Money used in gaming is associated with problem gambling: Results of the ESPAD 2019 Finland

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ABSTRACT

Background and aims: The convergence of gaming and gambling may pose a risk for adolescents. Thus, it is important to find out how these behaviours are associated with other addictive behaviours in order to develop efficient preventive measures for youth. The aim of this study was to examine 1) whether problematic gaming and money used for gaming activities are risk factors for gambling, and 2) what kind of impact adolescents' substance use along with other factors related to friends and parents have on this association. *Methods:* The European School Survey Project on Alcohol and Other Drugs data, 2019 of Finnish adolescents aged 15 to 16 ($N = 4595$). Cross-tabulations with Rao-Scott's chisquare tests were applied to study the associations of the background factors with gambling in the past 12 months. A multinomial logistic regression model was fitted for the outcome variable (gambling in the past 12 months) adjusted for all independent and background variables. *Results:* Problematic gaming alone was not associated with gambling participation, whereas using money for digital games increased the risk of gambling. Boys gamble more than girls. The use of alcohol and drugs increased the risk of gambling. Parental monitoring reduced the risk of gambling, whereas hanging around weekly with friends increased the risk. *Discussion and conclusions:* Using money on gaming sites may put some adolescents at risk of developing problems with either gaming or gambling. The link between using money in digital games and gambling participation calls for preventive measures, intervention and regulatory acts.

INTRODUCTION

It is well-established that adolescents participate in various risky and addictive behaviours (Delfabbro, King, & Derevensky, 2016; Floros, 2018), especially boys (ESPAD Group, 2020; Andrie et al. 2019; Botella-Guijarro, Lloret-Irles, Segura-Heras, Caberera-Perona, & Moriano, 2020). Gambling is one of the risky behaviours often linked to other risky or addictive behaviours such as substance use or problematic gaming. It is important to explore possible factors that may be linked to youth gambling in order to gain more understanding of these behaviours in adolescents and to identify protective factors.

Increased rates of problem gambling and gambling disorders have been reported worldwide in recent years (Calado et al., 2017; Andrie et al., 2019). The prevalence rate of

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problem gambling for adolescents has been variously estimated from 1.6% to 6.7% and is higher than that of adults (Calado et al., 2017). On average, 14% of European adolescents had gambled during the past year in 2015 (European School Survey Project on Alcohol and Other Drugs, ESPAD) (ESPAD Group, 2016), while in 2019, the corresponding proportion was 22% (ESPAD Group, 2020).

Engagement in gambling activities is associated with the use of alcohol, tobacco and illicit substances (other than cannabis) (Burleigh, Griffiths, Sumich, Stavropoulos, & Kuss, 2019; Kakihara & Tilton-Weaver, 2009). Peers also have an important role and a strong influence on risky adolescent behaviours such as substance use, gaming and gambling (Derevensky, 2015; Gunuc, 2017; Helmer et al., 2021; Kristjansson, Sigfusdottir, & Allegrante, 2013; Zhaia et al., 2017). Furthermore, research in parenting styles has highlighted that consistency in parenting, parental monitoring and a positive relationship with parents are important factors protecting youth from problematic behaviours, including video gaming and gambling (Canale et al., 2016; Kapetanovic, Bohlin, Skoog, & Gerdner, 2020; Kveton & Jelínek, 2016; Molinaro et al., 2018; Pisarska & Ostaszewski, 2020; Sobotková, Blatný, Jelínek, & Hrdlička, 2013). Individual behaviours such as going out in the evening also increase the odds of being a gambler (Molinaro et al., 2018).

Problematic gaming resembles problem gambling in many ways, yet it has not been as thoroughly investigated as gambling in general. Gaming may pose a risk to adolescents, who are the majority of gamers. In Finland, 85% of 15- to 17-year-olds reported playing digital games (including video games), and 10.8% felt that gaming had been a problem at least sometimes during the past year (Salonen, Lind, Hagfors, Castrén, & Kontto, 2020). In 2019, 59% of ESPAD students reported having played digital games on a typical school day, and 68% reported having played them on a non-school day within the last 30 days (ESPAD Group, 2020). However, problematic adolescent video gaming has been reported to vary from 1.2 to 18.4%, depending on the measure used (Chia et al., 2020; King et al., 2020; Lemmens, Valkenburg, & Peter, 2009; Mak et al., 2014; Mentzoni et al., 2011; Müller et al., 2015; Rehbein, Kliem, Baier, Mössle, & Petry, 2015).

Rapid growth and the expansion of technological advancements in gaming and gambling markets, as well as cultural changes in media and social life, have led to the convergence of gaming and gambling (cf. Jenkins, 2006). This means that modern video games have started to resemble gambling. Video games are designed to encourage gamers to spend money on virtual items or currency within the game (in-game purchases, microtransactions) in order to advance their gaming experience with functional advantages or cosmetic features (Drummond & Sauer, 2018). Loot boxes are monetized virtual items in video games that contain random gambling-like content. They have been likened to slot machines, and they can be purchased for real money and can be used to take part in gambling activities (Drummond et al., 2020; Larche et al., 2021; Macey & Hamari, 2019; Rockloff et al., 2021; Zendle & Cairns, 2019a, 2019b). Several studies have found that using loot boxes in gaming is

associated with problem gambling (Brooks & Clark, 2019; Drummond et al., 2020; Li, Mills, & Nower, 2019; Rockloff et al., 2021; von Meduna, Steinmetz, Ante, Reynolds, & Fiedler, 2020; Zendle & Cairns, 2018, 2019; Zendle, Meyer, & Over, 2019) There has been some debate as to whether problematic video gaming serves as a 'gateway' to problematic gambling behaviour (Delfabbro & King, 2020; Molde et al., 2019), but this view was not supported in a recent review (Delfabbro & King, 2020) and several other studies (Forrest, King, & Delfabbro, 2016; Macey & Hamari, 2018).

