**Original Article**

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**Conflito de interesses:** nada a declarar.

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Número de tabelas e figuras:   2

**Título:** Dependência de videojogos: um problema pediátrico emergente?

**Title:** Addictive video game use: an emerging pediatric problem?

**Introdução:** O uso excessivo de videojogos é um problema emergente que tem vindo a ser estudado no âmbito de comportamentos de dependência. Objetivo: determinar a prevalência de dependência de videojogos num grupo de crianças e identificar fatores protetores ou de risco e potenciais consequências deste comportamento.

**Material e Métodos:** Estudo transversal e observacional de uma população de crianças, do 6º ano escolar, através de um questionário anónimo. A dependência de videojogos foi definida como presença de 5 dos 9 comportamentos adaptados dos critérios do DSM-5 de ‘Pathological Gambling’. Crianças com 4 dos 9 critérios foram incluídas no ‘Grupo de Risco para dependência de videojogos’. Foram entregues 192 questionários, com resposta a 152 (taxa de resposta 79,2%). A análise estatística foi feita com base no SPSS.

**Resultados:** Metade dos participantes eram do sexo masculino, com média de idade 11 anos. A dependência de videojogos esteve presente em 3,9% da população, sendo que cerca de 33% da amostra cumpria critérios de ‘Risco de dependência de videojogos’. A maioria das crianças joga sozinha. Outros fatores de risco encontrados para ‘Grupo de risco de dependência’ foram mais tempo de uso; tipo de jogo online, ação e luta (p<0,001). Este grupo de crianças apresenta menos tempo de sono.

**Discussão:** Um número significativo de crianças da nossa amostra cumpre critérios de dependência de videojogos numa idade precoce, e um número maior pode estar em risco desse comportamento (33%). É um problema clínico emergente, que merece atenção e mais estudos.

**Conclusão:** Este estudo exploratório sugere que a dependência de videojogos em crianças é um problema emergente.

**Palavras-chave:** 1 – comportamento aditivo, 2- videojogos, 3- criança

**Abstract**

**Introduction:** The excessive use of video games is an emerging problem that has been studied in the context of addictive behaviors.

Objective: To determine the prevalence of addictive video games use in a group of children and to identify risk factors, protective factors and potential consequences of these behaviors.

**Material and Methods:** Observational and cross-sectional study of children from the 6th grade using an anonymous questionnaire. Addictive videogame use was defined by the presence of 5 of 9 behavioral items adapted from the DSM-5 criteria for ‘Pathological Gambling’. Children who answer “yes” to 4 items were considered as “Risk Group for addictive videogame use”. We delivered 192 questionnaires and 152 were received and included in the study (79.2%). SPSS statistical software was used.

**Results:** Half of the participants were male and the median age was 11 years old. Addictive video game use was present in 3.9% children and 33% fulfilled the Risk Group criteria. Most children played alone. We found additional factors associated with being in the Risk Group: greater time of use; online, action and fighting games (p<0.001). Children with risk behaviors showed a shorter sleep duration (p<0.001).

**Discussion:** A significant number of children of our sample met criteria for addictive video games use in an early age and a greater number may be at risk (33%). It is a problem that warrants further research and clinical attention.

**Conclusion:** This exploratory study helps to understand that VG addiction in young is an emergent problem.

**Keywords:** 1 - addictive behavior, 2- video games, 3- children

**Introduction**

Recent advances in new technologies, internet and video games (VG) have made these activities the top leisure time occupation for children and adolescents1. Although they are very appealing for free time, negative effects of their excessive use have been increasingly recognized. These include sedentarism with increased risk of childhood obesity; sleep disorders related to excessive daytime somnolence; exposure to inappropriate content for age; and psychological addiction to this activity. Various authors have suggested that videogames are potentially addictive. 1-3

