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## Problem gambling and gaming in elite athletes

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## ABSTRACT

**Background:** High-level sports have been described as a risk situation for mental health problems and substance misuse. This, however, has been sparsely studied for problem gambling, and it is unknown whether problem gaming, corresponding to the tentative diagnosis of internet gaming disorder, may be overrepresented in athletes. This study aimed to study the prevalence and correlates of problem gambling and problem gaming in national team-level athletes.

**Methods:** A web-survey addressing national team-level athletes in university studies (survey participation 60%) was answered by 352 individuals (60% women, mean age 23.7), assessing mental health problems, including lifetime history of problem gambling (NODS-CLIP) and problem gaming (GASA).

**Results:** Lifetime prevalence of problem gambling was 7% (14% in males, 1% in females,  $p < 0.001$ ), with no difference between team sports and other sports. Lifetime prevalence of problem gaming was 2% (4% in males and 1% in females,  $p = 0.06$ ). Problem gambling and problem gaming were significantly associated ( $p = 0.01$ ).

**Conclusions:** Moderately elevated rates of problem gambling were demonstrated, however with large gender differences, and interestingly, with comparable prevalence in team sports and in other sports. Problem gaming did not seem more common than in the general population, but an association between problem gambling and problem gaming was demonstrated.

## 1. Introduction

In recent years, mental health issues specific to athletes, including addictive disorders, have been highlighted. In general, it has been suggested that the prevalence of mental health problems in elite sports seems to mirror society as a whole (Rice et al., 2016), however, although a sparsely studied area, participation in team sports has been described as a particular risk factor of addictive behaviour (Grunseit et al., 2012). More specifically, higher prevalence of risky drinking in athletes was explained by higher rates of risk-taking and sensation-seeking behaviour (Mastroleo et al., 2013). Furthermore, the context of high-level sports has been described as a potential risk situation for hazardous use of alcohol and other substances (Veliz et al., 2016, 2017). Participating in youth sports has been associated with increased alcohol problems among adolescents, although associations are complex and may be related to other characteristics in a young individual's life (Martin, 1998; Mays et al., 2010). Somewhat in contrast to this notion, data has demonstrated a healthier life-style and less substance use in high school students participating in sports, compared to non-

participants (Pate et al., 2000). Altogether, it has been suggested that the context of competitive sports increases vulnerability to addictive behaviours, however data is so far limited and inconsistent.

Gambling and problem gambling, a condition associated with financial consequences and severe mental health complications (Ronzitti et al., 2018), may intuitively have an association with a typical competitive mind-set that is fostered and seen as a normal and desirable part of sports. This potential link between sports and gambling has frequently been reported in media revealing sports stars and their addictive gambling, such as the Swedish multiple Olympic and world champion medallist in table tennis, Jan-Owe Waldner (Moldovan, 2011). Altogether, several factors suggest that the context of competitive sports may be a potential risk factor for problem gambling. More recently, there has been an increasing involvement of gambling marketing in sports (Lopez-Gonzalez and Griffiths, 2018); gambling operators have been reported to represent some of the most common sponsorships in national and club level sports (Maher et al., 2006), and this includes the involvement of well-known athletes in gambling-related marketing. Also, the age span of elite level athletes (i.e., the years

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they compete at national or international level) typically corresponds well to the age where problem gambling has been found to be the most pronounced (Allen & Hopkins, 2015; Abbott et al., 2014), and personality traits of competitiveness have been suggested to be a risk factor of problem gambling (Harris et al., 2015).

However, despite this potential link between sports and gambling, studies in the area have been few. Stillman and co-workers reported that problem gambling may be more prevalent in athletes than in the general population (Stillman et al., 2016), and higher in male athletes than in their female counterparts (Huang et al., 2010). Grall-Bronnec and colleagues reported 8.2% of lifetime prevalence of problem gambling in European professional athletes in a number of team sports (Grall-Bronnec et al., 2016), and this can be compared to the prevalence of problem gambling in the general population, reported to be between 0.7 and 6.5% world-wide, although definitions and instruments have varied across studies (Calado and Griffiths, 2016). However, no research has studied whether problem gambling differs between team sports and individual sports, a relevant research question based on the large involvement of gambling marketing in particularly team sports (Maher et al., 2006).

