Structured relapse prevention program for Chinese patients in Hong Kong with comorbidity of substance use and mental health disorders: A feasibility study.

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Abstract

The prevalence rate of substance misuse is high among people with mental illnesses. This study adopted an individualized structured relapse prevention program (SRPP) by using an integrative motivational interviewing (MI) and cognitive behavioral therapy (CBT) approach for people with dual diagnosis, i.e., substance use disorder (SUD) comorbid with mental illnesses, in a Chinese population. This study assessed the feasibility of the SRPP and its preliminary effects to provide directions for future wide-scale trials. The program consisted of eight one-to-one interviews conducted weekly. Each interview lasted 1 h. MI was scheduled in the first session, followed by six sessions of CBT and a final session for concluding remarks. The high recruitment and retention rates of the participants indicated that the SRPP was feasible in Hong Kong. Preliminary results reflected a significant increase in self-efficacy to abstain from substance misuse and a decrease in the psychiatric symptoms among the participants with SUD. These effects were sustained 3 months after the intervention. A large sample size and the inclusion of a control group are warranted in future trials to determine the causal relationship between treatment and effect.

INTRODUCTION

According to the UN Office on Drugs and Crime (UNODC 2017), approximately 5% of the global adult population has experienced substance misuse at least once in 2015, and approximately 29.5 million of these may experience drug dependence and may require treatment. The magnitude of the harmful effects induced by drug use is reflected by the 17 million healthy lives lost to substance use disorder (SUD) (UNODC 2017). According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-V 2013), SUD refers to "patterns of symptoms resulting from the use of a substance that one continues to take, despite experiencing problems as a result." The harmful effects of psychoactive drugs can induce adverse effects on physical coordination, concentration, and judgment; increase bodily injuries and suicide rate; and result in negative social consequences, such as relationship and social problems (WHO 2004; Vasconcelos et al. 2016). In addition to the physical and social consequences, substance misuse also impairs self-efficacy, which decreases the confidence in one's ability to organize and execute behavior to manage daily life (Vasconcelos 2016).

The prevalence rate of substance misuse is high among people with mental illnesses, as approximately 50% of patients with mental illnesses will also experience SUD and vice versa (Ross and Peselow 2012). This finding indicates the high risk of substance misuse among people with mental illnesses or the high prevalence of psychopathology associated with drug use (Volkow 2001). This co-occurrence of illnesses is denoted as dual diagnosis in the current study. In an epidemiological study of China on over 60,000 participants, it was showed that "the one-month prevalence of any mental disorder and SUD were 17.5% and 5.9% respectively" (Leung 2015). Moreover, persons with schizophrenia have an odds ratio of 6.2 for developing SUD (Leung 2015). The risk factors for SUD include, but are not limited to, the

exacerbations of mental disorders, social pressures from drug use networking, lack of meaningful activities and social support, and lack of appropriate dual diagnosis treatments (Drake, Wallach, and McGovern 2005).

Relapse prevention strategies aim to combat drug dependence by inducing changes in one's behavior, increasing motivation to stop or reduce drug use, teaching coping skills, and enhancing social support and functioning (Kleber 2007). A review of 59 studies summarized numerous psychosocial interventions for relapse prevention among people with dual diagnosis, such as motivational interviewing (MI), cognitive behavioral therapy (CBT), contingency management, case management, and skills training. However, many studies suffer from small sample size, high attrition rates, short follow-up periods, and inadequate description of treatment protocols (Horsfall et al. 2009). Therefore, effective interventions for people with SUD must be developed for people with dual diagnosis. MI is an evidence-based innovation that deals with substance misuse comorbid with psychotic disorders (Martino et al. 2002). Its treatment effect is enhanced when combined with other treatment approaches, such as cognitive therapy, relapse prevention, family interventions, social skills training, and urinalysis contingency management (Barrowclough et al. 2010; Bellack et al. 2006).

