malaysia, the use of stimulant drugs by some MSM to facilitate and enhance sexual pleasure has been documented. [10] In a qualitative study of stimulant-using MSM, sexual disinhibition and hypersexuality were common during chemsex, leading to decreased condom use, sex with multiple partners and other high-risk sexual behaviours that increased the likelihood of HIV and STI transmission. MSM who have problematic use suffer from a range of physical, mental, and social harms associated with stimulant use. [10] Despite draconian drug laws in Malaysia, crystal methamphetamine, ecstasy and GHB/GBL were among the popular drugs for chemsex. The normalization of stimulant drug use can be observed in gay dating apps and social media where stimulant-using MSM seek chemsex partners and trade stimulant drugs.

Due to cultural and legal prohibition of same-sex activities and illicit drug use in Malaysia, stimulant-using MSM is marginalized and hidden. [10] Many MSM who have stimulant use problems do not seek help or treatment to address their drug use problems. Some may not be aware of the available psychiatric and substance abuse services in Klang Valley and other parts of Malaysia. These services may be limited as the providers may not be familiar with issues surrounding sexual orientation and the health needs of MSM. Due to cultural and legal prohibition, perceived stigma and discrimination against gay men in healthcare settings remain prevalent in Malaysia. In general, stimulant-using MSM trusts their peers, especially former stimulant-drug users in disclosing their drug use and sexual behaviours. Currently, the

majority of stimulant-using MSM use various gay dating apps and social media such as Twitter for advertising and seeking chemsex partners. [10] Community-based harm reduction intervention using social media engagement may effectively reach this MSM subpopulation.

OBJECTIVES

This study aimed to develop an online intervention by adapting the existing ASSIST-brief intervention and Chemsex Care Plan to reduce drug use and HIV sexual risks, besides determining the technical feasibility and efficacy of an online intervention for stimulant-using MSM in Malaysia.

The specific aims of the study are:

1. To adapt ASSIST-brief intervention, Chem Sex Care Plan to reduce drug use and HIV sexual risks for stimulant-using MSM in Malaysia
2. To determine the feasibility and efficacy of an online intervention for stimulant-using MSM in Malaysia.

3.1 LITERATURE REVIEW

The study conducted a thorough review of the literature related to HIV and chemsex prevalence among MSM in Malaysia. The reviews also included the social and mental health consequences related to drug use. Data and information on the Chemsex Care Plan intervention tool were obtained to design the content of the study website.

4.0 METHODOLOGY

This study consisted of 2 phases which are:

(i) Study website development and training of the case workers for ASSIST Brief Intervention

(ii) Randomised control trial

A study website was developed to allow data collection and access to useful resources on chemsex harm reduction. Participants were enrolled on the website to be randomized into case and control groups. Chemsex Care Plan and WHO Self-Help toolkit were made available to case and control groups respectively. The efficacies of interventions were evaluated using ASSIST, DASS-21 and URICA frameworks using self-administered questionnaires. Participants were able to access the study website with individual ID/passwords to complete

the self-administered assessments with no identifiable information collected. The study was approved by the Medical Ethics Committees of the University of Malaya (202092-9036).

4.1 DEVELOPMENT OF STUDY WEBSITE

The study website (www.chemfunsupport.online) was developed and went live in October 2021. Since the launch of the website, it was reported that there were a total of 843 users accessing the website with an average engagement time of 5 minutes 47 seconds. 83% of users came from Malaysia, whereas the rest assessed the website from the United States (8%), Czech Republic (2%), China (2%), Singapore (1%), India (1%) and Taiwan (1%). Google Analytics revealed that about half of the users assessed the website via direct website link, followed by organic website search and organic social media linkage channels.

Besides the login page, the interactive website consisted of resources including information on community outreach support, chemsex drugs, service linkages to MSM-friendly clinics, PrEP locator, chemsex first aid, HIV testing website and frequently asked questions (FAQ). Four videos were produced on different topics, from chemsex and website introduction to harm reduction strategies. Contact information was provided should the participant need assistance from the study team. The logo, images chosen and language used throughout the website were culturally tailored for the MSM community. A focus group discussion regarding feedback on the developed website (content, design, user-friendliness and recommendations) was conducted with a group of MSM, with the majority having engaged in chemsex for at least a year. The comments were studied to make appropriate changes to the website accordingly.

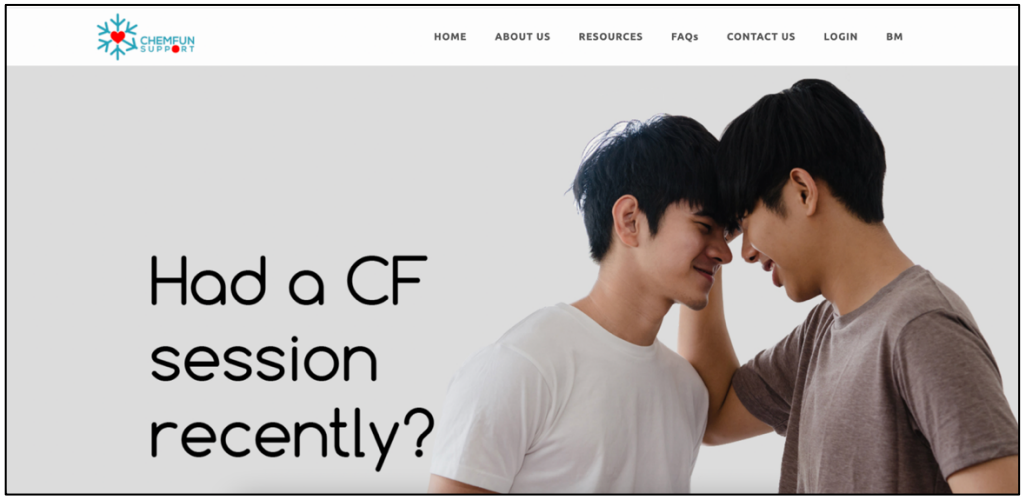


Figure 1: Landing page of Chemfun Support Online

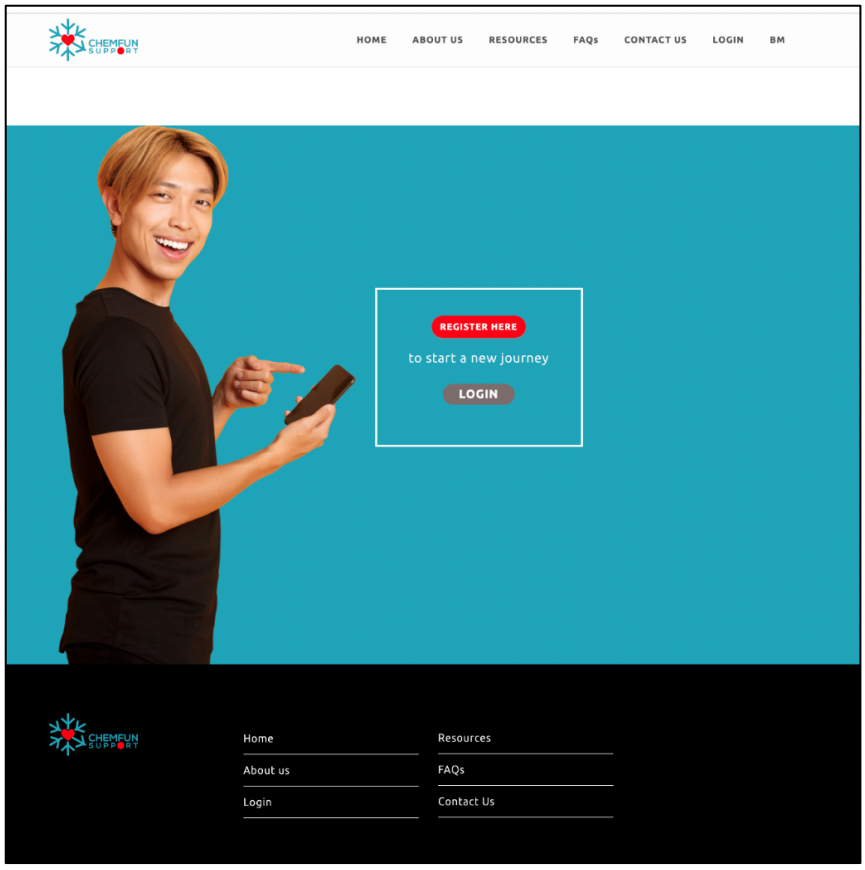


Figure 2: Login/ Registration page of Chemfun Support Online

4.2 RECRUITMENT OF CASEWORKERS

Two rounds of caseworkers recruitment were conducted throughout the study. A total of 14 individuals consisting of NGO members, volunteers and peers were appointed as caseworkers in February 2021. These caseworkers were responsible for recruiting participants by referral and carrying out ASSIST brief intervention for the case group. However, due to commitment and personal wellbeing issues, 13 of them gradually discontinued their involvement with the project when the recruitment officially started in October. The second batch of 11 caseworkers of both genders from NGOs, postgraduate students, counselling trainees and volunteers were recruited in January 2022. The diverse background showed that effective intervention with non-peer caseworkers was possible.

4.3 BRIEF INTERVENTION TRAINING

A series of training on ASSIST brief intervention (www.assistportal.com.au) was conducted in February 2021 and February 2022 respectively. The caseworkers first underwent ASSIST Virtual Workshop by Professor Robert Ali from the University of Adelaide, then attended the

Addiction and ASSIST workshop by the University of Malaya Centre for Addiction Science Studies (UMCAS) to learn how about the framework and how to conduct a brief intervention in Bahasa Malaysia. The topics included i) Drug use and its consequences, ii) Overview of the ASSIST, iii) How to administer ASSIST, and iv) How to conduct ASSIST-linked Brief Interventions. A participant would first complete an 8-item questionnaire to determine his psychoactive substance use and its risk level. Subsequently, a virtual brief intervention of less than 45 minutes with a caseworker would be carried out to increase the participant's awareness and motivation to make a change in their chemsex behaviours. Role play and evaluations were done before certificates were issued to caseworkers. An open-ended question, a decisional balance, the identification of triggers and craving management were among the motivational interviewing techniques the caseworker used to get the participants to reflect on their methamphetamine use during the brief intervention while also reviewing the participants' ASSIST scores on the baseline questions. Average time for the brief intervention was 30 minutes. Participants were given access to the Chemsex Care Plan afterwards, which helped them identify their harm reduction objective and then work toward it.

