

A Randomized Controlled Study of Collective Motivational Interviewing (CMI) for Adolescents with Internet Gaming Disorder

Document Date: 1 March 2022

Uploaded: 24 March 2023

Abstract

Internet gaming disorder (IGD) is a widespread public health problem. Hong Kong is no exception. In alignment with the global trend of the increasing concern on IGD among young people, especially during the COVID-19 pandemic, the situation becomes worsened. Because of the social distancing measures, students stay home for virtual classes, and screen time increases. They are prone to engage in numerous digital activities, such as gaming, social media, binge-watching, and so on.

Excessive online gaming by adolescents could lead to getting too little sleep, eating improperly, failing to maintain proper personal hygiene, and withdrawing from social interactions, which also detriment interpersonal development. With the atmosphere of “Academic Performance First” in Hong Kong, most parents stress on academic accomplishments of their children, leading to strained relationships when their child’s gaming behaviour threatens educational efforts.

Our project collaborators, including Caritas, HKCYS, HKPA and the largest counselling teacher’s association, also alert the IGD problems among adolescents in Hong Kong. They look for a low-threshold, brief and effective intervention to deal with the concern. However, in some existing interventions for IGD, such as cognitive behaviour therapy and multidimensional family therapy, the inadequate research method caused no strong conclusions on its efficacy. Motivational Interviewing (MI) is an evidence-based counselling approach with over three thousand randomized controlled trials across populations, disciplines, settings, and cultures. MI was originally developed for treating alcohol problems and further applied to address lifestyle problems in healthcare settings, but it was never examined for IGD. Furthermore, in literature, the effectiveness of MI for adolescents varied. Both the service and research gaps have opened a fruitful opportunity for this project.

Collective Motivational Interviewing (CMI) is a locally innovated change technology to mobilise a client’s motivation to change with the support of concerned significant others (CSOs). CMI roots in the forty decades of MI evidence in addictive treatment, groundbreaking to engaging CSOs into the motivational process to cultivating positive and productive dialogues among the involved parties. The proposed study rides on the preliminary result of CMI in drug addiction in terms of reducing drug use, enhancing motivation, and strengthening social support, which has confirmed the feasibility of CMI in working with addictive behaviours.

Our international research team will conduct a parallel two-armed randomized controlled trial to test the efficacy of CMI in improving IGD among adolescents with IGD in Hong Kong (N = 172 pairs of adolescents and their CSOs). The research participants will be randomly assigned to the intervention group (CMI intervention plus IGD education materials) and control group (IGD education materials only). The primary outcome of the efficacy of the intervention will be indicated by the severity of IGD symptoms, together with secondary outcomes of motivation to change maladaptive gaming behaviour, craving for gaming, and social support from CSOs; such indicators will be measured at baseline, post-intervention, 3-month follow-up, and 6-month follow-up. In addition, fidelity control will be monitored.

The proposed project responds to the vision of RGC 「活研活用」 that transfers research knowledge and skills into promoting a better quality of life for individuals, communities and society as a whole. CMI intends to provide a promising solution to this alarming public health topic. The present study will also contribute to the local Chinese community with a practical intervention approach for counsellors, social workers, and service providers to improve the quality of life among adolescents with IGD and their CSOs. Still, it undoubtedly facilitates international scholarly discussions in its feasibility, applicability and replicability.

RESEARCH DETAILS

1. Project Objectives

The primary objective of the proposed randomized controlled trial (RCT) is to investigate the relative efficacy of collective motivational interviewing (CMI) plus provision of education information in the intervention group versus that of provision of education information alone in the control group in reducing symptoms of Internet gaming disorder (IGD) among adolescents at risk of IGD (i.e., probable IGD cases) aged 10-16 years in Hong Kong.

Secondary objective is to (a) enhance motivation for change maladaptive gaming behaviours, (b) reduce cravings for gaming, and (c) enhance support obtained from the concerned significant others (CSO). It is hypothesized that better primary and secondary outcomes would be obtained in the intervention group than in the control group.

2. Pathways to Impact Statement

There are several contributions and impacts of this study:

1. Academic impact:

The development of psychotherapy was driven mainly by research conducted in Western countries. Health professionals in Hong Kong always learn and apply the counselling approach developed in the West. Motivational Interviewing (MI) is a powerful evidence-based and hand-on counselling tool that helps people to make a change. It is very commonly used among health professionals in areas such as addiction. Yet, the latest MI literature often discusses about two areas that may need improvement. First, it is well known that influences of significant others (e.g., family members) are significant factors of behavioural change. In both real-life counselling practices, loved ones frequently place excessive blame on the client, which makes conjoint interviews unhelpful and even damaging their relationship. The first important challenge is how to apply MI- counselling style with the significant others, so as to enhance their readiness and sharpen their language use in a supportive way, i.e., how to create a collaborative change partnership between the client and his/her CSO. The second challenge and novelty of the proposed study is that, to the best of our knowledge, MI has been tested in populations of substance addiction (e.g., alcohol use, smoking, and substance use), but NOT in the context of reducing Internet gaming disorder (IGD) with a robust method (e.g., RCT).