In the Diagnostic Systematic Manual (DSM-5), in 2013, internet gaming disorder was introduced as a tentative disorder added to a list of disorders requiring more research (American Psychiatric Association, 2013), and the recent inclusion of gaming disorder in the International Classification of Diagnoses (ICD-11, World Health Organization, 2018) further calls for an increased attention on problem gaming in epidemiological and clinical research. Problem gaming has been demonstrated to be associated with negative health outcomes (Mentzoni et al., 2011; Vadlin et al., 2016). Limited research indicates that problem gaming may occur in roughly 3–4% in adolescents and young adults, although probably with large age differences within that group (Mentzoni et al., 2011; Thoresen Wittek et al., 2016). While the study of problem gambling in athletes has been sparse, no studies have addressed whether elite athletes' gaming and problematic gaming may be more common than in the general population.

Based on the research gaps in this area, we aimed to study the prevalence of both gambling and gaming in elite athletes, and whether these problem behaviours may be related to the type of sport, as well as to other potential risk factors, including gender, treatment seeking for mental health problems and hazardous drinking.

## 2. Materials and methods

The present study was part of a larger project addressing mental health in elite athletes. An online survey was sent to individuals who applied for a student scholarship for university studies and have a history of elite sport and national team participation; thus, subjects addressed in the present study are athletes in sports included in the Swedish Sports Federation, participate on national team level, and conduct post-high school studies. The study and its questionnaire were completely separated from the application process, and only used this for the selection of e-mail addresses for recruitment. The definition of an elite athlete has been under debate (Swann et al., 2015). In the present study elite athletes are defined by a history of representing the national team in their sports.

The study was distributed electronically as a web survey. In total, 60.2 (n = 352) percent of subjects who received an e-mail invitation (N = 584) participated in the survey. The overall project addressed psychological distress and mental health problems in a number of aspects. The present study focuses on problematic gambling and gaming, and their correlates, including treatment seeking for mental health problems and hazardous drinking, representing the measure of substance-related addictive behaviour assumed to be the most common in the present setting. The present study included the following assessments:

Problem gambling, measured with the NODS-CLiP (Toce-Gerstein

et al., 2009). Problem gambling was defined as the endorsement of one or more of the three items. The NODS-CLiP has been described to have high sensitivity (0.94–0.99) and specificity (0.88–0.95) for the detection of problem gambling (Toce-Gerstein et al., 2009).

Problem gaming was measured with the Gaming Addiction Scale Adolescents (GASA, Lemmens et al., 2009), which in its present version includes seven items, theoretically addressing seven aspects of the tentative diagnostic criteria for the internet gaming disorder (American Psychiatric Association, 2013). Relatively few studies have reported an established cut-off separating problem gaming from non-problematic gaming. In the present study, we used both the absolute value of the added item scores, and a suggested cut-off for problem gaming, i.e. the endorsement of four or more criteria (at least 3 out of 5 on a Likert scale). A more concise definition of a probable gaming disorder has been applied in the literature, comprising the fulfilment of all seven items, but due to the low number of subjects with a problematic gaming behaviour in the present study, this narrower definition was dropped. The GASA has demonstrated high construct validity (Lemmens et al., 2009) and an internal consistency of 0.72–0.86 in different samples (Festl et al., 2012; Lemmens et al., 2009), and the scale has been used for the screening of problem gaming in a number of studies (Festl et al., 2012; Lloret Irlas et al., 2017; Mentzoni et al., 2011).

Hazardous alcohol drinking was measured with the AUDIT-C (Bush et al., 1998), the three-item short version of the Alcohol Use Disorder Identification Test (Saunders et al., 1993), describing three aspects of consumption. In the present study, we applied established cut-off values for hazardous drinking from these three consumption items; five points or more for men and four points or more for women. AUDIT-C has demonstrated an internal consistency of 0.80 and predictive value for the detection of alcohol use disorders comparable to that of the full AUDIT (Rumpf et al., 2013).

One item included in the study described whether an individual had sought treatment for a mental health problem. In addition, age, gender, and the type of sport were included. Type of sport was intended to separate team sports from individual sports, thereby comparing the type of athletes assessed in a previous study (Grall-Bronnec et al., 2016) to athletes who compete individually.

The study was approved by the regional ethics committee, Stockholm, Sweden (file number 2017/270-31/4).

## 3. Results

A total of 352 subjects responded to the questionnaire and were included in the study (60% female, n = 211). Respondents had an average age of 23.7 years (std dev 3.18 years, median 23 years, inter-quartile range 21–26, range 18–36 years). In total, 95% of participants reported to be currently active in their sport (n = 333), whereas the remaining participants terminated their activity earlier in 2017 or in 2016. A majority (77%, n = 271) reported representing an individual sport and the remaining represented a team sport. Participants represented a very wide range of sports; among the most common types of sports represented were athletics (11%, n = 38), cross-country skiing (5%, n = 17), martial arts (5%, n = 16), handball (4%, n = 15), canoeing (4%, n = 14), and alpine skiing (4%, n = 13). Eleven percent (n = 37) represented an aesthetic sport (e.g. gymnastics), and 3% (n = 11) represented a Paralympic sport.

