

The impact of heavy and disordered use of games and social media on adolescents' psychological, social, and school functioning

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Aim: To extend the scholarly debate on (a) whether or not the compulsive use of games and social media should be regarded as behavioral addictions (Karddefelt-Winther et al., 2017) and (b) whether the nine DSM-5 criteria for Internet gaming disorder (IGD; American Psychiatric Association [APA], 2013) are appropriate to distinguish highly engaged, non-disordered users of games and social media from disordered users, this study investigated the impact of engaged and disordered use of games and social media on the psychosocial well-being and school performances of adolescents. **Methods:** As part of the Digital Youth Project of the University of Utrecht, a three-wave longitudinal sample of 12- to 15-year-old adolescents ($N = 538$) was utilized. Three annual online measurements were administered in the classroom setting, including IGD, social media disorder, life satisfaction, and perceived social competence. Schools provided information on students' grade point average. **Results:** The symptoms of disordered use of games and social media showed to have a negative effect on adolescent's life satisfaction, and the symptoms of disordered gaming showed a negative impact on adolescents' perceived social competence. On the other hand, heavy use of games and social media predicted positive effects on adolescents' perceived social competence. However, the heavy use of social media also predicted a decrease in school performances. Several gender differences in these outcomes are discussed. **Conclusion:** The findings propose that symptoms of disordered use of games and social media predict a decrease in the psychosocial well-being and school performances of adolescents, thereby meeting one of the core criteria of behavioral addictions.

Keywords: game addiction, social media addiction, psychosocial well-being, school functioning, adolescents, consequences

INTRODUCTION

Intensive gaming and social media use have frequently been linked to the development of addictive-like behaviors among adolescents (Griffiths, Kuss, & Demetrovics, 2014; Lemmens, Valkenburg, & Gentile, 2015; Van den Eijnden, Lemmens, & Valkenburg, 2016; Van Rooij, Schoenmakers, Van den Eijnden, & Van de Mheen, 2010). Although there is an ongoing debate on the conceptualization and measurement of addictive use of games (e.g., De Cock et al., 2014; Festl, Scharkow, & Quandt, 2013; Griffiths, King, & Demetrovics, 2014), *Internet gaming disorder* (IGD) has been included in section III of the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association [APA], 2013), and gaming disorder has recently received an official status as mental health condition in the ICD-11 (World Health Organization, 2018). In contrast, addictive-like social media use – here referred to as *social media disorder* (SMD; Van den Eijnden et al., 2016) and regarded an umbrella term for addictive-like use of all social network sites (e.g., Facebook, Instagram, and Twitter) and instant messengers (e.g., WhatsApp and Snapchat) – now has no status in DSM-5 or ICD-11. An increasing body of evidence, however, suggests that both IGD and SMD are

growing mental health problems, particularly among adolescents (Kuss & Griffiths, 2011, 2012; Mentzoni et al., 2011; Pantic, 2014; Ryan, Chester, Reece, & Xenos, 2014), with 3%–9% of adolescent online gamers meeting the criteria for IGD (Festl et al., 2013; Müller et al., 2015; Van Rooij, Schoenmakers, Vermulst, Van Den Eijnden, & Van De Mheen, 2011) and 5%–11% of youngsters meeting the criteria for SMD (Boer & Van den Eijnden, 2018; Van den Eijnden et al., 2016). Since adolescence is a developmental period marked by profound physical, cognitive, emotional, and social changes, IGD and SMD may have significant and enduring consequences for the psychological and social development of youngsters. It is therefore of vital importance to have a better understanding of the impact of these phenomena on adolescent development.

Conceptualization of IGD and SMD

Existing research has predominantly defined IGD on the basis of the six core criteria for substance dependence,

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i.e., loss of control, preoccupation, problems, tolerance, withdrawal symptoms, and coping/escapism (Brand, Laier, & Young, 2014; Kuss & Griffiths, 2011; Müller et al., 2015; Wegmann, Stodt, & Brand, 2015). The DSM-5 definition for IGD additionally lists symptoms of deception, displacement, and conflict (Petry et al., 2014). Together, these nine criteria have been adopted by the IGD scale developed by Lemmens et al. (2015), as well as the SMD scale developed by Van den Eijnden et al. (2016). However, some researchers have warned against the use of substance addiction criteria to define Internet-related and other behavioral addictions, asserting that these criteria do not adequately distinguish disordered behavior (i.e., addicted) from highly engaged (i.e., heavy), non-disordered behavior (Deleuze et al., 2017; Kardefelt-Winther et al., 2017). In an attempt to elucidate what is fundamental for the characterization of behavioral addictions, Kardefelt-Winther et al. (2017, p. 2) had proposed to define it as “repeated behavior leading to significant harm or distress of a functionally impairing nature, which is not reduced by the person and persists over a significant period of time.” Thus, to determine whether IGD and SMD should be regarded as behavioral addictions, insight into whether symptoms of IGD and SMD predict significant impairments in adolescents’ psychosocial and school functioning over time is urgently needed.