The CBT model illustrates how emotional problems can be driven by negative thinking patterns and proposes that problems can be alleviated by changing the thinking process of an individual. CBT is effective across a wide range of SUDs, including alcohol dependence (Kiluk

et al. 2016), marijuana dependence (Trigo et al. 2018), and smoking cessation (Spears et al. 2017). In a randomized trial, an integrated CBT treatment approach could yield a more stable effect than facilitation therapy in terms of reducing substance use 6 months after intervention among people with depressive disorders (Brown et al. 2006). CBT is a highly individualized and flexible intervention, as the therapist carefully matches the content, timing, and nature of the presentation of materials to the individual patient. The therapist attempts to provide training for skills most needed by the patient. Such skills are essential components of an intervention.

The combination of MI and CBT is effective in previous clinical studies. An Australian study evaluated the effectiveness of a weekly group intervention consisting of MI and CBT and reported a significant reduction in substance use and symptomatology after therapy (Bradley, Baker, and Lewin 2007). However, given the nature of group therapy, the effects of individual approaches cannot be determined. Although people with dual diagnosis have many common concerns and difficulties, they benefit from focused programs for individual needs (Horsfall et al. 2009). Jones et al. (2011) reported a successful integration of MI and CBT for bipolar disorder comorbid with substance use, as reflected by the reduction of drug or alcohol use at 6 months follow-up. However, only case studies were reported. The effectiveness of the application of the integrative approach of using MI and CBT in the Chinese population with dual diagnosis has yet to be fully determined.

The current research is a study on the adoption of an individualized structured relapse prevention program (SRPP) involving the use of an integrative MI and CBT approach for the Chinese population with dual diagnosis (i.e., substance misuse problems comorbid with mental illnesses). The purpose of this study was to assess the feasibility of the SRPP and its preliminary effects to provide directions for future wide-scale trials. This study hypothesized that the SRPP would increase self-efficacy to abstain from substance misuse, reduce psychiatric symptoms and toxic substances in urine.

METHODS

Settings and participants

This study followed a one-group pre-posttest design. Participants were recruited at a substance misuse clinic of the Hong Kong East Cluster of the Hospital Authority. This clinic is affiliated with a regional hospital of Hong Kong, and accepts referrals from counselling centres, voluntary agencies, health care providers, or patients seeking service (Substance Abuse Clinic, 2009). The usual treatment protocol included the use of diazepam for managing withdrawal symptoms; naltrexone and buprenorphine as anticraving medications, and antipsychotic medications for controlling symptoms arising from mental disorders (Douaihy, Kelly, and Sullivan 2013). Included were patients (1) aged 18 years old or older; (2) with documented medical diagnosis of suffering from SUD and co-occurring mental illness disorders according

to DSM-V (2013); (3) capable of reading, writing, and speaking Cantonese; and (4) willing to participate and commit to the intervention. Excluded were patients (1) currently under relapse prevention programs delivered by other substance misuse services; (2) suffering from alcohol use disorder, which is "characterized by compulsive alcohol use, loss of control over alcohol intake, and a negative emotional state when not using" (DSM-V 2013); and (3) with neurological deficits or intellectual disabilities. Recruitment was made via postings in substance misuse clinics, doctors' referrals, or direct contact with potential participants by the research team during clinic sessions. According to Lancaster, Dodd, and Williamson (2004), 30 participants or more must be recruited to estimate a parameter in a feasibility study. Therefore, the estimated sample size of 42 was adopted in this study. The estimated attrition rate was 30%.

Intervention and Procedures

The major components of the SRPP are MI and CBT. SRPP was adapted from the program developed by Annis, Herie, and Watkin–Merek (2006). The program consisted of a eight one-to-one interviews conducted weekly. Each interview lasted 1 h. The MI was scheduled in the first session, followed by six sessions of CBT and a final session for concluding remarks. All sessions were conducted at the substance misuse clinic. Any participant who missed two consecutive sessions was dropped from the program. The two nurse therapists involved in this study are registered psychiatric nurses of Hong Kong who had completed a postregistration

certification course in substance abuse nursing organized by the Institute of Advanced Nursing

Studies of the Hospital Authority (Hong Kong). These nurses also received intensive coaching

from the first author (CN), who is an advanced practice nurse in psychiatry, has formal training

in CBT, and is a certified trainer on MI.

