Clinical Social Work Journal
https://doi.org/10.1007/s10615-024-00968-5

ORIGINAL PAPER

Group Motivational Interviewing for Adolescents at Risk of Internet Gaming Disorder: A Mixed-Methods Preliminary Evaluation

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Accepted: 10 October 2024

Abstract

Internet gaming disorder (IGD) among adolescents is a widespread public health issue, with far-reaching negative impacts on adolescents' health and relationships with their families. This study evaluated the preliminary outcomes of a two-session Group Motivational Interviewing (GMI) programme designed to address the risk of IGD among students across primary, secondary, and university levels. Conducted in-person during short periods of time when schools were open during the COVID pandemic, the programme used experiential activities and guided discussions to (1) facilitate participants' reflection on time management, life goals, and gaming behaviours, and (2) cultivate readiness for change. Fifty-five students, aged 9 to 21, participated in the study, and outcomes were evaluated using a mixed-methods approach. Quantitative data tracked changes in severity of IGD symptoms, motivation for change, and time consumption on gaming, studying, and outdoor activities. The qualitative component involved analysing goal-setting worksheets to understand participants' motivations and potential barriers to change. Intervention fidelity was monitored using a modified checklist from the Assessment of Motivational Interviewing Groups– Observer Scale. Results revealed significant pre- to post-treatment reductions in gaming time and enhancements in motivation for change, but there was no significant change in the risks of IGD from baseline to post-treatment or three-month follow-up. Changes in the Contemplation Ladder indicated a sustained increase in motivation for change over the three-month follow-up. Furthermore, qualitative analysis revealed academic study as a crucial factor, serving both as a goal (improving academic results) and a barrier (alleviating academic stress) for changes in gaming behaviour. In conclusion, this study demonstrates that the two-session GMI programme is a feasible and potentially effective approach to engage students in reflecting on their gaming habits and promoting readiness for change. These preliminary results also provide support for conducting a full clinical trial on the effectiveness of the programme.

Keywords Motivational interviewing · Effectiveness · Evaluation · School counselling · Addictive behavior · Excessive gaming

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Video and computing gaming has become one of the most popular past times among young people worldwide (King et al., 2020; Marmet et al., 2023). While gaming platforms offer entertainment, social interaction, and potential stress relief (Bowman et al., 2022; Martinez et al., 2022; Pallavicini et al., 2022; Putra et al., 2023), they also present potential risks for addiction and poor health outcomes. Video games are designed to provide instant gratification and a sense of achievement as gamers move toward mastering more gaming skills and the increasing challenges of games (Groening & Binnewies, 2019). While the reward system in gaming can elicit pleasure and foster a sense of mastery and control, these systems can also lead to the development of compulsive gaming and loss of self-control over gaming behaviour (Billieux et al., 2019).

Published online: 07 November 2024

The rising prevalence of excessive gaming, particularly among children and adolescents, has raised public health concerns (Long et al., 2022). Many young gamers devote a great deal of time to this activity, often prioritising it over other critical daily tasks (Carlisle, 2021; Macur & Pontes, 2021; Stevens et al., 2021). While 'Internet Gaming Disorder' (IGD) remains a provisional disorder in the 5th revision of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013), the 11th revision of the International Classification of Diseases has recognised 'Gaming Disorder' (GD) as a mental disorder. The proposed diagnosis in ICD aims to encourage comprehensive research, on the diagnostic criteria, prevention, and treatment strategies of addictive gaming behaviour (World Health Organization, 2020). To meet the ICD criteria for disorder, the gaming behaviour needs to be severe enough to result in significant impairments in personal, familial, social, educational, and occupational functioning, or impairments in other areas of function for at least 12 months (World Health Organization, 2018).

Recent systematic reviews and meta-analyses have estimated the prevalence rate of IGD to be between 3.05% and 4.6% (Fam, 2018; Stevens et al., 2021). The rate is significantly higher in males than females (Kim et al., 2022), and when present, the disorder often starts between the ages of 12 and 18 years (Gentile et al., 2017). During the COVID-19 pandemic in Hong Kong, a school-based survey revealed that 83% of student respondents engaged in video gaming. Additionally, 20.9% exhibited signs of excessive gaming (four to six items out of seven items on the Game Addiction Scale [GAS]), and 5.3% met the criteria (seven items) for pathological gaming (Zhu et al., 2021). Excessive gaming has been shown to be associated with a range of biopsychosocial problems among adolescents, including poor academic achievement, poor diet and sleep patterns, increased tendencies for physical aggression, increased levels of depression and anxiety, social phobia, and strained parent-child relationships (Chan et al., 2022; Mihara & Higuchi, 2017).

In response to these growing concerns, health and social care practitioners have pioneered primary care and early intervention approaches to reduce the risk of IGD among adolescents (Marshall et al., 2022). A systematic review concluded that cognitive-behavioural therapy (CBT) approach is the most commonly used and effective non-pharmaceutical interventions for young people with gaming disorder. While there is empirical support for using CBT to treat gaming addiction (Hofmann et al., 2012; Ji & Wong, 2023), a significant proportion of individuals do not find the CBT approach to be acceptable or useful for addressing behavioural issues in gaming. This is reflected by a substantial non-compliance rate with treatment tasks, high dropout rates from CBT treatment exceeding 25% (Fernandez et al., 2015), and failure to maintain change after initial success (Gates et al., 2021; LeBeau et al., 2013; Naar-King et al., 2013; Zieve et al., 2019). The aim of this study was to determine if a Group Motivational Interviewing approach could provide an alternative therapeutic approach for those at risk of gaming disorder.

Group Motivational Interviewing for IGD

Motivational Interviewing (MI) is an evidence-based counselling approach for addressing addiction and related lifestyle issues (Miller & Rollnick, 2023). There have been numerous attempts to apply it in management of IGD in adolescents (Lindenberg et al., 2022). MI provides a therapeutic atmosphere to facilitate change, which is cultivated through a combination of the relational and technical components of MI. The relational component refers to the spirit of MI, including clinician behaviours that foster partnership, acceptance, compassion, and empowerment. The technical component refers to the clinical skills of asking open-ended questions, giving affirmation, doing reflection, and providing a summary. MI aims to help people resolve ambivalence and enhance motivation to change health-compromising behaviours, and is rooted in a client-centred approach (Miller & Rollnick, 2023). MI originated as a treatment for addiction but subsequently became widely employed to address a variety of other lifestyle and health issues, such as inactivity (Galbraith et al., 2022) and maladaptive diabetes management (McDaniel et al., 2021).

Although individual and group MI share the relational and technical components of all MI-based interventions, they are distinct in how these components are applied. Individual MI follows a four-task model consisting of engagement, which involves establishing a working relationship; focusing, which involves clarifying the client's agenda; evoking, which involves eliciting the client's reasons for change; and planning, which involves developing a change plan (Miller & Rollnick, 2023). On the other hand, group MI incorporates group dynamics (i.e., interaction patterns, norms, communication and roles within a group) and follows a similar but also distinct four-phase model that includes (1) group engagement– establishing a supportive and trusting group environment; (2) moving forward– encouraging exploration of personal motivations and ambivalence toward change; (3) perspective broadening– expanding understanding and consideration of different viewpoints and potential strategies for change, and (4) moving into action– developing and implementing actionable plans for change (Wagner & Ingersoll, 2012).