Therefore, it is important to investigate the association between using money for gaming and gambling behaviour. The use of personal money and affordability have been linked to adolescents' drinking patterns (Lintonen & Nevalainen, 2017) and smoking (Valencia, Tran, Lim, Choi, & Oh, 2019). The Finnish ESPAD data allows us to investigate the use of money in gaming and its possible association with gambling participation. The convergence of gaming and gambling may be a new risk along with other risky adolescent behaviours that should be acknowledged and included in preventive initiatives. This study aims to explore: (1) whether problematic gaming and money used for gaming are risk factors for gambling and (2) what kind of impact other known risk factors for gambling (alcohol and drug use, daily smoking, lack of parental control and hanging around with friends) have on this possible association and what the independent effect is of these other risk factors.

METHODS

Participants

The analysis utilized data from the European School Survey Project on Alcohol and Other Drugs (ESPAD) from Finland on a representative cross-section of young people born in 2003. The data was collected in spring 2019. The target population was defined as: (1) regular students who (2) turned sixteen in the calendar year of the survey and (3) were present in class on the day of the survey administration. This definition includes students who were enrolled in regular or general studies but excludes both special schools for students with learning disorders or severe physical disabilities and students who did not speak Finland's national languages Finnish or Swedish. There were 298 schools in the Finnish sample, and the final number of participating schools was 264. The number of students in the sample was 5,593. The students answered the questionnaires in a classroom setting. Those not belonging to the target group and those who had responded inconsistently had clearly exaggerated their answers, or had not answered over half of the questions were removed from the data. The final data consisted of 4,595 students. The proportion of girls (50.5%) was slightly higher than that of boys.

Procedure

A two-stage systematic probability-proportional-to-size sampling method using the Nomenclature of Territorial

Units for Statistics 2 regions (NUTS 2) as strata and schools as clusters (NUTS 2, 2020) was used to collect nationally representative samples through a self-administered pen-and-paper questionnaire. Participation was voluntary, and anonymity was ensured (ESPAD Group, 2020; Raitasalo & Härkönen, 2019). Population weights based on municipality, gender and immigrant background status were used to reflect a representative sample of Finnish ninth graders.

Measures

We chose to dichotomise the independent variables for two main reasons. The categorical form of the original variables is not suited for regression analysis, and the prevalence provided by dummy variables simplifies the interpretation of the results compared to the means of categorical variables. Dichotomising the independent variables, however, means a loss of variation, which in turn could lead to model underestimation. The results should therefore be interpreted as minimum estimates.

Gambling for money was assessed by asking students about both the frequency of their gambling activity in general and the frequency of gambling with different types of games (slot machines, cards or dice, lotteries, or betting on sports/animals) in the last 12 months. Online gambling was assessed by asking the students how often they had gambled for money in the last 12 months using the Internet, for overall gambling, for each of the four games or for online gambling.

A summary index for *problematic gaming* was calculated (range 0–3). This non-clinical screening tool (Holstein et al., 2014) focuses on a student's perception of problems related to the time spent gaming, bad feelings in the case of restricted access, and parental concerns. Students were asked to what extent they agreed with three statements on gaming ('I think I spend way too much time playing games', 'I get in a bad mood when I cannot spend time on games', 'My parents say that I spend way too much time on gaming', with the response categories being 'strongly agree', 'partly agree', 'neither agree nor disagree', 'partly disagree' and 'strongly disagree'. Positive answers ('strongly agree' and 'partly agree') were summed to produce an index score. An index score of 0–1 points was considered to indicate a low level of self-perceived problems, and a score of 2–3 points was considered to indicate a high level of self-perceived problems related to gaming.

The amount of money used for digital games was measured with the question: 'How many euros a week do you usually spend on digital games' with an open response. Those who had spent more than 0 euros per week were coded as 1 and all other responses as 0.

Alcohol use was measured by asking 'On how many occasions (if any) have you had any alcoholic beverages to drink during the past 12 months?', with seven response alternatives from 'Never' to '40 times or more'. The responses were collapsed into a dichotomous variable (0 = 'no', 1 = 'yes, at least once').

Daily cigarette smoking was assessed with the question: 'How frequently have you smoked cigarettes during the last 30 days?', with seven response alternatives from 'not at all' to more than 20 cigarettes per day'. The responses were collapsed into a dichotomous variable (0 = 'not at all', 1 = 'yes, at least one cigarette per day').

To measure *drug use*, several variables measuring drug use were combined. The students were asked (1) 'On how many occasions (if any) have you used cannabis during the last 12 months?', with seven response alternatives from 'Never' to '40 times or more' and (2) 'On how many occasions (if any) have you used ecstasy/amphetamines/methamphetamines/cocaine/heroin/inhalants during the last 12 months?', with three response alternatives (0, 1–2 and 3 or more times). Lifetime use of LSD or other hallucinogens, magic mushrooms, GHB or drugs by injection with a needle was asked in the same way. The variable was dichotomized in the analysis (0 = no drug use, 1 = yes, any drug at least once).

Parental control was assessed with the question: 'Do your parents know where you spend Friday/Saturday nights?' (1 = 'they always know', 2 = 'they know quite often', 3 = 'they know sometimes', 4 = 'they usually do not know'). Those answering 'they always know' were coded as 1, and all other responses were coded as 0.

