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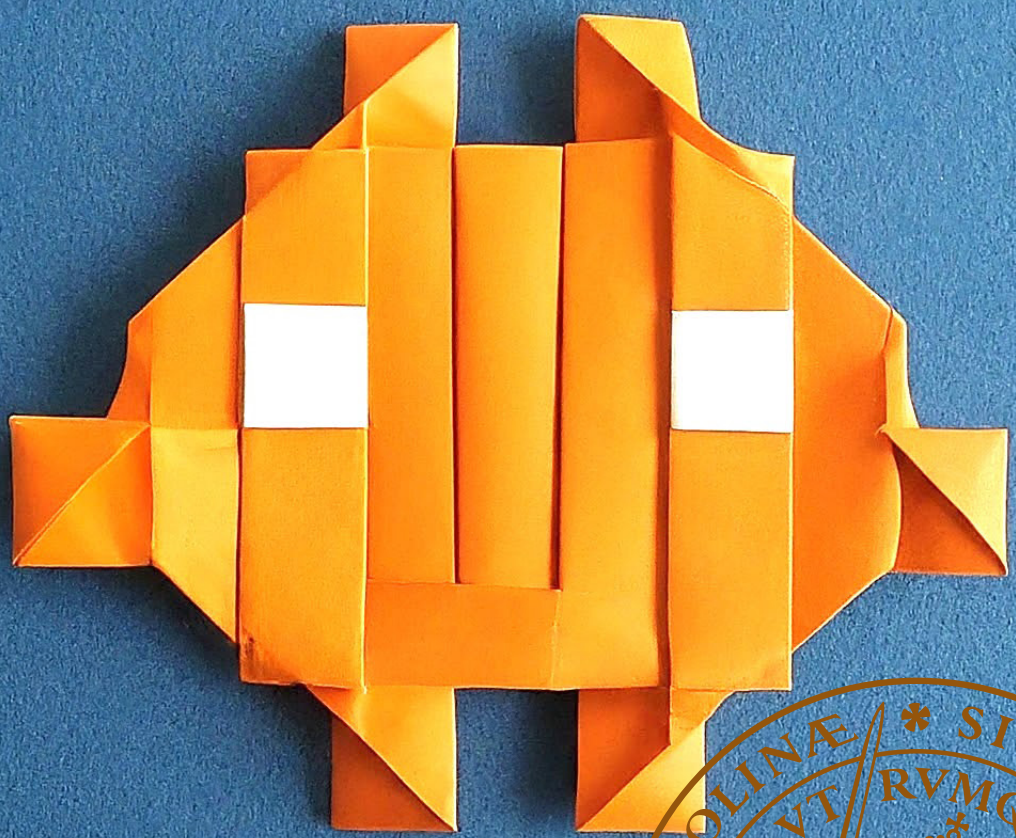

Problem gaming in a clinical child and youth population
– from prevalence data to evidence-based intervention

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Frida André, MD

LUND
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Abstract

Background: Video gaming is a highly common leisure activity, a majority of 13–18-year old's in Sweden report that they play video games daily. A minority of those develop a problematic gaming behavior, a phenomenon that reached formal recognition with the inclusion of Gaming Disorder (GD) in ICD-11. Both general society, school health care and Child and Adolescent Psychiatry (CAP) inquires systematic knowledge on problem gaming (PG) but also on prevalence and treatments of the behavior. The aim of this thesis was to explore PG among CAP patients, the screening thereof, basic characteristics but also to implement and evaluate a treatment. *Methods:* This thesis includes four studies and one study protocol on gaming among CAP patients. The patients (12-18 years old) were recruited from CAP clinics in Region Skåne. The first paper explores the prevalence of PG and gambling within CAP using the validated screening tools Game Addiction Scale for Adolescents (GASA) regarding gaming and the short version of The NORC Diagnostic Screen for Gambling Problems (NODS) NODS-CLiP, with three NODS questions pertaining to loss of Control, Lying and Preoccupation – the 'CLiP regarding gambling. The second paper evaluates GASA psychometrically with an analysis of gaming behavior, gender differences and ADHD through the GASA items. The third paper is the pilot version of an RCT evaluating Relapse Prevention as a treatment of PG and problem gambling. This pilot feasibility study implemented and evaluated RP, a 7-week CBT program, as a treatment of PG. A total of 9 adolescents received the treatment and were assessed regarding symptoms of PG pre-, post-treatment, and 6-month follow-up. In addition to acceptability and satisfaction with treatment, symptoms of DG were assessed with standardized interview and self-report measures post-treatment. Out of nine, five participants agreed to take part of the evaluation. The fourth paper is a study protocol that specifies the research plan for the RCT. The fifth paper is an RCT that further evaluates RP as a treatment of PG. Children, coming for their first visit to CAP during 2022, were screened for gaming behavior and those who met the criteria for PG were offered participation in the trial. A total of 102 participants were included in the study (intervention = 47, control = 55). The intervention, RP, was provided individually in five to seven 45-minute sessions over a period of five to seven weeks, versus treatment as usual. *Results:* The first paper showed that 33 percent of the CAP patients met the criteria for PG, 44 percent of the subjects with ADHD, 52 percent of the male subjects and that 11 percent of the study participants showed problem gambling. The results of the second paper suggest that negative consequences of over consumption of games take a social direction for boys and an emotional direction for girls. Also, ADHD was significantly associated with over consumption of video games and the negative consequences thereof for girls. The third paper showed that the participants who completed treatment and all outcome assessments reported satisfaction with the treatment. The participants showed fewer symptoms of DG after treatment, and the proportion who met the criteria for video game addiction decreased from 56 to 0%. No effect was seen on problem gambling. The fourth paper was a full description of the RCT including objectives, design, methodology and statistical considerations. The fifth paper showed that both the control group and the treatment group lowered their mean GASA score from baseline to follow-up significantly, but the improvement was greater in the treatment group. *Conclusions:* Problem gaming seem to be highly common within a CAP context and possibly patients should be screened for gaming behavior more frequently and in relevant cases, be offered treatment.

Key words: Gaming Disorder, Internet Gaming Disorder, ADHD, Child and adolescent psychiatry, Gender

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MADE IN SWEDEN

To Vilgot and Marta

”Två sanningar närmar sig varann.
En kommer inifrån, en kommer utifrån
och där de möts har man en chans att få se sig själv.”

Tomas Tranströmer

Table of Contents

Abstract

Background

Video gaming is a highly common leisure activity and a majority of 13–18-year old's in Sweden report that they play video games daily. A minority of those develop a problematic gaming behavior, a phenomenon that reached formal recognition with the inclusion of Gaming Disorder in ICD-11. Growing public concern regarding problem gaming (PG) behavior among youth has prompted the deployment of healthcare and research professionals within child and adolescent psychiatry (CAP) to empirically investigate its prevalence, etiology, prognosis, and effective treatment options.

Methods

This thesis includes four research studies and one study protocol on gaming among CAP patients. The patients (12-18 years old) were recruited from CAP clinics in Region Skåne. The first paper explores the prevalence of problem gaming and gambling using the Game Addiction Scale for Adolescents (GASA) and the short version of the NORC Diagnostic Screen for Gambling Problems (NODS) NODS-CLiP, respectively. The latter screening tool consists of three NODS questions pertaining to loss of Control, Lying and Preoccupation with gambling. The second paper evaluates GASA psychometrically with an analysis of aspects of gaming behavior captured by the GASA items. The second paper explores gender differences in gaming behavior and the relationship between ADHD and gaming. The third paper is the pilot version of an RCT evaluating Relapse Prevention as a treatment of PG. This pilot feasibility study implemented and evaluated RP, a 7-week CBT program, as a treatment of PG. A total of 9 adolescents received the treatment and were assessed regarding symptoms of PG pre-, post-treatment, and 6-month follow-up. In addition to acceptability and satisfaction with treatment, symptoms of PG were assessed with standardized interviews and self-report measures post-treatment. Out of nine, five participants agreed to take part of the evaluation. The fourth paper is a study protocol that specifies the research plan for the RCT. The fifth paper is an RCT that further evaluates RP as a treatment of PG. Children, coming for their first visit to CAP during 2022, were screened for problematic gaming behavior and those who met the criteria for PG were offered participation in the trial. A total of 102 participants were included in the study and randomized into two groups (intervention = 47, control = 55). The intervention group received RP individually in five to seven 45-minute sessions over a period of five to seven weeks, and the control group received treatment as usual.

Results

The first paper showed that 33 percent of the CAP patients met the criteria for PG, 44 percent of the subjects with ADHD, 52 percent of the male subjects and that 11 percent of the study participants endorsed problem gambling. The results of the second paper

suggested that negative consequences of over consumption of games take a social direction for boys and an emotional direction for girls. Also, ADHD was significantly associated with over consumption of video games and the negative consequences thereof for girls. The third paper showed that the participants who completed treatment and all outcome assessments reported satisfaction with the treatment. The participants showed fewer symptoms of PG after treatment, and the proportion of those who met the criteria for computer game addiction decreased from 56 to 0%. The fourth paper was a full description of the RCT including objectives, design, methodology and statistical considerations. The fifth paper showed that both the control group and the treatment group lowered their mean GASA score from baseline to follow-up significantly, but the improvement was greater in the treatment group.

Conclusions

Problem gaming appears to be common within a CAP context. Our research suggests that it may be of clinical interest to screen patients for gaming behavior more frequently and, in relevant cases, be offered treatment. More research on problematic gaming is necessary, not least to understand sex differences in its effects. Additional investigation into treatments for problematic gaming is vital for creating effective interventions that can benefit a wide range of individuals.

Populärvetenskaplig sammanfattning på svenska

Introduktion: Dataspelande är en väldigt vanlig fritidssyssla och en majoritet av svenska ungdomar uppger att de spelar dataspel dagligen. En minoritet av dessa utvecklar ett problematiskt spelbeteende, ett fenomen som fått formellt erkännande i och med att diagnosen Gaming Disorder (GD) inkluderats i diagnossystemet ICD-11. Nu efterfrågar både barn- och ungdomspsykiatrin (BUP), skolhälsovården och samhället i stort systematisk kunskap om problematiskt dataspelande, om vad som kännetecknar tillståndet och inte minst hur det kan behandlas.

Dataspelande är vanligast förekommande bland yngre individer och är vanligare bland pojkar än flickor. Man har i tidigare forskning sett att pojkar också är överrepresenterade bland de som utvecklar ett problematiskt spelbeteende men man vet inte så mycket om vad könsskillnaderna beror på eller vad som kännetecknar flickors dataspelande. Ett problematiskt dataspelande har i tidigare forskning visats ha koppling till såväl försämrad sömn, försämrat psykiskt och fysiskt mående och försämrade skolresultat. Dessutom påverkas både sociala relationer och förmågor negativt och tillståndets har visats öka risken för både nedstämdhet och ångest. Problematiskt dataspelande har visats vara särskilt vanligt bland personer med barnpsykiatriska diagnoser som framför allt ADHD men även autism.

Det finns inga riktlinjer för hur man ska screena för problematiskt dataspelande, var gränsen ska gå mellan ett sunt och osunt spelande och inte heller hur tillståndet ska behandlas. Det förekommer otaliga skattningsskalor och en av de som används mest är Game Addiction Scale for Adolescents (GASA). GASA är utformad för unga och innehåller 7 frågor som rör dataspelande de senaste 6 månaderna. Frågorna handlar både om känslor och beteenden kopplade till dataspelande men också om negativa konsekvenser. Beroende på hur man besvarar GASA-frågorna kan graden av spelproblem bestämmas. Tidigare forskning föreslår att man genom en prioritering av de ingående frågorna kan särskilja och gradera dataspelande från oproblematiskt till engagerat, problematiskt och dataspelsberoende. Det här görs genom att betrakta de frågor som rör negativa konsekvenser som kärnkriterier medan de övriga betraktas som perifera – ”core approach”. Genom ”core approach” hoppas man på att ringa in och fånga upp det spelbeteende som faktiskt är riskabelt eller problematiskt just för att det medför negativa konsekvenser och undvika ett överdrivet patologiserande eller moraliserande över något som för de flesta är ett fritidsintresse bland andra.

Det finns ett fåtal behandlingsstudier som utvärderar olika typer av behandling av problematiskt dataspelande och bland dessa är KBT-baserad behandling den mest välstuderade och resultaten är lovande om än något varierande. Det är ännu oklart om och varifrån behandling ska erbjudas och det finns inget behandlingskrav på regionerna.

Mot bakgrund av ovanstående vill vi bidra med ökad kunskap om problematiskt dataspelande genom att undersöka tillståndet i ett barn- och ungdomspsykiatriskt sammanhang. Vi är intresserade av att kartlägga prevalens, könsskillnader och koppling till psykiatriska diagnoser. Vi vill också utvärdera GASA som skattningsskala men också olika tolkningar av den och hur skalan reflekterar olika komponenter av dataspelande samt om dessa skiljer sig åt beroende på kön och eventuell ADHD-diagnos. Vi ska dessutom utforma och utvärdera den KBT-baserade behandlingen återfallsprevention (ÅP) som behandling av problematiskt dataspelande.

Metod: Vi har undersökt den generella förekomsten av problematiskt dataspelande och spel om pengar bland barn- och ungdomspsykiatriska patienter och specifikt bland pojkar, flickor och patienter med ADHD. Vi har också utvärderat GASA och ”core approach” utifrån frågornas innehåll och innehållets relation till kön och ADHD-diagnos. Vi har också implementerat och utvärderat Återfallsprevention (ÅP) som behandling av problematiskt dataspelande och problematiskt spel om pengar genom en första pilotstudie med ett mindre antal patienter och genom en andra så kallad Randomized Control Trial (RCT), med ett större antal patienter som slumpats in i antingen behandlings- eller kontrollgrupp.

Patienter har rekryterats från BUP-kliniker i Skåne. Samtliga projekt har baserats på screening av nybesök genomförda i två omgångar, 2020 och 2022–2023. Patienter som då uppfyllt kriterier för PG har erbjudits deltagande i behandlingsprojekten.

Resultat: Vi har sett att 33 procent av BUP-patienterna uppfyllde kriterier för problematiskt dataspelande, 44 procent av patienterna med ADHD-diagnos och mer än hälften. (53%) av pojkarna. Utvärderingen av mätinstrumentet GASA visade att ”core approach” passade väl för den undersökta gruppen. Genom att betrakta de perifera kriterierna som överkonsumtion och kärnkriterierna som negativa konsekvenser, antingen sociala eller emotionella, kunde vi se att de negativa konsekvenserna var övervägande sociala för pojkar och emotionella för flickor. Vi såg också ett samband mellan ADHD och både överkonsumtion av dataspel och de negativa konsekvenserna därav, bland flickor. Pilotstudiens resultat var lovande, de deltagare som deltog i utvärderingen var nöjda med behandlingen och andelen som uppfyllde kriterier för dataspelsberoende minskade från 56 till 0 procent. Resultatet av RCTn visade att både behandlingsgruppen och kontrollgruppen förbättrades avseende symtom relaterade till problematiskt dataspelande, men behandlingsgruppen förbättrades mer.

Slutsats: Problematiskt dataspelande, är mycket vanligt bland patienter inom barn- och ungdomspsykiatrin och kanske bör man därför screena för detta för att vid behov kunna erbjuda behandling. Mer forskning om problematiskt dataspelande behövs, både om könsskillnader och dataspelandets koppling till psykiatriska diagnoser. Mer behandlingsforskning behövs för att möjliggöra utformandet av en behandling som kan bedrivas och erbjudas på ett sådant sätt att den kommer så många som möjligt till största möjliga nytta.

Abbreviations

ADD	Attention deficit disorder
ADHD	Attention deficit hyperactivity disorder
ASD	Autism spectrum disorder
APA	American Psychiatric Association
CAP	Child and adolescent psychiatry
CBT	Cognitive behavioral therapy
CFA	Confirmatory Factor Analysis
DSM	Diagnostic and statistical manual of mental disorders
GASA	Game addiction scale for adolescents
GAS	Game addiction scale
NC	Negative consequences
NODS	NORC Diagnostic Screen for Gambling Problems
CLiP	Control, lying, and preoccupation
GD	Gaming disorder
ICD	International statistical classification of diseases and related health problems
IGD	Internet gaming disorder
OC	Overconsumption
PG	Problem gaming
RP	Relapse prevention
RSP	Remaining study participants
SD	Standard deviation
SEM	Structural equation modeling
TAU	Treatment as usual
WHO	World health organization

Original papers

I. The prevalence of gaming and gambling in a child and adolescent psychiatry unit.
Frida André, Anders Håkansson, Björn Axel Johansson, Emma Claesdotter-Knutsson.
Dept. of Clinical Sciences Lund, Lund University, Sweden.
Journal of Public Health Research. 2022;11 (2).
DOI:10.1177/22799036221104160

II. Game Addiction Scale for Adolescents-Psychometric Analyses of Gaming Behavior, Gender Differences and ADHD.
Frida André, Ingrid Munck, Anders Håkansson, Emma Claesdotter-Knutsson.
Dept. of Clinical Sciences Lund, Lund University, Sweden.
Front Psychiatry. 2022 Mar 9;13:791254. DOI: 10.3389/fpsyt.2022.791254

III. Cognitive behavioral treatment for disordered gaming and problem gambling in adolescents: a pilot feasibility study.
Frida André, Isak Einarsson, Elisabeth Dahlström, Katalin Niklasson, Anders Håkansson, Emma Claesdotter-Knutsson.
Dept. of Clinical Sciences Lund, Lund University. Ups J Med Sci. 2022 Aug 8;127. DOI: 10.48101/ujms.v127.8693

IV. Relapse Prevention Therapy for Problem Gaming or Internet Gaming Disorder in Swedish Child and Youth Psychiatric Clinics: Protocol for a Randomized Controlled Trial.
Sabina Kapetanovic, Sevtap Gurdal, Isak Einarsson, Marie Werner, Frida André, Anders Håkansson, Emma Claesdotter-Knutsson.
Dept. of Clinical Sciences Lund, Lund University. . JMIR Res Protoc. 2023 Jan 5;12:e44318. DOI: 10.2196/44318

V. Relapse prevention therapy for internet gaming disorder in Swedish child and adolescent psychiatric clinics: a randomized controlled trial.
Frida André, Sabina Kapetanovic, Isak Einarsson, Sunna Trebbin Harvard, Leonard Franzén, Annika Möttus, Anders Håkansson, Emma Claesdotter-Knutsson.
Dept. of Clinical Sciences Lund, Lund University. Front Psychiatry. 2023 Oct 20;14:1256413. DOI: 10.3389/fpsyt.2023.1256413

Introduction

Background

Video gaming is a common leisure activity, not least among children and adolescents (1-6). A majority, 68%, of Swedish 13–16-year olds and 55% of 17–18-year olds report that they play video games daily (7). For most people, it is a positive activity, even bearing a potential to enhance mental health and overall well-being (5, 8, 9). However, a minority of all those who engage in gaming develops problematic gaming behavior, which entails negative consequences (3, 4, 6, 10-12). The downsides of problematic gaming (PG) and the potential consequences thereof have reached formal recognition with the inclusion of Gaming Disorder (GD) as an official diagnosis in the International Classification of Diseases and Related Health Problems in 2019 (13). The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) on the other hand, mentions Internet Gaming Disorder (IGD) as a tentative diagnosis requiring more clinical research (14).

Despite an increasing amount of research on PG, controversy and uncertainties remain regarding fundamentals such as the validity of the condition but also regarding terminology, measurement approach and diagnostic cut-off (15-21). The prevalence rate of PG varies across studies, likely due to the use of different measures and cross-cultural disparities, with notably higher prevalence in Asian countries (15, 22). A recent meta-analysis showed a global prevalence rate of 1.96%, with significantly higher prevalence rates in adolescent samples (15). Young age and male sex are the two most prominent risk factors in PG research (6, 12, 15, 23-26). Although extant evidence suggests that gaming experiences and motivation may differ by sex (24, 27, 28), few investigations have specifically sought to determine how gender affects gaming behavior or vice versa (27, 28).

Most research agrees on a pathological potential of gaming and previous studies report that PG shows high comorbidity with other psychiatric disorders, such as depression, anxiety, and obsessive-compulsive disorder (12, 29-32), as well as neuropsychiatric conditions, such as attention-deficit hyperactivity disorder (ADHD) and autism spectrum disorder (ASD) (32-37). Further, people with PG have a higher risk of sleep disturbance, emotional deregulation, poorer executive functioning, higher impulsivity, poorer academic performance, and suicidal ideation (38-41).

There is no consensus regarding which measures should be used for diagnosing PG and different scales are used both in clinical practice and research (19, 32). Many of the existing scales are based on the DSM-criteria for pathological gambling (3, 19, 42-44). One of the most frequently used questionnaires for disordered gaming in adolescents is the 7-item GASA (Game Addiction Scale for Adolescents) (19, 45). The instrument applies to gaming behavior during the past six months and is based on the DSM-IV criteria for problem gambling (14, 45). It has been argued that the GASA items should be categorized into 'core criteria' and 'peripheral criteria' – as the 'core' questions (applying to relapse, withdrawal, conflicts, and problems) relate more heavily to addiction than the 'peripheral' criteria (concerning salience, tolerance, and mood modification) (46, 47). By applying a prioritization of the four core criterion, the 'core approach' creates three categories of gamers: engaged gamers, problem gamers, and addicted gamers (47).

With the aim to avoid conceptual confusion, I will use the term problematic gaming (PG) throughout this thesis. The concept will include the core approach definition of both problem and addicted gamers (when these categories are not specified), in terms of the results produced within the frame of the current project.

While the interest in treatments for PG is growing, indicated by the increasing number of published articles on the subject – likely reflecting a recognized need by parents, school health care, CAP, and other health care providers – the existing research is described as too flawed and insufficient to draw far-reaching conclusions (48-50). Cognitive behavioural treatment (CBT) is one of the methods that has been explored in relation to PG (48, 51, 52) and has been recommended as a first line treatment (52).

Given this, in my thesis I have focused on PG in a Swedish child and adolescent psychiatric context, with the aim to explore both prevalence of PG, a screening tool for PG and the implementing and evaluating of a treatment thereof.

Definition

In 2013, the American Psychiatric Association (APA) included internet gaming disordering (IGD) in section III of the fifth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-V) (14). APA defines IGD as a tentative diagnose and calls for more research before formal inclusion. The DSM lists nine criteria for IGD whereof at least five should be met within the past year to qualify for a diagnosis (14). The criteria proposed by APA are: (I) preoccupation, preoccupation with gaming; (II) withdrawal, unpleasant symptoms when gaming is taken away; (III) tolerance, the need to spend increasing amounts of time gaming; (IV) loss of control, unsuccessful attempts to control the gaming behavior; (V) Give up other activities, loss of interest in previous hobbies and entertainment as a result of, and with the exception

of, games; continuation, (VI) continued excessive gaming despite awareness of psychosocial problems; (VII) deception, deceiving family members, therapists, or others regarding the magnitude of gaming; (VIII) escape, the use of games to escape or ease negative moods; and (IX) negative consequences, risking or losing an important relationship, job, education or career opportunity due to participation in games (14).

Five years from the somewhat incomplete DSM-V inclusion of IGD, the World Health Organization (WHO) officially included gaming disorder (GD) as a mental disorder in the 11th version of the International Classification of Diseases (ICD-11) (13). Unlike APA, WHO applies a monothetic approach in which all criteria must be met to qualify for a GD diagnosis (13). The ICD -11 criteria are (I) impaired control over gaming; (II) increasing priority given to gaming over other activities; (III) continuation or escalation of gaming despite its negative consequences; and (IV) the gaming behavior causes clinically significant distress or impairments in important areas of functioning (13).

The ICD criteria partially incorporate the DSM criteria, except for the withdrawal and tolerance criteria, which concern more biological consequences. The two definitions from the two different classification systems have been compared (53-55). Starcevic et al., found that the GD criteria reflected a more intense and pathological gaming behavior more heavily associated to ADHD and coping as the main reason for gaming in comparison to the IGD criteria (53). Yen et al., concluded that the ICD-11 threshold for diagnosing GD is higher than that of the DSM-V (55). Consistent with the Yen et al., finding Jo et al., showed that 100% of those who met the GD criteria also met the IGD criteria, whereas 16.4% of those who met the IGD criteria also met the GD criteria (54).

The ICD's emphasis on functional impairment is something that also characterizes a substantial part of gaming research (13, 46, 47, 56-58). This emphasis may be a response to the ongoing questioning of the relevance of the condition (59-62). Dullar and Starceviv argue that the inclusion of IGD in DSM-V was premature and that the low diagnostic threshold entails a risk of not only overdiagnosing but also stigmatizing normal gamers (59). Other scholars agree on the risk of pathologizing healthy gamers and creating moral panic (60-62). Aiming to minimize that risk, several studies emphasize the importance of using screening tools and diagnostic cutoffs that truly separate pathological from non-pathological gaming (46, 47, 56-58, 63, 64).

Peripheral and core symptoms

Already in 2002, Charlton argued that an adoption the DSM's polythetic diagnostic system for classifying pathological gambling will likely lead to an over-estimation of the number of people addicted to gaming (65). Charlton evaluated Brown's (e.g., 1991, 1993) six criteria for behavioral addiction derived from the criteria for pathological gambling in DSM-IV (65-68). Factor analysis showed that items relating to Brown's criteria—tolerance, euphoria and cognitive salience (labelled peripheral criteria)—had a higher engagement factor loading than the addiction factor. On the other hand, the items related to the criteria of conflict, withdrawal, behavioral salience, relapse and reinstatement (labelled core criteria) showed a high loading only on the addiction factor (65). In 2009, Charlton and Danforth presented concordant results, adding to the idea that the peripheral group of symptoms possessed a potential to evolve into addictive gaming under certain circumstances. They suggested an existence of a developmental process whereby the peripheral criteria precede the core criteria (69).

More recent research supports the distinguishment of engagement and addiction as separate constructs with regards to gaming (46, 47, 56-58, 63, 64, 70). Ever since Charlton's distinction between peripheral and core criteria, various studies have demonstrated the clinical significance of this theoretical system. Krossbakken et al., showed that high alcohol consumption was found antecedent to addictive gaming and that anxiety was a consequence of addictive gaming, whereas these association were not seen among gamers that met the peripheral criteria (71). Deleuze et al., showed that factors commonly associated with problematic behaviors, such as impulsivity or depressive symptoms, did not correlate with the engagement construct, which assessed the peripheral criteria. Conversely, the addiction construct including core criteria was linked to heightened impulsivity and depressive symptoms (70). Fergusen et al., performed a meta-analysis of prevalence and comorbidity of pathological gaming and showed that studies that used measures based on the polythetic problematic gambling approach (relying on both core and peripheral criteria) produced higher prevalence numbers and lower correlation with negative outcomes (72). Studies that focused on the core criteria demonstrated lower prevalence numbers and higher correlations with negative outcomes (72).

Game Addiction Scale for Adolescents (GASA)

In 2009, Lemmens et al. developed and evaluated the Game Addiction Scale for Adolescents. They developed 21 items representing seven of the DSM-IV's pathological gambling criteria (salience, tolerance, mood modification, withdrawal, relapse, conflict and problems)(45). Each of the items in GASA is preceded by the statement: ''How often during the last six months…?'', referring to Young's suggestion that internet addiction is present when a person meets the specified criteria during a period of six months (45, 73).

Lemmens et al. demonstrated that the 21-item scale, as well as a shortened 7-item version, showed high reliabilities and good concurrent validity across samples (45). The items in the GASA was intended to correspond to the developmental stage of an adolescent and relate to school and relationship to family (45). The adult version of the GASA, the Game Addiction Scale (GAS), has been tested repeatedly and has been shown to provide both good reliability and validity (19, 74-76). King et al. reviewed different scales assessing PG, and showed that GAS was one of two instruments that provided the best clinical information for the diagnosis of PG (19). Among 32 different screening tools, GAS was found to be one of the five tools that had greater evidential support regarding psychometric properties (19). Finserås et al. evaluated the adolescent version of the GASA in relationship to the nine DSM-V criteria for IGD, giving support for the King et al. finding (19, 74).

Core approach

Brunborg et al. applied the "core approach" to categorize gamers into engaged, problem, and addicted gamers based on their GASA score (47). Each of the GASA items are answered on a five-point scale and an item should, according to Lemmens et al., be considered endorsed when rated three or higher (corresponding to sometimes, often or very often) (45). According to the core approach should those that endorsed each of the core items (withdrawal, relapse, conflict and problems) be categorized as addicted gamers, those that endorsed two or three core items should be categorized as problem gamers and those that endorsed each of the peripheral items (salience, tolerance, mood modification) should be categorized as engaged gamers (47). Consequently, the core items are emphasized in the creating of categories of gaming severity. Both the rationale and principle behind this categorization system is concordant with previous distinctions between core and peripheral symptomatology and correspond to the critique against the DSM's polythetic diagnostic system (46, 47, 56-58, 63, 64). The aim is to yield a more precise and relevant estimate of prevalence,

whereby a diagnosis of gaming addiction should be related to comorbidity and interference rather than high engagement (47).

The core approach prioritizes the items in the GASA that concern negative consequences. The first core item ("3. Have others unsuccessfully tried to reduce your time spent gaming?"), according to Lemmens et al., corresponds to the addiction criterion of relapse (14, 45), but it could also be considered an adolescent version of the ICD-criteria loss of control (13). The second core item ("5. Have you felt upset when you were unable to play?") correspond to the DSM-V criteria withdrawal (14, 45) but is not as easily translated to any of the ICD criteria even though it does involve distress, which is part of the fourth ICD criterion. The third core item ("5. Have you had arguments with others (e.g., family, friends) over time spent on games?") correspond to the DSM-V criterion concerning deception of others and could be considered to correspond to the ICD-11 criterion of continuous use despite negative consequences (13, 14, 45). The last core item, item 7 in GASA, also mirrors DSM-V and ICD-11 criterion of increasing priority over other activities, although the wording in GASA appears to include negative consequences more implicitly (13, 14, 45).

Brunborg et al. applied the core approach in a nationally representative sample of eighth-grade students in Norway. Their findings revealed that engaged gamers did not exhibit a higher risk of psychological health complaints, whereas both the addicted gamers and the problem gamers were found to have an elevated risk of experiencing feelings of low mood, irritability, nervousness, fear, and fatigue. (47). In a subsequent analysis, Brunborg and colleagues reevaluated the core approach using factor analysis, which showed that a two-factor structure (peripheral criteria separated from core criteria) fitted their data better than the original one-factor structure (46). This observation was true for both male and females, encompassing individuals aged 16–33 years, as well as those aged 34–74 years. (46).

Jonsson and colleagues conducted an assessment of an online gambling self-test called GamTest, which bears substantial resemblance to GASA. These researchers pinpointed two primary indicators of early signs of problematic gambling: overconsumption (OC) and negative consequences (NC) (77). The peripheral criteria align with overconsumption, while the core criteria relate to negative consequences. Furthermore, the negative consequences items were conceptually subdivided into social and emotional components, corresponding to the dimensions in GamTest (77). The application of this psycho-social model specification enables an exploration of overconsumption as an explanatory variable for problematic use of games, going beyond merely documenting peripheral components. This approach, (table 1) corresponds with the suggestion by Charlton and Danforth that peripheral criteria may precede core criteria (69, 77).

Table 1. Game Addiction Scale for Adolescents, core approach, addiction criterion and theoretical psychosocial model.

How often in the last 6 months:	Peripheral items	Core items	Addiction criterion	Early signs of problems
Have you thought all day long about playing a game?	X		Salience/ preoccupation	Over consumption
Have you played longer than intended?	X		Tolerance	Over consumption
Have you played games to forget about real life?	X		Mood modification	Over consumption
Have others unsuccessfully tried to reduce your time spent gaming?		X	Relapse	Negative consequence - social
Have you felt upset when you were unable to play?		X	Withdrawal	Negative consequence - emotional
Have you had arguments with others (e.g., family, friends) over time spent on games.		X	Conflict	Negative consequence - social
Have you neglected important activities (e., school, work, sports) to play games?		X	Problems/ Neglect duties	Negative consequence - emotional

Prevalence

The prevalence rate of PG varies across studies (15, 16). In a meta-analysis from 2020, Stevens et al. estimated the worldwide PG prevalence to be 3.05% (15). According to studies using stratified random sampling, the prevalence drops to 1.96%, though this estimate was subject to significant variability (15). Stevens et al. concluded that the variance was largely (70%) caused by the choice of measurement approach. Other factors which raised the prevalence numbers were adolescent and small samples. In 2022, Kim et al. reported similar figures in their meta-analysis of the global PG prevalence (16). Their prevalence estimate was 3.3%, dropping to 2.4% when only representative sample studies were included (16). Sample size, mean age, and study quality were found to be negatively associated with PG prevalence (16).

Both the Stevens et al. and the Kim et al. studies presented notably higher prevalence in Asian countries, a PG feature that has been replicated repeatedly (6, 15, 16, 78, 79). It has been argued that cultural factors such as the substantial gaming market in Asia, a more accepting cultural attitude towards gaming in general and the intense and pervasive gaming culture in, specifically, South Korea, and possibly also environmental factors, such as technological development, contributes to the high prevalence of PG seen in Asian countries (15, 16). A longitudinal study of gaming among Korean adolescents suggested that cultural factors such as excessive parental interference and poor communication with parents significantly influenced academic stress and consequently

increased pathological gaming (80). However, the prevalence estimates also vary widely across studies within the Asian countries and Kim et al. speculates that the PG prevalence in Asia may be overestimated due to the measurements used in some of the prevalence studies that do not adhere to the DSM-5 criteria (16). A prevalence study on South Korean adolescents reported that the PG prevalence ranged between 1.7% and 25.5% depending on whether the use of the DSM criteria was polythetic or monothetic (81). When only the core criteria were applied (according to the Charlton and Danforth approach (69), 2.7% were classified as addicted (81). Liao et al. investigated the prevalence in east Asia in a meta-analysis and showed that the prevalence was 12%, but 6% when only representative sample studies were included (79).

Stevens et al. presented an overall European prevalence of PG at 2.7% (15). In 2016, Vadlin et al. investigated the prevalence of PG among Swedish adolescents (age 12-18 years) and reported a prevalence of PG at 11% (35). In contrast, Gerdner et al. reported a prevalence of 1.2% for PG among a community sample of 18-year-olds in Sweden in 2022 (82). Using a lower threshold definition, they observed a prevalence of 5.7% for pathological gaming, which decreased to 3.0% when adjusted for gender (82).

The prevalence of PG is also known to be specifically high in adolescents (6, 12, 15). Kim et al. reported a prevalence of 6.7% among children and adolescents (8-18 years). Fam et al. investigated the prevalence of PG in adolescents in a meta-analysis from 2018 and showed that the prevalence was 4.6% (6). A more recent meta-analysis of the global PG prevalence from 2022 by Gao et al. presented a prevalence of 10.4% among adolescents (12). Gaming is most common among children, adolescents and young adults (1) and a higher prevalence of PG could be considered to be expected among youth. Also, impulse control capabilities, such as self-regulation, are not yet mature in children (83), and one could argue that this makes children more vulnerable to PG, but possibly also more likely to grow out of the condition (16). The findings on the natural course of PG differ across studies (84). Gentile et al. showed that 84% of the pathological gamers in a secondary school setting were still pathological gamers two years later (44). Another study, also conducted on a sample of secondary school students, showed that 50% of the addicted gamers were still addicted one year later (85), while Krossbakken et al. found that 35% of a representative sample of Norwegian 17-year-old addicted gamers retained the condition over the course of three years (71). In a systematic review of longitudinal studies, a stable tendency was found in adolescents, but not in adult age groups (84).

Another repeated reported feature of PG is that the prevalence is significantly higher among males than females (15, 35, 86). Stevens et al. showed that PG prevalence among males was 2.5 times greater than the prevalence among females (15). Extant evidence suggests that gaming experiences and motivation may differ by sex, but few investigations have specifically sought to determine how sex or gender affects gaming behavior and experiences or vice versa (27, 28).

Comorbidity

As ICD highlights, the gaming behavior should cause clinically significant distress or impairments in important areas of functioning in order to be classified as a disorder (13). Individuals with PG have been shown to exhibit an elevated risk of experiencing suicidal ideation, sleep disturbances, emotional deregulation, compromised executive functioning, heightened impulsivity, and poorer academic performance (38-41, 87).

Research indicates a substantial comorbidity with various psychiatric disorders, including depression, anxiety, and obsessive-compulsive disorder (29-31), as well as neuropsychiatric conditions like attention-deficit hyperactivity disorder (ADHD) and autism spectrum disorder (ASD) (33-35, 86).

In 2018, González-Bueso et al. summarized the research on comorbid psychopathology of PG in their comprehensive review and revealed that the strongest correlation consistently found was that between PG and anxiety (92%) followed by depression (89%), ADHD (85%) and social phobia/anxiety and obsessive-compulsive symptoms (75%) (29). They also concluded that there is a lack of longitudinally designed studies which prevent conclusion on causality (29).

Further, González-Bueso et al. emphasized the complexity of the association between PG and its comorbid psychopathology (29). Regarding this relationship they mention four explanatory models often considered in understanding comorbidity between addictive and psychiatric disorders: common factor models, secondary substance-use disorder models, secondary psychiatric disorder models, and bidirectional models (29). In the common factor model, both disorders share risk factors, leading to higher comorbidity. In the secondary substance-use disorder model, the addictive disorder contributes to the development of other psychiatric disorders. Conversely, in the secondary psychiatric disorder model, a pre-existing psychiatric disorder triggers the onset of the addictive behavior. Lastly, bidirectional models suggest that either disorder can increase vulnerability to the other (29).

In 2020, Richard et al. conducted a scoping review of existing longitudinal studies on PG and its consequences. From 57 studies, they identified 33 antecedents, 24 consequences and 9 variables that showed a reciprocal relationship with PG (87). Inattentive symptoms, social isolation and depressive symptoms were commonly found to be correlated with PG (87). The most common risk factors for PG were emotion dysregulation and low self-esteem whereas PG most frequently was shown to cause heightened anxiety, strained parental relationships, and declines in both life satisfaction and academic performance (87).

In summary, PG evidently presents with various psychiatric comorbidity profiles and the disorder can lead to strained parental relationships and decreases in both life satisfaction and academic performances.

Gambling

Gambling disorder is a recognized diagnosis in the DSM-5 (14). Vadlin et al. documented a connection between problematic gaming and problematic gambling among young individuals (88). They further demonstrated that problematic gaming involving money did not serve as a predictor for problematic gambling in adulthood (88). In a non-longitudinal design, Karlsson et al. identified an association between gambling and problem gaming, along with excessive internet use in adults. (89). PG and gambling have been linked repeatedly, yet the nature of this relationship remains poorly understood. (90-92). The hypothesis of a shared personality trait has been proposed but the connection between addictive gaming and gambling appears to be relatively weak. Sanders et al. demonstrated that most past year gamers also reported gambling during the same period, and vice versa. However, the overlap between problematic levels of gaming and gambling was found to be modest. (90). According to Swedish law, gambling for money is permissible only for adults 18 years or older (93). Nonetheless, there is evidence that this behavior is present also among the younger segment of the Swedish population. An epidemiological study conducted in 2022 on Swedes aged 16 years and above revealed that approximately 3% of Swedish ninth graders reported experiencing some degree of problem gambling. (94).

A fact that adds complexity to the relationship between gaming and gambling is the presence of monetary elements in games. An increasing amount of attention and criticism has been directed towards the monetary components in games, along with the financial principles that underlie them (95-101). In-game monetization strategies manifest in various forms, encompassing advertising and microtransactions. Microtransactions include loot-boxes, cosmetic customization, pay-to-win, power-ups, in-game currency, among others (95, 96, 98, 99). A distinction can be made between microtransactions, where users select specific items, and loot-boxes, which yield random outcomes akin to gambling (98). Loot boxes are virtual items in video games that can be purchased, often with real money, and contain randomized rewards or items (100, 101). The items that will be received are typically hidden, as the contents are determined by chance or a random number generator (100, 101). These rewards can range from cosmetic items like character skins to in-game currency or powerful items that affect gameplay (100, 101). Recent research has focused on exploring parallels between microtransactions and gambling behavior (96, 100). Studies indicate that individuals with higher in-game expenditures are more prone to exhibiting symptoms of problematic gaming behavior, problem gambling, and psychological distress (97, 99).