Negative consequences of IGD and SMD

In cross-sectional studies, problematic gaming has been linked to a range of negative outcomes, such as lower school grades (Chiu, Lee, & Huang, 2004; Gentile, 2009; Kuss & Griffiths, 2012; Müller et al., 2015; Skoric, Teo, & Neo, 2009), depression and low self-esteem (Männikkö, Billieux, & Käriäinen, 2015; Mentzoni et al., 2011; Müller et al., 2015; Van Rooij, Ferguson, Van de Mheen, & Schoenmakers, 2015), and low life satisfaction (Festl et al., 2013; Lemmens et al., 2015; Mentzoni et al., 2011; Subramaniam et al., 2016). Other studies have found problematic gaming to be related to social problems, such as loneliness and decreased social competence (Kuss & Griffiths, 2011; Lemmens et al., 2015; Müller et al., 2015). However, only a handful of studies have utilized the longitudinal design that is required to gain more insight into the order of events, and these studies generated inconclusive results regarding the effects of IGD. Gentile et al. (2011) found that the pathological video game use among Singaporean adolescents predicted poorer school grades and lower psychological well-being 2 years later. In contrast, Ferguson and Ceranoglu (2014) found no effect of pathological gaming on grade point average (GPA) scores 1 year later. Lemmens, Valkenburg, and Peter (2011) and Scharkow, Festl, and Quandt (2014) did not report any longitudinal effects of IGD on life satisfaction, self-esteem, and perceived social competence, but found pathological gaming to predict increased loneliness 6 months later.

In comparison to the literature on IGD, research on the correlates of addictive-like social media use is much more limited, and longitudinal research is almost missing. In cross-sectional research, SMD (including Facebook, social network site, and instant messaging addiction) has been related to lower life satisfaction (Satici & Uysal, 2015),

lower psychological well-being (De Cock et al., 2014; Hong, Huang, Lin, & Chiu, 2014; Koc & Gulyagci, 2013; Van den Eijnden et al., 2016; Wang, Gaskin, Wang, & Liu, 2016), more loneliness (De Cock et al., 2014; Van den Eijnden et al., 2016; Yu, Wu, & Pesigan, 2015), lower levels of social competence (Satici, Saricali, Satici, & Çapan, 2014), and negative learning outcomes (Aladwani & Almarzouq, 2016; Huang & Leung, 2009). However, due to the absence of longitudinal studies, we do not know whether these correlates are predictors or outcomes of SMD. The only longitudinal study that we are aware of showed that time spent on Facebook directly predicted a decrease in self-reported academic performance 6 months later, whereas Facebook addiction alone indirectly affected the perceived academic performance through decreased academic motivation (Wohn & LaRose, 2014).

The present study

To summarize, although cross-sectional studies suggest that SMD may impact adolescents’ psychosocial well-being and school functioning, longitudinal research addressing SMD as an umbrella concept is missing. Moreover, the current state of the art shows inconclusive findings with regard to the longitudinal consequences of IGD. Therefore, the current three-wave longitudinal study, with 1-year interval periods, aims to contribute to the existing knowledge by examining whether IGD and SMD predict a decline in life satisfaction, perceived social competence, and learning outcomes (i.e., GPA) over time among adolescents aged 12–15 years. To contribute to the discussion of whether IGD and SMD should be regarded as behavioral addictions (Kardefelt-Winther et al., 2017) and whether the current IGD and SMD criteria adequately distinguish highly engaged (i.e., heavy), non-disordered users of games and social media from disordered (i.e., addicted) users, we will test the outcomes of intensities of both game and social media use as well as the symptoms of IGD and SMD. Finally, since boys and girls differ in their use of online applications, with boys being more involved in gaming and more likely to develop symptoms of disordered gaming (Chiu et al., 2004; Gentile, 2009; Lemmens et al., 2011; Mentzoni et al., 2011) and girls being more attracted to social media use (e.g., Kuss & Griffiths, 2011; Lenhart et al., 2015), we will explore whether gender moderates the impact of intensity of games and social media use and symptoms of IGD and SMD on adolescents’ life satisfaction, perceived social competence, and GPA.

METHODS

Sample

The data were derived from the Digital Youth Project, an ongoing longitudinal study at Utrecht University. Data were collected through online self-report questionnaires administered in the classroom setting using Qualtrics survey software. For this study, students in the 7th and 8th grades (at T₁) of two schools for secondary education were followed

for 2 years with annual assessments from February to March 2015 (T₁), 2016 (T₂), and 2017 (T₃). The final sample consisted of 543 adolescents with ages ranging from 12 to 15 years ($M_{\text{age}} = 12.9$, $SD = 0.73$) at T₁, of whom five repeated class at T₂ or T₃. As repeating a class may influence school grades, these adolescents were excluded from the analyses. This resulted in a sample of 538 adolescents eligible for analyses. Gender was evenly distributed (51.1% girls) and most adolescents had a Dutch ethnic background (96.5%). Students were in lower level vocational education (4.6%), moderate level secondary education (47.8%), and high school or preuniversity education (47.6%).