2. Collective motivational interviewing (CMI) is a novel intervention method developed by the principal applicant. It is a culturally feasible counselling approach that can potentially reduce addictive problems. In this present study, CMI extends the application of MI to a new social nexus paradigm by incorporating both the clients and their CSO in the motivational interviewing process, which is distinctive from that of the original MI process, which involves one-on-one counselling. It is also different from family therapy which joins family members together without considering how to get both parties ready to make a collaborative change. The present RCT investigates the efficacy of CMI in reducing IGD. A tailored fidelity control instrument will be used to monitor the quality of CMI intervention. To create global influences, Dr. Mark Griffiths (Co-I), who is the director of the international gaming research unit, will create international academic discussions in meetings or webinars on applications of CMI for reducing IGD.

3. Practice/clinical impact:

The concern over IGD is increasing in different societies. It has detrimental effects on the development of adolescents in terms of physical, psychological, and social aspects. Many

parents solicit assistance from social services. However, IGD tailored services are unavailable in Hong Kong. It might be attributed to a lack of effective intervention approaches to deal with IGD. Most mainstream service provision in Hong Kong remains focused on public education. Social service providers and health professionals are looking for empirically validated, hands-on skills, brief, and low-threshold counselling approaches to help adolescents with IGD and their families. There is hence a pressing need to investigate the efficacy of CMI as a robust methodology to fill out the service gap.

4. Professional impact:

The project will boost the capacity building of the frontline social workers, counsellors, and health professionals by equipping them with advanced counselling skills on CMI. The development and application of CMI will make a long-lasting impact on professionals of social services, health, and education to deal with adolescent IGD problems. In addition, the service providers may also apply CMI to the population of the hidden drug misusers and/or non-engaged youths, motivate them to change, and develop better lifestyles with the support of CSOs.

5. Educational impact:

The CMI intervention protocol for IGD and the fidelity instruments will be published for sharing with other local and international researchers who may be interested in this counselling approach. In addition, the present study would modify a CMI protocol – IGD version from the version for drug use problems which is a valuable teaching material for disseminating the good practice approach to address IGD among adolescents.

The CMI training workshops would provide an in-depth understanding of the application of CMI in working with adolescents with IGD.

Social media dissemination: Apart from the traditional written work, Dr. Tse Ka-wo will also disseminate the application of CMI for IGD via the YouTube Channel. Social work/counselling/psychology students and other interested scholars who would like to understand how CMI is applied to IGD/ the findings of the present study/ CMI demonstration can visit the YouTube Channel. The above education plan would foster the broader use of CMI in clinical settings.

3. Research Project Statement

Introduction

Internet gaming disorder (IGD) is a widespread public health problem. It has been formally recognized as a diagnosable mental health condition in the appendix of the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)* (American Psychiatric Association, 2013) and a mental health disease in the *International Classification of Diseases 11th version (ICD-11)* (World Health Organization, 2018). It is characterized by persistent gaming behaviour, impaired control over gaming, and functional impairment, usually for a period not less than 12 months (Carlisle, 2021). People with IGD prioritize gaming over other activities, resulting in missed life opportunities for other activities and interference with regular self-care (i.e., sleeping, eating and drinking, personal hygiene), fewer face-to-face interactions with others and detrimental social relationships (e.g., family and friends), and important obligations, such as education and work, care of children (Carlisle, 2021; Humphreys, 2019; Kim et al., 2022; Peter et al., 2020).

Prevalence of IGD

The prevalence of IGD estimates ranged from 2% to 15% internationally. The varied findings may be partly due to variations in definitions of IGD, assessment instruments, and sampling (Gentile et al., 2013). A systematic review and meta-analysis reported that the pooled global prevalence of gaming disorder was 3.05% (Stevens et al., 2021). The time between ages 12 and 18 is generally the most vulnerable period for developing addictive disorders, including IGD (Gentile et al., 2017). The prevalence of IGD among adolescents was 4.6%, according to a meta-analysis, male adolescents (6.8%) tended to have a higher prevalence of IGD than female adolescents (1.3%) (Fam, 2018). The prevalence of adolescents with IGD was 14.6% in the U.K. (Lopez-Fernandez et al., 2014), 1.16% in Germany (Rehbein et al., 2015), 5.9% in Korea (Yu & Cho, 2016), and 5.5% in the Netherlands (Lemmens et al., 2015); 17.0% of the Chinese adolescent game players have had IGD according to the diagnostic criteria (Liao et al., 2020). The prevalence of IGD among adolescents in Hong Kong was higher than that of the global average level. The latest student survey in Hong Kong, during the COVID-19, about 83% of students participated in gaming activities, the prevalence of excessive and pathological game addiction was 20.9% and 5.3%, respectively (Zhu et al., 2021). It is hence warranted to reduce IGD symptoms among those showing such symptoms and are at high risk of IGD.