Going out with friends weekly was assessed with two questions: 'How often (if at all) do you (1) go out with friends in the evening (to a café, restaurant, movies, etc.) and (2) go around with friends to shopping centres, streets, parks, etc., just for fun', with five response alternatives for each ranging from never to almost every day. Those answering at least once a week or almost every day to either of these questions were coded as 1 and all others were coded as 0.

All models were adjusted for the respondents' *gender* and *parents' education*. Parents' education was defined by whether or not either of the parents had had any education after compulsory education to the best of the respondent's knowledge. The original question with the response options was: 'What is the highest level of schooling your (a) father and/or (b) mother completed?' 'comprehensive school or less' (grades 1–9), 'some upper secondary/vocational education, 'completed upper secondary/vocational school', 'some college or university', 'completed college or university', 'don't know', 'does not apply'.

The distributions of responses to each question by gender are presented in Table 1.

Statistical analysis

First, cross-tabulations with Rao-Scott's chi-square tests were applied to study the associations of the background factors with gambling in the past 12 months.

Second, a multinominal logistic regression model was fitted for the outcome variable (gambling in the past 12 months), adjusting for all independent and background variables. Odds ratios with 95% confidence intervals were then derived from the full model as marginal estimates.

The sample design was taken into account in all analyses by adjusting the student-level standard errors for clustering effects. This was carried out using the survey procedures offered by SAS EG 7.1 (SAS/STAT®, 2011)

Table 1. Distributions of the used variables, proportions of "yes" answers by gender (N = 4,528)

	Boys % (n)	Girls % (n)	Total % (n)
Gambling in the past 12 months	48.1% (1,071)	27.4% (617)	37.7% (1,687)
Problematic gaming	22.7% (505)	3.6% (81)	13.1% (586)
Used money for digital games	19.8% (440)	2.2% (56)	10.9% (490)
Parents' education beyond secondary school	77.6% (1,690)	79.2% (1,741)	78.4% (3,431)
Daily smoking	6.0% (134)	7.2% (162)	6.6% (296)
Alcohol use past 12 months	60.5% (1,315)	60.2% (1,328)	60.3% (2,643)
Drug use past 12 months	11.7% (253)	8.4% (186)	10.0% (439)
Parents know about Fridays	89.5% (1,952)	88.8% (1,978)	89.1% (3,930)
Going out weekly with friends	66.1% (1,454)	60.4% (1,348)	63.2% (2,803)

using NUTS2 regions (NUTS2, 2020) as strata and schools as clusters.

Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki. The Institutional Review Board of the Finish Institute for health and Welfare approved the study (THL/1740/6.02.01/2018). Parental consent for their children's participation in the survey was requested.

RESULTS

Table 2 shows how different background factors are related to gambling in the past 12 months. Gambling was more common among boys than girls. Parental education was not associated with gambling. Those who reported problematic gaming did not differ from their peers with regard to gambling but those who had used money for digital games engaged more in gambling compared to their peers. Daily smoking, as well as alcohol and drug use, were all associated with gambling in the past 12 months so that those who engaged in these behaviours had more often gambled in the past 12 months. To continue, parents not knowing about Friday nights and going out weekly with friends were both associated with gambling.

To estimate the effect of gaming behaviour on gambling in the past 12 months, a composite variable consisting of problematic gaming and the use of money for digital games was constructed. The categories of this variable were (1) no problematic gaming and no money used in gaming (79%),

Table 2. Proportions of students and their past 12 months gambling with background factors, %(n) with Rao-Scott's chi square test results

		Past 12 months gambling 38% (1,687) % (no.)	p(chisq)
	All		
Gender	Boy	48 (1,071)	
	Girl	27 (617)	<0.0001
Parents' education beyond secondary school	Yes	38 (1,320)	
	No	35 (328)	ns
Problematic gaming	Yes	42 (246)	
	No	37 (1,442)	ns
Used money for digital games	Yes	51 (250)	
	No	36 (1,437)	<0.0001
Daily smoking	Yes	55 (163)	
	No	36 (1,518)	<0.0001
Alcohol use past 12 months	Yes	45 (1,183)	
	No	26 (456)	<0.0001
Drug use past 12 months	Yes	57 (248)	
	No	35 (1,391)	<0.0001
Parents know about Fridays	Yes	35 (1,393)	
	No	54 (261)	<0.0001
Going out weekly with friends	Yes	43 (1,199)	
	No	29 (474)	<0.0001

(2) problematic gaming but no money used for gaming (10%), (3) no problematic gaming but has used money for gaming (8%), (4) problematic gaming and has used money for gaming (3%).

As the parents' level of education was not related to gambling in the past 12 months according to the chi-square test, it was not included in the analysis.