There is a scarcity of systematic knowledge regarding both the prevalence and the possible coexistence of behavioral addictions in child and adolescent psychiatry.

Treatment

There is currently no established standard treatment for PG (or problem gambling) in young individuals. In Sweden, there are no national guidelines for the screening or treatment of these issues, and it is still unclear whether young people with PG or problem gambling should seek assistance from CAP or social services. Nevertheless, it is evident that some children and adolescents engaged in frequent digital gaming and gambling may require professional intervention to enhance control over their behavior (102). Although the available evidence is limited, cognitive behavioral therapy (CBT) is frequently considered a first-line treatment for PG. (48, 51).

In a 2019 meta-analysis by Stevens et al. (52), 12 treatment trials of Cognitive Behavioral Therapy (CBT) for PG were identified. The majority of these trials were conducted in Asia (52). CBT was administered in either group or individual formats, with a primary focus on assisting patients in recognizing triggers (cue-induced cravings) and developing beliefs and behaviors to enhance their motivation to quit or reduce gaming (52). Despite substantial heterogeneity across studies, significant effect sizes were observed for PG and comorbid depression, with moderate effect sizes for comorbid anxiety (52). Although a relatively small number of participants in the trials were below 18 years of age, the authors found no evidence suggesting that the treatment was less effective for adolescents compared to adults (52).

In a systematic review published in 2020, Zajac et al. identified only four previously published RCTs (Randomized Control Trials) evaluating CBT-based treatments for PG (48). One of these trials involving a sample of 30 students and university employees indicated that a mindfulness-oriented group treatment was more effective than a support group (103). One other trial in 65 male adolescents diagnosed with major depressive disorder revealed that a combination of CBT and bupropion was superior to bupropion alone (104). The other two RCTs did not demonstrate a clear advantage of CBT (105, 106). Both provided therapeutically active treatments for the control group, and both had relatively small sample sizes, with 28 and 24 participants, respectively (105, 106).

There has been a notable surge in interest in the treatment of PG in recent years (48, 51, 52). What was until recently essentially non-existent has transformed into a proliferating body of published articles on the subject (48, 51). The growing scientific interest in PG treatment likely reflects a perceived need identified by parents, school healthcare providers, and other caregivers who observe issues they associate with excessive gaming in children. However, the current research in this domain remains limited and is often characterized by methodological shortcomings (48, 51).

In a Swedish setting, it is still unclear whether and/or from where treatment for problematic gaming should be offered, and there is no regional requirement for

treatment. Relapse prevention (RP) is a form of CBT, initially designed to treat alcohol-related issues in adults. However, this method has been adapted to the treatment of both addiction to various substances, including alcohol, drugs, tobacco, and behavioral addictions such as gambling, among both adults and adolescents (107). RP primarily involves cognitive restructuring and trigger recognition, making it a relatively concise and cost-effective treatment (107). Moreover, RP has the advantage of being well-established and positively received within the clinics associated with the current project. To our knowledge, there is no previously published treatment research regarding PG in a Swedish context, and no one has previously evaluated RP as a treatment for PG.

Aims of the thesis

The association between PG and both young age and neuropsychiatric conditions is well known. The main aim of this thesis was to explore PG within a clinical child and youth population. We aimed to investigate the prevalence of PG within child and adolescent psychiatry and its correlates. Further, we sought to evaluate the GASA and the core approach. Lastly, we intended to implement and evaluate a treatment for PG.

The specific aims were:

1. To explore the prevalence of problem gaming and gambling in patients at CAP and assess the correlations between these conditions to each other but also to psychiatric diagnoses, as well as sex, age, type of care and housing situation.
2. To evaluate the core approach and the specific indicators of gaming behavior in GASA and explore the sex differences, focusing on ADHD.
3. To evaluate the acceptability and feasibility of relapse prevention as a treatment for PG and problem gambling within a pilot setting.
4. To specify the research plan for an RCT including objectives, design, methodology and statistical considerations.
5. To evaluate the effectiveness of relapse prevention (RP) as a treatment for PG.

Ethical considerations

Project I-II was approved by the Ethics committee (Dnr: 2019-02967). Written informed consent was obtained from all participants and their parents/guardians. Project III-V was reviewed and approved by the Swedish Ethical Review Authority (Ref 2019-04797, December 13, 2019). Subsequent amendments were approved (Ref 2021-05592-01, January 3, 2021; Ref 2022-01289-02, March 15, 2022). Written informed consent was obtained from all participants and from their parents/guardians if they were younger than 15 years old. All participants were informed of their right to withdraw from the studies at any time without giving any reason.

Methods

Subjects

Participants in all studies were recruited from child and adolescent clinics (CAP clinics) in Eslöv, Lund and Malmö, three cities in the south of Sweden. All patients were diagnosed according to the DSM-5 (14). Written informed consent was obtained from all the subjects and from their parents/guardians if they were younger than 15 years.

Paper I

Patients coming to the Child and Adolescent Psychiatry clinic (in- and out-patient departments, respectively) in Skane during the study period of 4 months (Feb–May) during 2020 were asked to participate. Clinicians (psychologists, psychiatrists) were systematically provided with questionnaires and were asked to distribute these to their patients. We used the NODS-CLiP when screening for problem gambling and GASA when screening for PG.

The study included a total of 138 participants. The survey was answered by 144 children and adolescents between 8 and 18 years of age. Six individuals participated without sharing social security number which made the collecting of other information (gender, age, housing situation, type of care, diagnosis) impossible. These individuals were excluded from the data file leaving 138 remaining individuals, specified in Table 2.

Table 2. Participants. Paper I.

	n	**(*n*)**	**%**	**(%)**
Sex				
Female	68		49.3	
Male	70		50.7	
Age				
8–12	28		20.3	
13–18	110		79.7	

Paper II

This study was conducted on the same sample as our first study (Paper I); thus, the recruitment procedure and participant characteristics is already mentioned. One individual abstained from answering the GASA-items, leaving 137 individuals.

Paper III

The participants included in Paper I-II composed the base for recruitment for Paper III. Roughly, 30% (*n* = 29) of the 137 individuals that were screened during the spring of 2020 met the criteria for PG, according to the tentative criteria suggested by the DSM-5 (14). Those aged 12–17 years were offered to participate in an interventional study. Altogether, nine children and adolescents (13–17 years), eight (89%) male and one (11%) female, were included. Characteristics are specified in table 3.

Table 3. Participants. Paper III.

	n	%
Sex		
Male	8	89
Female	1	11
Age		
13	1	11
14	1	11
15	0	-
16	3	33
17	4	44

Paper IV

Paper IV is a study protocol which specify the research plan for the fifth study (Paper V), the RCT. The study protocol clarifies objectives, design, methodology and statistical considerations. An informed consent was obtained from the each of the participants and their guardian/guardians.

Paper V

This trial and recruitment were performed from 1 September 2021 to 30 December 2022. All patients between the years 13–18, coming for their first visit to CAP were screened via an application, called The Blue App, for gaming behavior. Those meeting the proposed DSM-5 criteria for IGD (14) were offered participation in the trial. Patients without the ability to provide written informed consent or speak Swedish were excluded. Unfortunately, not every patient was screened digitally due to technical problems, thus some were provided the assessment on paper. Caregivers' consents were required for children younger than 15 years.

Out of 2,630 new visits, we were able to register 622 (≈24%) patients assessed with GASA whereof 123 (≈20%) met the cut off for PG. In the study protocol for this trial (Paper IV), we presented a power calculation estimating that approximately 40% in the intervention group and 20% in the control group would improve by follow-up. With these figures, we estimated that 160 (80 + 80) patients should be included in the trial for us to be able to demonstrate a significant difference with sufficient power (108).

However, among the CAP patients meeting the criteria for PG during the study's inclusion period, a total of 113 patients agreed to participate. One patient was excluded due to incorrect inclusion, being younger than 13 years old, and 10 patients were excluded because of not completing follow-up measures. The final sample consisted of 102 participants aged between 13 and 18 years old (*M* age = 14.42 years, *SD* = 1.367). Characteristics are specified in table 4. For an overview of the inclusion, exclusion and randomization, see the flow diagram in Figure 1.

Table 4. Participants. Paper 4.

	Control		Treatment		Total	
	Frequency	**%**	**Frequency**	**%**	**Frequency**	**%**
Total sample	55	53.9	47	46.1	102	100
Dropouts	0	0	6	5.7	6	5.9
Sex						
Male	36	65.5	39	83.0	75	73.5
Female	19	34.5	8	17.0	27	26.5
Age, years						
13-15	43	78.2	38	80.9	81	79.4
16-18	12	21.8	9	19.1	21	20.6

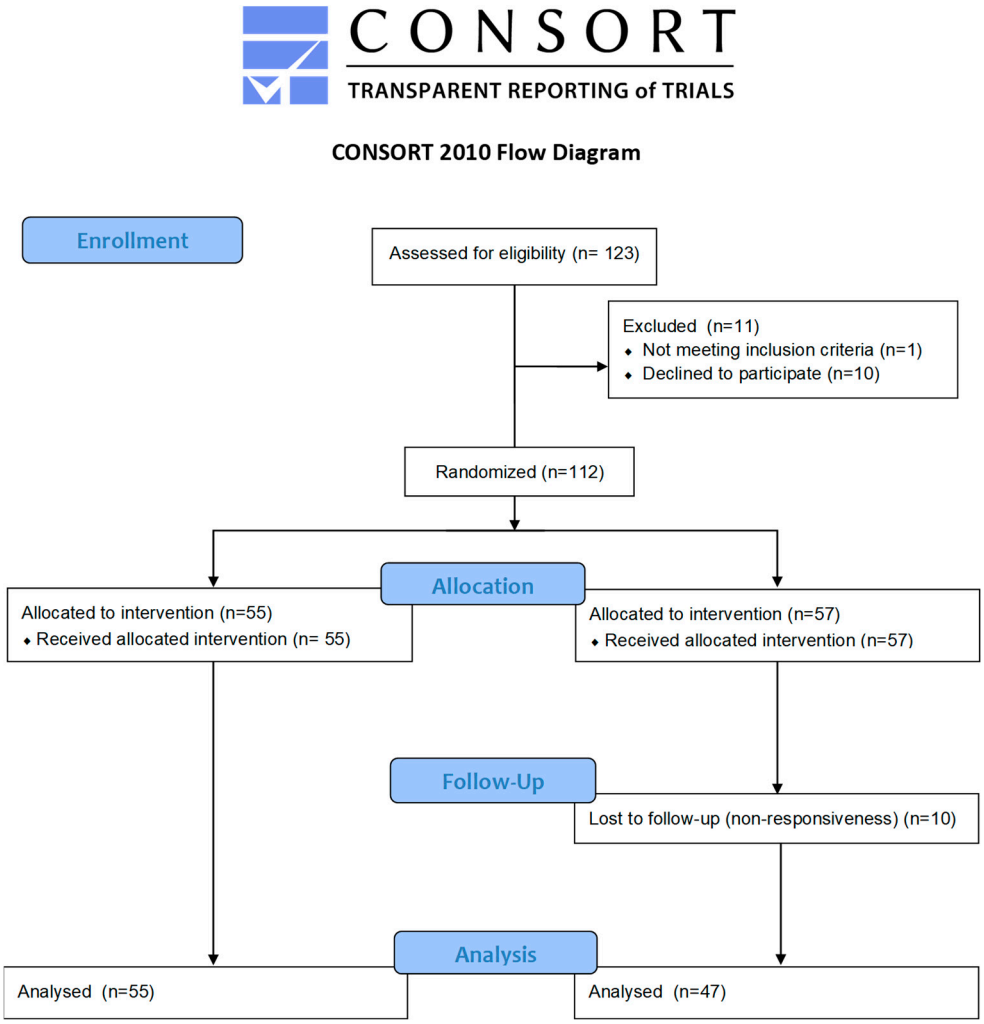

Figure 1. Consort flow diagram for inclusion, exclusion, and randomization.

Intervention

Relapse prevention (Paper III and V)

Relapse Prevention (RP), a form of CBT initially aimed at alcohol-related issues in adults, has been adapted for various substance and behavioral addictions, including gambling, in both adults and adolescents (107). RP primarily focuses on cognitive restructuring and trigger recognition, offering a concise and cost-effective treatment (107). It is well-established and positively received in clinics affiliated with our project.

To address child and adolescent problematic gaming (PG), we developed a CBT-based manual derived from RP, tailored with input from experienced clinical psychologists to suit CAP contexts. Sessions were condensed, and a fictionalized adolescent character was introduced to illustrate key themes.

In the development of the treatment manual, two main aspects were considered: tailoring the content and examples to children and adolescents, and structuring sessions to accommodate the participant's primary problem behavior—whether it was gaming or gambling. Patients meeting the criteria for disordered gaming or gambling, per tentative DSM-5 criteria, were given the option to join a relapse prevention treatment at their local or nearby clinic. To ensure accessibility, sessions were available in-person and via video link for those living further from participating clinics.

The treatment comprised three parts: (1) establishing goals, (2) identifying high-risk situations and problem behaviors, and (3) reinforcing the new activity schedule and recognizing future high-risk behaviors. The initial phase involves assessing the patient's behavior, motivation for change, and setting treatment goals, varying from 1 to 3 sessions based on individual motivation levels. Additional sessions could be provided if necessary. The second part employs traditional CBT techniques, including functional analysis to explore problematic situations, identifying triggers, and managing gaming time through activity scheduling and problem-solving exercises. The final phase involves recognizing early warning signs and reinforcing the most beneficial aspects of the treatment to maintain the new routine.

Participants allocated to the treatment group underwent RP across five to seven sessions, with each session lasting 45 minutes. Each session was delivered individually either at the respective CAP units or through a video link, with a clinician leading the sessions. The treatment team comprised four licensed psychologists, certified by the Swedish National Board of Health and Welfare, one social worker, and one psychiatrist, all equipped with expertise in CBT. The treatment protocol encompassed three main components: (1) goal setting, involving an examination of the patient's unwanted behavior, exploration of motivation for change, and establishing treatment goals; (2) understanding and identifying high-risk situations and problematic behaviors; and (3) recognizing future high-risk behaviors and early warning signals while solidifying the new activity schedule. A crucial aspect of the treatment involved theme-specific homework, to be discussed and evaluated in the subsequent session.

Treatment as usual (Paper V)

In Paper V, participants in the control group received treatment as usual (TAU). However, CAP, school healthcare staff, nor social services did not have a universal treatment they provided to children and adolescents to cease or regulate their gaming behavior. As a result, participants in the control group receiving TAU underwent various interventions based on existing practices.

Measures

GASA (Paper I-V)

The 7-item GASA was used for PG screening and for evaluation of PG symptoms (45). GASA aligns with the DSM-V criteria for problem gambling, encompassing salience, tolerance, mood modification, relapse, withdrawal, conflicts, and problems, focusing on gaming behaviour over the past six months (14). The DSM-V suggests that meeting half of the criteria qualifies for a diagnosis (14). However, a proposed ranking of constituent items suggests that 'core criteria'—relapse, withdrawal, conflicts, and problems—carry more weight in addiction than the 'peripheral' criteria of salience, tolerance, and mood modification, as argued by some scholars (46, 47, 69). Hence, the 'core approach' involves prioritizing the four core criteria, leading to the categorization of gamers into three groups: engaged gamers, problem gamers, and addicted gamers (47). This approach has been deemed clinically relevant, as the categories created appears to correlate with varying degrees of negative consequences and to the severity of addictive behaviour (25,36).

The 7 item responses were given on a 5-point scale from 1 = never, to 5 = very often. An item was considered endorsed when rated 3 or higher (45). The scale yields two outcome measures: firstly, a GASA score ranging from a minimum of seven points to a maximum of 35, and secondly, gamer categories (engaged, problem, and addicted gamers) based on the core approach (47).

CLiP (Paper I, III- IV)

In 1999, Gerstein et al. introduced a screening tool for gambling disorder known as the NORC Diagnostic Screen for Gambling Problems (NODS) (109). The 17-item questionnaire aligns with the DSM-IV criteria for Problem Gambling (PG) and generates a score ranging from 0 to 10 (109). NODS-CLiP comprises the NODS items related to loss of control, lying, and preoccupation—collectively referred to as 'CLiP' (110, 111). The questionnaire has demonstrated excellent sensitivity and specificity for NODS constructs (110, 111). A positive response to at least one item indicates problem gambling (110, 111).

Participant evaluation (Paper III)

All participants included in the pilot study (Paper III) were provided with the opportunity to assess the received treatment anonymously. The assessment questionnaire consisted of eight questions. The initial query was, 'How much has the treatment helped you in regulating your gaming, 0–10?'. Respondents were instructed to indicate a value between 0 and 10, where 0 denoted 'Not at all', 5 corresponded to 'Medium', and 10 equated to 'Extreme'. The second and third questions mirrored this format, addressing how much gaming bothered participants before and after the

treatment. The fourth question focused on motivation to engage in the treatment, requiring participants to assign a value between 0 and 10.

Question 5 inquired, 'Was it easy to understand what we talked about?', with response options including 'No', 'Yes, a little', or 'Yes, a lot'. Question 6 consisted of three sub-questions under the heading 'The treatment contained different parts, how much has the following helped you:'. The first part related to gaining more knowledge about game addiction, the second part concerned tasks done with a therapist, and the third part focused on homework. Responses were recorded as 'Not at all', 'Quite a bit', 'Partly', 'Quite a lot', or 'Very much'.

Questions seven and eight were open-ended and asked, 'What was the best part of the treatment?' and 'What could be improved before future treatments?'.

Statistics

Statistical analyses were performed in SPSS (IBM SPSS statistics version 27-28) and in Mplus (Version 8.6). The level of statistical significance was set to $p = 0.05$.

Comparison of proportions between two groups

Fishers exact test (Paper I)

This Fishers exact test is analogous to the Chi-square test but should be used when the sample size is small (when the anticipated values in any cell of a contingency table fall below 5.). Fishers exact test is used to determine if there are significant associations between two categorical variables.

Specifically, Fisher's exact test helps to assess whether the observed distribution of data into different categories is significantly different from what would be expected by chance. It's often used in contingency tables, where data is cross classified into categories, and it can be applied to 2x2 tables or larger tables.

In summary, Fisher's exact test tells you if there is a significant association between two categorical variables by comparing the observed distribution of data to the distribution expected under the assumption of independence. If the p-value is below a chosen significance level (e.g., 0.05), it suggests that there is evidence to reject the null hypothesis of independence.

This test was used in Paper I to determine the association of the prevalence of problem-/addictive gamers and gamblers between binary categorical variables of interest (sex, age, housing situation, diagnosis, type of care).

McNemars test (Paper III)

As Fisher's exact test, McNemars test involves a 2x2 contingency table but is used to analyze paired nominal data such as when the same subjects are involved in two related conditions or treatments. This test enables a comparing of proportions or outcomes within matched pairs or groups.

This test was used in paper III evaluate if the proportion of gaming categories changed after completed treatment.

McNemar's test was also applied in Paper V to compare the proportion of gaming categories between before and after treatment, in control group and treatment group separately.

Examination of the relationship between the outcome and predictors

Linear regression (Paper I and V)

Linear regression is a statistical method used to model the association between a dependent variable and one or more independent variables. The simplest form is simple linear regression, which involves predicting a dependent variable based on one independent variable. A multiple linear regression includes more than one independent variable, used to predict the dependent variable - the outcome of interest. This method yields a correlation coefficient, offering insights into the strength of the linear relationship.

This method was used in Paper I to examine the relationship between symptoms of problem gambling (CLiP score) and problem gaming (GASA score) and age, type of care, housing situation and psychiatric diagnosis.

A linear regression was also performed in Paper V to quantify the impact of treatment, measured as the difference/improvement in GASA score from baseline to follow up.

Test of correlation

Correlation analysis (Paper I)

Correlation analysis is a statistical method used to evaluate the strength of a relationship between two quantitative variables. The result of a correlation analysis is expressed as a correlation coefficient, which ranges from -1 to 1 and quantifies the degree to which changes in one variable are associated with changes in another. Correlation analysis does not imply causation but measures the strength of an association and provides a numerical summary of how closely related two variables are.

This method was used in Paper II to test how closely related problematic gaming and gambling were in the CAP sample.

Test of assessments

Reliability test

A reliability test assesses the consistency and stability of measurements or scores obtained from a particular instrument or assessment tool. The aim is to determine the extent to which the instrument produces consistent and reliable results over time or across different conditions. The reliability test produces a coefficient which ranges from 0 to 1, 0 indicating no reliability (complete inconsistency) and 1 indicating perfect reliability (complete consistency).

There are different types of reliability tests. In Paper II, we examine the internal consistency reliability of both the GASA and the CLiP. The internal consistency reliability is based on the evaluation of the consistency of responses within a single administration of a test.

Psychometric analyses

Confirmatory factor analyses (CFA) (Paper II)

Confirmatory Factor Analysis (CFA) is a statistical method within structural equation modeling (SEM) used to assess and confirm the hypothesized relationships between observed variables and latent constructs. The main objective of CFA is to determine whether a specified measurement model accurately represents the observed data.

In CFA, a theoretical model is proposed which specifies how a set of observed variables (indicators) are related to underlying latent constructs (factors). The model assumes that the observed variables are influenced by the latent factors, and these relationships are represented by factor loadings. CFA aims to confirm or disconfirm this theoretical model.

CFA is used to evaluate how well the proposed model fits the observed data. Good model fit suggests that the theoretical model accurately represents the relationships among variables. If the fit is not satisfactory, it is possible to modify the model, such as adjusting factor loadings or adding paths, to improve the fit.

CFA is primarily used in psychology, education, and other social sciences to assess the validity and reliability of measurement instruments and to test theories regarding hypothesized underlying factors.

CFA was applied in Paper II to identify constructs captured by the GASA items. We evaluated the GASA items based on different models in which both the two-factor core approach was evaluated and a three-factor version of the scale.

Analysis of variances

One-way repeated measures ANOVA (Paper III)

One-way repeated measures analysis of variance (ANOVA) is used to analyze the mean differences among two or more related groups in a within-subjects or repeated measures design. Each participant serves as their own control, making the test particularly useful when studying the effects of interventions or treatments over time.

In Paper III we performed a one-way repeated measures ANOVA to evaluate the efficacy of RP on symptoms of PG. The mean GASA score was compared between before treatment, after treatment, and at follow-up.

In Paper V we performed a one-way repeated measures ANOVA to evaluate the change in mean GASA score in the treatment group. The mean GASA score at baseline, after treatment, and at follow-up, was analyzed against each other.

Two-way repeated measures ANOVA (Paper V)

Two-way repeated measures ANOVA is used to analyze the mean differences among two or more related groups and includes two independent variables, wherein one or both variables involve repeated measurements. This method enables an examination of the main effects and interaction between the two independent variables over multiple measurement points.

This test involves an outcome variable which is measured repeatedly across the different conditions or levels of the independent variables. One component of the test is the within-subject factor – the repeated measures of the independent variables and the between-subject factor – representing the different groups or conditions.

The two-way repeated measures ANOVA is especially useful in longitudinal studies or studies involving repeated assessments of the same subjects under different conditions.

In Paper V, we performed a repeated measure ANOVA to compare the change in mean GASA score in the control group and the treatment group between baseline and follow up.

Comparison of means

Independent sample t-test

The independent-samples t-test compares the means of two independent groups to determine if there is a significant difference between them.

This test was used in Paper V to compare the mean difference in GASA score between baseline and follow-up (improvement) between treatment group and control group, enabling the estimation of the effect of treatment on GASA scores.

Results

Paper I

This project was started with a prevalence study in which we wanted to explore the prevalence of both problem gaming and gambling within CAP. We also wanted to examine whether these conditions were related to each other but also to psychiatric diagnosis, gender, age, type of care or housing situation.

Results

We estimated the prevalence of problem gaming and gambling among 138 CAP patients. Gaming behavior was measured with GASA and used to categorize participants into four groups: engaged gaming, problem gaming, addictive gaming and remaining study participants (RSP). The participants in the RSP group did not meet the cut-off for any of the gaming categories mentioned. Gambling behavior was assessed with CLiP resulting in problem gamblers and non-problem gamblers.

A third (33%) of the study participants showed problem/addictive gaming. Roughly half of the males in the study showed problem/addictive gaming and 44 percent of the subjects with ADHD showed problem/addictive gaming. More than one out of ten (11%) endorsed problem gambling behavior.

As shown in Table 5, a significant majority of the problem/addictive gamers were male when compared with the non-problem/addictive gamers (RSP group and engaged gamers). The prevalence of problem/addictive gaming was also significantly overrepresented among individuals with ADHD (44%, p=0.027).

The regression analysis (table 6-7), performed for males and females separately, showed a positive association between ADHD and GASA score for both boys and girls. Being 13 years of age or older was also consistently positively associated to severe gaming.

A positive association was also seen between problem gambling and ADHD as well as being 13 years or older.

Table 5. Prevalence of problem-/addictive gamers and problem gamblers among boys versus girls. RSP (Remaining Study Participants) and engaged gamers and non-problem gamblers were set as the reference categories for c2 comparisons.

	Boys % (n)	Girls % (n)	p-value
Problem-/addictive gaming	52.2 (36)	13.2 (9)	<0.001
Problem gambling	14.5 (10)	7.4 (5)	0.274

Table 6. Linear regression. Dependent variable GASA T-score.

Gender		Unstandardized coefficients		Standardized coefficients		
		B	Standard error	Beta	*t*	Sig.
Female	Thirteen or older	61.098	5.268	0.723	11.598	<0.001
	Inpatient care	7.717	14.369	0.031	0.537	0.593
	ADHD	46.547	8.997	0.305	5.174	<0.001
Male	Thirteen or older	93.838	13.676	0.572	6.861	<0.001
	Inpatient care	22.038	27.043	0.059	0.815	0.418
	ADHD	67.723	13.860	0.371	4.886	<0.001

Table 7. Linear regression. Dependent variable CLiP T-score.

Gender		Unstandardized coefficients		Standardized coefficients		
		B	Standard error	Beta	*t*	Sig.
Female	Thirteen or older	83.717	4.900	0.838	17.086	<0.001
	Inpatient care	23.527	13.364	0.079	1.760	0.083
	ADHD	27.666	8.368	0.153	3.306	0.002
Male	Thirteen or older	77.654	13.832	0.510	5.614	<0.001
	Inpatient care	39.356	27.351	0.223	1.439	0.155
	ADHD	63.178	14.018	0.373	4.507	<0.001

Paper II

Our second study was conducted using the same database used in Paper I, apart from one participant which was excluded due to non-response to the GASA items. This study was an evaluation of the instrument we used throughout the project to assess gaming behavior – GASA. We wanted to explore the dimensionality of the items in GASA and the potential impact of sex and/or ADHD. We also wanted to analyze the fitting of the two-factor core approach in which the peripheral items were considered to correspond to overconsumption (OC) and the core items to negative consequences (NC). We also

wanted to evaluate the fitting of an adapted three-factor version of the core approach, by dividing the core items into social and emotional consequences.

Results

The CFA showed that the two-factor core approach showed a satisfactory fit to the CAP sample. The three-factor version in which the core items were divided into social and emotional consequences, also showed a good fit. The overall estimate of the correlation between overconsumption (OC) and negative consequences (NC) was high, 0.91 (0.89 for females and 0.97 for males). As illustrated in Figure 2, when the path coefficient for OC → NC was differentiated into social and emotional path coefficients, the strongest association for boys appeared as OC → NC social (0.89) and for girls OC → NC emotional (0.95).

Figure 3 illustrates the addition of ADHD as a covariate. The estimated path coefficients showed that ADHD constituted a significant correlate for both over consumption of gaming and social aspects of negative consequences for females but not for males.

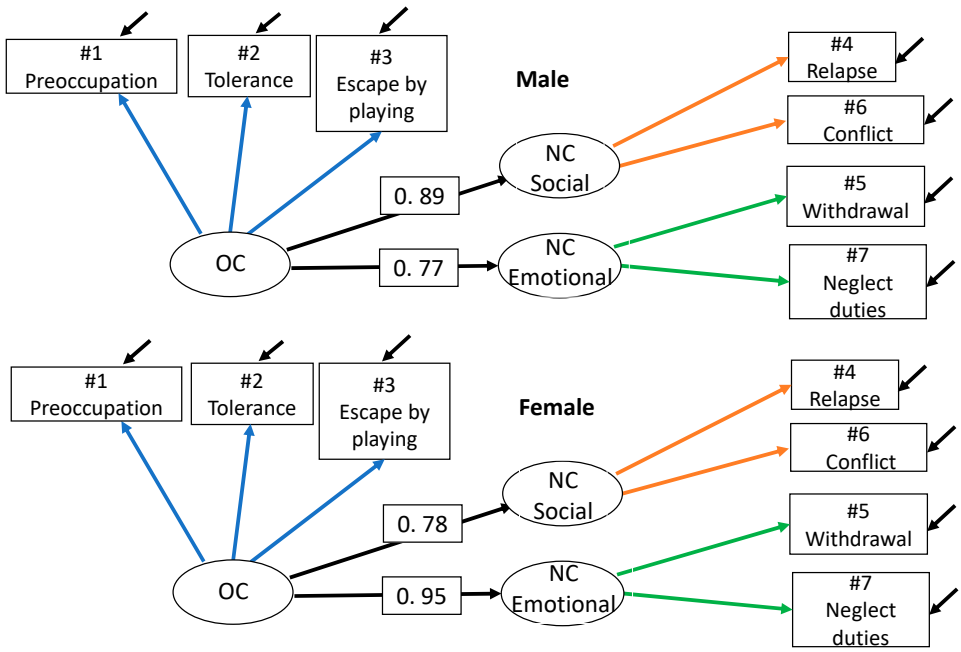

Figure 2. Two-group three-factor model by gender with core items divided into NC social and emotional with equality constraints across gender groups for corresponding measurement models.
Note. Residual correlations NC Social with NC Emotional (not represented in the path diagram) for male is 0.40 and for female 0.87.

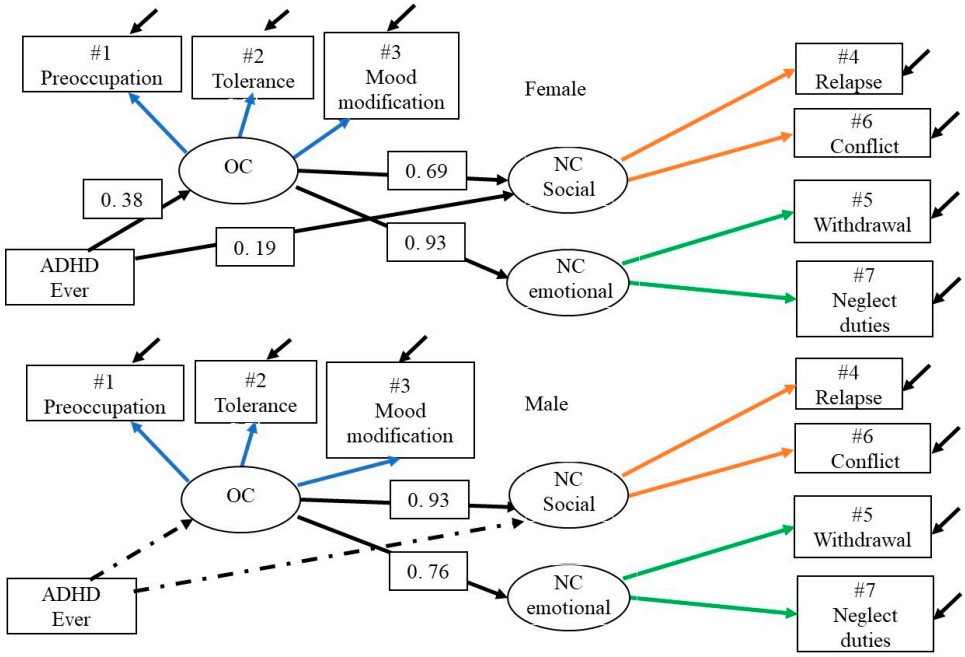

Figure 3. The two-group three-factor model with equality constraints across gender for corresponding measurement models and with covariate ADHD ever.
Note. Dotted line is non-significant path.

Paper III

The main aim of the third paper was to evaluate the feasibility of delivering relapse prevention (RP) as treatment of PG in a CAP setting. The third paper is a pilot project which explores the outcome of RP on PG and how the participants experienced the treatment. The CAP patients (aged 13-18 years) that met the criteria for PG in the previously conducted studies were offered to participate in this intervention study. Nine children and adolescents were included, of whom eight (89%) were male and one (11%) was female. After completing the treatment, the participants were offered to evaluate the intervention anonymously. The response rate for the post-treatment evaluation was 56%.

Results

Figure 4 illustrates the variations in GASA scores before treatment, after treatment, and at follow-up, 6 months post treatment. The results of the repeated measures ANOVA are presented in Table 2. The initial mean GASA score was 24, decreasing to 15 after treatment and further to 13 at follow-up. The analysis shows significant differences in

mean GASA scores between pre-treatment and post-treatment, as well as between pre-treatment and follow-up. However, there was no significant difference between the mean score after treatment and the GASA score at follow-up. Tables 8 and 9 reveal that, at follow-up, a significantly higher proportion of participants exhibited very few PG symptoms, not meeting the criteria for either engaged gaming according to the core approach or the criteria for problem gaming, according to the DSM-V. Figure 5 was not included in Paper III and serves here as an illustration of the numbers presented in Table 2.

Out of the nine participants, three individuals (33%) fulfilled the criteria for problem gambling both before and after treatment. Two individuals who engaged in gambling before the treatment ceased this behavior after completing the treatment. Conversely, two participants who did not gamble before treatment endorsed gambling after completing the treatment. One individual acknowledged gambling for money both before and after treatment.

The evaluation showed that the respondents consistently noted that the treatment had effectively assisted them in managing their gaming behavior. A majority expressed that gaming was more disruptive to them before the treatment than after. Notably, one individual rated the impact of gaming on them higher after the treatment compared to before. The motivation to engage in the treatment varied, with scores ranging from 4 to 10 (4–6, 10). Most participants found it very easy to comprehend the therapists' explanations, though one individual found it challenging. Question 6 inquired about the perceived effectiveness of different components of the treatment, and the majority responded positively to all aspects (increased knowledge about disordered gaming, tasks with a therapist, and homework). Participants conveyed in free-text responses that they found the treatment enjoyable, considered it beneficial overall, and mentioned learning a lot. One participant highlighted the positive aspect of the treatment as "the conversation, as the therapist had a different perspective on disordered gaming than me, and it was helpful to discuss it." Suggestions for improvement included incorporating more hands-on activities to concretely reduce gaming, introducing more game-free days earlier in the treatment, providing better access to materials, ensuring all materials are attached together, and potentially including more in-depth conversations on specific areas rather than introducing additional tasks.

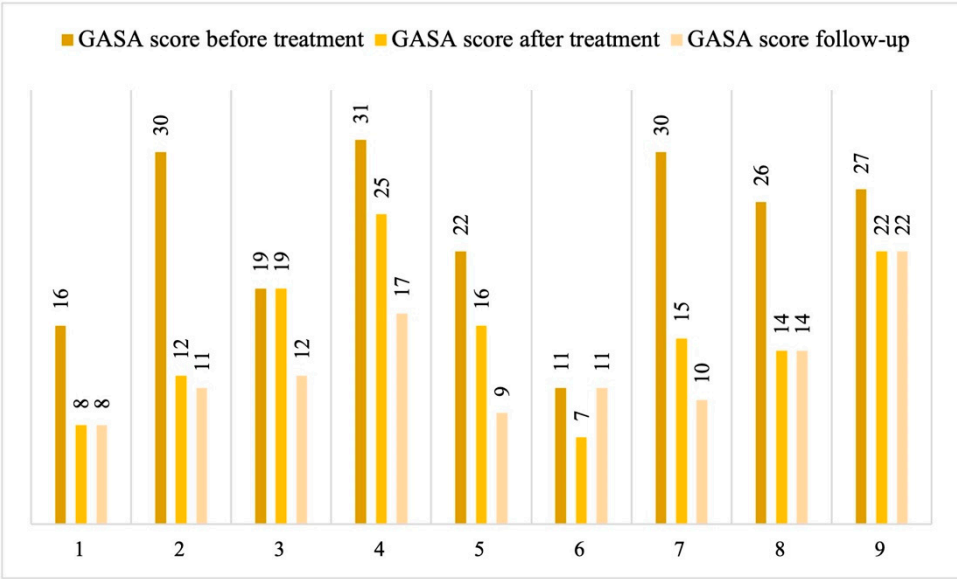

Figure 4. Individual GASA score before treatment, after treatment, and at follow-up.

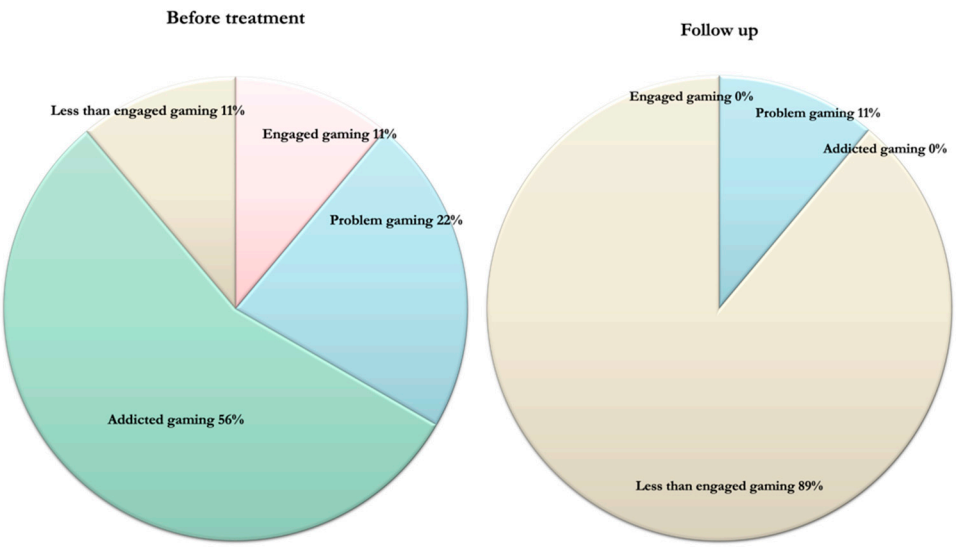

Figure 5. Prevalence of gaming categories before and after treatment.

Table 8. McNemar's test for X^2 comparisons of the prevalence of gaming categories between before treatment and follow-up.

Core approach	Before treatment % (n)	Follow-up % (n)	*p*-value
Engaged gaming	11 (1)	0.0 (0)	-
Problem gaming	22 (2)	11.1 (1)	1.000
Addicted gaming	56 (5)	0.0 (0)	-
Less than engaged gaming	11 (1)	88.9 (8)	0.016
DSM approach			
Problem gaming	78 (7)	11.1 (1)	
No-problem gaming	22 (2)	88.9 (8)	0.031

Table 9a. Estimates of mean GASA score, before treatment, after treatment, and at follow-up.

	Mean	95% Confidence interval
Before treatment	23.6	18.2 – 29.0
After treatment	15.3	10.7 – 20.0
Follow-up	12.7	9.3 –16.0

Table 9b. One-way repeated measures ANOVA. Comparison of GASA-score between before treatment, after treatment, and at follow-up.

		Mean difference	*p*-value	95% Confidence interval for difference
Before treatment	After treatment	8.2	0.003	3.8 – 12.6
	Follow-up	10.9	0.001	5.9 – 15.9
After treatment	Before treatment	-8.2	0.003	- 12.6 – -3.827
	Follow-up	2.7	0.092	-0.5 – 5.9
Follow-up	Before treatment	-10.9	0.001	-15.9 – -5.9
	After treatment	-2.7	0.092	-5.9 – 0.5

Paper V

The final part of this project was an RCT evaluating relapse prevention as a treatment for PG. This study included 102 CAP patients aged 13-18 years old, randomly allocated to relapse prevention (RP, *n*=57) or treatment as usual (TAU, *n*=55).