To be considered an addictive behavior, it is not enough to take into account the amount of the time spent in this activity, but also the extent of interference in social (family, friendships and relationships), academic or occupational life.4,5 Although there is still no consensus or enough studies to  establish a definitive diagnosis, the American Psychiatric Association introduced the term ‘Internet Gaming Disorder’ in the 5th Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), in the section “Conditions for further study”.4,6,7 In this context, VG addictive behavior may be defined based on 4 symptoms similar to ‘Pathological Gambling’: loss of control over the activity; decreased tolerance of use, with progressive increase of activity to achieve satisfaction; negative behavioral effects when it is not possible to continue the activity; and interpersonal and occupational interference.6

Although international literature suggests that there are players who experience similar symptoms to other addictive behaviors (pathological gambling, drug addiction), there is no agreement if they truly are players with addictive use.6,8 There is still a lack of systematic research concerning not only prevalence rates, but also the definition and nature of problem VG use.9

The only data from Portuguese children about the prevalence of VG patterns use is published in a report from WHO published in 2014.10 Besides that, currently, there is no validated Portuguese questionnaire to evaluate pathological VG use.

Although we are aware of the variations in cut-off values to diagnose addictive VG use, the primary study aim was to characterize the habits of VG use in a group of children, with mean age 11 years-old, and to find the prevalence of addictive VG use in early ages, rather than test a diagnostic instrument. We also tried to identify risk and protective factors of this pattern of behavior.

**Methods**

 A transversal and observational study was carried out. The target population was 5th or 6th grade students, from different social and cultural status.

 Participants: The sample include 6th grade students from two public Schools from the same suburban area (Cascais, near Lisbon). The schools were selected to include participants from a range of economic and cultural backgrounds. Authorization was requested from the Health Delegate, School Director and Education Officers.

Inclusion criteria: 6th grade students from the selected schools with consent from Education Officers.

Exclusion criteria: All children without Education Officers consent.

We delivered 192 questionnaires and e received 152 (response rate 79.2%).

**Material**

An anonymous self-administered questionnaire with multiple choice and short-answer questions was applied to a convenience sample of the target population. Initial pre-test was performed on a group of 20 children, to gauge the children's acceptance and understanding of the questionnaire.

Questions included: demographic information; 9 items adapted from DSM-5 criteria of addictive gambling use; VG use habits (time of use, places where they play, who they played with); school performance; extra-curricular activities; sleep habits, evaluation of daytime sleepiness; parent's education. Responses were collected between April to June 2016 by pediatric resident.

Gaming frequency was measured in hours per day. Daytime sleepiness was established applying the Pediatric Daytime Sleepiness Scale (PDSS), validated in Portuguese. 11

**Definitions**

Addictive VG use was measured by evaluating the presence of the four symptoms from ‘Pathological Gambling’, based on answers to a short version of adapted items from DSM-5 symptoms/diagnostic criteria. The participants were asked to indicate how often they had experienced each of the situations described in the items within the last year. They were allowed to choose on of three possible answers: ‘yes’, ‘sometimes’ and ‘no’– (colocar tabela 1 aqui) table 1.

We considered the behavior present when there was a “Yes” answer to at least half of items. We defined addictive VG use by the answers "Yes" to at least 5 of 9 questionnaire items adapted from the DSM-5.

Due to the high prevalence of children that answered “Yes” to 4 of the 9 items we felt it important to consider them as a separate group which we termed the “Risk Group” for addictive VG use.

Statistical analysis and evaluation of risk and protective factors was performed in two steps:

Group 1: Children “with addictive VG use” vs “without addictive VG use”

Group 2: Children “at risk of addictive VG use” vs without risk (children with “addictive VG use” were excluded).

The results were analyzed using SPSS (Statistics 19) and p value <0,05 was considered statistically significant. Chi-square test, Fisher test and Mann-Whitney test were applied.

**Results**

**Sample characteristics**

The sample consisted of 152 children. The gender distribution was 72 (47%) female and 80 (53%) male. The age range of participants was from 10 to 14 years-old, with a mean age of 11,5 years and a median of 11 years. -With regards to parents’ educational level 24,8% had basic education (Until the 9th Grade), 35,8% had high school level education and 43% had a degree level education.