Table 3 shows the results of the logistic regression analysis where the effect of problematic gaming together

Table 3. The effect of problematic gaming and money used for gaming adjusted for the background factors on the risk of gambling in the past 12 months, odds ratios with 95% confidence levels

	Model 1 OR (95% CL)	Model 2 AOR (95% CL)
Problematic gaming and money used for gaming (ref = none of these)		
Problematic gaming alone	1.215 (0.940–1.571)	1.023 (0.770–1.359)
Money used for gaming alone	1.977 (1.480–2.640)	1.479 (1.094–1.999)
Both	1.705 (1.180–2.463)	1.145 (0.756–1.734)
Gender (ref = girl)		2.308 (1.883–2.828)
Daily smoking (ref = no)		1.252 (0.862–1.819)
Alcohol use past 12 months (ref = no)		1.859 (1.488–2.322)
Any drug use past 12 months (ref = no)		1.404 (1.072–1.839)
Parents don't know about Fridays (ref = yes)		1.588 (1.236–2.042)
Going out weekly with friends (ref = no)		1.359 (1.127–1.639)

Model 1: The effect of the gaming variable alone.
Model 2: The effect of the gaming variable adjusted for other background variables.
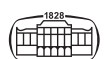
with money used for gaming on the risk of gambling in the past 12 months are estimated. Model 1 shows the unadjusted effect of the composite variable of problematic gaming and money used for gaming on gambling in the past 12 months. Model 2 shows the effect when adjusted for all background factors. Problematic gaming alone per se did not significantly increase the risk of gambling. In contrast, using money for digital games alone increased the risk (OR = 1.479, 95% CL 1.094–1.999). However, using money for gaming together with problematic gaming did not statistically significantly increase the risk of gambling in the past 12 months.

To continue, the analysis shows that boys were at higher risk of gambling than girls after the adjustments (OR = 2.308, 95% CL 1.883–2.828). Alcohol and drug use both increased the risk of gambling (OR = 1.859, 95% CL 1.488–2.322 and OR = 1.404, 95% CL 1.072–1.839, respectively), whereas daily smoking had no statistically significant effect. Additionally, parents not knowing about Friday nights and going out weekly with friends increased the risk of gambling in the past 12 months (OR = 1.588, 95% CL 1.236–2.042 and OR = 1.359, 95% CL 1.127–1.639, respectively).

DISCUSSION

The present study examined the risk factors of youth gambling, specifically the association of problematic gaming and money used for gaming, and furthermore, the effect other known risk factors (substance use, parental control and hanging around with friends) had on problem gambling behaviour.

According to our findings, using money for digital games is a risk factor for gambling participation, as shown previously (Brooks & Clark, 2019; Drummond et al., 2020; Rockloff et al., 2021; Zendle & Cairns, 2018; Zendle, Cairns, Barnett, & McCall, 2020), but problematic gaming alone or the combination of using money for gaming and falling into the problematic gaming category did not increase the risk of gambling. Although our study showed an association between purchases made in gaming and gambling, due to cross-sectional data, it does support the gateway hypothesis. Delfabbro and King (2020) did not find strong evidence for the gateway hypothesis in estimating the covariance of these two activities. Spending money on digital games can reflect the development of problem gaming, as shown in our study: 3% of those who used money for gaming were identified in the problematic gaming category and 8% used money for gaming with no identified problem with gaming, at least so far. Furthermore, our results show that there are various types of gamers: no-problem gamers who play without using money and those who are identified as playing at a problematic level and still not using money for this activity. It is possible that with gaming, there exists a similar continuum than has been identified with gambling, and individuals may shift from the at-risk level to the level of severe problems (The Diagnostic and Statistical Manual for Mental Disorders, 5th ed. DSM-5; American Psychiatric Association

(APA), 2013). Furthermore, the role of using money in investigating the gaming continuum would be an interesting area of further research. The availability of money may also be a risk factor for both gaming and gambling, as has been found for smoking and the use of alcohol (Lintonen & Nevalainen, 2017; Valencia et al., 2019). Therefore, it is important to follow the future developments of technological platforms where underaged people may use money for various attractive purposes and on attractive sites, as noted by Macey and Hamari (2018, 2019). In addition, it is important to increase both youth and parents' awareness of possible risks related to gaming sites (i.e. the mechanisms of loot boxes) and hope for clearer regulation on using money in video games is needed to protect minors from possible harm (Derevensky & Griffiths, 2019; Kim & King, 2020; Zendle & Cairns, 2018, 2019a) as well as well-defined ratings and classifications (e.g. content descriptors specific to loot boxes) in addition to setting an age limit on games with items to be purchased are needed from the agencies like PEGI (Pan European Game Information) and ESBR (Entertainment Software Rating Board).

Further examination with adjusted background factors shows that boys are at greater risk of gambling compared to girls, thus confirming the findings of earlier studies. Males are typically more interested in gambling (and gaming) and are also more prone to develop problems with both behaviours than females (Derevensky, 2015; Lee, Stuart, Ialongo, & Martins, 2013; Kinnunen, Taskinen, & Mäyrä, 2020; Männikkö, Ruotsalainen, Tolvanen, & Kääriäinen, 2020; Salonen et al., 2020; Sugaya, Shirasaka, Takahashi, & Kanda, 2019; Weidberg et al., 2018). Problem gambling at an early age has a range of negative consequences, such as mental health problems, family conflicts, delinquency and legal complications (Derevensky, 2015; Dowling et al., 2017) and may even lead to the development of substance use disorders and serious psychiatric problems in adulthood (Grant, Potenza, Weinstein, & Gorelick, 2010). This highlights the need for early detection (screening) of possible gambling problems for youth, especially boys.

When investigating the effect of other known risky youth behaviours for gambling participation, alcohol and drug use were significantly associated with gambling participation, as noted by other studies (Burleigh et al., 2019; Castrén, Grainger, Lahti, Alho, & Salonen, 2015). This finding underlines the importance of paying attention to the co-occurrence of substance use and behavioural addictions (Burleigh et al., 2019; Ko et al., 2008). It should be noted that substance and behavioural addictions may strengthen each other with negative consequences: substance use may escalate gambling behaviour and problem gambling can fuel substance use.

