

Article

Gaming, substance use and distress within a cohort of online gamblers

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Abstract

Background: The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) included Internet Gaming Disorder (IGD) as a tentative diagnosis and inquires for additional research. The research on gaming is inconsistent regarding measurement approach and diagnostic cut-offs. Some scholars suggest the core approach, accentuating some of the diagnostic criteria to avoid pathologizing harmless behaviour. Also, the co-occurrence of gaming and other addictions, gambling in specifically, is frequently reported but poorly understood. The present study aimed to explore gaming within a population of online gamblers in order to evaluate the core approach but also to investigate the possible co-occurrence of different addictions.

Design and methods: The present study is derived from material collected for a study on online gambling. The study addressed 1007 adult individuals from the general population who had gambled for money on an online casino site or an online betting site, on at least 10 occasions during the past 12 months.

Results: Both the level of distress and problem gambling increased as the severity of gaming increased. The co-occurrence of problems with alcohol, illicit drug use/prescription sedatives/strong painkillers and gambling was roughly 50% among the addictive gamers.

Conclusion: The present study suggests that the core approach manages to distinguish in severity of gaming in regards to interference and comorbidity. We also brought light to the occurrence of gaming within a population of gamblers and our results indicate that this specific group of addicted gamers are particularly burdened by co-occurrent addictive behaviours and severe distress.

Introduction

Behavioural or non-substance addictions have relatively recently been formally acknowledged.¹⁻³ “Substance-Related and Addictive disorders”, was included as a new diagnostic category;

in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), including not only alcohol and drug abuse but also gambling disorder. The DSM-5 acknowledges Internet gaming disorder (IGD) as a tentative diagnosis requiring additional research and clinical experience before inclusion as a formal disorder.¹ The 11th revision of the International Classification of Diseases (ICD 11) includes gaming disorder, defined as a gaming behaviour in sufficient severity to cause significant impairment in areas of function.³ IGD have been reported to be associated to numerous negative health correlates such as depression, anxiety, low self-esteem, sleeping disorder, loneliness and low social competence.⁴⁻⁶ Like other behavioural addictions such as gambling, IGD has been reported as related to substance addiction, however not entirely consistently and seemingly to a lesser extent.⁷⁻¹⁰ Marmet *et al.* reported on an association between game addiction and addiction to tobacco, alcohol and illicit drugs among adult men,⁸ while Turel *et al.* found that limited video gaming among adolescents could be protective against substance use while a habit of gaming 30 hours or more per week seemed to increase the risk.⁷ The co-occurrence of different addictions is a relatively established phenomenon.^{8,9,11,12} However, the research on co-occurrence of behavioural addictions and substance addictions as well as other behavioural addictions, is far from as thorough as the research regarding substance use. Gaming and gambling have been linked repeatedly although the relationship is poorly understood. A sharing of personality trait has been hypothesized but in most studies the association between addictive gaming and gambling is rather weak.^{9,10,13} Sanders *et al.* showed that most past year video gamers reported gambling in the past year and *vice versa* but the overlap between problematic levels of gaming and gambling was modest.⁹

Despite the growing recognition scientifically, theoretically as well as formally,^{1,3,14,15} debate and controversy remain in the IGD research field that still lacks consistency in terms of terminology, measurement approach, diagnostic cut-off and hence both prevalence rates and comorbidity estimates.^{4,16,17} Some scholars argue that an application of gaming disorder as a clinical diagnosis is

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 fifth edition of the DSM-5 included Internet Gaming Disorder as a tentative diagnosis and inquires for additional research. The research on gaming is inconsistent regarding measurement approach and diagnostic cut-offs. Some scholars suggest the “core approach”, which accentuates some of the diagnostic criteria in order to capture and differentiate truly pathological from harmless gaming behaviour. This study evaluates the core approach and explore gaming within a population of gamblers. The attention and interest of problems related to gaming and gambling in media, institutions such as schools, social services and other health institutions are huge. Despite this little is known about the co-occurrence of gaming and other addictions, gambling in specifically. Our findings are clinically relevant in screening and treatment of both problem gamers and problem gamblers.

premature and alarms about the risk of pathologizing normal behaviour.¹⁶ Others emphasize the responsibility to systematically distinguish between engagement and addiction in order to avoid such implications.¹⁸⁻²¹ While the DSM-5 suggests just over half of their criteria to be met when diagnosing IGD, some researchers suggest a ranking of the criteria in order to separate engaged, and possibly less destructive gaming from problematic or addictive gaming.^{1,4,8-21}