Twenty-nine percent (n = 103) had ever sought treatment for any kind of mental health problems. Median AUDIT-C score in the data set was 3 (inter-quartile range 1–4, range 0–8), and 26% (n = 91) reached the cut-off for hazardous drinking.

Seven percent (n = 23) were problem gamblers, with a significant gender difference (p < 0.001, Fisher's exact test); 14% of men (n = 20) and 1% of women (n = 3). Among the 23 subjects endorsing at least one of the CLiP criteria, 11 endorsed only one criterion, 10 endorsed two criteria, and two individuals endorsed all three criteria. Problem gamblers did not differ from the rest of the sample with respect to age

**Table 1**  
Variables tested for association with problem gambling. Univariate analyses.

	Problem gambling (n = 23), % (n)	No problem gambling (n = 229), % (n)	p	Odds ratio (OR) <sup>c</sup>
Male gender	87 (20)	37 (121)	< 0.001 <sup>a</sup>	11.46 (3.34–39.36)
Age	24 (22–28) <sup>d</sup>	24 (22–27) <sup>d</sup>	0.87 <sup>b</sup>	0.99 (0.87–1.14)
Team sport athletes	22 (5)	23 (71)	0.88 <sup>a</sup>	1.08 (0.39–3.01)
Ever sought treatment	22 (5)	30 (98)	0.41 <sup>d</sup>	1.53 (0.55–4.23)
Hazardous drinking	30 (7)	26 (84)	0.60 <sup>a</sup>	1.28 (0.51–3.21)
AUDIT-C score	3 (2–5) <sup>d</sup>	3 (1–4) <sup>d</sup>	0.41 <sup>b</sup>	1.22 (0.97–1.54)
GASA score	7 (7–14) <sup>d</sup>	7 (7–8) <sup>d</sup>	0.10 <sup>b</sup>	1.22 (1.10–1.36)
Problem gaming	13 (3)	2 (5)	0.01 <sup>c</sup>	9.72 (2.17–43.60)

<sup>a</sup> Chi-square test.

<sup>b</sup> Mann-Whitney *U* test.

<sup>c</sup> Binary logistic regression, unadjusted.

<sup>d</sup> Continuous variables reported as median (inter-quartile range).

( $p = 0.87$ ), having sought treatment for mental health problems ( $p = 0.41$ ), hazardous alcohol drinking ( $p = 0.60$ ), absolute AUDIT-C value ( $p = 0.41$ ), or across sports categories ( $p = 0.88$ ), whereas it was significantly associated with problem gaming ( $p = 0.01$ ), although not with the absolute GASA score ( $p = 0.10$ , Table 1). In logistic regression, including the only two variables significantly associated with problem gambling in the univariate analyses, male gender (OR 10.56 [3.05–36.53]) and problem gaming (OR 6.19 [1.25–30.68]) remained significantly associated with problem gaming, when controlling for one another.

The median GASA score in the data set was 7 (inter-quartile range 7–8, range 7–22), and significantly higher in men (mean 9.1, median 8) than in women (mean 7.6, median 7,  $p < 0.001$ , Mann-Whitney *U* test). GASA was not significantly higher in problem gamblers (mean 10.4, median 7) than in the remaining sample (mean 8.1, median 7,  $p = 0.10$ ). The prevalence of problem gaming was 2% ( $n = 8$ ), 4% in males ( $n = 6$ ) and 1% in females ( $n = 2$ ,  $p = 0.06$ , Fisher's exact test). Problem gamblers were significantly more likely to be problem gamblers ( $p = 0.01$ ), and the association with male gender nearly reached statistical significance ( $p = 0.06$ ). As only one variable significantly separated problem gamblers from other participants, no multivariate analysis was carried out (Table 2).

#### 4. Discussion

The present study demonstrated a moderately elevated prevalence of problem gambling in this population of elite athletes applying for a post-high school scholarship. One important finding is the particularly large difference in problem gambling prevalence between men and women. Moreover, the results indicated an association between video game behaviour, including problem gaming, and problem gambling, whereas problem gaming did not appear to be more common than in the general population.

