Case report

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Craving as a Nexus Of Gaming Disorder, its Assessment Scarcity and Role in Therapy Response: a Case Series

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Abstract - Gaming disorder (GD) is a recently recognized mental health disorder and has been garnering international attention. It shares core concepts with other addiction disorders and arguably the craving criterion. Craving has been well studied in substance and gambling addiction, with specific instruments for more objective measurement and distinctive contextual variables pertaining the craving. We present, for the first time, a series of four cases from the Indonesian national addiction clinic that demonstrated certain levels of craving might impede therapeutics response, the difficulty in assessing craving level on distinct scenarios, and the various variables influencing craving. The first two cases displayed low improvement and poorer prognosis compared to the two latter cases. Overall, these cases posited a great need of focus to measure, monitor, and manage craving among GD patients.

Keywords: internet gaming disorder; craving; surveys and questionnaires; case management; prognosis

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Introduction

Gaming disorder (GD) is a novel psychiatric disorder, introduced in the International Classification of Diseases 11th revision (ICD-11) within the category 'disorders due to addictive behaviour', along with gambling disorder [1]. The diagnostic criteria set out for GD include increasing prioritization of gaming, continuation of gaming despite negative consequences, and disturbed control of gaming behaviour. The patient should evidence significant dysfunction and/or impairment in daily life domains due to gaming for consideration of this disorder. One of the reasons for this development stem from GD having similar core concepts to addiction disorders, both in the neurobiology and clinical symptoms [2].

Within the field of addiction, craving has been notably central, with its inclusion as one of the novel criteria for substance use disorder (SUD) [3]. Craving is the intense desire to consume or engage in substances and behaviours that result in pleasurable sensations thus leading to the development, progression, and maintenance of addictive disorders [4]. Craving has been described to arise from the learned mechanisms of cue-reactivity, which

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is the appetitive conditioned response toward an addictive stimulus that manifests as the anticipation of rewarding attributes from drug consumption [5]. Neurobiologically, it has been implicated with perturbed activations in the limbic, striatal, and cortical regions. Studies have shown recruitment of the dorsolateral prefrontal cortex, orbitofrontal cortex, anterior cingulate cortex, amygdala, hippocampus, striatum and insula during cue- and stress-induced craving towards nicotine, cocaine, opiates, and methamphetamine [3,6]. Psychologically, anxiety, restlessness, and irritability have also risen along with increasing craving; along with other physiological changes such as nausea, increasing heart rate, and other arousal symptoms [3].

Notably, the U.S. Food and Drug Administration has included craving as an endpoint for drug addiction, particularly smoking cessation [7]. The linkages of craving to abstinence and relapse have been accumulating for substance addiction. Craving has been shown to predict relapse; more specifically baseline craving seemed to plateau, in contrast to cue-induced craving which displayed increasing pattern during abstinence [8,9]. This cue-induced craving was also predictive to smoke latency and intensity, which could be influence by amelioration in levels of decision making and emotion regulation [10,11]. Similarly, cue-reactivity and craving, dysfunctional cognitive inhibition, and impaired decision making have been described as the core concepts of GD [5]. Through empiri-