To ensure the consistency of the program intervention between the two therapists, we

designed a training manual written in English and Chinese. The interview questions and

worksheets were translated into verbatim Cantonese scripts by CN to facilitate the participants'

understanding. The manual focused on the four processes of MI, namely, engaging, focusing,

evoking, and planning (Miller & Rollnick, 2012). A detailed description of the guideline and

handouts of each CBT session was also provided. A specially designed form was used to record

the progress of the participants in each session.

MI session

MI was used to motivate the participants to change. The interview questions were developed

by the research team with reference to the materials published by Miller and Rollnick (2012).

The core interview skills in MI focus on the effective use of OARS, that is, asking open

questions (O), affirming and recognizing one's strength and efforts (A), reflecting (R), and

summarizing (S). Partnership and therapeutic relationships between the therapist and the

participant are established through the engaging process. Focusing uses an agenda mapping

bubble sheet to identify mutually agreeable direction. The evoking process should help resolve

ambivalence in the direction of change by using a decisional balance sheet and a value card sort,

and planning is the bridge to change (Miller & Rollnick 2012).

CBT sessions

Once the participant reached the planning stage after the MI session, the CBT sessions were

initiated. The CBT of the relapse process was originally designed by Marlatt and Gordon (1985).

This model provides a framework that aims to increase a person's confidence to deal with

difficult situations by improving their coping strategies and reducing the chances of relapse.

The CBT manual used in this study was adapted from the information published by Annis et

al (2006).

At the beginning of each CBT session, the therapist assisted each participant to set an

agenda and reviewed the homework from the previous session completed by the participant.

The participant then shared unique triggers and high-risk situations for substance misuse, such

as pleasant/unpleasant emotions, self-control, social pressure, and temptations. The therapist

helped the participant identify such triggers and high-risk situations that can lead to substance

misuse and exacerbation of psychotic symptoms. The purpose of the CBT sessions was to

increase the participants' understanding and help them manage high risk-situations, including

craving management; determine strategies for coping with stress; and identify ways to refuse

and resist substance misuse. During the sessions, the therapist taught the participants how to apply specific techniques in managing substance misuse problems and symptoms via role playing and using terms commonly used by the Chinese population. Homework was given to the participants after each session to help them apply the skills in daily life.

The individual CBT sessions aimed to enhance the coping strategies of the patients not only to reduce substance misuse problems but also to offer advice in the management of mental disorders. The topics of the seven individual sessions were, in order, managing high-risk situations, types of high risk situations, managing cravings, understanding and managing relapse, refusal of alcohol/drugs, coping with stress, and relapse prevention.

Written informed consent was obtained from each participant upon recruitment. Participation in the study was voluntary, and all potential participants were assured that they could withdraw from the study any time. The personal information and data of the participants were made confidential and anonymous. Ethical approvals from the Human Research Ethics Review Committee of the Hong Kong Polytechnic University and the Clinical Research Ethics Committee of the Hong Kong East Cluster of the Hospital Authority were granted.

Outcome measures

Another assistant who was unaware of the type of treatment modality received by the participants evaluated the effects of the treatment to achieve evaluator blinding. Treatment

effects were monitored by the subjective and objective measures described below and assessed at the baseline, post-intervention, and at 3 months of follow-up.

Primary outcome

Llevel of self-efficacy to abstain from substance misuse was the primary outcome. Self-efficacy is the degree at which an individual feels confident in performing a certain behavior in a specific situational context and is the predictor of addictive behavior (Witkiewitz and Marlatt, 2004). The original eight-item Drug Taking Confidence Questionnaire (DTCQ-8) was designed to assess anticipatory coping self-efficacy over the eight categories of high-risk situations for substance use. This questionnaire exhibits a high reliability of 0.97 as a global indicator of coping self-efficacy (Skylar, Annis, and Turner 1997). With the approval from the original authors, the questionnaire was translated to Chinese, that is, the Chinese Drug Taking Confidence Questionnaire (CDTCQ-8). The backward translation of this tool was conducted to ensure translation equivalence.

