



Problematic Gaming in Youth and Its Association with Different Dimensions of Quality of Life

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Abstract: *Objective:* The problematic use of computer games was included in the DSM-5 and in the ICD-11. Initial research revealed associations between problematic gaming (PG) and quality of life (QoL). However, clarification is needed concerning which dimensions of the multidimensional construct QoL are particularly relevant for PG. *Method:* To answer this question empirically, we asked 503 parents (mean age: 47.63 years) to rate their 503 children (average age: 14.60 years) regarding QoL and PG, using validated questionnaires on parental assessments of adolescent PG and health-related QoL to collect the data. Correlation analyses were calculated to determine bivariate relations, and a multiple linear regression was used to conduct a multivariable analysis. *Results:* In the bivariate analyses, a higher severity of PG was associated with a lower health-related QoL in all five surveyed dimensions. In the multivariable model (corrected $R^2 = 0.35$), we observed statistically significant associations between higher severity of PG and male sex and lower age of the adolescent as well as lower QoL in the dimensions of physical well-being and school environment. *Conclusions:* According to the findings of the present study, physical well-being and school environment should be especially focused on in preventive approaches against the development of PG in youth.

Keywords: gaming disorder, internet addiction, quality of life, health, adolescent

Problematisches Computerspiel bei Jugendlichen und sein Zusammenhang mit verschiedenen Dimensionen der Lebensqualität

Zusammenfassung: *Fragestellung:* Der problematische Gebrauch von Computerspielen wurde in das DSM-5 und in das ICD-11 aufgenommen. Erste Untersuchungen ergaben Assoziationen zwischen problematischem Computerspiel (PC) und Lebensqualität (LQ). Es ist jedoch noch zu klären, welche Dimensionen des multidimensionalen Konstrukts LQ für PC besonders relevant sind. *Methode:* Um dieser Frage empirisch nachzugehen, baten wir 503 Eltern (mittleres Alter: 47,63 Jahre), ihre 503 Kinder (mittleres Alter: 14,60 Jahre) bezüglich LQ und PC zu beurteilen. Zur Datenerhebung wurden validierte Fragebögen zur elterlichen Einschätzung des jugendlichen PC und der gesundheitsbezogenen LQ verwendet. Korrelationsanalysen wurden berechnet, um bivariate Beziehungen zu ermitteln, und eine multiple lineare Regression wurde verwendet, um eine multivariable Analyse durchzuführen. *Ergebnisse:* In den bivariaten Analysen ging in allen fünf erhobenen Dimensionen ein höherer Schweregrad des PC mit einer niedrigeren gesundheitsbezogenen LQ einher. Im multivariablen Modell (korrigiertes $R^2 = 0,35$) beobachteten wir statistisch signifikante Assoziationen zwischen höherem Schweregrad des PC und männlichem Geschlecht und niedrigerem Alter des Jugendlichen sowie geringerer LQ in den Dimensionen körperliches Wohlbefinden und schulisches Umfeld. *Schlussfolgerungen:* Nach den Ergebnissen der vorliegenden Studie sollten das körperliche Wohlbefinden und das schulische Umfeld bei präventiven Ansätzen gegen die Entwicklung von PC bei Jugendlichen besonders berücksichtigt werden.

Schlüsselwörter: Gaming disorder, Internetabhängigkeit, Lebensqualität, Gesundheit, Jugendlicher

Introduction

Computer games are very popular worldwide and are used regularly by many people, especially by children and adolescents. Feierabend et al. (2018) investigated a representative sample of 12- to 19-year-olds in Germany (where the present study was also conducted) on the use of video games and reported that "... only one-tenth of the youth never play" (p. 599). Most players use digital games as a form of leisure activity without negative consequences,

but a minority seems to be developing a problematic pattern of video game use (hereinafter referred to as problematic gaming, PG). In representative samples, 2.6 % of adolescents in Slovenia (Pontes et al., 2016) and 3.5 % in Germany (Wartberg et al., 2020) reported PG. According to a current systematic review by Männikkö et al. (2020), PG behavior is associated with detrimental health-related outcomes. Their meta-analytic approach showed adverse health implications especially in mental health: depression, anxiety, obsessive-compulsive disorder, and somati-

zation. Overall, research activities and the number of publications have increased steadily in the field of PG (Lopez-Fernandez, 2018).