Impact of IGD on adolescents

IGD could cause multidimensional negative impacts on adolescents. A review of longitudinal studies reported that adolescent IGD was predictive of increased physical problems (e.g., increased physical aggression), mental health problems (e.g., depression and anxiety), psychosocial problems (e.g., social phobia and poor parent-child relationship), and worsened academic achievements (Mihara & Higuchi, 2017).

Family interaction and IGD

Evidence implicates that familial influences contribute to both the risk and sustainable factors of adolescent IGD problems. Adolescents with IGD often reported more family conflicts and worse family relationships (Bonnaire & Phan, 2017) and poor interpersonal relationships and conflicts (Wartberg et al., 2017) than non-IGD adolescents. In addition, several familial influences, such as the parent-child relationship, supervision of gaming, parent socioeconomic status, and family composition, may affect the chance an adolescent turns into a problematic gamer (Schneider et al., 2017). Some interventions related to IGD also involved family members. Family hence plays an important role in development and interventions regarding IGD.

Intervention approaches for IGD

Researchers and health care workers have pointed out that there is a strong but unmet demand for interventions that can effectively reduce IGD symptoms (Zajac et al., 2020). The number of interventions backed up by randomized clinical trials (RCTs) is small and inadequate (Zajac et al., 2020). Theory-based RCTs are strongly warranted, and this study is an innovative attempt. A systematic review and meta-analysis has shown that cognitive behavioural therapy (CBT) effectively reduces IGD and depressive symptoms and may bring short-term benefits (Stevens et al., 2019). Group CBT has also reduced IGD symptoms (Han et al., 2020). As discussed, adolescent IGD may not always be solely attributable to intrapersonal factors which CBT targeted, but also to familial and parental factors (Nielsen et al., 2020). In addition, Bonnaire et al. (2019) recommends that it is crucial to involve family members when treating adolescents with IGD. Interventions for adolescents may be more effective when taking into consideration the family context, rather than emphasizing only individual-based treatment (Schneider et al., 2017). Social network incorporated interventions (e.g., family members) require more empirical attention given their promising findings (Liu et al., 2015). Multidimensional family therapy (MDFT) was useful in treating adolescent IGD, which focused on improving family relationships to contribute to the treatment outcome. Yet, MDFT is a relative intensive approach and requires more sessions, and the small sample size of the MDFT studies limits the generalizability (Nielsen et al., 2021). Alternatively, the proposed Collective Motivational Interviewing (CMI) is a brief, low-threshold, concerned significant others-involved counselling tool to facilitate productive conversation among involved parties (Tse et al., 2022).

A novel intervention grounding on evidence of Motivational Interviewing (MI) accumulated in four decades

Motivational Interviewing (MI) is an evidence-based psycholinguistic counselling approach. The essence of MI is the combination of a client-centred approach and goal-oriented strategies. It helps people resolve ambivalence about changing with the spirit of partnership, acceptance, evocation and compassion. Counsellors emphasize exploring the client's own reasons for change by developing the discrepancy between the status and the desired goal. Client-centred counselling skills consist of open-ended questions, reflection, summary and affirmation, formulating a guiding communication style to facilitate clients' self-exploration on their own reasons for change. Four-process model includes engaging process, focusing process, evoking process and planning process, leading a more systematic and structured motivational process (Miller & Rollnick, 2013).

MI can be implemented by trained social workers, teachers and counsellors and even research assistants and is thus a scalable method. Initially, MI was nurtured in working with alcohol problems, extensively examined in drug addiction. Subsequently, it has been broadly applied in healthcare settings to motivate patients to make behavioural changes. Its effectiveness has been examined more than 3000 RCTs across disciplines, populations, settings, and cultures (Hallgren et al., 2018; Miller & Moyers, 2021). It has been effective in changing addictive behaviours such as substance use, smoking, alcohol (Miller et al., 2003). The principal applicant and Li et al. (2016) jointly published a systematic review and meta-analysis that demonstrated the efficacy of MI for adolescents with illicit drug use. Yet, MI has seldom been applied to deal with adolescent IGD. Furthermore, the individual-based MI did not take into account the influence of significant others (e.g., family members), as most IGD cases begin at adolescence and prompting family involvement is a critical part of the intervention process.