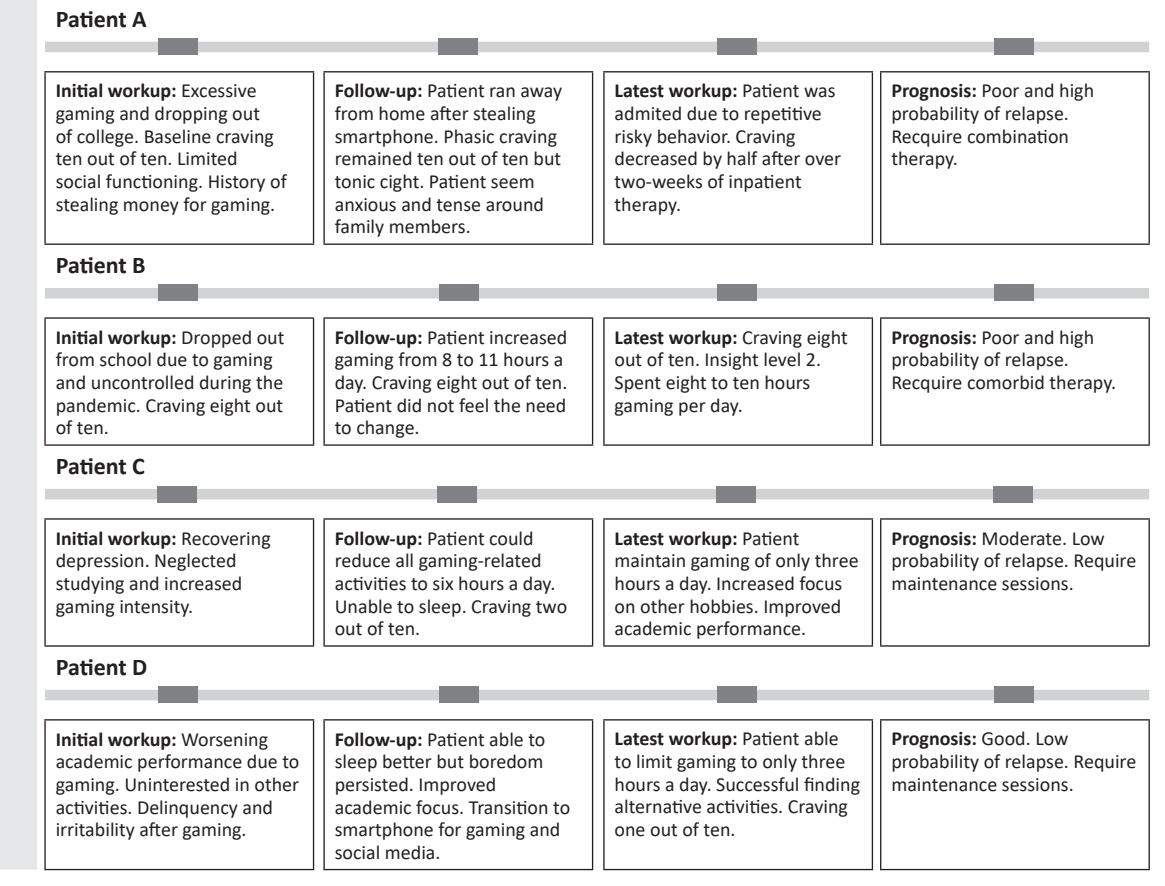

Figure 1. Timeline and prognosis of the four clinical cases

cal data, gaming cue-elicited craving has been shown for GD samples and neuroimaging results indicated recruitment of analogous areas, for example ventral and dorsolateral striatum, dorsolateral prefrontal cortex, and anterior cingulate cortex [12-16]. Cognitive tasks (e.g., go/no-go task, Stroop) have also been employed to exhibit impaired response and lower executive function [17,18]most game-users do not develop problems and only a relatively small subset experiences IGD. Game playing may have positive health associations, whereas IGD has been repeatedly associated with negative health measures, and it is thus important to understand differences between individuals with IGD, recreational (non-problematic. More recently, a connectome-based machine learning was able to determined canonical networks of craving within GD subjects, predicted craving score (compared to actual craving score), and correlated the scores to craving network strength [19].

However, there have yet been translation of these findings into clinical data or setting and GD-specific data for craving and disease progression. Further, there has been paucity in a psychometrically sound instrument to gauge levels and trajectory of craving among GD patients. In this paper, we presented four patients (see Figure 1 for summary) diagnosed with GD per ICD-11 with variable degrees of craving, highlighting the desirability of a valid, contextual, and clinically relevant craving instrument for GD.