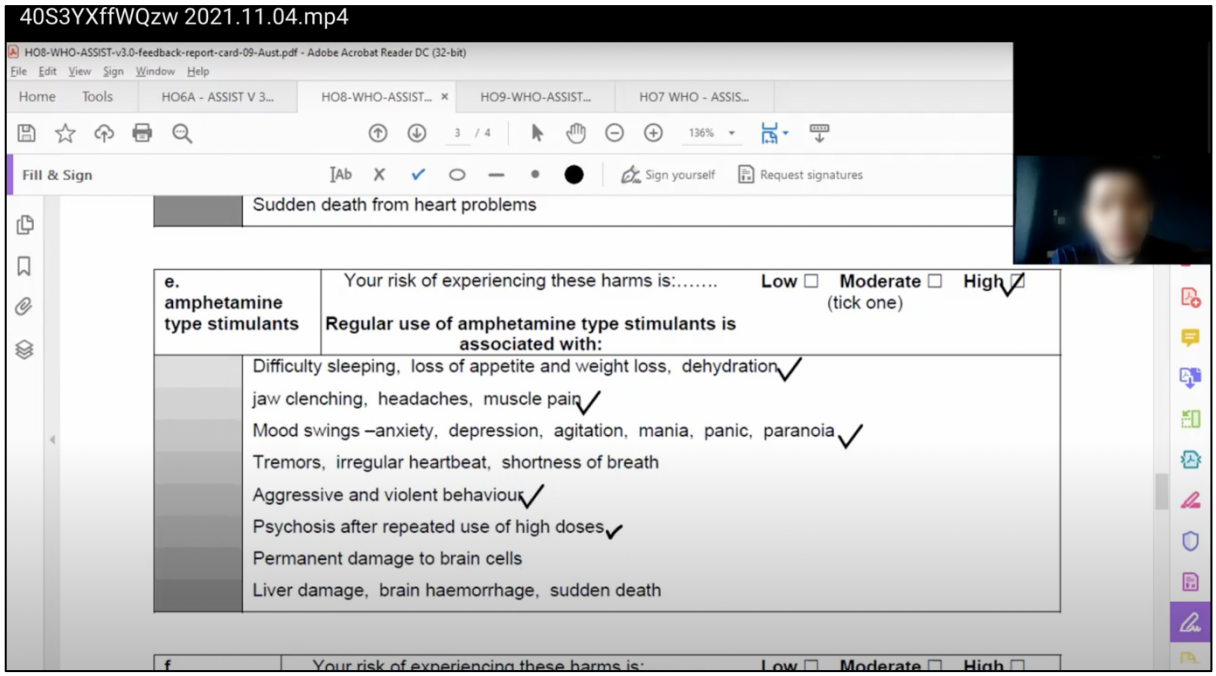


Figure 3: ASSIST Brief intervention with a caseworker

4.4 CHEMSEX CARE PLAN TRAINING

The Chemsex Care Plan was developed by the chemsex counsellor, David Stuart, from the renowned sexual health clinic at 56 Deans' Street (https://www.davidstuart.org/care-plan) to aid in making a change in chemsex practice. The Care Plan was designed based on motivational interviewing and has incorporated elements of cognitive behavioural therapy. Four options were available where users could select their current goals related to substance use including i) Abstinence, ii) Take a short break, iii) Play more safely, and iv) Still not sure what I want to do. The caseworkers received two sessions of training from Stuart in March 2021 via Zoom. Introduction to the Care Plan, knowledge and experience sharing on dealing with different types of clients' needs covered over the two sessions.

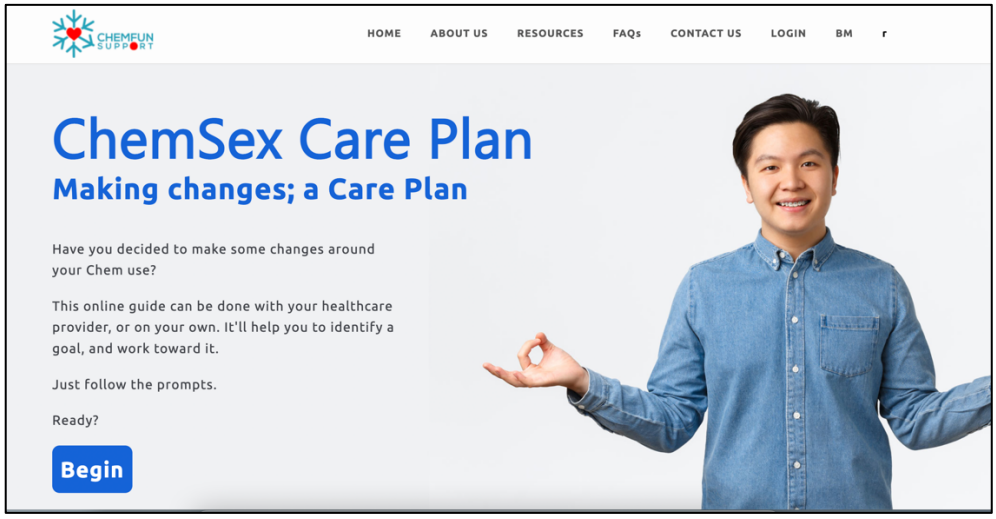


Figure 4: Chemsex Care Plan page on Chemfun Support Online

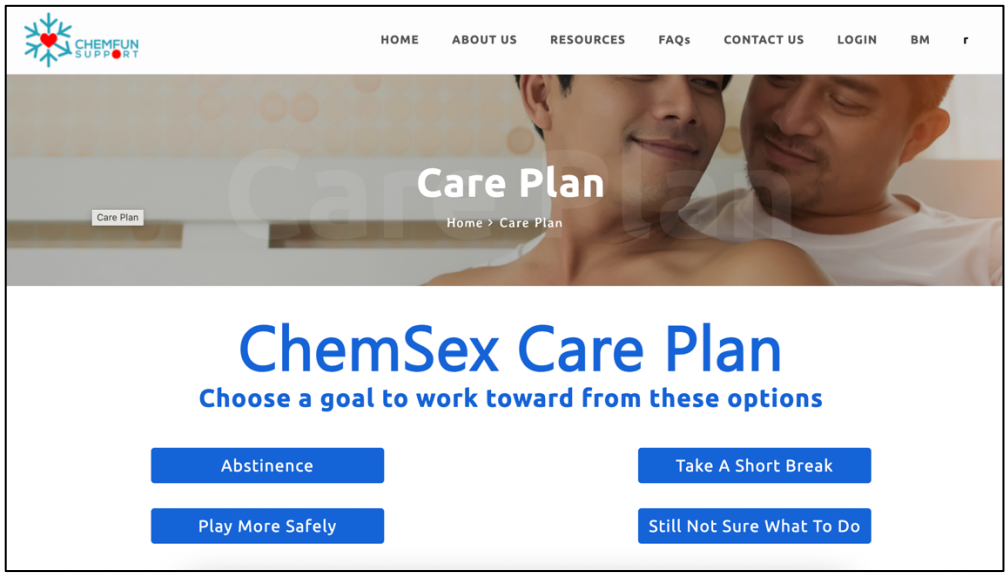
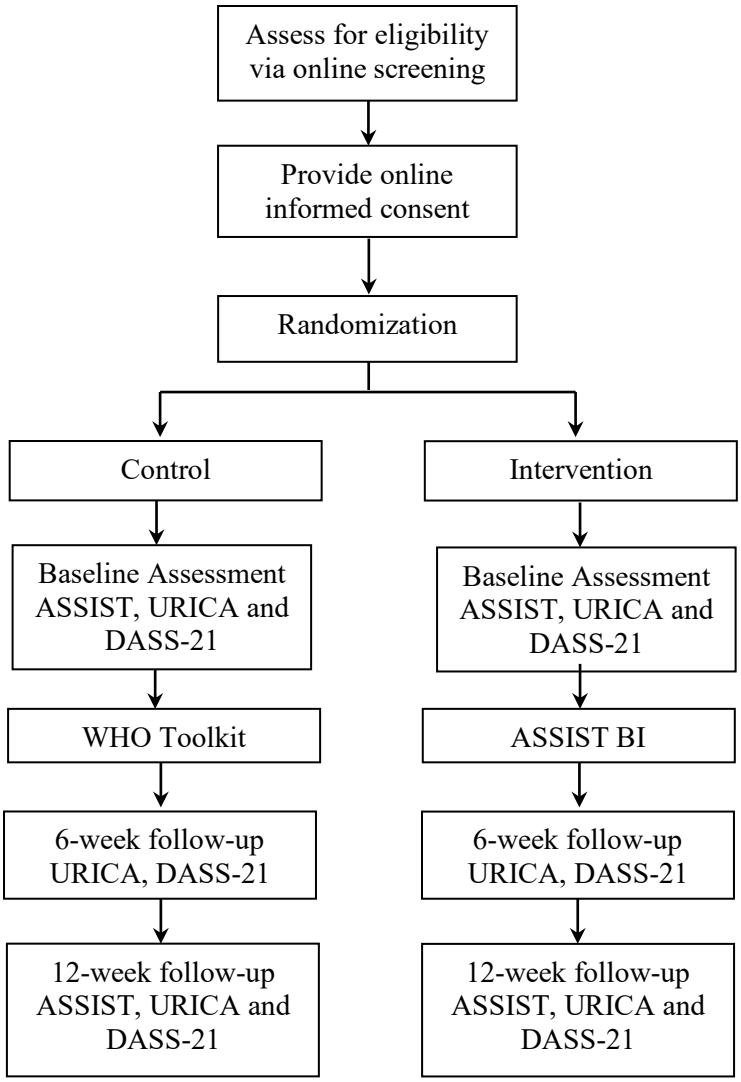


Figure 5: Chemsex Care Plan goals selection

4.5 RANDOMISED CONTROL TRIAL

The participants were recruited primarily via two ways: referral by caseworkers and social media (Twitter) recruitment drive. Interested individuals registered on the dual-language study website to first fill in a brief eligibility survey. Participants had to be biological men who were 18 years of age or older, engaged in "chemsex" with other men in the past 12 months (defined as using crystal methamphetamine, GBL/GHB, or ecstasy/MDMA), could read and understand Malay or English, were willing to be contacted for follow-up surveys, and could give informed consent online. MSM who were currently in drug rehabilitation, receiving treatment for drug abuse, and actively engaging in narcotics anonymous or other modes of behavioural intervention-based treatment were excluded. They were informed that the participation was voluntary and confidential, besides the possible risks and disadvantages that may occur. Upon successful registration, the participants were randomised into case and control groups. Baseline questionnaires consisting of demographic information, URICA, ASSIST and DASS-21 were accessible to be completed anytime based on their availability. The case group was then approached by the assigned caseworkers for an online ASSIST Brief Intervention (BI) within one week of registration whereas the control group was given access to the WHO Self Help Strategies (Cutting Down or Stopping Substance Use) toolkit. The participants were followed up by caseworkers and a research team at 6-week and 12-week time points. Participants were able to access the study website with individual ID/passwords to complete the self-administered assessments with no identifiable information collected. MSM participants were compensated with RM50 after completion of each stage of questionnaires, totalling RM150 for complete participation. The study flow chart is presented below.