Concerned significant others (CSOs) is a major source influencing one's motivation. For instance, the Theory of Planned Behavior suggests that support given by the significant others (subjective norm) is a strong determinant of health-related behaviour (Mak & Davis, 2014). The family-based approach has been gaining traction as a preferred intervention for adolescent IGD problems. Collective Motivational Interviewing (CMI) is thus crucial and a potential breakthrough that integrates MI with CSOs' influences. Previous research has never examined the efficacy of MI sessions involving both the client and his/her CSOs for IGD. The involvement of CSOs in MI is potentially important. For instance, family members might place too much blame on the client, often causing counterproductive result. The conjoint MI sessions proposed in this study aim at creating understanding and supportive interactions that boost the adolescents' motivation to make changes regarding Internet gaming. Readiness of client and CSO is the key to fostering joint change partnership.

Details about Collective Motivational Interviewing (CMI)

CMI is a newly developed motivational approach, which was developed to firstly to tackle substance use problems. It is derived from the aforementioned evidence-based psycholinguistic counselling method of MI. It involves MI sessions targeting both the client and his/her CSOs. The principal investigator is the developer of this method. CMI retains the brief, client-centred and goal-oriented features of MI but expands the application of MI to the social nexus paradigm (i.e., CSO). It only requires four short sessions. Individual sessions are held for the client and CSOs, respectively, elicit the client's motivation to change, and furthermore, cultivate CSO's motivation to support the client to change, followed by two conjoint sessions that would facilitate a joint change partnership toward a clear, common, achievable goal under an atmosphere of non-judgemental climate, with non-threatening trust and mutual support (Tse et al., 2022). A pilot study has examined the feasibility of CMI among twenty pairs of persons with drug use problems and one of their respective CSO. The preliminary findings showed that CMI was able to achieve reduction in drug use ($z = -2.02, p < .05, r = -.319$), enhancement of motivation to change [$F(3, 17) = 7.78, p < .01, \eta^2 = .579$], and strengthening social support ($z = -2.14, p < .05, r = -.338$) at three-month follow-up (Tse, 2021). This study further applies CMI to adolescents with IGD and their CSOs.

Research and service gaps

Feasible low-intensity evidence-based interventions for IGD are not available in the field. To our knowledge, no MI intervention has been tested in treating IGD. There is a strong and unmet need to expand MI to motivate the adolescents to change and their CSOs to support them. Most clinical trials on IGD reduction examined CBT and Family Therapy which were relatively structured and intensive. Such interventions require trained clinical psychologists which are expensive to access and in short supply in general. Furthermore, motivation is a prerequisite to participate in such interventions, which is often lacking. CMI is a brief, motivational-focused, and CSO-involved motivational tool. As a stand-alone intervention approach, CMI can provide a safe platform for adolescents with IGD and their CSOs to create constructive dialogues, which are much needed but hard to happen. CMI would also facilitate mutual understanding and support to reach a common goal. As a prelude tool, CMI can also help to get ready both parties to participate in other intensive treatment.

Methodological robustness is important. Notwithstanding the latest systematic review showing the recent increase in the publication of interventions for IGD, methodological inadequacies (e.g., a lack of control groups) make it tough to draw definitive conclusions about the effectiveness of IGD interventions (Zajac et al., 2020). RCTs with follow-up assessments is a robust way to examine the efficacy of IGD intervention (King & Delfabbro,

2019; Zajac et al., 2020). The proposed RCT fills out the aforementioned gaps. As MI can be performed by trained non-professionals (e.g., peer counsellors), it increases scalability and potential applications in the future.

Research questions

The present study examines the efficacy of CMI in reducing adolescent IGD symptoms and enhancing social support given by CSOs among adolescents with high risk of IGD (probable IGD cases screened positive by validated tools). It is hypothesized that the intervention group (with CMI plus IGD education materials for both the clients and his/her selected CSO) would show more improvements in reduction in the severity of IGD, motivation to change maladaptive gaming behaviour, craving on gaming, and social support obtained from CSOs than to the control group (only educational materials for both the client and the CSOs) from the baseline (T0) to posttest (T1), 3-month follow-up (T2) and 6-month follow-up (T3). The research question is whether CMI would result in better intervention outcomes than the control group.