Preliminary findings suggest that MI could be an effective counselling approach in addressing gaming addiction tendency (Afriwilda & Mulawarman, 2021), often using a manualized MI-based intervention (Pallesen et al., 2015) or in combination with cognitive-behavioural therapy (Nierenberg, 2018). However, many of these studies were exploratory, and very few were randomised controlled trials. Moreover, MI is typically delivered in an individual format; however, there has been an emerging trend to evaluate the effects of Group Motivational Interviewing (GMI) (Wagner & Ingersoll, 2012), especially in substance abuse (D'Amico et al., 2014; Moreno et al., 2022; Santa Ana et al., 2021) and gaming addiction (Yakovenko et al., 2015).

With a growing interest in applying GMI to gaming disorder (Sun, 2022), implementing MI in a group format holds promise by fostering peer connections, shared learning experiences, and providing a supportive atmosphere conducive to expressing empathy among students (Santa Ana et al., 2007). Young people talk more comfortably in groups with peers who share similar cultures and values. A skilled group facilitator can use group dynamics to establish group norms, elicit insights, and promote behavioural change (Veenstra & Laninga-Wijnen, 2022). Moreover, GMI has the potential to be a more cost-effective alternative to individual counselling (Navidian et al., 2016; Spitz, 2001). Despite these advantages, few studies have evaluated the efficacy of GMI in clinical practice, particularly in IGD. In light of these considerations, the current study sought to address this research and clinical gap by developing a GMI intervention tailored for children and adolescents with a high risk for IGD and evaluating its feasibility in this population.

Methods

This study is one of the first attempts to evaluate the potential of GMI for IGD among adolescents. It used a mixed-methods methodology. The quantitative portion of the study employed a single-group pre-post design to evaluate changes in the severity of IGD symptoms, motivation for change, time spent on academic work, engagement in recreational activities, and involvement in outdoor pursuits. Data were collected at three time points: baseline, post-intervention, and three-month follow-up. The qualitative portion of the study examined the contents of the goal-setting worksheets completed by participants during the programme. This analysis provides insights into the facilitators and barriers to change among the participants.

The research questions guiding this study were structured as follows: (1) Might the GMI intervention enhance motivation for change among participating students with probable IGD? (2) Might the GMI interventions reduce IGD symptoms among the participating students? (3) What are the common goals for change among the participating students? (4) What factors might act as facilitators and barriers of making changes about gaming or other life goals?

Group Motivational Interviewing for Internet Gaming Disorder (GMI-IGD) Intervention

Drawing on the work of Wagner and Ingersoll (2012), we developed a Group Motivational Interviewing for Internet Gaming Disorder (GMI-IGD) intervention protocol. The intervention consisted of four progressively structured phases, each aimed at facilitating participation and involvement. In the initial phase called– Group Engagement– our focus was on fostering a welcoming, enjoyable, and supportive group atmosphere. In the second phase called– Moving Forward– the programme facilitator elicited information from their perspectives about gaming. In the third phase called– Perspective Broadening– the facilitator supports participants in examining their personal values and enhancing their motivation to make changes, mostly through the use of reflective statements. In the fourth and final phase– Moving into Action– the facilitator assists participants in developing a change plan while exploring any setbacks and challenges that have been encountered up to this point and might be encountered in the future. The intervention was manualized, and a copy of the treatment manual is available upon request from the first author.

The two 90–minute group sessions sought to help participants: (1) gain insight into their gaming behaviour by using the decisional balance to explore pros and cons of gaming; (2) develop a discrepancy between status quo (i.e., gaming habits) and change goals (e.g., improving family relationships or academic performance); and (3) resolve any ambivalence about change by evoking and strengthening the importance (i.e., personal values) and confidence (i.e., self-efficacy) levels about change. The group facilitator guided the participants in setting goals for behavioural changes that were particularly important to them, extending beyond merely gaming behaviour with autonomy support. The group facilitator was a senior social worker with a doctoral degree in addiction counselling. He is also a member and certified trainer of the Motivational Interviewing Network of Trainers (MINT), and has over ten years in the therapeutic application of MI.

Study Design and Procedures

Ethical approval for the study was obtained from the Human Subjects Ethics Sub-committee of the Hong Kong Polytechnic University (Reference Number: HSEARS20180604002-02). The GMI was conducted from June 2021 to January 2022 at one primary school, two secondary schools, and a university in Hong Kong. Participants for this study were recruited from students who participated in a health screening survey assessing their risks for IGD and related musculoskeletal and vision problems (Tsang et al., 2023) aged 9- to 21-year-old students ($N = 1{,}066$). We obtained written consent from all participants before they joined the group MI programme. Students aged 18 and over provided their own consent. For students under 18, their parents signed the consent forms to confirm their agreement for their child to participate in the programme.

The eligibility criteria for inclusion included: (1) a score of ≥ 16 on the Internet Gaming Disorder Scale Short Form (IGD9S-SF) (Severo et al., 2020); (2) not having a diagnosis of mental illness, and (3) not undergoing regular counselling for gaming problems.

Measures

Demographic and Descriptive Variables

At baseline, all participants were asked to provide demographic information (e.g., age and gender identity) and reported the amount of time spent using electronic devices for entertainment and study, as well as engaging in outdoor activities.

Severity of IGD

We used the 9-item Internet Gaming Disorder Scale-Short Form (IGDS9-SF; Pontes & Griffiths, 2015) to assess the severity of IGD. The IGDS9-SF items were developed based on the DSM-5 proposed criteria for Internet gaming disorder (Pontes & Griffiths, 2015). Respondents indicate how often they engage in behaviours indicative of IGD using a 5-point Likert scale (1 = '*Never*' to 5 = '*Very often*'). The IGDS9-SF has been translated into 15 languages and is widely used in research and clinical practice. It has been translated and validated for use in Chinese populations (Yam et al., 2019). The IGD9-SF employs a cutoff value of ≥ 32 for IGD classification in the Chinese population to avoid overestimation of prevalence in the Chinese context (Qin et al., 2020). A lower cut-off of 16 was chosen in the present study to detect students who may have potential gaming problems (Monacis et al., 2016), while a higher cut-off of 21 was used to assess students with probable IGD (Severo et al., 2020). The aim of using this scale in the current study was to track changes in addiction symptoms before through, follow-up of the intervention. We did not use this scale to classify the participants as definitively having or not having IGD, as previous research suggested that variation cut-offs at 16- or 21-points might lead to a false positive (Qin et al., 2020). Here, we adopted thresholds to distinguish between those with low-risk, probable, and very high-risk IGD. In collectivist cultures, students tend to evaluate their behaviors according to group norms. According to this study, student self-perceived gaming behavior may be highly common among peers, and non-perceived as problematic. Another possible aspect is that traditional Chinese families exercise relatively strict parental control over their children's gaming habits and academics, particularly when students are still in school. This, in turn, may result in a higher classification threshold for Chinese individuals compared to those from Italian and Brazilian backgrounds.