One of the most frequently used questionnaires for gaming addiction is the GAS (Game Addiction Scale).^{18,19,22-25} King *et al.* stated that the GAS was one of two scales that best provided clinical information for the diagnosing, in a review of different instruments assessing IGD,²³ a conclusion verified by Finserås *et al.*²⁵ The GAS was theoretically based on the DSM-5 criteria for pathological gambling; salience/preoccupation (exaggerated preoccupation in thoughts and habits), tolerance, mood modification, withdrawal, relapse, conflicts and problems.²² The criteria tolerance, mood modification and cognitive salience have been reported as associated to engagement rather than addiction while the opposite applies for the criteria withdrawal, relapse, conflicts and problems.^{20,21,26,27} Hence, Brunborg *et al.* suggested “the core approach”, a system that distinguishes engaged gamers from problem- and addicted gamers by accentuating the criteria withdrawal, relapse, conflict and problems in order to estimate a precise and relevant prevalence whereas a potential diagnosis of game addiction is expected to relate to interference and comorbidity.^{18,19} Brunborg *et al.* performed a factor analysis and managed to demonstrate that the Goodness of Fit Index of the core approach showed a good model fit, the two-factor model improved the model fit compared to the one-factor approach (without distinction between core and peripheral criteria),¹⁸ a finding that has been verified in a more clinical setting (André *et al.*, personal communication). The implication of the core approach has also been tested, showing that the problem- and addicted gamers show more negative health correlates than the engaged gamers.^{18,19,28} However, more research is needed in order to explore and possibly confirm whether the core approach manage to capture and differentiate truly pathological from harmless gaming behaviour.

Thus, we wanted to explore gaming within a population of online gamblers in order to evaluate the core approach but also to investigate the possible co-occurrence of different addictions.

The aim of this study was to:

- i) Explore the prevalence and characteristics of engaged-/problem- and addictive gaming within a population of gamblers.
- ii) Investigate whether engaged gamers, problem gamers and/or addicted gamers differentiate in terms of basic demographics, show disproportionate prevalence of distress and/or substance use and/or problem gambling.
- iii) Explore the clinical relevance of the core approach by charting whether the prevalence of substance use and/or distress and/or problem gambling increase with increasing gaming severity.

Design and Methods

The present study is derived from material collected in May 5 to 12, 2020. The material was primarily aimed for a study on online gambling in Sweden, published in December 2020.²⁹ The study addressed roughly 1,000 adult individuals from the general population who had gambled for money on an online casino site or an online betting site, on at least 10 occasions during the past 12 months.²⁹ As every single participant (n=1007) answered completely on the items on gaming, no individual was excluded. A

range from 3-18 individuals either abstained or answered incompletely to other items, those were declared missing in the analyses.

The material is based on a web survey addressing online gamblers in Sweden. The participants were recruited from members of a pre-existing web panel of the market survey company Ipsos. Members of the web panel regularly receive offers to participate in market surveys and political opinion polls but also to participate in research studies.^{29,30} Participants recruited from the same web panel were previously reported as skewed toward higher level of education and higher monthly income, compared to the general Swedish population.³⁰

The present project was reviewed by the Swedish Ethical Review Authority (Dnr: 2020-00364), which expressed no ethical concerns with the project and stated that it formally did not require ethical approval as it does not include personal data possible to link to an identified individual.

Measures

Game Addiction Scale

The 7-item GAS applies to gaming behaviour during the last 6 months. Lemmens *et al.* constructed the scale with the aim to capture components of addiction and the consequences thereof, namely: salience, tolerance, mood modification, relapse, withdrawal, conflict and problems.²² Each question covers 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.²²

The core approach was applied in order to distinguish levels of severity within the group of gamers. The individuals meeting all of the core criteria (relapse, withdrawal, conflicts and problems) composed the group addicted gamers. The respondents that endorsed 2-3 of the core criteria but none of the peripheral criteria (salience, tolerance, mood-modification) 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.^{18,19} The remaining participants comprised a fourth contrasting group, hereafter named remaining study participants (RSP). Accordingly, the RSP-group included both individuals with gaming behaviour below the cut off for engaged gaming and individuals without gaming behaviour.