Case Report

First clinical case description

Mr. A (22-year-old male, an undergraduate dropped out) was brought in by his first uncle to the outpatient addiction clinic as the patient dropped out from university due to his excessive gaming behaviour. He admitted to playing at least seven hours every weekday on mainly first-person shooting and massive-online battle arena (MOBA) games. Mr. A described that game allowed him to achieve recognition from his friends and he could find romantic relationship through games. He would also spend about a thousand dollars (fifteen million Indonesian rupiahs) every month on in-game items. The patient obtained the cash by embezzling his father's and uncle's money. The patient had started playing online games since he was in junior high school. His parents lived in another island, as such the patient stayed with his uncle. Mr. A disclosed feeling alienated and inferior due to comments received in college by staffs and friends. The patient said that he started playing games since he was eight years old by playing offline games. It was still under control because of the rules and obligation of going to school regularly. He denied any history of substance use or previous hospitalization. Mr. A was the oldest of four siblings. His father and mother tend to be permissive as they hoped he would continue the family business; something that the patient was always opposed to. The patient scored 143 on the Indonesian Internet Addiction Diagnostic Questionnaire (KDAI) with highest score on withdrawal and loss of control domains and he scored 7 on the ten-item internet gaming disorder test (IGDT-10). The patient appeared appropriate to his age, appeared overweight, with furtive eye contact. He seemed to be very nervous in conveying his thoughts. However, he was fluent and confident when talking about his gaming activity. The patient was diagnosed with gaming disorder and obesity. In the first session, the patient and his family were assessed and given psychoeducation about his current conditions and cognitive behavioural therapy. He was also prescribed with escitalopram 5mg once daily. The patient agreed to a gaming reduction plan along with his family. He would only be permitted to play a maximum of three hours per day and his gadgets would be kept by his family member except for urgent matters.

The following week the patient was brought back by another family member. Three days prior, he was reported to have stolen his family's employee's handphone, ran away, and slept by the road. His family member disclosed that the patient had been agitated since following the plan, he would always try to access any games through any gadgets in his vicinity. After spending a night on the street, he returned to his second uncle's house. He was unable to crack the handphone's security and felt uncomfortable sleeping on the street. He denied any wrongdoing on the event and felt that he did not have any strong craving to game in the past week. The patient was admitted to the hospital after long discussion between the family members. His medication was increased to escitalopram 10mg once daily and quetiapine extended release 200 mg once daily every night was added.

During the hospital stay, the patient experienced a significant experience of withdrawal and craving. He

described his craving ranging from 6 to 10 at different times, the lowest would be when there was no gaming-related cue and the highest when he heard words relating to games or seeing gadgets/smartphones. He underwent Cognitive Behavioural Therapy (CBT) for addiction with cue exposure therapy. At first, during therapy, he confessed to having thoughts of stealing phones from the medical staffs to play games. Upon hearing some cue related to the title or other game-related words, he would have a craving of ten out of ten. Patient remained admitted until day 15 and discharged after he learned new skills of dealing with craving and some effective communication skills. These skills were able to decrease the tonic craving into four out of ten. During his release, some agreements were made, e.g., he was prohibited to play any online games and he should follow the arranged schedule. Patient was prescribed escitalopram 10mg once daily and quetiapine extended release 400 mg once daily and advised for bi-weekly clinic appointment.

Second clinical case description

Patient B (20-year-old male, a student) presented with uncontrolled gaming during pandemic. He had been playing mostly (MOBA games and shared that he performed 'modding' (term for modification of original games) on the game with his friends. The patient described that he had been playing games since he was in elementary school. His parents provided him with various facilities related to gaming requested by the patient, such as gaming chair and multiple computer screens, because they trusted him for his modding ability. However, in the past month he had been playing uncontrollably for at least 8 hours per day. He could not resist his urge to continue gaming and code for his mods because then the patient was grinding to get his levels up. Mr. B dropped out of high-school due to his gaming behaviour and was taking high-school diploma equivalent certification. His mother and 2 older siblings supervised him intensely to ensure he completed the courses, since the equivalent certification was his last resort to attaining any academic degree. Unfortunately, due to the sparse course and exam schedule and pandemic he felt he had a lot of free time; thus, he increased his gaming duration. The patient mentioned that he did not what else to do apart from gaming and 'modding', he did not think that his gaming behaviour was a problem to begin with and that he would not be able to decrease his gaming as well. On the other hand, the patient hinted that he understood to pursue his dream as a programmer, he would have to balance his time to learn more professional coding.

