Original Research Article

Problematic computer game use as expression of Internet addiction and its association with self-rated health in the Lithuanian adolescent population

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**Abstract**

**Background and objective:** Computers and the Internet have become an integral part of today's life. Problematic gaming is related to adolescent’s health. The aim of our study was to evaluate the prevalence of Internet addiction among 13–18-year-old schoolchildren and its relation to sex, age, and time spent playing computer games, game type, and subjective health evaluation.

**Materials and methods:** A total of 1806 schoolchildren aged 13–18 years were interviewed. The evaluation of Internet addiction was conducted by the Diagnostic Questionnaire according to Young’s methodology. The relation between the choice of computer games type, time spent while playing computer games and respondents’ Internet addiction were assessed by using multivariate logistic regression analysis.

**Results:** One-tenth (10.6%) of the boys and 7.7% of the girls aged 13–18 years were Internet addicted. Internet addiction was associated with the type of computer game (action or combat vs. logic) among boys (OR = 2.42; 95% CI, 1.03–5.67) and with the amount of time spent playing computer games per day during the last month (≥5 vs. <5 h) among girls (OR = 2.10; 95% CI, 1.19–3.70). The boys who were addicted to the Internet were more likely to rate their health poorer in comparison to their peers who were not addicted to the Internet (OR = 2.48; 95% CI, 1.33–4.62).

**Conclusions:** Internet addiction was significantly associated with poorer self-rated health among boys.

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1. Introduction

Numerous studies have analyzed the influence of health-harmful behavior, such as alcohol consumption and smoking, and overweight on health outcomes of adolescents [1–3]. Recent studies have showed that excessive gaming and Internet addiction are parts of new harmful health behavior for adolescents [4,5]. Computers and the Internet have become an integral part of today’s life. Each generation has its own values, hobbies, and leisure activities. Internet and computer games take up a large part of children’s time in recent years [6,7]. Games and the Internet are closely related as computer games became online games. The Internet addiction of adolescents and a long time spent playing games are related to age, gender, social and personal characteristics [8,9]. Moreover, excessive gaming can affect mental health, depression, poor sleep quality, worsened academic achievements, low wellbeing and high loneliness [10,11]. On the other hand, problematic gaming is related to somatic health problems. Internet addiction is related to juvenile overweight, physical inactivity, musculoskeletal and vision disorders [3,12]. However, little is known about the incidence and behaviors related to the Internet addiction. The aim of our study was to evaluate the associations between self-rated health and Internet addiction.

2. Materials and methods

The study design was cross-sectional. The study protocol was approved by the Department of Municipality Administration Education and Culture Education and Education Division (Protocol No. 35-2-703) and the Regional Biomedical Research Ethics Committee (Protocol No. BE-2-61). Parental consent was obtained from each participant of the study.

2.1. Sample and setting

A multilevel sampling method (county, school, and class) [13] was employed in composing a nationally representative sample in Lithuania (Kaunas County). According to the data provided by the Ministry of Education and Science, there were 56 municipality schools with 14,589 schoolchildren from grade 9 to grade 11 in Kaunas County. Sample power analysis revealed that determined sample size was 1450 schoolchildren. In our survey, we randomly selected 20 of 56 schools. Of the 240 classes in the selected schools, 80 classes (every third) were randomly selected. Thus, a total of 1806 registered schoolchildren from grade 9 to grade 11 (aged 13–18) were invited to participate in this study. The response rate was 95.8% (n = 1730). Information from 76 schoolchildren was included in the survey mainly due to schoolchildren being absent from school when their class completed the survey or due to the fact that less than half of the questionnaire questions had been completed.

The study population consisted of 50.2% (n = 869) boys and 49.8% (n = 861) girls. The mean age of male and female respondents was 15.86 ± 0.94 and 15.81 ± 0.93 years, respectively.

2.2. Data collection

The questionnaire was distributed by the researcher in selected schools during 2012. The schoolchildren had the option to refuse participation in the survey. The researcher did not attempt to persuade any potential respondent to participate.