Other possible addictive behaviours

Previous research suggests an association between IGD and both problem gambling and several substance addictions.⁷⁻¹⁰ We aimed to explore the prevalence of engaged- problematic and addictive gaming within a population of gamblers but also whether the gamers showed a disproportionate prevalence of tobacco use or problems with either alcohol, illicit drugs or gambling and further whether the prevalence increased as the level of severity increased. The respondents were asked if they were everyday smokers and if they ever felt the need to seek treatment due to problems with alcohol consumption, problem gambling or illicit drug use/prescription sedatives/strong painkillers. Binary variables of each substance item and the gambling item were created in which the endorsement of the question was coded as 1 and the denying was coded as 0.

Problem Gambling Severity Index

Problem Gambling Severity Index (PGSI) was used for further assessment of problem gambling.³¹ The 9-item PGSI scale is an established measure of gambling problems, summarized to a total score of 0-27.^{31,32} For the characteristics (Tables 1 and 2), 0 point was considered no-risk gambling, 1-2 low-risk gambling, 3-7 mod-

erate-risk gambling and 8 or more points were categorized as problem gamblers as suggested in previous research.^{21,30,32,33} The individuals that answered incompletely to the PGSI-items but still met the cut-off for the most severe degree of gambling were categorized as such. When using the PGSI score as continuous variables in ANOVA tests uncomplete responses were declared missing.

Psychological distress

IGD have been associated to various expressions of psychological health complaints.⁴⁻⁶ We aimed to address how the gamers estimated their psychological health and how that potentially would differ within the groups of gamers according to severity level. The respondent's psychological health was assessed through Kessler-6 distress scale. The 6-item inventory is rated on a 5-point Likert scale, summarized to a total score of 0-24. It is a condensed version of the Kessler-10 distress scale focusing on depressive and anxiety related symptomology with a purpose to function as a global measure of distress. It measures distress over a period of four weeks prior to administration of the test.^{34,35} The individuals that answered incompletely to the Kessler-6 items but still met the cut-off for the most severe degree of distress were categorized as such. When using the Kessler-6 score as a continuous variable in ANOVA tests uncomplete responses were declared missing.

Data analysis

Estimates of frequencies and percentages as well as statistical analysis were performed in SPSS (IBM SPSS statistics v. 27). Fisher's exact test was used for statistical association analysis of the prevalence of everyday smokers, reporting of problems with alcohol, illicit drugs prescription sedatives/strong painkillers, gambling, been prescribed medication/therapy for mental illness and the reporting of severe distress within each of the gaming categories and compared with the prevalence within the RSP-group and with the preceding gaming category. The continuous variables of Kessler score and PGSI score were used for ANOVA testing of differences in distress severity and gambling severity respectively between the gaming categories.

Results

Sample characteristics

The original material comprised 1007 individuals whereof no single individual abstained from answering items on gaming. Hence, 1007 individuals were included in this study. A range from 3-18 individuals either abstained or answered incompletely to

Table 1. Sample characteristics.^o

| | Total % (n) |
|--|-------------|
| Total | |
| Gender | 100 (1007) |
| Female | 25.5 (257) |
| Male | 74.5 (750) |
| Age | |
| 18-24 | 1.1 (11) |
| 25-29 | 4.5 (45) |
| 30-39 | 13.9 (140) |
| 40-49 | 16.4 (165) |
| 50-59 | 26.3 (265) |
| 60-69 | 21.6 (218) |
| 70 | 16.2 (163) |
| Daily tobacco use | |
| Yes | 35.5 (357) |
| No | 64.3 (647) |
| Missing/incomplete answer | 0.3 (3) |
| Alcohol consumption[#] | |
| Yes | 8.6 (87) |
| No | 90.3 (909) |
| Missing/incomplete answer | 1.1 (11) |
| Illicit drug use/prescription sedatives/strong painkiller # | |
| Yes | 4.7 (47) |
| No | 94.6 (953) |
| Missing/incomplete answer | 0.7 (7) |
| Gambling[#] | |
| Yes | 5.0 (50) |
| No | 94.6 (953) |
| Missing/incomplete answer | 0.4 (4) |
| Gambling severity[§] | |
| No-risk | 51.0 (514) |
| Low-risk | 22.8 (230) |
| Moderate-risk | 15.3 (154) |
| Problem gambling | 9.8 (99) |
| Missing/incomplete answer | 1.0 (10) |
| Level of distress[^] | |
| No or less than moderate | 47.4 (477) |
| Moderate | 41.7 (420) |
| Severe | 9.8 (99) |
| Missing | 1.1 (11) |
| Gaming severity[§] | |
| Engaged gamers | 2.4 (24) |
| Problem gamers | 4.7 (47) |
| Addicted gamers | 2.6 (26) |
| RSP (Remaining Study Participants) | 90.4 (910) |

^oThe listed data has partly been previously published by Håkansson et al.29; [#]have you ever felt the need to seek treatment due to problems with ...?; [§]according to the Problem Gambling Severity Index (PGSI); [^]according to the Kessler-6 score; [§]according to the Game Addiction Scale (GAS) – core approach.