In order to better understand the social factors related to risky adolescent behaviours, social factors such as the role of family (parental involvement) and peers were examined. Lack of parental involvement, such as not knowing where the adolescent was on a Friday night, increased the risk of becoming involved in gambling activities. Parental involvement measured by the parent's awareness of where their

children were on Friday nights was protective against gambling, as found earlier (Molinaro et al., 2018). Parental support, attitudes and behaviour play a pivotal role in the current and future gambling behaviour of their children (Pisarska & Ostaszewski, 2020; Shead, Derevensky, & Meerkamper, 2011). Gambling-related behaviour and the attitudes of parents can enhance or reduce the risk that their children will begin gambling and the extent to which they will continue to gamble as they grow older (Shead et al., 2011).

Along with parents, friends play a crucial role in adolescents' lives and can act either as a protective or a risk factor (endorsing or promoting risky behaviour). Going out with friends increased the risk of gambling, which suggests that gambling is a social activity, especially slot machines, which are the most prevalent game type used for gambling in Finland (Salonen et al., 2020). From our data, we cannot show whether gambling takes place with peers, but the role of peers in risky adolescent behaviour should be noted, as previous studies suggest that having a gambling or substance-using friend increases the risk of these behaviours (Dickson, Derevensky, & Gupta, 2008; Gunuc, 2017; Helmer et al., 2021). Active efforts in increasing parents' as well as youth's awareness and knowledge of gambling and risks related to it are important areas of preventive programmes.

Strengths and limitations

There are limitations that need to be considered when discussing the results of this study. First, surveys have been generally criticised for failing to reach the most vulnerable and problematic parts of the population, in this case, those dropping out of school and those who are vulnerable to alcohol and drug use. However, the response rate was high, the whole target group (15- to 16-year-olds) are still in schools and no challenges regarding the school participation rates were found (ESPAD Group, 2020). As always with self-reporting data, there is a risk that students consciously or unconsciously do not give accurate, honest answers about all their behaviour. The direction of these incorrect answers may go both ways, i.e. there may be over-reporting as well as under-reporting, depending on what is socially desired and/or accepted in different contexts. However, a validity report on the ESPAD (Hibell et al., 2012) shows that only a very small minority (1–2%) do not answer honestly to questions on substance use. There is no reason to suspect that this would be somehow different regarding questions on gambling and gaming. In addition, because of the cross-sectional nature of the survey, no conclusions related to causality between different factors related to gambling and gaming can be made. It can also be considered a limitation that we did not have information on the different features of video games (for example information on loot boxes), but the only available measure on gaming was self-perceived problems related to it.

Future studies should address the different, possibly addiction-provoking properties, structural features, game types (Macey & Hamari, 2019), cognitions and cognitive frameworks (Brooks & Clark, 2019; Macey & Hamari, 2020)

of video games in order to better understand how these two potentially addictive behaviours—gambling and gaming—might be interrelated.

CONCLUSIONS

Problematic gaming alone was not associated with gambling participation, but money used in gaming increased the risk of youth gambling. Alcohol and drug use increased the risk of gambling in general. Preventive efforts are needed to enhance public awareness, good parental supervision and gambling-related risks, and special attention is needed to prevent boys from developing problems with gaming and gambling. Identifying and helping adolescents at risk of addictive behaviour might help mitigate a host of negative long-term consequences. Using money on gaming sites (in-game purchases, microtransactions, loot boxes) may put some adolescents at risk of developing problems with either gaming or gambling. Youth preventive programmes should include early assessments of both gambling and gaming along with other risky behaviours.

REFERENCES

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596.

Andrie, E. K., Tzavara, C. K., Tzavela, E., Richardson, C., Greydanus, D., Tsolia, M., & Tsitsika, A. K. (2019). Gambling involvement and problem gambling correlates among European adolescents: Results from the European Network for Addictive Behavior study. *Social Psychiatry and Psychiatric Epidemiology*, *54*, 1429–1441. https://doi.org/10.1007/s00127-019-01706-w.

Botella-Guijarro, Á., Lloret-Irles, D., Segura-Heras, J. V., Cabrera-Perona, V., & Moriano, J. A. (2020). A longitudinal analysis of gambling predictors among adolescents. *International Journal of Environmental Research and Public Health*, *17*. https://doi.org/10.3390/ijerph17249266.

Brooks, G. A., & Clark, L. (2019). Associations between loot box use, problematic gaming and gambling, and gambling-related cognitions. *Addictive Behaviors*, *96*, 26–34. https://doi.org/10.1016/j.addbeh.2019.04.009.

Burleigh, T. L., Griffiths, M. D., Sumich, A., Stavropoulos, V., & Kuss, D. J. (2019). A systematic review of the co-occurrence of gaming disorder and other potentially addictive behaviors. *Current Addiction Reports*, *6*, 383–401. https://doi.org/10.1007/s40429-019-00279-7.

Calado, F., Alexandre, J., & Griffiths, M. D. (2017). Prevalence of adolescent problem gambling: A systematic review of recent research. *Journal of Gambling Studies*, *33*, 397–424. http://dx.doi.org/10.1007/s10899-016-9627-5.

Canale, N., Vieno, A., ter Bogt, T., Pastore, M., Siciliano, V., & Molinaro, S. (2016). Adolescent gambling-oriented attitudes mediate the relationship between perceived parental knowledge and adolescent gambling: Implications for prevention. *Prevention Science*, *17*, 970–980. https://doi.org/10.1007/s11121-016-0683-y.

Castrén, S., Grainger, M., Lahti, T., Alho, H., & Salonen, A. H. (2015). At-risk and problem gambling among adolescents: A convenience sample of first-year junior high school students in Finland. *Substance Abuse Treatment, Prevention, and Policy*, *10*. https://doi.org/10.1186/s13011-015-0003-8.