Results

Both the control and the treatment groups showed a reduction in their GASA scores over time. The mean scores from baseline and follow-up are depicted in Figure 6. The repeated measures ANOVA test of within-subject effects showed a significant interaction effect between time and treatment ($p < 0.001$) and significant differences

between the control and treatment groups in the mean GASA score at both baseline (mean difference 2.2, p = 0.008, 95% CI = 0.578, 3.806) and follow-up (mean difference –2.7, p = 0.026, 95% CI = –0.322, –4.999). Both the control and treatment groups showed a significant reduction in their mean GASA scores from baseline to follow-up (mean difference in the control group –5.1, p < 0.001, 95% CI = –3.390, –6.755; mean difference in the treatment group –9.9, p < 0.001, 95% CI = –11.746, –8.105). The independent samples t-test indicated a significant difference in the mean improvement in GASA score between the two groups (t(100) = –3.88, p = <0.001, 95% CI = –7.331, –2.374). The effect size, as measured by Cohen's d, was d = 0.77, indicating a medium effect (112).

The regression analysis (table 10) revealed a significant contribution of the treatment to a more pronounced difference in GASA scores from baseline to follow-up, indicating a significantly greater improvement among those who underwent the treatment. The mean GASA score at baseline significantly contributed to the model, suggesting that a higher baseline score was positively associated with a greater improvement. Demographic factors such as age, gender, and housing situation did not significantly contribute to any change in GASA score, nor did any of the most common diagnoses.

The treatment group underwent a separate repeated measure ANOVA incorporating also the GASA scores collected immediately after treatment. The mean scores from baseline, post-treatment, and follow-up are depicted in Figure 7. As the post-treatment GASA score was missing for five individuals, this analysis included 43 participants. The mean difference in GASA scores was significant both between baseline and post-treatment (mean difference = 8.4, p < 0.001, 95% CI = –10.813 – –5.954) and from post-treatment to follow-up (mean difference = 2.0, p = 0.007, 95% CI = –3.612 – –0.481).

McNemar's test (table 11) revealed a significant decrease in the proportion of individuals classified as both problem and addicted gamers at follow-up compared to baseline in the treatment group. In contrast, no notable difference was observed in the control group.

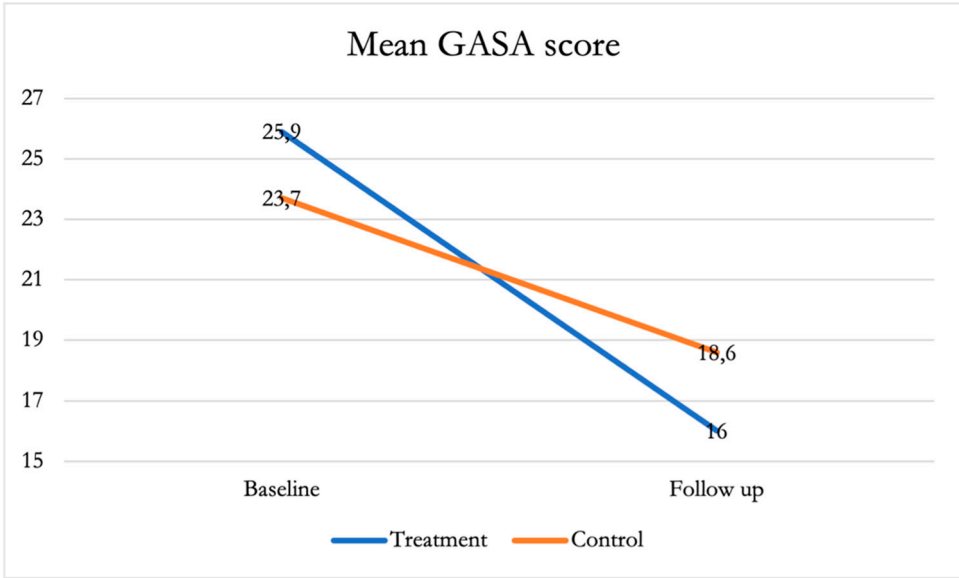

Figure 6. Mean GASA score. Changes in mean score from baseline to follow-up. N=102.

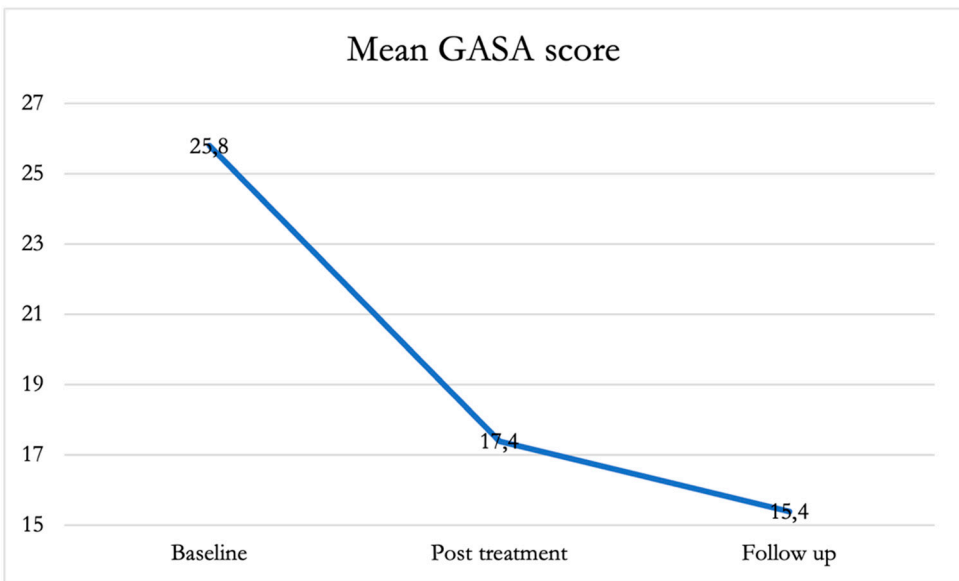

Figure 7. Mean GASA score at baseline, post-treatment, and at follow-up. Treatment group (non-respondents of post treatment measures excluded). N=43.

Table 10. Hierarchical linear regression analysis. Dependent variable GASA mean improvement. N=102.

	Coefficients		Model Summary			
Predictor	**β**	**Sig.**	**R^2**	**Δ R^2**	**ΔF**	**Sig. ΔF**
Model 1			**0.131**	**0.131**	**15.088**	**<0.001**
Treatment	4.853	<0.001				
Model 2			**0.277**	**0.146**	**19.995**	**<0.001**
Treatment	3.472	0.004				
Baseline GASA score	0.630	<0.001				
Model 3			**0.255**	**0.000**	**0.001**	**0.979**
Treatment	3.468	0.005				
Baseline GASA score	0.629	<0.001				
Male gender	0.036	0.159				
Model 4			**0.292**	**0.015**	**2.014**	**0.979**
Treatment	3.514	0.004				
Baseline GASA score	0.639	<0.001				
Male gender	-0.050	0.970				
< Age 15	2.008	0.159				
Model 5			**0.292**	**0.000**	**0.015**	**0.904**
Treatment	3.501	0.005				
Baseline GASA score	0.637	<0.001				
Male gender	-0.038	0.978				
< Age 15	2.019	0.160				
Cohabiting parents	-0.142	0.904				
Model 6			**0.292**	**0.025**	**0.832**	**0.508**
Treatment	3.462	0.007				
Baseline GASA score	0.616	<0.001				
Male gender	0.080	0.953				
< Age 15	1.682	0.268				
Cohabiting parents	-0.003	0.998				
ADHD	1.348	0.355				
ADD	1.714	0.329				
ASD	1.999	0.111				
Depression	4.017	0.378				

Table 11. McNemar's test for X^2- comparisons of the prevalence of gaming categories between baseline and follow-up, in control group and treatment group separately. N=102.

	Control			Treatment		
	Baseline N (%)	**Follow-up N (%)**	**p-value**	**Baseline N (%)**	**Follow-up N (%)**	**p-value**
< Engaged gamers	0 (0)	34.5 (19)	-	0 (0)	59.6 (28)	-
Engaged gamers	10.9 (6)	5.5 (3)	0.453	0 (0)	4.3 (2)	-
Problem gamers	54.5 (30)	41.8 (23)	0.167	48.9 (23)	25.5 (12)	**0.043**
Addicted gamers	34.5 (19)	18.2 (10)	0.064	51.1 (24)	10.6 (5)	**<0.001**

Discussion

In summary, within the current project, we aimed to investigate the prevalence and basic characteristics of PG among CAP patients. We also wanted to evaluate a screening tool thereof – GASA. Finally, we wanted to implement and evaluate a CBT based treatment of youth PG. Our first paper suggests that the prevalence of problematic gaming appears to be very high within CAP, affecting as many as a third of the included patients and more than half of the male patients. As repeatedly reported previously, an association was found between ADHD and PG symptoms. The evaluation of GASA in Paper II showed that a distinction of the GASA items into core and peripheral criteria – known as the core approach, fit the CAP sample. Also, a theoretical model further distinguishing the core items into social or emotional negative consequences showed an even better fit. This extended version of the core approach revealed that the negative consequences tended to be emotional for female gamers and social for male gamers. Lastly, both Paper III and Paper V presents results that motivates further research on RP as treatment of youth PG.

The prevalence

The fact that the prevalence of PG was so high among CAP patients demands both clarification and problematization. Firstly, the definition should be discussed. We used the GASA to screen for PG and applied the core approach to determine the threshold for pathological gaming behavior. The methodological prioritization of the core items is an approach in line with the ICD's emphasis on functional impairment. The core items, which all entail negative consequences, are relatively similar to the ICD criteria for PG. The categories created by the core approach are engaged, problem and addicted gamers. We combined the categories of problem and addicted gamers when estimating the prevalence of PG within CAP. Thus, this definition is not as strict as the ICD threshold for PG as the category of problem/addicted gamers comprises some gamers that only met half of the core criteria. However, one could argue that the fulfillment of the criteria for problem gaming, not far from the DSM-V threshold for IGD, reasonably correspond to problematic behavior that does warrant attention, not least when it's seen among young and vulnerable individuals (e.g., CAP patients). Support for such reasoning can be found in other research (47, 71).

Still, when we compare our prevalence estimate to other research, it may be advisable to use the higher threshold definition – the category of addicted gamers. In our first

paper, we showed that the prevalence of addicted gamers was 10.1% within our CAP sample. In 2016, Vadlin et al. performed a comparative study in which they investigated the prevalence of PG in one clinical and one non-clinical sample of Swedish adolescents (age 12-18 years). Their prevalence estimate was close to ours (clinical: 11.0% vs. non-clinical: 9.8%), and the difference between the two samples was non-significant. On the other hand, in 2022, Gerdner et al. presented a 1.2% prevalence of PG within a community sample of Swedish 18-year-olds (82). The lower threshold definition presented by Gerdner et al. showed a 5.7% prevalence of pathological gaming, reduced to 3.0% when adjusted for gender (82). Müller et al. investigated the prevalence of PG among European adolescents (age 14-17 years) and found that 1.6% of the adolescents met their criteria for PG, whereas 5.1% were defined as being at risk for PG (22).

We hypothesized that the prevalence of PG would be specifically high among CAP patients. One reason for this hypothesis is empirical, based on clinical experience and perception. The other reason is both theoretical and empirical. On the clinical side, there is a perception that PG is particularly common among patients with ADHD and ASD. The theoretical aspect involves the frequently reported association between PG and psychiatric disorders, notably ADHD, as well as various psychiatric symptoms (29, 33, 36, 37, 113). Further, extant research describes an interaction between PG and psychiatric diagnoses, such as ADHD symptoms, that both predispose to and is aggravated by PG (36, 37). It is difficult to compare the prevalence that we showed in Paper I with other research as both sampling and assessment methods differ. However, in comparison to the community prevalences presented by Gerdner et al. and Müller el al. (22, 82), the prevalence that we present appears to be particularly high.

The use of GASA, the core approach and the evaluation thereof

The GASA is one of many existing PG screening tools and one could question our choice of this specific assessment. The reason we chose the GASA is partly because the assessment has been frequently used and appreciated within the current research group and within the clinics involved in this project.

One other important reason is the fact that the assessment was developed specifically for adolescent populations. While both the DSM-V and the ICD-II criteria for GD and IGD, respectively, concern the last 12 months (13, 14), the GASA assesses gaming habits during the last 6 months (45). Based on our clinical knowledge and experience with youth gaming, we believe that engaging in destructive gaming for a period of 6 months is sufficient to lead to adverse consequences and a need for help. Also, Lemmens et al. created the items to capture the developmental stage of adolescents (45). Some items pertain to school or parents (45). Further, some of the items capture the fact that the behavior could be considered problematic for children and adolescents partly or mainly because their parents consider it problematic (e.g., item 4. “Have others

unsuccessfully tried to reduce your time spent gaming?" and item 6. "Have you had arguments with others (e.g., family, friends over time spent on games?").

The core approach places emphasis on the items in the GASA that relate to adverse outcomes. Lemmens et al. suggest that core items, such as whether others have unsuccessfully attempted to limit gaming time, reflect characteristics associated with the addiction criterion of relapse (14, 45), However, this criterion might also signify an adolescent form of loss of control, as defined by the ICD. (13). Similarly, other core items, like feeling upset when unable to play, align with the withdrawal criteria in the DSM-V (14, 45) , The connection to ICD criteria is less direct, although it does involve distress, which is part of the fourth GD criterion (13). The presence of arguments with others over gaming time corresponds to deception criterion in the DSM-V and may be consistent with the ICD-11 criterion for persistent use despite negative consequences (13, 14, 45). Finally, the prioritization of gaming over other activities, as indicated in the fourth core item of the GASA, is akin to criteria in both the DSM-V and ICD-11, although the wording in the GASA implies negative consequences more directly (13, 14, 45). In summary, the use of GASA and the core approach could possibly be regarded as a compromise between the diagnostic criteria's of the ICD-II and the DSM-V, which with the inclusion of the peripheral criteria, enables a mapping ofpotentially risky gaming that could transition into PG (69).

In the second paper included in this project, we wanted to evaluate the GASA and specifically the core approach. In this study, we considered the core items to relate to negative consequences and differentiated them into social and emotional consequences. The peripheral items were considered to correspond to overconsumption. With this psycho-social model we aimed to explore overconsumption (the peripheral items) as an explanatory variable for problematic use of games (core items). This aligns with the suggestion made by Charlton and Danforth that peripheral criteria may precede the core criteria (69). We showed that the two-factor version (core approach) demonstrated a satisfactory fit to the data. Additionally, the three-factor version (segregating core items into social and emotional consequences) showed a good fit.

Interestingly, the negative consequences for male gamers tended to be predominantly social, whereas for female gamers, they leant more towards the emotional aspect. Bonnaire et al. explored sex differences in PG and revealed that male gamers were more inclined to be single compared to their female counterparts, while female gamers exhibited higher anxiety scores (40). The Bonnaire et al. findings could be considered to reinforce the results of this study, shedding light on sex-specific emotional and social consequences of gaming (40).

In our second paper, we showed that ADHD was significantly associated with both overconsumption of video games and the resulting negative consequences, for females. In the prevalence study (Paper I), which was performed on the same sample as the second paper, we did see an association between ADHD and PG symptoms among

both male and female participants. When the PG symptoms were divided into items concerning overconsumption and different negative consequences, the association appeared only among female participants. One could argue that these results suggests that ADHD could be a greater risk factor for overconsumption of computer games and the negative consequences thereof for girls than for boys. An explanation or investigation of such sex discrepancy could not easily be found in previous literature. However, somewhat in line with our results, a study by Martins et al. examined gender differences in mental health characteristics among adolescent gamblers and revealed that parents of female gamblers were disproportionately more likely to rate high levels of childhood hyperactivity compared to parents of male gamblers (114). Possibly, the fact that both problematic gaming and gambling is more common among males could contribute to a greater tendency of predisposing conditions among female gamers and gamblers.

Male participants, regardless of a potential ADHD diagnosis, exhibited higher degrees of overconsumption of games and more severe consequences compared to females. Also, the association between overconsumption and negative consequences was stronger among male participants. Generally, boys invest more time in gaming and are overrepresented among the minority experiencing gaming problems (27, 30). Most research indicates that being male poses a risk factor for PG (25, 27, 30). The male participants overall showed a substantially greater burden of PG symptoms, possibly making the presence of overconsumption more obligatory.

The treatment

The third, fourth and fifth Paper all concern the evaluation of RP as a treatment for youth PG. The results of the pilot study were promising, RP reduced the proportion who met the criteria for gaming addiction from 56% at baseline to 0% post-treatment. Only one participant met the criteria for PG at follow-up. The sample was small, and the results should be interpreted with caution. However, the primary aim of this project was to assess the acceptability and feasibility of a CBT-based treatment for PG in adolescents recruited from CAP in southern Sweden. As part of the study, therapists were trained in RP, and a limited number of patients from CAP were enrolled for treatment. In summary, the findings from this study suggest potential effectiveness. Participants involved in the evaluation consistently reported that the treatment assisted them in managing their gaming habits, and they significantly rated their gaming lower after completing the treatment.

The fourth paper was a study protocol that detailed the methods and circumstances behind the final project, the RCT. The final paper was an extension of the preceding pilot project, evaluating RP as a treatment for youth PG, within the framework of a full Randomized RCT. Participants underwent evaluations for PG symptoms via GASA at baseline and follow-up, conducted three months after the initial screening. Additionally, the treatment group underwent assessments for PG symptoms

immediately after completing the treatment. Both the treatment and control groups demonstrated improvement in PG symptomatology from baseline to follow-up. However, in the treatment group, children and adolescents showed significantly greater improvement in their PG symptoms. Furthermore, the proportion of both addicted and problem gamers exhibited a significant decrease from baseline to follow-up in the treatment group, while no such difference was observed in the control group.

Both the control and treatment groups exhibited significant improvement in terms of PG symptomatology, from baseline to follow-up. Possibly, this improvement may indicate a self-correcting nature of the condition. Research on the natural course of PG diverges (84). Gentile et al. found that 84% of the problematic gamers in a secondary school setting remained problematic gamers after 2 years (44). Another study, involving secondary school students, reported that 50% of the problematic gamers remained problematic gamers after 1 year (85), while Krossbakken et al. documented a three-year stability of 35% in a representative sample of problematic gaming 17-year-olds in Norway (71).

Alternatively, the improvement seen in the control group could be a result of the fact that the participants in the control group received some form of psychiatric care. Their improvement might be a positive side effect of adequate treatment for another psychiatric comorbidity. It is evident that there is a reciprocal relationship between psychological distress and IGD (71). Hence, it is plausible that addressing psychiatric issues had a positive spill-over effect on PG symptoms.

In this trial, the treatment group showed a greater reduction in terms of PG symptoms compared to the control group. Furthermore, the analyses of the prevalence of gaming categories revealed a significant reduction in problem and addicted gamers within the treatment group, whereas no such decrease was observed in the control group. This aspect may be held more clinically relevant than the change in GASA score (46, 47). Drawing a direct comparison between the effectiveness of this treatment and the result of other research poses a challenge due to the limited number of comparable studies and variations in outcome measures (15, 48, 51, 52). In 2023, Gavriel-Fried et al. explored the concept of PG recovery in a scoping review (115). They concluded that recovery is a term that seldom is used in gaming research and that most studies instead explore symptom reduction (115), which is the case throughout this thesis, too. Gavriel-Fried et al. also mention abstinence in the sense that the research field is still not in agreement regarding whether total abstinence can or should be achieved or if symptom reduction should be sought instead (115). Within the framework of the treatment received in our trial, therapists and patients collaboratively set treatment goals, and there was no explicit ambition for abstinence.

Further, Gavriel-Fried et al. lists factors within and outside an individual that either support or impede the process of recovery – internal and external factors. They mention impulsivity, high aggression, harm avoidance as negatively associated with PG recovery.

Depression and ADHD scores are mentioned as critical internal negative predictors of recovery from PG. External factors mentioned are social, such as perceived family cohesion and the involvement of family members which has been showed to contribute positively to the recovery process by supporting treatment attendance and completion (115). In our trial, neither of the psychiatric diagnoses had any impact on the improvement seen. Possibly, the impact of the diagnoses is clouded as all participants had some form of psychiatric diagnose. However, it can be considered particularly relevant and hopeful to observe such a positive effect of treatment, despite the treated group having a substantial number of both internal and external factors with expected unfavorable effects on improvement (115).

Limitations

The majority of the limitations of this thesis are outlined in the included papers. Overarching limitations will be discussed.

One limitation that should be mentioned is the relatively small sample size in Papers I, II and III. Also, the same sample was analyzed in both Paper I and II and this sample also formed the basis for recruitment in Paper III. This aspect is theoretically allowing for the continuation of potential errors as they could have been carried forward.

One limitation that primary concern Papers I and II is the possibility for selection bias. Clinicians were provided with questionnaires and were supposed to distribute them to all their patients. However, we have no insight into which patients were actually handed the questionnaires and whether they were selected for any reason. Additionally, we lack information on the numbers of patients who declined to participate and, if they did, wherefore. Nevertheless, the gender distribution was balanced, ADHD was the most prevalent disorder, as anticipated, and there is no apparent reason to believe that the sample deviated considerably from a typical CAP population.

Additionally, the cross-sectional design of Paper I and II precludes drawing conclusions regarding causation; a longitudinal investigation would be necessary for this purpose. Moreover, the measures employed throughout this thesis relied on self-reporting, which introduces a potential risk of recall bias.

One could argue that the use of a self-assessment questionnaire (e.g., GASA), rather than a standardized structured clinical interview, would have facilitated a more precise assessment of either the DSM-5 diagnostic criteria or the ICD-II criteria. Nonetheless, the use of questionnaires is common in psychiatric research, including prevalence studies on PG (19, 25, 32, 78).

Another potential limitation is that the GASA assesses experiences with games over the past 6 months, whereas the DSM-5 criteria for IGD pertain to the last 12 months (14, 45). However, it's worth noting that GASA is specifically designed for adolescents (45), and our clinical knowledge and experience regarding youth gaming indicate that 6 months of problematic gaming can indeed lead to negative consequences and necessitate intervention.

Another limitation which concerns Paper IV and V, is the manualized format of the treatment. It's essential to acknowledge that a one-size-fits-all approach may not be

suitable, considering the diversity among patients in terms of maturity and comorbidities. For instance, a patient with ADHD may not derive the same benefit from the treatment as a patient with depression, despite both experiencing PG. However, in the regression analysis conducted in Paper 5, no significant importance of psychiatric diagnosis for treatment outcome was demonstrated.

One might contend that the CAP focus of this thesis, with the implication of a diagnosis of a psychiatric condition in each participant, could impact the generalizability of the results. However, this circumstance could also be viewed as enhancing external validity, given that psychiatric comorbidity, especially ADHD (29, 33, 72), is a recognized characteristic of PG.

Conclusions

This thesis explores problematic gaming in a CAP context with a focus on prevalence, screening, and treatment of the behavior. Problematic gaming appears to be highly prevalent among patients in child and adolescent psychiatry and should perhaps, therefore, be screened for to enable the offering of treatment when needed. GASA and the core approach fitted the sample used in this thesis and Relapse Prevention had a positive effect on PG symptomatology, relative to control. However, additional research on problematic gaming is needed. Sex differences in PG and its consequences warrant additional exploration. Further research on PG treatments is necessary to enable the development of a treatment that can be conducted and offered in a way that maximizes its benefits for as many individuals as possible.

Clinical implications

This thesis highlights a problematic behavior that is evidently common in CAP patients, which likely deserves more attention and knowledge within CAP services. The behavior should also be considered in the clinical diagnostics of other settings where child and adolescent psychiatric conditions are present. We have also demonstrated that the screening tool GASA and the core approach are suitable for this specific sample, and based on our findings, continued use within CAP could be encouraged. The project has also shown that it is possible to conduct RP as a treatment for PG within CAP, and it is likely that RP could be offered as treatment through other channels such as school health care or primary care.

Future

Future research would benefit from a greater consensus regarding terminology, screening methods, and diagnostic cut-off. By reducing discrepancies, the prevalence would become more accurate and comparable between populations and studies. Additionally, comorbidity estimations would be more accurate, as would the reported association with negative consequences.

There is evidence for sex differences in gaming, which becomes apparent also in this thesis, but these are insufficiently explored and explained. More research on female gaming and sex specific characteristics of PG is needed. Specifically, sex differences in terms of risk factors for PG and the potential negative consequences thereof, as well as potential sex specific comorbidity and health correlates of PG would be interesting to further explore.

During the implementation of the RCT, it became evident, especially for the practicing therapists, that the participants' guardians could have been involved to a greater extent. Parents did express a need for personalized relational and practical support aligned with their specific circumstances, alongside a desire for increased involvement in their children's treatment. It would be interesting to design and evaluate a treatment, possibly based on RP, that involves parents in the treatment and its core elements.

In Paper III, we mention that the participants rated their motivation to participate in the intervention as relatively low. The participation was voluntary so one could expect that the motivation would have been higher. This motivational aspect does deserve further investigation. When it comes to youth gaming, it is conceivable that, in some cases, the behavior is considered problematic mainly from the parental perspective and that the child/adolescent above all experiences the conflicts concerning gaming to be problematic. Possibly, the motives for participation in a treatment is being carried mainly by the parents. Regardless, it would be relevant to explore how the motivation might impact the efficacy of a given treatment and whether the parental motivation matter.

Also, the parent-child relationship warrants additional exploration. A project conducted in conjunction with the RCT included in this thesis, was a qualitative investigation of the adolescents' perceptions of RP as treatment for PG (116). This study unveiled that the primary outcomes of the treatment were increased awareness of how the gaming and related behaviors influenced other aspects of their lives.

Participants believed that the treatment enhanced their relationship with their parents by reducing everyday conflicts (116). Possibly, an effective treatment of PG could include an even greater emphasis on psychoeducation and be more focused on conflict resolution and family strategies to handle challenges.

One aspect that we do not address in this thesis is the relationship between different genres or specific titles and PG symptoms. Genre research exists, but much of the existing research is outdated as the gaming industry and the game genres have undergone great changes (86). More studies are needed to identify which types of games and in-game features may pose the greatest risk for developing PG. A deeper understanding of this relationship could likely facilitate harm reduction through advice on avoiding specific titles, for example, but possibly also through potential legislation regarding elements that may need regulation.

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References

1. Entertainment Software Association Essential facts about the video game industry 2023 https://www.theesa.com/wp-content/uploads/2023/07/ESA_2023_Essential_Facts_FINAL_07092023.pdf (2023).
2. King DL, Delfabbro PH. The cognitive psychology of Internet gaming disorder. Clin Psychol Rev. 2014;34(4):298-308.
3. Gentile DA, Bailey K, Bavelier D, Brockmyer JF, Cash H, Coyne SM, et al. Internet Gaming Disorder in Children and Adolescents. Pediatrics. 2017;140(Suppl 2):S81-s5.
4. Paulus FW, Ohmann S, von Gontard A, Popow C. Internet gaming disorder in children and adolescents: a systematic review. Dev Med Child Neurol. 2018;60(7):645-59.
5. Granic I, Lobel A, Engels RC. The benefits of playing video games. Am Psychol. 2014;69(1):66-78.
6. Fam JY. Prevalence of internet gaming disorder in adolescents: A meta-analysis across three decades. Scand J Psychol. 2018;59(5):524-31.
7. Council, T. S. M. (2019). Youth and media 2019. Article in Swedish. Statens Medieråd. https://www.statensmedierad.se/rapporter-och-analyser/material-rapporter-och-analyser/ungar--medier-2019.
8. Jones CM, Scholes L, Johnson D, Katsikitis M, Carras MC. Gaming well: links between videogames and flourishing mental health. Front Psychol. 2014;5:260.
9. Halbrook Y, O'Donnell A, Msetfi R. When and How Video Games Can Be Good: A Review of the Positive Effects of Video Games on Well-Being. Perspectives on Psychological Science. 2019;14:1096-104.
10. George S, Griffiths MD. Gaming disorder: what doctors need to know. Br J Hosp Med (Lond). 2020;81(8):1-6.
11. Lee SY, Lee HK, Choo H. Typology of Internet gaming disorder and its clinical implications. Psychiatry Clin Neurosci. 2017;71(7):479-91.
12. Gao Y-X, Wang J-Y, Dong G-H. The prevalence and possible risk factors of internet gaming disorder among adolescents and young adults: Systematic reviews and meta-analyses. Journal of Psychiatric Research. 2022;154:35-43.
13. World Health Organization. (2018). International classification of diseases for mortality and morbidity statistics (11th Revision). https://icd.who.int/browse11/l-m/en.
14. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders: DSM-5, Vol 5. Washington, DC: American Psychiatric Association; 2013.

15. Stevens MW, Dorstyn D, Delfabbro PH, King DL. Global prevalence of gaming disorder: A systematic review and meta-analysis. Aust N Z J Psychiatry. 2020:4867420962851.
16. Kim HS, Son G, Roh E-B, Ahn W-Y, Kim J, Shin S-H, et al. Prevalence of gaming disorder: A meta-analysis. Addictive Behaviors. 2022;126:107183.
17. Brand M, Rumpf H-J, King DL, Potenza MN, Wegmann E. Clarifying terminologies in research on gaming disorder and other addictive behaviors: distinctions between core symptoms and underlying psychological processes. Current Opinion in Psychology. 2020;36:49-54.
18. King DL, Haagsma MC, Delfabbro PH, Gradisar M, Griffiths MD. Toward a consensus definition of pathological video-gaming: a systematic review of psychometric assessment tools. Clin Psychol Rev. 2013;33(3):331-42.
19. King DL, Chamberlain SR, Carragher N, Billieux J, Stein D, Mueller K, et al. Screening and assessment tools for gaming disorder: A comprehensive systematic review. Clin Psychol Rev. 2020;77:101831.
20. Petry NM, Zajac K, Ginley MK. Behavioral Addictions as Mental Disorders: To Be or Not To Be? Annu Rev Clin Psychol. 2018;14:399-423.
21. Markey PM, Ferguson CJ. Internet Gaming Addiction: Disorder or Moral Panic? Am J Psychiatry. 2017;174(3):195-6.
22. Müller KW, Janikian M, Dreier M, Wölfling K, Beutel ME, Tzavara C, et al. Regular gaming behavior and internet gaming disorder in European adolescents: results from a cross-national representative survey of prevalence, predictors, and psychopathological correlates. Eur Child Adolesc Psychiatry. 2015;24(5):565-74.
23. Chen KH, Oliffe JL, Kelly MT. Internet Gaming Disorder: An Emergent Health Issue for Men. Am J Mens Health. 2018;12(4):1151-9.
24. Yu Y, Mo PKH, Zhang J, Li J, Lau JTF. Why is Internet gaming disorder more prevalent among Chinese male than female adolescents? The role of cognitive mediators. Addict Behav. 2021;112:106637.
25. Kim HS, Son G, Roh EB, Ahn WY, Kim J, Shin SH, et al. Prevalence of gaming disorder: A meta-analysis. Addict Behav. 2022;126:107183.
26. Zhuang X, Zhang Y, Tang X, Ng TK, Lin J, Yang X. Longitudinal modifiable risk and protective factors of internet gaming disorder: A systematic review and meta-analysis. J Behav Addict. 2023;12(2):375-92.
27. López-Fernández FJ, Mezquita L, Griffiths MD, Ortet G, Ibáñez MI. The role of personality on disordered gaming and game genre preferences in adolescence: Gender differences and person-environment transactions. Adicciones. 2021;33(3):263-72.
28. Lopez-Fernandez O, Williams AJ, Kuss DJ. Measuring Female Gaming: Gamer Profile, Predictors, Prevalence, and Characteristics From Psychological and Gender Perspectives. Front Psychol. 2019;10:898.
29. González-Bueso V, Santamaría JJ, Fernández D, Merino L, Montero E, Ribas J. Association between Internet Gaming Disorder or Pathological Video-Game Use and

Comorbid Psychopathology: A Comprehensive Review. Int J Environ Res Public Health. 2018;15(4).

30. Schou Andreassen C, Billieux J, Griffiths MD, Kuss DJ, Demetrovics Z, Mazzoni E, Pallesen S. The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. Psychol Addict Behav. 2016;30(2):252-62.
31. Ostinelli EG, Zangani C, Giordano B, Maestri D, Gambini O, D'Agostino A, et al. Depressive symptoms and depression in individuals with internet gaming disorder: A systematic review and meta-analysis. J Affect Disord. 2021;284:136-42.
32. Darvesh N, Radhakrishnan A, Lachance CC, Nincic V, Sharpe JP, Ghassemi M, et al. Exploring the prevalence of gaming disorder and Internet gaming disorder: a rapid scoping review. Syst Rev. 2020;9(1):68.
33. Dullur P, Krishnan V, Diaz AM. A systematic review on the intersection of attention-deficit hyperactivity disorder and gaming disorder. J Psychiatr Res. 2021;133:212-22.
34. Murray A, Koronczai B, Király O, Griffiths MD, Mannion A, Leader G, Demetrovics Z. Autism, Problematic Internet Use and Gaming Disorder: A Systematic Review. Review Journal of Autism and Developmental Disorders. 2021;9(1):120-40.
35. Vadlin S, Åslund C, Hellström C, Nilsson KW. Associations between problematic gaming and psychiatric symptoms among adolescents in two samples. Addictive Behaviors. 2016;61:8-15.
36. Salerno L, Becheri L, Pallanti S. ADHD-Gaming Disorder Comorbidity in Children and Adolescents: A Narrative Review. Children (Basel). 2022;9(10).
37. Koncz P, Demetrovics Z, Takacs ZK, Griffiths MD, Nagy T, Király O. The emerging evidence on the association between symptoms of ADHD and gaming disorder: A systematic review and meta-analysis. Clinical Psychology Review. 2023;106:102343.
38. Kim DJ, Kim K, Lee HW, Hong JP, Cho MJ, Fava M, et al. Internet Game Addiction, Depression, and Escape From Negative Emotions in Adulthood: A Nationwide Community Sample of Korea. J Nerv Ment Dis. 2017;205(7):568-73.
39. Kristensen JH, Pallesen S, King DL, Hysing M, Erevik EK. Problematic Gaming and Sleep: A Systematic Review and Meta-Analysis. Front Psychiatry. 2021;12:675237.
40. Bonnaire C, Baptista D. Internet gaming disorder in male and female young adults: The role of alexithymia, depression, anxiety and gaming type. Psychiatry Research. 2019;272:521-30.
41. Billieux J, Potenza MN, Maurage P, Brevers D, Brand M, King DL. Chapter 16 - Cognitive factors associated with gaming disorder. In: Verdejo-Garcia A, editor. Cognition and Addiction: Academic Press; 2020. p. 221-30.
42. Fisher S. Identifying video game addiction in children and adolescents. Addictive Behaviors. 1994;19(5):545-53.
43. Griffiths MD, Hunt N. Dependence on computer games by adolescents. Psychological reports. 1998;82(2):475-80.
44. Gentile DA, Choo H, Liau A, Sim T, Li D, Fung D, Khoo A. Pathological video game use among youths: a two-year longitudinal study. Pediatrics. 2011;127(2):e319-29.

45. Lemmens JS, Valkenburg PM, Peter J. Development and Validation of a Game Addiction Scale for Adolescents. Media Psychology. 2009;12(1):77-95.
46. Brunborg GS, Hanss D, Mentzoni RA, Pallesen S. Core and peripheral criteria of video game addiction in the game addiction scale for adolescents. Cyberpsychology, behavior and social networking. 2015;18(5):280-5.
47. Brunborg GS, Mentzoni RA, Melkevik OR, Torsheim T, Samdal O, Hetland J, et al. Gaming Addiction, Gaming Engagement, and Psychological Health Complaints Among Norwegian Adolescents. Media Psychology. 2013;16(1):115-28.
48. Zajac K, Ginley MK, Chang R. Treatments of internet gaming disorder: a systematic review of the evidence. Expert Rev Neurother. 2020;20(1):85-93.
49. Bickham DS. Current Research and Viewpoints on Internet Addiction in Adolescents. Curr Pediatr Rep. 2021;9(1):1-10.
50. Ayub S, Jain L, Parnia S, Bachu A, Farhan R, Kumar H, et al. Treatment Modalities for Internet Addiction in Children and Adolescents: A Systematic Review of Randomized Controlled Trials (RCTs). J Clin Med. 2023;12(9).
51. Zajac K, Ginley MK, Chang R, Petry NM. Treatments for Internet gaming disorder and Internet addiction: A systematic review. Psychol Addict Behav. 2017;31(8):979-94.
52. Stevens MWR, King DL, Dorstyn D, Delfabbro PH. Cognitive-behavioral therapy for Internet gaming disorder: A systematic review and meta-analysis. Clin Psychol Psychother. 2019;26(2):191-203.
53. Starcevic V, Choi TY, Kim TH, Yoo S-K, Bae S, Choi B-S, Han DH. Internet gaming disorder and gaming disorder in the context of seeking and not seeking treatment for video-gaming. Journal of Psychiatric Research. 2020;129:31-9.
54. Jo YS, Bhang SY, Choi JS, Lee HK, Lee SY, Kweon YS. Clinical Characteristics of Diagnosis for Internet Gaming Disorder: Comparison of DSM-5 IGD and ICD-11 GD Diagnosis. J Clin Med. 2019;8(7).
55. Yen JY, Higuchi S, Lin PY, Lin PC, Chou WP, Ko CH. Functional impairment, insight, and comparison between criteria for gaming disorder in the International Classification of Diseases, 11 Edition and internet gaming disorder in Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. J Behav Addict. 2022;11(4):1012-23.
56. Snodgrass JG, Zhao W, Lacy MG, Zhang S, Tate R. Distinguishing Core from Peripheral Psychiatric Symptoms: Addictive and Problematic Internet Gaming in North America, Europe, and China. Cult Med Psychiatry. 2019;43(2):181-210.
57. Billieux J, Flayelle M, Rumpf H-J, Stein DJ. High Involvement Versus Pathological Involvement in Video Games: a Crucial Distinction for Ensuring the Validity and Utility of Gaming Disorder. Current Addiction Reports. 2019;6(3):323-30.
58. Slack JD, Delfabbro P, King DL. Toward a delineation of the differences between high engagement and problem gaming. Addict Behav Rep. 2022;16:100462.
59. Dullur P, Starcevic V. Internet gaming disorder does not qualify as a mental disorder. Aust N Z J Psychiatry. 2018;52(2):110-1.

60. van Rooij AJ, Ferguson CJ, Colder Carras M, Kardefelt-Winther D, Shi J, Aarseth E, et al. A weak scientific basis for gaming disorder: Let us err on the side of caution. J Behav Addict. 2018;7(1):1-9.
61. Bean AM, Nielsen RK, Van Rooij AJ, Ferguson CJ. Video game addiction: The push to pathologize video games. Professional Psychology: Research and Practice. 2017;48(5):378.
62. Aarseth E, Bean AM, Boonen H, Colder Carras M, Coulson M, Das D, et al. Scholars' open debate paper on the World Health Organization ICD-11 Gaming Disorder proposal. J Behav Addict. 2017;6(3):267-70.
63. Moge CE, Romano DM. Contextualising video game engagement and addiction in mental health: the mediating roles of coping and social support. Heliyon. 2020;6(11):e05340.
64. Lehenbauer-Baum M, Klaps A, Kovacovsky Z, Witzmann K, Zahlbruckner R, Stetina BU. Addiction and Engagement: An Explorative Study Toward Classification Criteria for Internet Gaming Disorder. Cyberpsychol Behav Soc Netw. 2015;18(6):343-9.
65. Charlton JP. A factor-analytic investigation of computer 'addiction' and engagement. Br J Psychol. 2002;93(Pt 3):329-44.
66. Brown, R.I.F. (1991). Gaming, gambling and other addictive play. In J.H. Kerr & M.J. Apter (Eds.), Adult play: A reversal theory approach (pp. 101-118). Amsterdam: Swets & Zeitlinger.
67. Brown, R.I.F. (1993). Some contributions of the study of gambling to the study of other addictions. In W.R. Eadington & J.A. Cornelius (Eds.), Gambling behavior and problem gambling (pp.241-272). Reno: University of Nevada.
68. American Psychiatric Association. (1994). Diagnostic and statistical manual of mental disorders (4th edition revised). Washington, DC: American Psychiatric Association.
69. Charlton JP, Danforth IDW. Distinguishing addiction and high engagement in the context of online game playing. Computers in Human Behavior. 2007;23(3):1531-48.
70. Deleuze J, Long J, Liu T-Q, Maurage P, Billieux J. Passion or addiction? Correlates of healthy versus problematic use of videogames in a sample of French-speaking regular players. Addictive Behaviors. 2018;82:114-21.
71. Krossbakken E, Pallesen S, Mentzoni RA, King DL, Molde H, Finserås TR, Torsheim T. A Cross-Lagged Study of Developmental Trajectories of Video Game Engagement, Addiction, and Mental Health. Frontiers in Psychology. 2018;9.
72. Ferguson CJ, Coulson M, Barnett J. A meta-analysis of pathological gaming prevalence and comorbidity with mental health, academic and social problems. Journal of Psychiatric Research. 2011;45(12):1573-8.
73. Young KS. Caught in the Net: How to Recognize the Signs of Internet Addiction-- and a Winning Strategy for Recovery. 1st ed. USA: John Wiley \& Sons Inc.; 1998.
74. Finserås TR, Pallesen S, Mentzoni RA, Krossbakken E, King DL, Molde H. Evaluating an Internet Gaming Disorder Scale Using Mokken Scaling Analysis. Front Psychol. 2019;10:911.