Assess for eligibility via online screening
Provide online informed consent
Randomization
Control
Intervention
Baseline Assessment ASSIST, URICA and DASS-21
Baseline Assessment ASSIST, URICA and DASS-21
WHO Toolkit
ASSIST BI
6-week follow-up URICA, DASS-21
6-week follow-up URICA, DASS-21
12-week follow-up ASSIST, URICA and DASS-21
12-week follow-up ASSIST, URICA and DASS-21

4.6 INSTRUMENTATION

Socio-demographic and HIV/STI risk information

A socio-demographic form was created to obtain social and demographic information regarding the participants. In this section, participants were required to provide information such as age, gender, ethnicity, employment status, HIV testing history, and HIV and STI status. Additionally, participants were asked a few questions on HIV risk behaviours, such as condom-less anal intercourse with regular/casual partners and the number of sexual partners in the past 30 days.

Chemsex Care Plan

The Chemsex Care Plan was developed by David Stuart from the famous sexual health clinic (56 Deans' Street). The Chemsex Care Plan (https://www.davidstuart.org/care-plan) is an online tool for motivational interviewing and has incorporated elements of cognitive behavioral therapy. Recognizing the participants may be at different levels of readiness to reduce or quit using stimulant drugs, the care plan first asks clients to select their current goal related to drug use: 1) Abstinence, 2) Take a short break, 3) Play more safely, and 4) Still not sure what I want to do. Depending on the stages of change – participants will be directed to a subpage that would best match their needs. Additionally, it asks participants about their confidence in meeting those goals and the importance of making these goals.

ASSIST (Alcohol, Smoking and Substance Involvement Screening Test)

The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) (www.assistportal.com.au) was developed by the World Health Organization (WHO). It is an 8-item clinician-administered questionnaire developed to detect psychoactive substance use and related problems in primary care patients. [11] The ASSIST screens for a lifetime and current (within the past three months) substance use of 10 different substances (tobacco, alcohol, cannabis, cocaine, amphetamine-type stimulants, inhalants, sedatives/sleeping pills, hallucinogens, opioids and 'other' drugs). The ASSIST has good concurrent, construct, predictive and discriminative validity, including the development of cut-off scores. [11-15] Designed for time-pressured environments, ASSIST takes approximately 5 minutes to complete and helps identify the risks associated with substance use and the personalised feedback helps explore options for change. The Malay version has been validated with Cronbach alpha of 0.8. [16]

University of Rhode Island Change Assessment Scale (URICA)

The URICA is a self-reported assessment that measures stages of change within an individual, where each subscale (Precontemplation, Contemplation, Action and Maintenance) can be identified through responses given on a 5-point Likert Scale and be combined arithmetically to obtain a second-order score that can be used to assess 'Readiness to Change' in beginning treatment. The scale was developed by the University of Rhode Island [17] and has been validated in Bahasa Malaysia. [18] The URICA Scale helps in identifying the willingness of participants to engage in treatment and prompts the development of appropriate interventional treatments. The reliability of URICA is good with a coefficient alpha of 0.79. [19]

Depression, Anxiety and Stress Scale (DASS-21)

The DASS-21 is a 21-item questionnaire developed by Lovibond & Lovibond. [20] It is an abbreviated version of the original 42-item DASS-42 questionnaire developed by the same author. DASS-21 is a simple and concise self-administered tool that is used for the screening of depression, anxiety and also stress. DASS-21 has 7 items per domain of depression, anxiety and stress. It has been validated in many languages, including the Malay language with good reliability for depression (0.81), anxiety (0.76) and stress (0.84). [21] The higher the total scores for each domain reflect the severity of the respective domains. The severity scores for depression in DASS-21 are stratified into normal (0-9 scores), mild (10-13 scores), moderate (14-20 scores), severe (21-27 scores), and extremely severe (28 scores or more).

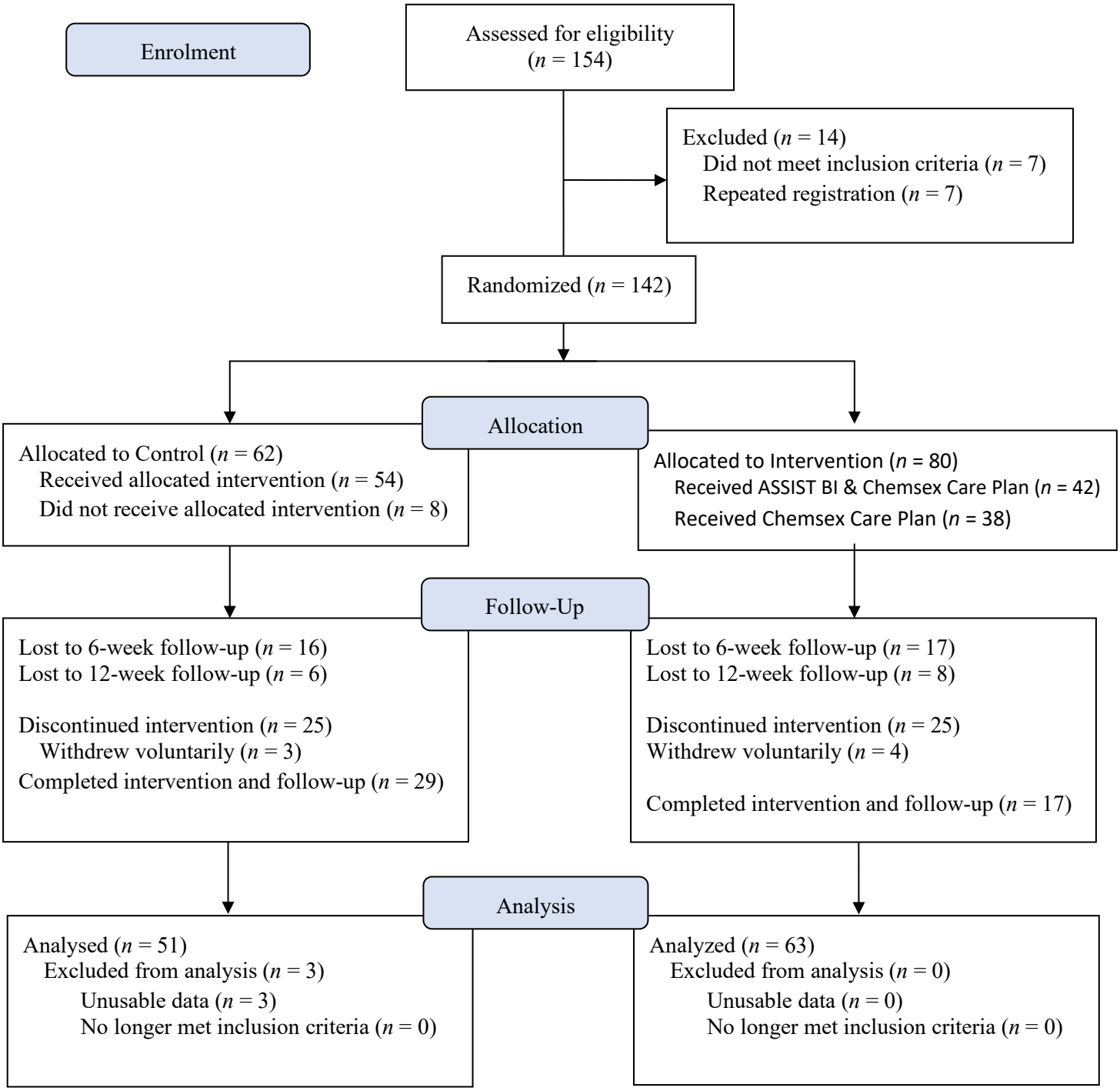
4.7 DATA ANALYSIS

The collected data was recorded in the encrypted database on the study website. The anonymized and de-identified data were extracted to conduct quantitative analysis to evaluate the efficacy of chemsex interventions using SPSS (Statistical Package for the Social Sciences) software Version 26. [22] Homogeneity tests between intervention and control groups were first carried out. Before the missing data at follow-ups was imputed, Little's Missing Completely at Random Test was conducted to test whether data were completely at random. Subsequently, repeated measure ANOVA (RMANOVA) and Generalized Estimating Equation (GEE) tests were performed to analyse DASS and URICA, as well as ASSIST outcomes respectively.

5.0 FINDINGS

A total of 154 stimulant-using MSM who engaged in chemsex participated in the study. The consort flowchart and socio-demographic information are presented below.

5.1 CONSORT FLOWCHART



5.2 RESULTS

5.2.1 SOCIO-DEMOGRAPHIC AND SEXUAL BEHAVIOURAL CHARACTERISTICS AT BASELINE

Table 1: Socio-demographic and sexual behavioural characteristics of MSM who engaged in chemsex (n=114)

Category	n	(%)
Ethnicity		
Malay	69	58.0
Chinese	34	28.6
Sabahan	8	6.7
Indian	3	2.5
Others	3	2.5
Sarawakian	2	1.7
State		
Selangor	75	63.0
Kuala Lumpur	20	16.8
Johor	5	4.20
Perak	5	4.20
Sabah	4	3.40
Kedah	2	1.70
Pahang	2	1.70
Penang	2	1.70
Kelantan	1	0.8
Melaka	1	0.8
Sarawak	1	0.8
Terengganu	1	0.8
Marital Status		
Single	92	77.3
Married	4	3.4
Divorced	2	1.7
(no answer)	21	17.6
Highest level of education		
University/college	49	41.2
Diploma/trade/vocational certificate	19	16.0
Secondary school	17	14.3
Postgraduate	12	10.1
(No answer)	22	18.5
Work status		
Employed full time	79	66.4
Unemployed, looking for work	21	17.6
Employed part-time	13	10.9
Unemployed, not looking for work	6	5.0

Category	n	(%)
Monthly income		
No stable income	49	41.2
RM4360 (U40)	34	28.6
>RM4360 – RM9619 (M40)	28	23.5
>RM 9619 (T20)	5	4.2
(No answer)	3	2.5
Currently studying		
No	102	85.7
Yes	15	12.6
(No answer)	2	1.7
Sexuality		
Homosexual/Gay/PLU	83	69.7
Heterosexual/Straight	2	1.7
Confused/Questioning	4	3.4
Bisexual	19	16.0
(No answer)	11	9.2
Sold sex in the last 6 months	82	68.9
No	35	29.4
Yes	2	1.7
(No answer)		
Paid for sex		
No	83	69.7
Yes	34	28.6
(No answer)	2	1.7
Had anal sex with another men in the last 6 months		
No	11	9.2
Yes	105	88.2
(No answer)	3	2.5
Used condoms for anal sex with male partner in the last 6 months		
Occasionally		
Never	45	37.8
Often	39	32.8
Always	14	11.8
(No answer)	10	8.4
	11	9.2
Had chemsex in the past 6 months		
Yes	108	90.8
No	7	5.9
(No answer)	4	3.4