The survey data included information about what grade and school each schoolchild attended, which made it possible to conclude that the absent schoolchildren were randomly distributed between the schools. The survey was conducted with voluntary and anonymous participation by respondents.

2.3. Questionnaire

A self-report questionnaire was employed in this study. The questionnaire consisted of four questions regarding socio-demographic data (gender, age, school, and grade); 8 items regarding Internet addiction; 5 questions regarding habits related to choice of computer game type and time spent playing computer games, and 1 question regarding self-rated health. In order to determine the amount of time that respondents had spent playing computer games, schoolchildren were asked “How many hours per day did you play computer games during the last month?” In order to identify heavy computer game players, the following response options were provided: <5 h and ≥5 h [14]. The respondents who played computer games were allowed to identify one of their most favorite computer games, which they usually play. The most popular online games were World of War Craft, World of Tanks, Grand Theft Auto, Quick Fire Pool, etc. According to the respondents’ answers about their most favorite computer game, the schoolchildren were classified in two groups: (1) schoolchildren with a preference for logic computer games; (2) schoolchildren with a preference for action or combat computer games.

The evaluation of computer-Internet addiction was conducted by applying the short 8-item version of the Diagnostic Questionnaire by Young [15]. This version of the Diagnostic Questionnaire by Young was validated and adapted for the Lithuanian adolescents’ population. The cutoff score of five or more criteria was consistent with the number used to diagnose pathological gambling [15]. If the participant answered “yes” to five or more criteria, he/she was classified as a dependent Internet user (Internet addiction), and the remainder were classified as nondependent Internet users (no Internet addiction).

The respondents were categorized into two groups according to their self-rated health: (1) excellent, very good, and good; and (2) poor and very poor.

2.4. Statistical analysis

Statistical analysis of data was performed using the SPSS 13.0 software package for Windows. Cronbach’s alpha was used as estimate for the validity Internet addiction test (alpha coefficient 0.83). The data were analyzed by assessing the differences of results in relation to gender, age and the amount of time spent while playing computer games with respect to the respondents’ Internet addiction and self-rated health.
and chi-square ($\chi^2$) tests evaluated statistical hypotheses on the difference in the distribution of variables between the groups of respondents. Associations among variables were evaluated by $\chi^2$. The relation between the choice of computer games type, time spent while playing computer games and respondents’ Internet addiction were assessed by odds ratio (OR) and its 95% confidence interval (CI) using multivariate logistic regression analysis (data were adjusted for age and gender). A dependent variable was respondent’s self-rated health. Response options were recoded into dichotomous outcome variables (1, poor and very poor self-rated health; 0, excellent, very good, and good self-rated health). Independent variables – age, computer game type, time spent gaming per day, and Internet addiction – were used in analysis. The level of statistical significance was set at $P < 0.05$.

### 3. Results

Characteristics of the respondents are shown in Table 1. Only 1.2% of the boys and 9.9% of the girls aged 13–18 years did not play any computer games ($P < 0.001$). The majority (86.3%) of the boys (irrespective of age) reported that they usually played action or combat computer games. A similar percentage of the girls answered that they usually played logic computer games and action or combat computer games (46.6% and 43.5%, respectively). There were significant associations between the type of computer game and respondents’ age (in boys $\chi^2 = 5.93$, $df = 2$, $P = 0.05$; in girls $\chi^2 = 8.17$, $df = 2$, $P = 0.017$). Younger girls (13–15 years old) played action and combat computer games more frequently than their older counterparts (16–18 years old) ($P < 0.001$).

Nearly one-third (32.9%) of the boys and 81.1% of the girls had played computer games less than 5 h per day during the last month ($P < 0.001$); 67.1% of the boys and 18.9% of the girls reported that they had played computer games $\geq 5$ h per day during the last month ($P < 0.001$) (Table 1). No significant associations between time spent playing computer games and respondents’ age were found.