Chia, D. X. Y., Ng, C. W. L., Kandasami, G., Seow, M. Y. L., Choo, C. C., Chew, P. K. H., . . . Zhang, M. W. B. (2020). Prevalence of internet addiction and gaming disorders in Southeast Asia: A meta-analysis. *International Journal of Environmental Research and Public Health*, *17*. https://doi.org/10.3390/ijerph17072582.

Delfabbro, P., & King, D. L. (2020). Gaming-gambling convergence: Evaluating evidence for the 'gateway' hypothesis. *International Gambling Studies*, *20*, 380–392. https://doi.org/10.1080/14459795.2020.1768430.

Delfabbro, P., King, D. L., & Derevensky, J. L. (2016). Adolescent gambling and problem gambling: Prevalence, current issues, and concerns. *Current Addiction Reports*, *3*, 268–274. http://dx.doi.org/10.1007%2Fs40429-016-0105-z.

Derevensky, J. L. (2015). Youth gambling: Some current misconceptions. *Austin Journal of Psychiatry and Behavioral Sciences*, *2*(2), 1039.

Derevensky, J. L., & Griffiths, M. D. (2019). Convergence between gambling and gaming: Does gambling and gaming industry have a responsibility in protecting consumer? *Gaming Law Review*, *23*, 633–639. https://doi.org/10.1089/glr2.2019.2397.

Dickson, L., Derevensky, J., & Gupta, R. (2008). Youth gambling problems: Examination of risk and protective factors. *International Gambling Studies*, *8*, 25–47. https://doi.org/10.1080/14459790701870118.

Dowling, N. A., Merkouris, S. S., Greenwood, C. J., Oldenhof, E., Toumbourou, J. W., & Youssef, G. J. (2017). Early risk and protective factors for problem gambling: A systematic review and meta-analysis of longitudinal studies. *Clinical Psychology Review*, *51*, 109–124. https://doi.org/10.1016/j.cpr.2016.10.008.

Drummond, A., & Sauer, J. (2018). Video game loot boxes are psychologically akin to gambling. *Nature Human Behaviour*, *2*, 530–532. https://doi.org/10.1038/s41562-018-0360-1.

Drummond, A., Sauer, J. D., Ferguson, C. J., & Hall, L. C. (2020). The relationship between problem gambling, excessive gaming, psychological distress and spending on loot boxes on Aotearoa New Zealand, Australia, and the United States – A cross-national survey. *PloS One*, *15*. https://doi.org/10.1371/journal.pone.0230378.

ESPAD Group (2016). *ESPAD report 2015: Results from the European school survey project on alcohol and other drugs*. Luxembourg: Publications Office of the European Union.

ESPAD Group (2020). *ESPAD report 2019: Results from the European school survey project on alcohol and other drugs*. EMCDDA Joint Publications. Publications Office of the European Union. http://espad.org/sites/espad.org/files/2020.3878_EN_04.pdf.

Floros, G. D. (2018). Gambling disorder in adolescents: Prevalence, new developments, and treatment challenges. *Adolescent Health, Medicine and Therapeutics*, *9*, 43–51. https://doi.org/10.2147/AHMT.S135423.

Forrest, C. J., King, D. L., & Delfabbro, P. H. (2016). The gambling preferences and behaviors of a community sample of Australian regular video game players. *Journal of Gambling Studies*, *32*, 409–420. https://doi.org/10.1007/s10899-015-9535-0.

Grant, J. E., Potenza, M. N., Weinstein, A., & Gorelick, D. A. (2010). Introduction to behavioral addictions. *The American Journal of Drug and Alcohol Abuse*, *36*(5), 233–241. https://doi.org/10.3109/00952990.2010.491884.

Gunuc, S. (2017). Peer influence in internet and digital game addicted adolescents: Is internet/digital game addiction contagious?. *International Journal of High Risk Behaviors and Addiction*, *6*. https://doi.org/10.5812/ijhrba.33681.

Helmer, S. M., Burkhart, G., Matias, J., Buck, C., Engling Cardoso, F., & Vicente, J. (2021). "Tell me how much your friends consume"—Personal, behavioral, social, and attitudinal factors associated with alcohol and cannabis use among European school students. *International Journal of Environmental Research and Public Health*, *18*, 1684. https://doi.org/10.3390/ijerph18041684.

Hibell, B., Guttormsson, U., Ahlström, S., Balakireva, O., Bjarnason, T., Kokkevi, A., & Kraus, L. (2012). *The 2011 ESPAD report: Substance use among students in 36 European countries*. Swedish Council for Information on Alcohol and Other Drugs, Stockholm, European Monitoring Centre for Drugs and Drug Addiction, Council of Europe, Cooperation Group to Combat Drug Abuse and Illicit Trafficking in Drugs (Pompidou Group).

Holstein, B. E., Pedersen, T. P., Bendtsen, P., Rich Madsen, K., Riebeling Meilstrup, C., Nielsen, L., & Rasmussen, M. (2014). Perceived problems with computer gaming and internet use among adolescents: Measurement tool for non-clinical survey studies. *BMC Public Health*, *14*. http://www.biomedcentral.com/1471-2458/14/361.

Jenkins, H. (2006). *Convergence culture. Where old and new media collide*. New York & London: New York University Press.

Kakihara, F., & Tilton-Weaver, L. (2009). Adolescents' interpretations of parental control: Differentiated by domain and types of control. *Child Development*, 80, 1722–1738. https://doi.org/10.1111/j.1467-8624.2009.01364.x.