Category	n	(%)
No. of days of using crystal meth in the past 30 days		
0	69	58.0
1	9	7.6
2	3	2.5
3	3	2.5
5	2	1.7
6	2	1.7
7	5	4.2
8	1	.8
9	2	1.7
10	2	1.7
12	3	2.5
14	1	.8
15	5	4.2
20	3	2.5
23	1	.8
25	2	1.7
28	2	1.7
30	4	3.4
Had a test for a sexually transmitted infection (STI), other than HIV, in the last 12 months		
Yes	73	61.3
No	28	23.5
(No answer)	18	15.1
Diagnosed with a sexually transmitted infection (STI), other than HIV, in the last 12 months		
Yes	35	29.4
No	35	29.4
(No answer)	49	41.2
Had HIV test in life		
Yes	52	43.7
No	9	7.6
(No answer)	58	48.7
Result of the last HIV test		
Positive	26	21.8
Negative	23	19.3
Don’t know/Rather not say	4	3.4
(No answer)	66	55.5
Know about PrEP for HIV prevention		
Yes	103	86.6
No	12	10.1
(No answer)	4	3.4

Category	n	(%)
Currently taking PrEP		
No	72	60.5
Yes, I'm on daily PrEP	33	27.7
Yes, I'm on on-demand PrEP	11	9.2
(No answer)	3	2.5

More than half of the participants were Malay ethnic (58%), followed by Chinese (34%), Sabahan (6.7%), Indian (2.5%), Others (2.5%) and Sarawakian (1.7%). The participants, aged 18 to 56 years old, came from 12 states and territories across Malaysia, with Selangor (63%) and Kuala Lumpur (16.8%) topping the list. In terms of marital status, 77.3% were single, 3.4% and 1.7% of participants were married and divorced respectively while 17.6% preferred not to reveal their marital status. The participants had attained different highest levels of education including university/college (41.2%), diploma/vocational certificate (16%), secondary school (14.3%) and postgraduate (10.1%) levels, and 85.7% of them were not currently studying. While the majority of the participants were employed either full-time (66.4%) or part-time (10.9%), many reported no stable income (41.2%) or were classified in the B40 group (28.6%) followed by M40 (23.5%) and T20 (4.2%).

The majority of participants identified themselves as homosexual (69.7%) and bisexual (16%). In terms of sexual behaviour, it was revealed that 88.2% had anal sex with another man in the last 6 months and 90.8% had used stimulant drugs such as crystal methamphetamine (crystal meth) for chemsex, where condoms were occasionally (37.8%) or never (32.8%) used. In the past half-year, 29.4% had sold sex while 28.6% paid for sex. For crystal meth used in the past 30 days, 58% reported no record of using while for those who did, the usage ranged from 1 day to 30 days. Within the same period, more than half did not have chemsex (56.3%), nearly one-fifth had it with one man (19.3%) and the rest (24.4%) had chemsex with 2 to 60 men. Among those who had chemsex in the past month, 39.5% revealed to have had bareback sex with 1 to 60 men. The majority had a test for a sexually transmitted disease (STI), other than HIV, in the last 12 months (61.3%), of which 29.4% were diagnosed with an STI. More than two-fifths ever had HIV test in life (43.7%), where 21.8% were positive, 19.3% were negative and 58.4% did not know or rather not say. There was high awareness regarding PrEP for HIV prevention as most of the participants were aware (86.6%) of such treatment and currently received daily PrEP (27.7%) and on-demand PrEP (9.2%).

5.2.2 DASS-21 EMOTIONAL STAGE OF DEPRESSION, ANXIETY AND STRESS AT BASELINE

Category	n	(%)
Depression		
Normal	34	28.6
Mild	13	10.9
Moderate	26	21.8
Severe	13	10.9
Extremely Severe	32	26.9
Anxiety		
Normal	29	24.4
Mild	11	9.2
Moderate	16	13.4
Severe	13	10.9
Extremely Severe	49	41.2
Stress		
Normal	36	30.3
Mild	28	23.5
Moderate	24	20.2
Severe	20	16.8
Extremely Severe	10	8.4

Table 2: Depression, Anxiety and Stress Scores at baseline

In terms of mental health, emotional states of depression, anxiety and stress were measured. It revealed that 60.5% had moderate to extremely severe depression. Nearly two-thirds (66.4%) were categorized into moderate to extremely severe anxiety while 46.2% were moderate to extremely severe stress.

5.2.3 URICA STAGE READINESS OF CHANGE AT BASELINE

Category	n	(%)
Precontemplation Stage	19	16.0
Contemplation Stage	75	63.0
Preparation/Action Stage	19	16.0
Maintenance	6	5.0

Table 3: URICA scores at baseline

For readiness to change, more than half were at the contemplation (63%) stage of change, while 16% were at the pre-contemplation and preparation stages respectively. It also showed that 5% were at the maintenance stage at the point of data collection.

5.2.4 ASSIST RISKY SUBSTANCE USE LEVEL AT BASELINE

Category	n	(%)
Tobacco products		
Low	58	48.7
Moderate	37	31.1
High	24	20.2
Alcoholic beverages		
Low	86	72.3
Moderate	29	24.4
High	4	3.4
Cannabis		
Low	84	70.6
Moderate	31	26.1
High	4	3.4
Amphetamine		
Low	13	10.9
Moderate	62	52.1
High	44	37.0
Inhalants		
Low	92	77.3
Moderate	25	21.0
High	2	1.7
Sedatives		
Low	89	74.8
Moderate	24	20.2
High	6	5.0
Hallucinogens		
Low	100	84.0
Moderate	16	13.4
High	3	2.5
Opioids		
Low	102	85.7
Moderate	14	11.8
High	3	2.5
Other		
Low	89	74.8
Moderate	28	23.5
High	2	1.7

Table 4: ASSIST scores at baseline

In ASSIST, the majority reported moderate (52.1%) and high (37%) levels of crystal meth use. Across other types of substances, most were at the low-risk levels for tobacco (48.7%), alcoholic beverages (72.3%), cannabis (70.6%), cocaine (73.9%), inhalants (77.3%), sedatives (74.8%), hallucinogens (84%), opioids (85.7%) and others (74.8%).

5.2.5 AVERAGE TIME SPENT ON THE INTERVENTION WEBSITE

Activity	Average Time Spent (minute)
Answering Baseline Questionnaires	22.9
Answering 6-week Questionnaires	8.2
Answering 12-week Questionnaires	17.2
Assessing Chemsex Care Plan (for those who did)	20.8
Assessing Chemsex Care Plan (for all controls, including those who did not assess the Plan)	13.5

Table 5: Average time spent on intervention website

The average time spent on baseline questionnaires was the longest at 22.9 minutes. Subsequently, participants spent 8.2 minutes and 17.2 minutes completing 6-week and 12-week questionnaires respectively. In Chemsex Care Plan, those who assessed the plan spent about 20.8 minutes while on average all intervention participants spent 13.5 minutes on the intervention.

5.2.6 INTENT-TO-TREAT (ITT)

Intention to treat analysis was done only for all research variables since there were cases that missed the follow-up test. The ITT was carried out by replacing the missing follow-up data using multiple imputations. Little's: Randomly Missing Completely, which is one of the typical tests for evaluating this assumption. This test compares the real data set's missing data pattern to a random distribution of missing data (Roderick et al., 2002). The Missing at Random assumption implies that there is no correlation between whether a data point is missing and any values in the data set, missing or seen ($\chi 2$ = 21645.276, DF = 2791, p = 1.000). Multiple imputations might be employed to fill in the gaps if this supposition is accurate and the values were absent at random. To prevent too positive assessments of the intervention's efficacy, the ITT was conducted. In other words, more thorough analyses could paint a deceptively optimistic image, showing that participants who adhere to the intervention may believe that it has benefited them while others who leave out or are non-compliant don't experience any benefits at all. Both per-protocol analysis and ITT analysis yielded the same results.

5.2.7 COMPARISON OF URICA

According to the results correlation coefficient among pre-contemplation, contemplation, action, maintenance and readiness, it was found that all these variables were highly correlated (Appendix 1) furthermore all these variables were normally distributed in both intervention and control groups, therefore a two-way repeated measure ANCOVA was applied to compare groups across the time.

According to the result of the two-way repeated measure ANCOVA on the total score of pre-contemplation among participants it was found that the main effect of the group was not significant which means there was no significant difference between the groups (F=0.052, p=0.821). Furthermore, there was no significant effect of time on the total score of pre-contemplation (F= 0.973, p= 0.330). According to these results it was found that the interaction between time and group also was not significant (F= 0.576, p=0.452) which means the two groups had the same pattern of pre-contemplation over time (Baseline, and Week 12).

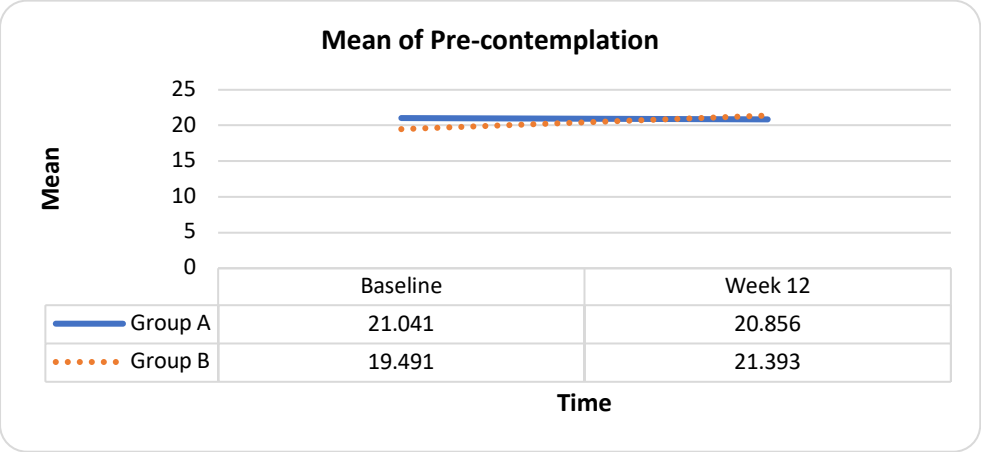


Figure 6: Mean of Precontemplation across the time for both groups

The result of the two-way repeated measure ANCOVA on the total score of contemplation among participants showed that the main effect of the group was not significant which means there was no significant difference between the groups (F=0.235, p=0.63). Furthermore, there was no significant effect of time on the total score of contemplation (F=0.01, p=0.920). According to these results, it was found that the interaction between time and group also was not significant (F= 0.319, p=0.576) which means the two groups had the same pattern of contemplation over time (Baseline and Week 12).