According to our study, 8.4% of the boys and 15.0% of the girls aged 13–18 years reported that their health was poor ($P < 0.001$) (Table 1). There was a significant association between self-rated health and respondents’ age (in boys $\chi^2 = 5.79$, $df = 1$, $P = 0.016$; in girls $\chi^2 = 4.02$, $df = 1$, $P = 0.045$). Boys and girls aged 16–18 years reported that their health was poor more frequently than their younger peers (13–15 years old) ($P < 0.001$).

The results of our study showed that 10.6% of the boys and 7.7% of the girls aged 13–18 years were Internet addicted, and Internet addiction was more prevalent among boys than girls ($P = 0.037$) (Table 1). However, there were no significant associations between Internet addiction and respondents’ age.

Multivariate logistic regression analysis revealed that Internet addiction was associated with the computer game type (action or combat vs. logic) and the amount of time per day that respondents had spent playing computer games during the last month ($\geq 5$ h vs. $< 5$ h). The boys who played action or combat computer games had a greater likelihood of Internet addiction than the male respondents who played logic computer games (OR = 2.42; 95% CI, 1.03–5.67; $P = 0.042$) (data adjusted for age). The girls who had spent $\geq 5$ h playing computer games were more likely to be Internet addicted as compared with their peers who spent $< 5$ h playing computer games (OR = 2.10; 95% CI, 1.19–3.70; $P = 0.010$) (data adjusted for age).

Multivariate logistic regression analysis showed that the probability of poorer self-rated health evaluation among boys and girls was associated only with age and Internet addiction (Table 2). The boys and girls aged 16–18 years were more likely to rate their health poorer than their younger peers (OR = 2.02 and OR = 1.52 for boys and girls, respectively). Also the boys who were addicted to the Internet had a greater likelihood of poorer self-rated health than their peers who were not addicted to the Internet (OR = 2.48).
Computer use has become an ever-increasing part of many adolescents’ leisure time [4,7]. Prevalence rates greatly differ by the country. In the studies from Taiwan and the United States the proportion of players which are described as addicted were 39% and 46% [16,17]. However, German, Greek, Dutch, and Norwegian studies reported that only 0.6%–3% of respondents met the criteria of Internet addiction [7,9,18,19].

Our study showed that 10.6% of the boys and 7.7% of the girls were Internet addicted. Such considerable differences among countries and populations could be a result of two reasons: the criteria for assessing addiction and cultural differences and the limited access to computers and/or the Internet.

There was no significant relation between gaming and respondents’ age, but the results of our study showed that boys played computer games more often and spent more time than girls. Other studies also reported that boys were playing computer games more frequently and more intensively than girls [20]. Our results are in line with the findings of the study by Tsitsika by et al., who concluded that a small minority of girls played action games [19]. However, the girls who play action or combat computer games show stronger Internet addiction than boys.

There are gender differences in the impact of gaming on physical aggression. Research shows that pathological gaming has a different influence on adolescents of both sexes: gaming among adolescent girls predicts a decrease and among boys, an increase in aggression [21]. High gaming addiction is associated with aggression, low sociability and self-efficacy, and lower satisfaction with life [7,22].

Games and Internet addiction are very closely related. We classified players according to the type of the computer game they mostly prefer, and our data showed that the adolescents playing action and combat games displayed higher addiction in comparison with their peers playing logic games. These findings are in agreement with other publications reporting that role-play game users and multiplayer features showed significantly higher Internet addiction scores in comparison to sports, logic game, and web board users [23,24].

Previous studies have shown that problematic gaming is associated with lower levels of sociability, less perceived social support, lower expectations of self-efficacy, aggressive behavior, and lower life satisfaction [7]. Adolescents usually have worse self-control and self-regulation, lower social competence, so they are considered as the most vulnerable group to the temptations of computer games [25]. Besides social and psychological changes in their behavior, there are changes in health and health perception. Self-rated health in adolescence is significantly associated with a broad spectrum of independent variables reflecting medical, social, and personal factors [26,27].