Measures

Gaming hours per week was measured using two items asking for the number of days playing games per week (0–7 days per week) and the duration of playing (0–9 hr or more per day). The two items were multiplied. Five respondents were indicated as outliers and their scores were recoded into mean score + 2SD.

IGD symptoms were measured using nine dichotomous (1 = no/2 = yes) items of the IGD scale (Lemmens et al., 2015), which were based on the diagnostic criteria of IGD, i.e., *Preoccupation, Persistence, Tolerance, Withdrawal, Displacement, Escape, Problems, Deception, and Conflict*, as described in the Appendix of the DSM-5. A sample item measuring Persistence is, “During the last 12 months . . . were you unable to reduce your time playing games after others had repeatedly told you to play less?” A sum score of the nine items was calculated. Cronbach’s α values were .73 (T₁) and .76 (T₂).

Frequency of social media use was measured using six items. Prior to these questions, a definition of social media use was given: “The term social media refers to social network sites (e.g., Facebook, Instagram, and Twitter), and instant messengers (e.g., WhatsApp, Snapchat, and Facebook messenger).” Four items reflected the use of social networking sites (e.g., “How many times a day do you check your social network sites?”) and two items reflected instant messaging through smartphone (e.g., “How many times a day do you send a message, picture, or video with your smartphone?”) using a 7-point response scale [ranging from 0 (*less than once a day/week*) to 7 (*more than 40 times a day/week*)]. An average score of the six items was calculated. Cronbach’s α value was .87 at T₁ and T₂.

SMD symptoms were measured using nine dichotomous (yes/no) items of the SMD scale (Van den Eijnden et al., 2016). These nine items measured the same nine criteria that were used to measure IGD, but then were applied to social media use. Adolescents were, for instance, asked “During the past year, have you . . . regularly neglected other activities (e.g., hobbies and sport) because you wanted to use social media?” A sum score was calculated. Cronbach’s α values were .67 (T₁) and .73 (T₂).

Perceived social competence was assessed using the 5-item Dutch version of the Harter’s Self Perception Profile of Adolescents (Harter, 1988; Treffers et al., 2002). We used the subscale “Close Friendships” for assessing the ability to establish and retain close friendships, using a 6-point answer

scale ranging from 1 (*totally agree*) to 6 (*totally disagree*). An example of an item is “I find it hard to get friends on whom I can count.” Items were recoded so that the mean score indicated a higher level of perceived social competence. Cronbach’s α values ranged from .67 (T₁ and T₃) to .77 (T₂).

Life satisfaction was measured with the 5-item Satisfaction with Life Scale developed by Diener, Emmons, Larsen, and Griffin (1985) and two additional items. An example of an item is “I am satisfied with my life.” Response categories ranged from 1 (*totally agree*) to 6 (*totally disagree*). A mean score was calculated. Cronbach’s α values ranged from .81 to .86.

GPA was calculated on the basis of the school grades that were provided by the schools. GPA was computed as the average grade of the six most important courses and ranged from 0 to 10.

Level of education was divided into low to moderate education (lower vocational training or moderate level secondary education; 52.4%) and higher education (lower vocational training or moderate level secondary education; 52.4%).

Strategy for analysis

Of the 538 participants, there were 293 (54.1%) complete cases in which individuals participated in all three measurement occasions and 493 (90.9%) individuals participated in at least two measurement occasions. While Little’s Missing Completely at Random Test (Little, 1988) was significant, $\chi^2(289) = 405.70$, $p < .001$, a normed χ^2 (χ^2/df) value of 1.40 was identified, indicating a good fit between the sample scores with and without imputation (Bollen, 1989). Missing data were estimated in Mplus using the Full Information Maximum Likelihood with Robust Standard Errors default setting, allowing information of all the 538 participants to be used for analysis (Muthén & Muthén, 1998–2012; Werner, 2000).

Descriptive statistics and correlations were retrieved for the total group, for boys and girls separately, and for each measurement occasion. We used structural equation modeling to test two models: one model with game hours per week and IGD symptoms and other model with frequency of social media use and SMD symptoms as predictors (combined models). In both models, the two predictors were regressed upon three outcome variables, i.e., life satisfaction, perceived social competence, and GPA. The direct effects were examined for the predictor variables at T₁ on the subsequent outcome variables at T₂ and at T₂ on the subsequent outcome variables at T₃. In each of the models, the outcome variable at the previous measurement was included as a control variable, as well as level of education and gender. In line with Nieminen, Lehtiniemi, Vähäkangas, Huusko, and Rautio (2013), we used the standardized β s as effect size indices, whereby $\beta < 0.2$ was considered a small, $0.2 < \beta < 0.5$ a moderate, and $\beta > 0.5$ a strong effect. Then, the interaction terms between the predictor variables and gender were added to the models. Due to missing data, adding these interaction terms resulted in a lower sample size for the analyses from T₂ to T₃ ($n = 366$).