Kapetanovic, S., Bohlin, M., Skoog, T., & Gerdner, A. (2020). Structural relations between sources of parental knowledge, feelings of being overly controlled and risk behaviors in early adolescence. *Journal of Family Studies*, 26, 226–242. https://doi.org/10.1080/13229400.2017.1367713.

Kim, H. S., & King, D. L. (2020). Gambling-gaming convergence: New developments and future directions. *International Gambling Studies*, 20, 373–379. https://doi.org/10.1080/14459795.2020.1822905.

King, D. L., Chamberlain, S. R., Carragher, N., Billieux, J., Stein, D., Mueller, K., . . . Delfabbro, P. H. (2020). Screening and assessment tools for gaming disorder: A comprehensive systematic review. *Clinical Psychology Review*, 77. https://doi.org/10.1016/j.cpr.2020.101831.

Kinnunen, J., Taskinen, K., & Mäyrä, F. (2020). Pelaajabarometri 2020. Pelaamista koronan aikaan. TRIM research reports 29. Tampere: Tampere University Press. http://urn.fi/URN:ISBN:978-952-03-1786-7.

Ko, C., Yen, J.-Y., Yen, C., Chen, C., Weng, C., & Chen, C. (2008). The association between internet addiction and problematic alcohol use in adolescents: The problem behavior model. *CyberPsychology & Behavior*, 11, 571–576. https://doi.org/10.1089/cpb.2007.0199.

Kristjansson, A. L., Sigfusdottir, I. D., & Allegrante, J. P. (2013). Adolescent substance use and peer use: A multilevel analysis of cross-sectional population data. *Substance Abuse Treatment, Prevention, and Policy*, 8. https://doi.org/10.1186/1747-597X-8-27.

Kveton, P., & Jelínek, M. (2016). Parenting styles and their relation to Videogame addiction. *International Journal of Psychological and Behavioral Sciences*, 10, 1961–1964. http://scholar.waset.org/1307-6892/10004682.

Larche, C. J., Chini, K., Lee, C., Dixon, M. J., & Fernandes, M. (2021). Rare loot box rewards trigger larger arousal and reward responses, and greater urge to open more loot boxes. *Journal of Gambling Studies*, 37, 141–163. https://doi.org/10.1007/s10899-019-09913-5.

Lee, G. P., Stuart, E. A., Ialongo, N. S., & Martins, S. S. (2013). Parental monitoring trajectories and gambling among a longitudinal cohort of urban youth. *Addiction*, 109, 977–985. https://doi.org/10.1111/add.12399.

Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2009). Development and validation of a game addiction scale for adolescents. *Media Psychology*, 12, 77–95. https://doi.org/10.1080/15213260802669458.

Li, W., Mills, D., & Nower, L. (2019). The relationship of loot box purchases to problem video gaming and problem gambling. *Addictive Behaviors*, 97, 27–34. https://doi.org/10.1016/j.addbeh.2019.05.016.

Lintonen, T., & Nevalainen, J. (2017). Has the role of personal income in alcohol drinking among teenagers changed between 1983 and 2013: A series of nationally representative surveys in Finland. *BMJ Open*, 7. https://doi.org/10.1136/bmjopen-2016-013994.

Macey, J., & Hamari, J. (2018). Investigating relationships between video gaming, spectating esports, and gambling. *Computers in Human Behavior*, 80, 344–353. https://doi.org/10.1016/j.chb.2017.11.027.

Macey, J., & Hamari, J. (2019). eSports, skins and loot boxes: Participants, practices and problematic behaviour associated with emergent forms of gambling. *New Media & Society*, 21, 20–41. https://doi.org/10.1177/1461444818786216.

Macey, J., & Hamari, J. (2020). GamCog: A measurement instrument for miscognitions related to gamblification, gambling, and video gaming. *Psychology of Addictive Behaviors*, 34, 242–256. https://psycnet.apa.org/doi/10.1037/adb0000526.

Mak, K. K., Lai, C. M., Watanabe, H., Kim, D. I., Bahar, N., Ramos, M., . . . Cheng, C. (2014). Epidemiology of Internet behavior and addiction among adolescents in six Asian countries. *Cyberpsychology, Behavior, and Social Networking*, 17, 720–728. https://doi.org/10.1089/cyber.2014.0139.

Männikkö, N., Ruotsalainen, H., Tolvanen, A., & Kääriäinen, M. (2020). Problematic gaming is associated with some health-related behaviors among Finnish vocational school students. *International Journal of Mental Health & Addiction*, 18, 993–1007. https://doi.org/10.1007/s11469-019-00100-6.

von Meduna, M., Steinmetz, F., Ante, L., Reynolds, J., & Fiedler, I. (2020). Loot boxes are gambling-like elements in video games with harmful potential: Results from a large-scale population survey. *Technology in Society*, 63. https://doi.org/10.1016/j.techsoc.2020.101395.

Mentzoni, R. A., Brunborg, G. S., Molde, H., Myrseth, H., Skouverøe, 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. https://doi.org/10.1089/cyber.2010.0260.

Molde, H., Holmøy, B., Merkesdal, A. G., Torsheim, T., Mentzoni, R. A., Hanns, D., . . . Pallesen, S. (2019). Are video games a gateway to gambling? A longitudinal study based on a representative Norwegian sample. *Journal of Gambling Studies*, 35, 545–557. https://doi.org/10.1007/s10899-018-9781-z.