**VG global habits of the sample:**

Most children (n= 97; 63,8%) received their first electronic device between 6 and 10 years of age. However, 3,3% (n=5) of children claimed to have started playing VG before the age of 4 years old.

When asked about the daily time spent playing VG, most children answered that they play less than 2 hours (n=107; 70,8%). However, 29 (19,2%) play between 2-3 hours and 15 (9,9%) play more than 4 hours during the week. During the weekend, 26 (17,1%) play between 2-3 hours and 37 (24,3%) play more than 4 hours.  We found that males tended to play more time, although without statistical significance.

We found that most children enjoy playing alone (n=107; 70,9%) or with friends (n=89; 58,9%). The type of favorite VG are: multiplayer online (n=81, 53,6%), adventure (n=77; 51%) and action (n=69; 45,7%). We also verified that the main reasons why they like to play are: to relax (n=68; 44,7%), to forget problems (n=68; 44,7%) and for the challenge of the game (n=67; 44,1%).

P**revalence of addictive use and identification of protective factors and risk factors:**

1. **Addiction prevalence**

Considering the DSM-5 based criteria, we found that 6 children (3.9%) fulfilled the “addictive VG use” criteria (answered at least 5 of 9 questionnaire items). None of the participants answered “yes” to more than 5 items. On other hand, we observed a far greater number of our sample (51 children - 33%) answering “yes” to 4 of the 9 DSM-5 items. We included them in the group “at risk for addictive VG use”.

1. **Risk factors**

There were no statistically significant differences between the number of hours playing VG during the week or weekend, and VG addiction. In fact, 93,3% of children who played more than 4 hours belonged to the group without addictive VG use (table 2). However, this relationship was statistically significant with the “risk of addictive VG use” Group (p<0,001) – table 2 (colocar tabela 2 aqui).

The results show that multiplayer online games and action/fight games were statistically associated with “risk of addictive VG use” (p<0.001) – Table 2. This relationship was not statistically significant for children with “addictive VG use”.

There were no differences in other variables, such as the age of starting to play VG or the time of receiving the first electronic device, between the two groups.

1. **Comorbidities**

Sleep duration was lower in children with “risk for addictive VG use” (average 8h48, SD 01h07) when comparing to children without these criteria (average 09h17, SD 00h47, p=0.007, Mann-Whitney test).  Children who play less than 2 hours per day have more sleeping hours (p <0.001, Mann-Whitney test). Regarding PDSS daytime sleepiness score, we found no significant differences between child with and without “addictive VG use” and between children “at risk for addictive VG use” and without these criteria (Mann-Whitney tests, respectively, p=0.068 and p=0.120) - table 2.

1. **Protective factors**

With regard to parents´ educational level we did not find statistically differences between “addictive VG use” and parents’ educational levels.

In this study, we were also unable to identify other protective factors between the two groups of children amongst the studied variables, namely, the existence of a playmate during VG use (parents, siblings, grandparents, friends or others) and extracurricular activities (sports, dance classes, music classes, etc.).

**Discussion**

In our study 29% of children play VG more than two hours per day during week time and 41% during the weekend. Besides, 10% and 25% of our sample play VG more than 4 hours during week and weekend, respectively. Although our population is younger, the numbers are similar to those from the WHO report about VG habits in Portuguese adolescents (about 40% of adolescents play VG between 1 to 3 hours per day and about 11% of children plays more than four hours during the weekend).10 The concern about VG habits among children led to the American Academy of Pediatrics (AAP) providing a new set of recommendations and resources concerning children and adolescents’ media, in order to help parents to set a balance in digital activities.12 For children aged 6 years and older, the AAP recommended to set consistent limits about on the time spent using media, the types of media, and to make sure that it does not take the place of adequate sleep, physical activity and other behaviors essential to good health. 12

The aim of our exploratory study was to estimate the addictive VG use prevalence in a pediatric Portuguese sample. In previous studies, the incidence ranged from 2,5% to 19,9%.1-3,13,14 More recent data shows lower percentages of players who can be labelled as probably addicted (0,2-2%), and describes others as problematic users (3,7%-9%), depending on methodological issues and the cut-off for “addiction” or “problematic” use.8,9,15 Some authors defend that 5 criteria of 9 should classify players just as “problematic” instead of as addictive players.8,9 In our study, we defined addictive VG use with the cut-off of 5 item, which represents the minimum number of symptoms necessary to classify an addiction pattern based on ´gambling addiction’ DSM-5 criteria. Considering this, 3,9% of our sample would be classified as having an addictive VG use.