The present study identified 7% of participants as problem

gamblers. Despite difficulties in comparison across studies and settings, this prevalence is at the upper end of the range reported from the general population, where lifetime rates of problem gambling have ranged from 0.7 to 6.5% (Calado and Griffiths, 2016). Previous research in the Swedish context with general population surveys, although using other instruments, reported lifetime prevalence of problem gambling to be 2.9 to 4.5% (Abbott et al., 2014, 2018). Although, based on general population data that indicate a higher prevalence in young adults (Abbott et al., 2014), the prevalence figure of the present study may well compare to the general population in corresponding age groups. Also, the present prevalence may be comparable to that reported by Grall-Bronnec (current or past problem gambling in 8.2% of professional athletes, Grall-Bronnec et al., 2016).

The gender difference in problem gambling in the present study is noteworthy; 14% of males and only 1% of females endorsed criteria of problem gambling. Gender differences in gambling behaviour and in problem gambling prevalence are well-known in the general population and in clinical settings. However, although the absolute numbers are low, the prevalence gap between males and females in the present study appears to be particularly large compared to other cohorts assessed for problem gambling, and other and larger studies should study whether this large gender difference in athletes can be confirmed. Treatment-seeking individuals with gambling disorder in the present setting demonstrate a 4-to-1 male/female ratio (Håkansson et al., 2017), and clear differences in the general population prevalence have been seen (Blanco et al., 2006; Ekholm et al., 2014; Husky et al., 2015; Sherba and Martt, 2015), with the prevalence among men being around three times higher than in women (Blanco et al., 2006; Husky et al., 2015; Sherba and Martt, 2015). Indeed, young males have been described as a particular risk group with respect to problem gambling (Götestam and Johansson, 2003), also corresponding to the age groups in which most elite athletes are active, and likewise, women are known to have a later onset of gambling than men do, possibly contributing to the large difference in prevalence in younger adults (Diez et al., 2014; Grant et al.,

**Table 2**  
Variables tested for association with problem gaming. Univariate analyses.

	Problem gaming (n = 8), % (n)	No problem gaming (n = 344), % (n)	p	Odds ratio (OR) <sup>c</sup>
Male gender	75 (6)	39 (135)	0.06 <sup>a</sup>	4.64 (0.92–23.35)
Age	25 (19.5–26.75) <sup>d</sup>	23 (21–26) <sup>d</sup>	0.48 <sup>b</sup>	1.01 (0.81–1.25)
Team sport athletes	13 (1)	23 (80)	0.69 <sup>a</sup>	2.12 (0.26–17.50)
Ever sought treatment	13 (1)	30 (102)	0.45 <sup>a</sup>	2.95 (0.36–24.29)
Hazardous drinking	50 (4)	25 (87)	0.21 <sup>a</sup>	2.95 (0.72–12.06)
AUDIT-C score	3.5 (1.5–5) <sup>d</sup>	3 (1–4) <sup>d</sup>	0.54 <sup>b</sup>	1.14 (0.78–1.68)
Problem gambling	38 (3)	6 (20)	0.01 <sup>a</sup>	9.72 (2.17–43.60)

<sup>a</sup> Fisher's exact test.

<sup>b</sup> Mann-Whitney *U* test.

<sup>c</sup> Binary logistic regression, unadjusted.

<sup>d</sup> Continuous variables reported as median (inter-quartile range).

2012; Grant and Kim, 2002; Tavares et al., 2001). However, the 14% prevalence reported in males in the present study should lead stakeholders in the world of sports to address particularly the risk and potential treatment needs in young male athletes with respect to gambling.

One important – and somewhat unexpected – finding is the lack of difference in problem gambling between athletes in team sports, such as team ball sports, and other sports. Previous data in this area is scarce. Grall-Bronnec's study identified that betting on your own team was a risk factor of problem gambling and although that study included only athletes in team ball sports, this association still could be suspected to increase gambling problems more in team players (Grall-Bronnec et al., 2016), but no studies have addressed solely elite athletes on a national team level. Previous data has indicated that, e.g., binge alcohol drinking, smoking and involvement in alcohol commercials are more common in team sports than in individual sports (Grunseit et al., 2012), and the present study rather indicates that this would not necessarily be the case for gambling. The proportion of problem gamblers in team sports and individual sports was close to identical, making it unlikely that a difference would be seen even in a larger data set. Altogether, in regard of practical use of the data it should be acknowledged that the results from the present study suggest that male athletes, regardless of the type of sport, may be at risk for problematic gambling, and these issues should be raised also in sports less typically associated with a high involvement of gambling marketing.