Perceived social competence, life satisfaction, and GPA were all negatively skewed at all time points. Thus, bootstrapping was used to generate random samples (500) based on the original data to account for non-normality, and 95% confidence intervals were based on the bootstrap corrected estimates of direct effects (Geiser, 2013; Selig & Preacher, 2009). Goodness of model fit was evaluated using the comparative fit index (CFI) and the root mean square error of approximation (RMSEA). Standard criteria were used to assess acceptable model fit indices wherein CFI should be 0.90 or higher and RMSEA should be 0.08 or below (Geiser, 2013).

Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki and were approved by the board of ethics of the Faculty of Social Sciences at Utrecht University (FETC16-076 Eijnden). All participants and their parents were fully informed about the study and were granted the right to refuse to participate before the study began or at any juncture of the data.

RESULTS

Descriptive statistics

Descriptive statistics were calculated across measurement occasions for the total group and boys and girls separately (Table 1). Girls reported fewer game hours ($T_1: t = -12.35, p < .001; T_2: t = -7.89, p < .001$) and IGD symptoms ($T_1: t = -7.49, p < .001; T_2: t = -4.14, p < .001$) compared to boys. Girls use social media somewhat more frequently ($T_1: t = 3.62, p < .001; T_2: t = 3.58, p < .001$), experience a higher perceived social competence ($T_1: t = 3.49, p < .001; T_2: t = 3.48, p < .001$), and have a higher GPA ($T_1: t = 4.72, p < .001; T_2: t = 2.74, p < .05$) than boys. No gender differences were found in SMD symptoms and life satisfaction.

Correlations between all constructs that were measured at different time points can be found in Table 2 (separately for girls and boys). The overall pattern is that IGD is negatively related to the perceived social competence and life satisfaction of both boys and girls (for almost all measurements) and that SMD is negatively related to the life satisfaction of girls (all measurements) and boys at T_2 . In addition, SMD is negatively related to the GPA at T_2 for girls, but not to the GPA for boys. Moreover, the frequency of social media use is negatively related to the GPA of boys at T_2 and T_3 and of girls at T_2 and to the perceived life satisfaction of boys (almost all measurements), but not that of girls. Finally, one positive correlation was found, namely between frequency of social media use at T_2 and perceived social competence of girls at T_3 .

Gaming hours and IGD symptoms

The model testing the effect of gaming hours and IGD showed an acceptable model fit (CFI = 0.88, RMSEA = 0.07). However, no significant main effects of hours gaming per week on school grades and life satisfaction, were found (Table 3). Instead, there was a small positive effect of gaming hours T_1 on perceived social competence T_2 , suggesting that the intensity of gaming predicted an increase in perceived social competence 1 year later.

IGD symptoms at T_1 showed to have a small effect on life satisfaction T_2 ($\beta = -0.17, p < .05$) and this effect was marginally significant from T_2 to T_3 ($\beta = -0.16, p = .08$; Table 3). In addition, IGD symptoms showed to have a moderate negative effect on subsequent perceived social competence ($T_2: \beta = -0.22, p < .001; T_3: \beta = -0.29, p < .001$). There was no effect found on GPA.

Two interaction effects with gender were found. Gender showed to moderate the effect of IGD symptoms T_2 on both life satisfaction T_3 ($\beta = 0.56, p < .01$) and social competence T_3 ($\beta = 0.56, p < .05$). As shown in Figure 1, the negative effects of IGD symptoms on life satisfaction and perceived social competence were significant only for boys, and not for girls.

Table 1. Descriptive statistics at each time point for the total group and separately for girls and boys

Variable	Total	M (SD)	
		Girls (51.1%)	Boys (48.9%)
Age	12.90 (0.73)	12.84 (0.68)	12.96 (0.78)
Level of education (% high)	95.40	95.60	95.10
Gaming hours T_1	8.30 (8.37)	4.13 (5.31)	12.22 (8.83)**
Gaming hours T_2	8.02 (9.29)	3.75 (6.54)	11.42 (9.76)**
Internet gaming disorder T_1	9.79 (1.42)	9.32 (0.96)	10.23 (1.63)**
Internet gaming disorder T_2	9.73 (1.43)	9.36 (0.99)	10.02 (1.65)**
Frequency of social media use T_1	22.52 (8.44)	23.79 (8.19)	21.19 (8.49)**
Frequency of social media use T_2	22.54 (7.88)	23.96 (7.53)	21.06 (7.98)**
Social media disorder T_1	9.85 (1.29)	9.85 (1.32)	9.86 (1.26)
Social media disorder T_2	10.00 (1.56)	10.06 (1.67)	9.96 (1.43)
Social competence T_2	5.23 (0.66)	5.34 (0.58)	5.11 (0.72)**
Social competence T_3	5.23 (0.67)	5.33 (0.59)	5.09 (0.74)**
Life satisfaction T_2	4.71 (0.79)	4.69 (0.78)	4.73 (0.81)
Life satisfaction T_3	4.61 (0.78)	4.56 (0.78)	4.68 (0.78)
School grade T_2	6.74 (0.74)	6.91 (0.75)	6.55 (0.67)**
School grade T_3	6.52 (0.72)	6.59 (0.77)	6.44 (0.64)*

Note. The symbol “*” indicates whether boys significantly differ from girls with $*p < .05$ and $**p < .01$. SD: standard deviation.