Our results suggest that self-rated health is related to pathological gaming among adolescents of this age group. It should be considered that pathological gaming can lead to serious health problems, which can appear in adolescence. Evaluation of Internet addiction and excessive gaming is a useful tool for identifying adolescents who need psychological support and additional health investigation. Research shows that poor self-rated health in adolescents is a strong predictor of future illness [28]. Our study suggests that adolescents’ behavioral factor such as Internet addiction is strongly related to their self-rated health. Our findings could be useful for public health specialists, school nurses and psychologists, and people who work with adolescents in other settings. These specialists play a major role in practices and policies aimed to improve mental health in the community due to close contacts they have with adolescents and school personnel. Health promotion programs for adolescents, their family members, and school staff can be developed. These programs should target unhealthy adolescents’ behavior for prevention of future life-course disadvantages in terms of mental and physical health. At the same time, our findings indicate the need for more studies with a longitudinal design in order to investigate associations among Internet addiction, pathological gaming, and self-rated health.

Major strengths of our study were a large sample size and a high response rate. However, the study had some limitations as well. The study design was cross-sectional, and therefore, our study could examine only associations between reported gaming and self-rated health at one point of time, instead of drawing conclusions about the underlying development of reported behavioral patterns. It is not possible to show a causal relationship, because there are a number of possible factors that may influence associations and that need to be investigated more deeply. A longitudinal design of the study would have strengthened the findings, allowed the assessment of changes over time, and these are our plans for future research. Another potential limitation is that our study was based on self-reported measures, so we must believe that our respondents conscientiously filled out questionnaires and provided an accurate evaluation of their gaming and health

![Table 2 - The probability of poorer self-rated health evaluation among respondents (multivariate logistic regression model).](image)

<table>
<thead>
<tr>
<th>Boys</th>
<th>OR (95% CI)</th>
<th>Girls</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age groups</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13–15 years</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16–18 years</td>
<td>2.02 (1.15–3.56)</td>
<td>1.52 (1.02–2.27)</td>
<td></td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>0.015</td>
<td>0.038</td>
<td></td>
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<tr>
<td><strong>Type of computer game</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logic</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Action or combat</td>
<td>1.39 (0.64–3.03)</td>
<td>0.99 (0.67–1.46)</td>
<td></td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>0.407</td>
<td>0.939</td>
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<tr>
<td><strong>Time spent gaming per day</strong></td>
<td></td>
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<tr>
<td>During the last month</td>
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<tr>
<td>&lt;5 h</td>
<td>1</td>
<td>1</td>
<td></td>
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<tr>
<td>≥5 h</td>
<td>0.67 (0.41–1.12)</td>
<td>1.51 (0.94–2.43)</td>
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<tr>
<td><strong>P</strong></td>
<td>0.126</td>
<td>0.088</td>
<td></td>
</tr>
<tr>
<td><strong>Internet addiction</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2.48 (1.33–4.62)</td>
<td>1.53 (0.82–2.88)</td>
<td></td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>0.004</td>
<td>0.186</td>
<td></td>
</tr>
</tbody>
</table>

* In the model, the following independent variables were included: age, computer game type, time spent gaming per day, Internet addiction.

4. Discussion

- In the model, the following independent variables were included: age, computer game type, time spent gaming per day, Internet addiction.
assessments. The large sample size in our study could have reduced the influence of potential random error related to self-reporting.

Therefore, some cross-sectional studies revealed that social anxiety, loneliness, depression, introversion, aggression, and shyness are also related to Internet addiction [29,30]. Other study found a direct correlation between level of social anxiety and the amounts of time spent on the Internet [31].

Many of the aforementioned limitations could be addressed in future prospective studies that could investigate computer game playing in more detail, and which could include a variety of investigation methods to evaluate a causal relationship for development of pathological gaming, factors influencing self-rated health, changes in gaming patterns and health perception over time from primary school to adolescence.

5. Conclusions

Our study showed that 10.6% of the boys and 7.7% of the girls aged 13–18 years were Internet addicted. Internet addiction was significantly associated with a poorer health assessment only among boys: the respondents who were addicted to the Internet had a higher probability of poorer self-rated health in comparison with the boys who were not addicted to the Internet.

Conflict of interest

The authors have no conflict of interest to declare.

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References