75. Khazaal Y, Breivik K, Billieux J, Zullino D, Thorens G, Achab S, et al. Game Addiction Scale Assessment Through a Nationally Representative Sample of Young Adult Men: Item Response Theory Graded-Response Modeling. J Med Internet Res. 2018;20(8):e10058.
76. Khazaal Y, Chatton A, Rothen S, Achab S, Thorens G, Zullino D, Gmel G. Psychometric properties of the 7-item game addiction scale among french and German speaking adults. BMC Psychiatry. 2016;16:132.
77. Jonsson J, Munck I, Volberg R, Carlbring P. GamTest: Psychometric Evaluation and the Role of Emotions in an Online Self-Test for Gambling Behavior. J Gambl Stud. 2017;33(2):505-23.
78. Chia DXY, Ng CWL, Kandasami G, Seow MYL, Choo CC, Chew PKH, et al. Prevalence of Internet Addiction and Gaming Disorders in Southeast Asia: A Meta-Analysis. International Journal of Environmental Research and Public Health. 2020;17(7):2582.
79. Liao Z, Chen X, Huang Q, Shen H. Prevalence of gaming disorder in East Asia: A comprehensive meta-analysis. J Behav Addict. 2022;11(3):727-38.
80. Jeong EJ, Ferguson CJ, Lee SJ. Pathological Gaming in Young Adolescents: A Longitudinal Study Focused on Academic Stress and Self-Control in South Korea. Journal of Youth and Adolescence. 2019;48(12):2333-42.
81. Seok S, DaCosta B. The world's most intense online gaming culture: Addiction and high-engagement prevalence rates among South Korean adolescents and young adults. Computers in Human Behavior. 2012;28(6):2143-51.
82. Gerdner A, Håkansson A. Prevalence and comorbidity in a Swedish adolescent community sample - gambling, gaming, substance use, and other psychiatric disorders. BMC Psychiatry. 2022;22(1):594.
83. Giedd JN, Blumenthal J, Jeffries NO, Castellanos FX, Liu H, Zijdenbos A, et al. Brain development during childhood and adolescence: a longitudinal MRI study. Nature Neuroscience. 1999;2(10):861-3.
84. Mihara S, Higuchi S. Cross-sectional and longitudinal epidemiological studies of Internet gaming disorder: A systematic review of the literature. Psychiatry Clin Neurosci. 2017;71(7):425-44.
85. Van Rooij AJ, Schoenmakers TM, Vermulst AA, Van den Eijnden RJ, Van de Mheen D. Online video game addiction: identification of addicted adolescent gamers. Addiction. 2011;106(1):205-12.
86. Király O, Koncz P, Griffiths MD, Demetrovics Z. Gaming disorder: A summary of its characteristics and aetiology. Comprehensive Psychiatry. 2023;122:152376.
87. Richard J, Temcheff C, Derevensky J. Gaming Disorder Across the Lifespan: A Scoping Review of Longitudinal Studies. Current Addiction Reports. 2020.
88. Vadlin S, Åslund C, Nilsson KW. A longitudinal study of the individual-and group-level problematic gaming and associations with problem gambling among Swedish adolescents. Brain and behavior. 2018;8(4):e00949.

89. Karlsson J, Broman N, Håkansson A. Associations between problematic gambling, gaming, and internet use: a cross-sectional population survey. Journal of addiction. 2019;2019.
90. Sanders J, Williams R. The Relationship Between Video Gaming, Gambling, and Problematic Levels of Video Gaming and Gambling. J Gambl Stud. 2019;35(2):559-69.
91. King DL, Ejova A, Delfabbro PH. Illusory control, gambling, and video gaming: an investigation of regular gamblers and video game players. J Gambl Stud. 2012;28(3):421-35.
92. Walther B, Morgenstern M, Hanewinkel R. Co-occurrence of addictive behaviours: personality factors related to substance use, gambling and computer gaming. Eur Addict Res. 2012;18(4):167-74.
93. *SFS 2021:1254, Spellag.* Available from: Lag om ändring i spellagen (2018:1138) | Svensk författningssamling (svenskforfattningssamling.se) [cited 11 December 2023]. [Ref list].
94. Folkhälsomyndigheten. *Statistik över spelproblem i Sverige* [updated 16 Mars 2023]. Available from: https://www.folkhalsomyndigheten.se/spelprevention/statistik/spelproblem/ [cited 10 December 2023]. [Ref list].
95. King DL, Delfabbro PH. Video Game Monetization (e.g., 'Loot Boxes'): a Blueprint for Practical Social Responsibility Measures. International Journal of Mental Health and Addiction. 2019;17(1):166-79.
96. King DL, Russell AMT, Delfabbro PH, Polisena D. Fortnite microtransaction spending was associated with peers' purchasing behaviors but not gaming disorder symptoms. Addict Behav. 2020;104:106311.
97. Li W, Mills D, Nower L. The relationship of loot box purchases to problem video gaming and problem gambling. Addict Behav. 2019;97:27-34.
98. Drummond A, Sauer JD. Video game loot boxes are psychologically akin to gambling. Nature Human Behaviour. 2018;2(8):530-2.
99. Brooks GA, Clark L. Associations between loot box use, problematic gaming and gambling, and gambling-related cognitions. Addict Behav. 2019;96:26-34.
100. Spicer SG, Nicklin LL, Uther M, Lloyd J, Lloyd H, Close J. Loot boxes, problem gambling and problem video gaming: A systematic review and meta-synthesis. New Media & Society. 2021;24(4):1001-22.
101. Macey J, Cantell M, Tossavainen T, Karjala A, Castrén S. How can the potential harms of loot boxes be minimised?: Proposals for understanding and addressing issues at a national level. J Behav Addict. 2022;11(2):256-66.
102. Rangmar J, Thomée S. När datorspelandet blir problematiskt – en kunskapsöversikt om gaming disorder hos barn och unga. Report No.: 2019:31. Västra Götaland: Länsstyrelsen; 2019.
103. Li W, Garland EL, McGovern P, O'Brien JE, Tronnier C, Howard MO. Mindfulness-oriented recovery enhancement for internet gaming disorder in U.S. adults: A stage I randomized controlled trial. Psychol Addict Behav. 2017;31(4):393-402.

104. Kim SM, Han DH, Lee YS, Renshaw PF. Combined cognitive behavioral therapy and bupropion for the treatment of problematic on-line game play in adolescents with major depressive disorder. Computers in Human Behavior. 2012;28(5):1954-9.
105. Park SY, Kim SM, Roh S, Soh M-A, Lee SH, Kim H, et al. The effects of a virtual reality treatment program for online gaming addiction. Computer Methods and Programs in Biomedicine. 2016;129:99-108.
106. Li H, Wang S. The role of cognitive distortion in online game addiction among Chinese adolescents. Children and Youth Services Review. 2013;35(9):1468-75.
107. Marlatt G, Witkiewitz K. Relapse Prevention for Alcohol and Drug Problems. Am Psychol. 2004;59.
108. Kapetanovic S, Gurdal S, Einarsson I, Werner M, André F, Håkansson A, Claesdotter-Knutsson E. Relapse Prevention Therapy for Problem Gaming or Internet Gaming Disorder in Swedish Child and Youth Psychiatric Clinics: Protocol for a Randomized Controlled Trial. JMIR Res Protoc. 2023;12:e44318.
109. Gerstein D, Volberg RA, Toce M, Harwood H, Johnson R, Buie T, et al. Gambling impact and behavior study: Report to the national gambling impact study commission. Chicago: National Opinion Research Center. 1999.
110. Toce-Gerstein M, Gerstein DR, Volberg RA. The NODS-CLiP: a rapid screen for adult pathological and problem gambling. J Gambl Stud. 2009;25(4):541-55.
111. Volberg RA, Munck IM, Petry NM. A quick and simple screening method for pathological and problem gamblers in addiction programs and practices. Am J Addict. 2011;20(3):220-7.
112. Lakens D. Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. Front Psychol. 2013;4:863.
113. Dell'Osso L, Amatori G, Muti D, Giovannoni F, Parri F, Violi M, et al. Autism Spectrum, Hikikomori Syndrome and Internet Gaming Disorder: Is There a Link? Brain Sci. 2023;13(7).
114. Martins SS, Storr CL, Ialongo NS, Chilcoat HD. Gender differences in mental health characteristics and gambling among African-American adolescent gamblers. Am J Addict. 2008;17(2):126-34.
115. Gavriel-Fried B, Serry M, Katz D, Hidvégi D, Demetrovics Z, Király O. The concept of recovery in gaming disorder: A scoping review. J Behav Addict. 2023;12(1):26-52.
116. Gurdal S, Kapetanovic S, Einarsson I, Boson K, Claesdotter-Knutsson E. Adolescents' Perceptions of a Relapse Prevention Treatment for Problematic Gaming-A Qualitative Study. Healthcare (Basel). 2023;11(17).

Paper I

Original Article

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The prevalence of gaming and gambling in a child and adolescent psychiatry unit

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Abstract

Background: Gaming and gambling are frequently reported from child and adolescent psychiatry and school health care. Swedish epidemiological data show that 1.3% of the population meet the criteria for gambling disorder. Risk factors are male gender, young age, single status and being born outside Sweden. Both problem gaming and gambling are associated with compulsion, psychiatric and physical symptoms, impaired cognitive development and school performance. Based on the limited knowledge and the need for more research into these behaviours among young individuals, the present study aimed to look at the prevalence of gaming and gambling in patients at the child and adolescent psychiatry department (CAP) in Skåne, a region in the south of Sweden.

Design and methods: The overall aim is to explore gaming and gambling in a child and youth population. Children aged 8–18 years ($N = 144$) from CAP in Skåne were assessed with two self-screening instruments: GASA (Game Addiction Scale for Adolescents) and NODS-CLiP (NORC Diagnostic Screen for Gambling Problems). Information were collected regarding type of care, housing situation and diagnosis.

Results: Thirty-three percent of the study participants showed problem/addictive gaming. Fifty-two percent of the males in the study showed problem/addictive gaming. Forty-four percent of the subjects with ADHD showed problem/addictive gaming. Eleven percent of the study participants showed problem gambling.

Conclusions: The present study reports hitherto unreported figures of problem gaming and gambling. Our results show the importance of screening children and adolescents for these conditions when admitting subjects to CAP in/outpatient care.

Keywords

Gambling disorder, problem gambling, internet gaming disorder, problem gaming

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Introduction

Gaming Disorder (GD) was introduced in the 11th revision of the International Classification of Diseases (ICD 11), defined as a gaming behaviour in sufficient severity to consequence significant impairment in areas of function.[1] The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) identifies Internet Gaming Disorder (IGD) as a 'condition for further studies', hence additional clinical experience and research is needed before inclusion as a formal disorder.[2] The diagnostic criteria for IGD suggested in DSM-5 includes (I) preoccupation with gaming, (II) withdrawal symptoms, (III) increased tolerance to gaming, (IV) unsuccessful attempts to reduce or stop gaming, (V) loss of interest in other hobbies/activities, (VI) continued excessive gaming despite negative consequences, (VII)

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deceiving others regarding the amount of gaming; (VIII) use of gaming to escape or relieve negative moods and (IX) jeopardizing or losing a significant relationship, job, education or career opportunity because of gaming.[2]

A meta-analysis across three decades shows a worldwide prevalence of IGD of 1.3%–6.8%.[3] Stevens et al.[4] reported, in a meta-analysis, a prevalence of pathological gaming worldwide of 3.05%. Vadlin et al.[5] showed that risk factors for problematic computer gaming were male gender, ADHD and depression/anxiety. Problematic computer gaming is reported from child and adolescent psychiatry and school health care.[6] The clinical picture describes compulsion, psychiatric and physical symptoms and impaired school performance.[3,6] In Király et al.[6] highlighted the interplay of three key factors in IGD development: structural aspects of computer games, psychological characteristics of the player and motivational aspects of computer game playing.

Gambling disorder is a well-established diagnosis in the diagnostic manual DSM-5.[2] Vadlin et al.[5] reported on an association between problematic computer gaming and problematic gambling with money among young individuals. They also showed that problematic computer gaming with money did not predict problematic gambling in adulthood.[6] Karlsson et al.[7] found an association between gambling and problematic computer games without money and excessive internet use in adults, but in a non-longitudinal design. Both studies are small and more research is needed. Risk factors for gambling have been shown to be male gender, age (adolescents or young adults), single people and those born outside Sweden.[8] Thus, even for gambling, there is a possible connection to young people's online behaviour.

In child and adolescent psychiatry, it has been noted that patients with certain neuropsychiatric disabilities; attention deficit and hyperactivity disorder (ADHD) and autism spectrum disorder (ASD) are overrepresented among those who seek treatment for problem gaming.[5,9] It is known that depression, anxiety and ADHD in child and adolescent populations are associated with IGD.[10–12] Studies regarding psychiatric comorbidity among problem gambling adolescents have been published but lack sufficient data from clinical settings for children and adolescents with neuropsychiatric comorbidities.[13,14] Based on the design of the games with repetitions and immediate reinforcement, it can be suspected that patients with ADHD/ASD have an increased risk of developing problem gambling.[3,10]

The range of digital games has increased in recent years and is easily accessible to a large part of the young Swedish population. These games are largely aimed at children, adolescents and young adults. The systematic knowledge about prevalence of behavioural addictions in child and adolescent psychiatry is sparse.

The aim of the study was to look at the prevalence of gaming and gambling in patients at a child and adolescent psychiatry department and to correlate these conditions to each other but also to psychiatric diagnosis, as well as gender, age, type of care and housing situation.

Design and methods

The study was performed in Skåne, a county in the south of Sweden with 1.36 million inhabitants, of which 280,000 are individuals under 18 years of age. In 2018 CAP Skåne had 55,000 unique visits. There are seven out-patient child and adolescent psychiatry units in Skåne and one in-patient unit. The out-patient units cater for all types of child and adolescent diagnoses but have no assignment to either diagnose or treat addiction problems. Addiction among children and adolescents in Skåne is treated at special units that are collaborations between psychiatry and social services.

In order to digitalize screening instruments and make administration easier, the Child and Adolescent Psychiatry clinic in Skåne developed an app, 'Blå appen'.[15] The answers form the basis for diagnosis and further treatment. In the present study, patients coming to the Child and Adolescent Psychiatry clinic (in- and out-patient departments respectively) in Skåne during the study period of 4 months (Feb–May) were asked to participate. We used the NODS-CLiP when screening for gambling[16] and GASA when screening for IGD.[17] Total time required for both forms: 15 min. The following variables were obtained from subjects in the study: NODS-CLiP, GASA, gender, age, housing situation (with whom you live), type of care given at CAP (in-/out-patient care) and diagnosis at CAP.

The study was approved by the Ethics committee (Dnr: 2019-02967). Written informed consent was obtained from all participants and their parents/guardians. The study was performed between Feb 2020 and May 2020.

Measures

Game Addiction Scale

There is no consensus regarding which rating scales should be used for assessment of gaming behaviour and different scales are used both in research and in clinical practice. GASA (Game Addiction Scale for Adolescents) is one of the most frequently used questionnaires for gaming addiction.[17–19] The scale was constructed by Lemmens et al.[17] based on the DSM-5 criteria for pathological gambling. For details see Supplemental Table S1. While the DSM-5 requires half (or more) of their criteria to be met when diagnosing pathological gamblers, scholars within the field of gaming suggest a ranking of the criteria. They describe how the criteria tolerance, mood modification and cognitive salience rather associate to engagement and not necessarily to addiction, while the contrary applies for the criteria withdrawal, relapse, conflict and problems; the 'core approach'.[18–20]

The 7 item GASA applies to gaming behaviour during the last 6 months. Each question covers one criterion (salience,

tolerance, mood modification, withdrawal, relapse, conflicts or problems), answered on a five-point scale from 1=never to 5=very often. An item should according to Lemmens et al.[17] be considered endorsed when rated 3 or higher.

Aiming to distinguish level of severity within the group of gamers, the core approach was applied whereby individuals meeting all of the core criteria (relapse, withdrawal, conflicts and problems) constituted the group addicted gamers.[18,20] The respondents that endorsed two–three of the core criteria were grouped as problem gamers and those that endorsed all three of the peripheral criteria but not more than one of the core criteria were grouped as engaged gamers,[18,20] items are specified in Supplemental Table S1. Those who remained comprised the fourth and contrasting group, hereafter named remaining study participants (RSP). The RSP group included individuals without gaming behaviour and individuals with gaming behaviour below the cut-off for engaged gaming.

Since both the problem gamers and the addicted gamers were assumed to be associated with more severe gaming behaviour, as well as more negative outcomes, these two groups also constituted one combined group (two–four endorsed core criteria) enabling analyses against the rest of the respondents (=fewer than two endorsed core criteria).

NODS-CLiP

In 1999 Gerstein et al.[21] developed a 17-item screen instrument for the US national epidemiological and policy study regarding gambling problems – The NORC Diagnostic Screen for Gambling Problems (NODS). NODS has been used in research worldwide.[7,16,21,22] NODS yield a score ranging from 0 to 10, corresponding to the DSM-IV criteria for gambling, where a score of 5 or more qualifies as pathological.[2] A score of 3–4 corresponds to the subclinical syndrome of problem gambling, and scores of 1–2 an 'at-risk' status, with increased likelihood of progression to problem or pathological status.

NODS-CLiP comprises three NODS items that best describe problem gambling, with three NODS questions pertaining to loss of Control, Lying and Preoccupation – the 'CLiP'.[16,22] The NODS-CLiP items are listed in Supplemental Table S2.

NODS-CLiP requires 1 min to administer and identifies virtually all pathological gamblers and most (90%) problem gamblers captured by the complete NODS.[16] The NODS-CLiP shows excellent sensitivity and specificity for NODS constructs.[16] Answering 'yes' on one or more items indicates problem gambling.

Severity measures for correlation analyses

In order to capture the addiction severity for correlation and regression analyses a one factor analysis was performed. The analysis showed reliability factor scores for the two measurements used, reliability coefficient for GASA=0.90 and NODS-CLiP=0.65. The f-score values were transformed into a T-score scale with mean 100 and sd 50 (for details see Supplemental Material).

Data preparation

Estimates of frequencies and percentages as well as statistical analysis were performed in SPSS (IBM SPSS statistics version 27).

The demographics and diagnoses were all recoded into binary variables, as shown in Table 1 (details are presented in the Supplemental Material). Each of the diagnoses constituted one binary variable in which the diagnosis listed as either primary or secondary were coded as 1 against the absence of the same diagnose, coded as 0. The diagnoses containing the smallest number of individuals (Eating disorder, OCD, Bipolar disease, Psychosis) were further merged into a new variable labelled 'other diagnoses'.

Four gaming categories were created, 'engaged gamers' (endorsed the peripheral 3 GASA items and not more than core item), 'problem gamers' (endorsing 2 or 3 core items) and 'addicted gamers' (endorsed all 4 core items). The problem gamers and addicted gamers were merged into a fourth gaming category of 'problem-/addictive gamers'. Those that endorsed at least 1 out of the NODS-CliP items constituted the group of 'problem gamblers'.

Data analysis

For the prevalence part of the study, Fisher's exact test was used for statistical association analysis between the prevalence of problem-/addictive gamers and gamblers and each of the subcategories in the 0/1 variables such as gender, age categories, housing situation, type of care and diagnoses. For the correlation part of the study, the GASA T-score and the NODS-CLiP T-score were used in the regression analyses as dependent variables. The GASA T-score and the NODS-CLiP T-score was correlation tested against each other and analysed separately for reliability.

The GASA T-score was used as the dependent variable in a regression model analysis with age, type of care, housing situation and each of the diagnoses as independent variables, using depression as reference group (for details see Supplemental Table S6). As the NODS-CLiP T-score variable showed a skewed distribution with only 15 observations with 0/1 item above 0, the number of parameters that could be used in the regression analysis were limited.[23] The prevalence analysis formed the basis for choosing variables to use in the gender divided regression analysis. Age 13 or older, inpatient care and ADHD showed the highest prevalence measures regarding both problem-/addictive gaming and problem gambling, with the exception of the subgroup other diagnosis. A linear regression analysis with GASA T-score and NODS-CLiP T-score as dependent variables

Table 1. Sample characteristics.

	Code	*n*	(*n*)	%	(%)
Gender					
Female	0	68		49.3	
Male	1	70		50.7	
Age, years					
8–12	0	28		20.3	
13–18	1	110		79.7	
Type of care					
Outpatient care	0	122		88.4	
Inpatient care	1	16		11.6	
Housing situation					
Living with both parents	1	82		59.4	
Divorced parents	0	49		35.5	
Foster care	0	7		5.1	
Diagnosis[°]					
ADHD	1(/0)	49	(58)	35.5	(42.0)
Depression	1(/0)	42	(52)	30.4	(37.7)
ASD	1(/0)	15	(19)	10.9	(13.8)
Anxiety	1(/0)	15	(29)	10.9	(21.0)
Other diagnosis[#]	1(/0)	17	(19)	12.3	(13.8)
Eating disorder		*9*	(10)	*6.5*	*(7.2)*
OCD		*4*	(4)	*2.9*	*(2.9)*
Bipolar disease		*3*	(4)	*2.2*	*(2.9)*
Psychosis		*1*	(1)	*0.7*	*(0.7)*
Social phobia		*0*	(1)	*0.0*	*(0.7)*
Gaming behaviour					
Engaged gamers	1(/0)	5		3.6	
Problem gamers	1(/0)	31		22.5	
Addicted gamers	1(/0)	14		10.1	
RSP[§]	1(/0)	87		63.0	
Missing		1		0.7	
Problem gambling					
Yes	1	15		10.9	
No	0	122		88.4	
Missing		1		0.7	

[°]Diagnosis listed as primary without parentheses, diagnosis listed as either primary or secondary in parentheses.
[#]Including diagnoses listed below in italics: *Eating disorder, OCD, Bipolar disease and Psychosis, Social phobia.*
[§]Remaining Study Participants – Non-problem-, Non-addictive-, Non-engaged gamers.

was done separately, using age, type of care and ADHD as independent variables in both analyses.

Results

Sample characteristics

The survey was answered by 144 children and adolescents between 8 and 18 years of age. Six individuals participated without sharing social security number which made the collecting of other information (gender, age, housing situation, type of care, diagnosis) impossible. These individuals were excluded from the data file leaving 138 remaining individuals, characteristics specified in Table 1. One individual abstained from answering the GASA-item and one other individual did not answer the NODS-CLiP items, declared missing in the analyses. The gender distribution was even, and a majority were older than 13 years. We got information about the participants housing situation, type of care given and diagnoses from the medical chart (Table 1). The participant's main as well as secondary diagnosis was registered. The diagnoses were referred to as the Manual of Mental Disorders, 5th edition, describes them.[2] All patients were assessed in clinical settings by trained psychologists and child and adolescent psychiatrists.

The respondents who endorsed all four core criteria and consequently met the addiction cut-off constituted 10% of the study population. The problem gamers were 23%, the engaged gamers 4%. The respondents who met the cut-off for problem gaming and addictive gaming created a new

Table 2. Prevalence of problem-/addictive gamers and problem gamblers among boys versus girls. RSP (Remaining Study Participants) and engaged gamers and non-problem gamblers were set as the reference categories for χ^2 comparisons.

	Boys % (*n*)	Girls % (*n*)	*p*-value
Problem-/addictive gaming	52.2 (36)	13.2 (9)	≤0.001
Problem gambling	14.5 (10)	7.4 (5)	0.274

group named problem-/addictive gamers, comprising 33% of the study population. The remaining 63% comprised the RSP group. A significant majority of both the problem and addictive gamers were male, when compared with the non-problem/addictive gamers (RSP group and engaged gamers). Among the male respondents, 48% were non-problem gamers (RSP group and engaged gamers) and among the female respondents this increased to 87% ($n=33$ vs $n=59$, $p \leq 0.001$). Among the male respondents, 52% were problem-/addictive gamers whereas 13% of the female respondents met the cut-off for at least problem gaming ($n=36$ vs $n=9$, $p \leq 0.001$), for details see Supplemental Tables S4 and S5. The problem gamblers constituted 10%–15% male respondents and 7% female ($n=10$ vs $n=5$, $p=0.274$) (Table 2).

Problem/addictive gaming

The prevalence of problem/addictive gamers was counted for within subcategories and compared with the prevalence of non-problem/addictive gamers (RSP group and engaged gamers), as Table 3 shows. The prevalence of problem/addictive gaming was significantly overrepresented among individuals diagnosed with ADHD (44%, $n=25$, $p=0.027$). The regression analysis showed the same tendency but not consistently. The analysis was performed as a model analysis, adding variables step by step and as shown in Supplemental Table S6, ADHD appeared as a significant risk factor in the first two steps. When the background variables (age and gender) were added, the significant association with ADHD disappeared. In the final step, gender appeared as the dominating risk factor for severe gaming. Table 4 shows the gender divided regression analysis presenting a positive association between ADHD and GASA score for both boys and girls. Being 13 years of age or older regardless of gender was also positively associated to severe gaming.

Problem gambling

The prevalence of problem gamblers was likewise counted for within the subcategories and compared with the prevalence of non-problem gamblers. As Table 3 shows, problem gambling was shown to be significantly overrepresented among the merged subgroup of other diagnoses (26%, $N=5$, $p=0.037$). Specifically, two individuals with eating disorder, two individuals with OCD and one individual with psychosis met the cut off for problem gambling. Table 5 shows the gender divided regression analysis presenting a positive association between severe gambling and ADHD as well as being 13 years of age, regardless of gender.

GASA T-score and CLiP T-score

The correlation analysis between GASA T-score and CLiP T-score showed a significant correlation of 0.291 ($p \leq 0.001$). The reliability test showed that the GASA T-score reliability coefficient was 0.90 and the reliability

Table 3. Prevalence of problem-/addictive gaming versus non-problem-/addictive gaming within subgroups, gender divided and entire sample. Fisher's exact test for x^2 comparisons of the prevalence of problem behaviour versus non-problem behaviour within subgroups of entire sample (male and female respondents).

	Problem-/addictive gaming				Problem gambling			
	Girls	*Boys*	Entire sample % (*n*)	*p*-value[°]	*Girls*	*Boys*	Entire sample % (*n*)	*p*-value [#]
Total	*13.2 (9)*	*51.4 (36)*	32.6 (45)		*7.4 (5)*	*14.5 (10)*	10.9 (15)	
Age 13 or older	*12.9 (8)*	*53.2 (25)*	30.3 (33)	0.260	*8.1 (5)*	*17.0 (8)*	11.9 (13)	0.736
Cohabiting parents	*7.9 (3)*	*51.4 (18)*	28.8 (21)	0.362	*2.6 (1)*	*14.3 (5)*	8.2 (6)	0.290
Hospitalized	*14.3 (1)*	*55.6 (5)*	37.5 (6)	0.778	*28.6 (2)*	*22.2 (2)*	25.0 (4)	0.077
ADHD[§]	*26.3 (5)*	*52.6 (20)*	43.9 (25)	*0.027*	*5.3 (1)*	*15.8 (6)*	12.3 (7)	0.783
Depression[§]	*13.2 (9)*	*47.8 (11)*	25.0 (13)	0.138	*6.9 (2)*	*17.4 (4)*	11.5 (6)	1.000
ASD[§]	–	*54.5 (6)*	31.6 (6)	1.000	–	*9.1 (1)*	5.3 (1)	0.694
Anxiety[§]	*11.1 (2)*	*45.5 (5)*	24.1 (7)	0.373	–	*27.3 (3)*	10.3 (3)	1.000
Other diagnosis[§]	*13.3 (2)*	*75.0 (3)*	26.3 (5)	0.606	*20.0 (3)*	*50.0 (2)*	26.3 (5)	*0.037*

[°]Prevalence of problem-/addictive gaming versus non-problem gaming (RSP-group and engaged gamers) within subgroups (Yes or No).
[#]Prevalence of problem gambling versus non-problem gambling within subgroups (Yes or No).
[§]Diagnosis listed as primary or secondary.

Table 4. Linear regression. Dependent variable GASA T-score.

Gender		Unstandardized coefficients		Standardized coefficients		
		B	Standard error	Beta	*t*	Sig.
Female	Thirteen or older	61.098	5.268	0.723	11.598	≤0.001
	Inpatient care	7.717	14.369	0.031	0.537	0.593
	ADHD	46.547	8.997	0.305	5.174	≤0.001
Male	Thirteen or older	93.838	13.676	0.572	6.861	≤0.001
	Inpatient care	22.038	27.043	0.059	0.815	0.418
	ADHD	67.723	13.860	0.371	4.886	≤0.001

Table 5. Linear regression. Dependent variable CLiP T-score.

Gender		Unstandardized coefficients		Standardized coefficients		
		B	Standard error	Beta	*t*	Sig.
Female	Thirteen or older	83.717	4.900	0.838	17.086	≤0.001
	Inpatient care	23.527	13.364	0.079	1.760	0.083
	ADHD	27.666	8.368	0.153	3.306	0.002
Male	Thirteen or older	77.654	13.832	0.510	5.614	≤0.001
	Inpatient care	39.356	27.351	0.113	1.439	0.155
	ADHD	63.178	14.018	0.373	4.507	≤0.001

coefficient of the CLiP T-score was 0.65 (see Supplemental Table S3).

Discussion

The present study is to our knowledge the first Swedish study exploring the prevalence of gaming and gambling in a CAP cohort. This study contributes to the understanding of pathological gaming and gambling. Research in this field is scarce and inconsistent in terms of measurement approach and attitudes towards tentative diagnosis. The Manual of Mental Disorders (DSM-5) identifies IGD as a condition requiring further clinical experience and research before inclusion as a formal disorder.[2] This study presents a prevalence measure of gaming and gambling in a CAP cohort and explores the behaviours in relation to gender, type of care given, housing status and diagnosis.

In our study, male gender was significantly associated with problem/addictive gaming. This has been shown in several other studies where male predominance is a well-known feature of IGD, with a reported male to female ratio of 2.5:1.[3,4] The explanation for the male predominance in IGD is unknown and deserves further exploration. Karlsson et al.[7] hypthezied on three key factors in IGD development; structural aspects of computer games, psychological characteristics of the player and motivational aspects. Massively Multiplayer Online Role-Playing Games (MMORPGs), have been found to have an addictive potential because of their specific structural characteristics and progression of social interactions and grouping in guilds (a party or raid).[24–26] Lately the Multiplayer Online Battle Arena (MOBA) video games have become the most popular type played worldwide.[26] MMORPGs and MOBAs feature similar characteristics of advancement and social interactions.[27] Both MMORPGs and MOBAs attract mostly males, compared to story-driven games or constructive games, which attract mostly females . Further, 61% of female MMORPG players played with a romantic partner compared with 24% of men.[28] The motives to engage in gaming also appears to differ between genders. Females have been reported that they want to complete challenges or immerse themselves in other worlds, while men give as a main reason for gaming the opportunity to compete or destroy things.[28,29]

In a review of 24 studies González-Bueso et al.[14] discuss the relationship between IGD and comorbid conditions. Of the 24 articles, 10 debated the circumstances for children and adolescents ($N=36{,}124$). A high correlation between IGD and depression was reported as well as a correlation between IGD and ADHD.[14] ADHD is a widespread and impairing childhood neurodevelopmental disorder and it is recognized as one of the most common in childhood.[23] The condition is heterogenous with persistent symptoms of hyperactivity, inattention and impulsiveness that impair functioning in multiple settings.[2] The DSM-5 lists ADHD as a comorbidity of IGD.[2] The relation can possibly be partly explained by the attention difficulties and impulsivity that individuals with ADHD present. The design and content of the games meets their need for immediate reinforcement when they play[30,31] Accordingly,

it is possibly easier to concentrate on a computer game than learning in the classroom at school. Another conceivable explanation for the association between ADHD and pathological gaming is to be found in the dopamine system. There is consensus that an underlying dysfunctions in ADHD can be found in the dopamine system.[32] As early as 1998 Koepp et al.[33] reported evidence for high dopamine release during computer gaming. The high rate of IGD in adolescent and young adults with ADHD may reflect a tendency for these individuals to use the game to 'self-medicate' deficits in dopamine function. Han et al.[34] treated gaming addiction successfully with 8 weeks of methylphenidate, the drug of choice for ADHD; this also speaks in favour of the relationship between ADHD and pathological gaming.

Autism spectrum disorder (ASD) is an impairing and heterogeneous neurodevelopmental disorder with an early onset.[1,2] ASD is characterized by social impairments, communication difficulties, altered sensory processing and repetitive and restricted behaviours.[1,2] Studies have shown possible social gains for online gamers, such as decreased feelings of loneliness, increased feelings of connectedness to friends, increased social capital between players and increased social bridging between players.[24] Children with ASD tend to show restricted and repetitive behaviours, interests or activities and if these include gaming they have a potentially higher risk of developing IGD.[1,2] Because of previous research[9,31] we expected a higher prevalence of gaming and/or gambling in the ASD group but we did not find such a relationship. In our study, the numbers of participants with ASD are too small (14%, $n = 19$) to draw any conclusions.

In our material 15 out of 138 respondents (10.9%, 10 boys and 5 girls) answered affirmative to items on gambling. Games with or without money constitute adjacent phenomena in the sense that money elements, such as so-called loot boxes, are common in computer games or through more computer-game-like virtual environments where games about money take place. One possibility could be that the participants meant games containing such money elements when endorsing items on gambling in the questionnaire.

In the present study gambling was shown to be significantly overrepresented among patients recruited through inpatient care and among individuals within the constructed group other diagnoses. Specifically, two cases of problem gambling were found among individuals with eating disorder (20%), two cases among individuals with OCD (50%) and in one individual with psychosis (100%).

The research on potential relationship between psychosis and gambling is scarce at best but a disproportionate prevalence of psychosis among problem gamblers have been reported.[35] Also, previous research suggests an association between compulsivity and behavioural addiction and groups of disordered gamblers have been showed to score high on measures of compulsivity.[36] Patients with eating disorders exhibit obsessive-compulsive traits and research describe an overlap with OCD-related conditions.[37] The numbers if individuals with psychosis, OCD and eating disorder included in this study is however too small for conclusions to be drawn. One could also speculate about whether the fact that 25% ($n = 4$) of the patients recruited through inpatient care met the cut off for problem gambling could be a representation of a more severe morbidity related to gambling among children and adolescents. But then again, the sample size was too small for conclusions to be drawn. Also, the gender divided regression analysis showed no association between high NODS-CLiP score and type of care. In the regression analysis, being 13 years of age or older and diagnosed with ADHD appeared as risk factors for problem gambling, this is in line with previous research showing adult individuals with problem gambling as more than four times more likely to have ADHD than controls.[38]

To our knowledge no previous study has investigated how problem gambling relate to age among children. Possibly, money elements are more common in games preferred by older individuals. However, as gambling is allowed only for adults by Swedish law our findings should be interpreted with great caution.[39]

The correlation analysis showed that the GASA T-score and the CLiP T-score was significant but moderately associated (Correlation coefficient 0.29, p-value 0.001). Possibly this could be interpreted as a finding in line with previous research, reporting problem gambling and problem gaming as associated[5,7] The fact that the association was so low could be further interpreted as a sign that the measurements used actually managed to capture two separate behaviours, despite the reality that gambling is illegal for children in Sweden.[39]

Compatible with results from previous research the reliability test showed that GASA exhibited excellent internal consistency (Cronbach's α 0.9).[18,40] The reliability coefficient of NODS-CLiP was 0.65 which ultimately is pleasing considering the fact that the items reply to 0/1 responses but also with regard to the sample characteristics, children are prohibited from gambling by Swedish law[39] and the NODS-CLiP is to the best of our knowledge previously mainly used in adult populations.[7,16,21]

The present study has several limitations. One obvious limitation is the sample size, the limited numbers of participants could result in higher variability which affects the reliability of our results.[40] The sample size partly resulted in custom handling of the data. As the expected frequencies were below five in some cells, Fisher's exact test was used.[40] Since the individuals diagnosed with eating disorder, OCD, bipolar disease, psychosis and social phobia were so few in numbers, they were merged into a new group named other diagnosis. This grouping had no empirical or theoretical basis which undoubtedly complicates

interpretation of a potential correlate, therefor this subgroup was omitted from further analysis. Another limitation is that the IGD criteria were acquired using a self-assessment questionnaire (GASA),[17] rather than by a standardized structured clinical interview, which would have allowed a more accurate assessment of the DSM-5 diagnostic criteria. However, the use of questionnaires is widespread in psychiatric research including prevalence studies on IGD.[3,4,17] NODS-CLiP is a valuable screening tool for identifying gambling disorders.[16,22] But the instrument is designed to classify just that, not patients at risk of developing problem gambling which would have been valuable particularly in screening children and adolescents. One other limitation is that the NODS-CLiP is previosly mainly examined in an adult population[8,16] and the applicability to a child and adolescent sample is unexplored. However, the reliability coefficient was acceptable and could possibly have been further improved by expanding the Yes/No answer options to continuum scales.[40] The cross-sectional design of this study does not permit conclusions to be drawn regarding causation; this would require longitudinal investigation. Further, the measures used for this study were based on self-reporting, which implies a risk for recall bias. The sample size is too small to draw any definite conclusions regarding the potential correlates or even lack of correlates. However, the prevalence is notable.

Future research should consider examining differences between the prevalence of IGD and its comorbidities for inpatients, non-inpatients and non-treatment seeking adolescents, respectively. Despite the huge interest in gaming and gambling disorder in both popular science and more clinical and scientific contexts, there is a considerable lack of prevalence studies, especially on the youth population. To our knowledge our study is the first of its kind and provides a unique prevalence measure of problem/addictive gaming as well as problem gambling within different settings in a CAP unit.

Conclusion

Problem/addictive gaming is a common concern among patients seeking treatment at CAP. The main characteristic is male gender and ADHD diagnosis. Gambling should also be considered when assessing children seeking treatment at CAP units.

Author contributions

All authors have contributed significantly and agree with the content of the manuscript.

Declaration of conflicting interests

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Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study was approved by the Ethics committee (Dnr: 2019-02967).

Patient consent for publication

Written informed consent was obtained from all participants and their parents/guardians.

Informed consent

Written informed consent was obtained from a legally authorized representative for anonymized patient information to be published in this article.

Significance for public health

Internet gaming is a highly common recreational behaviour, mainly without negative consequences. However, most research agree on a pathological potential in gaming and the DSM-5 included Internet Gaming Disorder as a tentative diagnosis and inquires for additional research. Gambling is an established diagnosis and Swedish epidemiological data show that 1.3% of the population meet the criteria for gambling disorder. Both problem gaming and gambling are associated with compulsion, psychiatric and physical symptoms, impaired cognitive development, and school performance. Gaming and gambling are frequently reported from child and adolescent psychiatry and school health care, even though gambling is illegal for children in Sweden. Based on the limited knowledge and the need for more research into these behaviours among young individuals, the present study aimed to look at the prevalence of gaming and gambling in patients at the child and adolescent psychiatry department (CAP).