Similar to the original DTCQ-8, CDTCQ-8 assesses how confident a person is in resisting the urge toward substance misuse in each of the eight situations on a six-point scale ranging from 0 (not at all confident) to 100 (extremely confident). The following eight subscale scores were obtained to establish the profiles of the participants' anticipated coping self-efficacy across eight types of high-risk situations: 1) unpleasant emotions, 2) physical discomfort, 3) pleasant

emotions, 4) testing personal control, 5) urges and temptations to use, 6) conflict with others, 7) social pressure to use, and 8) pleasant times with others. The scores ranged from 0 to 800; the higher the score is, the more confident and the higher the efficacy of the participant in resisting the urge to take drugs. The scores were also converted to percentages to facilitate comparison. The percentages were classified as having low self-efficacy (below 20%), moderate self-efficacy (20%–80%), or high self-efficacy (>80%) according to the criteria suggested by Vasconcelos et al. (2016). The test–retest reliability coefficient of 0.95 was confirmed for the CDTCQ after administration on a one-month interval in this study.

Secondary outcomes

Even low substance misuse or dependence levels represent a risk factor for severe complications related to mental health, including suicide, poor treatment compliance, inpatient stays, violence, and a poor overall prognosis (Smith and Hucker, 1994). Therefore, psychiatric symptoms were used as a secondary outcome in this study to examine whether any reduction in psychiatric symptoms can be achieved following the intervention. Psychiatric symptomology was assessed by Chinese Brief Psychiatric Rating Scale (CBPRS-18). BPRS was first published in 1962 as a six-construct tool by Overall and Gorham (1988). BPRS consists of 18 symptom constructs, with the scale ranging from 1 (not present) to 7 (extremely severe) and with 0 denoting unassessed items. The scores ranged from 16 to 112; the higher the score is, the more

severe the psychiatric symptoms experienced by the person are. BPRS-18 shows a reliability of 0.75 for the total score and for individual items (Crippa et al. 2001). CBPRS-18 was validated in this study with a test–retest reliability coefficient of 0.88.

Another secondary outcome was the presence/absence of toxic substances in urine. A one-step drug test device (Guangzhou Wondfo Biotech Co., Ltd., ISO 9001 Certificate and FDA approval) was used to detect drug metabolites in the urine samples of the participants. A positive result indicated that the participant was taking specific drugs at a certain period of time. The test kit is widely used in the substance misuse clinics of the Hospital Authority and other nongovernment antidrug agencies in Hong Kong.

Data analyses

Descriptive statistics were determined using sociodemographic data and the characteristics of the participants. The estimated mean and standard error were computed for the outcome variables of each time point. Primary analysis was conducted using the generalized estimating equation (GEE) model with an autoregression correlation structure to evaluate the changes in the outcome variables over time (baseline to 3 months of follow-up) on the primary (i.e., CDTCQ-8) and secondary outcomes (CBPRS-18 and urine toxicology). Missing data were handled using the GEE model and were assumed to be random (Bell et al. 2018). SPSS version

25.0 (IBM Corporation, USA) was used for all statistical analyses. All statistical tests were two sided, with the significance level set at $p = 0.05$.

RESULTS

Participant characteristics

The gender distribution of the 42 participants was equal. Most of the participants were aged between 20 and 39 years (76.2%), received secondary education (78.5%), were single (73.8%), and had parents as their primary caretakers (61.9%). The top three substances being misused by the participants were ketamine (42.8%), methylamphetamine (ice) (14.3%), and zopiclone (11.8%). All participants were dual diagnosed by the psychiatrist with substance misuse and mental illnesses, including drug-induced psychosis (62%), depression (14%), thought disorder (12%), bipolar affective disorder (7%), and anxiety disorder (5%). A majority of the participants set a high treatment goal of either total abstinence (39.2%) or decreased substance misuse frequency (34.8%) after the intervention (Table 1).