Readiness for Change

The Readiness to Change Questionnaire Treatment Version (RCQ-TV) is an instrument used to measure an individual's readiness to change. Respondents used a five-point Likert scale ranging from *'Strongly Disagree'* to *'Strongly Agree'* to answer 12 items. The RCQ-TV has three subscales that represent the stages of change in pre-contemplation, contemplation, and action. Higher scores indicate greater readiness for change (Heather & Hönekopp, 2008). The Chinese version of RCO-TV has demonstrated a Cronbach's $\alpha = 0.67$, indicating a marginal to acceptable range of internal consistency for the total score (Chen et al., 2017). Cronbach's α values for the precontemplation, contemplation, and action scales were 0.57, 0.42, 0.77, respectively, indicating inadequate reliability for the first two scales and adequate reliability of the action scale.

We also used the Contemplation Ladder for Internet Gaming (CL-LG) to assess readiness to change gaming behaviour. The original Contemplation Ladder was developed to measure readiness to quit drug use (Biener & Abrams, 1991; Slavet et al., 2006). Respondents use an 11-point scale to indicate their overall readiness for change, representing five stages: pre-contemplation (0–3), contemplation (4–6), preparation (7–8), action and maintenance (9–10) (Prochaska et al., 1992). The contemplation ladder has been used in smoking cessation research, demonstrating high reliability and validity with strong intercorrelations (Pearson's $r = .82$–0.98) (Rustin & Tate, 1993).

Implementation Fidelity

We developed the Fidelity Control Group Motivational Interviewing Compliance Monitoring Checklist (GMI-CMC) to monitor treatment adherence, which was modified from the Assessment of Motivation Interviewing Groups Observer Scale (AMIGOS; Wagner & Ingersoll, 2017). GMI-CMC comprises three components. The first component, "content compliance" checks whether the facilitator adheres to the intervention protocol and performs specific therapeutic tasks. This component consists of seven items rated using four options ranging from *'Yes*, *' 'Partial*, *' 'No*, *'* and *'Not applicable'*. The second component, 'skills adherence', has three subscales: group engagement (six items), client-centred style (six items), and MI change focus (six items). The third component 'Group development' checks the group processes (six items). The assessors rated 31 items using a three-option scale ranging from 'Yes (3–5 scores), ' 'No (1*–2 scores)*, *'* and *'Not applicable (0 score)'* to rate the compliance of the group to 24 criteria. Higher overall scores indicate greater compliance with group MI treatment protocol.

Goal-Settings Worksheet

In the final phase of each group session, participants were guided to complete a Goal-setting Worksheet (see Table 1), a tool used in MI to elicit change talk and plan for specific behavioural changes. The statement of goals for change clarifies one's desire, reasons, needs, and activation of one's intentions, plans for social support, and encourages open discourse on overcoming potential obstacles. The worksheet offered qualitative data to enrich the understanding of whether GMI could help participants in establishing a change plan for gaming or related behaviour. Furthermore, it aims to identify the facilitators and challenges associated with the implementation of the proposed change plan.

Table 1 Guiding questions for goal-setting worksheet

1.	I would like to make changes on _____. Which area(s) do you want to make changes on?
2.	The most important reason for making these changes. What is the most important reason for you to set these goals?
3.	To make it happen, I plan to take these actions. What is your plan for you to achieve your goals?
4.	Is there anything that can be done by someone else to help you achieve these goals?
5.	How do you know that your plan is practical/achievable?
6.	Is there anything that can possibly prevent you from achieving your plan?

Data Analysis

Data were analysed using SPSS version 26.0 (IBM Corp, 2022). Descriptive statistics were used to describe the sample characteristics, and internal consistency reliability was examined for each measure. Repeated measures analysis of variance (ANOVA) using the general linear model (GLM) procedures was performed to compare outcomes at baseline, post-test, and 3-month follow-up after the GMI intervention. To ensure fidelity control of the GMI intervention, two research assistants received three hours of training from an experienced coder on the effective use of CMI-CMC. These individuals then participated as observers during the group sessions and rated the fidelity of practice to Group MI standards using the GMI-CMC.

For qualitative data analysis, the content provided by the participants in the goal-setting worksheets was coded by two researchers. These two coders devised codes and themes collaboratively using a summative content analysis approach to quantify the occurrence of specific goals and interpret their meaning (Hsieh & Shannon, 2005). There were eight steps in this process: (1) reviewing and analysing the goal-setting worksheet; (2) becoming familiar with the data by repeatedly reading it; (3) defining and categorising the nature of goals; (4) organising and conceptualising the categories with a set of rules for coding in terms of commonalities and differences; (5) sorting the content by identifying common phrases, patterns, and relationships; (6) summarising a frequency table to demonstrate the analysis results; (7) drawing conclusions based on the results; and (8) reporting the findings. Two coders achieved an overall inter-rater reliability of 0.83, as measured by the Intraclass Correlation Coefficient (ICC), which indicates the consistency of their coding across the entire dataset. The inter-rater reliability (estimated by ICCs) for coding the content under the five sections of the worksheets by two raters were: desire (0.99), reason for change (0.98), taking steps (0.86), external support (0.85), and troubleshooting (0.85).

Results

Treatment Retention, Attrition, and Sample Characteristics

Out of 55 participants, forty-eight (87%) completed both of the sessions of GMI and all the three assessments. At the 3-month follow-up, 45 participants (81.82%) were able to be contacted with completion of the follow-up measures.

Among the participants, 33% ($n=18$) were primary school students, 53% ($n=29$) were secondary school students, and 15% ($n=8$) were university students. The average

age of the participants was 14.75 years ($SD = 3.5$ years; Range, 9 to 21 years), with 52% self-identifying as female and 48% as male. The screening results indicated that 13% ($n = 7$) met the criteria for marginal risky gaming but did not reach a score of16, 40% ($n = 22$) engaged in risky gaming (scores between 16 and 20), and 47% ($n = 26$) were identified as having probable IGD (scores of 21 or above). Participants reported spending an average of 6.0 h ($SD = 3.2$) on electronic devices for entertainment. 2.7 h ($SD = 3.2$) on study, and 2.8 h per day ($SD = 3.2$) on outdoors activities.

Quantitative Results

Changes in Severity of IGD Symptoms

Using General Linear Model, we analysed changes in IGD9-SF scores over baseline, post-intervention, and 3-month follow-up. No significant change was observed in the IGDS9-SF scores across three points, as indicated by the overall repeated-measures ANOVA (Wilk's $\lambda = 0.98$, $p = .671$).

Changes in Readiness for Change

An overall change was observed in the RCQ-TV questionnaire (Wilk's $\lambda = 0.68$, $p = .036$). There were no significant changes in the pre-contemplation subscale ($F = 1.27$, $p = .267$) and contemplation subscale ($F = 2.63$, $p = .083$), but there was a significant increase in the action subscale over the three time points ($F = 6.48$, $p = .003$). This indicates a significant improvement in participants' readiness to take action towards change. Among the 45 participants, 44.2% ($n = 20$) were in the action stage, 42.2% ($n = 19$) were in the contemplation stage, and 13.3% ($n = 6$) were in the pre-contemplation stage.

Analysis of the Contemplation Ladder using Friedman's Two-Way ANOVA revealed a statistically significant difference in readiness for change over the three measures ($F = 18.77$, $p < .001$). Pairwise comparison showed statistically significant changes between baseline and post-intervention ($p = .003$) and between baseline and follow-up ($p = .004$), with no significant difference between post-intervention and follow-up measures. These results suggest a significant increase in readiness for change between baseline and post-intervention, with gains in readiness for change maintained over the three-month follow-up period.