Study design

This study adopts a randomized controlled efficacy study with an open-label parallel-group design (see the flowchart on p.30). The trial will be registered by the WHO's International Clinical Trials Registry Platform once the project is approved. Research participants will be recruited from the primary and secondary schools, and the youth social services. After completing the screening process, research participants who are confirmed to fit the inclusion criteria will be randomly assigned to the intervention group with CMI intervention plus IGD education materials to both adolescents with IGD and their CSO or the control group with IGD education materials alone. The present study sets four-time points to track change the between-group difference of the primary and secondary outcomes from the baseline (T0) to post-intervention (T1), 3-month follow-up (T2) and 6-month follow-up (T3).

Target research participants

Inclusion Criteria include: (1) adolescents aged between 10-16; (2) probable IGD condition screened by the Internet Gaming Disorder Scale-Short-Form (IGDS9-SF) reaching the cut-off value at 32, those at high risk of having IGD but no IGD cases with clinical diagnosis, although the symptoms measured by IGDS9-SF are equivalent to DSM-5 IGD criteria); (3) Hong Kong ID card holder; (4) Chinese speaking; (5) student identity; (6) possessing an electronic mobile device or computer, and (7) willingness to participate in the intervention/control group and complete four surveys (baseline, post-intervention, 3-month follow-up, and 6-month follow-up); (8) can nominate a CSO (e.g., parents) [client's autonomy is a critical factor to facilitate motivation posited by the self-determination theory (Ryan & Deci, 2020)], and (9) to obtain informed consent and parental consent. The justification for the age group: (a) according to the World Health Organization, adolescents are those aged 10 to 19, (b) previous student survey reported that the mean age of students with excessive and pathological gaming is 12 years old (Zhu et al., 2021), and (c) Hong Kong adolescents aged 10-16 had higher prevalence of IGD and greater needs for intervention based on PI's and collaborators' practice experiences. *Exclusion Criteria*: Participants self-reporting having psychiatric problems such as psychosis, significant cognitive impairment and/or receiving active and structured psychotherapy about IGD elsewhere will be excluded (Nielsen et al., 2021). *Inclusion criteria for CSO* included those (1) aged greater than 18 years (2) having close relationship with the adolescent with probable IGD (as rated by participants being generally supportive of the participants) and (3) being willing to participate in the present study and provide informed consent. *Exclusion Criteria for CSO* include those self-reporting (1) having psychosis, aggressive or suicidal behaviour and (2)

having life-threatening medical conditions.

Recruitment

The target participants are between the ages of 10 and 16 years old; Our project develops a strong local alliance with three leading children and youth services in Hong Kong, including Caritas Hong Kong, Hong Kong Children & Youth Association, and Hong Kong Playground Association. On top of it, the largest counselling teacher's association covers the largest network of primary schools and secondary schools have agreed to facilitate the recruitment process. For recruitment via the children & youth service (Pathway A), Introduction package will be delivered to the collaborative agencies, including: (a) briefing sessions (either zoom or in-person, dependent on the feasibility); (b) QR codes with access to information about the project; (c) training for the fieldworkers (collaborators' staff, including social workers/ counsellors/ psychologists), to identify potential participants and teach them how to use the screening tool and the inclusion and exclusion criteria through a standardized pre-recorded video. For recruitment via School counselling services of the Primary and Secondary Schools (Pathway B), the project officer or PI will send invitation letters to all school social work/counselling services through the network of the Hong Kong Association for School Discipline and Counseling Teachers that covers most primary and secondary schools in Hong Kong. Research team will conduct three open briefing sessions (either zoom or in-person, dependent on the feasibility). Interested schools will be invited to join the briefing sessions. The introduction package, the same as the one in Pathway A, will be sent to social workers of such schools. Afterwards, the trained fieldworkers (agency's staff) will screen prospective participants from both Pathway A and Pathway B (including both participants and the CSOs) for their eligibility, obtain informed consent from i) the participants and their parents and ii) the CSOs, and refer the participants to the project officer (i.e. the social worker recruited for managing this study).

Baseline screening and randomization

With written informed consent obtained from both target research participants and their CSOs, the baseline survey will be conducted over the phone for about 15 minutes to obtain data about potential confounders (e.g., socio-demographics) and key variables (e.g., motivation to change and cravings on gaming). As the present study will adopt a two-armed RCT to examine the efficacy of CMI on improving IGD among adolescents with IGD. The research participants will be randomly assigned to either the intervention group (four-session CMI intervention plus IGD educational materials) or the control group (IGD education materials alone). Block randomization will be executed, of which the block size is 4. Computer-generated randomization allocation codes will be produced and sealed in opaque envelopes by a research associate with no involvement in recruitment. One envelope will be drawn and opened by the project officer.

Control group

The control group with IGD education materials alone

After completing the baseline screening, survey and randomization, the participants in the control group will receive educational materials regarding topics including: (1) what IGD is and its consequences, (2) how to communicate with parents about the gaming time, and (3) how to develop a healthy lifestyle, etc. The research team will develop the IGD education materials and provide them through the electronic mean, say WhatsApp.