The patient did not present with any abnormal physical examination. The examining psychiatrist noted that the patient appeared anxious, had insight grade 2, and borderline IQ score of 70. Mr. B described that his craving was six out of ten and had increased to eight out of ten, especially when exposed to any gaming-cues. He said that he was obsessed with playing games all the time that his daily self-care was affected. He scored 199 on KDAI with the highest domain being increase priority and salience. Patient's 2 older siblings had no academic difficulty nor psychiatric history, although notably they were neither employed nor in further education. His parents were described as indifferent types and emotionally absent. They did not have any regulations at home, while hoping their children to be able to take care of themselves. His mother said that she did not recognize anything wrong with the patient, until she was informed by his teacher about his absence from school activities. As the patient showed minimal motivation in treating his condition, he was planned to undergo motivational enhancement therapy (MET) and prescribed with aripiprazole 2.5mg twice a day and sertraline 25mg twice a day.

On follow up, the patient mentioned that in the past two weeks the patient had increased gaming intensity to an average of 11 hours per day. He would also compensate on every other day if in a single day he played less than 11 hours. The patient had finished his equivalency certification examination and was waiting for the results. He shared that he mainly increased his time gaming with friends, but the overall time was long due to the amount required for 'modding'. Patient B described that successfully creating a mod with his friends was an accomplishment and made him happy because he felt superiors to other players. He mentioned that, on the downside, due to his lengthy gaming behaviour, he gained weight and was continuous sleepy throughout the day. Apart from gaming or 'modding', he would spend the day reading comics or watching cartoons. The patient remained unbothered by his gaming behaviour and gauged his intention to change at 50 out of 100. His KDAI score remained above the threshold. His medications were adjusted to aripiprazole 15mg once a day and sertraline 75 mg once a day. The patient continued with MET combined with Behavioural Therapy for about twelve months. The patient was targeted to slowly curtail the duration of gaming to 3 hours a day but the patient was reluctant in fulfilling this because he had no idea how to spend his leisure time. Nevertheless, after about 8 sessions, he had a slight improvement, such as gaming was reduced to about 4-6 hours a day, went for an online programming course, and decided to go to

college. However, the patient did not come back for therapy for about four months due to family affairs.

On the latest meeting, the patient mentioned that he still felt high urge to game when he felt irritated and while doing other activities, he would imagine his past gaming and mods, which drove his craving even further. He scored his craving to be eight out of ten. He would play games for about 8 to 10 hours a day, a few hours reading comics, and spent the rest of the day sleeping. He felt that through sleeping he could manage his emotions better. He went into a lot of arguments with his mother as he was forbidden from playing. His mother was busy working since his father suffered from stroke. The patient had finished his high-school equivalency certification but had not gone to college. He mentioned that he would not refuse a work offer but the patient declined to go looking for a job. The patient grew distant with his siblings as well. He still felt he did not have the intention to manage his gaming behaviour.

Third clinical case description

Patient C, a 15-year-old high school female, first came to the child and adolescents' psychiatry outpatient clinic in late 2020 with complaints that she was sad all day long and demotivated for an estimated duration of six months. According to her mother, the patient often quarrelled with her and did not want to obey when reprimanded for skipping studying for exam and neglecting her schoolwork. Meanwhile, from the patient's perspective, her parents were too controlling. They treated her like a child by overtaking everything under their control until she felt powerless in taking care of her affairs. The patient is the second child of 2 siblings. Her sister was diagnosed with depression and borderline personality disorder and was also treated by a psychiatrist. The patient had a history of being bullied at her old school, making her move to a new school with a better environment. However, the patient remained feeling lazy and had no desire to study even with more positive surroundings. The patient was first diagnosed with depression and treated with sertraline 50 mg once daily, quetiapine 75 mg once daily, psychotherapy, and family therapy. In addition to this treatment, she also has a hobby of playing online games to overcome her depression. She tended to play online games to divert her usual sadness and annoyance. Nearing a year of treatment in dealing with her depression, she was increasingly playing online games until her parents got another warning from the teacher about her deteriorating grades at school. In addition, her mother also admitted that the patient was often sleepy and unfocused during online school due to playing online games until dawn.