The increasing relevance of PG became evident in 2013 with the inclusion of “Internet Gaming Disorder” in the Appendix to the DSM-5 (American Psychiatric Association, 2013, as a diagnosis for which further research is needed) and in 2018 with the inclusion of “Gaming Disorder” as a new diagnosis in the ICD-11 (WHO, 2018). Both diagnoses refer to video games and the period of the last 12 months. However, the formulated criteria catalogs for the problematic behavioral patterns are not identical. In the DSM-5, the American Psychiatric Association (2013) defined nine criteria for Internet Gaming Disorder: (A) pre-occupation with playing computer games (gaming), (B) withdrawal symptoms, (C) development of tolerance, (D) unsuccessful attempts to control or quit gaming, (E) loss of interest in other previous hobbies and leisure activities, (F) continuing to game, despite insight into the psychosocial consequences, (G) deceiving family members or others about the amount of time spent on gaming, (H) use of gaming to relieve negative moods and (I) risk, having jeopardized or lost a job or relationship due to gaming. In the ICD-11, Gaming Disorder was classified diagnostically in the category “Disorders Due to Substance Use or Addictive Behaviours,” and three criteria were formulated: (I) impaired control over gaming, (II) increased priority given to gaming over other interests and daily activities, and (III) continuation or escalation of gaming despite the occurrence of negative consequences (WHO, 2018). Additionally, the diagnosis requires a “... significant impairment in personal, family, social, educational, occupational, or other important areas of functioning” (WHO, 2018) due to PG. In the ICD-11, PG is considered as a new disease or an “addictive behaviour” (WHO, 2018).

According to the biopsychosocial model of the development of disease [in general: Engel (1977) or specific to addictive disorders: Griffiths (2005)], psychological and social aspects always interact with biological components. The subjective experience of health-related psychological and social factors can be well described by the multidimensional construct of quality of life (QoL). The term QoL refers to the state of health experienced by patients in physical, psychological, social, mental, and functional terms (Bullinger, 2016). Usually, different aspects of QoL are recorded, and different dimensions (e.g., physical versus mental) and their respective degrees must be empirically differentiated.

Based on this theoretical foundation, initial empirical findings showed associations between PG and QoL. There are considerably more results available on the construct of problematic internet use (often referred to as “internet addiction”), including a meta-analysis conducted by Cheng

and Li (2014) regarding the relation to quality of environmental conditions (which is also assessed in some QoL instruments). However, empirical findings show that a content-related distinction between the constructs of problematic internet use and PG and their correlates is necessary (e.g., Király et al., 2014); accordingly, findings for one construct cannot be transferred to the other without examination. In a combined approach, Lehenbauer-Baum and Fohringer (2015) used the Internet Addiction Scale (Hahn & Jerusalem, 2010) to distinguish between “engaged” and “addicted” adult computer gamers and reported lower QoL for the addicted gamers on several dimensions each (physical health, psychological health, social relationships and environment). This finding was confirmed by Lehenbauer-Baum et al. (2015) shortly afterwards.

Up to now, very few studies have examined the relationships between PG and QoL. Wartberg et al. (2017) observed an association between PG and lower (general) health-related QoL in a study with in 1,095 adolescents. Recently, Beranuy et al. (2020) investigated vocational training students and compared seven cases (which met the criteria for an Internet Gaming Disorder) with 341 adolescents and young adults (without Internet Gaming Disorder). Beranuy and colleagues (2020) reported mean differences in health-related QoL regarding the scales physical well-being, psychological well-being, peers and social support and school environment (p. 9). Most recently, Fazeli et al. (2020) surveyed 1,512 adolescents and found that psychological distress (i.e., depression, anxiety, and stress) served as a strong mediator in the relation between PG and (general) QoL during the COVID-19 outbreak.

In summary, first studies have shown empirical associations between PG and lower QoL. However, there is a broad consensus that QoL is best understood as a multidimensional construct (e.g., Bullinger, 2016). Currently, it is still unclear which of the dimensions are particularly relevant for problematic gaming. To answer this question empirically, we investigated the following research question: What are the bivariate and multivariable associations between PG and different dimensions of quality of life?