Although we must have caution on labelling behavior as abnormal, we found important to show that a greater population may be at “risk of addictive VG use”, since almost one third of our sample had “borderline” criteria answering ‘yes’ to 4 items. However, as Scharkow et al described, longitudinal studies are needed in order to confirm this finding and to understand the trajectories of these children along the years. In fact, they suggested that problematic gaming is highly volatile.9

It has been observed that behavioral changes can start at early ages.3,13 Ko et al; Johansson et al and Johansson & Gotestam found prevalence of addictive use in children as soon as 15-years old, and Douglas Gentile et al since 8-years-old. 1,3 We felt it important to study this age range to get data from Portuguese children.

Several game types and personal characteristics seem to act as risk factors. 1,13,16,17 Although we did not find relationship between addiction and the amount of spend time playing it may be due to the small number of children with these criteria with these criteria. In fact, we identified that time of VG use seems to contribute to being at “risk of addictive VG use”. Other authors justify the frequent playing as a result from simply healthy enthusiasm.8 In the same way, multiplayer online, action and fighting game types, which are the favorite VG of our sample, were associated with this Group. Other authors have demonstrated the importance of game type and content, 3,12 as violent games have been shown to have short and long-term effects on behavior, such as aggressive behaviors becoming more frequent.1,4,5 There was no relation with the age when children started to play video games and addictive use but, as we mentioned, longitudinal studies are needed.

In our sample, parental educational level did not influence the patterns of VG use. This can be justified by the current lifestyle in which a large number of children use mobile phones and computers, even in economically disadvantaged families.12 On the other hand, a high socioeconomic level does not necessarily mean greater awareness of their risks and readiness to take actions in order to prevent or control excessive VG use. Another reason may be related to the life and parenting style that allows children to spend more time unsupervised, and more susceptible to VG overuse.

Unfortunately, our study was unable to identify protective factors that could help preventing addictive VG use. A different study design is needed, including variables about parent educational styles/social support and both parental and child mental health.

With regard to other possible consequences of VG use, we found that children “at risk of VG addiction” slept for significantly fewer hours. Non significant results for the “addictive VG use” group and for the PDSS somnolence scores may be due to the small sample size of the study groups. The relation between VG use and sleep is relevant as sleep may impact learning, emotional regulation and behavior.18,19

In the present exploratory approach, we used a convenience sample that may not fully represent the target population. However, we found our sample with a significant number of children, from different social and cultural status, which may help to highlight this emergent problem. The behavioral evaluation was performed using a self-reported questionnaire that was not previously submitted to clinical validation. Nevertheless, this questionnaire has the strength of being based on the DSM-5 proposed criteria and the pretest show that it was easy to fill out, allowing a good response rate. In future studies, child psychological assessment should be also included in order to clarify the link between VG use and emotional problems.

**Conclusion:** This exploratory study helps to understand that VG addiction in youth is an emergent problem. However, because of smaller incidence than reported by other authors, our results may indicate a far less stable condition that in previous studies. This process of addiction is possible to change and both parents and children need to be educated about the risks and impact of these behaviors and to develop a healthier lifestyle and leisure habits. Further, researches are needed in order to clarify whether these characteristics represent a ‘gaming disorder’ or ‘gaming addiction’. 15,20

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Legendas tabelas:

**Table 1**: Questions, adapted from DSM-5 criteria, to determine addictive gambling use

**Table 2:** Risk factors for addictive VG use