Likewise, in the present study, no association was seen between problem gambling and hazardous alcohol drinking. This is a somewhat surprising finding, since, Huang and co-workers presented a clear association between alcohol drinking and problem gambling in high school athletes (Huang et al., 2007, 2011). In young individuals in the general population, alcohol drinking and problem gambling are associated (Barnes et al., 1999; Buja et al., 2017; Peters et al., 2015). In the general population, it has been described that the association between problem gambling and alcohol can be seen only in men (Pilver et al., 2013). Due to the low number of female problem gamblers in the present study, it cannot be fully tested whether gender interacts with this lacking association, but we carried out a post hoc sub-analysis of men only, still demonstrating a clear lack of significant association between gambling and alcohol ( $p = 0.43$ ). Drinking patterns in athletes may be rather complex, possibly with a seasonal pattern affecting alcohol intake during the competitive season. Interestingly, in contrast, the literature suggests that young athletes actually have a higher alcohol consumption than their non-athlete counterparts (Diehl et al., 2012). It remains to be understood whether the lack of association is unique to the present group of athletes recruited among applicants for a post-high school scholarship, or whether it can be confirmed in other groups of elite athletes.

While this is – to the best of the authors' knowledge – the first study describing problem gaming in a sample of elite athletes, the prevalence of problem gaming was comparable to general population data. Two Norwegian general population surveys have demonstrated prevalence rates of problem gaming of four (Mentzoni et al., 2011) and 3%, respectively, although with a clearly higher risk in younger age groups (Thoresen Wittek et al., 2016). Likewise, in a German population, and with the same instrument as here, in the age group most comparable to the present study (19–39 years), 3.3% of video gamers were classified as problem gamers (Festl et al., 2012). In the meta-analysis of Ferguson and colleagues a prevalence estimate of 3% was reported, although including studies aiming to assess the diagnostic level of gaming rather than a broader problem description, such that the 2% prevalence of the present finding is likely to be lower than or in the lower range of available data (Ferguson et al., 2011). Altogether, although few comparison groups are available, the gaming data available from the present study does not demonstrate an elevated prevalence of problem gaming in elite athletes.

In addition to male gender, the only variable separating problem

gamblers from other subjects in the study was the association with gaming addiction scores. The potential link between problematic video gaming and problem gaming for money is a novel area of research, so far with relatively limited data. In adolescents, population data has indicated that an association between gambling and gaming on its own is unlikely, and that the statistical association may be related mainly to confounding variables (Delfabbro et al., 2009). Moreover, recent data has highlighted the fact that problem gaming and problem gambling represent different constructs and that risk factors are partly different (Mallorquí-Bagué et al., 2017). In the present study, gambling and gaming were indeed associated, also when controlling for gender. While the prevalence estimate among this cohort of athletes was low for problem gaming, more research is needed in order to deepen the understanding of the potential interplay between these two phenomena in this specific context where a wining mind-set is fostered, reinforced and praised.

The present study has a number of limitations. One limitation is the use of self-reported health variables rather than a more objective or face-to-face assessment. Although novel in its design with respect to problem gambling and the inclusion of problem gaming in the study of elite athletes' health, it is limited by the low prevalence of a positive problem gaming screen, meaning that the study would have needed to be larger in order to demonstrate risk factors for problem gaming in this kind of population. Also, in view of the results presented here, more gambling-specific measurements would have been valuable to include, such as the money or time spent on gambling. In addition, the present study addresses elite athletes, but only those who applied for a scholarship for studying post high-school. This implicate that the cohort of athletes included may be biased towards a higher level of academic interest and performance, such that participants may be more highly motivated than other groups of athletes. More research is needed in order to study subgroups of athletes with respect to the risk of problem gambling and problem gaming, with larger cohorts allowing for a larger number of comparisons.

## 5. Conclusions

In conclusion, the present study, from a larger project focusing on elite athletes' mental health, demonstrated rates of problem gambling comparable to those of the general population. It demonstrated a strong association between male gender and problem gambling, and an association with problematic video gaming, although not with the level of gaming behaviour itself, and without association with hazardous alcohol drinking or treatment for psychological distress. The measure of problem gaming in athletes is a novel approach, but its prevalence in the present setting was low, and associated mainly with problem gambling. Although comparable to general population data, the prevalence of problem gambling in elite athletes is at the upper end of general population prevalence estimates, and with a large gender difference. Involvement in high-level sports may need to be addressed in clinical settings, as well as the link between problem gaming and problem gambling.

## Author disclosure

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Parts of the research work was financed by Dr. Håkansson's general research funding, which is provided from Svenska spel AB (the state-owned Swedish gambling monopoly) to Lund University. This funding is general and unrelated to the present particular study. The funding source had no influence on, and no involvement in, the present study.