Table 2. Correlations of all studied variables at each time point for girls and boys separately

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Age	1	-.06	-.11	-.14	.08	-.06	-.05	.07	-.02	.07	-.09	.05	-.05	-.04	-.06	-.11*
2. Level of education (1 = low)	.10	1	-.06	-.02	.08	.06	.03	-.07	.05	-.03	.03	-.01	.04	-.10	-.19*	-.09
3. Gaming hours T ₁	-.05	.04	1	.52**	.54**	.44**	.05	.05	.19**	.10	-.03	-.16	-.13	-.06	-.10	-.02
4. Gaming hours T ₂	-.01	-.03	.34**	1	.42*	.66**	-.03	.01	.11	.13	-.26**	-.29**	-.09	-.06	-.04	.02
5. Internet gaming disorder T ₁	-.06	.07	.37**	.18*	1	.56**	.02	-.08	.47**	.31**	-.25**	-.25*	-.28**	-.33**	-.03	.06
6. Internet gaming disorder T ₂	-.01	-.03	.22**	.37**	.41**	1	.01	.02	.22**	.37**	-.35**	-.40*	-.38**	-.41**	-.13	-.04
7. Frequency of social media use T ₁	.04	.04	.17	.03	.07	-.01	1	.60**	.39**	.27*	.04	.11	-.16	-.16	-.27*	-.17
8. Frequency of social media use T ₂	.12	-.03	.09	.02	-.03	.02	.59**	1	.17*	.28**	.12	.23**	-.18	-.04	-.29*	-.17
9. Social media disorder T ₁	-.02	.09	.18*	-.01	.45**	.06	.29**	.19**	1	.47**	-.13	-.13	-.43**	-.33**	-.19*	-.02
10. Social media disorder T ₂	.08	.02	.08	.07	.41**	.35**	.18*	.30**	.54**	1	-.16	-.16	-.48**	-.55**	-.26*	-.08
11. Social competence T ₂	.01	.06	-.02	-.22*	-.26**	-.31**	.01	.06	-.10	-.22*	1	.48**	.29**	.24*	.08	.00
12. Social competence T ₃	-.04	.02	.12	-.08	-.10*	-.23**	.12	.01	.02	.07	.47**	1	.31**	.41**	.05	-.09
13. Life satisfaction T ₂	-.06	.11	-.13	-.12	-.25**	-.29**	-.15*	-.19**	-.21*	-.33**	.28*	.30*	1	.66**	.25**	.11
14. Life satisfaction T ₃	-.10	.03	.07	-.03	-.29**	-.11	-.09	-.18*	-.11	-.09	.09	.42**	.60**	1	.10	-.01
15. School grade T ₂	-.14	-.18	-.03	.12	-.06	-.03	-.21**	-.20**	-.20	-.16	-.04	-.13	.27**	.20	1	.67**
16. School grade T ₃	-.15	-.10	-.05	.03	-.04	-.01	-.33**	-.23**	-.19	-.15	-.14	.01	.15	.22	.54**	1

Note. Correlations for girls are displayed above the diagonal and correlations for boys are displayed beneath the diagonal.

* $p < .05$. ** $p < .01$.

Table 3. Longitudinal relations between game hours per week and IGD symptoms at T₁ and T₂ on GPA, life satisfaction, and social competence 1 year later (N = 538)

Control variables	GPA						Life satisfaction						Social competence					
	T ₂		T ₃		T ₃		T ₂		T ₃		T ₃		T ₂		T ₃			
	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p		
Gender (1 = boy)	-.09	.07	0.05	.28	0.07	.23	0.06	.31	-.01	.06	-.01	.06	-.09	.24	-.09	.24		
Level of education (1 = low)	-.03	.29	0.02	.63	0.07	.04	-.01	.29	-.01	.90	-.01	.90	-.02	.70	-.02	.70		
T-1 predictor	0.65	.00	0.65	.00	0.45	.00	0.62	.00	0.40	.00	0.40	.00	0.47	.00	0.47	.00		
Main effects																		
Hours per week	-.03	.57	-.03	.59	-.01	.87	0.01	.98	0.11	.04	0.11	.04	0.13	.16	-.02	.16		
IGD symptoms	0.04	.52	0.04	.41	-.01	.02	-.01	.08	-.02	.00	-.02	.00	-.02	.00	-.02	.00		

Note. Model fit: CFI = 0.88 and RMSEA = 0.07. Bold values are significant at $p < .05$. IGD: Internet gaming disorder; GPA: grade point average; CFI: comparative fit index; RMSEA: root mean square error of approximation.