Changes in Hours Spending on Entertainment, Study and Outdoor Activities

Multivariate tests supported the conclusion that there was an overall change in entertainment, study, and outdoor activities (Wilk's $\lambda = 0.52$, $p = .001$). Univariate analysis showed that there were significant reduction in entertainment time ($F = 7.03$, $p = .003$) and increase in study time ($F = 7.69$, $p = .004$) but no significant changes in outdoor activities ($F = 0.31$, $p = .73$) over the three repeated measures (see Table 2).

Pairwise comparisons among pre-treatment, post-treatment, and follow-up measure showed that there was a significant reduction in entertainment hours from pre-treatment to post-treatment ($F = 6.17$, $p = .018$). and from post-treatment

Table 2 Analysis of changes in outcomes over pre-treatment, post-treatment, and follow-up by ANOVA ($N = 45$)

Variables	Pre-treatment		Post-treatment		Follow-up		Wilk's λ	F	η_p^2	F	
	M	SD	M	SD	M	SD				Pre-treatment vs. Post-treatment	Post vs. Follow up
IGDS9-SF	21.00	5.23	21.00	6.60	20.26	5.82	0.98	0.40	0.02	0.00	0.76
Readiness to Change (RCQ-TV)							0.68	2.59*	0.32	---	---
Pre-contemplation	-1.23	2.25	−0.92	3.03	−0.53	2.80	---	1.27	0.03	0.59	1.77
Contemplation	1.72	2.71	1.87	2.26	0.94	2.73	---	2.63	0.07	0.21	3.79
Action	−0.64	2.92	0.62	3.05	0.72	2.75	---	6.48**	0.15	8.49**	4.25*
Activity Hours							0.52	4.85**	0.18	---	---
Entertainment	6.00	3.15	4.89	2.38	4.25	2.51	---	7.03**	0.16	6.17*	7.74**
Study	2.73	3.20	1.74	1.38	4.54	4.34	---	7.69**	0.17	5.22*	8.22**
Outdoor activities	2.83	2.18	2.85	2.32	2.54	2.35	---	0.31	0.01	0.01	0.59
Contemplation Ladder for Internet Gaming (CL-LG)	1.52[a]	---	2.25[a]	---	2.23[a]	---	---	18.77	---	3.33**[b]	.11[b]

Note ANOVA = analysis of variance; IGDS9-SF = The nine-item Internet Gaming Disorder Scale-Short-Form; RCQ-TV = Readiness to Change Questionnaire – Treatment Version

[a] mean rank was reported, as data in the Contemplation Ladder is ordinal in nature. Friedman's Two Way ANOVA was used to compare mean ranks across the three repeated measures

[b] standardised test statistics of pair-wise comparisons was reported

*$p < .05$. **$p < .01$. ***$p < .001$

Table 3 Goals of participants ($N=76$)

Category of Goals	Examples of goals	Frequency	%
Self-management	Improve self-control Reduce time on smartphone Sleep more Less gaming Reduce harm on eyes Stop procrastination	34	44.7
Academic	Academic study Study	20	26.3
Participate more in other activities	More physical activities More reading Doing something more productive, fulfilling More extra-curriculum activities Develop different hobbies	13	17.1
Broad goals about future and development	Wealth Broaden horizons Character development Living style Understanding the world	5	6.6
Specific personal goals	Relationship with parents or friends Reduce body weight Diet	4	5.3

Table 4 Barriers to change ($N=51$)

Category of Barriers	Examples of Barriers	Frequency	%
Use of gadgets and games devices	Attraction of new games/videos Gaming Smartphone Electronic devices	15	29.4
Motivation	Laziness Lack of motivation Easy to give up	10	19.6
Self-management	Poor time management Lack of self-control Number of choices Urgency of other matters	7	13.7
Study	Academic burden Study/work	7	13.7
Body condition	Sleepiness Tiredness Sickness	4	7.8
Pressure from others	Chatting with friends Peer pressure Disagreement with parents	3	5.9
Emotions	Boredom Feeling discouraged	2	3.9

to follow-up ($F=7.74$, $p=.008$). There was also a significant increase in study hours between pre-treatment and post-treatment ($F=5.22$, $p=.028$), and from post-treatment to follow-up ($F=8.22$, $p=.007$).

Fidelity Control

In the present study, seven GMI groups were conducted, and each session was independently evaluated by two trained coders using the GMI-CMC checklist. The results indicated that skill adherence, content compliance, and group development were 'Yes,' demonstrating a high level of treatment fidelity. The high treatment integrity may be attributed to the fact that the facilitator was a senior clinical social worker with rich experience in delivering MI groups.

Qualitative Results

Content Analysis of Change Goals and Barriers to Goals Completion

A total of 76 goals were captured from the goal exercise worksheet. These goals were coded independently by two team members and analysed into five areas (see Table 3): (1) academic study and results ($n=20$, 26.3%); (2) participation in activities other than games and smartphones ($n=13$, 17.1%); (3) self-management ($n=34$, 44.7%); (4) broad goals about the future and personal development ($n=5$, 6.6%); and (5) specific goals ($n=4$, 5.3%).

The analysis of barriers to goal completion revealed 51 barriers (see Table 4). The most common barriers to achieving personal goals were the availability of games and gadgets ($n=15$, 29.4%), followed by motivation ($n=10$, 19.6%), self-management ($n=7$, 13.7%), academic burden ($n=7$, 13.7%), body condition ($n=4$, 7.8%), pressure from others ($n=3$, 5.9%), playing with others ($n=3$, 5.9%), and emotions ($n=2$, 3.9%).

Discussion

The aim of this study was to evaluate the feasibility of GMI for addressing internet gaming problems among adolescents in school settings. Despite the fact that the GMI intervention evaluated was the preliminary results provide tentative support for its efficacy in promoting motivation for change in gaming behaviour. This was evidenced by a significant increase in scores on the action subscale of the RCQ-TV and the Contemplation Ladder. Participants also took specific action to change between the end of the programme and the three-month follow-up, suggesting that they developed awareness of the need for change after they joined the GMI (Velasquez et al., 2006).

The positive impact of GMI on treatment participation is consistent with prior research demonstrating that MI enhances treatment adherence and retention (Hurlocker et al., 2023; Jake-Schoffman et al., 2021). In the same vein of

GMI for substance use treatment, this study indicated high levels of engagement and treatment retention, emphasising the potential effectiveness of GMI for IGD (Carroll et al., 2006; Li et al., 2016; Macaulay et al., 2023). Higher treatment engagement is associated with better treatment outcomes for lifestyle changes (Nurmi et al., 2020).

Most participants completed goal-setting activities and expressed their intentions to make changes. These actions were consistent with our observations during the group sessions, where participants appeared quite ready to set goals for change (Resnicow & McMaster, 2012). Many were aware that they were spending too much time on entertainment, not just gaming, and set goals to balance study and entertainment time. This suggests that MI-based group sessions could help participants transition from contemplation to action.