Methods

Procedure

The data collection was carried out among the 503 parents between June and August 2020. Recruitment took place with a digital flyer and personal contacts of students (who were involved in the research project). Parents who signed up to participate in the survey were initially contacted by telephone. During the call, the research assistant checked

whether the parents had a child aged between 11 and 17 years. If this was the case, the parent received a code over the phone and the link to the online survey. At the beginning of the online survey, the parent needed to enter the code before they could proceed with the further questions. A total of 610 parents took part in the study, and 525 of them completed the online survey. In a total of 503 cases, the entered code was assigned in advance by phone. These cases were included in the data analysis.

Measures

We used the parental version of the Internet Gaming Disorder Scale (PIGDS, Wartberg et al., 2019), which is a validated parental assessment of adolescent PG in the last 12 months. The parent reports on all types of online or offline games their child played on computer, tablet computer, games console, and smartphone. The PIGDS comprises nine questions with a binary response format. A sum score for PIGDS is computed by summing up the nine answers. A higher PIGDS sum score indicates a higher severity of adolescent problematic gaming. The reliability coefficient of the PIGDS in the investigated sample was 0.86.

The health-related QoL within the last week for the child or adolescent was measured with the established KIDSCREEN-27 (Ravens-Sieberer et al., 2007). Self-report and parent proxy versions are available for the KIDSCREEN-27 (Ravens-Sieberer et al., 2007). In the present study, we utilized the parental rating. The instrument consists of 27 items with a changing 5-level response format. The KIDSCREEN-27 is divided into five scales (Physical Well-Being, Psychological Well-Being, Parent Relations & Autonomy, Social Support & Peers, and School Environment) assessing different dimensions of QoL. According to Ravens-Sieberer et al. (2007), the scale Physical Well-Being "... explores the level of the child's/adolescent's physical activity, energy and fitness ...", the scale Psychological Well-Being "... includes items on positive emotions, satisfaction with life, and feeling emotionally balanced ...", the scale Parent Relations & Autonomy "... examines relationships with parents, the atmosphere at home, and feelings of having enough age-appropriate freedom, as well as degree of satisfaction with financial resources ...", the scale Social Support & Peers surveys "... relationships with other children/adolescents ...", and the scale School Environment "... explores the child's/adolescent's perceptions of his/her cognitive capacity, learning and concentration, and their feelings about school" (p. 1349). In each of the five scales, a higher score indicates a higher QoL. In our sample, we observed the following reliability coefficients (Cronbach's α): Physical Well-Being: $\alpha = 0.80$, Psychological Well-Being: $\alpha = 0.87$, Parent Relations & Autonomy: $\alpha = 0.73$, Social Support & Peers: $\alpha =$

0.82, and School Environment: $\alpha = 0.82$. Additionally, we collected sociodemographic data of the parent and the related child or adolescent (e.g., her or his sex and age).

Participants

The total sample consists of 503 parents (most of them biological mothers and fathers plus a small percentage of other caregivers such as stepmothers, stepfathers, one foster father, and one aunt). In the following, all participants in the study are uniformly referred to as parents for the sake of simplification. Sociodemographic characteristics of the surveyed sample are shown in Table 1.

Statistical Analyses

We calculated frequencies, means, standard deviations, reliability coefficients, bivariate correlation analyses, and a multiple linear regression analysis. The dependent variable in the multiple linear regression analysis was PG (operationalized via the sum value of the PIGDS). We used sex and age of the surveyed parent, sex and age of the adolescent as well as all five investigated dimensions of QoL (Physical Well-Being, Psychological Well-Being, Parent

Table 1. Sociodemographic characteristics of the investigated sample

Variable	Total sample (N = 503) % or M (SD)
Sex (parent)	77.7 % (female) 22.3 % (male)
Mean age ^a (parent)	47.63 (5.80)
Relationship to adolescent (parent)	76.1 % (biological mother) 21.3 % (biological father) 1.4 % (stepmother) 0.8 % (stepfather) 0.2 % (foster father) 0.2 % (aunt)
Level of graduation (parent)	4.0 % (low educational level) 25.6 % (medium educational level) 70.4 % (high educational level)
Sex (adolescent)	37.6 % (female) 62.4 % (male)
Mean age ^a (adolescent)	14.60 (1.74)
Prospective level of graduation ^b (adolescent)	3.6 % (low educational level) 15.3 % (medium educational level) 81.1 % (high educational level)

Note: ^ain years; ^bforecast.