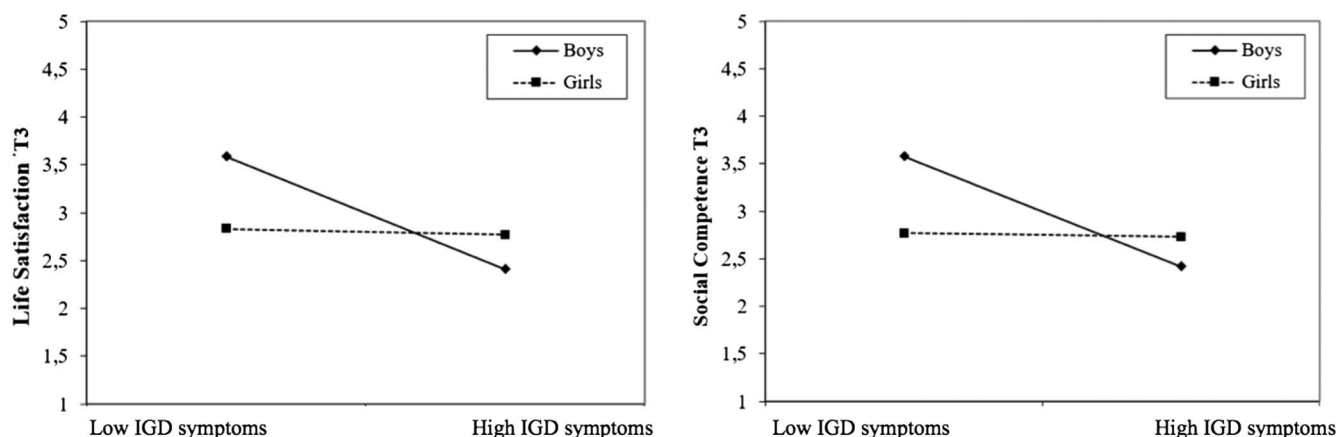


Figure 1. The effect of IGD symptoms T₂ on life satisfaction T₃ and perceived social competence T₃ by gender

Table 4. Longitudinal relations between frequency of social media use at T₁ and T₂ on GPA, life satisfaction, and social competence 1 year later (N = 538)

	GPA				Life satisfaction				Social competence			
	T ₂		T ₃		T ₂		T ₃		T ₂		T ₃	
	β	p	β	p	β	p	β	p	β	p	β	p
Control variables												
Sex (1 = boy)	-0.13	.00	0.04	.31	0.05	.29	0.05	.42	-0.11	.03	-0.08	.23
Level of education (1 = low)	-0.16	.00	0.02	.54	0.05	.09	-0.09	.33	0.01	.74	-0.02	.82
Outcome T-1	0.61	.00	0.64	.00	0.23	.02	0.58	.00	0.41	.00	0.49	.00
Main effects												
Frequency	-0.09	.04	-0.05	.26	0.14	.07	0.09	.13	0.01	.79	0.14	.03
SMD symptoms	-0.01	.85	0.05	.30	-0.77	.00	-0.17	.04	-0.05	.40	-0.12	.08

Note. Model fit: CFI = 0.90 and RMSEA = 0.06. Bold values are significant at $p < .05$. GPA: grade point average; CFI: comparative fit index; RMSEA: root mean square error of approximation; SMD: social media disorder.

Frequency of social media use and SMD symptoms

The model fit of the model was satisfactory (CFI = 0.90, RMSEA = 0.06). There was a small negative effect of frequency of social media use (Table 4) T₁ on GPA T₂ ($\beta = -0.09, p < .05$), suggesting that more frequent social media use T₁ predicted a lower GPA T₂. In addition, there was a small positive effect of social media use T₂ on perceived social competence T₃ ($\beta = 0.14, p < .05$), indicating that more frequent social media use improved the perceived social competence after 1 year.

SMD symptoms T₁ revealed a strong negative effect on life satisfaction T₂ ($\beta = -0.77, p < .001$) and SMD symptoms T₂ also had a similar – although smaller – effect on life satisfaction T₃ ($\beta = -0.17, p < .05$; Table 4). Thus, more SMD symptoms predicted a lower level of life satisfaction 1 year later.

Three significant interaction effects with gender were found. Gender moderated the effect of SMD symptoms on life satisfaction T₂ ($\beta = 0.44, p < .01$) and T₃ ($\beta = 0.49, p < .001$). As shown in Figure 2, the negative effect of SMD symptoms on life satisfaction was stronger for boys than for girls. Finally, SMD symptoms T₂ predicted a decrease in GPA at T₃ for girls, but not for boys ($\beta = -0.38, p < .05$; Figure 2).