Comparing post-test and follow-up data, we observed that participants decreased their entertainment time and increased their time spent studying. This finding supports the conclusion that a significant proportion of the participants worked on and achieved the goals of change they set during the group. GMI is designed to facilitate participants in reflecting on their core values, exploring intentions for change, establishing goals, and facilitating autonomy in goal setting. All of these can cultivate a sense of control over their own achievement. Consequently, GMI may contribute to a greater motivation to reach one's personal goals (Koestner, 2008; Pritchard et al., 2022). An alternative explanation of these achievements is that the participants could have already been ready for change (preparation stages) when they joined the group intervention. The group might have mainly facilitated them to move on to set goals and take action. A randomised controlled trial is needed to determine how much of the improvements observed were due to the treatment, and how much might be due to other factors, such as expectancy effects and regression to the mean. The findings from the current study indicate that such an RCT is warranted.

The qualitative data derived from the goal-setting worksheet exercises offer valuable insights into the participants' behaviour and attitudes toward their gaming habits and time management. The primary goal identified across the change plans was self-management, indicating that the participants were aware of their gaming habits, internet overuse, or excessive screen time. They expressed their desire to manage their use of electronic devices and explored alternatives to gaming. The second most mentioned goal was academic study, which is consistent with the high expectations about academic achievement in Hong Kong (Chyu & Chen, 2022). It is well known that academic success can be negatively impacted by excessive gaming and Internet addiction (Farillon et al., 2022), especially children (Ippolito & Pressman, 2024). Frustrations with study and academic results could also be linked to development of gaming addiction (Hawi et al., 2018; Mihara & Higuchi, 2017). The third most common goal was to engage more in other activities, suggesting that reducing time spent on gaming could be achieved by diversifying activities. This finding resonates with the elevated academic expectations prevalent in Hong Kong, where students use gaming to alleviate academic stress (Kwok et al., 2021). Additionally, research indicates that playing online games is not positively correlated with academic performance (Ciris et al., 2022). Conversely, collaborative gaming can improve students' abilities and behaviour and, possibly, their academic success in comparison with other students (Lamb et al., 2018; Vlachopoulos & Makri, 2017). However, the question, 'What came first, the chicken or the egg?' remains open.

Regarding barriers to change, the most mentioned factors are the use of gadgets and game devices, motivation for change, and lack of self-management. These findings largely reiterate that self-management is the most important target for facilitating change. The fourth most commonly mentioned barrier to change was study. It is interesting to note that academic study is regarded as both a goal and a barrier. This reveals the ambivalence that many students may have about doing well in academic study, and may also reflect the difficulty for many to find time to increase their study hours. Young people who are frustrated with their academic studies may gravitate towards addictions to gaming and internet, which are rather immediately and effortlessly rewarding. The participants also mentioned the impact of gaming on body condition (e.g., tiredness and drowsiness), emotions, and peer pressure (playing with friends and siblings), but these factors were not mentioned frequently. Thus, these latter factors are unlikely to be the key barriers to change.

Limitations

This pilot study used a single-group pretest-posttest design and as a pilot study had a relatively small sample size, both of which limit the reliability of, as well as the conclusions which can be drawn from, the study findings. As noted previously, research using a more rigorous randomised controlled trial design with larger sample sizes is needed to draw firmer conclusions regarding the effects of the intervention. In addition, the sample was fairly heterogeneous, as the participants came from a wide age range and level of study covering primary, secondary, and university education. While we used a similar group intervention content and protocol for young people of different ages and educational levels, we found that the groups were more interactive for participants who were older (in their late teens), and group

facilitation was likely more effective. Thus, the intervention may need to be adapted to be more effective for younger children. Moreover, more accurate estimates of the intervention can be obtained in samples that are more homogeneous.

In addition, this study was conducted during the COVID-19 pandemic, which presented several challenges. There were periods of lockdown followed by loosening of social restrictions. Although we were able to conduct all groups in a face-to-face mode, we had problems running more sessions with each group and performing more follow-up measurements during the pandemic. Social restrictions and infection control measures (like wearing masks and social distancing) could also have some impact on group interaction and dynamics.

Practical Implications

This pilot feasibility study supports the possibility that a brief group MI programme could be helpful in facilitating motivation for change in adolescents with probable IGD. From the perspective of an addiction counsellor, a group for managing gaming disorder could be quite different from a group for substance or sex addiction, in which clients are much more guarded in taking about their behaviour. The counsellor began by discussing and exploring the benefits and positive aspects of gaming, which appeared to facilitate a safe and non-confrontational and less defensive atmosphere within the group. However, the discussion of benefits of gaming could be contrary to the standard practice of MI, which emphasizes strengthening change talk and minimizing sustain talk in the motivational process.

We also noticed that the use of experiential exercises, activities, and guided worksheets was very helpful in facilitating the group process. Young people enjoyed participation in experiential activities, which were followed by reflection and discussion. Most of the participants made effort to complete the written worksheet. Worksheets are commonly used learning tools in schools, and the worksheet helped participants focus on issues and present their ideas to other group members. This could be incorporated into developing a manualised approach to GMI for gaming problems.

Future Research

These findings highlight the need for more clinical trials of GMI in school counselling settings. The most rigorous studies would include use of control group and random assignment. Future studies could recruit a more homogeneous sample with a smaller range in age and level of study. They may also examine if GMI programme of more sessions (than two) could be even more effective in reducing risk of gaming issues. Future studies could also compare GMI with other similar interventions across different contexts and populations. It could also explore the effectiveness of GMI, which is a brief intervention that focuses on motivation as a prelude and has the potential to be integrated with other intensive treatments, such as cognitive behavioural therapy. Additionally, the study sheds light on potential barriers to change, such as the availability of gadgets and gaming devices, as well as the role of self-management in both facilitating and hindering change. Further research could delve deeper into these barriers to develop effective strategies to overcome them.

Conclusion

The study findings support the potential feasibility of GMI for helping adolescents who are at-risk for IGD. Specifically, the findings suggest that GMI has the potential to promote changes in readiness for change and taking action. Group process data from the goal-setting worksheets showed that the participants were well aware of the need for better self-management and were ambivalent about engaging or disengaging in academic study. Academic study is seen as an important goal for change, but also a barrier to instigating change in gaming behaviour.

Acknowledgements The authors would like to acknowledge the principals, teachers, and students at the schools and the support of InnoHK initiative to this study.

Authors Contributions S.T.: Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Writing - review & editing. N.T.: Intervention, Data analysis, Writing - original draft, Writing - review & editing. A.S.: Funding acquisition, Data curation, Formal analysis, Software, Validation, Writing - review & editing. M.J.: Funding acquisition, Writing - review & editing.

Funding This research was supported by Health and Medical Research Fund (Project number.: 02180348).
Open access funding provided by The Hong Kong Polytechnic University

Data Availability The data utilized in this study is considered confidential and can be requested upon formal request to the corresponding author.

Declarations

Competing Interests (First author) was employed by this project to deliver the group motivational interviewing with children and adolescents who are at risk of developing gaming disorder. The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

Afriwilda, M. T., & Mulawarman, M. (2021). The effectiveness of motivational interviewing counselling to improve psychological well-being on students with online game addiction tendency. *Islamic Guidance and Counselling Journal*, *4*(1), 106–115. https://doi.org/10.25217/igcj.v4i1.1235

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5*. American Psychiatric Publishing Inc.