Table 2. Characteristics. RSP (Remaining Study Participants) as the reference category for x2 comparisons. Background variables, proportion within gaming categories.

| | RSP | Engaged gamers | Problem gamers | Addicted gamers |
|------------------|------------|----------------|------------------------|-------------------------|
| Male gender | 75.8 (690) | 62.5 (15) | 70.2 (33) | 46.2 (12) ^{#§} |
| Age ≤ 30 | 4.2 (38) | 8.3 (2) | 21.3 (10) [#] | 23.1 (6) [#] |
| Single household | 24.6 (224) | 33.3 (8) | 23.4 (11) | 19.2 (5) |
| Working/studying | 61.5 (556) | 74 (18) | 61.7 (29) | 84.6 (22) ^{o§} |

^op<0.05; [#]p<0.001; [§]p<0.05 when compared to the preceding category (addicted vs problem gamers, etc.); [^]p<0.001 when compared to the preceding category.

other items, those were declared missing in the analyses. Sample characteristics are reported in Table 1. As Table 1 also shows, the prevalence of engaged gamers was 2.4%, problem gamers 4.7% and the addicted gamers composed 2.6% of the study population.

Background variables

Male gender was significantly underrepresented among addicted gamers, when compared to the RSP group. Age below 30 years was significantly overrepresented among both problem gamers and addicted gamers, when compared to the RSP group. Working/studying was significantly more common among the addicted gamers, both when compared to the RSP group and the problem gamers.

Interference/comorbidity

As Table 3 shows, daily tobacco use was significantly more common among both problem- and addicted gamers, when compared to the RSP group. The reporting of a need to seek treatment due to problems with both alcohol consumption, Illicit drug use/prescription sedatives/strong painkillers and gambling was significantly more common among both problem- and addicted gamers, when compared to the RSP group. The reporting of a need to seek treatment due to problems with both alcohol consumption, illicit drug use/prescription sedatives/strong painkillers and gambling was also significantly more common among addicted gamers, when compared to the problem gamers. The ANOVA testing, reported in Table 4, showed that the Kessler distress mean score significantly increased from the RSP-group to the group of engaged gamers and to the problem gamers, whereas no significant difference was seen between problem- and addictive gaming.

The ANOVA testing of PGSI score, reported in Table 4, showed that the PGSI mean score significantly differed between each of the gaming categories with an increase from the RSP-group to the group of engaged gamers, from the engaged to the problem gamers and from the problem to the addicted gamers.

The ANOVA testing of Kessler score, reported in Table 5, showed that the Kessler distress mean score significantly increased from the RSP-group to the group of engaged gamers and to the problem gamers, whereas no significant difference was seen between problem- and addictive gaming.

Discussion

The present study explored gaming within a population of gamblers in order to evaluate the clinical relevance of the core approach but also to investigate the possible co-occurrence of both substance use and problem gambling. The prevalence of addicted gamers within this specific population was 2.6%, mainly among the younger part of the population, more commonly working/studying and surprisingly many were female. The co-occurrence of problems with alcohol, illicit drug use/prescription sedatives/strong painkillers and gambling was high, roughly 50%, among the addicted gamers. Our results do support implication of the core approach as the occurrence of interference and comorbidity seem to be more heavily related to the core criteria than the peripheral. Specifically, the prevalence of problematic use of both alcohol consumption, illicit drug use/prescription sedatives/strong painkillers and gambling increased as the level of gaming severity increased. Also, both the level of distress and problem gambling

Table 3. RSP (Remaining Study Participants) as the reference category for x2 comparisons. Negative associates, proportion within gaming categories.