DISCUSSION

The present longitudinal study with three annual measurement waves is one of the first studies investigating the outcomes of engaged (i.e., heavy) and disordered (i.e., addicted) gaming and social media use of young adolescents. In general, heavy gaming and social media use do not appear to have negative effects on the psychosocial well-being of adolescents. On the contrary, some positive effects are found, suggesting that frequent engagement in either gaming or social media use can be helpful in developing and maintaining social relations and friendships. In contrast, symptoms of disordered engagement in gaming and social media use seem to decrease the psychosocial well-being, with symptoms of disordered gaming (IGD) having small to moderate negative effects on life satisfaction and perceived social competence and symptoms of disordered social media use (SMD) having strong negative effects on life satisfaction. All these negative outcomes generally appear to be stronger in boys than in girls. With regard to school performances, the findings show a small negative effect of heavy social media use on adolescents' GPA and an additional negative effect of symptoms of SMD only for girls.

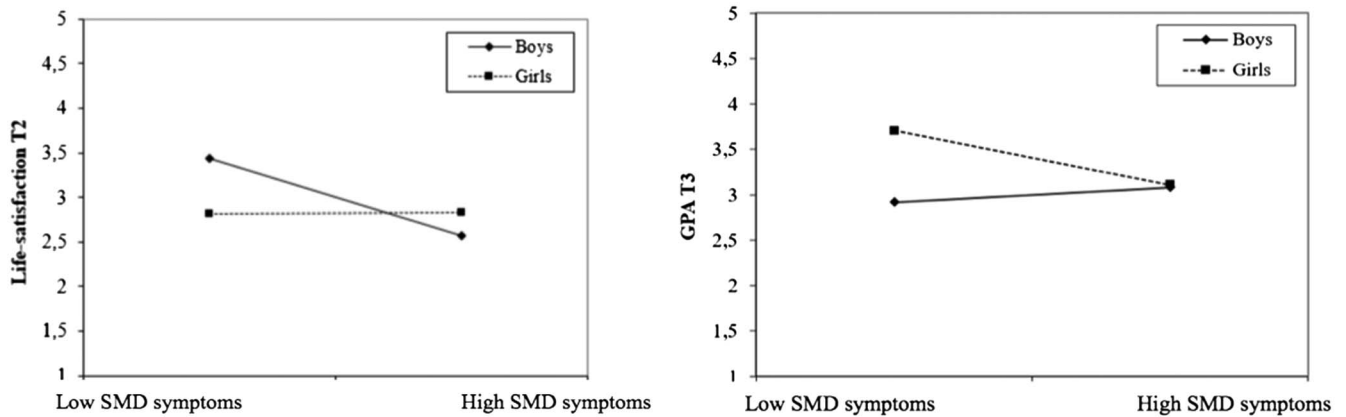


Figure 2. The effect of SMD symptoms T_1 on life satisfaction T_2 and SMD symptoms T_2 on GPA T_3 by gender

Outcomes of IGD symptoms and intensity of game use

The findings of this study imply that symptoms of IGD negatively impact the psychological and social functioning of adolescents, whereas these effects are absent for heavy (engaged) gaming. On the contrary, engaged gaming may even generate a positive effect on perceived social competence. These findings are relevant for the scholarly discussion about whether IGD should be regarded as a behavioral addiction and whether the nine DSM-5 criteria for IGD (APA, 2013) are appropriate to differentiate between highly engaged and disordered users of games. In general, our findings confirm that it is not the frequency of gaming as such, but disordered gaming as assessed by the IGD scale that is responsible for negative outcomes. In addition, boys appear to be more sensitive to these negative effects, with negative outcomes of IGD symptoms being stronger in boys than in girls.

Our results are only partly in line with earlier studies. The findings of this study seem to contradict previous zero-findings with regard to life satisfaction and perceived social competence found by Lemmens et al. (2011). These authors, however, found a significant longitudinal effect of IGD on loneliness, a concept that is closely related to the perceived social competence. Moreover, in contrast with the study by Gentile et al. (2011), we did not find any evidence that frequent gaming or IGD symptoms negatively affected the adolescents' school performances. These inconsistent findings may relate to the fact that this study used school-reported GPA, whereas Gentile et al. relied on self-reported measures, which may have been affected by adolescent's subjective experience of school performances.

Boys appear to be more vulnerable to negative effects of disordered gaming than girls. This result may be understood in the light of the fact that IGD symptoms are much less common in girls. Thus, the absence of effects in girls may be related to the lower prevalence of IGD symptoms in them, and thus to the lower statistical power. This gender difference, however, might also be related to the different games that boys and girls are playing, i.e., male gamers seem to be drawn more to games from the Strategy, Role Playing, Action, and Fighting genres, whereas female gamers are more likely to be drawn to games from the Social, Puzzle/Card, Music/Dance, Educational/

Edutainment, and Simulation genres (Phan, Jardina, Hoyle, & Chaparro, 2012). The game genres preferred by boys may have a higher addictive potential. Future research should further address these gender differences and the role of preferred game genres.