Biener, L., & Abrams, D. B. (1991). The contemplation ladder: Validation of a measure of readiness to consider smoking cessation. *Health Psychology*, *10*(5), 360–365. https://doi.org/bmxgxv

Billieux, J., Flayelle, M., Rumpf, H. J., & Stein, D. J. (2019). High involvement versus pathological involvement in video games: A crucial distinction for ensuring the validity and utility of gaming disorder. *Current Addiction Reports*, *6*, 323–330. https://doi.org/10.1007/s40429-019-00259-x

Bowman, N. D., Rieger, D., & Lin, J. H. T. (2022). Social video gaming and well-being. *Current Opinion in Psychology*, *45*, 101316. https://doi.org/10.1016/j.copsyc.2022.101316

Carlisle, K. (2021). Utility of DSM-5 criteria for internet gaming disorder. *Psychological Reports*, *124*(6), 2613–2632. https://doi.org/10.1177/00332941209654

Carroll, K. M., Ball, S. A., Nich, C., Martino, S., Frankforter, T. L., Farentinos, C., Kunkel, L. E., Mikulich-Gilbertson, S. K., Morgenstern, J., Obert, J. L., Polcin, D., Snead, N., & Woody, G. E. (2006). Motivational interviewing to improve treatment engagement and outcome in individuals seeking treatment for substance abuse: A multisite effectiveness study. *Drug and Alcohol Dependence*, *81*(3), 301–312. https://doi.org/bz8vjr

Chan, G., Huo, Y., Kelly, S., Leung, J., Tisdale, C., & Gullo, M. (2022). The impact of eSports and online video gaming on lifestyle behaviors in youth: A systematic review. *Computers in Human Behavior*, *126*, 106974. https://doi.org/gnkwd4

Chen, H. L., Chen, V. C. H., Wang, S. Y., & Lin, T. Y. (2017). The reliability of readiness to change questionnaire-treatment version Chinese version (RCQ-TV [Ch]) in heroin users. 臺灣精神醫學, *31*(4), 355–360. https://www.airitilibrary.com/Article/Detail?DocID=10283684-201712-201712250018-201712250018-355-360

Chyu, E. P. Y., & Chen, J. K. (2022). Associations between academic stress, mental distress, academic self-disclosure to parents and school engagement in Hong Kong. *Frontiers in Psychiatry*, *13*, 911530. https://doi.org/10.3389/fpsyt.2022.911530

Ciris, V., Baskonus, T., Kartal, T., & Tasdemir, A. (2022). A study on digital game addictions of adolescents in the Covid-19 pandemic. *Journal of Education in Science Environment and Health, 8*(2), 168–186. https://doi.org/10.55549/jeseh.01113707

D'Amico, E. J., Houck, J. M., Hunter, S. B., Miles, J. N., Osilla, K. C., & Ewing, B. A. (2014). Group motivational interviewing for adolescents: Change in talk, alcohol, and marijuana outcomes. *Journal of Consulting and Clinical Psychology*, *83*(1), 68–80. https://doi.org/10.1037/a0038155

Fam, J. Y. (2018). Prevalence of internet gaming disorder in adolescents: A meta-analysis across three decades. *Scandinavian Journal of Psychology*, *59*(5), 524–531. https://doi.org/10.1111/sjop.12459

Farillon, L. M. F., Farillon, K. S. F., & Farillon, E. F. (2022). Computer games addiction and class performance of selected Philippine senior high school students. *Utamax: Journal of Ultimate Research and Trends in Education*, *4*(3), 186–201. https://doi.org/10.31849/utamax.v4i3.10292

Fernandez, E., Salem, D., Swift, J. K., & Ramtahal, N. (2015). Meta-analysis of dropout from cognitive behavioral therapy: Magnitude, timing, and moderators. *Journal of Consulting and Clinical Psychology*, *83*(6), 1108–1122. https://doi.org/10.1037/ccp0000044

Galbraith, N., Rose, C., & Rose, P. (2022). The roles of motivational interviewing and self-efficacy on outcomes and cost-effectiveness of a community-based exercise intervention for inactive middle-older aged adults. *Health & Social Care in the Community*, *30*(4), e1048–e1060. https://doi.org/10.1111/hsc.13510

Gates, V., Hsiao, M., Zieve, G. G., Courry, R., & Persons, J. B. (2021). Relationship to CBT outcome and dropout of decision support tools of the written case formulation, list of treatment goals and plot of symptom scores. *Behavior Research and Therapy*, *142*, 103874. https://doi.org/10.1016/j.brat.2021.103874

Gentile, D. A., Bailey, K., Bavelier, D., Brockmyer, J. F., Cash, H., Coyne, S. M., Doan, A., Grant, D. S., Green, C. S., & Griffiths, M. (2017). Internet gaming disorder in children and adolescents. *Pediatrics*, *140*(Supplement_2), S81–S85. https://doi.org/10.1542/peds.2016-1758H

Groening, C., & Binnewies, C. (2019). Achievement unlocked!-The impact of digital achievements as a gamification element on motivation and performance. *Computers in Human Behavior*, *97*, 151–166. https://doi.org/10.1016/j.chb.2019.02.026

Hawi, N. S., Samaha, M., & Griffiths, M. D. (2018). Internet gaming disorder in Lebanon: Relationships with age, sleep habits, and academic achievement. *Journal of Behavioral Addictions*, *7*(1), 70–78. https://doi.org/10.1556/2006.7.2018.16

Heather, N., & Hönekopp, J. (2008). A revised edition of the readiness to change questionnaire [Treatment version]. *Addiction Research & Theory*, *16*(5), 421–433. https://doi.org/10.1080/16066350801900321

Hofmann, S. G., Asnaani, A., Vonk, I. J., Sawyer, A. T., & Fang, A. (2012). The efficacy of cognitive behavioral therapy: A review of meta-analyses. *Cognitive Therapy and Research*, *36*, 427–440. https://doi.org/10.1007/s10608-012-9476-1

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Hurlocker, M. C., Moyers, T. B., Hatch, M., Curran, G., McCrady, B., Venner, K. L., & Witkiewitz, K. (2023). Effectiveness and feasibility of a motivational interviewing intake (MII) intervention for increasing client engagement in outpatient addiction treatment: An effectiveness-implementation hybrid design protocol. *Addiction Science & Clinical Practice*, *18*(1), 63. https://doi.org/10.1186/s13722-023-00412-y

IBM Corp. (2022). *IBM SPSS statistics for Windows, Version 26.0*. IBM Corp.

Ippolito, M., & Pressman, S. M. (2024). The influence of social media and gaming practices on perceived academic performance in children. *Advance*. https://doi.org/10.31124/advance.24916098.v1

Jake-Schoffman, D. E., Brown, S. D., Baiocchi, M., Bibeau, J. L., Daubenmier, J., Ferrara, A., Galarce, M. N., Hartogensis, W., Hecht, F. M., & Hedderson, M. M. (2021). Methods-motivational

interviewing approach for enhanced retention and attendance. *American Journal of Preventive Medicine*, *61*(4), 606–617. https://doi.org/10.1016/j.amepre.2021.04.005

Ji, Y., & Wong, D. F. K. (2023). Effectiveness of an integrated motivational cognitive–behavioral group intervention for adolescents with gaming disorder: A randomized controlled trial. *Addiction*, *118*(11), 2093–2104. https://doi.org/10.1111/add.16292

Kim, H. S., Son, G., Roh, E. B., Ahn, W. Y., Kim, J., Shin, S. H., Chey, J., & Choi, K. H. (2022). Prevalence of gaming disorder: A meta-analysis. *Addictive Behaviors*, *126*, 107183. https://doi.org/gnt8gt