| | RSP | Engaged gamers | Problem gamers | Addicted gamers |
|---|------------|----------------|------------------------|-------------------------|
| Daily tobacco use | 33.6 (305) | 45.8 (11) | 48.9 (23) ^o | 72.0 (18) [#] |
| Alcohol consumption [§] | 6.2 (56) | 12.5 (3) | 30.4 (14) [#] | 58.3 (14) ^{#§} |
| Illicit drug use/prescription sedatives/strong painkillers [§] | 3.3 (30) | - | 12.8 (6) ^o | 44.0 (11) ^{#§} |
| Gambling [§] | 2.9 (26) | 8.3 (2) | 17.0 (8) [#] | 56.0 (14) ^{#^} |

^op≤0.05; [#]p≤0.001; [§]p≤0.05 when compared to the preceding category (addicted vs problem gamers, etc.); [^]p≤0.001 when compared to the preceding category; [§]have you ever felt the need to seek treatment due to problems with ...?

Table 4. One-way ANOVA. Tukey's-b post-hoc test. Dependent variable PGSI score.

| | N | Subset for alpha = 0.05 | | | |
|-----------------|-----|-------------------------|--------|--------|---------|
| | | 1 | 2 | 3 | 4 |
| RSP | 900 | 1.5011 | | | |
| Engaged gamers | 23 | | 3.5652 | | |
| Problem gamers | 46 | | | 8.9783 | |
| Addicted gamers | 25 | | | | 12.2000 |

Table 5. One-way ANOVA. Tukey's-b post-hoc test. Dependent Variable Kessler-6 score.

| | N | Subset for alpha = 0.05 | | | |
|-----------------|-----|-------------------------|--------|---------|---------|
| | | 1 | 2 | 3 | 4 |
| RSP | 894 | 4.2964 | | | |
| Engaged gamers | 24 | | 9.0833 | | |
| Problem gamers | 46 | | | 12.2174 | |
| Addicted gamers | 25 | | | | 14.0000 |

increased as the severity of gaming increased.

IGD has frequently been reported as related to problem gambling, both regarding shared personality traits but also as behaviours with similar demographic features and health problems.⁸⁻¹⁰ Thus, one could have expected the prevalence of gamers within this population of online gamblers to be higher than within the average population. The fact that a majority of this study sample was 50 years or older could be an explanation to the fact that the prevalence of addicted gamers was relatively low, as IGD is known to be associated with young age,¹⁷ an association supported by our results as both the problem- and addictive gamers showed a disproportionately high prevalence of individuals younger than 30 years. This association is also a possible explanation to the disproportionately high prevalence of individuals working/studying within the group of addicted gamers.

The male predominance in IGD is frequently reported.^{4,17} Within this specific sample however, female gender was significantly overrepresented among the addicted gamers. As gender differences among gamblers is evident but poorly understood,³⁶ this specific result should be interpreted with caution. However, Håkansson who explored the same cohort, showed that while a minority of the participating online gamblers were female, they exhibited more severe gambling behaviour and a higher prevalence of problem gambling.³⁵ Possibly, the threshold is higher for women to participate in settings such as the current, than it is for men. The association between problem gambling and gaming⁸ and the fact that the participating women showed a higher frequency of problem gambling³³ could be an explanation to our finding of a female predominance among the addicted gamers.

As previously mentioned, Turel *et al.* found that limited video gaming among adolescents could be protective against substance use while a habit of gaming 30 hours or more per week seemed to increase the risk.⁹ Our results suggest that the prevalence of daily tobacco use and the reporting of a need to seek treatment due to problems with both alcohol consumption, illicit drug use/prescription sedatives/strong painkillers and gambling is significantly more common among both problem- and addicted gamers but not engaged gamers, when compared to the RSP group. The engaged gamers, in our material, did not show a disproportionately low prevalence of these substances but our findings do somewhat support the result presented by Turel *et al.* Also, the fact that the prevalence of individuals that reported that they ever felt the need to seek treatment due to problems with both alcohol consumption, illicit drug use/prescription sedatives/strong painkillers and gambling was more common among addicted- than problem gamers, support the suggestion that the core approach manage to discriminate between different levels of gaming severity.^{18,19,28} After all, as the severity in gaming increases the interference and comorbidity is expected to increase. Interestingly, the addicted gamers showed a very high prevalence of both daily tobacco use (72%), problems with alcohol (58%), Illicit drug use/prescription sedatives/strong painkillers (44%) and gambling (56%). Marmet *et al.* also showed an increased prevalence of substance use and gambling among individuals with IGD but their prevalence of corresponding problem behaviours was much lower (tobacco: 28.9%, alcohol: 13.7%, illicit drug use: 17.3% gambling: 5.2%).⁸ The high prevalence of gamblers is somewhat expected considering the study setting - the participation required gambling for money on at least 10 occasions during the past 12 months. However, it is remarkable that the co-occurrence of both daily tobacco use and problems with alcohol and illicit drug use/prescription sedatives/strong painkillers was so frequent among both problem- and addicted gamers. One could argue that it could be the gambling and not the gaming that brings the co-occurrent substance use but even though Marmet *et al.*