Availability of data and materials

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

Supplemental material

Supplemental material for this article is available online.

References

1. World Health Organization. International classification of diseases for mortality and morbidity statistics (11th revision), https://icd.who.int/browse11/l-m/en (2018, accessed 31 May 2022).
2. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 5th ed. Washington, DC: American Psychiatric Association, 2013.
3. Fam JY. Prevalence of internet gaming disorder in adolescents: a meta-analysis across three decades. *Scand J Psychol* 2018; 59(5): 524–531.
4. Stevens MW, Dorstyn D, Delfabbro PH, et al. Global prevalence of gaming disorder: a systematic review and meta-analysis. *Aust N Z J Psychiatr* 2021; 55: 553–568.
5. Vadlin S, Åslund C and Nilsson KW. A longitudinal study of the individual- and group-level problematic gaming and associations with problem gambling among Swedish adolescents. *Brain Behav* 2018; 8(4): e00949.
6. Király O, Griffiths MD, Urbán R, et al. Problematic internet use and problematic online gaming are not the same: findings from a large nationally representative adolescent sample. *Cyberpsychol Behav Soc Netw* 2014; 17(12): 749–754.
7. Karlsson J, Broman N and Håkansson A. Associations between problematic gambling, gaming, and Internet use: a cross-sectional population survey. *J Addict* 2019; 2019: 1464858.
8. Håkansson A, Kostevski A and Ekblad S. Gambling habits, gambling norms, and problem gambling in foreign born and native populations in Denmark — a general population survey. *Addict Behav Rep* 2019; 9: 100183.
9. Durkin K. Videogames and young people with developmental disorders. *Rev Gen Psychol* 2010; 14(2): 122–140.
10. Ko CH, Yen J-Y, Yen C-F, et al. The association between Internet addiction and psychiatric disorder: a review of the literature. *Eur Psychiatry* 2012; 27(1): 1–8.
11. Bozkurt H, Coskun M, Ayaydin H, et al. Prevalence and patterns of psychiatric disorders in referred adolescents with Internet addiction. *Psychiatry Clin Neurosci* 2013; 67(5): 352–359.
12. Carli V, Durkee T, Wasserman D, et al. The association between pathological internet use and comorbid psychopathology: a systematic review. *Psychopathology* 2013; 46(1): 1–13.
13. Fuchs M, Riedl D, Bock A, et al. Pathological internet use—an important comorbidity in child and adolescent psychiatry: prevalence and correlation patterns in a naturalistic sample of adolescent inpatients. *Biomed Res Int* 2018; 2018: 1629147.
14. González-Bueso V, Santamaría JJ, Fernández D, et al. Association between internet gaming disorder or pathological video-game use and comorbid psychopathology: a comprehensive review. *Int J Environ Res Public Health* 2018; 15(4): 668.
15. Hansson K, Johansson BA, Andersson C, et al. Issues in child and adolescent inpatient assessment and evaluation after discharge: protocol for app development and a randomized controlled trial. *JMIR Res Protoc* 2018; 7(11): e10121.
16. Toce-Gerstein M, Gerstein DR and Volberg RA. The NODS-CLiP: a rapid screen for adult pathological and problem gambling. *J Gambl Stud* 2009; 25(4): 541–555.
17. Lemmens JS, Valkenburg PM and Gentile DA. The Internet Gaming Disorder Scale. *Psychol Assess* 2015; 27(2): 567–582.
18. Brunborg GS, Hanss D, Mentzoni RA, et al. Core and peripheral criteria of video game addiction in the game addiction scale for adolescents. *Cyberpsychol Behav Soc Netw* 2015; 18(5): 280–285.
19. Brunborg GS, Mentzoni RA, Melkevik OR, et al. Gaming addiction, gaming engagement, and psychological health complaints among Norwegian adolescents. *Media Psychol* 2013; 16(1): 115–128.
20. Charlton JP and Danforth IDW. Distinguishing addiction and high engagement in the context of online game playing. *Comput Human Behav* 2007; 23(3): 1531–1548.
21. Gerstein D, Volberg RA, Toce M, et al. *Gambling impact and behavior study: Report to the national gambling impact study commission*. Chicago, IL: National Opinion Research Center, 1999.
22. Volberg RA, Munck IM and Petry NM. A quick and simple screening method for pathological and problem gamblers in addiction programs and practices. *Am J Addict* 2011; 20(3): 220–227.
23. Polanczyk G and Rohde LA. Epidemiology of attention-deficit/hyperactivity disorder across the lifespan. *Curr Opin Psychiatry* 2007; 20(4): 386–392.
24. Martončik M and Lokša J. Do World of Warcraft (MMORPG) players experience less loneliness and social anxiety in online world (virtual environment) than in real world (offline)? *Comput Human Behav* 2016; 56: 127–134.
25. Nuyens F, Deleuze J, Maurage P, et al. Impulsivity in Multiplayer Online Battle Arena gamers: preliminary results on experimental and self-report measures. *J Behav Addict* 2016; 5(2): 351–356.
26. Billieux J, Deleuze J, Griffiths MD, et al. Internet gaming addiction: the case of massively multiplayer online roleplaying games. In: El-Guebaly N, Galanter M and Carrá G (eds.) *Textbook of addiction treatment: International perspectives*. New York: Springer, 2015, pp.1515–1525.
27. Müller KW, Janikian M, Dreier M, et al. Regular gaming behavior and internet gaming disorder in European adolescents: results from a cross-national representative survey of prevalence, predictors, and psychopathological correlates. *Eur Child Adolesc Psychiatry* 2015; 24(5): 565–574.
28. Williams D, Consalvo M, Caplan S, et al. Looking for gender: gender roles and behaviors among online gamers. *J Commun* 2009; 59: 700–725.
29. Yee N. Motivations for play in online games. *Cyberpsychol Behav* 2006; 9(6): 772–775.
30. Gentile DA, Choo H, Liau A, et al. Pathological video game use among youths: a two-year longitudinal study. *Pediatrics* 2011; 127(2): e319–e29.
31. Mazurek MO and Engelhardt CR. Video game use in boys with autism spectrum disorder, ADHD, or typical development. *Pediatrics* 2013; 132(2): 260–266.
32. Krause K-H, Dresel SH, Krause J, et al. Increased striatal dopamine transporter in adult patients with attention deficit hyperactivity disorder: effects of methylphenidate as measured by single photon emission computed tomography. *Neurosci Lett* 2000; 285(2): 107–110.

33. Koepp MJ, Gunn RN, Lawrence AD, et al. Evidence for striatal dopamine release during a video game. *Nature* 1998; 393(6682): 266–268.
34. Han DH, Yoo M, Renshaw PF, et al. A cohort study of patients seeking internet gaming disorder treatment. *J Behav Addict* 2018; 7(4): 930–938.
35. Cassetta BD, Kim HS, Hodgins DC, et al. Disordered gambling and psychosis: prevalence and clinical correlates. *Schizophr Res* 2018; 192: 463–464.
36. el-Guebaly N, Mudry T, Zohar J, et al. Compulsive features in behavioural addictions: the case of pathological gambling. *Addiction* 2012; 107(10): 1726–1734.
37. Bang L, Kristensen UB, Wisting L, et al. Presence of eating disorder symptoms in patients with obsessive-compulsive disorder. *BMC Psychiatry* 2020; 20(1): 36.
38. Theule J, Hurl KE, Cheung K, et al. Exploring the relationships between problem gambling and ADHD: a meta-analysis. *J Atten Disord* 2019; 23(12): 1427–1437.
39. Spellag (2018:1138). https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/spellag-20181138_sfs-2018-1138 (2021, accessed 10 June 2021).
40. Field AP and Field AP. *Discovering statistics using IBM SPSS statistics*. London; Thousand Oaks, CA: SAGE Publications, 2018.

Paper II

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ORIGINAL RESEARCH
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Game Addiction Scale for Adolescents—Psychometric Analyses of Gaming Behavior, Gender Differences and ADHD

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Background: Internet gaming disorder (IGD) was recently added in the Diagnostic and Statistical Manual of Mental Disorder as a "condition for further studies." There is no consensus regarding which rating scales should be used but many scholars suggest the GASA (Game Addiction Scale for Adolescents) and a ranking of the criteria, "the core approach" to avoid over-diagnosing of disordered gaming. Male gender and ADHD are commonly listed as risk factors for disordered gaming but little is known about sex differences in gaming and gender specific health correlates.

Purpose: The present study aims to evaluate the core approach and the specific indicators of gaming behavior in GASA from a multifactorial perspective and explore the gender differences in a clinical setting, focusing on ADHD.

Patients and Methods: Children and adolescents aged 8–18 years ($n = 144$) from Child and adolescent psychiatry (CAP) in Skane were assessed with the GASA. Psychometric analyses including confirmatory factor analyses (CFA) and structural equation modeling (SEM) were used to identify well-defined constructs and gender differences. Refined factor scores for single constructs were the outcome of alignment, a procedure for assessing measurement equivalence across gender. New model-based gaming behavior variables were used for descriptive statistics and ANOVA testing of gender differences.

Results: The results confirm that the core approach two-factor model is valid for the CAP sample, as well as a theory based psycho-social model for gaming behavior with over consumption and negative social and emotional consequences. Our findings suggest that negative consequences of over consumption take a social direction for boys and an emotional direction for girls. Also, ADHD was significantly associated with over consumption of video games and the negative consequences thereof for girls.

Conclusion: Guided by psychometric analyses, the GASA could be strengthened by advancing the questionnaire design and by adding complementary items in order to illuminate the complexity of gaming behavior. Our findings suggest that additional research on potential gender related discrepancies of disordered gaming is needed.

Keywords: internet gaming disorder GASA, core approach, gender differences, psycho-social model, aligned factor scores

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INTRODUCTION

In the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) the American Psychiatry Association (APA) identified Internet Gaming Disorder as a tentative diagnose; a "condition for further studies" (1). Nine criteria for IGD has been proposed: preoccupation, preoccupation with gaming; withdrawal, experience of unpleasant symptoms when gaming is taken away; tolerance, the need to spend increasing amounts of time engaged in games; loss of control, unsuccessful attempts to control participation in games; Give up other activities, loss of interest in previous hobbies and entertainment as a result of, and with the exception of, internet games; continuation, continued excessive gaming despite knowledge of psychosocial problems; deception, deceiving family members, therapists, or others regarding the quantity of gaming; escape, the use of games to avoid or relieve negative moods; and negative consequences, risking or losing an important relationship, job or education or career opportunity due to participation in games. Five of the nine criteria must be met within a year to be diagnosed as IGD (1). However, APA indicated that further clinical experience and research was needed before inclusion of IGD as a formal disorder (1).

In 2018, the World Health Organization (WHO) included Gaming Disorder (GD) in the 11th revision of the International Classification of Diseases (ICD 11) (2). According to ICD-11 a patient must exhibit three symptoms (impaired control, increasing priority given to gaming, continuation or escalation of gaming despite the occurrence of negative consequences) to be officially diagnosed with GD (2). Consequently, the criteria withdrawal and tolerance which concerns rather biological consequences is excluded from the ICD-11 GD diagnosis criteria.

There is no consensus regarding which rating scales should be used for diagnosing disordered gaming and different scales are used both in research and in clinical practice. Most studies have used the criteria for pathological gambling to define the pathological gaming (3, 4). Different researchers have used different cutoffs of the criteria to establish a diagnosis (5–8), others have focused strictly on online games (9), and some researchers have adopted their own criteria for disordered gaming (10, 11). One of the most frequently used questionnaires for disordered gaming in adolescents is the GASA (Game Addiction Scale for Adolescents) (12–16). GASA was developed specifically for adolescents. The items in the GASA relate to homework and relationship to parents, designed to correspond to the developmental stage of an adolescent (15). The adult version of the GASA; Game Addiction Scale (GAS) has been showed to provide both good reliability and validity and in a review of different instruments assessing disordered gaming King et al., found that GAS was one of two scales that provided the best clinical information for the diagnosis of disordered gaming (16). King et al. reviewed 32 different scales and found that GAS was one out of five tools that had greater evidential support regarding psychometric properties (16). Finserås et al. verified this finding in their evaluation of the adolescent version of the scale (GASA) in relationship to the nine criteria for disordered gaming suggested by the APA (17). In 2019 Donati et al. developed and evaluated a Video-Gaming-Scale—For Children (VGS-C), aiming to assess pathological gaming behavior in children specifically (18). The GASA has the advantage of being a well-established and well-proven assessment of disordered gaming (12–17). However, the scale has to our knowledge not yet been evaluated in a child and adolescent sample.

GASA was theoretically based on seven of the DSM-5 criteria for pathological gambling: salience (exaggerated preoccupation in thoughts and habits), tolerance, mood modification, withdrawal, relapse, conflicts, and problems (15). When diagnosing pathological gamblers, the DSM-5 requires at least half of their criteria to be met while scholars in the gaming research field prefer a ranking of the criteria, which they call "the core approach" (1, 5, 12–14, 19). These scholars believe that the criteria for tolerance, mood modification and cognitive salience are associated with engagement and not necessarily with addiction while the contrary is true for the criteria for withdrawal, relapse, conflicts and problems (5, 13, 14). The core approach thus distinguishes engaged gamers from problem- and addicted gamers by emphasizing the "core criteria" namely, withdrawal, relapse, conflict and problems in order to yield a more precise and relevant estimate of prevalence whereby a diagnosis of game addiction should be related to comorbidity and interference rather than high engagement (13, 14, 17, 20).

The psychometric properties of GAS have been tested among adult men in Switzerland showing satisfactory internal consistency (21), and in a population of Iranian adolescents supporting the measurement invariance also across gender (22). Brunborg et al. evaluated the core approach using a confirmatory factor analysis showing that a two-factor structure (peripheral criteria separated from core criteria) fitted their data better than the original one-factor structure. The same applied for groups of men and women, both aged 16–33 years and for those aged 34–74 years (13). However, when Brunborg et al. evaluated the two-factor solution no evidence was found for metric invariance, implicating that comparison between different subpopulations should be done with caution (13). Charlton and Danford contributed with an influential distinction between peripheral and core symptomatology in terms of gaming, early in the field of gaming research. Consistent with the Brunborg et al. research they considered cognitive salience, tolerance, and mood modification as a peripheral group of symptoms, though with a potential to develop into disordered gaming in certain circumstances (5, 19). Concordantly, they suggested an existence of a developmental process whereby the peripheral criteria precede the core criteria (5).

Jonsson et al. evaluated a self-test, GamTest, for online gambling, largely similar to GASA. These researchers identified two main components of early signs of problematic gambling: over consumption (OC) and negative consequences (NC) (23). The peripheral criteria correspond to over consumption and the core criteria to the negative consequences. The negative consequences items where further divided conceptually into a social and an emotional part, corresponding to the dimensions in GamTest (23). The application of this psycho-social model specification enables an exploration of over consumption as an explanatory variable for problematic use of games rather than just charting peripheral components, in accordance with the

Charlton and Danford suggestion that the peripheral criteria might precede the core criteria (5, 23).

International studies have found the prevalence of disordered gaming to range between 1.3 and 6.8 percent (24). Stevens et al. report that the prevalence of disordered gaming worldwide in a meta-analysis is 3.05 percent (25). The differences in prevalence are likely due to differences in assessment methods, sample characteristics, and cultures in different countries (24, 26). Child and adolescent psychiatrists as well as school health care workers have reported disordered gaming among their patients and students. These clinicians describe compulsion, psychiatric and physical symptoms and impaired school performance as components of the disorder (27, 28). Most research on disordered gaming reports that males are more likely than females to experience disordered gaming (25, 27, 29–31) and the prevalence rates are commonly higher in adolescent samples (24, 25). Several previous studies report on the association between ADHD and disordered gaming (29, 32, 33) and DSM-5 lists ADHD as a comorbidity of IGD (1). Stavropoulos et al. presented a theory on gender dependent ADHD characteristics as a possible explanation to the gender discrepancy regarding disordered gaming (29). However, sex differences in gaming and potential gender specific health correlates are poorly understood.

In summary, the GASA is an established measure of gaming behavior, but the psychometric properties of the scale have previously mainly been investigated in adult or adolescent populations (16, 24, 25). Male gender and ADHD are frequently reported as risk factors for disordered gaming (24, 25, 29, 32, 33) but no previous research has to our knowledge evaluated how these factors relate to the components in GASA. This study contributes to the knowledge of gaming, using a clinical sample of children and adolescents to explore the psychosocial dimensions of the GASA.

The present study evaluates the indicators of gaming behavior in GASA from a multifactorial perspective and explores the gender differences in a clinical setting, focusing on ADHD. Both the two-factor core approach and an alternative three-factor version are analyzed psychometrically. The study aims are specified as follows:

1. Explore the dimensionality of the items in GASA and the potential impact of gender and/or ADHD.
2. Analyze the fitting of the two-factor core approach on the CAP sample.
3. Analyze the fitting of an adapted three-factor version of the core approach on the CAP sample, by dividing the core items into social and emotional categories.

METHODS

Participants

The study was performed in Skane, a county in the south of Sweden with 1.36 million inhabitants, of which 280,000 are individuals under 18 years of age. In 2018 CAP Skane had 55,000 unique visits. There are seven out-patient child and adolescent psychiatry units in Skane and one in-patient unit. The out-patient units cater for all types of child and adolescent diagnoses but have no assignment to either diagnose or treat addiction problems. In the present study, patients coming to the Child and Adolescent Psychiatry clinic (in- and out-patient departments, respectively) in Skane during the study period of 4 months (Feb–May) during 2020 were asked to participate. Clinicians (psychologists, psychiatrists) were systematically provided with questionnaires and were asked to distribute these to their patients. The study was approved by the Ethics committee (Dnr: 2019-02967). Written informed consent was obtained from all participants and their parents/guardians.

TABLE 1 | Descriptive statistics for CAP sample, $n = 137$.

Description	*N*	%
Gender		
Male	69	50.4
Female	68	49.6
Type of care		
Outpatient care	121	88.3
Inpatient care	16	11.7
Age, years		
8–12	28	20.4
13–18	109	79.6
ADHD lifetime		
Yes	57	41.6
No	80	58.4

The survey was answered by 144 children and adolescents between 8 and 18 years of age. Six individuals participated without sharing social security number which made the collecting of other information (gender, age, diagnosis) impossible. One individual abstained from answering the GASA-items. Concordantly, seven individuals were excluded from the data file leaving 137 individuals, characteristics specified in **Table 1**. The gender distribution was even, most of the participants were recruited through outpatient care and a majority were older than 13 years. The mean age was 14.5 years. The participant's main as well as secondary diagnosis, when applicable, was registered. The diagnoses were referred to as the Manual of Mental Disorders, 5th edition, describes them (1). ADHD was the most prevalent diagnosis. Other diagnoses that occurred were depression, autism spectrum disorder, anxiety, eating disorder, anxiety/depression, bipolar disease, obsessive compulsive disorder, social phobia, and psychosis. All patients were assessed in clinical settings by trained psychologists and child and adolescent psychiatrists.

Concerning sample size for the GASA analyses, the Price guidelines are for a minimum sample size equal to 105 (7 items × 15 patients) (34). The CAP sample includes $n = 137$ observations and accordingly fulfills the requirements according to guidelines (34).

Measures

One of the most used questionnaires for disordered gaming in adolescents is GASA (Game Addiction Scale for Adolescents), constructed by Lemmens et al. (13–17). The seven-item GASA applies to gaming behavior in the last 6 months, see **Table 2**. Each

TABLE 2 | GASA, peripheral and core items corresponding to OC and NC, respectively.

How often in the last 6 months:	Peripheral items	Core items	Addiction criterion	Early signs of problems[a]
1. Have you thought all day long about playing a game?	x		Salience/ preoccupation	OC
2. Have you played longer tan intended?	x		Tolerance	OC
3. Have you played games to forget about real life?	x		Mood modification	OC
4. Have other unsuccessfully tried to reduce your time spent on games?		x	Relapse	NC social
5. Have you felt upset when you were unable to play?		x	Withdrawal	NC emotional
6. Have you had arguments with others (e.g., family, friends) over your time spent on games?		x	Conflict	NC social
7. Have you neglected important activities (e.g., school, work, sports) to play games?		x	Problem/ Neglect duties	NC emotional

[a]*According to GamTest (28, 29).*
GASA, game addiction scale for adolescents; OC, over consumption; NC, negative consequences.

item concerns one criterion, answered on a five-point scale: 1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = very often and should be considered endorsed when rated 3 or higher (15).

With support from previous research, empirical data and theoretical reasoning (5, 13–15, 19, 23, 35, 36) the GASA items were associated with the different factors in a psycho-social conceptual model to enable testing of a two-factor approach (core approach) and a three-factor approach, in which the peripheral items/negative consequences were differentiated into negative consequences social and negative consequences emotional, see **Table 2**. The psychosocial conceptual model is guiding the specification of measurement and structural models analyzed. For details see **Supplementary Diagram 1** and paragraph 3 (conceptual model) and 4 (GASA instrument) in the electronic supplement. This model specification aims to consider over consumption as an explanatory variable for problematic use of games rather than a peripheral component.

The following variables were obtained from subjects in the study: GASA, gender, age, housing situation (with whom you live), type of care given at CAP (in-/out-patient care) and diagnosis at CAP.

Statistical Analysis

Psychometric analyses including confirmatory factor analyses (CFA) were used to identify constructs captured by the GASA items through well-fitting measurement models. These analyses were performed within the latent variable framework in Mplus software Version 8.6 (30). Robust maximum-likelihood estimation MLR was applied to adjust for skewed item distributions in the goodness-of-fit testing. Item analysis and trimming of skewed item distributions was performed to improve the fulfillment of the requirements of the chi square testing in the CFA and SEM analyses Gender differences in GASA measurement models were assessed using multiple-group confirmatory factor analysis (MGCFA). In order to explore if the latent variables were equivalent across groups, test for invariance in measurements were executed for group comparisons of CFA models. Factor analysis of multiple groups considers three degrees of measurement invariance: configural, metric (also referred to as weak factorial invariance) and scalar (strong factorial invariance). In the present study, a two-group two factor metric model corresponding to the core approach shows acceptable fit. This measurement model with equality constraints for corresponding measurement models (metric invariance) across gender was used as the outcome variable in a multiple-group structural equation model (SEM) to examine gender differences exploring direct and indirect effects of a diagnosis of ADHD on over consumption and negative consequences social and emotional (34). Details are available in the electronic supplement.

Goodness of Fit Indexes were calculated for the One-Two- and Three factor Solutions to the GASA Scale, for the whole sample ($n = 137$) and divided according to gender (male $n = 69$, female $n = 68$), with metric invariance, with and without equality constraints. Ever being diagnosed with ADHD was added as a covariate independent variable, hereafter mentioned as ADHD lifetime. The goodness-of-fit of the CFA/SEM models was assessed using the root mean square error of approximation (RMSEA) and the comparative fit index (CFI). Values above 0.95 (CFI) and below 0.08 (RMSEA) were considered acceptable (37, 38).

A three-factor model in which negative consequences was differentiated into social and emotional harm was explored regarding the impact of over consumption.

This measurement model (3.1 gm) was used as a vehicle to test gender differences exploring direct and indirect effects of the risk factor diagnose ADHD lifetime on over consumption and negative consequences social and negative consequences emotional (Model 3.2 gdia).This model assumed equality constraints for corresponding measurement models, see **Table 3**.

Factor scores and means optimized for measurement non-invariance across gender were computed with the alignment procedure in Mplus based on a one-factor model fitted to over consumption items and negative consequences items separately (39). Factor scores and means in an alignment optimization metric were saved for further post processing in SPSS, for details see **Supplementary Table 4** in the electronic supplement. ANOVA testing of effects by gender and ADHD lifetime diagnosis as well as gender and age group were reported with the test variable F. All statistical analyses are based on the reduced sample $n = 137$, with no missing data. Details are available in the electronic supplement.

TABLE 3 | Goodness of fit Indexes for the one-, two- and three-factor solutions of GASA.

Model	Model description	CFI	RMSEA
1.1	GASA CFA 1 core items NC all	0.994	0.051
1.1 g	GASA MGCFA 1 core items NC by gender configural	0.954	0.077
1.2	GASA CFA 1 OC and NC all	0.960	0.077
1.2 g	GASA MGCFA 1 OC and NC by gender configural	0.886	0.095
2.1	GASA CFA 2 all	0.973	0.065
2.1 g	GASA MGCFA 2 by gender configural	0.933	0.077
2.1 gc	GASA CFA 2 by gender configural with correlation errors between item 5 and 7	0.971	0.059
2.1 gm	GASA MGCFA 2 by gender metric, model 2.1 gc with eq constraints	0.935	0.079
3.1	GASA CFA 3 all	0.974	0.069
3.1 gm	GASA MGCFA 3 by gender metric eq constraints	0.959	0.069
3.2 g.dia	GASA MCCFA 3 by gender model 3.1 gm with covariate diagnose ADHD lifetime	0.954	0.067

Whole sample all n = 137 and multiple-group by gender, n (female) = 68, n (male) = 69. CFI, comparative fit index; RMSEA, root mean square error of approximation; GASA, game addiction scale for adolescents; CFA, confirmatory factor analyses; MGCFA, multiple-group confirmatory factor analysis; OC, over consumption; NC, negative consequences; ADHD, attention deficit hyperactivity disorder.

RESULTS

Overview of Goodness of Fit Results for GASA CFA and SEM Models

Model fitting results are reported in **Table 3**. The Goodness of Fit Indexes for models including all 7 items, the one-factor model (model 1.2) and the two-factor model/core approach (Model 2.1), showed a good model fit. The Goodness of Fit index for the two-factor model did not meet the cutoff values when the sample was divided by gender. When correlation errors between item 5 and 7 and equality constraints were added the adjusted two-factor model showed an acceptable fit. The three-factor model (model 3.1) showed a good fit for the whole sample and when divided by gender and when being diagnosed with ADHD lifetime was added as a covariate diagnose.

The Psychometric Model for the Core Approach

Path Diagram for the two-factor CFA model, peripheral-core approach is reported in **Figure 1**. The peripheral items correspond to over consumption (OC) and the core items reflect negative consequences (NC). In the measurement Model 2.1 (**Figure 1**) the estimate of the correlation between f (OC) and f (NC) was high, 0.91. The model showed an acceptable fit (CFI = 0.973; RMSEA = 0.065) which confirmed that the core approach shows a valid factor structure for the total sample $n = 137$ (see **Figure 1**; **Table 3**).

The two-factor model (core approach) divided by gender showed a CFI value just below 0.95. When inserting the correlation between error terms for item 5 (withdrawal) and 7 (neglect duties) in Model 2.1 g (the negative consequences emotional factor) the goodness of fit was improved, see **Figure 2** and **Table 3**. The correlation between OC and NC latent variables was 0.89 for girls and 0.97 for boys.

The Three-Factor Model

The three-factor model showed an acceptable fit (CFI = 0.974; RMSEA = 0.069) which confirms that this alternative version of the core approach constitutes a valid factor structure for the total sample $n = 137$. The factor structure remained valid when analyzed with a two-group model with equality constraints across gender groups for corresponding measurement models (see **Table 3**; **Figure 3**).

Residual correlations of NC social with NC emotional (not represented in the path diagram) for males was 0.40 and for females 0.87. When the path coefficient for OC → NC was differentiated into a social and emotional path coefficient, the strongest relationship for boys appeared as OC → NC social equal to 0.89 and for girls OC → NC emotional equal to 0.95.

Gender Differences in the Three-Factor Model With Covariate ADHD

When the risk factor being diagnosed with ADHD was added as a covariate the estimated path coefficient showed that ADHD constituted a significant correlate for both over consumption of gaming and negative consequences specified as social for females but not for males, see **Figure 4**.

The Impact of Age and ADHD on Differences in Gaming Behavior for Boys and for Girls

The new aligned T-scores measure severity of over consumption and negative consequences at a common scale. Minor and non-significant differences appeared between the child and teenage groups concerning their gaming severity, both regarding over consumption and negative consequences, among both male and female participants. The effect of age is illustrated in **Figure 5** and further described in ANOVA tests reported in **Supplementary Table 8** and through descriptive statistics in **Supplementary Table 9** in the electronic supplement. The female participants show a significant difference between ADHD lifetime and other diagnoses both for over consumption (mean 100 vs. 60, $p = 0.01$) and for negative consequences (mean 93 vs. 67, $p = 0.03$) while male's mean profiles are very close and non-significant but at a higher level compared with the females. The interaction effect is illustrated in **Figure 6** and further described in ANOVA tests reported in **Supplementary Table 5** and through descriptive statistics in **Supplementary Table 6** in the electronic supplement.

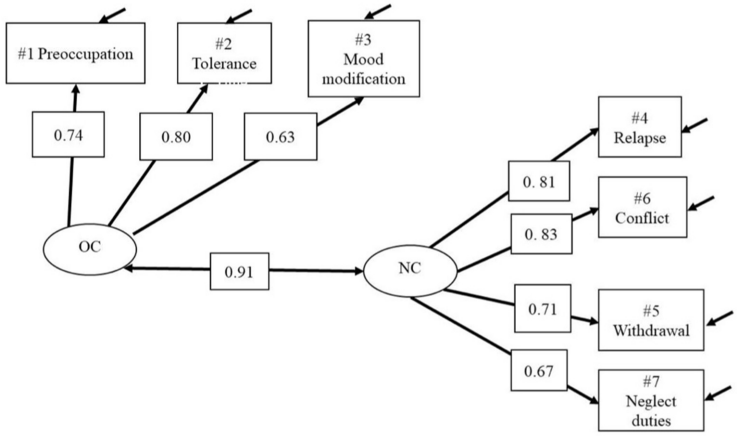

FIGURE 1 | Model 2.1—GASA CFA 2 all. Two-factor Core approach model, OC/Peripheral and NC/Core. OC, over consumption; NC, negative consequences.

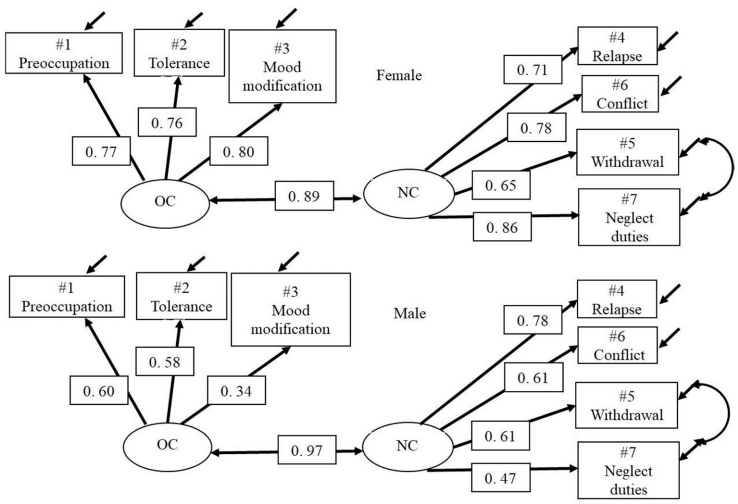

FIGURE 2 | Model 2.1 gc—GASA MGCFA 2 by gender configural. Two-group two-factor Core approach model, OC/Peripheral and NC/Core. With correlated errors between NC item #5 Withdrawal and #7 Neglect duties.

DISCUSSION

The present study contributes to our understanding of the dimensionality of GASA but also presents results that indicate a gender dependent distinction regarding the negative consequences of over consumption of gaming. The two-factor model of the core approach showed a satisfactory fit to the data. The three-factor version of the core approach also showed a good fit, when differentiating the negative consequences core items into social and emotional consequences. Interestingly, our findings suggest that over consumption of video games is more heavily associated with negative consequences for

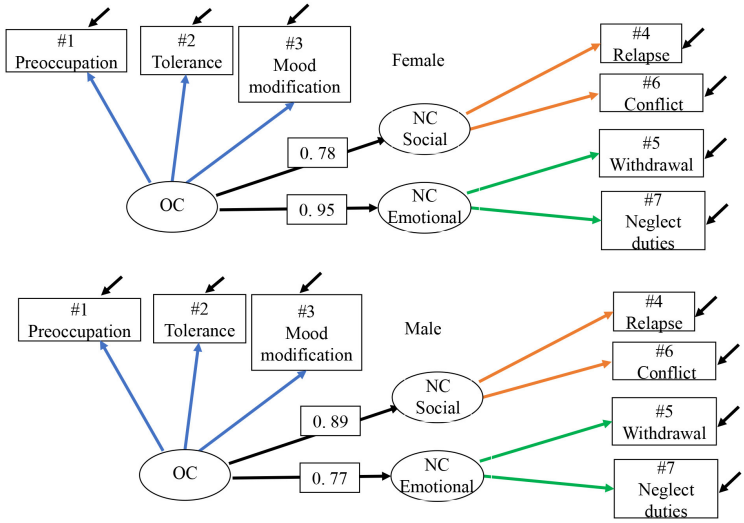

FIGURE 3 | Model 3.1 gm—GASA MGCFA 3 by gender, metric. Two-group three-factor model by gender with core items divided into NC social and emotional with equality constraints across gender groups for corresponding measurement models. Residual correlations NC social with NC emotional (not represenated in the path diagram) for males is 0.40 and for females 0.87. OC, over consumption; NC, negative consequences.

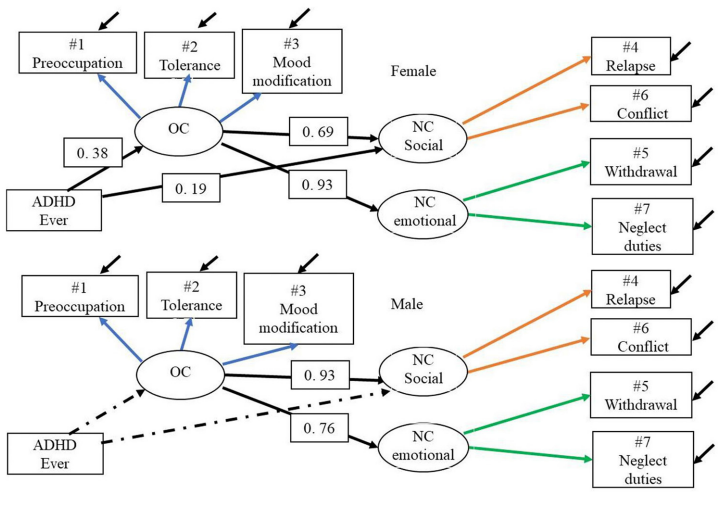

FIGURE 4 | Model 3.2 g.dia—GASA MGCFA 3 by gender, metric with covariate. The two-group three-factor model with equality constraints across gender for corresponding measurement models and with covariate ADHD ever. Dotted line is non-significant path. OC, over consumption; NC, negative consequences.

male gamers but also that their negative consequences of over consumption tend to be social rather than emotional, as was the case for female gamers. ADHD was significantly associated with over consumption of video games and the

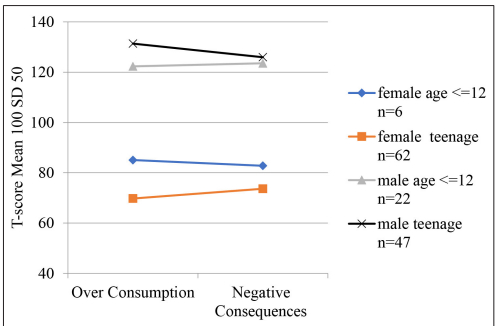

FIGURE 5 | Over consumption and negative consequences mean profiles for gender by age groups. Scale is aligned factor T-scores. Mean 100 and SD 50 for the CAP sample. For data see electroninc **Supplementary Table 6**.

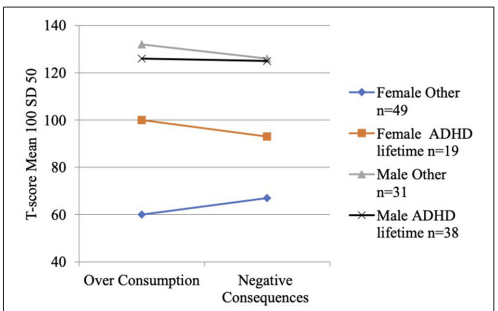

FIGURE 6 | Over consumption and negative consequences mean profiles for gender by ADHD lifetime diagnosis groups. Scale is aligned factor T-scores. Mean 100 and SD 50 for the CAP sample. For data see electroninc **Supplementary Table 6**.

negative consequences thereof for girls. The male participants over consumed games to a higher degree than the females and showed more severe consequences, regardless of a potential ADHD diagnosis.

The fact that the three-factor model showed a good fit to the data confirms that the division of negative consequences into negative consequences social and negative consequences emotional could be a valid alternative factor structure. However, these constructs only contain two items each, making the social and emotional dimensions insufficiently grounded for reliable factor scores. Three items with high loadings are required to establish a solid factor (34). This suggests that further development of GASA is needed in order to capture both social and emotional components.

Most research agree that male gender is a risk factor for disordered gaming (25, 27, 30). Boys in general tend to spend more time on gaming and they are overrepresented among the minority that exhibits gaming problems (27, 30). Time spent on gaming has been reported as a risk factor for disordered gaming (30, 40) but whether the time spent constitute a greater risk for boys than for girls remains unclear. Our findings suggest that the association between over consumption of games and negative consequences thereof is stronger for boys. Further, our results suggest that the negative consequences of over consumption take a social direction for boys and an emotional direction for girls, a distinction that warrant additional investigation. Bonnaire et al. investigated gender differences in disordered gaming and showed that male gamers were disproportionately more likely to be single than female gamers whereas the female gamers showed a higher anxiety score (31). Possibly, the results presented by Bonnaire et al. (31) supports the tendency shown in this study using the three-factor structure of GASA, illuminating gender distinctive emotional and social consequences of gaming. GASA could be further developed with complementary items on social as well as emotional aspects of gaming in order to determine and further explore a potential psychosocial gender discrepancy of disordered gaming. In the 15-item gambling Gam Test the emotional factor was measured with 5 items, including aspects such as; feeling bad when thinking about gambling, gambling resulting in feelings of irritation and "I do not want to tell other people about how much time and money I spend on my gambling" (23). Similar items, adapted to gaming and to young individuals, could theoretically be added to the GASA to strengthen the factors of both the emotional and social dimensions.

ADHD is one of the most prevalent neurodevelopmental disorder in childhood with an estimated prevalence of 5 per cent, globally (41, 42). It is a heterogeneous condition with persistent symptoms of hyperactivity, inattention and impulsiveness that impair functioning in multiple settings (1). Researchers have found that ADHD is a particular risk factor for disordered gaming (32, 33, 43–46). In the current CAP sample, ADHD was significantly associated with over consumption of video games and the negative consequences thereof for girls, an association that was not seen among the male participants. Possibly, our results could be interpreted as being diagnosed with ADHD increases the risk of over consumption of computer games and the negative consequences thereof more for girls than for boys. To our knowledge, this gender discrepancy has not previously been explored. However, consistent with our findings, Yen et al. showed that the association between ADHD and Internet addiction was greater among female than male college students (32). Somewhat contractionary to our findings, Stavropoulos et al. hypothesized that the fact that female ADHD predominantly demonstrates inattention while males rather experience hyperactivity-impulsivity symptoms could contribute to a gender discrepancy regarding disordered gaming (29). They further hypothesized that hyperactivity-impulsivity mediates a greater risk for disordered gaming, which they managed to demonstrate, in consistency with other research (29, 47). However, Stavropoulos et al., did neither investigate whether ADHD is associated with a greater increase in risk for disordered gaming for either boys or girls nor did they define whether female gender affected the impact of hyperactivity-impulsivity/inattention. Martins

et al., who investigated gender differences in mental health characteristics among adolescent gamblers, showed that parents to female gamblers were disproportionally likely to rate high levels of childhood hyperactivity when compared to parents to male gamblers (48). Since both gaming and gambling are more common and socially accepted behaviors among men, it is possible that women are more prone to exhibit predisposing conditions. Regardless, our findings warrant additional research to establish and explain a potential gender discrepancy regarding the association between ADHD and disordered gaming.