King, D. L., Delfabbro, P. H., Billieux, J., & Potenza, M. N. (2020). Problematic online gaming and the COVID-19 pandemic. *Journal of Behavioral Addictions*, *9*(2), 184–186. https://doi.org/10.1556/2006.2020.00016

Koestner, R. (2008). Reaching one's personal goals: A motivational perspective focused on autonomy. *Canadian Psychology/Psychologie Canadienne*, *49*(1), 60–67. https://doi.org/10.1037/0708-5591.49.1.60

Kwok, C., Leung, P. Y., Poon, K. Y., & Fung, X. C. (2021). The effects of internet gaming and social media use on physical activity, sleep, quality of life, and academic performance among university students in Hong Kong: A preliminary study. *Asian Journal of Social Health and Behavior*, *4*(1), 36–44. https://doi.org/10.4103/shb.shb_81_20

Lamb, R. L., Annetta, L., Firestone, J., & Etopio, E. (2018). A meta-analysis with examination of moderators of student cognition, affect, and learning outcomes while using serious educational games, serious games, and simulations. *Computers in Human Behavior*, *80*, 158–167. https://doi.org/10.1016/j.chb.2017.10.040

LeBeau, R. T., Davies, C. D., Culver, N. C., & Craske, M. G. (2013). Homework compliance counts in cognitive-behavioral therapy. *Cognitive Behavior Therapy*, *42*(3), 171–179. https://doi.org/10.1080/16506073.2013.763286

Li, L., Zhu, S., Tse, N., Tse, S., & Wong, P. (2016). Effectiveness of motivational interviewing to reduce illicit drug use in adolescents: A systematic review and meta-analysis. *Addiction*, *111*(5), 795–805. https://doi.org/gdskpn

Lindenberg, K., Kindt, S., & Szász-Janocha, C. (2022). Effectiveness of cognitive behavioral therapy–based intervention in preventing gaming disorder and unspecified internet use disorder in adolescents: A cluster randomized clinical trial. *JAMA Network Open*, *5*(2), e2148995. https://doi.org/10.1001/jamanetworkopen.2021.48995

Long, J., Bhad, R., Potenza, M. N., Orsolini, L., Phan, V., Kanabar, M., & Achab, S. (2022). Public health approaches and policy changes after the inclusion of gaming disorder in ICD-11: Global needs. *BJPsych International*, *19*(3), 63–66. https://doi.org/10.1192/bji.2021.57

Macaulay, S., Grinzi, P., & Slota-Kan, S. (2023). Engaging patients who use alcohol and other drugs: A practical approach. *Australian Journal of General Practice*, *52*(3), 115–121. https://doi.org/10.31128/ajgp-04-22-6387

Macur, M., & Pontes, H. M. (2021). Internet gaming disorder in adolescence: Investigating profiles and associated risk factors. *Bmc Public Health*, *21*, 1–9. https://doi.org/10.1186/s12889-021-11394-4

Marmet, S., Wicki, M., Dupuis, M., Baggio, S., Dufour, M., Gatineau, C., Gmel, G., & Studer, J. (2023). Associations of binge gaming (5 or more consecutive hours played) with gaming disorder and mental health in young men. *Journal of Behavioral Addictions*, *12*(1), 295–301. https://doi.org/10.1556/2006.2022.00086

Marshall, B., Warburton, W., & Kangas, M. (2022). Internet gaming disorder (IGD) in children: Clinical treatment insights. *Annals of Case Reports*, *7*(2), 816. https://doi.org/10.29011/2574-7754.100816

Martinez, L., Gimenes, M., & Lambert, E. (2022). Entertainment video games for academic learning: A systematic review. *Journal of Educational Computing Research*, *60*(5), 1083–1109. https://doi.org/10.1177/07356331211053

McDaniel, C. C., Kavookjian, J., & Whitley, H. P. (2021). Telehealth delivery of motivational interviewing for diabetes management: A systematic review of randomized controlled trials. *Patient Education and Counselling*, *105*(4), 805–820. https://doi.org/10.1016/j.pec.2021.07.036

Mihara, S., & Higuchi, S. (2017). Cross-sectional and longitudinal epidemiological studies of internet gaming disorder: A systematic review of the literature. *Psychiatry and Clinical Neurosciences*, *71*(7), 425–444. https://doi.org/10.1111/pcn.12532

Miller, W. R., & Rollnick, S. (2023). *Motivational interviewing: Helping people change and grow* (4 ed.). Guilford Press.

Monacis, L., Palo, V. D., Griffiths, M. D., & Sinatra, M. (2016). Validation of the internet gaming disorder scale–short-form (IGDS9-SF) in an italian-speaking sample. *Journal of Behavioral Addictions*, *5*(4), 683–690. https://doi.org/10.1556/2006.5.2016.083

Moreno, O., Avila, M., Garcia-Rodriguez, I., Romo, S., Rodriguez, J., Matos, C., Fuentes, L. S., Hernandez, C., Ramos, M. S., & Muñoz, G. (2022). Culturally enhancing a group-based motivational interviewing substance use prevention program for latine youth. *Contemporary Clinical Trials Communications*, *30*, 100991. https://doi.org/10.1016/j.conctc.2022.100991

Naar-King, S., Earnshaw, P., & Breckon, J. (2013). Toward a universal maintenance intervention: Integrating cognitive-behavioral treatment with motivational interviewing for maintenance of behavior change. *Journal of Cognitive Psychotherapy*, *27*(2), 126–137. https://doi.org/10.1891/0889-8391.27.2.126

Navidian, A., Kermansaravi, F., Tabas, E. E., & Saeedinezhad, F. (2016). Efficacy of group motivational interviewing in the degree of drug craving in the addicts under the methadone maintenance treatment (MMT) in South East of Iran. *Archives of Psychiatric Nursing*, *30*(2), 144–149. https://doi.org/10.1016/j.apnu.2015.08.002

Nierenberg, B. J. (2018). *A proposed intervention treatment program for video game addiction utilizing evidence-based interventions from cognitive-behavioral therapy and motivational interviewing* (Publication Number 13423114) The Chicago School of Professional Psychology]. Unpublished doctoral dissertation.

Nurmi, J., Knittle, K., Ginchev, T., Khattak, F., Helf, C., Zwickl, P., Castellano-Tejedor, C., Lusilla-Palacios, P., Costa-Requena, J., & Ravaja, N. (2020). Engaging users in the behavior change process with digitalized motivational interviewing and gamification: Development and feasibility testing of the precious app. *JMIR mHealth and uHealth*, *8*(1), e12884. https://doi.org/10.2196/12884

Pallavicini, F., Pepe, A., & Mantovani, F. (2022). The effects of playing video games on stress, anxiety, depression, loneliness, and gaming disorder during the early stages of the COVID-19 pandemic: PRISMA systematic review. *Cyberpsychology Behavior and Social Networking*, *25*(6), 334–354. https://doi.org/10.1089/cyber.2021.0252

Pallesen, S., Lorvik, I. M., Bu, E. H., & Molde, H. (2015). An exploratory study investigating the effects of a treatment manual for video game addiction. *Psychological Reports*, *117*(2), 490–495. https://doi.org/10.2466/02.PR0.117c14z9

Pontes, H. M., & Griffiths, M. D. (2015). Measuring DSM-5 internet gaming disorder: Development and validation of a short psychometric scale. *Computers in Human Behavior*, *45*, 137–143. https://doi.org/10.1016/j.chb.2014.12.006

Pritchard, L., Phelan, S., McKillop, A., & Andersen, J. (2022). Child, parent, and clinician experiences with a child-driven goal setting approach in paediatric rehabilitation. *Disability and Rehabilitation*, *44*(7), 1042–1049. https://doi.org/10.1080/09638288.2020.1788178

Prochaska, J. O., DiClemente, C. C., & Norcross, J. C. (1992). In search of how people change: Applications to addictive behaviors. *American Psychologist*, *47*(9), 1102–1114. https://doi.org/dhxbjh.