Compliance, expectation, and satisfaction toward treatment

Most potential subjects were referred by psychiatrists. A total of 78 clients were contacted and screened, and 56 agreed to participate, resulting in an acceptance rate of 71.8%. Finally, 46 clients were eligible and met the inclusion criteria (recruitment rate: 82.1%). Only four participants dropped out of the study (one withdrew due to personal reasons, one died, and two lost contact), resulting in a retention rate of 91.3%. For those who remained in the study (n = 42), their attendance in the SRPP sessions was 100%. The recruitment flowchart is illustrated in Fig. 1.

Treatment Outcome

The comparison of the outcome variables within the group at different time points was examined using the GEE model. Overall, the differences in CDTCQ-8 over time from the baseline, post-intervention, and at 3 months of follow-up were significant ($p<0.001$). The increase in the level of efficacy in abstaining from substance misuse over time in individual items, except for item 3 ("If I remembered something good that had happened"), was significant. The change in the CDTCQ-8 percentages indicated that the participants showed increased self-efficacy from a low level ($14.48\% \pm 1.44\%$) to a moderate level after the therapy ($33.69\% \pm 1.09\%$) and at the 3 month follow-up ($35.89\% \pm 1.26\%$) (Table 2). Changes in the psychiatric symptoms based on CBPRS-18 were also observed over time ($p < 0.001$). For the urine toxicology test, the differences between baseline and post-intervention ($p < 0.001$) and between post-intervention and the 3 month follow-up were significant ($p = 0.003$), whereas those between the baseline and the 3 month follow-up was insignificant ($p = 0.177$) (Table 3).

DISCUSSION

The SRPP with MI and CBT was feasible in substance misuse clinic services in Hong Kong. Outcome analyses demonstrated a significant increase in the self-efficacy to abstain from substance misuse among the participants with SUD, and this effect was sustained at 3 months after the intervention.

Hodges and Oei (2007) explored the conceptual compatibility between CBT and the common values of Chinese culture via meta-analysis. The authors commented that the use of homework outside therapy sessions can equip a client with the ability to cope with symptoms in their daily life and that the "Chinese client is likely to expect that solutions to one's problem

will be brought about by diligent effort and persistence." Asian clients generally prefer structured counseling sessions with practical and immediate solutions to their problems. Therefore, directive counseling approaches, such as CBT, are more effective than nondirective approaches in Chinese clients. CBT is effective in counseling Chinese clients because of its high level of compatibility with Chinese values, beliefs, world views, and cultural characteristics (Lin 2001).

Self-efficacy is a cognitive process that describes patients' confidence in abstaining from substance misuse in high-risk situations (Milios 2017). People with additional positive experiences from drug abstinence may exhibit a high self-efficacy during abstinence (Majer, Jason, and Olson 2004; Vasconcelos et al. 2016). Individuals who have high self-efficacy are willing to tolerate physical discomfort and psychological frustration without abandoning the path to achieve their goal (Katja, Vesa, and Pekka 2011). The objective of the SRPP is to increase the self-efficacy of patients to deal with high-risk situations; hence, the higher their level of self-efficacy is, the higher their capability to resist substance misuse will be. When the abuser understands their behavioral pattern and problems associated with the consumption of psychoactive drugs, their self-efficacy increases, and they can resist the urge to consume drugs (Vasconcelos et al. 2016). With the implementation of this program, many people with SUD can resist the urge to consume drugs during high-risk situations, including unpleasant emotions, physical discomfort, environmental temptations, conflict with others, and social pressure. The

insignificant differences in the efficacy level in item 3 ("If I remembered something good that had happened") is in accordance with the findings of Vasconcelos et al. (2016), who also found that the domain pleasant emotions is not a high-risk situation for drug consumption because users attain high self-efficacy levels to resist the desire to use these substances even before the program. Therefore, seeking healthy habits that produce pleasant emotions in life is an important strategy to enhance one's self-efficacy to resist substance misuse. In addition, the high treatment goal of the majority of the participants in this study might have facilitated the success of the intervention.