Molinaro, S., Benedetti, E., Scalese, M., Bastiani, L., Fortunato, L., Cerrai, S., . . . Urdih Lazar, T. (2018). Prevalence of youth gambling and potential influence of substance use and other risk factors throughout 33 European countries: First results from the 2015 ESPAD study. *Addiction*, 113, 1862–1873. https://doi.org/10.1111/add.14275.

Müller, K. W., Janikian, M., Dreier, M., Wölfling, K., Beutel, M., Tzavara, C., . . . Tsitsika, A. (2015). Regular gaming behavior and internet gaming disorder in European adolescents: Results from a cross-national representative survey of prevalence, predictors, and psychopathological correlates. *European Child & Adolescent Psychiatry*, 24, 565–574. https://doi.org/10.1007/s00787-014-0611-2.

NUTS2. Available at http://ec.europa.eu/eurostat/web/nuts/overview.

Pisarska, A., & Ostaszewski, K. (2020). Factors associated with youth gambling: Longitudinal study among high school students. *Public Health*, 184, 33–40. https://doi.org/10.1016/j.puhe.2020.03.017.

Raitasalo, K., & Härkönen, J. (2019). *Nuorten päihteiden käyttö ja rahapelaaminen: ESPAD-tutkimus 2019*. Tilastoraportti 40. Helsinki: Terveyden ja hyvinvoinnin laitos. http://urn.fi/URN:NBN:fi-fe2019110737026.
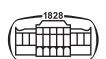
Rehbein, F., Kliem, S., Baier, D., Mößle, T., & Petry, N. M. (2015). Prevalence of internet gaming disorder in German adolescents: Diagnostic contribution of the nine DSM-5 criteria in a state-wide representative sample. *Addiction*, *110*, 842–851. https://doi.org/10.1111/add.12849.

Rockloff, M., Russell, A. M. T., Greer, N., Lole, L., Hing, N., & Browne, M. (2021). Young people who purchase loot boxes are more prone to have gambling problems: An online survey of adolescents and young adults living in NSW Australia. *Journal of Behavioral Addictions*. https://doi.org/10.1556.2006.2021.00007.

Salonen, A., Lind, K., Hagfors, H., Castrén, S., & Kontto, J. (2020). *Rahapelaaminen, peliongelmat ja rahapelaamiseen liittyvät asenteet ja mielipiteet vuosina 2007–2019. Suomalaisten rahapelaaminen 2019*. Raportti 18. Helsinki: Terveyden ja hyvinvoinnin laitos.

SAS Institute. Inc. (2011). *SAS/STAT® 9.3 User's guide*. Cary: SAS Institute, Inc.

Shead, N. W., Derevensky, J. L., & Meerkamper, E. (2011). Your mother should know: A comparison of maternal and paternal attitudes and behaviors related to gambling among their adolescent children. *International Journal of Mental Health & Addiction*, *9*, 264–275. https://doi.org/10.1007/s11469-010-9279-0.

Sobotková, V., Blatný, M., Jelínek, M., & Hrdlička, M. (2013). Antisocial behavior in adolescence: Typology and relation to family context. *Journal of Early Adolescence*, *33*, 1091–1115. https://doi.org/10.1177/0272431612445377.

Sugaya, N., Shirasaka, T., Takahashi, K., & Kanda, H. (2019). Biopsychosocial factors of children and adolescents with internet gaming disorder: A systematic review. *BioPsychoSocial Medicine*, *13*. https://doi.org/10.1186/s13030-019-0144-5.

Valencia, M. L. C., Tran, B. T., Lim, M. K., Choi, K. S., & Oh, J.-K. (2019). Association between socioeconomic status and early initiation of smoking, alcohol drinking, and sexual behavior among Korean adolescents. *Asia Pacific Journal of Public Health*, *31*, 443–453. https://doi.org/10.1177/1010539519860732.

Weidberg, S., Gonzalez-Roz, A., Fernandez-Hermida, J. R., Martinez-Loredo, V., Grande-Gosende, A., Garcia-Perez, A., & Secades-Villa, R. (2018). Gender differences among adolescent gamblers. *Personality and Individual Differences*, *125*, 38–43. https://doi.org/10.1016/j.paid.2017.12.031.

Zendle, D., & Cairns, P. (2018). Video game loot boxes are linked to problem gambling: Results of a large-scale survey. *PloS One*, *13*. https://doi.org/10.1371/journal.pone.0206767.

Zendle, D., & Cairns, P. (2019a). Video game loot boxes are linked to problem gambling: Results of a large-scale survey. *PloS One*, *14*. https://doi.org/10.1371/journal.pone.0214167.

Zendle, D, & Cairns, P (2019b). Video game loot boxes are linked to problem gambling: Results of a large-scale survey. *Plos One*, *14*(3), e0214167. https://doi.org/10.1371/journal.pone.0214167.

Zendle, D., Cairns, P., Barnett, H., & McCall, C. (2020). Paying for loot boxes is linked to problem gambling, regardless of specific features such as cash-out or pay-to-win. *Computers in Human Behavior*, *102*, 181–191. https://doi.org/10.1016/j.chb.2019.07.003.

Zendle, D., Meyer, R., & Over, H. (2019). Adolescents and loot boxes: Links with problem gambling and motivations for purchase. *Royal Society Open Science*, *6*. https://doi.org/10.1098/rsos.190049.

Zhaia, Z. W., Yipa, S. W., Steinberg, M. A., Wamplerd, J., Hoffa, R. A., Krishnan-Sarina, S., & Potenza, M. (2017). Relationships between perceived family gambling and peer gambling and adolescent problem gambling and binge-drinking. *Journal of Gambling Studies*, *33*, 1169–1185. https://doi.org/10.1007/s10899-017-9670-x.