Putra, P. Y., Fithriyah, I., & Zahra, Z. (2023). Internet addiction and online gaming disorder in children and adolescents during COVID-19 pandemic: A systematic review. *Psychiatry Investigation*, *20*(3), 196. https://doi.org/10.30773/pi.2021.0311

Qin, L., Cheng, L., Hu, M., Liu, Q., Tong, J., Hao, W., Luo, T., & Liao, Y. (2020). Clarification of the cut-off score for nine-item internet gaming disorder scale–short form (IGDS9-SF) in a Chinese context. *Frontiers in Psychiatry*, *11*, 470. https://doi.org/10.3389/fpsyt.2020.00470

Resnicow, K., & McMaster, F. (2012). Motivational interviewing: Moving from why to how with autonomy support. *International Journal of Behavioral Nutrition and Physical Activity*, *9*(1), 1–9. https://doi.org/10.1186/1479-5868-9-19

Rustin, T. A., & Tate, J. C. (1993). Measuring the stages of change in cigarette smokers. *Journal of Substance Abuse Treatment*, *10*(2), 209–220. https://doi.org/b7bq67

Santa Ana, E. J., Wulfert, E., & Nietert, P. J. (2007). Efficacy of group motivational interviewing (GMI) for psychiatric inpatients with chemical dependence. *Journal of Consulting and Clinical Psychology*, *75*(5), 816–822. https://doi.org/10.1037/0022-006X.75.5.816

Santa Ana, E. J., LaRowe, S. D., Gebregziabher, M., Morgan-Lopez, A. A., Lamb, K., Beavis, K. A., Bishu, K., & Martino, S. (2021). Randomized controlled trial of group motivational interviewing for veterans with substance use disorders. *Drug and Alcohol Dependence*, *223*, 108716. https://doi.org/gjrzrh

Severo, R. B., Barbosa, A. P. P. N., Fouchy, D. R. C., da Cunha Coelho, F. M., Pinheiro, R. T., de Figueiredo, V. L. M., de Siqueira Afonso, V., Pontes, H. M., & Pinheiro, K. A. T. (2020). Development and psychometric validation of internet gaming disorder scale-short-form (IGDS9-SF) in a Brazilian sample. *Addictive Behaviors*, *103*, 106191. https://doi.org/10.1016/j.addbeh.2019.106191

Slavet, J. D., Stein, L., Colby, S. M., Barnett, N. P., Monti, P. M., Golembeske, C. Jr, & Lebeau-Craven, R. (2006). The Marijuana Ladder: Measuring motivation to change marijuana use in incarcerated adolescents. *Drug and Alcohol Dependence*, *83*(1), 42–48. https://doi.org/bqznrj

Spitz, H. I. (2001). Group psychotherapy of substance abuse in the era of managed mental health care. *International Journal of Group Psychotherapy*, *51*(1), 21–41. https://doi.org/10.1521/ijgp.51.1.21.49726

Stevens, M. W., Dorstyn, D., Delfabbro, P. H., & King, D. L. (2021). Global prevalence of gaming disorder: A systematic review and meta-analysis. *Australian & New Zealand Journal of Psychiatry*, 1–16. https://doi.org/10.1177/0004867420962851

Sun, X. (2022). *The effects of online group Motivational Interviewing intervention for adolescents with internet gaming disorder in Chin* (Publication Number 29318633) Regent University]. Unpublished doctoral dissertation.

Tsang, S. M., Cheing, G. L., Lam, A. K., Siu, A. M., Pang, P. C., Yip, K.-C., Chan, J. W., & Jensen, M. P. (2023). Excessive use of electronic devices among children and adolescents is associated with musculoskeletal symptoms, visual symptoms, psychosocial health, and quality of life: A cross-sectional study. *Frontiers in Public Health, 11*, 1178769. https://doi.org/10.3389/fpubh.2023.1178769

Veenstra, R., & Laninga-Wijnen, L. (2022). Peer network studies and interventions in adolescence. *Current Opinion in Psychology*, *44*, 157–163. https://doi.org/10.1016/j.copsyc.2021.09.015

Velasquez, M. M., Stephens, N. S., & Ingersoll, K. (2006). Motivational interviewing in groups. *Journal of Groups in Addiction & Recovery*, *1*(1), 27–50. https://doi.org/10.1300/J384v01n01_03

Vlachopoulos, D., & Makri, A. (2017). The effect of games and simulations on higher education: A systematic literature review. *International Journal of Educational Technology in Higher Education*, *14*, 1–33. https://doi.org/10.1186/s41239-017-0062-1

Wagner, C. C., & Ingersoll, K. S. (2012). *Motivational interviewing in groups*. Guilford Press.

Wagner, C. C., & Ingersoll, K. S. (2017). Development and initial validation of the Assessment of Motivational Interviewing Groups–Observer scales (AMIGOS). *International Journal of Group Psychotherapy*, *68*(1), 69–79. https://doi.org/10.1080/00207284.2017.1315587

World Health Organization (2018). *International statistical classification of diseases and related health problems (11th Revision)*. https://icd.who.int/browse11/l-m/en

World Health Organization (2020). *International classification of diseases, 11th revision (ICD-11)*. Retrieved 28 September, 2020 from https://www.who.int/classifications/icd/en/

Yakovenko, I., Quigley, L., Hemmelgarn, B. R., Hodgins, D. C., & Ronksley, P. (2015). The efficacy of motivational interviewing for disordered gambling: Systematic review and meta-analysis. *Addictive Behaviors*, *43*, 72–82. https://doi.org/10.1016/j.addbeh.2014.12.011

Yam, C. W., Pakpour, A. H., Griffiths, M. D., Yau, W. Y., Lo, C. L. M., Ng, J. M. T., Lin, C. Y., & Leung, H. (2019). Psychometric testing of three Chinese online-related addictive Behavior instruments among Hong Kong University students. *Psychiatric Quarterly*, *90*(1), 117–128. https://doi.org/10.1007/s11126-018-9610-7

Zhu, S., Zhuang, Y., Lee, P., Li, J. C. M., & Wong, P. W. (2021). Leisure and problem gaming behaviors among children and adolescents during school closures caused by COVID-19 in Hong Kong: Quantitative cross-sectional survey study. *JMIR Serious Games*, *9*(2), e26808. https://doi.org/10.2196/26808

Zieve, G. G., Persons, J. B., & Yu, L. A. D. (2019). The relationship between dropout and outcome in naturalistic cognitive behavior therapy. *Behavior Therapy*, *50*(1), 189–199. https://doi.org/10.1016/j.beth.2018.05.004

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