Project Title: A randomized control trial to study the effectiveness of the Mobile Functional Cognition Program for persons who have substance abuse

Project Reference Number: BDF 160032

Organization: United Christian Hospital

CONTENT

1. INTRODUCTION

Substance use disoder (SUD): a community issue

- Community health issue in personal, social, financial perspectives
- 4129 reported drug abusers in first quarters of 2020 in HK (Narcotics Division, Security Bureau, 2020)
- Increasing trend in younger drug abusers (HKSAR, 2019; Legislative Research Office, 2019)
- Affects cognitive and general everyday functioning in individuals (Leung, 2015)

SUD affects Functioning

Type of drugs	Function affected
Heroin (Tolomeo et al., 2020)	Deficited cognitive abilities: - memory - cognitive impulsivity - no planning impulsivity - compulsivity - decision making
Ketamine (Morgan & Curran, 2012; Chan et al., 2013)	1) Deficit in working and episodic memory 2) Selective deficits in frontal and medical temporal functioning → verbal information processing → cognitive processing speed

SUD affects functioning (cont'd)

Type of drugs	Function affected
Amphetamine (Rogers et al., 1999; Fermandez-Serrano, 2011)	Prominent impairment: → visual-spatial memory and processing → visual planning → pattern recognition memory
Cocaine (Sudai et al., 2011)	Impairment: → short-term verbal memory → visuospatial ability → working memory

Review of SUD Cognitive Training

- Goal Management Training and Mindfulness Medication (Valls-Serrano et al., 2016)

  → improve working memory (of polysubstance users)

- Cognitive rehabilitation treatement (Rezapour et al., 2019)

  → executive function (of opioid use disorder)

- Cognitive Remedial Treatment and Contigency Management (Kiluk et al., 2017)

  → enhance cognitive function

However…

- Limited numbers of studies
- Hong Kong has no particular program

The Mobile Functional Cognition Program (MFCP)

- 2 years pioneer program
- Launched by Occupational Therapists in United Christian Hospital
- July 1, 2015 – June 30, 2017
- Simple pre- and post design
- Preliminary positive results

Research aim and hypothesis

- Aim: To study the effectiveness of the MFCP.
- Hypothesis: Participants who receive the MFCP would improve their cognitive and everyday functioning compared to those who receive social activities.

2. METHOD

Study design

- A multi-center randomized controlled trial
- Conducted between September 1, 2017 and January 31, 2021

Participants

1) Sample size estimation:
   - Based on our pilot in 2015–17, assume the effect size is 0.4
   - Sample size estimation: 50 in each arm
   - Consider attrition: recruit 60 in each arm

2) A total of 134 participants recruited:
   - Counselling Centers for Psytropic Substance Abusers (CCPSAs)
   - Drug Treatment and Rehabilitation Centers (DTRCs)
   - Methadone Clinic and
   - Substance Abuse Clinic at UCH

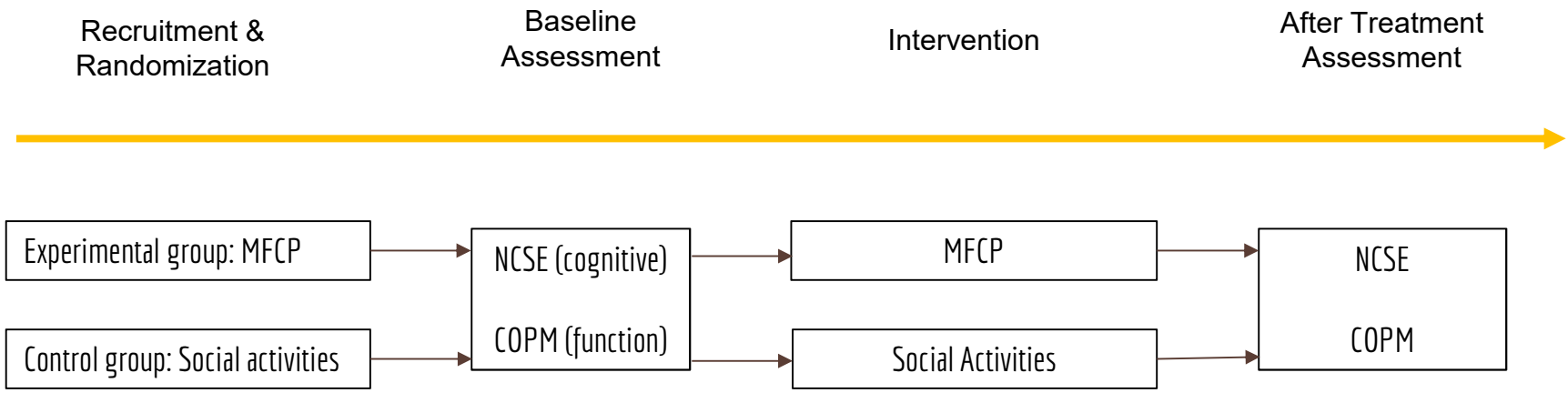
Participants

3) Inclusion: History of substance abuse in the past 12 months
   ⇒ willing to receive assessment and training in functional cognition