The underlying mechanism of substance misuse and mental illness comorbidity and the influence of drug addiction on the course of mental illness and vice versa are still poorly understood (Volkow 2001). One possible contributing factor is stress, which plays an important role in substance misuse and mental illness (Volkow 2001)..

With regard to the secondary outcomes, participants showed reduced psychiatric symptoms after the program with sustained effect 3 months after the intervention. The findings were consistent with a previous study, which demonstrated that the reduction in psychiatric symptoms is an additional benefit for substance misuse group therapy for women (McHugh and Greenfield 2010). Urine tests for toxicology showed a downward trend in drug-taking behavior, which was reflected in the significant increase in the negative result post-intervention but not in the 3-month follow-up ($p = 0.177$). This objective indicator showed that additional services

were required to maintain the effect. In a 10-year prospective follow-up study of clients with

co-occurring severe mental illnesses and SUD, approximately one-third of clients who were in

full remission relapsed in the first year, and two-thirds relapsed over the full follow-up period.

The predictors of relapse included being male, having low educational level, living

independently, and lacking continued treatment for substance misuse (Xie et al. 2005).

Therefore, support should be continuously provided to clients to promote recovery even after

full remission is attained.

At the time the study was conducted, ketamine was the most common substance being

misused by the participants. Ketamine has become a street drug in many countries, particularly

in Southeast Asia. The psychological effects of ketamine are associated with sensory

deprivation, addiction, mood elevation, cognitive impairment, ketamine-associated psychosis,

hallucinations, delusions, and negative symptoms (Xu and Lipsky 2015). According to the

Central Registry of Drug Abuse of the Narcotic Division of Hong Kong, a trend in the decreased

use of ketamine, and an increase use of   methamphetamine (ice) and cocaine among people

with substance misuse problems of all ages in 2018 was noted (CRDA 2014). Psychoactive

drugs are more available cross-border from Mainland China to Hong Kong, and hidden drug

users often have a high prevalence of dual diagnosis (Tam et al. 2018).   Therefore, the reasons

for the emerging use of these psychotropic substances is worth exploring to provide insights

into the enhancement of interventions targeting this transition.

Given the pilot nature of the intervention in this study, the lack of a control group, and the small number of participants, drawing conclusions regarding the intervention impact is not possible. A large sample size with a control group should be considered in future trials to evaluate treatment effects. Substance misuse refers to the hazardous use of psychoactive substances, including alcohol and illicit drugs; hence, future studies should also evaluate the effect of the SRPP on people with alcohol use disorder. The majority of the participants in this study were aged between 20 and 30 years, single, unemployed, and reliant on their parents as caretakers. Practical and financial support from the families of those suffering from co-occurring mental illnesses and SUD may enhance individual and group treatment approaches. Therefore, the design of future relapse programs may consider incorporating the use of familial relationship in maximizing the effects of such programs on the clinical outcomes and recovery of people with substance misuse problems.

The high recruitment and retention rates of the participants indicated that the SRPP with MI and CBT was feasible in Hong Kong. The preliminary results demonstrated a significant increase in self-efficacy and a decrease in the psychiatric symptoms among the participants with SUD. The effect was sustained 3 months after the intervention. A large sample size and the inclusion of a control group are warranted in future trials to determine the causal relationship between treatment and effect.