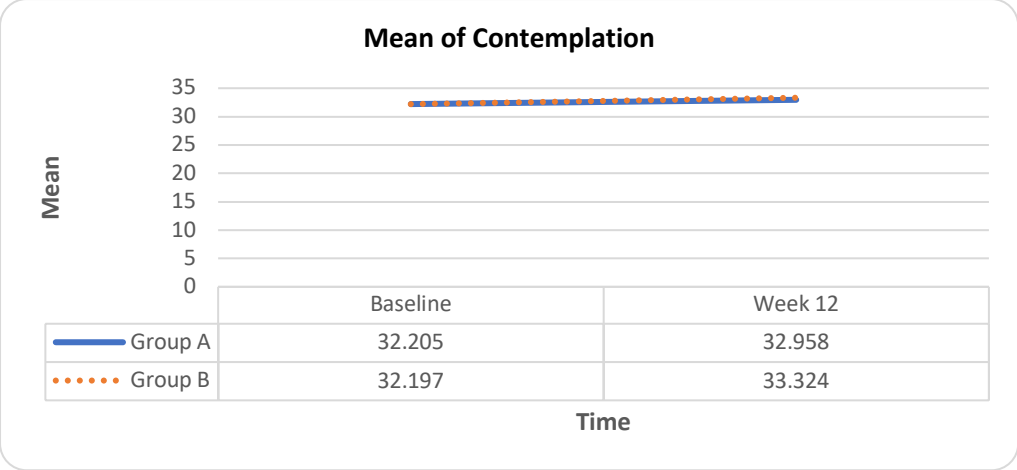


Figure 7: Mean of contemplation across the time for both groups

According to the result of the two-way repeated measure ANCOVA on the total score of action among participants, it was found that the main effect of the group was not significant which means there was no significant difference between the groups (F=0.467, p=0.498). Furthermore, there was no significant effect of time on the total score of action (F=0.036, p=0.850).

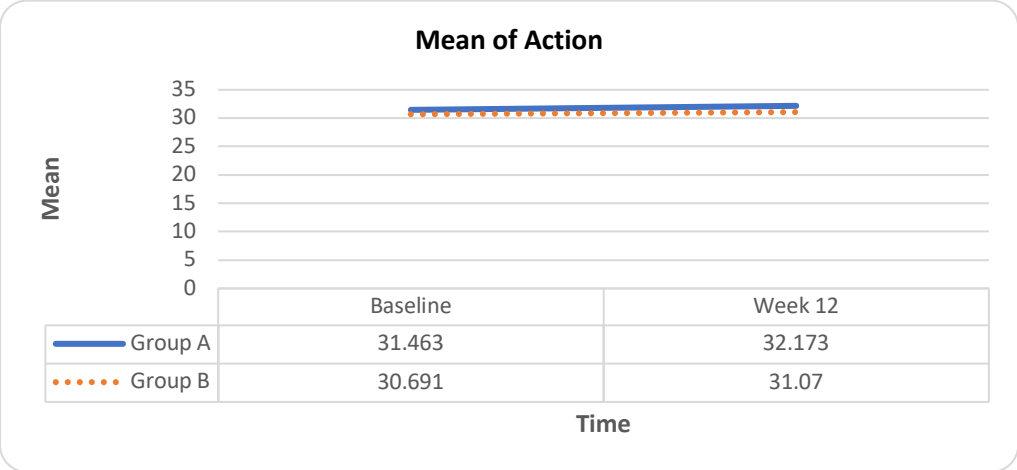


Figure 8: Mean of action across the time for both groups

The results show that the interaction between time and group also was not statistically significant (F= 0.016, p=0.898) which means the two groups had the same pattern of action over the time (baseline, and week 12). The result of the two-way repeated measure of ANCOVA on the total score of maintenance among participants showed that the main effect of the group was not significant which means there was no significant difference between the groups (F=1.183, p=0.283). Furthermore, there was no significant effect of time on the total

score of maintenance (F= 0.157, p= 0.694). According to these results, it was found that the interaction between time and group also was not significant (F= 0.104, p=0.749) which means the two groups had the same pattern of maintenance over time (Baseline and Week 12).

Figure 9: Mean of maintenance across the time for both groups

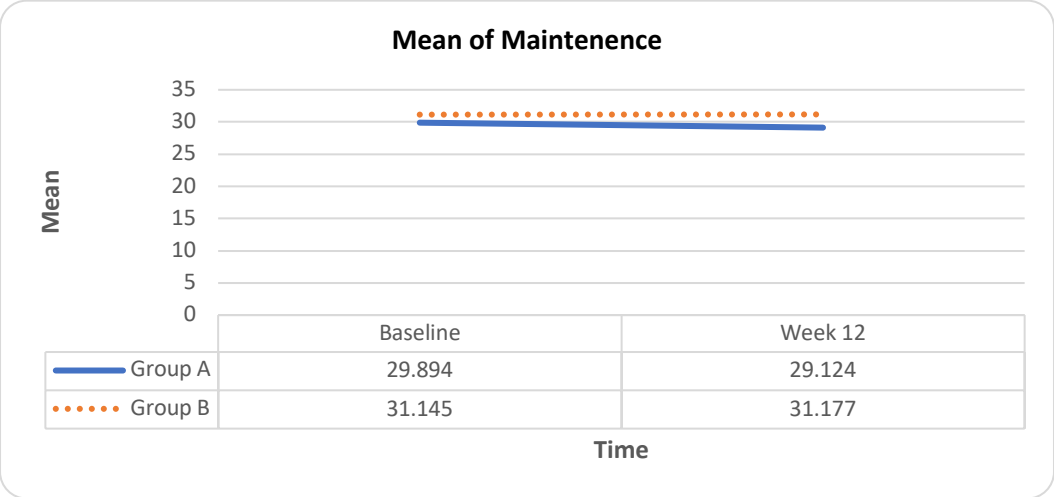


Table 6: Summary of Results of RMANCOVA on URICA components

Stage	Source of Variation	MS	F	p value
Precontemplation	Time	30.25	0.973	0.33
	Group	4.224	0.052	0.821
	Time * Group	17.923	0.576	0.452
Contemplation	Time	0.25	0.01	0.92
	Group	7.588	0.235	0.63
	Time * Group	7.773	0.319	0.576
Action	Time	1	0.036	0.85
	Group	14.469	0.467	0.498
	Time * Group	0.453	0.016	0.898
Maintenance	Time	4	0.157	0.694
	Group	44.914	1.183	0.283
	Time * Group	2.642	0.104	0.749

Results of the post hoc test (Bonferroni) revealed that all components of URICA, between Group A and Group B in both Baseline ($p>0.05$) and Week 12 ($p>0.05$) were not statistically

significant. These results also showed that there was no significant difference between Baseline and Week 12 in both Group A and Group B for all URICA components ($p>0.05$) ($p=0.01$). The calculated effect size for both groups across the time and results indicate that there was a small effect on URICA components in both Groups A and Group B ($d=0.50$).

Table 7: Between and within Groups Mean Comparison of URICA components

Substances	**Group**	**Baseline**			**Week 12**			**within group value**	**Cohen d**
		Mean	**SE**	**between group p value**	**Mean**	**SE**	**between group p value**		
Precontemplation	**A**	21.041	1.787	0.526	20.856	2.052	0.848	0.927	0.03
	B	19.491	1.42		21.393	1.631		0.244	0.14
Contemplation	**A**	32.205	1.621	0.997	31.958	1.055	0.346	0.891	0.10
	B	32.197	1.288		33.324	0.838		0.434	-0.22
Action	**A**	31.463	1.521	0.710	32.173	1.241	0.516	0.711	0.22
	B	30.691	1.209		31.07	0.986		0.804	0.02
Maintenance	**A**	29.894	1.487	0.539	29.124	1.405	0.288	0.677	0.21
	B	31.145	1.181		31.177	1.117		0.983	-0.07

5.2.8 COMPARISON OF DASS-21

The correlation coefficients among depression, anxiety and stress variables were highly correlated (Appendix 1), furthermore all these variables were normally distributed in both Group A and Group B, therefore a two-way repeated measure ANCOVA was applied to compare groups across the time

Comparison of depression between groups

Since depression scores were normally distributed in both groups 3 times (Baseline, Week 6 and Week 12), a two-way repeated measure ANOVA was employed. According to the result of the two-way repeated measure ANOVA on the total score of depression among participants, it was found that the main effect of the group was not significant which means there was no significant difference between the groups (F= 2.201, p=0.146). Furthermore, there was no significant effect of time on the total score of depression (F= 0.233, p= 0.74). According to these results, it was found that the interaction between time and group also was not significant (F= 0.539, p=0.44) which means the two groups had the same pattern over time (Baseline, Week 6 and Week 12) for depression.

Table 8: Summary of Results of RMANCOVA on Depression

	Mean Square	**F**	**p value**
Group	420.942	2.201	0.146
Time	22.766	0.233	0.74
Group*time	52.742	0.539	0.544

To compare the level of depression between two groups across the time (Baseline, Week 6 and Week 12), post hoc test (Bonferroni) was applied (Table 9) and the result revealed that the level of depression between Group A and Group B at baseline (p=0.97),w eek6 (p=0.86) and week 12 (p=0.29) were not statistically significant. The effect sizes defined as "small, d = .2," "medium, d = .5," and "large, d = .8". [23,24] For total depression score, effect sizes were calculated between groups at three time and results indicate that there was small effect on depression at baseline(d=0.03) and week 6 (d =0.02) while there was almost a moderate effect size in week 12 between group (d =0.40).

Table 9: Pairwise Comparison Between groups at 3 Times Time for Depression

Time	(I) Group	*(J)* Group	Mean Difference (I-J)	SE	P value	95%CI for Difference		Cohe nd
						LB	UB	
Baseline	A	B	0.19	4.27	0.97	-8.45	8.83	0.03
Week 6	A	B	-0.60	3.47	0.86	-7.62	6.41	0.02
Week 12	A	B	-4.19	3.88	0.29	-12.03	3.66	0.40

** The mean difference is significant at the .05 level Adjustment for multiple comparisons: Bonferroni. a: adjusted mean difference using covariate*

The result of the Bonferroni test showed that the difference in depression scores across the time between Baseline, Week 6 and Week 12 in Group A as well as Group B were not statistically different ($p<0.05$). Cohen's effect size results showed that there was an effect size between small and medium for the time in Group A ($d=0.35$) while in Group B there was a small effect size ($d=0.03$). These results indicated that despite non-significant results but the magnitude of changes in depression score among participants in Group A across the time was more than in Group B.