Intervention group

The intervention group with CMI intervention plus IGD education materials

Eligible participants will be given the same IGD education materials that are given to the control group by e-channel. They will further participate in the four-session CMI intervention. Trained CMI practitioners will follow the CMI intervention protocol-IGD, which will be modified from the CMI intervention protocol for families with drug use problems to conduct the counselling session. In the first session (60 mins), adolescents with IGD will be implemented a standard MI session to elicit and strengthen the clients' motivation to change. In the second session (60 mins), a nominated CSO of the client will participate in a standard MI session to elicit their motivation to help the client toward change and prepare positive attitudes of CSO for the conjoint session. Afterwards, the third (75 mins) and fourth sessions (75 mins) will be conjoint sessions. The CMI practitioners will create a safe platform for both parties to share their perspectives with openness and trustfulness, in turn, to reach an agreed goal (e.g., develop a change plan on internet gaming behaviours). All interview sessions will be conducted in a counselling/meeting room at the schools or the service unit of the collaborators.

The follow-up survey

The present sets four time points to track change the outcome indicators from the baseline (T0) to posttest (T1), 3-month follow-up (T2) and 6-month follow-up (T3). The telephone follow-up survey will be conducted by a research associate/project officer independent of the intervention.

Measurements (Appendix 4)

Assessments and measures

Assessments will be conducted at the baseline (T0) to posttest (T1), 3-month follow-up (T2) and 6-month follow-up (T3). Personal information will be gathered at baseline and 6-month follow-up, covering socio-demographics, risk behaviors, parenting style, school and work performances, peer relationship/support, and recreational activities. Apart from the questionnaire for the primary client, a questionnaire for parents is also included to track the changes in the parent's perception of the client's gaming severity, parental stress, parents' motivation to help, and feedback on the counseling process, in order to understand the impact of family engagement in the treatment process. The key outcome measures used in the present study will be described below:

Primary outcome - Severity of IGD

The nine-item Internet Gaming Disorder Scale-Short-Form (IGDS9-SF) will be used to detect the change in the severity of IGD. It is the first brief standardized psychometric tool of IGD based on the nine DSM-5 IGD criteria. This instrument has been translated into 15 languages and is widely used in research and clinical settings. In addition, a validated Chinese version with satisfactory psychometric properties is available (Qin et al., 2020). The items were rated by using 5-point Likert scales (1 = Never to 5 = Very often). The commonly-used cut-off value of 32 will be used to differentiate between IGD and non-IGD (Qin et al., 2020).

Secondary outcomes

Motivation to change maladaptive gaming behaviour

Contemplation Ladder for Internet Gaming (CL-LG), which is derived from the Contemplation Ladder measure the motivation to quit smoking (Biener & Abrams, 1991), will be employed. Contemplation Ladder for drug use problems is commonly used in clinical settings and research in Hong Kong (Siu et al., 2018). The instrument measures the motivation to abstain from maladaptive gaming behaviours based on a single brief option of 11 rungs and five types of statements. The instrument is rated on a scale from 0 to 10, with

each point representing a specific statement showing a corresponding stage of change. The ladder has been used in smoking cessation studies, which displayed strong reliability and validity with strong intercorrelations (Pearson's $r = .82 - .98$) (Rustin & Tate, 1993).

Craving for Internet Gaming

Craving for Internet Gaming Scale (CIGS) will be used. This CIGS is a unidimensional, self-report measure that assesses respondents' intensity, frequency, duration of their craving, and capability to resist acting on their craving for a particular period of time. It comprises five-item, scoring from 0 to 6 for each item. Respondents with higher scores tend to have higher levels of gaming craving (Cronbach's alpha was .88-.91) (Savci & Griffiths, 2019).

Social support from CSO

The 4-item significant other subscale of the Multidimensional Scale of Perceived Social Support (MSPSS) will be used. It is a self-reporting instrument designed for assessing the level of perceived social support from significant others. The items are scored on a 7-point Likert scale ranging from 1 (very strongly disagree) to 7 (very strongly agree). The Cantonese version has demonstrated high internal consistency coefficient with a Cronbach's alpha of .89 (Chou, 2000).

Pilot study

Developing and revising the CMI Protocol for the IGD version

CMI protocol for families with substance abuse problems was developed in 2016. The protocol was examined the feasibility throughout the doctoral study of the PI between 2017-2019. Based on the previous CMI protocol, the research team will modify the treatment manual and convert it into IGD-specific content.