This issue prompted the patient's mother to take her to the addiction clinic. The patient was later diagnosed with gaming disorder. The patient loved to play role playing games with the duration of 4-6 hours a day. According to the patient, online gaming was fun because it could divert negative emotions in the real world. She felt powerful in the gaming world because she could do whatever she wanted without being controlled by anyone, especially by her parents. Initially, the trigger for the patient to play games was her negative emotions, but then because of the frequency of this gaming, she continued to play and found it difficult to stop. She would always play with her friends, the games she opted for were all social games requiring other players. She disclosed to discussing about games a lot during the night through gaming chat apps with friends. When doing other activities, she did not experience craving very often and tended to be mild (one to two out of ten). When looking at gadgets, she does not always think about playing game, however, she did report higher urge (two to three out of ten) to play games whenever her gaming friends were online as well. The patient scored 158 on KDAI with loss of control and mood modification being the highest domains. After eight months since the patient first came for treatment at the addiction clinic, the patient's gaming disorder has improved with restrictions on playing games for only three hours per day and a maximum sleep requirement of 10:30 PM, along with Dialectical Behavioural Therapy. The patient could build offline friendships, maintain her gaming behaviour, and regulate her urge to play games if any of her friends were online. She described playing less than three hours per day and could focus more on school tasks.

Fourth clinical case description

Patient D, a 20-year-old male, an undergraduate student, came to the outpatient addiction psychiatric clinic in early 2021 complaining about his grades that had dropped due to excessive gaming time. He said that his declining grades made him distressed and emotional. The patient said that he really wanted to change his major but still had not decided on which university to transfer. On his first visit, he mentioned that he played mobile games around 6-8 hours per day and also frequently opened social media when bored. The patient stated that he was rarely temperamental except when there was a problem with the Internet. He chose to play by himself because he was worried about making himself or other players irritated during

the game. Furthermore, he preferred the game that did not take so much time in one session (casual games), stating that it was time consuming and required more complex skills to play. He loved games that provided experience of dressing up his avatar. He felt that he could express his creativity and being praised by other people on his avatar, which would enlighten his mood, because he was appreciated. The patient felt like he was already addicted to playing games since junior high school, but his grades had never been affected before. Not until his senior year that his academics began to fall apart. He was transferred to different schools for a couple times and repeatedly stole his parent's money for playing games. He had no history of medical or psychiatric illness.

Throughout the interview, the psychiatrist noted that the patient was feeling anxious and preoccupied with boredom. There were no abnormalities during physical examination. After filling some internet and gaming addiction questionnaires (IAT = 80, KDAI = 165, and IGDT = 12), the psychiatrist diagnosed him with gaming disorder and avoidant personality disorder, and noted that his highest domains for addiction were mood modification and impairment. He began the first course of CBT and was also prescribed with escitalopram 15 mg once daily.