Relations & Autonomy, Social Support & Peers, and School Environment) as explanatory variables. All of these statistical analyses were conducted with SPSS version 25.0 (IBM, 2017, New York, USA).

Results

Bivariate Associations

The bivariate correlation analyses showed statistically significant relations between PG and all five dimensions of QoL (Physical Well-Being, Psychological Well-Being, Parent Relations & Autonomy, Social Support & Peers, and School Environment). Higher severity of PG was associated with a lower health-related QoL in every dimension and with male sex of the parent as well as male sex and lower age of the adolescent (see Table 2). The relationship between PG and parental age was not statistically significant ($p = .056$).

Multivariable Associations

In the multiple linear regression analysis, we observed statistically significant associations between higher severity of PG and male sex of the adolescent, lower age of the ado-

lescent as well as lower health-related QoL in the dimensions of Physical Well-Being and School Environment (see Table 3). For the multivariable model, the corrected R^2 was 0.35, i.e., one-third of the variance in the outcome could be explained by the independent variables (see Table 3).

Discussion

The aim of the present study was to determine which dimensions of health-related QoL are specifically relevant for problematic use of video games. Initial studies (e.g., Wartberg et al., 2017) already showed lower QoL in persons who were affected by problematic gaming. Since QoL is nowadays regularly described as a multidimensional construct (e.g., Bullinger, 2016), it seems important to differentiate which partial aspects (often called “dimensions” in QoL research) are specifically relevant for the development of problematic gaming.

For this purpose, the KIDSCREEN-27 (Ravens-Sieberer et al., 2007), an established questionnaire, was applied, with which five central dimensions of health-related QoL can be surveyed both in the self-assessment of adolescents and in the external assessment by parents. A total of 503 parents assessed their 503 teenage children (mean age: 14.60 years) regarding PG (also with a validated instrument for an external rating) and in terms of QoL. In the

Table 2. Correlation matrix for the variables

Variable	1	2	3	4	5	6	7	8	9	10
1. Problematic gaming (PIGDS)	–									
2. Sex of parent ^a	–0.09*	–								
3. Age of parent	–0.09	0.01	–							
4. Sex of adolescent ^f	–0.42***	0.15**	0.03	–						
5. Age of adolescent	–0.20***	0.07	0.30***	0.05	–					
6. Physical well-being (KIDSCREEN-27)	–0.21***	–0.04	0.05	–0.11*	–0.05	–				
7. Psychological well-being (KIDSCREEN-27)	–0.27***	0.04	0.05	–0.06	–0.05	0.53***	–			
8. Parent relations & autonomy (KIDSCREEN-27)	–0.25***	0.05	0.13**	–0.03	0.15**	0.35***	0.58***	–		
9. Social support & peers (KIDSCREEN-27)	–0.25***	0.08	0.05	0.02	0.12**	0.38***	0.47***	0.37***	–	
10. School environment (KIDSCREEN-27)	–0.39***	0.04	0.01	0.13**	0.02	0.33***	0.47***	0.40***	0.42***	–

^aMale Sex = 0, female sex = 1. *** $p < .001$, ** $p < .010$, * $p < .050$.

Table 3. Multiple linear regression analysis on associations between PG and different dimensions of quality of life

Variable	Multiple linear regression (N = 503) Problematic gaming Standardized beta coefficient (95 %CI)
Sex of parent ^a	-0.01 (-0.07, 0.06)
Age of parent	0.00 (-0.07, 0.07)
Sex of adolescent ^a	-0.40*** (-0.47, -0.33)
Age of adolescent	-0.18*** (-0.26, -0.11)
Physical well-being (KIDSCREEN-27)	-0.11** (-0.20, -0.03)
Psychological well-being (KIDSCREEN-27)	-0.10 (-0.20, 0.00)
Parent relations & autonomy (KIDSCREEN-27)	-0.04 (-0.14, 0.05)
Social support & peers (KIDSCREEN-27)	-0.02 (-0.10, 0.07)
School environment (KIDSCREEN-27)	-0.23*** (-0.31, -0.14)
Corrected R ²	0.35

^aMale sex = 0, female sex = 1. *** $p < .001$, ** $p < .010$, * $p < .050$.

bivariate analyses, higher severity of PG was statistically significantly associated with lower health-related QoL in the scales Physical Well-Being, Psychological Well-Being, Parent Relations & Autonomy, Social Support & Peers, and School Environment. This finding of the present study corresponds well with the result of Beranuy et al. (2020), who also reported correlations between PG and QoL in these five dimensions in slightly older vocational training students (average age: 18.35 years). In addition, significant bivariate relations to sociodemographic characteristics were found in the present study, which are known from the scientific literature on PG with regard to adolescents (e.g., see Mentzoni et al., 2011, for male sex and lower age), but had not yet been reported concerning the parents (male sex). Whether fathers actually assess the PG of their children more critically (possibly due to greater personal experience with video games than mothers), however, must be empirically investigated in future studies.