reported higher corresponding prevalence numbers among the gamblers they were lower than ours (tobacco: 36.8%, alcohol: 30.3%, illicit drugs: 15.8%).⁸ Possibly, the group of gamers that also gamble at least occasionally are particularly prone to engage in other types of addictive behaviours as well. Such conceivable association warrant additional research as it would be clinically relevant in screening and treatment of both problem gamers and problem gamblers.

The ANOVA test of PGSI score showed that the gambling severity index closely followed the level of gaming severity. The test showed that the average engaged gamer met the cut-off for moderate-risk gambling (3-7 points) while the average problem- and addicted gamer met the cut-off for problem gambling (≥ 8).³⁰⁻³³ Also, the addicted gamers scored significantly higher than the problem gamers, bringing further legitimacy to the core approach. This finding strengthens the image of gaming and gambling as highly related behaviours, at least among this specific population of online gamblers.

The Kessler distress score increased as the level of gaming severity increased. The problem- and addicted gamers scored significantly higher than the engaged gamers, corresponding to the results presented by Brunborg *et al.* whom reported that the problem and addicted gamers had greater risk of various psychological health complaints (feeling low/irritable/in a bad mood/nervous/tired/exhausted and afraid) than the engaged gamers.¹⁹ Further, the fact that the mean Kessler score was 14 among the addicted gamers is noticeable as a score of 13 or more should be interpreted as severe distress.^{34,35} Hence, our findings indicate that the average addicted gamer experience severe distress.

This study had several limitations. First, the measures used for this study were based on self-reported data collected through a market survey company. The accuracy of the data could be limited by recall bias and the generalizability could be limited by various motivation to engage in answering questionnaires among different groups.³⁷ Second, the cross-sectional design of the study does not allow for conclusions to be drawn regarding causation since such would require longitudinal investigation. For instance, in regards to this specific sample of online gamblers it would be of relevance to explore whether gaming or gambling appeared prior to the one another. Also, the association found between gaming and gambling could be questioned considering the cohort of online gamblers. However, a majority of the participants did not even meet the cut-off for low-risk gambling and the increase in PGSI score seen over levels of gaming severity should not be diminished, yet interpreted with caution. One other limitation is the measures used for substance use. The respondents were asked whether they ever felt the need to seek treatment due to problems with either alcohol or illicit drug use/prescription sedatives/strong painkillers and the exact bearing of that could obviously differ between individuals. Future research could address co-occurrent addictions with either established screening instruments or laboratory indicators of various substance consumptions.

Conclusion

The present study provides an evaluation of the core approach confirming that the method manages to distinguish in severity of gaming in regards to interference and comorbidity, at least within this specific sample of online gamblers. We also brought light to the occurrence of gaming within a population of online gamblers and our results indicate that this specific group of addicted gamers are particularly burdened by co-occurrent addictive behaviours and severe distress. More research is needed to understand the relation-

ship between gambling and gaming, other co-occurrent addictive behaviours but also gender bound discrepancies.

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

Conflict of interest: Anders Håkansson has a position as a researcher in addiction medicine at Lund University which is sponsored by the Swedish state-owned gambling operator AB Svenska Spel, as part of AB Svenska Spel's responsible gambling policies. He also has research funding from the research council of AB Svenska Spel, and from the research council of the Swedish alcohol monopoly (Systembolaget AB) and from the Swedish Sports Federation (Riksidrottsförbundet). All authors have funding from the research council of AB Svenska Spel. None of these organizations have been involved in or had any influence on any part of the present work.

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Ethics approval and consent to participate: The present project was reviewed by the Swedish Ethical Review Authority (Dnr: 2020-00364), which expressed no ethical concerns with the project and stated that it formally did not require ethical approval as it does not include personal data possible to link to an identified individual. The patients/participants provided their written informed consent to participate in this study.

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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