Table 10: Pairwise comparison of Depression scores across time for both groups

Group	(I) Time	*(J)* Time	Mean Difference (I-J)	SE	P value	95%CI for Difference		Cohen d
						LB	UB	
A	**Baseline**	**Week6**	3.30	3.52	1	-5.50	12.10	
	Baseline	**Week12**	3.95	4.00	0.99	-6.07	13.97	0.35
	Week6	**Week12**	0.65	2.43	1	-5.43	6.72	
B	**Baseline**	**Week6**	2.51	2.67	1	-4.19	9.20	
	Baseline	**Week12**	-0.43	3.04	1	-8.05	7.19	0.03
	Week6	**Week12**	-2.94	1.85	0.359	-7.56	1.68	

** The mean difference is significant at the .05 level Adjustment for multiple comparisons: Bonferroni.*

Figure 1 shows the level of depression across the time which revealed there was an increase in Group B in week 12 while in Group A still the level of depression was decreased in week 12.

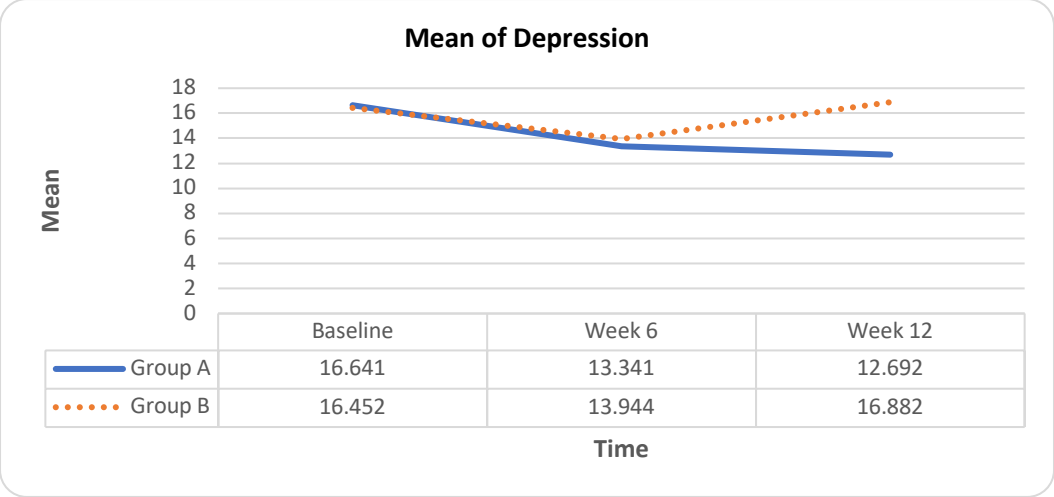


Figure 10: Mean of depression across the time for both groups

Comparison of anxiety between groups

Since anxiety scores were normally distributed in both groups across 3 times (Baseline, Week 6 and Week 12), a two-way repeated measure ANCOVA was employed. According to the result of the two-way repeated measure ANCOVA on the total score of anxiety among participants, it was found that the main effect of the group was not significant which means there was no significant difference between the groups (F=3.74, p=0.061). Furthermore, there was no significant effect of time on the total score of anxiety (F= 0.019, p= 0.981). According to these results, it was found that the interaction between time and group also was not significant (F= 0.098, p=0.44) which means two groups had the same pattern of anxiety over time (Baseline, Week 6 and Week 12).

Table 11: Summary of Results of RMANCOVA on Anxiety

Source	Mean Square	F	p value.
Group	692.433	3.74	0.061
Time	1.414	0.019	0.981
Group*time	7.441	0.098	0.906

To compare the level of anxiety between two groups across the time (Baseline, Week 6 and Week 12), post hoc test (Bonferroni) was applied (Table 12) and the result revealed that the level of anxiety between Group A and Group B at Baseline (p=0.50), Week 6 (p=0.64) and Week 12 (p=0.35) were not statistically significant. For the total anxiety score, the effect size was calculated between groups at three times and results indicate that there was a small effect on anxiety at baseline(d=0.25) and week 6 (d =0.10) while there was almost an increase in effect size in Week 12 between group (d =0.35).

Table 12: Pairwise Comparison Between groups at 3 Times for Anxiety

Time	(I) Group	*(J)* Group	Mean Difference (I-J)	SE	P value	95%CI for Difference		Cohe nd
						LB	UB	
Baseline	**A**	**B**	-2.59	3.84	0.50	-10.35	5.17	0.25
Week 6	**A**	**B**	-1.78	3.72	0.64	-9.32	5.76	0.10
Week 12	**A**	**B**	-3.75	3.93	0.35	-11.71	4.22	0.35

** The mean difference is significant at the .05 level Adjustment for multiple comparisons: Bonferroni.*
a: adjusted mean difference using covariate

The result of the Bonferroni test showed that the difference in anxiety scores across the time between Baseline, Week 6 and Week 12 in Group A as well as Group B was not statistically different ($p<0.05$). Cohen effect size results showed that there was a small effect size for the time in Group A ($d=0.12$) and Group B ($d=0.03$). These results indicated that despite non-significant results but the magnitude of changes in anxiety score among participants in Group A across the time was more than in Group B.

Table 13: Pairwise comparison of anxiety scores across time for both groups

Group	(I) Time	*(J)* Time	Mean Difference (I-J)	SE	P value	95%CI for Difference LB	UB	Cohen d
A	**Baseline**	**Week6**	0.79	3.49	1	-7.96	9.54	
	Baseline	**Week12**	1.43	3.81	1	-8.10	10.97	0.12
	Week6	**Week12**	0.64	2.62	1	-5.93	7.22	
B	**Baseline**	**Week6**	1.59	2.66	1	-5.06	8.25	
	Baseline	**Week12**	0.27	2.90	1	-6.98	7.53	0.03
	Week6	**Week12**	-1.32	2.00	1	-6.32	3.68	

** The mean difference is significant at the .05 level Adjustment for multiple comparisons: Bonferroni.*

Figure 7 shows the level of anxiety across the time which revealed there was an increase in Group B in week 12 while in Group A, still the level of anxiety was decreased in Week 12.

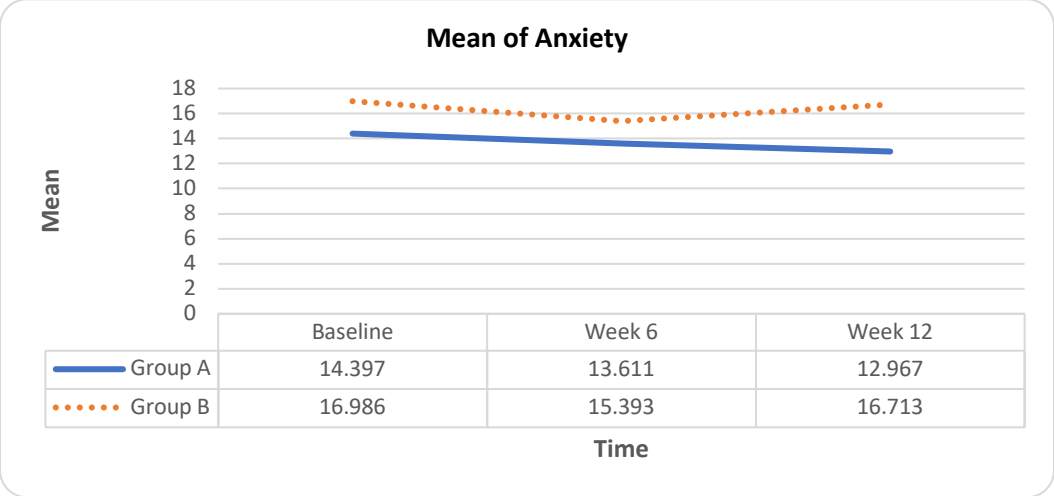


Figure 11: Mean of anxiety across the time for both groups

Comparison of stress between groups

Since stress scores were normally distributed in both groups across 3 times (Baseline, Week 6 and Week 12), a two-way repeated measure ANCOVA was employed. According to the result of the two-way repeated measure ANCOVA on the total score of stress among participants, it was found that the main effect of the group was not significant which means there was no significant difference between the groups (F=3.571, p=0.066). Furthermore, there was no significant effect of time on the total score of stress (F= 0.087, p= 0.916). According to these results, it was found that the interaction between time and group also was not significant (F= 0.215, p=0.807) which means the two groups had the same pattern of stress over the time (Baseline, Week 6 and Week 12).

Table 14: Summary of Results of RMANCOVA on stress

Source	Mean Square	F	p value.
Group	733.547	3.571	0.066
Time	5.567	0.087	0.916
Group*time	13.683	0.215	0.807

*Results after adjusting for two covariates (Studying and Q19)

To compare the level of stress between two groups across the time (Baseline, Week 6 and Week 12), post hoc test (Bonferroni) was applied (Table 15) and the result revealed that the level of stress between Group A and Group B at baseline (p=0.55), week6 (p=0.80) and week 12 (p=0.37) were not statistically significant. For the total stress score, the effect size was calculated between groups at three times and results indicate that there was a small effect on stress at baseline(d=0.19) and Week 6 (d =0.11) while there was almost an increase in effect size in Week 12 between group (d =0.37).

Table 15: Pairwise Comparison Between groups at 3 Times for stress

Time	(I) Group	*(J)* Group	Mean Difference (I-J)	SE	P value	95%CI for Difference		Cohen d
						LB	UB	
Baseline	**A**	**B**	-2.23	3.72	0.55	-9.76	5.31	0.19
Week 6	**A**	**B**	-0.92	3.70	0.80	-8.41	6.56	0.11
Week 12	**A**	**B**	-3.60	4.01	0.37	-11.71	4.51	0.37

** The mean difference is significant at the .05 level Adjustment for multiple comparisons: Bonferroni.*
a: adjusted mean difference using covariate

The result of the Bonferroni test showed that the difference in stress score scores across the time between Baseline, Week 6 and Week 12 in Group A, as well as Group B, was not statistically different ($p<0.05$). Cohen's effect size results showed that there was an almost medium effect size for the time in Group A ($d=0.40$) while in Group B there was a small effect size ($d=0.17$). These results indicated that despite non-significant results but the magnitude of changes in stress score among participants in Group A across the time was more than in Group B.