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Conflicts of Interest

None declared.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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Table 1: Socio-demographic and baseline characteristics of the participants sample (*N*=42)

	All N (%)
Age group	
Below 20	2 (4.8)
20 to 29	11 (26.2)
30 to 39	21 (50.0)
40 to 49	3 (7.1)
50 to 59	4 (9.5)
60 or above	1 (2.4)
Gender	
Male	21 (50.0)
Female	21 (50.0)
Education level	
Primary or below	3 (7.2)
Lower secondary	16 (38.1)
Upper Secondary	17 (40.4)
Tertiary or above	6 (14.3)
Marital status	
Single	31 (73.8)
Married	10 (23.8)
Divorced	1 (2.4)
Employment	
Full time	9 (21.4)
Part time	10 (23.8)
Supported employment by government	1 (2.4)
Unemployed/Retired/Student/Homemaker	22 (52.4)
Living with	
Alone	4 (9.5)
Parents	26 (61.9)
Spouse and/or offsprings	12 (28.6)
Primary caretaker	
Alone	6 (14.3)
Parents	26 (61.9)
Spouse	10 (23.8)
Primary substance misuse	
Katamine	18 (42.8)

Methylamphetamine	6 (14.3)
Zopiclone	5 (11.8)
Cough mixture	4 (9.5)
Heroin	2 (4.8)
Alcohol	2 (4.8)
Cocaine	2 (4.8)
Methylenedioxymethamphetamine (MDMA)	1 (2.4)
Cannabis	1 (2.4)
Midazolam	1 (2.4)
Mental illness diagnosed by psychiatrist	
Drug induced psychosis	26 (62.0)
Depression	6 (14.0)
Thought disorder	5 (12.0)
Bipolar affective disorder	3 (7.0)
Anxiety disorder	2 (5.0)
Targeted treatment goal	
Total abstinence	18 (39.2)
Decrease substance misuse frequency	16 (34.8)
Undecided	6 (13.0)
No change	6 (13.0)

Table 2: Within group comparison of self-efficacy to resist substance misuse measured by CDTCQ-8 at different timepoints using GEE analysis.

Outcome Variables	Estimated mean (SE) ※	95% Wald Confidence Interval	Within-group comparison (*p*-value)			
			(1) Vs (2)	(1) Vs (3)	(2) Vs (3)	Overall
Q1. If you were angry at the way things had turned out			<0.001***	<0.001***	<0.001***	<0.001***
Baseline	12.86 (2.22)	8.52 to 17.20				
Post intervention	39.05 (2.52)	34.12 to 43.98				
3 months follow up	48.10 (2.61)	42.97 to 53.22				
Q2. If I had trouble sleeping			<0.001***	<0.001***	0.147	<0.001***
Baseline	2.86 (1.08)	0.74 to 4.97				
Post intervention	24.29 (2.98)	18.45 to 30.12				
3 months follow up	23.33 (2.85)	17.75 to 28.92				
Q3. If I remembered something good that had happened.			0.139	0.236	0.249	0.229
Baseline	41.90 (3.74)	34.5 to 49.23				
Post intervention	48.57 (2.62)	43.44 to 53.71				
3 months follow up	47.14 (2.50)	42.24 to 52.05				
Q4. If I wanted to find out whether I could use drugs occasionally without getting hooked.			<0.001***	<0.001***	0.311	<0.001***
Baseline	8.57 (1.67)	5.30 to 11.84				
Post intervention	32.38 (2.60)	27.28 to 37.48				
3 months follow up	31.90 (2.53)	26.96 to 36.85				
Q5. If I unexpectedly found some drugs or happened to see something that reminded me of drugs.			<0.001***	<0.001***	0.026*	<0.001***
Baseline	0.48 (0.47)	-0.45 to 1.40				
Post intervention	30.00 (2.26)	25.57 to 34.43				
3 months follow up	33.33 (2.30)	28.83 to 37.84				
Q6. If other people treated me unfairly or interfered with my plans.			0.002**	0.003**	1.000	0.006**