To the best of authors' knowledge, this is the first study displaying that IGD symptoms have a negative influence on adolescents' life satisfaction and perceived social competence, particularly in boys. In addition, previous data indicated that lowered levels of perceived social competence increase the risk of developing pathological gaming (Peeters, Koning, & Van den Eijnden, 2018), suggesting a negative downward spiral whereby socially vulnerable adolescents may become more susceptible to developing symptoms of IGD, which in turn seem to harm social functioning and relationships with peers. Further research should also focus on gender differences, as this spiral seems to pertain much more to boys than to girls.

Outcomes of SMD symptoms and intensity of social media use

As with gaming, the findings of this study indicate that engaged social media use has a positive effect on perceived social competence, indicating that social media use may help adolescents in maintaining their social relationships. In contrast, the results imply that disordered social media use has a negative impact on adolescents' life satisfaction. This finding is noteworthy and implies that SMD symptoms may lead to significant psychological harm, thereby meeting one of the core criteria of a behavioral addiction. Remarkable enough, as for IGD symptoms, this negative effect of SMD symptoms on life satisfaction is higher in boys than in girls. Since there is no gender difference in SMD symptoms, and we know very little about gender differences in social media use preferences, we can only speculate about possible explanations. Future research has to address this gap in the literature.

With regard to school performances, the findings of this study suggest that engaged use of social media seems to have a small adverse effect on GPA. In addition, there is some evidence that SMD symptoms negatively impact the GPA of girls only. These findings are in line with the longitudinal study by Wohn and LaRose (2014) showing

that time spent on Facebook as well as addictive-like use of Facebook predicted a decrease in perceived academic performance, although the latter only showed an indirect effect through academic motivation. Although the size of these effects was small (Cohen, 1969), these outcomes should be taken seriously. Particularly because the small effect size may have resulted from the fact that the negative impact on school performances is more pronounced among certain subgroups of adolescents, e.g., adolescents with attention-deficit hyperactivity disorder, since they are more likely to be distracted by social media. Future research should address whether certain dispositional factors moderate the impact of engaged and disordered use of social media on school outcomes. Moreover, there is a need for research aiming at the mechanisms through which social media use may influence school performances. For instance, late-night social media use seems to affect the quality of sleep (Wolniczak et al., 2013) and may thereby negatively impact the school performances of youngsters.

Strengths and limitations

This study has important strengths, for instance, the longitudinal design with three annual measurements, the rigorous statistical tests that controlled for previous levels of engaged and disordered use of games and social media, and the inclusion of GPA as reported by the school. However, the findings should be interpreted in the light of several limitations as well, such as the fact that students from lower education levels (e.g., vocational training) were underrepresented in this sample. In addition, we had to rely on self-reports of social media and game use, since we were not able to verify these self-reports by tracking measures. In this regard, we also have to note that the age restriction of most social network sites (e.g., Facebook and Instagram) in the Netherlands is 13 years old. Because our sample was 12–15 years old at T₁, we checked whether these age restrictions might have influenced the reported use of social network sites. This, however, did not seem to be the case (i.e., 93% of both 12- and 13-year-old participants reported to use social network sites). Then, the model fit indices were satisfactory but not excellent, and several of the reported findings showed small effect sizes. However, with regard to the latter, we would like to refer to the rigorous statistical tests that were conducted, i.e., longitudinal models controlling for previous levels of the dependent variables as well as for demographic characteristics. Because of these strict tests, we believe that even the small effects that were found can be meaningful. Finally, we would like to note that even with the present longitudinal design we cannot rule out that a third factor, for instance, an underlying mental health problem, would be (partly) responsible for the longitudinal associations between engaged and disordered use and subsequent psychosocial and school functioning.

CONCLUSIONS

The results of this study provide important input for the debate on whether the used IGD and SMD scales (Lemmens et al., 2015; Van den Eijnden et al., 2016) that are based on

the DSM-5 criteria for IGD (APA, 2013) indicate behavioral addictions with all the implied negative consequences. In their attempt to prevent overpathologizing common behaviors, Kardefelt-Winther et al. (2017) emphasized that repeated behaviors should lead to significant impairment or distress of a functionally impairing nature to be regarded as disordered behaviors. It is concluded that both symptoms of IGD and SMD, but not engaged gaming and social media use, predict negative outcomes for the psychological well-being of adolescents and that IGD symptoms, but not engaged gaming, predict negative outcomes for youngsters' social functioning. The above findings support the idea that the symptoms of disordered use of games and social media, as measured by the IGD and SMD scales, should be regarded as developmental threats for young people, thereby supporting the assumption that disordered use of games and social media should be regarded behavioral addictions.

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