Parts of the research work was financed by Swedish Sport Federation, the umbrella organization of sports associations in Sweden. This organization was partly involved in the overall background idea of the research, and the co-author GK is employed partly by this

organization. However, the organization was not involved in the interpretation of data or the results.

### Contributors

GK and CÅ carried out the preparations of the overall research project, in close collaboration with AH, who is the main responsible for the current sub-study. CÅ arranged the actual data collection, and AH carried out statistical analyses and wrote the major part of the paper. GK and CÅ made significant contributions to the text. All three authors contributed significantly to the research idea and the interpretations of findings.

### Conflicts of interest

The authors report no conflicts of interest related to the present research project. AH holds a position as a researcher which is funded by Svenska spel AB (the state-owned Swedish gambling monopoly), as part of that company's responsible gambling policy, and in close collaboration with Lund University. This funding is general and unrelated to the present particular study. The funding source had no influence on, and no involvement in, the present study.

### References

- Abbott, M. W., Romild, U., & Volberg, R. A. (2014). Gambling and problem gambling in Sweden: Changes between 1998 and 2009. *Journal of Gambling Studies*, 30, 985–999.
- Abbott, M., Romild, U., & Volberg, R. (2018). The prevalence, incidence, and gender- and age-specific incidence of problem gambling: Results of the Swedish longitudinal gambling study (Swelogs). *Addiction*, 113, 699–707.
- Allen, S. V., & Hopkins, W. G. (2015). Age of peak competitive performance of elite athletes: a systematic review. *Sports Medicine*, 45, 1431–1441.
- American Psychiatric Association (2013). *Diagnostic and statistical manual of psychiatric disorders*. Arlington, VA: American Psychiatric Publishing.
- Barnes, G. M., Welte, J., Hoffman, J. H., & Dintcheff, B. A. (1999). Gambling and alcohol use among youth: Influences of demographics, socialization, and individual factors. *Addictive Behaviors*, 24, 749–767.
- Blanco, C., Hasin, D. S., Petry, N., Stinson, F. S., & Grant, B. F. (2006). Sex differences in subclinical and DSM-IV pathological gambling: Results from the National Epidemiologic Survey on alcohol and related conditions. *Psychological Medicine*, 36, 943–953.
- Buja, A., Lion, C., Scioni, M., Vian, P., Genetti, B., Vittadello, F., ... Baldo, V. (2017). SOGS-RA gambling scores and substance use in adolescents. *Journal of Behavioral Addictions*, 6, 425–433.
- Bush, K., Kivlahan, D. R., McDonnell, M. B., Fihn, S. D., & Bradley, K. A. (1998). The AUDIT alcohol consumption questions (AUDIT-C): An effective brief screening test for problem drinking. *Archives of Internal Medicine*, 158, 1789–1795.
- Calado, F., & Griffiths, M. (2016). Problem gambling worldwide: An update and systematic review of empirical research (2000–2015). *Journal of Behavioral Addictions*, 5, 592–613.
- Delfabbro, P., King, D., Lambos, C., & Pugliese, S. (2009). Is video-game playing a risk factor for pathological gambling in Australian adolescents? *Journal of Gambling Studies*, 25, 391–405.
- Diehl, K., Thiel, A., Zipfel, S., Mayer, J., Litaker, D. G., & Schneider, S. (2012). How healthy is the behavior of young athletes? A systematic literature review and meta-analyses. *Journal of Sports Science and Medicine*, 11, 201–220.
- Diez, D., Aragay, N., Soms, M., Prat, G., & Casas, M. (2014). Male and female pathological gamblers: Bet in a different way and show different mental disorders. *The Spanish Journal of Psychology*, 17, E101.
- Ekholm, O., Eiberg, S., Davidsen, M., Holst, M., Larsen, C. V., & Juel, K. (2014). The prevalence of problem gambling in Denmark in 2005 and 2010: A sociodemographic and socioeconomic characterization. *Journal of Gambling Studies*, 30, 1–10.
- Ferguson, C. J., Coulson, M., & Barnett, J. (2011). A meta-analysis of pathological gaming prevalence and comorbidity with mental health, academic and social problems. *Journal of Psychiatric Research*, 45, 1573–1578.
- Festl, R., Scharnow, M., & Quandt, T. (2012). Problematic computer game use among adolescents, younger and older adults. *Addiction*, 108, 592–599.
- Gøtestam, K. G., & Johansson, A. (2003). Characteristics of gambling and problematic gambling in the Norwegian context: A DSM-IV-based telephone interview study. *Addictive Behaviors*, 28, 189–197.
- Grall-Bronnec, M., Caillon, J., Humeau, E., Perrot, B., Remaud, M., Guilleux, A., ... Boujra, G. (2016). Gambling among European professional athletes. Prevalence and associated factors. *Journal of Addictive Diseases*, 35, 278–290.
- Grant, J. E., & Kim, S. W. (2002). Gender differences in pathological gamblers seeking medication treatment. *Comprehensive Psychiatry*, 43, 56–62.
- Grant, J. E., Odlaug, B. L., & Mooney, M. E. (2012). Telescoping phenomenon in pathological gambling: Association with gender and comorbidities. *The Journal of Nervous and Mental Disease*, 200, 996–998.
- Grunseit, A. C., MacNiven, R., Orr, R., Grassmayr, M., Kelly, B., Davies, D., ... Bauman, A. E. (2012). Australian athletes' health behaviours and perceptions of role modelling and marketing of unhealthy products. *Health Promotion Journal of Australia*, 23, 63–69.
- Håkansson, A., Mårdhed, E., & Zaar, M. (2017). Who seeks treatment when medicine opens the door to gambling disorder patients – Psychiatric co-morbidity and heavy predominance of online gambling. *Frontiers in Psychiatry*, 8, 255.