Strengths

The study provides an interdisciplinary perspective on diagnostic testing and applies a psychometric methodology capable of uncovering different aspects of gaming behavior in a clinical setting (49). Specifically, the statistical analyses take measurement errors in criteria as well as sample size into account. Alternative measurement models are tested for goodness-of-fit, including test for invariance across gender groups (34). In summary, the methodology is grounding the results in qualified empirical evidence.

Limitations

The present study does have some limitations. One limitation is the cross-sectional design which does not allow for conclusions regarding cause and effect. In order to explore causation a longitudinal investigation is required. Further, the measures used for this study are partly based on self-reporting, which implies a risk for recall bias. One other limitation is a possible selection bias. Clinicians were provided with questionnaires and were supposed to distribute them to their patients, but the study design does not provide any insight into the numbers of patients declining or more importantly why. However, the gender distribution was even, ADHD was the most prevalent disorder, as expected (41, 42) and we have no obvious reason to believe that the sample excelled heavily from an ordinary CAP population. The different specifications of alternative models relating over consumption with negative consequences show that the relationship is remarkably high, with correlations as high as 0.97, possible reflecting a weakness in the self-test of a strong general method factor present as part of both over consumption and negative consequences. Among issues in the design of GASA and in data collection causing bias in the correlation between over consumption and negative consequences through such a factor, is low motivation for youth to engage in answering questionnaires (50). Furthermore, GASA was originally developed based on the DSM-5 criteria for pathological gambling (15). Disordered gaming behavior among youth may involve other issues than those involved in gambling among adults.

CONCLUSION

The psychometric approach differentiates information gathered using established diagnostic instruments like GASA into measures of behavior lying underneath the different markers/diagnostic criteria. Available diagnostic instruments could be strengthened by complementary items designed for children and youth in order to illuminate the complexity of gaming behavior. Our results suggest that the association between over consumption of games and negative consequences thereof is stronger for boys than for girls. Negative consequences of over consumption take a social direction for boys and an emotional direction for girls. ADHD was significantly associated with over consumption of video games and the negative consequences thereof for girls, an association that was not seen among the male participants. Together, our findings should encourage further developments of the GASA instrument and additional research on potential gender related discrepancies of disordered gaming.

DATA AVAILABILITY STATEMENT

Data can be made available in case of a formal request from the authors to the ethics committee. Requests to access the datasets should be directed to: anders_c.hakansson@med.lu.se.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Swedish Ethics Committee (Dnr: 2019-02967). Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

FA: investigation, visualization, software, methodology, conceptualization, and writing. IM: data curation, visualization, software, methodology, conceptualization, formal analysis, and writing. AH: validation, methodology, conceptualization, writing, project administration, and supervision. EC-K: investigation, visualization, software, methodology, conceptualization, writing, resources, and supervision. All authors agree to be accountable for the content of the work.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2022.791254/full#supplementary-material

REFERENCES

1. *Diagnostic and Statistical Manual of Mental Disorders: DSM-5™*. 5th ed. Washington, DC: American Psychiatric Publishing, a division of American Psychiatric Association (2013).
2. World Health Organization. *International Classification of Diseases for Mortality and Morbidity Statistics (11th Revision)*. (2018). Available online at: https://icd.who.int/browse11/l-m/en (accessed February 11, 2022).
3. Choo H, Gentile D, Sim T, Li D, Khoo A, Liau A. Pathological video-Gaming among Singaporean Youth. *Ann Acad Med.* (2010) 39:822–9. Available online at: http://hdl.handle.net/10497/16240
4. Gentile D. Pathological video-game use among youth ages 8 to 18: a national study. *Psychol Sci.* (2009) 20:594–602. doi: 10.1111/j.1467-9280.2009.02340.x
5. Charlton JP, Danforth IDW. Distinguishing addiction and high engagement in the context of online game playing. *Comp Human Behav.* (2007) 23:1531–48. doi: 10.1016/j.chb.2005.07.002
6. Chou TJ, Ting CC. The role of flow experience in cyber-game addiction. *Cyberpsychol Behav.* (2003) 6:663–75. doi: 10.1089/109493103322725469
7. Griffiths M, Hunt N. Computer game playing in adolescence: prevalence and demographic indicators. *J Commun Appl Soc Psychol.* (1995) 5:189–93. doi: 10.1002/casp.2450050307
8. Hauge MR, Gentile DA, editors. *Video Game Addiction Among Adolescents: Associations With Academic Performance and Aggression. Society for Research in Child Development Conference*. Tampa (2003).
9. Young K. Internet addiction. *Am Behav Sci.* (2004) 48:402–15. doi: 10.1177/0002764204270278
10. Wan CS, Chiou WB. Why are adolescents addicted to online gaming? An interview study in Taiwan. *Cyberpsychol Behav.* (2006) 9:762–6. doi: 10.1089/cpb.2006.9.762
11. Chiu SI, Lee JZ, Huang DH. Video game addiction in children and teenagers in Taiwan. *Cyberpsychol Behav.* (2004) 7:571–81. doi: 10.1089/cpb.2004.7.571
12. Brunborg GS, Mentzoni RA, Frøyland LR. Is video gaming, or video game addiction, associated with depression, academic achievement, heavy episodic drinking, or conduct problems? *J Behav Addict.* (2014) 3:27–32. doi: 10.1556/JBA.3.2014.002
13. Brunborg GS, Hanss D, Mentzoni RA, Pallesen S. Core and peripheral criteria of video game addiction in the game addiction scale for adolescents. *Cyberpsychol Behav Soc Netw.* (2015) 18:280–5. doi: 10.1089/cyber.2014.0509
14. Brunborg GS, Mentzoni RA, Melkevik OR, Torsheim T, Samdal O, Hetland J, et al. Gaming addiction, gaming engagement, and psychological health complaints among norwegian adolescents. *Med Psychol.* (2013) 16:115–28. doi: 10.1080/15213269.2012.756374
15. Lemmens JS, Valkenburg PM, Peter J. Development and validation of a game addiction scale for adolescents. *Med Psychol.* (2009) 12:77–95. doi: 10.1080/15213260802669458
16. King DL, Chamberlain SR, Carragher N, Billieux J, Stein D, Mueller K, et al. Screening and assessment tools for gaming disorder: A comprehensive systematic review. *Clin Psychol Rev.* (2020) 77:101831. doi: 10.1016/j.cpr.2020.101831
17. Finseras TR, Pallesen S, Mentzoni RA, Krossbakken E, King DL, Molde H. Evaluating an internet gaming disorder scale using mokken scaling analysis. *Front Psychol.* (2019) 10:911. doi: 10.3389/fpsyg.2019.00911
18. Donati MA, Sanson F, Mazzarese M, Primi C. Assessing video game habits and pathological behaviour in children through a new scale: psychometric properties of the video-gaming scale—for children (VGS-C). *Psychology.* (2019) 10:2190–208. doi: 10.4236/psych.2019.1016139
19. Charlton JP. A factor-analytic investigation of computer 'addiction' and engagement. *Br J Psychol.* (2002) 93:329–44. doi: 10.1348/000712602760146242
20. Ferguson CJ, Coulson M, Barnett J. A meta-analysis of pathological gaming prevalence and comorbidity with mental health, academic and social problems. *J Psychiatr Res.* (2011) 45:1573–8. doi: 10.1016/j.jpsychires.2011.09.005
21. Khazaal Y, Chatton A, Rothen S, Achab S, Thorens G, Zullino D, et al. Psychometric properties of the 7-item game addiction scale among french and German speaking adults. *BMC Psychiatry.* (2016) 16:132. doi: 10.1186/s12888-016-0836-3
22. Lin C-Y, Imani V, Broström A, Årestedt K, Pakpour AH, Griffiths MD. Evaluating the psychometric properties of the 7-item persian game addiction scale for iranian adolescents. *Front Psychol.* (2019) 10:1–13. doi: 10.3389/fpsyg.2019.00149
23. Jonsson J, Munck I, Volberg R, Carlbring P. GamTest: psychometric evaluation and the role of emotions in an online self-test for gambling behavior. *J Gambl Stud.* (2017) 33:505–23. doi: 10.1007/s10899-017-9676-4
24. Fam JY. Prevalence of internet gaming disorder in adolescents: a meta-analysis across three decades. *Scand J Psychol.* (2018) 59:524–31. doi: 10.1111/sjop.12459
25. Stevens MW, Dorstyn D, Delfabbro PH, King DL. Global prevalence of gaming disorder: a systematic review and meta-analysis. *Aust N Z J Psychiatry.* (2020) 2020:4867420962851. doi: 10.1177/0004867420962851
26. Kuss DJ, Griffiths MD. Internet gaming addiction: a systematic review of empirical research. *Int J Mental Health Addict.* (2012) 10:278–96. doi: 10.1007/s11469-011-9318-5
27. Paulus FW, Ohmann S, von Gontard A, Popow C. Internet gaming disorder in children and adolescents: a systematic review. *Dev Med Child Neurol.* (2018) 60:645–59. doi: 10.1111/dmcn.13754
28. Vadlin S, Åslund C, Nilsson KW. A longitudinal study of the individual- and group-level problematic gaming and associations with problem gambling among Swedish adolescents. *Brain Behav.* (2018) 8:e00949. doi: 10.1002/brb3.949
29. Stavropoulos V, Adams BLM, Beard CL, Dumble E, Trawley S, Gomez R, et al. Associations between attention deficit hyperactivity and internet gaming disorder symptoms: Is there consistency across types of symptoms, gender and countries? *Addict Behav Rep.* (2019) 9:100158 doi: 10.1016/j.abrep.2018.100158
30. Desai RA, Krishnan-Sarin S, Cavallo D, Potenza MN. Video-gaming among high school students: health correlates, gender differences, and problematic gaming. *Pediatrics.* (2010) 126:e1414–24. doi: 10.1542/peds.2009-2706
31. Bonnaire C, Baptista D. Internet gaming disorder in male and female young adults: the role of alexithymia, depression, anxiety and gaming type. *Psychiatry Res.* (2019) 272:521–30. doi: 10.1016/j.psychres.2018.12.158
32. Yen JY, Liu TL, Wang PW, Chen CS, Yen CF, Ko CH. Association between internet gaming disorder and adult attention deficit and hyperactivity disorder and their correlates: impulsivity and hostility. *Addict Behav.* (2017) 64:308–13. doi: 10.1016/j.addbeh.2016.04.024
33. Weiss MD, Baer S, Allan BA, Saran K, Schibuk H. The screens culture: impact on ADHD. *Atten Defic Hyperact Disord.* (2011) 3:327–34. doi: 10.1007/s12402-011-0065-z
34. Price LR. *Psychometric Methods: Theory Into Practice*. New York: The Guilford Press (2017).
35. Charlton JP, Danforth IDW. Validating the distinction between computer addiction and engagement: online game playing and personality. *Behav Inform Technol.* (2010) 29:601–13. doi: 10.1080/01449290903401978
36. Jonsson J. *Preventing Problem Gambling: Focus on Overconsumption [Doctoral thesis, comprehensive summary]*. Stockholm: Department of Psychology, Stockholm University (2019).
37. Hu Lt, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct Equat Mod.* (1999) 6:1–55. doi: 10.1080/10705519909540118
38. Schermelleh-Engel K, Moosbrugger H, Müller H. Evaluating the fit of structural equation models: tests of significance and descriptive goodness-of-fit measures. *Methods Psychol Res Online.* (2003) 8:23–74.
39. Asparouhov T, Muthén B. Multiple-group factor analysis alignment. *Struct Equat Mod.* (2014) 21:495–508. doi: 10.1080/10705511.2014.919210
40. Rho MJ, Lee H, Lee TH, Cho H, Jung DJ, Kim DJ, et al. Risk factors for internet gaming disorder: psychological factors and internet gaming characteristics. *Int J Environ Res Public Health.* (2017) 15:1–11. doi: 10.3390/ijerph15010040
41. Nuyens F, Deleuze J, Maurage P, Griffiths MD, Kuss DJ, Billieux J. Impulsivity in multiplayer online battle arena gamers: preliminary results

on experimental and self-report measures. *J Behav Addict.* (2016) 5:351–6. doi: 10.1556/2006.5.2016.028
42. Reebye P. Attention–deficit hyperactivity disorder: a handbook for diagnosis and treatment, third edition. *J Can Acad Child Adolesc Psychiatry.* (2008) 17:31–3.
43. Frölich J, Lehmkuhl G, Döpfner M. [Computer games in childhood and adolescence: relations to addictive behavior, ADHD, and aggression]. *Z Kinder Jugendpsychiatr Psychother.* (2009) 37:393–402; quiz 3–4. doi: 10.1024/1422-4917.37.5.393
44. Durkin K. Videogames and young people with developmental disorders. *Rev General Psychol.* (2010) 14:122–40. doi: 10.1037/a0019438
45. Carli V, Durkee T, Wasserman D, Hadlaczky G, Despalins R, Kramarz E, et al. The association between pathological internet use and comorbid psychopathology: a systematic review. *Psychopathology.* (2013) 46:1–13. doi: 10.1159/000337971
46. Han DH, Yoo M, Renshaw PF, Petry NM. A cohort study of patients seeking internet gaming disorder treatment. *J Behav Addict.* (2018) 7:930–8. doi: 10.1556/2006.7.2018.102
47. Vally Z. Symptoms of internet gaming disorder, inattention, and impulsivity: a cross-sectional study conducted in the United Arab Emirates. *Psychiatric Quart.* (2021) 92:301–10. doi: 10.1007/s11126-020-09799-2
48. Martins SS, Storr CL, Ialongo NS, Chilcoat HD. Gender differences in mental health characteristics and gambling among African-American adolescent gamblers. *Am J Addict.* (2008) 17:126–34. doi: 10.1080/10550490701861227
49. Ünlü A, Kiefer TA, Rupp A, Templin JL, Enson H. Diagnostic measurement: theory, methods, and applications. *Psychometrika.* (2011) 76:715–6. doi: 10.1007/s11336-011-9228-2
50. Rattray J, Jones MC. Essential elements of questionnaire design and development. *J Clin Nurs.* (2007) 16:234–43. doi: 10.1111/j.1365-2702.2006.01573.x

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Paper III

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ORIGINAL ARTICLE

Cognitive behavioral treatment for disordered gaming and problem gambling in adolescents: a pilot feasibility study

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ABSTRACT

Background: Disordered gaming and problem gambling (DG/PG) are associated with a range of functional impairments as well as psychiatric comorbidity. With the proliferation of digital gaming apps aimed at children and adolescents, which involve in-game purchases, there is increasing evidence that DG/PG are on the rise in this age range. The behavior can be detected in youth presenting at school-based health clinics and community psychiatric clinics. Cognitive behavioral therapy (CBT) is one of several recommended treatments for adults, but little evidence is available for the efficacy of this approach in adolescents with DG/PG.
Aim: To evaluate the acceptability and feasibility of a CBT-based intervention developed for adolescents with DG/PG, which can be delivered in routine psychiatric care facilities.
Methods: Adolescents who were patients at a child and adolescent psychiatry service were screened for DG/PG. Those aged 12–17 years with pronounced symptoms were invited to participate in a 7-week CBT program called Relapse Prevention. Nine adolescents agreed to participate and five consented to repeated assessments of outcome (pre-, post-treatment, and 6-month follow-up). In addition to acceptability and satisfaction with treatment, symptoms of DG were assessed with standardized interview and self-report measures.
Results: There were no dropouts from the treatment. Participants who completed treatment and all outcome assessments reported satisfaction with the treatment. The participants showed fewer symptoms of DG after treatment, and the proportion who met criteria for computer game addiction decreased from 56 to 0%. There was no reduction in the number of participants who met criteria for PG.
Conclusion: This study provides preliminary evidence for the acceptability and feasibility of a CBT-based intervention for DG/PG in adolescents. Preliminary data suggest that the treatment may be effective for DG but not PG. Further studies are needed to evaluate the efficacy of this approach for both conditions.

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Introduction

Research on the potentially harmful effects of gaming has grown in the last two decades (1, 2), with the field taking a big step forward with the introduction of Internet Gaming Disorder (IGD) as a tentative diagnosis in The Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) (3). Gambling for money is only allowed for adults by Swedish law (4). However, there is evidence that the behavior exists also among the younger part of the Swedish population. An epidemiological study from 2018, of Swedes aged 16 years and above, found that roughly 1% of those aged 16–17 years reported some degree of problem gambling (PG) (5). The prevalence of the diagnosis of IGD and its relationship to PG in Swedish youth have not yet been investigated (6). Comparable studies in neighboring countries report GD prevalence ranging from 0.6 to 5.5% (7), and a study from 2015 presented an overall European prevalence of 1.6% (8). Major international studies show the prevalence of disordered gaming (DG), a category broader than IGD as defined in ICD-11, ranging from 1.3 to 6.8% (2).

The availability of digital gaming applications (apps) aimed at children and adolescents has increased to a great extent during the past decades. It is increasingly common that these gaming apps encourage the player to purchase items, the so-called 'loot boxes', that give the player advantages in the game, blurring the line between gaming and gambling. A population survey of Swedes aged 15 years and above found an association between DG and PG (8). Two studies following a cohort of Swedish 13- and 15-year-olds over 3 years found an association between DG and

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PG among adolescents, but DG per se did not seem to predispose the youth to PG (9, 10). Whether PG is present or not, adolescents with DG often present as compulsive, with elevated levels of health and psychiatric complaints and with impaired academic functioning (6, 9). The presence of commonly occurring mental health conditions in youth, including attention deficit hyperactivity disorder (ADHD), depression, and anxiety, appears to be potential risk factors for DG (10). Among adolescents registered to child and adolescent psychiatry (CAP) clinics, those with ADHD and autistic spectrum disorder (ASD) are overrepresented among those seeking additional help for DG (10, 11). The authors speculate whether the repetitiveness and immediate reinforcement that characterize digital gaming may place these youth at increased risk for developing DG.

It is important to note that a wide range of scales are used for assessing DG in research and clinical settings, and this contributes to considerable variability in prevalence and comorbidity estimates (9, 10). Many studies use the criteria for pathological gambling to define pathological gaming (2, 10). One of the most frequently used questionnaires for assessing DG in adolescents is the Game Addiction Scale for Adolescents (GASA) (9, 12–14). The seven-item scale is based on the DSM-5 criteria for pathological gambling, with items corresponding to salience, tolerance, mood modification, withdrawal, relapse, conflict, and problems (14). The DSM-5 suggests that half or more of the criteria should be met when diagnosing pathological gamblers (3). However, DG gaming researchers point out that the tolerance, mood modification, and cognitive salience criteria correspond more to engagement and not necessarily addiction, while the contrary applies to the withdrawal, relapse, conflict, and problems criteria (12, 13, 15, 16). They suggest that a potential diagnosis of DG should distinguish engaged gamers from problem- and addicted gamers by accentuating the latter four criteria (withdrawal, relapse, conflict, and problems) (12, 13).

There is no gold standard treatment for either DG or PG in young people (6). As such, there are no national guidelines in Sweden for their screening or treatment, or on whether youth with DG/PG should be assisted by psychiatric or social services. Nevertheless, it is clear that some children and adolescents who engage in frequent digital gaming and gambling need professional help to gain better control over their behavior (6, 17). Cognitive behavioral therapy (CBT) is often identified as a first-line treatment for DG, but the available evidence is limited. A recent meta-analysis (18) identified 12 treatment trials of CBT for DG, the majority of which were carried out in Asia. Across trials, CBT was delivered in either group or individual formats and was focused on helping patients to recognize triggers (cue-induced cravings) and to develop beliefs and behaviors that increased their motivation to quit or reduce gaming (11, 19). There was considerable heterogeneity across studies, but large effect sizes were observed for DG and comorbid depression, and moderate effect sizes for comorbid anxiety. While relatively few of the participants in the trials were below 18 years of age, the authors found no evidence that treatment was less effective for adolescents than adults.

The present pilot study is a part of a larger research program aiming to develop knowledge on DG in youth and to design, implement, and evaluate a treatment for DG patients recruited from child and adolescent psychiatry (CAP) clinics across southern Sweden (Region Skåne).

First aim: to explore the feasibility of delivering relapse prevention (RP) as treatment of DG in a CAP setting.

Second aim: to explore the outcome of RP on DG.

Third aim: to explore the outcome of RP on PG.

Fourth aim: to explore how the participants experienced the treatment.

Materials and methods

A treatment model of DG/gambling based on RP has been developed (20). RP is a CBT-based form of treatment, originally developed for the treatment of alcohol problems in adults. Currently, RP is also used for addiction problems in both adults and adolescents regarding alcohol, drugs, tobacco, and gambling (21). In this study, the RP model is further adapted to enable treatment of DG among children and adolescents. The number of sessions was reduced, and the treatment was provided individually instead of being group based, to better fit the CAP sample's needs and preferences. The original idea was to provide RP as a group treatment as well, but none of the participants was interested in such an arrangement.

During the spring of 2020, patients within the CAP outpatient and inpatient care were screened for DG, originally to collect data for a study prior to the current one (22). Clinicians (psychologists and psychiatrists) were systematically provided with questionnaires to distribute to their patients. The survey reached 144 children and adolescents between 8 and 18 years of age. Seven individuals were excluded due to participating without sharing their social security number or not answering the items on gaming, leaving 137 individuals (22). Roughly, 30% ($n = 29$) met the criteria for DG, according to the tentative criteria suggested by the DSM-5 (3, 22). Those aged 12–17 years were requested to participate in an interventional study. Altogether, nine children and adolescents (13–17 years), eight (89%) male and one (11%) female, were included. Among the nine participants, seven (78%) met the criteria for DG at the start of the study. The participants were assessed with GASA regarding gaming (14) and Control, Lying, and Preoccupation (CLiP) regarding gambling (23), before treatment, after treatment, and at 6 months follow-up after treatment. The primary outcomes of interest were acceptability and feasibility of the treatment, and secondary outcomes were DG symptoms assessed via the GASA. A potential effect on PG, assessed via CLiP, constituted a tertiary outcome. Information on the participants' gender, age, housing situation, and main diagnosis was also collected. An informed consent was obtained from the participants and their guardian/guardians.

GASA

One of the most used measures for DG is GASA (9). The scale is based on seven of the nine DSM criteria for PG (salience,

tolerance, mood modification, relapse, withdrawal, conflicts, and problems) (14). The DSM-5 suggests that at least half of the criteria should be met for a diagnosis of gambling addiction (3), hereafter mentioned as the DSM approach (DSMA). Many of the gaming scholars emphasize the importance of differentiating highly engaged but harmless gaming from a truly pathological gaming behavior (12, 13, 15, 16, 24–26). The core approach (CA) is a method that accentuates the criteria that includes negative consequences, with the aim of separating highly engaged gaming from pathological gaming. The core approach implies that the endorsement of each of the 'core criteria' of relapse, withdrawal, conflicts, and problems implicates addictive gaming, while endorsement of two or three core criteria implicates DG, and the endorsement of one or less core criteria but each of the peripheral criteria (salience, tolerance, and mood modification) implicates engaged gaming (12, 13).

CLiP

In 1999, Gerstein et al. developed a screening instrument for gambling problems – the NORC Diagnostic Screen for Gambling Problems (NODS) (27). The 17-item questionnaire corresponds to the DSM-IV criteria for PG and yields a score ranging from 0 to 10. NODS-CLiP includes the NODS-items involving loss of control, lying, and preoccupation – the 'CLiP' (23, 28). The questionnaire has been shown to exhibit excellent sensitivity and specificity for NODS constructs (23, 28). Answering 'yes' on at least one item indicates PG (23, 28).

Participant evaluation

After completing the treatment, all participants were offered a chance to evaluate the treatment anonymously. The response rate for the evaluation was 56%. The evaluation consisted of eight questions developed by the authors. The first question was 'How much has the treatment helped you in regulating your gaming, 0–10?'. The respondents were supposed to mark a value between 0 and 10 in which 0 corresponded to 'Not at all', 5 corresponded to 'Medium', and 10 corresponded to 'Extreme'. The second question was 'How much did the gaming bother you before the treatment, 0–10?' and the third question applied the same but regarding after the treatment. The fourth question concerned motivation to participate in the treatment, also answered by marking a value between 0 and 10. Question 5 was 'Was it easy to understand what we talked about?' to which the respondent could answer 'No', 'Yes, a little' or 'Yes, a lot'. Question 6 contained three sub-questions with the heading 'The treatment contained different parts, how much has the following helped you:'. The first part applied to the gaining of more knowledge about game addiction, the second part applied to the tasks that were done together with a therapist, and the third part was about the homework. The respondent answered these questions with 'Not at all', 'Quite a bit', 'Partly', 'Quite a lot', or 'Very much'. Questions seven and eight were answered in free text and requested: 'What was the best parts of the treatment?' and 'What could be improved before future treatments?'.

The treatment

There is no consensus regarding the treatment method for PG. Together with four experienced psychologists in the field, we, therefore, developed a manual that we wanted to try out, primarily in the present pilot study and subsequently in a full RCT. We developed a manual based on previous knowledge in the field of addiction and in the field of child and adolescent psychiatric treatment. We used RP as a base and adapted the manual for children and adolescents. Clinicians (psychiatrists and psychologists) with training in CBT were educated in RP and were, throughout the treatment, supervised by experienced RP clinicians. The treatment was adapted to fit the participants' primary problem behavior, either gaming or gambling. Patients who met the criteria for DG (according to tentative criteria from the DSM-5) were offered a chance to participate in an RP-based treatment intervention at their local clinic or, where applicable, at an adjacent clinic or online through video-link. The treatment model is manualized and includes a motivating and relapse-preventative approach, in which the therapist explores not only the patient's exhibited and undesirable behavior but also their motivation for change, their goal, and which events, emotions, and thoughts induce the gaming behavior or result in continuation of the behavior or relapse (20). The treatment is individual and consists of seven sessions of 45 min over a period of 7 weeks.

Analysis

Statistical analysis and calculations were performed in SPSS (IBM SPSS statistics version 27). To evaluate the treatment efficacy, the difference in GASA score among before treatment, after treatment, and at follow-up was analyzed with a one-way repeated measures ANOVA. McNemar's test was used to evaluate if the proportion of participants who met the cut-offs for different levels of gaming changed after completed treatment. The gaming categories that were counted and compared were engaged gaming (CA), problem gaming (CA), addicted gaming (CA), and problem gaming (DSMA).

Ethical considerations

The participants' anonymity has been protected by de-identifying all participants' contributions. Any risks of participating in the study are considered minor. The risk of being exposed to physical harm by participating in the study is considered to be extremely limited. The patient is not left alone either during or after the assessment. All participation was voluntary, and the patients were informed that they could cancel their participation at any time without giving a reason. The current study was approved by the Ethics Committee (Dnr: 2019-04797).

Results

Sample characteristics

Table 1 shows the sample characteristics. Eight participants (89%) were male, and the age range was 13–17 years, whereof

Table 1. Sample characteristics, at the start of the study.

	n	%
Gender		
Male	8	89
Female	1	11
Age		
13	1	11
14	1	11
15	0	-
16	3	33
17	4	44
Diagnosis		
ADHD	5	56
Depression	3	33
Anxiety	1	11
Housing situation		
Cohabiting parents	4	44
Divorced parents	4	44
Other	1	11
Engaged gaming (CA)[1]	1	11
Problem gaming (CA)[1]	2	22
Addicted gaming (CA)[1]	5	56
<Engaged gaming (CA)[1]	1	11
Problem gaming (DSM)[2]		
Yes	7	78
No	2	22
Problem gambling[3]		
Yes	3	33
No	6	67

ADHD: attention deficit hyperactivity disorder; CA: core approach; DSM: .
[1]According to the Game Addiction Scale (GAS) – CA, core approach.
[2]According to the Game Addiction Scale (GAS) – DSM approach.
[3]According to the CLiP.

four (44%) were 17 years old. ADHD was the most common diagnosis, followed by depression. Anxiety was the main diagnosis only for one participant. Equally many lived with cohabitant and separated parents, while one individual reported other conditions. Before treatment, seven individuals (78%) met the criteria for (at least) problem gaming, regardless of the use of the DSMA or the core approach. Before treatment, three individuals (33%) answered affirmative to questions about gambling.

Outcome 1 – RP efficacy on gaming

Figure 1 illustrates how the GASA score changed among before treatment, after treatment, and at follow-up. Table 2 shows the results of the repeated measures ANOVA. The mean GASA score before treatment was 24, after treatment 15, and at the time of follow-up, it was 13. The repeated measure analysis shows that the mean GASA score differed significantly between before and after treatment, and so did the GASA score between before treatment and at follow-up. The mean score after treatment did not differ significantly from the GASA score at follow-up. Tables 3 and 4 show that the proportion of participants who showed very few DG symptoms that they did not even meet the criteria for engaged gaming, according to the core approach, was significantly higher at the time of follow-up. The proportion of participants who rated their gaming too low that they did not meet the criteria for problem gaming according to the DSMA also increased significantly.

Outcome 2 – RP efficacy on gambling

Among the nine participants, three individuals (33%) met the criteria for PG before treatment and just as many thereafter. Two individuals who gambled before the treatment did no longer gamble after completed treatment, while two individuals who did not gamble before treatment did endorse gambling after completed treatment. Only one individual affirmed gambling for money both before and after treatment.

Outcome 3 – participants' evaluation

The evaluation is illustrated in Figures 2–4. The participants who answered the evaluation reported that the treatment had helped them to regulate their gaming. Most of the participants stated that gaming disturbed them more before the treatment than after. However, one individual scored higher on item 3 (How much did the gaming bother you after the treatment?) than item 2 (How much did the gaming bother you before the treatment?). The motivation to participate in the treatment varied with scores ranging from 4 to 10 (4–6, 10). Most thought it was very easy to understand what the therapists were talking about. One individual did not find it easy to understand. Question 6 was about how much the different parts of the treatment had helped the participants, and the majority was positive to all the parts (increased knowledge about DG, tasks with a therapist, and homework). The participants stated in free text that 'a lot had been fun', 'everything, altogether was good', and 'it helped, taught me a lot'. One participant stated that the most positive thing about the treatment was 'the conversation, he had a different view on DG than me, it was good to talk about it'. Suggestions for improvement were formulated such as 'More hands on, try to reduce gaming concretely, more game-free days earlier in the treatment, better access to the material, have all the material attached so you do not lose it (like a book)' and 'maybe more conversations, the opportunity to go deeper into certain areas instead of getting another task'.

Discussion

The main purpose of this pilot study is to evaluate the acceptability and feasibility of a CBT-based treatment for DG in adolescents recruited from CAPs in southern Sweden. Within the framework of the current study, therapists have been trained in RP, and a small number of CAP patients have been admitted for treatment. In summary, the results of this study indicate that the treatment might be effective. Those who participated in the evaluation throughout reported that the treatment helped them to regulate their gaming, and the participants rated their gaming significantly lower after completing the treatment.

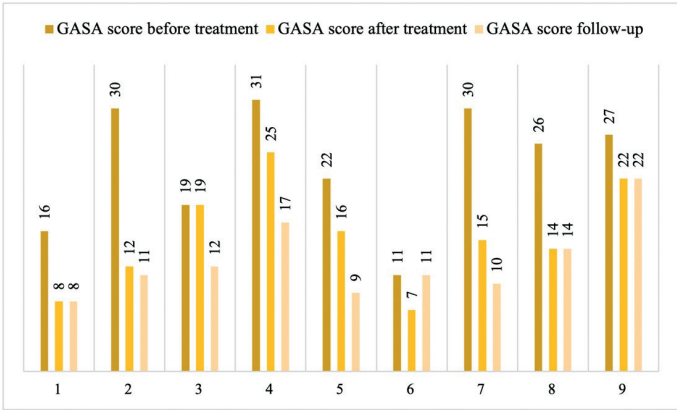

Figure 1. Individual GASA score before treatment, after treatment, and at follow-up.

Table 2. McNemar's test for X^2 comparisons of the prevalence of gaming categories between before treatment and follow-up.

	Before treatment % (*n*)	Follow-up % (*n*)	*p*
Core approach			
Engaged gaming	11 (1)	0.0 (0)	-
Problem gaming	22 (2)	11.1 (1)	1.000
Addicted gaming	56 (5)	0.0 (0)	-
Less than engaged gaming	11 (1)	88.9 (8)	0.016
DSM approach			
Problem gaming	78 (7)	11.1 (1)	
No-problem gaming	22 (2)	88.9 (8)	0.031

Table 3. Estimates of mean GASA score, before treatment, after treatment, and at follow-up.

Mean GASA score	Mean	95% confidence interval
Before treatment	23.6	18.2–29.0
After treatment	15.3	10.7–20.0
Follow-up	12.7	9.3–16.0

Table 4. One-way repeated measures ANOVA. Comparison of GASA-score among before treatment, after treatment, and at follow-up.

Mean GASA score		Mean difference	*p*	95% confidence interval for difference
Before treatment	After treatment	8.2	0.003	3.8 to 12.6
	Follow-up	10.9	0.001	5.9 to 15.9
After treatment	Before treatment	−8.2	0.003	−12.6 to −3.827
	Follow-up	2.7	0.092	−0.5 to 5.9
Follow-up	Before treatment	−10.9	0.001	−15.9 to −5.9
	After treatment	−2.7	0.092	−5.9 to 0.5

CBT-based treatment of DG is probably the most studied method, and the results are considered promising (18, 29, 30). However, the overall evidence is still described as insufficient for definitive conclusions, and further research is required (10, 29, 30). Furthermore, adults seem to respond better to treatment than youths, and the evidence to determine whether CBT treatment reduces time spent on gaming is still described as insufficient (18). Furthermore, there is an ongoing debate as to whether the absolute time spent on gaming is a relevant measure of outcome or whether it is the ability to control the gaming that matters (18). In line with that reasoning, several previous studies have emphasized the importance of avoiding pathologizing computer gaming per se, but only the gaming behavior that results in negative consequences. The core approach aims to separate extensive gaming from potentially pathological gaming by underlining the criteria that implicitly include negative consequences (12, 13). This study showed that the proportion of participants who met the criteria for computer game addiction, according to the core approach, decreased by 100% after treatment. Also, the proportion of participants who showed few symptoms of DG that they did not meet either the criteria for engaged gaming, according to the core approach, or the criteria for problem gaming, according to the DSMA, both increased significantly. The fact that so many different measurement approaches exist in previous research (2, 9) complicates conclusions regarding our results in comparison to others.

The main purpose of this study was to evaluate RP as a treatment for DG, serving as a precursor to a larger RCT about RP for DG. The secondary purpose of this study was to evaluate the effect on gambling. Two individuals who affirmed gambling before treatment denied gambling after treatment, while two other individuals answered affirmative to questions on gambling only after treatment. This outcome should be interpreted in the light of the fact that the treatment was adapted to fit the participants' primary problem behavior, either gaming or gambling. Gambling is illegal for children in Sweden (4). Games with or without money elements are closely related phenomena in the sense that financial transactions, the so-called 'loot boxes', are common in computer games, and computer game-like virtual environments occur where games about money take place. Furthermore, a link between the consumption of 'loot

boxes' and gambling for money has been demonstrated, and 'loot boxes' have been described as a gateway to gambling, among adults (31). The participants in this study did not specify what kind of gambling they endorsed, but nevertheless, they were too few in number for conclusions to be drawn regarding any positive effect of RP on the gambling intended. Gambling among children is still an unexplored phenomenon, and the high prevalence shown in this specific sample motivates extended exploration.

The participants who responded to the evaluation reported throughout that the treatment helped them to regulate their gaming. Yet, the participants did not consistently report that gaming disturbed them less after treatment than before. If a behavior disturbs more after a treatment than before, the treatment could possibly be considered a failure, even though the behavior has become easier to regulate. This discrepancy could be explained by an increased insight into negative aspects of one's own gaming behavior because of the treatment, and the long-term effect could possibly be more undividedly positive. However, this is an aspect that requires further investigation. The participation was voluntary, and one could expect that everyone who committed to the treatment would have been at least moderately motivated. The fact that two individuals rated their motivation lower than five (corresponding to medium) raises questions as to whether the motivation was carried primarily by the child/adolescent participating or by their guardian. It would be of interest to investigate whether the level of motivation to participate in the treatment had an impact on the outcome.

The pilot study served as a precursor in designing an RCT. The design of an RCT is a joint work between academia and CAP in Region Skåne. Recourses, both human (clinicians) and also localities, are of great importance. The pilot study was performed during the first wave of the COVID-19 pandemic, and our following work with the RCT was heavily affected by the pandemic.

Limitations

This study should be interpreted in the light of its limitations. It is a pilot version of the final RCT study that includes a control group, with the aim to modify and optimize the conditions for the final RCT study. An obvious limitation is the limited number of participants, which obstructs a deeper investigation of potentially underlying factors that affect the outcome of treatment. Furthermore, the feasibility approach of this pilot study and the fact that the relatively pronounced changes in this limited sample (such that the number of patients who fulfilled the addiction criteria for gaming using the core approach decreased by 100%) unfortunately mean that adequate power for a subsequent RCT is difficult to calculate. In addition, this study does not include a control group, and it is, therefore, possible that factors other than the treatment contributed to the suggested improvement in terms of DG symptoms, such as the attention suddenly received from the parent accompanying to the CAP clinic once a week. Also, since other treatment studies used different measurement scales, the results cannot be compared with others. The fact that only one of the study's nine participants was female must also be mentioned as a limitation. DG has been described as a male problem (32), but women are engaging in gaming to an increasing extent, and more research is needed to evaluate not only gender differences in DG but also potential gender differences in treatment outcomes. Another limitation is the manualized structure of the treatment. One treatment will not fit all, and in the future, one has to take into consideration the diversity of the patients regarding both maturity and comorbidity. A patient with ASD might not benefit from the same treatment as a patient with depression regardless of their similarity in PG. Only five respondents (56%) chose to participate in the evaluation, and the generalizability of the results of the evaluation to the entire sample is questionable. The evaluation included two open-ended questions, resulting in three and four freely formulated responses, respectively. The low number of quotes complicates a more pronounced qualitative design, which, otherwise, would have been appealing and could probably also have served as an interesting contribution to the study's content. In creating the RCT that will follow this pilot study, we need to address the motivational aspect since the participants will be randomized to RP treatment. In the RCT, we plan to add a qualitative part regarding both the participants' evaluation and the clinicians. Altogether, the results of the evaluation may be regarded as an opportunity for insight into how the treatment can be experienced, and it contributes to valuable insights, to implement in the future study design.

Conclusion

This study provides preliminary evidence for the acceptability and feasibility of a CBT-based intervention for DG and PG in adolescents. Preliminary data suggest that the treatment may be effective for DG but not PG. The participants showed less symptoms related to DG at the end of the treatment, and significantly, few participants met the criteria for game addiction according to the core approach.

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Disclosure statement

The authors report there are no competing interests to declare.

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Availability of data and materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study was approved by the Ethics Committee (Dnr: 2019-04797).

A written informed consent was obtained from a legally authorized representative for anonymized patient information to be published in this article.