Table 16: Pairwise comparison of stress scores across time for both groups

Group	(I) Time	*(J)* Time	Mean Difference (I-J)	SE	P value	95%CI for Difference LB	UB	Cohen d
A	**Baseline**	**Week6**	1.77	3.30	1.00	-6.49	10.02	
	Baseline	**Week12**	3.47	3.55	1.00	-5.41	12.35	0.40
	Week6	**Week12**	1.70	2.20	1.00	-3.81	7.22	
B	**Baseline**	**Week6**	3.07	2.51	0.69	-3.21	9.35	
	Baseline	**Week12**	2.10	2.70	1.00	-4.66	8.85	0.17
	Week6	**Week12**	-0.97	1.68	1.00	-5.17	3.22	

** The mean difference is significant at the .05 level Adjustment for multiple comparisons: Bonferroni.*

Figure 8 shows the level of stress across the time which revealed there was an increase in Group B in Week 12 while in Group A, still the level of stress was decreased in Week 12.

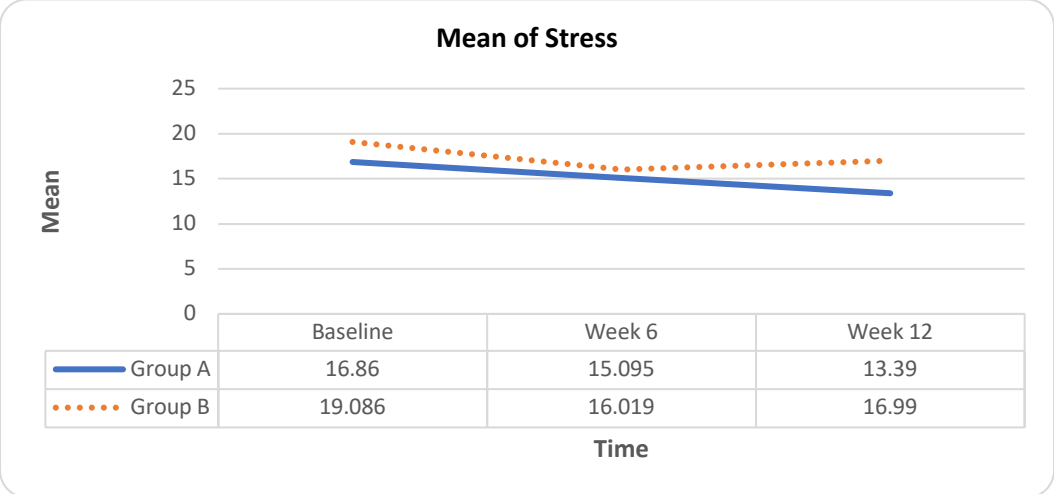


Figure 12: Mean of stress across the time for both groups

5.2.9 COMPARISON OF ASSIST

To assess the effectiveness intervention program on participants' substance use during the study (Baseline, Week 6 and Week 12), the Generalized Estimation Equation (GEE) was applied due to the non-normal distribution of ASSIST scores at all three times.

Findings on amphetamine-type stimulant use and risk level showed that the main effect of the group was not significant (χ^2= 1.032, p=0.31) while there was a significant effect of time on amphetamine-type stimulant use and risk level (χ^2= 72.487, p<0.001) but it was found that the interaction between time and group was not statistically significant (χ^2= 0.862, p=0.353), indicating that the two groups had the same pattern amphetamine-type stimulants use and risk level across time (Baseline and Week 12).

Table 17: Results of Generalized Estimating Equations (GEE) on ASSIST

Substance	Source of Variation	Wald Chi-Square	df	p value
Tobacco products	Time	33.781	1	<0.001
	Group	0.093	1	0.760
	Time * Group	0.05	1	0.823

To compare the amphetamine-type stimulants use and risk level between two groups across the time (Baseline and Week 12), a post hoc test (Bonferroni) was applied (Table 18) and the result revealed that the amphetamine-type stimulants use and risk level between Group A and Group B in Baseline (p=0.08) and Week 12 (p=0.88) were not statistically significant. These results also showed that there was a significant difference between Baseline and Week 12 in both Group A and Group B (p<0.001). For amphetamine-type stimulant use and risk level, the effect size was calculated for both groups across the time and results indicate that there was a large effect on amphetamine-type stimulant use and risk level in Group A (d =1.24) and in Group B (d =1.70).

Table 18: Between and within Groups Mean Comparison of ASSIST

Substances	Group	Baseline			Week 12			within group value	Cohen d
		Mean	SE	between group p value	Mean	SE	between group p value		
Amphetamine type stimulants	**A**	20.31	1.46	0.08	6.08	2.04	0.88	<0.001	**1.24**
	B	24.32	2.04		6.63	3.09		<0.001	**1.70**

Figure 9 shows the level of assist components across the time which revealed there was a reduction in both groups A and B at week 12.

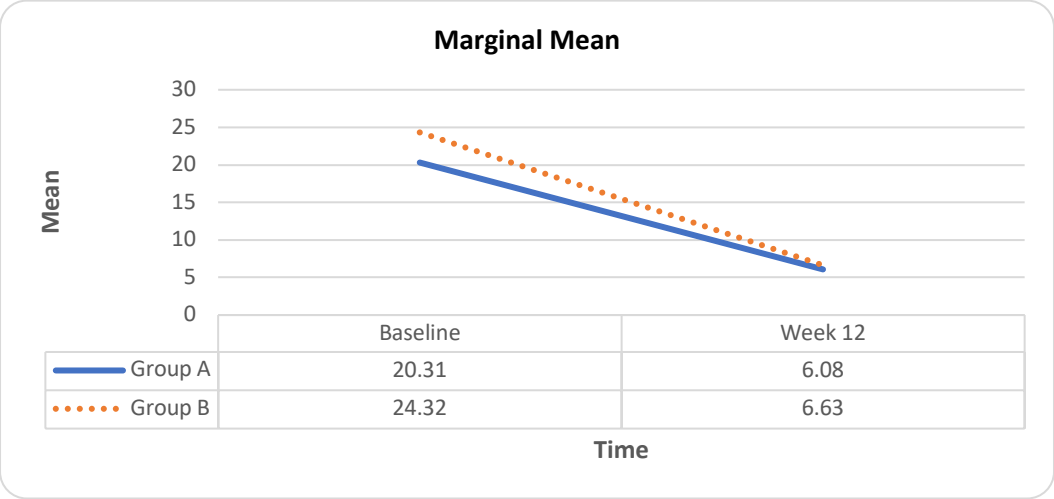


Figure 13: Estimated marginal mean of Amphetamine type stimulants use across the time in both groups

6.0 DISCUSSION AND RECOMMENDATIONS

The present study is the first study in Malaysia that develops and evaluate online intervention with existing ASSIST-brief intervention and Chemsex Care Plan to reduce drug use and HIV sexual risks for stimulant-using MSM in Malaysia. An interactive website comprising various resources such as outreach support, service linkages, chemsex first aid, harm reduction information and Chemsex Care Plan was designed. A total of 25 caseworkers were recruited in two batches after receiving ASSIST brief intervention trainings from University of Adelaide and UMCAS respectively. 154 stimulant-using MSM were recruited and 142 of them who fulfilled the inclusion criteria were randomized into the intervention group (Group A) and control group (Group B). Participants in the intervention and control groups were homogeneous except for there were more participants who were currently studying, and more participants reported having anal sex during chemsex in Group A.

Overall, participants in both control and intervention groups show significant differences across time in terms of their amphetamine use, while there is no difference between the groups even though a reduction trend was observed. ASSIST brief intervention model was adapted for its effectiveness in lowering substance use in the primary care setting.[11,12,25,26] The result obtained in this study could be due to the smaller sample size acquired hence future studies should include a larger sample size and retain them more effectively. Our study revealed several challenges in recruiting and retaining a hidden and mobile population who face multiple barriers to accessing health services and participating in research projects due to the criminalization and stigmatization of drug use and homosexuality.

Additionally, mental health issues were prevalent among MSM parallel with previous studies.[6,27-29] In general, the participants reported high levels of symptoms of anxiety, depression, and stress. More than half of the participants faced moderate to extremely severe depression and anxiety, while nearly half ranged from moderately to extremely severe stress. Both groups did not show improvement in mental health outcomes between groups across time. However, the intervention group showed a decrease in DASS-21 scores across time for all three mental health conditions. Besides, URICA revealed there are no significant differences between the groups across time. The mean scores of the four stages (pre-contemplation, contemplation, action, and maintenance) showed minimal difference indicating that the readiness of participants did not change after the 12th week. This might be due to the unsolved mental health issues among MSM

which inhibited their motivation to change even though they were well informed about the harms of chemsex and drug use. In our behavioral intervention, ASSIST plus brief intervention and Chemsex Care Plans are not designed to address mental health comorbidity associated with chemsex. Finding from this study shows that psychological interventions are needed in addressing chemsex and mental health altogether.

The participants were recruited primarily from Twitter. Recruitment-related tweets were promoted to engage more eligible individuals to sign up for this study. The main Twitter account (@CFsupport1) gained 204.7k impressions over 142 tweets with 2.5% engagement rate, 447 retweets without comment and 392 link clicks. On the other hand, promoted tweets (@CFSupport2) gained 48.2k impressions over 6 tweets with 4.3% engagement rate and 66 link clicks during the 14 days of running promoted tweet campaigns. However, even though there was consistent promotion on Twitter, this study failed to achieve the targeted sample size of 226 participants. This may be due to the little interest in chemsex-related interventions among the majority of social media users who were actively seeking sexual partners. Participation incentives may be the major motivation of MSM in participating in this project. The condition may explain the low retention rate where only 30% of participants were retained and completed the 12-week follow-ups. The adverse consequences of problematic substance use include cognitive impairment, paranoia, hallucination and overdose.[30,31] The unstable mental conditions due to substance dependence, and poor physical health may prevent them from participating in and committing to a study that requires multiple follow ups.

We propose the following recommendations as the online intervention is being transitioned to be a service website curated by the Malaysian AIDS Council. First, the data confidentiality and security on the online intervention website must be maintained at all times. Some of the security measures include using verified access to the original site, data encryption between personal computers and the website and encrypted database tables. The service provider has obligation to guarantee the safety of data because of the sensitivity and legality of the behavioural data reported by the clients who engaged in chemsex. Personal information should be fully protected and identifiable details such as real name, identity card number and workplace particulars must not be collected. For instance, this study only collected participants' email addresses for registration and their phone numbers for follow-up purposes. Informed consent must be obtained before the participants use the intervention services. With the security measures In place, the stimulant-using MSM community will gain confidence and trust in utilizing the

website to access harm reduction information and behavioural intervention such as ASSIST + brief intervention.