- Harris, N., Newby, J., & Klein, R. G. (2015). Competitiveness facets and sensation seeking as predictors of problem gambling among a sample of university student gamblers. *Journal of Gambling Studies*, 31, 385–396.
- Huang, J. H., Jacobs, D. F., & Derevensky, J. L. (2010). Sexual risk-taking behaviors, gambling, and heavy drinking among U.S. college athletes. *Archives of Sexual Behavior*, 39, 706–713.
- Huang, J. H., Jacobs, D. F., & Derevensky, J. L. (2011). DSM-based problem gambling: Increasing the odds of heavy drinking in a national sample of U.S. college athletes. *Journal of Psychiatric Research*, 45, 302–308.
- Huang, J. H., Jacobs, D. F., Derevensky, J. L., Gupta, R., & Paskus, T. S. (2007). Gambling and health risk behaviors among U.S. college student-athletes: Findings from a national study. *The Journal of Adolescent Health*, 40, 390–397.
- Husky, M. M., Michel, G., Richard, J. B., Guignard, R., & Beck, F. (2015). Gender differences in the associations of gambling activities and suicidal behaviors with problem gambling in a nationally representative French sample. *Addictive Behaviors*, 45, 45–50.
- Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2009). Development and validation of a game addiction scale for adolescents. *Media Psychology*, 12, 77–95.
- Lloret Irlés, D., Morell Gomis, R., Marzo Campos, J. C., & Tirado González, S. (2017). Validación Española de la escala de adicción a videojuegos para adolescentes (GASA). *Atencion Primaria*, 50, 350–358.
- Lopez-Gonzalez, H., & Griffiths, M. D. (2018). Betting, forex trading, and fantasy gaming sponsorships – A responsible marketing inquiry into the 'gamblification' of English football. *International Journal of Mental Health and Addiction*, 16, 404–419.
- Maher, A., Wilson, N., Signal, L., & Thomson, G. (2006). Patterns of sports sponsorship by gambling, alcohol and food companies: An internet survey. *BMC Public Health*, 6, 95.
- Malloqui-Bagué, N., Fernández-Aranda, F., Lozano-Madrid, M., Granero, R., Mestre-Bach, G., Bano, M., ... Jiménez-Murcia, S. (2017). Internet gaming disorder and on-line gambling disorder: Clinical and personality correlates. *Journal of Behavioral Addictions*, 6, 669–677.
- Martin, M. (1998). The use of alcohol among NCAA division I female college basketball, softball, and volleyball athletes. *Journal of Athletic Training*, 33, 163–167.
- Mastroiolo, N. R., Scaglione, N., Mallett, K. A., & Turrisi, R. (2013). Can personality account for differences in drinking between college athletes and non-athletes? Explaining the role of sensation seeking, risk-taking, and impulsivity. *Journal of Drug Education*, 43, 81–95.
- Mays, D., Depadilla, L., Thompson, N. J., Kushner, H. I., & Windle, M. (2010). Sports participation and problem alcohol use: A multi-wave national sample of adolescents. *American Journal of Preventive Medicine*, 38, 491–498.
- Mentzoni, R. A., Scott Brunborg, G., Molde, H., Myrseth, H., Mør Skouveoe, K. J., Hetland, J., & Pallesen, S. (2011). Problematic video game use: Estimated prevalence and associations with mental and physical health. *Cyberpsychology, Behavior and Social Networking*, 14, 591–596.
- Moldovan, I. (2011). The fire that burns from within: Tales of legendary Swedish table tennis players. *Master thesis in Sport Psychology. School of Health and Social Sciences, Halmstad University, Sweden*<http://www.diva-portal.se/smash/get/diva2:430980/FULLTEXT01.pdf>, Accessed date: 1 August 2018.
- Pate, R. R., Trost, S. G., Levin, S., & Dowda, M. (2000). Sports participation and health-related behaviors among US youth. *Archives of Pediatrics and Adolescent Medicine*, 154, 904–911.
- Peters, E. N., Nordeck, C., Zanetti, G., O'Grady, K. E., Serpelloni, G., Rimondo, C., ... Schwartz, R. P. (2015). Relationship of gambling with tobacco, alcohol, and illicit drug use among adolescents in the USA: Review of the literature 2000–2014. *The American Journal on Addictions*, 24, 206–216.
- Pilver, C. E., Libby, D. J., Hoff, R. A., & Potenza, M. N. (2013). Gender differences in the relationship between gambling problems and the incidence of substance-use disorders in a nationally representative population sample. *Drug and Alcohol Dependence*, 133, 204–211.
- Rice, S. M., Purcell, R., De Silva, S., Mawren, D., McGorry, P. D., & Parker, A. G. (2016). The mental health of elite athletes: A narrative systematic review. *Sports Medicine*, 46, 1333–1353.
- Ronzitti, S., Kraus, S. W., Hoff, R. A., Clerici, M., & Potenza, M. N. (2018). Problem-gambling severity, suicidality and DSM-IV Axis II personality disorders. *Addictive Behaviors*, 82, 142–150.
- Rumpf, H. J., Wohlert, T., Freyer-Adam, J., Grothues, J., & Bischof, G. (2013). Screening questionnaires for problem drinking in adolescents: Performance of AUDIT, AUDIT-C, CRAFFT and POSIT. *European Addiction Research*, 19, 121–127.
- Saunders, J. B., Aasland, O. G., Babor, T. F., de la Fuente, J. R., & Grant, M. (1993). Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption–II. *Addiction*, 88, 791–804.
- Sherba, R. T., & Martt, N. J. (2015). Overall gambling behaviors and gambling treatment needs among a statewide sample of drug treatment clients in Ohio. *Journal of Gambling Studies*, 31, 281–293.
- Stillman, M. A., Brown, T., Ritvo, E. C., & Glick, I. D. (2016). Sport psychiatry and psychotherapeutic intervention, circa 2016. *International Review of Psychiatry*, 28, 614–622.
- Swann, C., Moran, A., & Piggott, D. (2015). Defining elite athletes: Issues in the study of expert performance in sport psychology. *Psychology of Sport and Exercise*, 16, 3–14.