Pilot study

A pilot study will apply CMI to three pairs of adolescents with IGD and their CSOs. Four essential aspects will be tested, including process, resources, management and scientific (Thabane et al., 2010). It serves four aims to: (1) examine the flexibility of the revised CMI protocol, (2) check the readiness of pretest and posttest questionnaires, (3) the procedures for randomization, data collection and administrative tasks to make sure its smooth run. The project officer will interview both clients and CSOs regarding their subject experiences participating in the CMI intervention. The findings of the pilot study will provide evidence to modify the intervention protocol if needed for the main study.

Sample size estimation

We used G* Power software to calculate the sample size for the main study. (Faul et al., 2007). Considering that the between-group difference of IGD symptoms (the primary outcome) will be estimated with a medium effect size of .5, together with power of 80% and significance level of .05, a total sample size of 128 is required, which implies that 64 eligible paired participants (i.e., one participant paired with one CSO) are required for the intervention and control group, respectively. Referring to the dropout rate of 24.6% in CBT and MI for internet addiction (Thorens et al., 2014), this study allows the attrition rate of up to 25% at 6-month follow-up; the final sample size will be $N = 172$ paired participants (86 for intervention and control group each).

Statistical analysis plan

Baseline background data of the intervention and control groups will be compared by using t -test or X^2 test. Comparisons between the dropouts and non-dropouts will be analyzed. The

between-group (intervention versus control groups) differences in the primary and secondary outcomes will be compared by using logistic regression adjusting for baseline variables showing significant differences (i.e., potential confounders) as well as baseline values of such outcome variables. Intention-to-treat analysis will be used to examine between-group differences in the outcomes across time at baseline (T0) to posttest (T1), 3-month follow-up (T2) and 6-month follow-up (T3). Absolute and relative risk differences, number needed to treat (NNT), and respective 95% confidence intervals (CIs) will be reported. Multivariate analysis (e.g., Generalized Estimating Equation (GEE) for repeated measures) will also be applied to look at the between-group differences in the overall changes of the outcomes along time (e.g., time \times group interactions). One of the investigators (JTFL) is experienced in evaluating RCT studies.

Training and supervision

Professional training in Collective Motivational Interviewing for frontline workers

Collaborative parties are expected to nominate social workers/counsellors/counselling teachers to join a series of CMI training workshops (40 hours), which are led by the first and the only MINT certified MI trainer & a rater for the MI trainer certification scheme (PI-KW) in Hong Kong and also one of the founding researchers of CMI. The PI has solid clinical practice experience delivering MI-style practice, providing training and supervision. All prospective CMI practitioners are required to pass the competency assessment of CMI before providing the intervention in a real-life setting. It is expected that 5-8 CMI trainees will pass the competency assessment and conduct CMI sessions. Each trainee will take up 5 cases, then the maximum cases shared by CMI trainees will be 40 cases. The rest of the cases will be delivered by the project officer. The PI will provide on-job training to ensure the project officer will pass the CMI competence assessment.

Fidelity control

All trained CMI practitioners will follow the CMI intervention protocol for IGD to deliver the CMI intervention. The CMI intervention protocol – IGD will be modified from the original CMI protocol for people with drug use problems (Tse & Tse, 2016). On-going supervision will be held for the CMI practitioners to avoid therapist drift and offer support to resolve some difficulties in the CMI delivery. With the consent of research participants, all sessions of interventions will be audio-recorded to monitor and ensure the quality of CMI intervention. In addition, 20-min segments from 15% of CMI sessions will be randomly selected to go through the coding process for fidelity control by an expert third party who have been trained using the Collective Motivational Interviewing Treatment Integrity coding manual (cMITI) (Feldstein Ewing et al., 2021; Tse & Tse, 2020). cMITI was derived from the motivational interviewing treatment integrity coding system (Moyers et al., 2016). Two coders will analyse the same segments and make an agreement on the coding result. Inter-rater reliability will be reported.