4) Exclusion: not mentally and medically stable

5) Final sample after attrition:
   → 53 in experimental group
   → 57 in control group

Procedures


Recruitment & Randomization
Baseline Assessment
Intervention
After Treatment Assessment
Experimental group: MFCP
Control group: Social activities
NCSE (cognitive)
COPM (function)
MFCP
Social Activities
NCSE
COPM

Assessments

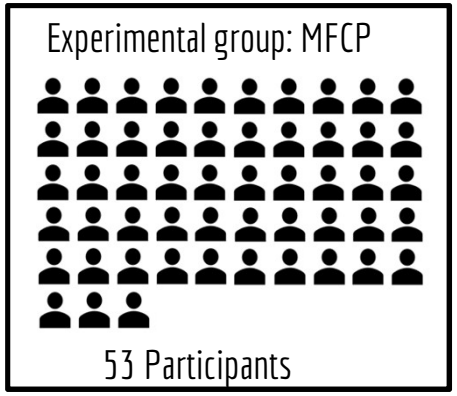
- Neurobehavioural Cognitive Status Examination (NCSE)
  - Cognitive assessment
  - Assesses 5 major cognitive abilities: language, spatial skills, memory, calculations, and reasoning
  - Detect cognitive impairment and measure treatment outcomes on substance abusers

- Canadian Occupational Performance Measure (COPM)
  - Assess participants' self-perceived everyday functioning
  - Semi-structured interviewing tool measuring all life areas: self-care, leisure, productivity
  - Individuals' perceptions of the importance and performance→ rated on 10-point Likert scale
  - Proven to be valid, reliable, practical, and responsive outcome measure

MFCP

8 sessions of MFCP:

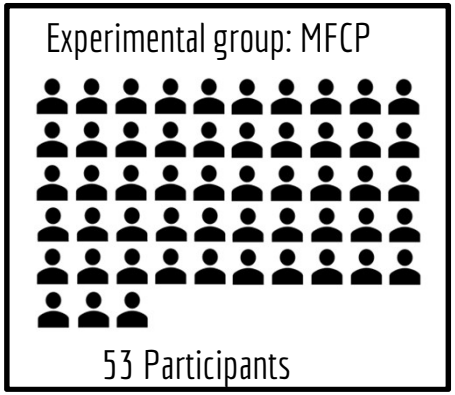
- 90 mins each session
- Included:
  - Psychoeducation
  - Teaching strategies for coping with cognitive deficits
  - CogniPlus training



Part 1	**One session on pre-assessment and recovery planning (1.5 hours):** • **Assessment on cognitive and occupational functioning** • **Psychoeducation on neuropsychological impact of substance abuse**
Part 2	Core content of mobile functional cognition training (1.5 hours each session): **Part 1** Computerized cognitive training using Cogniplus (30 minutes) **Part 2** Psychoeducation (45 minutes) ➢ Definition of cognitive function ➢ Relationship between substance abuse and cognitive function ➢ Functional cognitive strategies ➢ Cognitively Active Lifestyle Redesign ➢ Emotional regulation ➢ Sleep management **Part 3** Practical session of cognitive active lifestyle: ➢ Health Qigong (Baduajin Training)/ Cognitive stimulating group activities (15 minutes) *** Paper and pencil cognitive stimulating homework assignment after each session
Part 3	One session of post-assessment and round up (1.5 hours): • Assessment on cognitive and occupational functioning • Feedback on the progress in the functional cognitive training • Round up and prepare for discharge

MFCP

- CogniPlus training (Developed by SCHUHFRIED):
  - Computerized training system, resembles some actual daily activities
  - Automatically adapt the training level to suit the participants' performance levels
  - Covers attention, visual-field training, working memory, long-term memory, executive functions, spatial processing, and visuomotor skills.



Social Activities

8 sessions of social activities:

- 3 to 6 participants each session
- 90 mins each session
- Broad games or art and craft activities

3. RESULTS

Sociodemographic data of the sample

	Experimental Group (n=53)	Control Group (n=57)	Comparison	
			Statistics	*p*-values
	Count (%)	Count (%)		
Male	24 (45.3%)	25 (43.9%)	0.023[a]	.881
	Mean (SD)	Mean (SD)		
Age	35.4 (10.9)	37.1 (11.2)	1287[b]	.296
Education (years)	8.9 (2.2)	9.2 (2.4)	619[b]	.779