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References

1. Petry NM, Rehbein F, Gentile DA, Lemmens JS, Rumpf HJ, Mößle T, et al. An international consensus for assessing internet gaming disorder using the new DSM-5 approach. Addiction. 2014;109:1399–406. doi: 10.1111/add.12457
2. Fam JY. Prevalence of internet gaming disorder in adolescents: a meta-analysis across three decades. Scand J Psychol. 2018;59:524–31. doi: 10.1111/sjop.12459
3. Diagnostic and statistical manual of mental disorders: DSM-5. 5th ed. Arlington, VA: American Psychiatric Association; 2013.
4. SFS 2021:1254, Spellag. Available from: Lag om ändring i spellagen (2018:1138) | Svensk författningssamling (svenskforfattningssamling.se) [cited 28 December 2021].
5. Folkhälsomyndigheten. Statistik över spelproblem i Sverige [updated 25 October 2021]. Available from: https://www.folkhalsomyndigheten.se/spelprevention/statistik/spelproblem/ [cited 30 December 2021].
6. Rangmar J, Thomée S. När datorspelandet blir problematiskt – en kunskapsöversikt om gaming disorder hos barn och unga. Report No.: 2019:31. Västra Götaland: Länsstyrelsen; 2019.
7. Paulus FW, Ohmann S, von Gontard A, Popow C. Internet gaming disorder in children and adolescents: a systematic review. Dev Med Child Neurol. 2018;60:645–59. doi: 10.1111/dmcn.13754
8. Müller KW, Janikian M, Dreier M, Wölfling K, Beutel ME, Tzavara C, et al. Regular gaming behavior and internet gaming disorder in European adolescents: results from a cross-national representative survey of prevalence, predictors, and psychopathological correlates. Eur Child Adolesc Psychiatry. 2015;24:565–74. doi: 10.1007/s00787-014-0611-2
9. King DL, Chamberlain SR, Carragher N, Billieux J, Stein D, Mueller K, et al. Screening and assessment tools for gaming disorder: a comprehensive systematic review. Clin Psychol Rev. 2020;77:101831. doi: 10.1016/j.cpr.2020.101831
10. Stevens MW, Dorstyn D, Delfabbro PH, King DL. Global prevalence of gaming disorder: a systematic review and meta-analysis. Aust N Z J Psychiatry. 2020;55:553–68. doi: 10.1177/0004867420962851
11. Freeman A, Felgoise S, Nezu C, Nezu A, Reinecke M. Encyclopedia of cognitive behavior therapy. New York, NY: Springer; 2005.
12. Brunborg GS, Hanss D, Mentzoni RA, Pallesen S. Core and peripheral criteria of video game addiction in the game addiction scale for adolescents. Cyberpsychol Behav Soc Netw. 2015;18:280–5. doi: 10.1089/cyber.2014.0509
13. Brunborg GS, Mentzoni RA, Melkevik OR, Torsheim T, Samdal O, Hetland J, et al. Gaming addiction, gaming engagement, and psychological health complaints among norwegian adolescents. Media Psychol. 2013;16:115–28. doi: 10.1080/15213269.2012.756374
14. Lemmens JS, Valkenburg PM, Peter J. Development and validation of a game addiction scale for adolescents. Media Psychol. 2009;12:77–95. doi: 10.1080/15213260802669458
15. Charlton JP, Danforth IDW. Distinguishing addiction and high engagement in the context of online game playing. Comput Hum Behav. 2007;23:1531–48. doi: 10.1016/j.chb.2005.07.002
16. Ferguson CJ, Coulson M, Barnett J. A meta-analysis of pathological gaming prevalence and comorbidity with mental health, academic and social problems. J Psychiatr Res. 2011;45:1573–8. doi: 10.1016/j.jpsychires.2011.09.005
17. Greenfield DN. Treatment considerations in internet and video game addiction: a qualitative discussion. Child Adolesc Psychiatr Clin N Am. 2018;27:327–44. doi: 10.1016/j.chc.2017.11.007
18. Stevens MWR, King DL, Dorstyn D, Delfabbro PH. Cognitive-behavioral therapy for Internet gaming disorder: a systematic review and meta-analysis. Clin Psychol Psychother. 2019;26:191–203. doi: 10.1002/cpp.2341
19. Gentile DA, Bailey K, Bavelier D, Brockmyer JF, Cash H, Coyne SM, et al. Internet gaming disorder in children and adolescents. Pediatrics. 2017;140(Suppl 2):S81–5. doi: 10.1542/peds.2016-1758H
20. Witkiewitz K, Marlatt GA. Relapse Prevention for Alcohol and Drug Problems: That Was Zen, This Is Tao. American Psychologist. 2005;59:224–235. doi: 10.1037/0003-066X.59.4.224
21. Socialstyrelsen. Återfallsprevention [updated 2 December 2018]. Available from: https://www.socialstyrelsen.se/utveckla-verksamhet/evidensbaserad-praktik/metodguiden/aterfallsprevention/ [cited 30 December 2021].
22. André F, Munck I, Håkansson A, Claesdotter-Knutsson E. Game addiction scale for adolescents – psychometric analyses of gaming behavior, gender differences and ADHD. Front Psychiatry. 2022;13. doi: 10.3389/fpsyt.2022.791254
23. Toce-Gerstein M, Gerstein DR, Volberg RA. The NODS-CLiP: a rapid screen for adult pathological and problem gambling. J Gambl Stud. 2009;25:541–55. doi: 10.1007/s10899-009-9135-y

24. Lehenbauer-Baum M, Klaps A, Kovacovsky Z, Witzmann K, Zahlbruckner R, Stetina BU. Addiction and engagement: an explorative study toward classification criteria for internet gaming disorder. Cyberpsychol Behav Soc Netw. 2015;18:343–9. doi: 10.1089/cyber.2015.0063
25. Snodgrass JG, Zhao W, Lacy MG, Zhang S, Tate R. Distinguishing core from peripheral psychiatric symptoms: addictive and problematic internet gaming in North America, Europe, and China. Cult Med Psychiatry. 2019;43:181–210. doi: 10.1007/s11013-018-9608-5
26. Andre F, Broman N, Hakansson A, Claesdotter-Knutsson E. Gaming addiction, problematic gaming and engaged gaming – prevalence and associated characteristics. Addict Behav Rep. 2020;12:100324. doi: 10.1016/j.abrep.2020.100324
27. Gerstein D, Murphy S, Toce M, Volberg R, Harwood H, Tucker A, et al. Gambling impact and behavior study: report to the National Gambling Impact Study Commission. Chicago: National Opinion Research Center at the University of Chicago; 1999.
28. Volberg RA, Munck IM, Petry NM. A quick and simple screening method for pathological and problem gamblers in addiction programs and practices. Am J Addict. 2011;20:220–7. doi: 10.1111/j.1521-0391.2011.00118.x
29. Zajac K, Ginley MK, Chang R. Treatments of internet gaming disorder: a systematic review of the evidence. Expert Rev Neurother. 2020;20:85–93. doi: 10.1080/14737175.2020.1671824
30. Zajac K, Ginley MK, Chang R, Petry NM. Treatments for Internet gaming disorder and Internet addiction: a systematic review. Psychol Addict Behav. 2017;31:979–94. doi: 10.1037/adb0000315
31. Zendle D, Cairns P. Loot boxes are again linked to problem gambling: results of a replication study. PLoS One. 2019;14:e0213194. doi: 10.1371/journal.pone.0213194
32. Chen KH, Oliffe JL, Kelly MT. Internet gaming disorder: an emergent health issue for men. Am J Mens Health. 2018;12:1151–9. doi: 10.1177/1557988318766950

Paper IV

Protocol

Relapse Prevention Therapy for Problem Gaming or Internet Gaming Disorder in Swedish Child and Youth Psychiatric Clinics: Protocol for a Randomized Controlled Trial

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Abstract

Background: Although gaming is a common arena where children socialize, an increasing number of children are exhibiting signs of problem gaming or internet gaming disorder. An important factor to the development of problem gaming is parent-child relationships. A cognitive behavioral therapy–based form of treatment, labeled relapse prevention, has been developed as a treatment for child and adolescent problem gaming or internet gaming disorder. However, no study has evaluated the effect of this treatment among Swedish children and youth nor the role of the parent-child relationships in this treatment.

Objective: This study aims (1) to evaluate a relapse prevention treatment for patients showing signs of problem gaming or internet gaming disorder recruited from child and youth psychiatric clinics and (2) to test whether the quality of parent-child relationships plays a role in the effect of relapse prevention treatment and vice versa—whether the relapse prevention treatment has a spillover effect on the quality of parent-child relationships. Moreover, we explore the carer's attitudes about parent-child relationships and child gaming, as well as experiences of the treatment among the children, their carers, and the clinicians who carried out the treatment.

Methods: This study is a 2-arm, parallel-group, early-stage randomized controlled trial with embedded qualitative components. Children aged 12-18 years who meet the criteria for problem gaming or internet gaming disorder will be randomized in a 1:1 ratio to either intervention (relapse prevention treatment) or control (treatment as usual), with a total of 160 (80 + 80) participants. The primary outcomes are measures of gaming and gambling behavior before and after intervention, and the secondary outcomes include child ratings of parent-child communication and family functioning. The study is supplemented with a qualitative component with semistructured interviews to capture participants' and clinicians' experiences of the relapse prevention, as well as attitudes about parent-child relationships and parenting needs in carers whose children completed the treatment.

Results: The trial started in January 2022 and is expected to end in December 2023. The first results are expected in March 2023.

Conclusions: This study will be the first randomized controlled trial evaluating relapse prevention as a treatment for child and adolescent problem gaming and internet gaming disorder in Sweden. Since problem behaviors in children interact with the family context, investigating parent-child relationships adjacent to the treatment of child problem gaming and internet gaming disorder is an important strength of the study. Further, different parties, ie, children, carers, and clinicians, will be directly or indirectly

involved in the evaluation of the treatment, providing more knowledge of the treatment and its effect. Limitations include comorbidity in children with problem gaming and internet gaming disorder and challenges with the recruitment of participants.

Trial Registration: ClinicalTrials.gov NCT05506384 (retrospectively registered); https://clinicaltrials.gov/ct2/show/NCT05506384

International Registered Report Identifier (IRRID): DERR1-10.2196/44318

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KEYWORDS

problem gaming; internet gaming disorder; parent-child relationship; randomized controlled trial; relapse prevention; psychiatry; psychology; treatment

Introduction

Background

In 2013, internet gaming disorder, a syndrome of dysfunctional gaming behaviors that result in distress and affect personal, social, and educational functioning, was included in the appendix of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) [1] as a disorder that needed further research. Although the prevalence of internet gaming disorder is generally low, an increasing number of children who play digital games exhibit problematic gaming behaviors [2], which often result in dysfunctional social behaviors and mental health problems [3]. Delivering high-quality treatment for children with internet gaming disorder is key. This protocol describes a Swedish research project in which we will implement and evaluate an intervention labeled relapse prevention among children at Swedish child and youth psychiatry clinics.

Gaming, or playing offline or online digital games, has received a lot of attention from researchers and professionals in recent years. In Sweden, 68% of Swedish 13-16–year-old children and 55% of 17-18–year-old adolescents play computer games every day [4]. Gaming has become a common everyday arena where children and young people interact and socialize with others. Although some research suggests that gaming could be associated with more positive psychological outcomes, such as a stronger sense of belonging [5] and higher intelligence [6], other studies indicate that gaming can be linked to poor developmental outcomes such as physical and mental illness in adolescence [3]. Indeed, a small proportion of those who play digital games show a problematic development trajectory, similar to that of substance addiction, which is one of the reasons for including internet gaming disorder as an addiction diagnosis in the DSM-5 [1]. The diagnosis is phrased as "a persistent and recurrent use of the Internet to engage in games, often with other players, leading to clinically significant impairment or distress as indicated by five (or more) of the following criteria in a 12-month period: Preoccupation with gaming, withdrawal symptoms when gaming is taken away or not possible (sadness, anxiety, irritability), giving up other activities or continuing to game despite problems" [1]. Although the prevalence of problem gaming and internet gaming disorder in Swedish children and adolescents is to date unknown, a large European study with 12,938 children of 14-17 years of age reports that 5.1% exhibit problem gaming behaviors by fulfilling up to 4 criteria for internet gaming disorder, whereas 1.6% meet all the criteria for internet gaming disorder [7]. As many digital games are aimed at children, whose cognitive development means they are not always well equipped to deal with the instant gratification of most computer games [8], it is expected that problem gaming among children and adolescents will rise.

A development in the clinical management of the more well-established diagnosis of gambling addiction involving money [9,10] has brought attention to the possible association or co-occurrence of gambling, digital gambling, and problem gaming [11], not least given the development of in-game features such as loot boxes, ie, game-related purchases with a chance-based outcome. Moreover, earlier studies suggest that important correlates to child and adolescent problem gaming are male gender [12], neuropsychiatric disorder [13], difficulties with cognitive regulation [14], and substance use [15]. In addition, as parent-child relationships play an important role in child development [16], relationship features such as parent-child bonds and parent-child communication seem to be critical in terms of the development of problem gaming and internet gaming disorder [17]. Children with close parent-child bonds and open parent-child communication could more easily be offered and accept support from their parents, which subsequently could help them control their gaming behaviors. These factors need to be acknowledged both in routine practice as well as in the development of treatment for children and adolescents with problem gaming or internet gaming disorder.

To date, there is no gold standard treatment for children and adolescents with internet gaming disorder. Cognitive behavioral therapy (CBT) is, however, often identified as a first-line treatment for problem gaming, offering patients help with recognizing triggers and cues for gaming, and for understanding and controlling their gaming behaviors [18]. A CBT-based form of treatment, relapse prevention [19,20], has been developed as a treatment for child and adolescent problem gaming and internet gaming disorder. The relapse prevention program, which includes 3 to 8 sessions, has a motivational and relapse-prevention approach [19] where the therapist explores the target, ie, the problem behavior of the individual. Such program is traditionally used as a tertiary (or indicated) intervention strategy, meaning that such preventive effort is used to alleviate the impact of an ongoing problem and to prevent more complications. Relapse prevention treatment is often provided in outpatient clinics, for reducing the likelihood of relapsing into addiction and substance abuse. It is considered among the most effective preventive efforts for substance addiction [20] and works by teaching the individual to identify both internal and external cues to prevent future relapses in

similar situations. We hypothesize that by targeting these mechanisms, the treatment could also be effective in treating children and adolescents with problem gaming and internet gaming disorder, because of the similarities of these behavioral addictions to substance addiction.

The effect of an intervention such as relapse prevention could, however, be dependent on the general quality of parent-child relationships and interactions between parents and their adolescent children, such that adolescents with strong family bonds and open parent-child communication would be likely to have more promising outcomes than adolescents with poor family bonds and communication. In that sense, the parent-child relationship could be an important moderator for the effectiveness of an intervention. In addition, given that adolescent development happens in interaction with their environment, such as family and more specifically parents [16], it is also possible that an intervention aimed at adolescents would also have a spillover effect on their environments where parent-child relationships are included. In that sense, not only would the individual benefit from such an effort, but the entire family would as well. Although such ideas seem compelling, they have not been tested in a context of gaming or relapse prevention.

Aim and Objectives

The aim of the study is twofold: (1) to evaluate a relapse prevention treatment for patients with problem gaming and internet gaming disorder recruited from child and youth psychiatry clinics across southern Sweden (Region Skåne) and (2) to test whether the quality of parent-child relationships plays a role for the effect of relapse prevention treatment and vice versa—whether the relapse prevention treatment has a spillover effect on the quality of parent-child relationships.

The specific objectives are to:

1. Undertake an internal pilot to assess the recruitment and feasibility of delivering the treatment in a child and youth psychiatric clinic.
2. Conduct a randomized control trial (RCT) to determine the effectiveness of relapse prevention on child and adolescent problem gaming and internet gaming disorder.
3. Examine the moderating role of the parent-child relationship, including parent-child bonds and communication on the effect of relapse prevention on child and adolescent problem gaming and internet gaming disorder.
4. Investigate the effect of completed relapse prevention treatment on parent-child relationships
5. Introduce a qualitative component to address:
    - The subjective experiences of relapse prevention treatment among children and adolescents who took part in the program and their view of problematic gaming
    - Perceived attitudes about parent-child relationships and parenting needs in carers whose children accomplished the relapse prevention treatment
    - The feasibility of the treatment among clinicians who delivered the program

Methods

Design

This study is a 2-arm, parallel-group, early-stage RCT with embedded qualitative components. The internal pilot will determine the recruitment and feasibility of the treatment. The recruitment start date is January 1, 2022, and the end date is December 30, 2022.

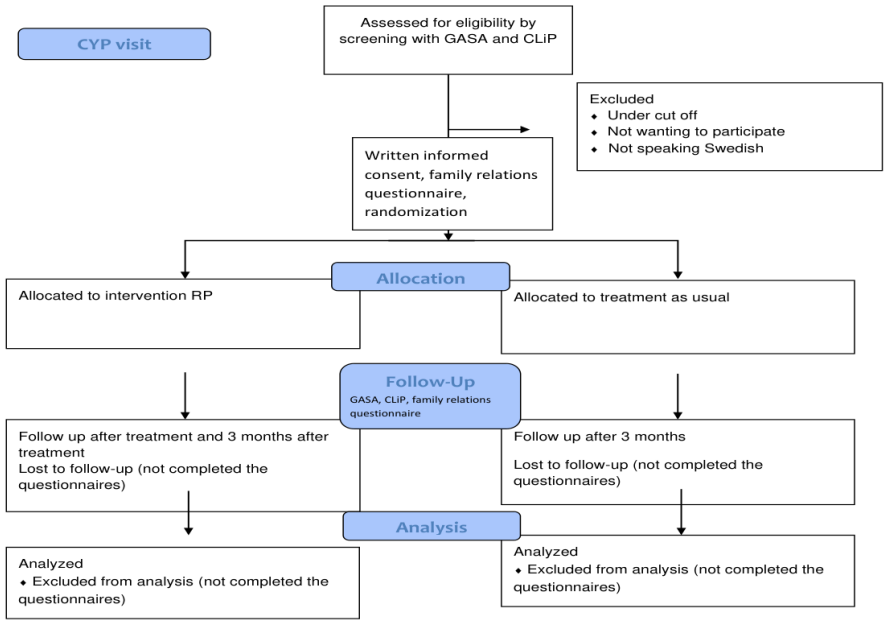
Recruitment and Eligibility

The trial and the recruitment will be carried out in several outpatient child and youth psychiatric clinics in Region Skåne in southern Sweden. As part of routine practice, all children (ages 12-18 years) coming for their first visit to 4 child and youth psychiatric units in Region Skåne will be screened for gaming or gambling behaviors. Children will be eligible to be included in the trial if they are aged 12-18 years and referred to outpatient child and youth psychiatric clinics in Region Skåne, meet criteria for problem gaming and internet gaming disorder, and have capacity to provide written informed consent. Children below the age of 15 years need to have their caregivers' consent. Children will be excluded if they do not speak Swedish. The clinicians who meet children during their first visit to the child and youth psychiatric unit will inform and invite the eligible children to participate in the study.

Randomization

Participants will be randomized in a 1:1 ratio to either intervention or control. The study will include a total of 160 participants, applying a random allocation sequence using the "chit method" by preparing 160 chits of paper indicating either control or treatment [21]. Each patient will be allocated to a condition (control or treatment), and the chit will not be replaced if the patient drops out of the study. The allocation to treatment and control arms may thus be uneven at certain times during the trial, but the end result of randomization will result in an equal distribution between control and treatment. It will not be possible to blind participants, clinicians, or supervising researchers to randomization allocation. The control group will receive "treatment as usual" at their home clinic. For an overview of recruitment and randomization, see the flow diagram in Figure 1.

Figure 1. Flow diagram. CYP: Child and Youth Psychiatric Clinic; CLiP: Control, Lying, and Preoccupation; GASA; Game Addiction Scale for Adolescents; RP: relapse prevention.



Intervention

There is at this time a lack of consensus regarding treatment methods for problem gaming [22], in part due to a lack of clinical research [23]. However, together with 4 experienced psychologists in the field, we developed a manual drawing on previous knowledge in the field of addiction and the field of child and adolescent psychiatric treatment. Relapse prevention for alcohol and substance abuse was used as a theoretical underpinning [20] to develop a manual with 2 aspects in mind: adapting the blurbs and examples for children and adolescents—in part by including a fictionalized adolescent when demonstrating the theme of the particular session; and by structuring the sessions so that they could be easily adapted to fit the participant's primary problem behavior—gaming or gambling. Patients who meet the criteria for disordered gambling or gaming (according to tentative criteria from the DSM-5) will be offered the opportunity to participate in a relapse preventive treatment intervention at their local clinic or where applicable at an adjacent clinic. The treatment will be administered in an individual format and consist of 7 to 9 sessions of 45 minutes over a period of 7 to 9 weeks. The treatment will be offered to participants both in person and via video link to facilitate participation for children and adolescents living further away from the participating clinics.

The treatment consists of three parts: (1) setting goals, (2) understanding and identifying high-risk situations and problem behaviors, and (3) consolidating the new activity schedule and identifying future high-risk behaviors. The first part is focused on examining the patient's undesirable behavior, his/her motivation for change, and establishing goals with the treatment (this part primarily draws on motivational interviewing). This part of the treatment therefore varies between 1 to 3 sessions as participants may have different levels of motivation for changing their primary problem behavior, which is why some participants may require 1 or 2 extra sessions at the start of the treatment. The second part (drawing more from traditional CBT techniques) consists of exploring problematic situations using functional analysis; identifying high-risk situations and events, emotions, and cognitions that induce the problematic gaming behavior or result in a relapse; and managing game time with activity scheduling and practicing problem-solving skills. The final part consists of recognizing early warning signals that may indicate that the primary problem behavior is more likely to occur and consolidating the parts of the treatment that have been the most helpful in maintaining the new activity schedule.

Clinicians (psychiatrists and psychologists) with training in CBT will beforehand be educated in relapse prevention and will throughout the treatment be supervised by a clinician with vast experience of treating adults with gambling and gaming addictions.

Sample Size

Patients who have agreed to participate in the treatment study will be randomized in a 1: 1 ratio between intervention and control group. In our power calculation, we estimated that 40% in the intervention group and 20% in the control group will see improvement through the treatment offered in different groups, and after this treatment fall under the cutoff for problem gaming. With these figures, 160 (80 + 80) patients must be included in

the treatment study for us to be able to demonstrate a significant difference with sufficient power. Given the large number of patients in pediatric and youth psychiatry in the region and the likely high incidence of problem behaviors in the population, we believe it is possible to reach this number of participants in the study.

Ethics Approval

The study was reviewed and approved by the Swedish Ethical Review Authority (Ref 2019-04797, December 13, 2019). Subsequent amendments have been approved (Ref 2021-05592-01, January 3, 2021; Ref 2022-01289-02, March 15, 2022).

Informed Consent

After eligibility is confirmed, written and verbal information about the study will be provided to all participants according to the Swedish Act concerning the Ethical Review of Research Involving Humans (SFS 2003:460). All patients, their carers, and clinicians who verbally agree to take part in the project will be provided with a consent form enabling them to provide written consent. For patients below the age of 15 years, a carer's written consent will be needed for their children to take part in the study. All participants will be informed that their partaking in the study is voluntary; their data would be handled with strict confidentiality; results will be reported on a group level, which means that individual participants will not be identifiable; and they are free to withdraw from the study at any time without reporting a reason for withdrawal. Please see Multimedia Appendix 1 for details. The trial intervention is similar to other clinical practices offered in child and youth psychiatric clinics, which is why we consider the risks with the trial as minimal.

Measures and Data Collection

Background information, including gender, age, housing situation, and diagnosis, as well as primary outcome measures assessing gaming and gambling problems, will be collected via the platform "Blå appen" ("Blue application" in Swedish). Blå appen is a digital platform developed by the child and youth outpatient department in Region Skåne, distributing and summarizing online self-rated questionnaires. It is used throughout Swedish child and youth psychiatry to facilitate the usage of self-rated questionnaires to patients. The secondary outcome measures, including parent-child communication and connectedness and family climate, will be administered in paper format after the child has provided consent to the study. Because the secondary outcomes measures assess general parent-child interactions, specific questions about gaming will also be added. The patients who consent to the RCT will rate their gaming and gambling activity as well as their parent-child relationships before and after the treatment. The "treatment at usual" arm will do the rating of gaming and gambling activity as well as their parent-child relationships at the inclusion and 3 months after the inclusion to the study. The following primary outcome measures will be used:

- The Game Addiction Scale for Adolescents [24] applies to gaming behavior during the previous 6 months based on 7 items. Each question covers one criterion in the DSM-5, answered on a 5-point Likert scale ranging from 1 (never) to 5 (very often) and should according to the developer be counted as endorsed when rated 3 or higher.
- The Diagnostic Screen for Gambling Problems–Control, Lying, and Preoccupation (NODS-CLiP) [25] is the shorter form of the NODS [26], which assesses gambling problems. NODS yield a score ranging from 0 to 10, corresponding to the DSM-4 criteria for gambling, where a score of 5 or more qualifies as pathological, a score of 3-4 corresponds to the subclinical syndrome of problem gambling, and scores of 1-2 corresponds to an "at-risk" status. NODS-CLiP comprises the 3 NODS items that best describe problem gambling, with 3 NODS questions pertaining to loss of Control, Lying, and Preoccupation—the "CLiP."

The following secondary, somewhat adapted, outcome measures will be used:

- Parent-child communication [27] includes six subscales: (1) parent knowledge of child activities (eg, "Do your parents know how much time you spend on gaming?"); (2) parent control (eg, "How often do your parents set rules about your gaming activities?"); (3) parent solicitousness (eg, "How often do your parents ask you about your gaming activities?"); (4) child disclosure (eg, "Do you tell your parents about your gaming activities?"); (5) child secrecy (eg, "Do you hide a lot from your parents in terms of your gaming activities?"); and (6) child feelings of being overly controlled (eg, "Do you think your parents want to know too much about your gaming activities?"). Items are rated on a 5-point Likert scale ranging from 1 (often) to 5 (never).
- Family climate [28] includes 2 subscales, family cohesion and conflict. Although family cohesion assesses the bonds between family members (eg, "In my family, we help and support each other"), family conflict assesses the conflicts between family members (eg, "In my family we often fight with each other"). Items are rated on a 4-point scale, ranging from 1 (not true at all) to 4 (very true).

Data Management

Personal and identifiable data will be collected from patients. Data will be kept confidential and managed in accordance with the Data Protection Act, General Data Protection Regulation policies and Swedish Act concerning the Ethical Review of Research Involving Humans (SFS 2003:460). Data will be held on services located within the Region Skåne databases, stored and secured both physically (in locked cabinets designed for the purpose) and electronically (behind firewalls), and be accessible to the study team only.

Statistical Analysis

Preliminary analyses will be conducted with regression analyses, paired sample *t* tests and ANOVAs. Analyses of pre- to postintervention change will be based on probability modeling using both unadjusted and adjusted models with 95% CIs. Appropriate interaction terms will be included to test subgroup differences in the models [29]. Analyses will be performed in Mplus [30].

Qualitative Component

In addition to the RCT, the study will be supplemented with a qualitative component with semistructured individual interviews in order to capture participants' and clinicians' experiences of the treatment, as well as attitudes about parent-child relationships and parenting needs in carers whose children completed the relapse prevention treatment. Specifically, the interviews with the children will focus on the children's meaning-making of problem gaming, their experiences of the treatment, as well as their reflections on parent-child relationships before and after treatment. The interviews with the clinicians will focus on the clinicians' experiences of carrying out the treatment, as well as their understanding of problem gaming. Finally, the interviews with the carers will focus on carers' attitudes in terms of parent-child relationships before and after treatment of the child, as well as their reflections on potential parenting support needs in terms of their child's gaming.

All interviews will be conducted by staff with knowledge of qualitative interview methodology. Each interview template will be pilot-tested prior to data collection. The respondents will be offered participation through a physical or digital interview. After the collection phase, the generated data will be analyzed with the help of thematic analysis based on the recommendations by Braun and Clarke [31].

Dissemination

Findings from the study will be published in peer-reviewed journals and presented at local, national, and international conferences; workshops with key stakeholders; and interviews, pods, seminars, and lectures with general audiences. Results will also be reported to the funders.

The trial was retrospectively registered on ClinicalTrials.gov (NCT05506384; date of registration: April 13, 2022) due to administrative overload.

Results

The trial started in January 2022 and is expected to end in December 2023. The first results are expected in March 2023.

Discussion

Expected Findings

In this research project, we will evaluate relapse prevention as a treatment for children and youth (aged 12-18 years) showing signs of problem gaming and internet gaming disorder. In addition, we will also test the role of parent-child relationships for the effects of treatment and include a qualitative component involving interviews with children, carers, and clinicians in order to gain a deeper understanding of the treatment and its anticipated effects.

CBT-based forms of treatment, such as relapse prevention [19,20], typically used as a treatment for substance addiction [20], has been adapted to the treatment of child and youth problem gaming and internet gaming disorder. The goal of the treatment is to help the individual to identify both internal and external cues to prevent future relapses in similar situations. More specifically, the relapse prevention treatment is thought to help children to recognize triggers and cues for gaming, as well as to understand and control their gaming behaviors. Therefore, we hypothesize that by targeting these mechanisms, the treatment could be effective in treating children and adolescents with problem gaming and internet gaming disorder. As children are a part of a family system [16], it is likely that aspects of parent-child relationship, such as communication and emotional bonds, would have impact on child gaming behaviors [17]. Acknowledging parent-child relationships as being an important factor for child behavioral development, we hypothesize that the quality of parent-child relationships will play role for the effect of the treatment in a sense that the treatment will be more efficient for children reporting stronger parent-child bonds and communication. In addition, as children and parents interact in a dynamic manner [16], we also expect that the treatment will have spillover effect on parent-child relationships. We also have exploratory components to the projects. As previous research on user acceptability and satisfaction with relapse prevention as a treatment for problem gaming and internet gaming disorder is lacking, we explore how children and their carers, as well as clinicians who carried out the treatment, experience relapse prevention as a treatment for problem gaming and internet gaming disorder among children and youth. In addition, we also explore carers' attitudes in terms of parent-child relationships before and after treatment of the child, as well as their reflections on potential parenting support needs in terms of their child's gaming.

Limitations and Strengths

There are however some limitations to the study. The trial is not blinded, which may have an impact on both the patients' behavior as well as clinicians' practices. On the other hand, blinding does not necessarily ensure internal or external validity of the results [32], which is why we consider this limitation minor. As neuropsychiatric disorder is one of the major risk factors in problem gaming and internet gaming disorder [13], we expect that many of the patients included in the trial with be diagnosed with a neuropsychiatric disorder. This could be a potential limitation of the trial as the effect of the treatment may be affected by comorbidity in children with problem gaming or internet gaming disorder. Another possible limitation is the difficulty with recruiting patients as well as the potential dropout. Many children who game may not be aware of the problems that their gaming is imposing on their everyday lives, which is why they may not be likely to seek help or accept the given support. In addition, they may not be motivated to be engaged in the treatment. Therefore, we offer motivational sessions in the beginning of the treatment. Despite these limitations, there are several strengths to be noted. To our knowledge, this is the first RCT study testing the effect of relapse prevention on child and adolescent problem gaming and internet gaming disorder. As an increasing number of children engage in gaming [4,24], for some children, this activity may include significant problems [6,22] that would need attention from the clinics. Evaluating the efforts made by the clinics may provide more knowledge of the treatment of problem gaming in children. As problem behaviors in children interact with the

family context, investigating parent-child relationships adjacent to the treatment of child problem gaming or internet gaming disorder is another important strength of the study. Further, this study includes a qualitative component involving different parties directly or indirectly involved in the treatment, ie, children, carers, and clinicians. Interviews with children, carers, and clinicians may help gaining knowledge of how the treatment is perceived by the individual who is directly involved in the treatment, the adults who take part in the child's life on a daily basis, as well as the clinicians who are important stakeholders of the treatment.

Conclusion

To conclude, in this project, we will evaluate relapse prevention as a treatment for children and youth (aged 12-18 years) showing signs of problem gaming and internet gaming disorder. The treatment will be evaluated in an RCT. The measures will include gaming frequency and gaming experiences, as well as perceived parent-child relationships and parent-child communication in order to understand the possible of role of parent-child relationship for the effect of the treatment. In addition, the study will also include a qualitative component involving interviews with children, carers, and clinicians in order to gain a deeper understanding of the treatment and its anticipated effects, as well as the parenting support needs the carers express. The results of the project will inform the development of practices in child and youth psychiatric clinics, putting focus on both children and their carers as important stakeholders in the practices.

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Data Availability

The data sets generated and/or analyzed during the current study are not publicly available because this study's ethical review does not allow for study data to be in a public repository. Requests to access the datasets should be addressed to ECK or SK.

Authors' Contributions

ECK, SK, SG, FA, and AH designed the trial and, together with IE and MW, contributed to the qualitative component, recruitment, and data collection. SK drafted the protocol. All authors read and approved the final manuscript. All authors have agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Conflicts of Interest

None declared.

Editorial Notice

This randomized study was only retrospectively registered, due to administrative overload. The editor granted an exception from ICMJE rules mandating prospective registration of randomized trials because the risk of bias appears low and the study was considered formative, guiding the development of the application. However, readers are advised to carefully assess the validity of any potential explicit or implicit claims related to primary outcomes or effectiveness, as retrospective registration does not prevent authors from changing their outcome measures retrospectively.

Multimedia Appendix 1

Information letters and consent forms.
[PDF File (Adobe PDF File), 541 KB-Multimedia Appendix 1]

Multimedia Appendix 2

Peer review report by Swedish Research Council for Health, Working Life and Welfare / Forskningsrådet för hälsa, arbetsliv och välfärd - FORTE (Stockholm, Sweden).
[PDF File (Adobe PDF File), 413 KB-Multimedia Appendix 2]

References

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders: DSM-5, Vol 5. Washington, DC: American Psychiatric Association; 2013.
2. Przybylski AK, Weinstein N, Murayama K. Internet gaming disorder: investigating the clinical relevance of a new phenomenon. Am J Psychiatry 2017 Mar 01;174(3):230-236 [FREE Full text] [doi: 10.1176/appi.ajp.2016.16020224] [Medline: 27809571]

3. Männikkö N, Billieux J, Kääriäinen M. Problematic digital gaming behavior and its relation to the psychological, social and physical health of Finnish adolescents and young adults. J Behav Addict 2015 Dec;4(4):281-288 [FREE Full text] [doi: 10.1556/2006.4.2015.040] [Medline: 26690623]
4. The Swedish Media Council. Ungar och Medier 2019. Youth and media 2019. Article in Swedish. Statens Medieråd. 2019 Sep 10. URL: https://www.statensmedierad.se/rapporter-och-analyser/material-rapporter-och-analyser/ungar--medier-2019 [accessed 2022-06-06]
5. Sharabi A, Margalit M. The mediating role of internet connection, virtual friends, and mood in predicting loneliness among students with and without learning disabilities in different educational environments. J Learn Disabil 2011 Apr 07;44(3):215-227. [doi: 10.1177/0022219409357080] [Medline: 20375289]
6. Sauce B, Liebherr M, Judd N, Klingberg T. The impact of digital media on children's intelligence while controlling for genetic differences in cognition and socioeconomic background. Sci Rep 2022 May 11;12(1):7720 [FREE Full text] [doi: 10.1038/s41598-022-11341-2] [Medline: 35545630]
7. Müller KW, Janikian M, Dreier M, Wölfling K, Beutel ME, Tzavara C, et al. Regular gaming behavior and internet gaming disorder in European adolescents: results from a cross-national representative survey of prevalence, predictors, and psychopathological correlates. Eur Child Adolesc Psychiatry 2015 May 5;24(5):565-574. [doi: 10.1007/s00787-014-0611-2] [Medline: 25189795]
8. Mazurek MO, Engelhardt CR. Video game use in boys with autism spectrum disorder, ADHD, or typical development. Pediatrics 2013 Aug 29;132(2):260-266. [doi: 10.1542/peds.2012-3956] [Medline: 23897915]
9. Petry NM, Stinson FS, Grant BF. Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. J Clin Psychiatry 2005 May 15;66(5):564-574. [doi: 10.4088/jcp.v66n0504] [Medline: 15889941]
10. Abbott MW, Romild U, Volberg RA. Gambling and problem gambling in Sweden: changes between 1998 and 2009. J Gambl Stud 2014 Dec 6;30(4):985-999. [doi: 10.1007/s10899-013-9396-3] [Medline: 23832754]
11. Spicer SG, Nicklin LL, Uther M, Lloyd J, Lloyd H, Close J. Loot boxes, problem gambling and problem video gaming: a systematic review and meta-synthesis. New Media & Society 2021 Jul 17;24(4):1001-1022. [doi: 10.1177/14614448211027175]
12. Blanco C, Hasin DS, Petry N, Stinson FS, Grant BF. Sex differences in subclinical and DSM-IV pathological gambling: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Psychol Med 2006 Jul;36(7):943-953. [doi: 10.1017/S0033291706007410] [Medline: 16650342]
13. Durkin K. Videogames and young people with developmental disorders. Rev Gen Psychol 2010 Jun 01;14(2):122-140. [doi: 10.1037/a0019438]
14. Paulus FW, Ohmann S, von Gontard A, Popow C. Internet gaming disorder in children and adolescents: a systematic review. Dev Med Child Neurol 2018 Jul 06;60(7):645-659 [FREE Full text] [doi: 10.1111/dmcn.13754] [Medline: 29633243]
15. Cheung NWT. Low self-control and co-occurrence of gambling with substance use and delinquency among Chinese adolescents. J Gambl Stud 2014 Mar 6;30(1):105-124. [doi: 10.1007/s10899-012-9351-8] [Medline: 23224660]
16. Sameroff A. A unified theory of development: a dialectic integration of nature and nurture. Child Dev 2010 Feb 04;81(1):6-22. [doi: 10.1111/j.1467-8624.2009.01378.x] [Medline: 20331651]
17. Shek DTL, Zhu X, Ma CMS. The influence of parental control and parent-child relational qualities on adolescent internet addiction: a 3-year longitudinal study in Hong Kong. Front Psychol 2018 May 1;9:642 [FREE Full text] [doi: 10.3389/fpsyg.2018.00642] [Medline: 29765349]
18. Gentile DA, Bailey K, Bavelier D. Internet gaming disorder in children and adolescents. Pediatr 2017 Nov 01;140(Supplement_2):81-85. [doi: 10.1542/peds.2016-1758h]
19. Marlatt GA, Donovan DM. Relapse Prevention: Maintenance Strategies in the Treatment of Addictive Behaviors. 2nd ed. New York, NY: The Guilford Press; 2005.
20. Marlatt GA, Witkiewitz K. Relapse prevention for alcohol and drug problems. In: Marlatt GA, Donovan DM, editors. Relapse Prevention: Maintenance Strategies in the Treatment of Addictive Behaviors. 2nd ed. New York, NY: The Guilford Press; 2005:1-44.
21. Singh G. Randomization made easy for small size controlled clinical trials. J Int Assoc Med Sci Educ 2006;16:75-78 [FREE Full text]
22. Rangmar J, Thomée S. När datorspelandet blir problematiskt – en kunskapsöversikt om gaming disorder hos barn och unga. When gaming becomes problematic – a literature review about gaming disorder in children and youth. Article in Swedish. The County Administrative Board Sweden. 2019. URL: https://www.lansstyrelsen.se/download/18.11a2cbf716d6c8f9f741aed/1569500082579/N%C3%A4r%20datorspelandet%20blir%20problematiskt%20%E2%80%93%20gaming%20disorder%20hos%20barn%20&%20unga%20(2019).pdf [accessed 2022-12-19]
23. King D, Delfabbro P. Internet Gaming Disorder: Theory, Assessment, Treatment, and Prevention. Cambridge, MA: Academic Press, Elsevier Inc; 2018:163-195.
24. Lemmens JS, Valkenburg PM, Peter J. Development and validation of a game addiction scale for adolescents. Media Psychology 2009 Mar 05;12(1):77-95. [doi: 10.1080/15213260802669458]

25. Toce-Gerstein M, Gerstein DR, Volberg RA. The NODS-CLiP: a rapid screen for adult pathological and problem gambling. J Gambl Stud 2009 Dec 15;25(4):541-555 [FREE Full text] [doi: 10.1007/s10899-009-9135-y] [Medline: 19603259]
26. Hodgins DC. Using the NORC DSM Screen for Gambling Problems as an outcome measure for pathological gambling: psychometric evaluation. Addict Behav 2004 Nov;29(8):1685-1690. [doi: 10.1016/j.addbeh.2004.03.017] [Medline: 15451138]
27. Stattin H, Kerr M. Parental monitoring: a reinterpretation. Child Dev 2000 Jul;71(4):1072-1085. [doi: 10.1111/1467-8624.00210] [Medline: 11016567]
28. Bloom BL. A factor analysis of self-report measures of family functioning. Fam Process 1985 Jun;24(2):225-239. [doi: 10.1111/j.1545-5300.1985.00225.x] [Medline: 4018243]
29. Jaccard J, Turrisi R. Interaction Effects in Multiple Regression. Thousand Oaks, CA: SAGE Publications; 2003.
30. Muthén LK, Muthén BO. Mplus User's Guide. 8th ed. Los Angeles, CA: Muthén & Muthén; Apr 2017.
31. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol 2006 Jan;3(2):77-101. [doi: 10.1191/1478088706qp063oa]
32. Dal-Ré R, Janiaud P, Ioannidis JPA. Real-world evidence: how pragmatic are randomized controlled trials labeled as pragmatic? BMC Med 2018 Apr 03;16(1):49 [FREE Full text] [doi: 10.1186/s12916-018-1038-2] [Medline: 29615035]

Abbreviations

CBT: cognitive behavioral therapy
DSM-5: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
NODS-CLiP: The Diagnostic Screen for Gambling Problems–Control, Lying, and Preoccupation
RCT: randomized controlled trial

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Relapse prevention therapy for internet gaming disorder in Swedish child and adolescent psychiatric clinics: a randomized controlled trial

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Objectives: To evaluate the effectiveness of relapse prevention (RP) as a treatment for internet gaming disorder (IGD).