Later during follow-up treatments, the patient came back with feeling of boredom due to little activities and unable to focus in his study from time to time. Sometimes, he diverted his boredom towards chatting on social media and gaming. However, he limited his internet use to 2-3 hours per day and made solid efforts to go to bed around 10 PM. His mother understood his weariness and reported that patient at time would access his phone more than his allocated time, but she confirmed that patient had been able to go to bed before 11 PM. Besides boredom, he also claimed that he had no craving towards gaming and social media. It was also around these visits when the psychiatrist found out more about his personality. He claimed that he was a very timid person who hardly started the conversation when talking to new people. He said that he hated being criticized or labelled with something negative by somebody else, even though he usually kept his feeling to himself. He also avoided expressing his negative emotions to his friends, especially when he was in high school. A year after therapy, the patient then again was asked to fill the internet addictions questionnaires. The result of the test was the patient no longer addicted to internet (KDAI = 35) and gaming (IGDT = 2). On top of that, the patient was able to decide which major and university he wanted to attend. The patient felt some changes in his daily lives. He already attended his new major in another university and did his assignments on time. He said that he was comfortable with the major, had no problem focusing on the subjects, and was able to spent some time with new friends. Moreover, nowadays he is often seen streaming online video in the living room, and rarely accessing games.

Discussion

The four clinical cases exhibited varying degrees of craving toward games. Severe craving was clinically observed to associate with poorer GD symptoms and response to therapy, as contrasted between the first and second compared to the third and fourth cases. To our knowledge, this is the first case-series of gaming disorder and craving relating to clinical presentation and therapeutic response from a national referral hospital setting in Indonesia. Craving and poorer therapeutic response were more apparent in patients with heightened loss of control and salience; interestingly, nearly all patients presented with some degree of mood modification.

Craving has been described as central to GD, which is a part of the addictive behaviour category. Real world observations have also demonstrated increasing morbidity and mortality from pathological gaming behaviour [20]. The integrated person-affect-cognition-execution (I-PACE) model reasons that pivotal to the development and maintenance of GD are the affective, cognitive, and executive processes which actualize the interaction of cue-reactivity and craving [21]. These cues may be external, for instance physical game-related cue confrontations, or internal (e.g., negative affect). Overtime, the explicit and implicit cognitive processes towards craving and appetitive rewards transitioned into conditioning and reinforcement, thus craving may arise more recurrent and intense [5]. However, research into craving in GD has not matured as much as gambling or SUD. Craving has been shown to have predictive power for repetitive addictive behaviour during and after treatment and relapse [8,22-24]. These longitudinal findings have not been replicated in GD, although

numerous studies have demonstrated the loss of top-down control among GD subjects, compared to healthy controls, through several cognitive tasks, i.e., go/no-go, stop signal, and Stroop [25]. Clinically, craving experiences will differ between GD subjects, depend on the timing of elicitation, situation, and affective state – all of which influence its force and required resistance. Some patients are able to independently resist their craving, though at the cost of extreme distress due to the repressed urge [26]. This latter scenario could lead to a vicious cycle of further stress-induced craving, reaching a peak that overwhelms the patient [27]. With this in mind, craving can be utilized as a measure for treatment goals of either curtailed gaming duration or transient abstinence, which would allow opportunity to equip patients with positive coping skills in high-risk situations. Treatment objective of GD has been debatable, with abstinence not seen as a preferrable goal [28,29]. For example, in patient A, a certain period of abstinence was introduced since reduction program failed and craving was not mitigated. Further, gaming was re-introduced slowly through games low in engagement, interactivity, and visuals which require basic technological capacity, particularly for patients with prominent phasic craving. While patient B underwent intermittent phasing out while decreasing his gaming duration. This proved effective in both cases to regain functional daily activities, especially in patient A to decrease his craving during inpatient therapy. In contrast, patient C and D never went through abstinence and were able to adhere to the reduction program. In the long term, healthy gaming behaviour is the most desirable goal, however, a period of abstinence in-between can be viewed as viable transition window for patients with severe craving, salience and loss of control. Overall, these emphasized the necessity for treatment focusing on craving integrated into GD clinical pathways across multiple settings and potentiating craving as a parameter of treatment target.