In the multivariable analysis, as sociodemographic aspects, male sex and lower age of the youth were associated with problematic gaming. Furthermore, statistically significant relationships with adolescent PG were observed for two out of five surveyed dimensions (Physical Well-Being and School Environment). The lower QoL in terms of

school environment may be related to poorer school performance, which has been reported for adolescents with PG in several studies (e.g., in both the adolescents' self-assessment and the parents' assessment by Wartberg et al., 2019). Poorer results in school exams are likely to influence subjective assessments of "... cognitive capacity, learning and concentration ..." and adolescents' "... feelings about school ..." (Ravens-Sieberer et al., 2007, p. 1349) – and thus the corresponding facet of QoL. Furthermore, the general importance of school-related factors for problematic patterns of use had already been demonstrated in other studies (e.g., Kindt et al., 2019). It is also conceivable that the findings of the present survey may have been influenced by the COVID-19 pandemic. At the time of data collection, schools in northern Germany were already reopened, but it is imaginable that the school closures shortly before had led to the assessment among parents that their children's quality of school life was particularly impaired during this school year.

According to Ravens-Sieberer et al. (2007), "... physical activity, energy and fitness ..." (p. 1349) are relevant for the dimension physical well-being. The findings of Liew, Stavropoulos, Adams, Burleigh, and Griffiths (2018) may be helpful in explaining the relation between lower physical well-being and problematic gaming. According to the results of Liew et al. (2018), physical activity can act as a protective factor against PG; conversely, it is easy to imagine that physical activity may be neglected in the case of excessive gaming. Since physical activity is also a well-known means of illness prevention, this may put further strain on youth's well-being. Again, the COVID-19 pandemic and its consequences may have been contributed to lower adolescent physical activity or physical well-being.

The present cross-sectional survey has several limitations. No representative sample was studied; accordingly, causality is unclear and also to what extent the results can be generalized to the general population and other age groups (e.g., adults). In addition, parents were asked to assess their teenage children in terms of PG and QoL, while self-assessments were not utilized. However, in a validation study, the assessment instrument we used for PG showed a high correlation ($r = 0.78$) between parental and adolescent ratings (Wartberg et al., 2019). The instrument we used for measuring health-related QoL (KIDSCREEN-27, Ravens-Sieberer et al., 2007) was also specifically constructed to collect a parental assessment. Nevertheless, it cannot be ruled out that the adolescents' assessments (e.g., of quality of life) could vary from those of their parents, and that the results therefore could be different. Problems in parental recall of adolescent PG or health-related QoL may also have influenced outcomes. The aim of the study was to investigate which partial aspects of QoL are specifically relevant for problematic gam-

ing, and we found some answers to this research question. Indeed, a recently published study (Fazeli et al., 2020) suggests that, for example, stress acts as an important mediator between PG and QoL during the COVID-19 outbreak. For research economic reasons, not all potentially relevant constructs (such as stress levels among adolescents) could be assessed in the present investigation; accordingly, it cannot be ruled out that important confounders for the results were not considered in the study design.

Despite the aforementioned limitations, the present survey yielded some interesting new and advanced findings. Prevention measures against PG or intervention measures for affected youth can use these results. Aspects of school environment and physical well-being should be taken into account. Physical well-being could be addressed in the form of increased physical activity, which, according to numerous empirical findings, also has a positive effect on psychological well-being (e.g., Biddle & Asare, 2011). With regard to the school environment, for example, interactions with classmates or even teachers could be trained as social skills. In the case of performance problems at school, educational support could be organized so that the school as a place of education can be (re-)experienced and perceived more positively by affected adolescents. Of course, these new findings on associations between PG and the different dimensions of health-related QoL require further empirical verification (for example, in longitudinal studies).

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