Remarks: [a]Chi-square; [b]Mann-Whitney *U*

- No difference in age, sex, and education level across the groups

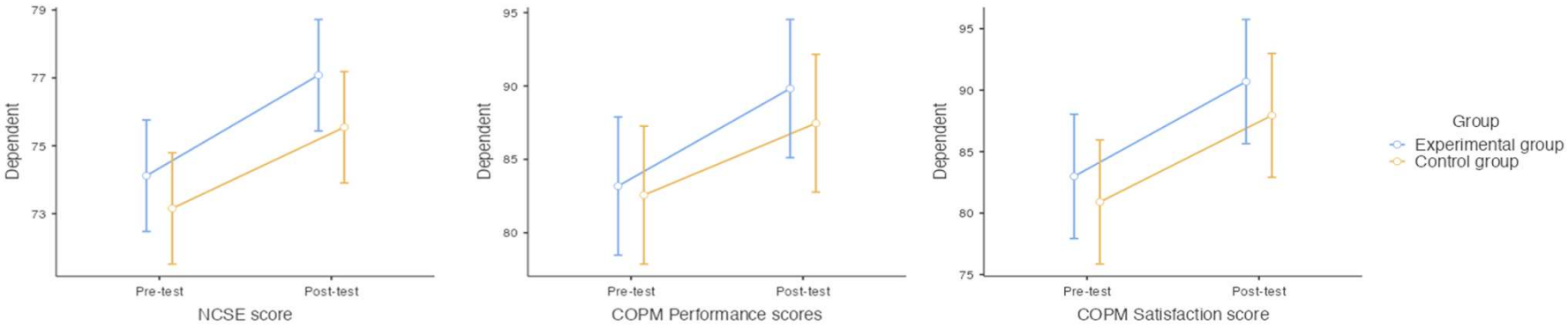
Cognitive and functional performances of the sample

	Experimental Group (n=53)		Control Group (n=57)		Repeated measure ANOVA (Outcome x group)	Post hoc Schèffe test		
	At baseline	After treatment	At baseline	After treatment		Experimental vs control at baseline	Pre vs post in Experimental group	Pre vs post in Control group
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	*F* (p-value)	*t* (p-value)	*t* (p-value)	*t* (p-value)
NCSE	73.6 (6.60)	76.5 (4.7)	72.8 (6.0)	75.4 (6.0)	0.09 (.759)	0.73 (.913)	4.26 **(< .001)**	3.97 **(.002)**
COPM Performance	81.8 (19.6)	88.5 (16.2)	81.1 (15.5)	87.2 (13.6)	0.04 (.844)	0.24 (.996)	3.19 **(.020)**	3.03 **(.032)**
COPM Satisfaction	81.6 (20.6)	89.4 (16.6)	79.9 (17.4)	87.8 (14.7)	0.003 (.959)	0.52 (.965)	3.56 **(.007)**	3.76 **(.004)**

Remarks: NCSE = the Neurobehavioral Cognitive State Examination; COPM = Canadian Occupational Performance Measure

- No difference in baseline NCSE and COPM scores across the groups
- Repeated measure ANOVA: The MFCP had no greater effect over the social activities
- Post hoc Schèffe test: The MFCP had significantly improved the **experimental group's** NCSE and COPM scores; similar pattern occurred in the **control group**

Plots of cognitive and functional performances of the sample



- Both experimental (MFCP) and control group (social activities) show improvement

Effect Size of Experimental (MFCP) against Control (Social Activities)

Improvement	Experimental Group (n=53)	Control Group (n=57)	Effect Size of experimental against control
	Mean (SD)	Mean (SD)	Cohen's *d*
NCSE	2.96 (5.34)	2.61 (4.60)	0.07
COPM Performance	6.70 (14.3)	6.12 (16.1)	0.04
COPM Satisfaction	7.77 (14.7)	7.93 (17.0)	-0.01

- The MFCP appeared to have slight advantage over social activities

4. DISCUSSION

Our Hypothesis and Recent Research

- Our finding: both MFCP and social activities improved cognitive and functioning.
- It concurs with observations in our 2015–17 pilot that the MFCP improves cognitive abilities.
- No other MFCP study so far.
- There are reports of positive effect of social activities on cognitive functioning (Cohn-Schwartz, 2020; Kelly ME et al, 2017; Li H et al., 2020).
- In our study, **MFCP seems having a slight advantage over social activities**; we may need longitudinal study to verify.

Limitations

- Therapists had to visit various centers to carry out the project
  ⇒ it was difficult to control the experiment between treatment sessions.
- DTRC staff reported that some control group participants asked their roommates and completed the experimental groups' assignments
  ⇒ confound the results of the research
- Did not apply a longitudinal study design
- Further evidence on cognitive training for SUD is necessary

Conclusion

- This study and our pilot (2015–17) support that the MFCP is practical and easy to use.
- Further study is needed to verify if the MFCP is better than social activities in improving cognition and functioning.