On the one hand, mindfulness-based behavioural therapy seemed successful in some patients by allowing patients to learn emotional and distress regulation, especially addressing the mood modification domain of GD [30]. On the other hand, the presence of loss of control and craving substantially negate these advances and render resistance through inflexible cognition and erroneous decisions. Craving complicates addiction and its response to therapy by perpetually engaging the addictive behaviour in line with the incentive sensitization theory [31]. Zooming in on the individuals, craving will vary depending on the degree of cognitive distortions, incentive saliency, impulsivity, coping skills, motivation to quit, affective state, and comorbidity. In the chronic view, motivation seeking coupled with diminished decision making capacity induce negative reinforcement of the addictive behaviour [32]. Incubation of craving during abstinence had been shown to correlate with dysfunction of the frontal impulsive control, which leads to relapse [33,34]. There is a need for an integrative therapy to manage craving during the clinical disorder phase that provides patients the competence to regulate craving continually, thus minimizing likelihood of relapse. Improved inhibitory control had been associated with positive prognosis in GD, which could be mediated through diminished craving [35]. Comparing persistent and recovered GD subjects, Dong and associates illustrated differences in insular activation correlating to symptom severity as well [36]. Initial evidence demonstrated targeting craving in a group therapy setting significantly reduced addiction score and weekly gaming duration by altering insular activation [37]. Multiple therapeutic studies (behavioural intervention, transcranial direct current stimulation, deep brain stimulation) have proposed fruitful methods for craving, however, the characterization of subjects for the therapy has been obscure, owing to the lack of validated instruments such as Gambling Urge Scale, Tobacco Craving Questionnaire or the Penn Alcohol Craving Scale [37-42]which has been used in several clinical trials at the University of Pennsylvania's Treatment Research Center. The PACS is a five-item, self-

report measure that includes questions about the frequency, intensity, and duration of craving, the ability to resist drinking, and asks for an overall rating of craving for alcohol for the previous week. Each question is scaled from 0 to 6.: To examine the questionnaire's psychometric properties, we sampled responses from 147 individuals participating in a 9-month combined natrexone (100 mg/day. Majority of studies would report craving through subjective reports of current craving level through a single-item rating scale in the range of one to ten (or hundred), as such eliminating many of the aspects attached toward craving, e.g., variability and contextuality [6,12,18,43]. The present case series noted that patients had difficulty in identifying what constituted a degree of one craving and what was degree ten craving. Moreover, some patients were not able to analyse correctly their gaming urge as craving. It is then also harder to assess meaningful reduction in craving which will influence clinical or functional improvements.

Through the clinical cases, craving might appear in the absence of any external cues, although, upon further scrutiny some cases did have internal triggers including memory and mental imagery and negative affect. External cues were seen to vary across a continuum of specificity, at the lower end being non-specific (e.g., any game-related words or technologies) to particular cues (e.g., certain game genre or character and definitive scenario of noticing friends' online status). Those with specific triggers would require relatively straightforward environmental and social adjustments, however, patients with non-specific stimuli and internal triggers required more arduous effort for surrounding alterations. The second type would call for emphasis on skills for positive cognitive processes and decision making during high-risk situations. Overall, future steps should include craving assessment which consider the numerous nuances and continuum of craving; then establishing a comprehensive treatment program that focus in tackling craving and its recurrence. Additionally, craving should also be assessed both in the presence (cue-induced) and absence (tonic/background) of game-related cues, with the latter implicated in post-treatment or abstinence relapse [44].

Patients with severe craving experienced difficulty regarding inhibitory control and heightened resistance to therapy. Craving was scored by single-item rating, which impeded more nuanced measurement of distinct craving types and triggers across individual patients and specific contexts. Craving was correlated in some with the loss of control domain and robust executive function potentially subdued actualization of the urges in other patients.

Conclusions

These clinical experiences highlight the necessity to investigate longitudinal consequences and trajectory of craving in the natural history of GD. As well as, portraying the possibility of incorporating a period of transient abstinence in accordance to the craving intensity. It is pertinent to design integrative craving-focused management with long-term craving regulation skill as an outcome parameter. Additionally, to develop, from the ground up, a valid tool to assess craving in GD which will aid in measuring efficacy of specific craving therapies.

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Conflict of interest

None to declare.

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