Design: Randomized controlled trial.

Setting: Three child and adolescent psychiatry (CAP) units in Region Skåne, Sweden.

Participants: Children aged 13–18 years, coming for their first visit to CAP during 2022, were screened for gaming behavior. Those who met the proposed DSM-5 criteria for IGD were offered participation in the trial, if they had the capacity to provide written informed consent and if they spoke Swedish. A total of 111 CAP patients agreed to participate. Out of those, 11 patients were excluded due to incorrect inclusion such as young age ($n = 1$), or due to the absence of responses to follow-up measures ($n = 9$). After exclusion, 102 participants remained (intervention = 47, control = 55).

Interventions: The intervention, RP, is based on cognitive behavioral treatment (CBT) and was provided individually, comprising of five to seven 45-min sessions over a period of 5 to 7 weeks versus treatment as usual.

Outcome measures: Participants were assessed with Game Addiction Scale for Adolescents pre-treatment (GASA) (baseline), post-treatment (treatment group only), and 3 months after baseline (follow-up).

Results: The repeated measures ANOVA showed a significant interaction effect between treatment and time. Both the control group and treatment group lowered their mean GASA score from baseline to follow-up significantly, but the improvement was greater in the treatment group (mean difference in control group −5.1, $p < 0.001$, 95% CI = – 3.390 to −6.755, mean difference in treatment group −9.9, $p < 0.001$, 95% CI = −11.746 to −8.105).

Conclusion: RP was found to be superior to treatment as usual in terms of reduction of IGD symptoms. Future research should address which aspects within a given treatment are effective, who benefits from treatment, in what aspects, and why.

Trial registration number: ClinicalTrials.gov, NCT05506384 https://clinicaltrials.gov/ct2/show/NCT05506384.

KEYWORDS

gaming, internet gaming disorder, CBT, GASA, relapse prevention

1. Introduction

Gaming is one of the most common leisure activities among children and adolescents and is nothing more than a source of entertainment, for the majority. However, some individuals engage in gaming in a way, and to such an extent, that negative consequences ensue (1–3). For some, gaming activity can become so extensive and severe that other activities and obligations, such as school, social relationships, and even physical needs, are neglected (2, 4). Most research agrees on the pathological potential of the behavior which has reached formal recognition with inclusion in both the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) and in the *International Classification of Diseases* (ICD-11). Gaming disorder (GD) has its own diagnostic code in ICD-11 while the DSM-5 mentions internet gaming disorder (IGD) as a tentative diagnosis requiring more clinical research (5, 6). The DSM-5 definition of IGD is similar to their definition of pathological gambling, and so is most of the numerous existing screening tools (6–8).

Despite the increasing amount of research on IGD, controversy remains regarding fundamentals such as the validity of the condition but also regarding terminology, measurement approach, and diagnostic cut-off (7–9). The greatly varying estimates of prevalence and comorbidity are likely influenced by the controversies and discord. The reported prevalence of IGD varies across studies but has globally been estimated as approximately 3%, with the highest numbers found in adolescent samples (8). Apart from age, male gender is an established risk factor, and commonly listed comorbidities are ADHD, anxiety, and depression (1, 10). IGD is further known to cause impairment in both school performances and sleep habits – causing great concern in child and adolescent psychiatry (CAP) and school healthcare (2, 11, 12).

There is no consensus on how to treat IGD, over the past years, a few treatment studies have been published (13). However, these studies have been criticized for poor design and methodological flaws such as lack of control groups (13–15). Cognitive behavioral treatment (CBT) is one of the few methods that have been explored in relation to IGD (13, 14) and is recommended as a first line of treatment (16).

Relapse prevention (RP) is a CBT-based treatment developed to treat alcohol problems in adults, but the method is also used to treat addiction to alcohol, drugs, tobacco, and gambling among both adults and adolescents (17). RP focuses on cognitive restructuring, control of, and recognition of triggers for a problem behavior and the method has been raised as a possible therapy for IGD (18). RP is a relatively short and low-cost treatment which is also an established and well-received treatment method within the clinics that are part of the current project. We developed a CBT-based manual derived from RP for treatment of child and adolescent IGD. Together with experienced clinical psychologists, the manual was adjusted to suit children and adolescents within the CAP context. The number of sessions was reduced, and a fictionalized person was incorporated in a series of vignettes when demonstrating a particular theme. In a pilot study, we evaluated RP as a treatment for IGD and gambling among children and adolescents, showing promising results (19).

While most youth engage in gaming to some extent, a minority need help to control their gaming or to reduce the negative consequences thereof. To this date, no specific treatment is offered to children and adolescents suffering from IGD. Given this, our aim was to evaluate the effectiveness of RP as a treatment for problematic gaming within a CAP setting.

2. Methods

2.1. Trial design and setting

The current study is a non-blinded randomized control trial, performed within three different child and adolescent psychiatric (CAP) units in Region Skåne, Sweden. Detailed methods are described in the trial protocol paper (20).

In our protocol, we specified that our aim in this trial was to determine the effectiveness of RP as a treatment of not only IGD but also problem gambling (20). The results regarding gambling will be published separately.

2.2. Ethics approval

The study was reviewed and approved by the Swedish Ethical Review Authority (Ref 2019-04797, December 13, 2019). Subsequent amendments have been approved (Ref 2021-05592-01, January 3, 2021; Ref 2022-01289-02, March 15, 2022).

2.3. Participants

This trial and recruitment were performed from 1 September 2021 to 30 December 2022. Due to administrative error the trial was not registered in the clinicaltrials.gov until August 2022. All patients, between the years 13–18, coming for their first visit to CAP, were supposed to be screened via an application called The Blue App, for gaming behavior. Those meeting the proposed DSM-5 criteria for IGD (6) were offered participation in the trial, if they had the capacity to provide written informed consent and if they spoke Swedish. Unfortunately, not every patient was screened digitally due to technical problems, thus some were provided the assessment on paper. Caregivers' consents were required for children younger than 15 years. Out of 2,630 new visits, we were able to register 622 (≈24%) patients assessed with GASA whereof 123 (≈20%) met the cut off for IGD. In

the study protocol for this trial, we present a power calculation estimating that approximately 40% in the intervention group and 20% in the control group would improve by follow-up. With these figures, we estimated that 160 (80 + 80) patients should be included in the trial for us to be able to demonstrate a significant difference with sufficient power (20). However, among the CAP patients meeting the criteria for IGD during the study's inclusion period, a total of 113 patients agreed to participate. One patient was excluded due to incorrect inclusion, being younger than 13 years old, and 10 patients were excluded because of not completing follow-up measures. The final sample consisted of 102 participants aged between 13 and 18 years old (M age = 14.42 years, SD = 1.367). For an overview of the inclusion, exclusion and randomization, see the flow diagram in Figure 1.

2.4. Randomization

Participants were randomized in a 1:1 ratio to either intervention or control. For randomization, we applied a random allocation sequence using the 'chit method' by preparing 160 chits of paper indicating either control or treatment (21). Each patient was distributed to a condition (control or treatment), and the chit was not replaced if the patient dropped out of the study. The control group received treatment as usual (TAU) at their home clinic. It was not possible to blind either participants, clinicians, or supervising researchers to randomization allocation.

2.5. Intervention

We collected pre-intervention (baseline) data from the participants before starting treatment. The treatment ran for 5 to 7 weeks for each participant. Post-intervention data were collected at weeks five to seven after completion of treatment. Follow-up data were collected 3 months after baseline date. The intervention ran for 14 months in total with final data collection and closure in month 16. We planned for the treatment to consist of seven to nine sessions over a period of 7 to 9 weeks. Based on experience from our pilot study (19), we decided to compress the treatment to facilitate participation. Consequently, the number of sessions differs from our protocol (20). The participants were considered dropouts if they completed less than five sessions.

2.5.1. Relapse prevention

Participants assigned to the treatment group were administered RP over the course of five to seven sessions, each session lasting

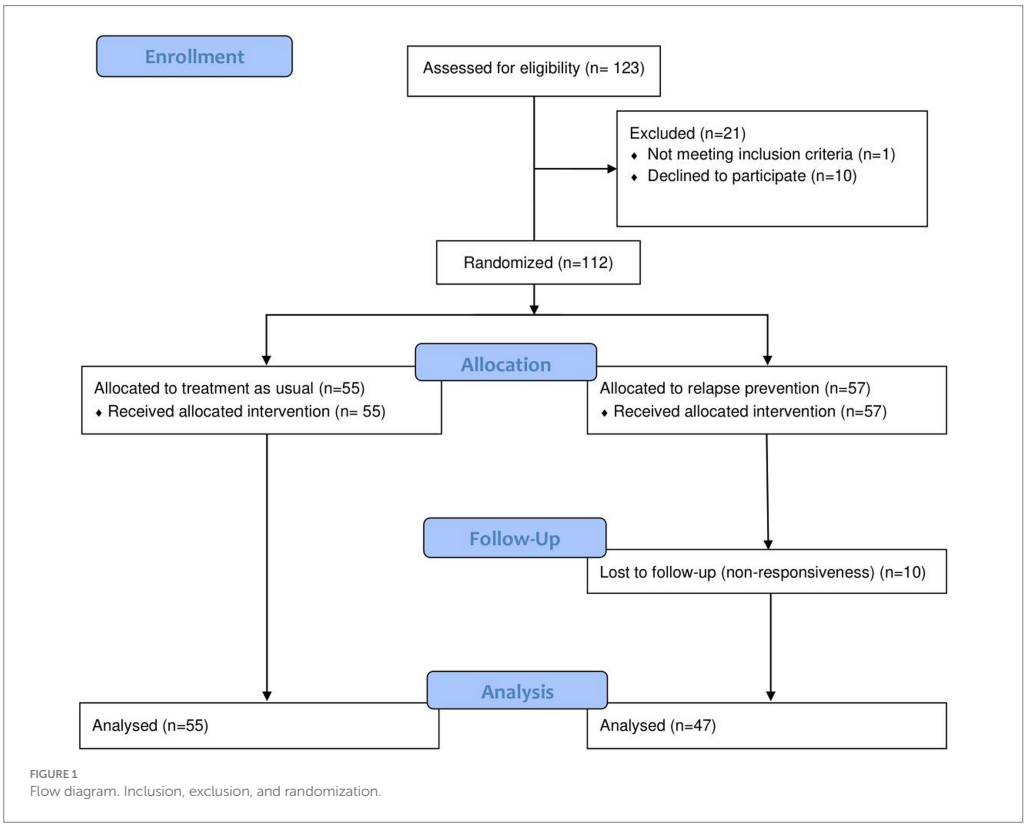

FIGURE 1
Flow diagram. Inclusion, exclusion, and randomization.

45 min. The intervention was provided individually at the respective CAP units or via video link and was led by a clinician. The clinicians implementing the treatment were four licensed psychologists, certified in accordance with the Swedish National Board of Health and Welfare, one social worker, and one psychiatrist; all of them had competence in CBT. The treatment consists of three parts: (1) setting goals, in which the clinician examines the patient's unwanted behavior, mapping his/her motivation for change and goals with treatment; (2) understanding and identifying high-risk situations and problem behaviors; and (3) identifying future high-risk behaviors and early warning signals and consolidating the new activity schedule. An important part of the treatment was theme- specific homework given at the end of each session to be discussed and evaluated at the next.

2.5.2. Treatment as usual

Neither CAP, school healthcare staff, nor social services currently provide any treatment to children and adolescents who need help to stop or regulate their gaming behavior. Consequently, participants in the control group who received TAU received different interventions according to existing practice. Treatments provided in the control group were counseling ($n = 21$), medication for ADHD (Methylphenidate $n = 22$, Dexamphetamine = 1), antidepressants (Sertraline $n = 1$), referral to other unit ($n = 1$), further psychiatric evaluation ($n = 1$). Some individuals ($n = 3$) were put on a waiting list and did not start treatment, and some ($n = 2$) were discharged from CAP during the study period.

2.6. Measures

In addition to assessment regarding gaming behavior, basic demographics routinely recorded in the journal, such as gender, age, housing situations, and diagnosis, were collected. The treatment group was assessed with GASA regarding gaming (22) at baseline (before treatment), after the treatment, and at follow-up (3 months after baseline assessment). The control group were assessed with GASA at baseline and at follow-up.

2.6.1. GASA

The 7-item GASA was used to screen for IGD (22). GASA is one of the most frequently used measures for IGD (22, 23). The instrument is based on the DSM criteria for problem gambling (salience, tolerance, mood modification, relapse, withdrawal, conflicts, and problems) and applies to gaming behavior during the past 6 months (22). The DSM suggests that half of the criteria should be met to qualify for a diagnosis. However, a ranking of the constituent items has been proposed. It has been argued that the 'core criteria' of relapse, withdrawal, conflicts, and problems relate more heavily to addiction than the criteria that concern salience, tolerance, and mood modification, which, according to some scholars, should be considered peripheral (16, 24, 25). Therefore, the 'core approach' applies a prioritization of the four core criterion, creating three categories of gamers: engaged gamers, problem gamers, and addicted gamers. This approach has been reported as clinically relevant as the created categories seem to relate to degrees of negative consequences as well as severity of addictive behavior (25, 26).

Responses were given on a 5-point scale from 1 = never, to 5 = very often. An item was considered endorsed when rated 3 or higher (22). The scale produces two outcome measures: firstly, a continuous GASA score with a minimum of seven points to a maximum of 35 and secondly, categories of gamers (engaged, problem, and addicted gamers) in accordance with the core approach (24).

2.7. Data preparation

Statistical analyses were performed in SPSS (IBM SPSS statistics version 27). Gender, housing situation, and diagnosis were recoded into binary variables (Yes = 1/No = 0). The least prevalent diagnoses were merged into a new variable labeled 'other diagnosis' (see Table 1). This variable included anxiety disorders (anxiety disorder, unspecified, 'mixed anxiety, and depressive disorder, generalized anxiety disorder), other symptoms and signs involving emotional state, obsessive compulsive disorder, adjustment disorder, pathological gambling, and diagnoses primarily used during the psychiatric evaluation phase (observation for suspected mental and behavioral disorders, general psychiatric examination, not elsewhere classified, examination and observation for unspecified reason, observation following alleged rape or seduction, examination and observation for unspecified reason).

The sum of GASA score at baseline, after treatment, and at follow-up composed separate continuous variables used as outcome measures for ANOVA analysis. The difference in score from baseline to follow up, labeled 'improvement', constituted another continuous outcome variable used in a linear regression analysis.

Individuals meeting every core criterion (16, 23–25) in GASA were categorized as 'addicted gamers'. The respondents that endorsed two to three of the core criteria were categorized as problem gamers, and those who endorsed all three of the peripheral criteria but not more than one of the core criteria were categorized as 'engaged gamers'. At follow-up, some participants did not meet the criteria for either of the gaming categories, and were labeled '<engaged gamers'.

2.8. Data analysis

The mean GASA score at baseline and at follow-up was used in a repeated measure ANOVA to compare the change in mean value between control group and treatment group. The treatment group was analyzed in a repeated measure ANOVA separately to compare the mean GASA score at baseline, after treatment, and at follow-up, against each other. The mean difference in GASA score between baseline and follow-up (improvement) was used in an independent sample *t*-test of the difference between treatment group and control group to unable an estimate of the effect size. The improvement in GASA score was also used as the dependent variable in a regression model to quantify the impact of treatment, with adjustment of baseline GASA score, demographics and comorbidity diagnosis.

McNemar's test was applied to compare the prevalence of gaming categories between baseline and follow-up, in control group and treatment group separately.

3. Results

Sample characteristics are shown in Table 1. Out of the 102 participants, 46% constituted the treatment group, and 6% were dropouts. One-quarter of the total sample was female and constituted 17% of the treatment group and 30% of the control group. A majority

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TABLE 1 Sample characteristics.

	Control		Treatment		Total	
	Frequency	%	Frequency	%	Frequency	%
Total sample	55	53.9	47	46.1	102	100
Dropouts	0	0	6	5.7	6	5.9
Gender						
Male	36	65.5	39	83.0	75	73.5
Female	19	34.5	8	17.0	27	26.5
Age, years						
13–15	43	78.2	38	80.9	81	79.4
16–18	12	21.8	9	19.1	21	20.6
Housing situation						
Cohabiting parents	33	60.0	23	48.9	56	54.9
Separated parents	22	40.0	24	51.1	46	45.1
Diagnosis						
ADHD	20	36.4	17	36.2	37	36.3
ADD	10	18.2	3	6.4	13	12.7
ASD	6	10.9	5	10.6	11	10.8
Depression	2	3.6	5	10.6	7	6.9
Other diagnosis	17	30.9	17	36.2	34	33.3

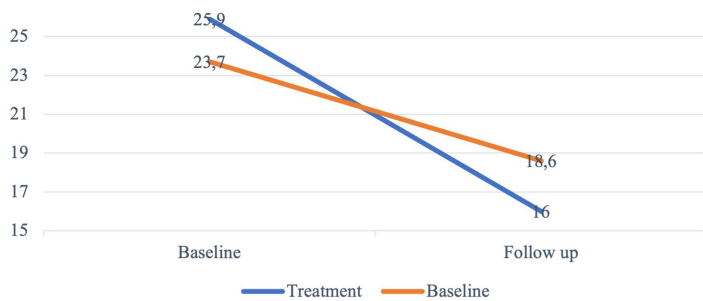

FIGURE 2
Mean GASA score. Changes in mean score from baseline to follow-up. $N = 102$.

were aged 13–15 years and the mean age was 14 years. The distribution of cohabiting and separated parents was relatively even. The most common diagnosis was ADHD followed by ADD, ASD, and depression.

At baseline, 11% met the cut off for engaged gaming in the control group and none in the treatment group. Problem gamers constituted 55 and 49% of the control and treatment group, respectively. Addicted gamers constituted 35 and 51% of the control and treatment group, respectively.

3.1. Reduction in mean GASA score

The following analyses were checked for assumptions of equal variance and normality, the assumptions were met.

As shown in Figure 2, both the control and treatment group lowered their GASA score over time. The repeated measures ANOVA test of within subject effects showed that there was a significant interaction effect between time and treatment ($p < 0.001$). The *post hoc* analysis of estimated marginal means (EMMEANS) showed that the mean GASA score differed significantly between control and treatment group, both at baseline (mean difference 2.2, $p = 0.008$, 95% CI = 0.578, 3.806) and at follow-up (mean difference −2.7, $p = 0.026$, 95% CI = −0.322, −4.999). Both the control group and treatment group lowered their mean GASA score from baseline to follow-up significantly (mean difference in control group −5.1, $p < 0.001$, 95% CI = − 3.390, −6.755, mean difference in treatment group −9.9, $p < 0.001$, 95% CI = −11.746, −8.105). The independent samples *t*-test showed a significant difference in the mean improvement in GASA

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scores between control group and treatment group ($t = -3.88$ (100), $p = <0.001$, CI = −7.331, −2.374). The effect size, as measured by Cohen's d, was $d = 0.77$, indicating a medium effect (27).

The linear regression model is reported in Table 2. The regression analysis showed that the treatment contributed significantly to a greater difference in GASA score from baseline to follow-up, meaning that the improvement among those who underwent treatment was significantly greater. Additionally, the mean GASA score at baseline contributed significantly to the model; a high baseline score was positively associated to a greater improvement. Demographics, such as age, gender and housing situation, did not contribute significantly to any change in GASA score and neither did any of the most common diagnosis.

The treatment group was further analyzed separately in a repeated measure ANOVA to unable incorporation of the GASA score collected immediately after treatment. The mean score from baseline, post treatment and follow-up are visualized in Figure 3. As the post-treatment GASA score was missing for five individuals, this analysis only included 43 participants. The mean difference in GASA score was significant, both between baseline and post-treatment (mean difference = 8.4, $p < 0.001$, 95% CI = −10.813 – −5.954), and from post-treatment to follow-up (mean difference = 2.0, $p = 0.007$, 95% CI = −3.612 – −0.481).

3.2. Reduction in gaming severity level

As shown in Table 3, McNemar's test showed that the proportion of both problem and addicted gamers was significantly lower at follow-up in comparison to baseline in the treatment group whereas no difference was seen in the control group.

TABLE 2 Hierarchical linear regression analysis.

	Coefficients		Model summary			
Predictor	β	Sig.	R^2	Δ R^2	ΔF	Sig. ΔF
Model 1			0.131	0.131	15.088	<0.001
Treatment	4.853	<0.001				
Model 2			0.277	0.146	19.995	<0.001
Treatment	3.472	0.004				
Baseline GASA score	0.630	<0.001				
Model 3			0.255	0.000	0.001	0.979
Treatment	3.468	0.005				
Baseline GASA score	0.629	<0.001				
Male gender	0.036	0.159				
Model 4			0.292	0.015	2.014	0.979
Treatment	3.514	0.004				
Baseline GASA score	0.639	<0.001				
Male gender	−0.050	0.970				
<Age 15	2.008	0.159				
Model 5			0.292	0.000	0.015	0.904
Treatment	3.501	0.005				
Baseline GASA score	0.637	<0.001				
Male gender	−0.038	0.978				
<Age 15	2.019	0.160				
Cohabiting parents	−0.142	0.904				
Model 6			0.292	0.025	0.832	0.508
Treatment	3.462	0.007				
Baseline GASA score	0.616	<0.001				
Male gender	0.080	0.953				
<Age 15	1.682	0.268				
Cohabiting parents	−0.003	0.998				
ADHD	1.348	0.355				
ADD	1.714	0.329				
ASD	1.999	0.111				
Depression	4.017	0.378				

Dependent variable GASA mean improvement.

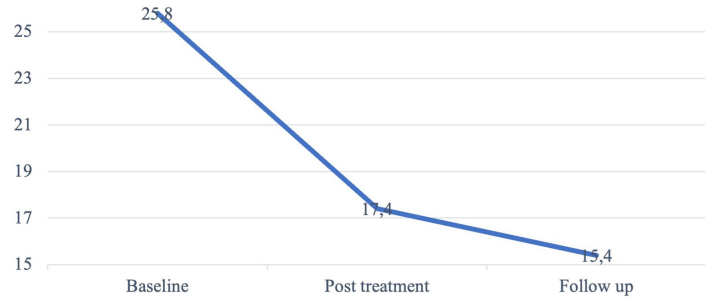

FIGURE 3
Mean GASA score at baseline, post-treatment, and at follow-up. Treatment group. $N = 43$.

TABLE 3 McNemar's test for X^2 -comparisons of the prevalence of gaming categories between baseline and follow-up, in control group and treatment group separately.

	Control			Treatment		
	Baseline N (%)	Follow-up N (%)	*p*-value	Baseline N (%)	Follow-up N (%)	*p*-value
<Engaged gamers	0 (0)	34.5 (19)	–	0 (0)	59.6 (28)	–
Engaged gamers	10.9 (6)	5.5 (3)	0.453	0 (0)	4.3 (2)	–
Problem gamers	54.5 (30)	41.8 (23)	0.167	48.9 (23)	25.5 (12)	0.043
Addicted gamers	34.5 (19)	18.2 (10)	0.064	51.1 (24)	10.6 (5)	<0.001

$N = 102$.

4. Discussion

Interest in the treatment of IGD has clearly increased in recent years, from a basically non-existent level to an ever-increasing number of published articles on the subject (13, 14). It seems reasonable to assume that the interest in the treatment of IGD represents a need, identified by parents, school healthcare providers, and other caregivers seeing problems they interpret as related to excessive gaming among children. However, existing research within this field is still sparse and marked by methodological flaws (13).

The present RCT evaluates RP as a treatment for IGD among children and adolescents ages 13–18, within the context of CAP in southern Sweden. The participants were assessed regarding symptoms of IGD at baseline and at follow-up, carried out 3 months after the initial screening. In addition, the treatment group was also assessed regarding symptoms of IGD immediately after the treatment had been completed. Both the treatment group and the control group improved regarding IGD symptomatology from baseline to follow-up. In the treatment group, however, children and adolescents exhibited significantly greater improvement in terms of their IGD. Further, the proportion of both addicted and problem gamers showed a significant decrease from baseline to follow-up in the treatment group, whereas no difference was seen in the control group.

Relapse prevention was developed in the 80s, originally as a response to the failed long-term effects of other therapies at the time (17, 28). The method has ever since been used for various substance use disorders but also for the treatment of behavioral addictions and it has been suggested as a treatment for IGD specifically (23, 28). The treatment model aims to identify and address triggers or high-risk situations/circumstances in order to prevent relapse, to preserve abstinence or to reduce harm, but also how to handle a relapse if occurred, such that further relapses can be prevented (17, 28). Possibly, the model is specifically beneficial when it comes to IGD as the confrontation with triggers is particularly frequent, considering young people's constant access to gaming via smart phones, tablets and computers.

Interestingly, both the control and the treatment group improved significantly regarding mean GASA score from baseline to follow-up. The findings on the natural course of IGD differ across studies (29). Gentile et al. showed that 84% of the pathological gamers, in a secondary school setting, were still pathological gamers 2 years later (30). Another study, also conducted on a sample of secondary school students, showed that 50% of the addicted gamers were still addicted 1 year later (31) while Krossbakken et al. reported on a three-year stability of 35%, among a representative sample of Norwegian 17-year-olds (3).

The fact that this trial also showed a significant improvement regarding IGD symptomatology in the control group could reflect the self-healing nature of the condition, but it could also be a consequence of the fact that the control group did receive some form of psychiatric care. Possibly, their improvement was a positive side effect of adequate care of another psychiatric comorbidity. It is evident that there is a reciprocal link between psychological distress and IGD (3) and it is

therefore possible that treatment of psychiatric problems had some positive spillover effect on IGD.

The treatment group in this trial improved to a higher degree relative to the control group. Additionally, the analyses of prevalence of gaming categories showed a significant decrease of problem and addicted gamers in the treatment group but not in the control group, which possibly should be considered more clinically relevant than the change in GASA score (24, 25). The prevalence of addicted gamers dropped by 79% in the treatment group, in comparison to a drop by 47% in the control group. Comparing this treatment efficacy with findings of previous research is not entirely straightforward as comparable studies are few and the outcome measures differ. Zajac et al. summarized the research field in a systematic review published in 2020, in which they identified only four previously published RCT evaluating CBT-based treatments of IGD. Among these trials, two did not find an advantage of CBT over control (13). One of the other two reported that a mindfulness-oriented group treatment was superior to a support group, in a sample of 30 students and university employees (32). The other successful trial showed that combined CBT and bupropion was an effective treatment of IGD in 65 male adolescents with major depressive disorder (33); thus, a study carried out in a very specific population. The less successful RCTs both provided therapeutically active treatments for the control group, and both had a relatively small sample size with 28 and 24 participants, respectively (34, 35). In summary, previous comparable research is barely existent, and the findings are not entirely clear-cut.

This trial contributes with further support for CBT-based treatments of IGD, specifically RP. RP has the advantages of being a relatively short, low cost and manual-based treatment that does not place higher demands on the practitioner than the basic psychotherapeutic competence. The treatment could thus be offered outside of psychiatry, such as through primary care or school healthcare. Knowledge gaps remain, such as how the family situation and parent–child relationships can affect and might be affected by IGD treatment (20). Also, future research should address which aspects within the given treatment are effective, who benefits from treatment, in what aspects, and why.

4.1. Strengths and limitations

The presented findings should be considered in the light of the study's limitations. One limitation is the fact that the treatment group showed a higher GASA score than the control group at baseline, which might impact the relative efficacy of treatment. One could argue that an individual with greater gaming problems would show a greater improvement than an individual with less pronounced problems, representing a ceiling effect (36). However, when the baseline score was controlled for, the effect of the treatment remained significant, which supports the main findings in the study.

One other potential limitation is the absence of blinding which entails a risk that the participants in the control group, and possibly also their parents, experienced disappointment when they were informed that they had been randomized to a group that would not receive gaming-specific treatment. Possibly this disappointment contributed to a reduction in improvement that might have been seen otherwise.

The fact that TAU could not be kept constant is another limitation. The interventions in the control group differed due to the diversity in the sample and TAU was not given for a particular diagnosis, but more non-specifically for each of the participants individual psychiatric problems. This is the naturalistic setting of CAP Skåne. As no specific treatment to date is provided targeting gaming behavior among adolescents within the Swedish CAP context, this methodological approach was the most reasonable for us.

One other possible limitation is the fact that GASA applies to experiences with games over the last 6 months whereas the DSM-5 criteria for IGD concern the last 12 months (6). However, GASA is developed for adolescents specifically (22) and our clinical understanding and experience of youth gaming is that 6 months of destructive gaming is enough to cause negative consequences and a need for help.

Also, measures other than GASA, and reflecting additional psychological health complaints used as secondary outcomes, would have contributed valuable information on the potential range of effects of the treatment provided.

One could argue that the fact that each of the participants was diagnosed with a psychiatric condition might affect the generalizability of the results. However, this specific circumstance could also be considered as strengthening the external validity since psychiatric comorbidity, not least ADHD, is a known feature of IGD (1). Our results show that the given treatment appears to be effective in an actual clinical setting, among individuals with psychiatric comorbidity who could be considered particularly difficult to treat.

Given the limitations mentioned, the current study is to our knowledge the largest RCT to evaluate a CBT treatment for IGD among children and adolescents, and the findings are promising.

4.2. Conclusion

Relapse prevention was found to be superior to TAU in terms of reduction of IGD symptoms among children and adolescents in CAP clinics. The present study adds to a research field still in its infancy with further evidence that CBT, and specifically RP can be an effective treatment for IGD among children and adolescents.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the Swedish Ethical Review Authority (Ref 2019-04797, December 13, 2019). Subsequent amendments was approved (Ref 2021-05592-01, January 3, 2021; Ref 2022-01289-02, March 15, 2022). The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required from the participants or the participants' legal guardians/next of kin. Written informed consent was obtained for every

participant and caregivers' consents were required for children younger than 15 years in concordance with Swedish regulations.

Author contributions

FA: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Visualization, Writing – original draft. SK: Conceptualization, Investigation, Methodology, Project administration, Supervision, Visualization, Writing – review & editing. IE: Conceptualization, Methodology, Visualization, Writing – review & editing. ST: Conceptualization, Methodology, Visualization, Writing – review & editing. LF: Conceptualization, Methodology, Visualization, Writing – review & editing. AM: Conceptualization, Methodology, Visualization, Writing – review & editing. AH: Conceptualization, Methodology, Supervision, Validation, Writing – review & editing. EC-K: Conceptualization, Investigation, Methodology, Project administration, Resources, Software, Supervision, Visualization, Writing – review & editing.

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Conflict of interest

AH has an employment at Lund University, sponsored by the state-owned Swedish gambling operator Svenska Spel. AH also has research funding from the research council of the Swedish state monopoly for alcohol, Systembolaget AB. EC-K has funding from the research council of Svenska Spel. None of these bodies had any role in, or influence on, the present study. The authors alone are responsible for the content and writing of the paper.

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.

Publisher's note

References

1. González-Bueso V, Santamaría JJ, Fernández D, Merino L, Montero E, Ribas J. Association between internet gaming disorder or pathological video-game use and comorbid psychopathology: a comprehensive review. *Int J Environ Res Public Health*. (2018) 15:668. doi: 10.3390/ijerph15040668

2. Zamani E, Chashmi M, Hedayati N. Effect of addiction to computer games on physical and mental health of female and male students of guidance school in city of Isfahan. *Addict Health*. (2009) 1:98–104.

3. Krossbakken E, Pallesen S, Mentzoni RA, King DL, Molde H, Finserås TR, et al. A cross-lagged study of developmental trajectories of video game engagement, addiction, and mental health. *Front Psychol*. (2018) 9:2239. doi: 10.3389/fpsyg.2018.02239

4. Alshehri AG, Mohamed A. The relationship between electronic gaming and health, social relationships, and physical activity among males in Saudi Arabia. *Am J Mens Health*. (2019) 13:1557988319873512. doi: 10.1177/1557988319873512

5. World Health Organization (2018). International classification of diseases for mortality and morbidity statistics (11th revision). Available at: https://icd.who.int/browse11/l-m/en.

6. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders: DSM-5*, vol. 5. Washington, DC: American Psychiatric Association (2013).

7. Kim HS, Son G, Roh E-B, Ahn W-Y, Kim J, Shin S-H, et al. Prevalence of gaming disorder: a systematic review and meta-analysis. *Addict Behav*. (2022) 126:107183. doi: 10.1016/j.addbeh.2021.107183

8. Stevens MW, Dorstyn D, Delfabbro PH, King DL. Global prevalence of gaming disorder: a systematic review and meta-analysis. *Aust N Z J Psychiatry*. (2020) 55:553–68. doi: 10.1177/0004867420962851

9. Brand M, Rumpf H-J, King DL, Potenza MN, Wegmann E. Clarifying terminologies in research on gaming disorder and other addictive behaviors: distinctions between core symptoms and underlying psychological processes. *Curr Opin Psychol*. (2020) 36:49–54. doi: 10.1016/j.copsyc.2020.04.006

10. Richard J, Fletcher É, Boutin S, Derevensky J, Temcheff C. Conduct problems and depressive symptoms in association with problem gambling and gaming: a systematic review. *J Behav Addict*. (2020) 9:497–533. doi: 10.1556/2006.2020.00045

11. Petry NM, Zajac K, Ginley MK. Behavioral addictions as mental disorders: to be or not to be? *Annu Rev Clin Psychol*. (2018) 14:399–423. doi: 10.1146/annurev-clinpsy-032816-045120

12. Király O, Griffiths MD, Urbán R, Farkas J, Kökönyei G, Elekes Z, et al. Problematic internet use and problematic online gaming are not the same: findings from a large nationally representative adolescent sample. *Cyberpsychol Behav Soc Netw*. (2014) 17:749–54. doi: 10.1089/cyber.2014.0475

13. Zajac K, Ginley MK, Chang R. Treatments of internet gaming disorder: a systematic review of the evidence. *Expert Rev Neurother*. (2020) 20:85–93. doi: 10.1080/14737175.2020.1671824

14. Zajac K, Ginley MK, Chang R, Petry NM. Treatments for internet gaming disorder and internet addiction: a systematic review. *Psychol Addict Behav*. (2017) 31:979–94. doi: 10.1037/adb0000315

15. Gentile DA, Bailey K, Bavelier D, Brockmyer JF, Cash H, Coyne SM, et al. Internet gaming disorder in children and adolescents. *Pediatrics*. (2017) 140:S81–5. doi: 10.1542/peds.2016-1758H

16. Charlton JP, Danforth IDW. Distinguishing addiction and high engagement in the context of online game playing. *Comput Hum Behav*. (2007) 23:1531–48. doi: 10.1016/j.chb.2005.07.002

17. Marlatt G, Witkiewitz K. Relapse prevention for alcohol and drug problems. *Am Psychol*. (2004) 59:224–35. doi: 10.1037/0003-066X.59.4.224

18. King DL, Delfabbro PH. 7- treatment for IGD In: DL King and PH Delfabbro, editors. *Internet Gaming Disorder*. San Diego: Academic Press (2018). 163–99.

19. André F, Einarsson I, Dahlström E, Niklasson K, Håkansson A, Claesdotter-Knutsson E. Cognitive behavioral treatment for disordered gaming and problem gambling in adolescents: a pilot feasibility study. *Ups J Med Sci*. (2022) 127:e8693. doi: 10.48101/ujms.v127.8693

20. Kapetanovic S, Gurdal S, Einarsson I, Werner M, André F, Håkansson A, et al. Relapse prevention therapy for problem gaming or internet gaming disorder in Swedish child and youth psychiatric clinics: protocol for a randomized controlled trial. *JMIR Res Protoc*. (2023) 12:e44318. doi: 10.2196/44318

21. Singh G. Randomization made easy for small size controlled clinical trials. *JIAMSE*. (2006) 16:25–28.

22. Lemmens JS, Valkenburg PM, Peter J. Development and validation of a game addiction scale for adolescents. *Media Psychol*. (2009) 12:77–95. doi: 10.1080/15213260802669458

23. King DL, Chamberlain SR, Carragher N, Billieux J, Stein D, Mueller K, et al. Screening and assessment tools for gaming disorder: a comprehensive systematic review. *Clin Psychol Rev*. (2020) 77:101831. doi: 10.1016/j.cpr.2020.101831

24. Brunborg GS, Hanss D, Mentzoni RA, Pallesen S. Core and peripheral criteria of video game addiction in the game addiction scale for adolescents. *Cyberpsychol Behav Soc Netw*. (2015) 18:280–5. doi: 10.1089/cyber.2014.0509

25. Brunborg GS, Mentzoni RA, Melkevik OR, Torsheim T, Samdal O, Hetland J, et al. Gaming addiction, gaming engagement, and psychological health complaints among Norwegian adolescents. *Media Psychol*. (2013) 16:115–28. doi: 10.1080/15213269.2012.756374

26. André F, Håkansson A, Claesdotter-Knutsson E. Gaming, substance use and distress within a cohort of online gamblers. *J Public Health Res*. (2021) 11. doi: 10.4081/jphr.2021.2434

27. Lakens D. Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. *Front Psychol*. (2013) 4:863. doi: 10.3389/fpsyg.2013.00863

28. Menon J, Kandasamy A. Relapse prevention. *Indian J Psychiatry*. (2018) 60:S473–8. doi: 10.4103/psychiatry.IndianJPsychiatry_36_18

29. Mihara S, Higuchi S. Cross-sectional and longitudinal epidemiological studies of internet gaming disorder: a systematic review of the literature. *Psychiatry Clin Neurosci*. (2017) 71:425–44. doi: 10.1111/pcn.12532

30. Gentile DA, Choo H, Liau A, Sim T, Li D, Fung D, et al. Pathological video game use among youths: a two-year longitudinal study. *Pediatrics*. (2011) 127:e319–29. doi: 10.1542/peds.2010-1353

31. Van Rooij AJ, Schoenmakers TM, Vermulst AA, Van den Eijnden RJ, Van de Mheen D. Online video game addiction: identification of addicted adolescent gamers. *Addiction*. (2011) 106:205–12. doi: 10.1111/j.1360-0443.2010.03104.x

32. Li W, Garland EL, McGovern P, O'Brien JE, Tronnier C, Howard MO. Mindfulness-oriented recovery enhancement for internet gaming disorder in U.S. adults: a stage I randomized controlled trial. *Psychol Addict Behav*. (2017) 31:393–402. doi: 10.1037/adb0000269

33. Kim SM, Han DH, Lee YS, Renshaw PF. Combined cognitive behavioral therapy and bupropion for the treatment of problematic on-line game play in adolescents with major depressive disorder. *Comput Hum Behav*. (2012) 28:1954–9. doi: 10.1016/j.chb.2012.05.015

34. Li H, Wang S. The role of cognitive distortion in online game addiction among Chinese adolescents. *Child Youth Serv Rev*. (2013) 35:1468–75. doi: 10.1016/j.childyouth.2013.05.021

35. Park SY, Kim SM, Roh S, Soh M-A, Lee SH, Kim H, et al. The effects of a virtual reality treatment program for online gaming addiction. *Comput Methods Prog Biomed*. (2016) 129:99–108. doi: 10.1016/j.cmpb.2016.01.015

36. Lim CR, Harris K, Dawson J, Beard DJ, Fitzpatrick R, Price AJ. Floor and ceiling effects in the OHS: an analysis of the NHS PROMs data set. *BMJ Open*. (2015) 5:e007765. doi: 10.1136/bmjopen-2015-007765

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