Besides, caseworkers play a critical role in this intervention as they administer the ASSIST brief intervention. Ideally, the individuals should come from counselling backgrounds, regardless of their gender identity and sexual orientation, as long as they are trained to execute the brief intervention in a non-judgmental approach. Moreover, it is best that the recruited caseworkers can commit on a full-time basis to empower harm reduction change in participants. Individuals who have recently recovered from drug use or those who are still struggling with drug use may not have the cognitive ability and emotional stability to administer the ASSIST brief intervention and should not be recruited as caseworkers. Furthermore, caseworkers are required to be proactive and shorten registration to first contact duration to minimize loss to follow-up.

Third, social media and referral approaches must be leveraged in the outreach and engagement with stimulant-using MSM. An engaging and well-maintained social media account specific to the intervention is needed on popular platforms because although the community who prefers anonymity may not interact with the account, sexual health, HIV/STI prevention and treatment information is conveyed to this hidden community as an initiative to show concerns and support to the community. As a country that criminalizes drug use, utilizing social media and the use of technology is advantageous[32] in reaching out to the hidden and fearful community in both urban and rural areas. Promotion of our study via a premium Twitter account has helped to recruit a large group of stimulant-using MSM online. Attractive infographics or videos that provide strategies to reduce harms associated with chemsex, promote awareness on PrEP and PEP for HIV prevention, as well as linkages to available HIV testing services could be disseminated on Twitter continually. The community consisted of individuals of varied comprehension levels, hence it is important that the content on social media be curated in a straightforward manner in multiple languages. Collaboration with NGOs is required to refer their clients or beneficiaries to the online intervention program. Meanwhile, the participants who reported serious mental health conditions (moderate to extremely severe in DASS-21), should be linked to appropriate services provided by NGOs or healthcare providers. Such actions may increase participants' motivation for accessing stimulant and chemsex-related harm reduction services.

Lastly, we recommend the online intervention to be evaluated for the longer-term, such as 6-month or 12-month, and to include a larger sample size involving stimulant-using MSM nationwide. Due to budget and time constraints, we were not able to do this in this project. The evaluation does not serve research purposes, but to assess the long-term impacts of interventions thus improving the existing program design. Additionally, qualitative observation with participants involved can be conducted during the term to gain in-depth insights and feedback. To achieve this objective, the interview could be carried out virtually without the need to turn on the camera or via an anonymous call so that the participants feel secure to speak up with their honest comments and underlying concerns which are potentially helpful in the betterment of this online intervention.

Access to chemsex-specific harm reduction services is currently limited in Asia, [32] let alone in Malaysia. However, such services need to be initiated and expanded despite legal and cultural barriers for MSM engaging in chemsex in Malaysia. HIV prevalence among MSM remains high while sexualised drug use continues to fuel the epidemic. Developing an online harm reduction platform allows those who wish to change to take their first steps while recognising the support available within the community which subsequently empowers them to reach abstinence eventually. Skilful and committed caseworkers, as well as extensive social media outreach with a referral system, are among the crucial strategies to reduce HIV transmission among MSM thereafter.

7.0 STUDY LIMITATIONS AND CHALLENGES

It is important to mention some limitations of the study. Firstly, the participation in the study was limited to MSM who were biologically male, while other key populations such as transgender women were excluded. The varied needs and reality faced by the two key populations might require different approaches to reduce drug use and HIV sexual risks while engaging in chemsex. Multiple challenging life circumstances among MSM who engage in chemsex may significantly affect their follow-up in the study. Furthermore, clarification of questions presented, if any, was not possible without contacting a caseworker or the research team. The level of honesty plays a crucial role in determining the validity of data collected, while social desirability bias may occur which hindered the optimal response rates of this study.

During the Covid-19 pandemic, face-to-face interactions between caseworkers and the research team were not possible. Initially, a total of 14 caseworkers were trained to conduct ASSIST brief intervention. Training, refresher sessions and team-building activities were conducted virtually which may create a sense of social isolation from the team. Additionally, the delay in website development due to technical issues created a long gap (of 8 months) between the completion of training and the expected execution date had caused the dropout of the first batch of caseworkers. Both commitment and personal well-being issues were among the top factors to discontinue their involvement in the study. Hence, the second batch of caseworkers with more diverse backgrounds was recruited and trained. Since the caseworkers were appointed to administer brief interventions on a part-time basis, the inconsistent commitment prolonged the process of registration and enrolment of participants. Consequently, some participants lost interest and decided to withdraw involvement from the study. Within the research team, there were team members, who were former or current users, struggled to keep up with their performance hence it was decided that a new team be formed. The incident caused a setback in the project timeline.

Because drug use and homosexual behaviours are heavily stigmatized and marginalized due to policy, legal, religious and cultural factors, many stimulant-using MSM were cautious concerning their visibility, personal data and privacy on the study website. As the level of stress and worry increased throughout the Covid-19 lockdown, illicit substance use skyrocketed. The legitimacy of this research study was questioned as a result of headlines in mainstream media about police raids on drug-fuelled gay parties. While the website security bugs were being validated and fixed, rumours were propagated among the MSM community amid a recruitment

drive where authorities could be taking actions to arrest the participants in this study, hence engagement outreach to potential participants was inhibited. Despite security and legal concerns, the recruitment budget limited the scale of tweet promotion on the social media account. Lastly, the data of the present study was collected through self-administered questionnaires, where the participants had total freedom in choosing their answers and whether they were willing to all sections in the questionnaires.

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APPENDICES

Appendix 1: test of Normality

	GROUP2	Kolmogorov-Smirnova		Shapiro-Wilk	
		Statistic	Sig.	Statistic	Sig.
Depression_S.T1	GROUP A	0.092	.200*	0.932	0.002
	GROUP B	0.1	.200*	0.947	0.024
Anxiety_S.T1	GROUP A	0.1	.200*	0.946	0.008
	GROUP B	0.114	0.097	0.955	0.05
Stress_S.T1	GROUP A	0.097	.200*	0.956	0.026
	GROUP B	0.086	.200*	0.954	0.048
Depression_S.T2	GROUP A	0.111	.200*	0.952	0.296
	GROUP B	0.114	.200*	0.93	0.04
Anxiety_S.T2	GROUP A	0.133	.200*	0.947	0.234
	GROUP B	0.162	0.032	0.927	0.033
Stress_S.T2	GROUP A	0.099	.200*	0.952	0.301
	GROUP B	0.136	0.139	0.944	0.1
Depression_S.T3	GROUP A	0.116	.200*	0.959	0.612
	GROUP B	0.148	0.12	0.932	0.068
Anxiety_S.T3	GROUP A	0.129	.200*	0.949	0.437
	GROUP B	0.107	.200*	0.959	0.33
Stress_S.T3	GROUP A	0.202	0.063	0.931	0.224
	GROUP B	0.112	.200*	0.939	0.105
ASSIST1.S.T1	GROUP A	0.261	0	0.782	0
	GROUP B	0.256	0	0.811	0
ASSIST2.S.T1	GROUP A	0.254	0	0.789	0
	GROUP B	0.254	0	0.737	0
ASSIST3.S.T1	GROUP A	0.3	0	0.666	0
	GROUP B	0.32	0	0.635	0
ASSIST4.S.T1	GROUP A	0.403	0	0.563	0
	GROUP B	0.312	0	0.585	0
ASSIST5.S.T1	GROUP A	0.149	0.001	0.929	0.001
	GROUP B	0.152	0.005	0.94	0.013
ASSIST6.S.T1	GROUP A	0.385	0	0.555	0
	GROUP B	0.347	0	0.472	0
ASSIST7.S.T1	GROUP A	0.324	0	0.608	0
	GROUP B	0.395	0	0.483	0
ASSIST8.S.T1	GROUP A	0.365	0	0.442	0
	GROUP B	0.357	0	0.515	0
ASSIST9.S.T1	GROUP A	0.455	0	0.438	0
	GROUP B	0.391	0	0.422	0
ASSIST10.S.T1	GROUP A	0.305	0	0.551	0
	GROUP B	0.26	0	0.676	0
ASSIST1.S.T2	GROUP A	0.526	0	0.371	0
	GROUP B	0.49	0	0.472	0

ASSIST2.S.T2	GROUP A	0.486	0	0.386	0
	GROUP B	0.498	0	0.483	0
ASSIST3.S.T2	GROUP A	0.539	0	0.188	0
	GROUP B	0.454	0	0.351	0
ASSIST4.S.T2	GROUP A	.	.	.	.
	GROUP B	.	.	.	.
ASSIST5.S.T2	GROUP A	0.415	0	0.596	0
	GROUP B	0.464	0	0.54	0
ASSIST6.S.T2	GROUP A	.	.	.	.
	GROUP B	.	.	.	.
ASSIST7.S.T2	GROUP A	0.531	0	0.289	0
	GROUP B	0.538	0	0.253	0
ASSIST8.S.T2	GROUP A	.	.	.	.
	GROUP B	0.538	0	0.253	0
ASSIST9.S.T2	GROUP A	.	.	.	.
	GROUP B	0.538	0	0.253	0
ASSIST10.S.T2	GROUP A	0.497	0	0.297	0
	GROUP B	0.516	0	0.377	0
Precontemplation.T1	GROUP A	0.056	.200*	0.983	0.538
	GROUP B	0.123	0.051	0.949	0.028
Contemplation.T1	GROUP A	0.196	0	0.825	0
	GROUP B	0.288	0	0.779	0
Action.T1	GROUP A	0.147	0.002	0.913	0
	GROUP B	0.219	0	0.826	0
Maintenance.T1	GROUP A	0.164	0	0.909	0
	GROUP B	0.145	0.009	0.899	0
Readiness.T1	GROUP A	0.102	0.179	0.957	0.03
	GROUP B	0.163	0.002	0.876	0
Precontemplation.T2	GROUP A	0.134	.200*	0.956	0.52
	GROUP B	0.166	0.047	0.947	0.166
Contemplation.T2	GROUP A	0.146	.200*	0.946	0.363
	GROUP B	0.121	.200*	0.977	0.784
Action.T2	GROUP A	0.096	.200*	0.959	0.573
	GROUP B	0.125	.200*	0.933	0.072
Maintenance.T2	GROUP A	0.113	.200*	0.971	0.818
	GROUP B	0.135	.200*	0.969	0.565
Readiness.T2	GROUP A	0.185	0.105	0.923	0.145
	GROUP B	0.074	.200*	0.99	0.995

Appendix 2
Correlation Matrix

	Depression	Anxiety	Stress
Depression	1		
Anxiety	.798**	1	
Stress	.888**	.911**	1

	Precontemplation	Contemplation	Action	Maintenance	Readiness
Precontemplation	1				
Contemplation	.186*	1			
Action	.284**	.837**	1		
Maintenance	.277**	.899**	.822**	1	
Readiness	-0.126	.915**	.847**	.872**	1