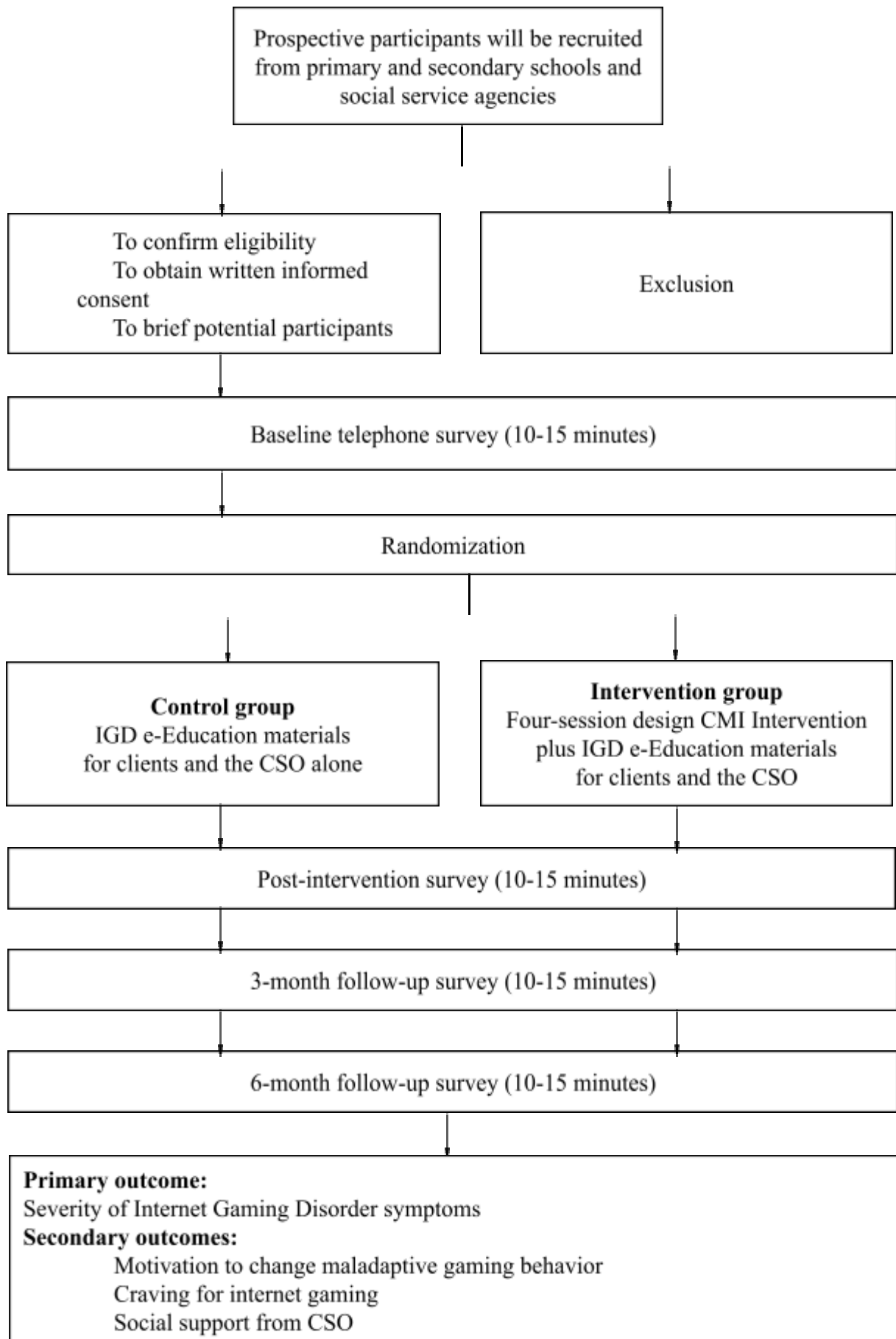
Ethical considerations

Ethical approval for the present study involving human participants will be obtained from the Research Ethics Review Panel, Research Coordination and Development Committee at CTIHE. In the present study, participants will be referred voluntarily from the schools and youth social service providers. The project officer will thoroughly explain the study goal, procedures, and potential benefits and risks to each participant. The project will obtain written informed consent from the clients (and their parents) and CSOs.

Contingency plan for the COVID-19 and other outbreaks of public health issues

When the social distancing measures are stringent because of the COVID-19 outbreak and another public health emergence in Hong Kong; face-to-face CMI intervention may be impossible. Then two alternatives will be considered. First, the CMI intervention will be moved to the Zoom/Online video conference platform. Second, the project may be postponed if approved by the RGC.

Flow chart of the Randomized Controlled Trial (RCT)



Project timetable

Tasks	Month Season	Year 1 - 2023				Year 2 - 2024				Year 3 - 2025			
		1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
PLANNING & DESIGN													
CMI intervention protocol-IGD													
Ethical approval													
Invite schools and confirm the participating schools													
Liaise collaborators and schedule the briefing sessions													
Recruitment of project officer & student helper													
Develop introduction package for the project													
Develop IGD education materials for control group													
Prepare pretest and posttest battery													
Train project officer													
CAPACITY BUILDING													
Promote CMI workshop													
Conduct CMI workshop													
CMI competency assessment													
INTERVENTION PHASE													
Piloting													
CMI intervention													
DATA MANAGEMENT													
Baseline Assessment													
Follow-up survey													
Data analysis													
FIDELITY CONTROL													
On-going supervision													
Coding process													
DISSEMINATION													
YouTube Videos													
Journal articles													
Project evaluation and writing up reports													

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