	Mean (SD)	95% CI				
Baseline	15.71 (3.27)	9.31 to 22.12				
Post intervention	27.62 (2.77)	22.18 to 33.05				
3 months follow up	27.62 (3.01)	21.72 to 33.51				
Q7. If I were out with friends and they kept suggesting we go somewhere and use drugs.			<0.001***	<0.001***	<0.001***	<0.001***
Baseline	2.38 (1.00)	0.42 to 4.34				
Post intervention	27.62 (2.12)	23.46 to 31.78				
3 months follow up	37.14 (2.82)	31.61 to 42.68				
Q8. If I wanted to celebrate with a friend.			0.001**	0.007**	0.435	0.004**
Baseline	31.90 (4.15)	23.76 to 40.05				
Post intervention	40.00 (3.56)	33.02 to 46.98				
3 months follow up	38.57 (3.65)	31.42 to 45.73				
CDTCQ-8 (total score)						
Baseline	116.67 (11.51)	94.12 to 139.22	0.001**	0.001**	0.001**	<0.001***
Post intervention	269.52 (8.73)	252.40 to 286.64				
3 months follow up	287.14 (10.08)	267.40 to 306.89				
CDTCQ-8 (percent)						
Baseline	14.58 (1.44)	11.76 to 17.40	<0.001***	<0.001***	0.001**	<0.001***
Post intervention	33.69 (1.09)	31.55 to 35.83				
3 months follow up	35.89 (1.26)	33.42 to 38.36				

GEE: Generalised estimating equations

CDTCQ-8: Chinese Drug-Taking Confidence Questionnaire (0 to 800, the higher the self-efficacy)

(1) = Baseline; (2) = Post intervention; (3) = 3 months follow up

*** Statistically significant at $p<0.001$
** Statistically significant at $p<0.01$
* Statistically significant at $p<0.05$

Table 3: Within group comparison of psychiatric symptoms and urine for toxicology at different timepoints using GEE analysis.

Outcome Variables	Estimated mean (SE) ※	95% Wald Confidence Interval	Within-group comparison (*p*-value)			
			(1) Vs (2)	(1) Vs (3)	(2) Vs (3)	Overall
CBPRS-18 (score)						
Baseline	34.52 (0.70)	33.15 to 35.90	<0.001***	<0.001***	0.001**	<0.001***
Post intervention	30.64 (0.59)	29.48 to 31.80				
3 months follow up	28.38 (0.42)	27.56 to 29.20				
	Negative Result N (%)	Positive Result N (%)				
Urine toxicology						
Baseline	13 (31.0)	29 (69.0)	<0.001***	0.177	0.003**	<0.001***
Post intervention	30 (71.4)	12 (28.6)				
3 months follow up	19 (45.2)	23 (54.8)				

GEE: Generalised estimating equations

CBPRS-18: Chinese Brief Psychiatric Rating Scale (18 to 126, the higher the more severe psychiatric symptoms)

(1) = Baseline; (2) = Post intervention; (3) = 3 months follow up

*** Statistically significant at *p*<0.001
** Statistically significant at *p*<0.01

Figure 1: Flowchart of recruitment


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         ┌────────────────────────────────┐
         │  Assessed for eligibility (n=78) │
         └────────────────────────────────┘
                      │        ┌────────────────────────────────┐
                      ├────────│  Declined to participate (n=22)  │
                      ▼        └────────────────────────────────┘
         ┌────────────────────────────────┐
         │  Agreed to participate (n=56)   │
         └────────────────────────────────┘
                      │        ┌──────────────────────────────────────┐
                      ├────────│  Did not meet inclusion criteria (n=10) │
                      ▼        └──────────────────────────────────────┘
         ┌────────────────────────────────┐
         │  Invited for participation (n=46) │
         │  Recruitment rate: 82.1%         │
         └────────────────────────────────┘
                      ▼
         ┌──────────────────────────────────────────────────┐
         │  Received allocated intervention (n=42)            │
         │  Did not receive allocated intervention (n=4)      │
         │  (Reasons: 1 withdrew due to personal reason, 1 died,│
         │   and 2 lost contact).                             │
         └──────────────────────────────────────────────────┘
                      ▼
         ┌──────────────────────────────────────────────────┐
         │            Post-assessment (n=42)                  │
         └──────────────────────────────────────────────────┘
                      ▼
         ┌──────────────────────────────────────────────────┐
         │          3-month follow up (n=42)                  │
         └──────────────────────────────────────────────────┘
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