- Tavares, H., Zilberman, M. L., Beites, F. J., & Gentil, V. (2001). Gender differences in gambling progression. *Journal of Gambling Studies*, *17*, 151–159.
- Thoresen Wittek, C., Reiten Finserås, T., Pallesen, S., Mentoni, R. A., Hanss, D., Griffiths, M. D., & Molde, H. (2016). Prevalence and predictors of video game addiction: A study based on a national representative sample of gamers. *International Journal of Mental Health and Addiction*, *14*, 672–686.
- Toce-Gerstein, M., Gerstein, D. R., & Volberg, R. A. (2009). NODS-CLiP: A rapid screen for adult pathological and problem gambling. *Journal of Gambling Studies*, *25*, 541–555.
- Vadlin, S., Åslund, C., Hellström, C., & Nilsson, K. W. (2016). Associations between problematic gaming and psychiatric symptoms among adolescents in two samples. *Addictive Behaviors*, *61*, 8–15.
- Veliz, P., Boyd, C. J., & McCabe, S. E. (2017). Nonmedical use of prescription opioids and heroin use among adolescents involved in competitive sports. *Journal of Adolescence*, *60*, 346–349.
- Veliz, P., McCabe, S. E., & Boyd, C. J. (2016). Extreme binge drinking among adolescent athletes: A cause for concern? *The American Journal on Addictions*, *25*, 37–40.
- World Health Organization (2018). *Gaming disorder*. <http://www.who.int/features/qa/gaming-disorder/en/>, Accessed date: 31 July 2018.