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Family functioning and problematic usage of the internet in youth: A cross-sectional investigation

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ABSTRACT

Background: Problematic usage of the internet (PUI) refers to maladaptive use of the Internet linked to functional impairment as a growing concern in many countries. Youths are often considered more vulnerable to PUI than other age groups. The relationship between PUI and family dynamics is likely bidirectional and complex, warranting further research. Using a cross-sectional study design, we aimed to determine the rate of PUI and the association between PUI and family functioning in a South African sample between the ages of 18 and 30 years.
Methods: South African youths were recruited via email and social media. Respondents completed an online survey as part of a cross-sectional study to assess the extent and the types of activities for which they use the internet, as well as the quality of their family relationships and functioning, employing standardised questionnaires (including the IAT-10) and the General Functioning Scale of the Family Assessment Device (GF-FAD). The sample included 814 participants (65% female; aged 21 years; *SD* 3 years).
Results: 15.5% of our sample presented with PUI. There was a significant, moderate positive correlation between totals on the IAT-10 and GF-FAD ($r = 0.33$, $p < .001$). An independent samples *t*-test found that individuals with self-reported PUI (GF-FAD: $M = 2.57$, $SD = 0.51$) had significantly poorer quality family functioning than individuals without PUI (GF-FAD: $M = 2.13$, $SD = 0.61$; $t(812) = -7.52$, $p < .001$; Cohen's $d = -0.73$, 95% CI [-0.92, −0.54]). Correlations were found between increased time spent on various online activities, including pornography ($r = 0.20$, $p < 0.001$), cyberbullying ($r = 0.17$, $p < 0.001$), social networking ($r = 0.11$, $p = 0.003$), and streaming media ($r = 0.11$, $p = 0.003$), and poorer quality family functioning.
Conclusion: PUI is common in South African youth. Presence of PUI and increased PUI severity were associated with worse family functioning in this sample. We recommend using family-based approaches in promoting a healthy family environment, and in the prevention of PUI and mitigation of its effects, with the goal of striking a balance between the benefits of the internet and its potential role in compromising aspects of family relationships.

1. Introduction

While there are many advantages to the internet, excessive or maladaptive usage thereof is associated with negative consequences, including loss of productivity at work or reduced scholastic achievement, poor physical health and insomnia, and mental health conditions including mood and anxiety disorders (Cai et al., 2023). Research also shows that excessive internet use can be implicated in unhealthy family functioning, which may entail increased conflict (Wu et al., 2016), poor communication (Park et al., 2008), and low levels of cohesion (Bonnaire and Phan, 2017). Problematic usage of the internet (PUI) is an umbrella term encompassing maladaptive engagement in one or more online activities such as online gaming, online gambling, and social networking (Dalal and Basu, 2016; Fineberg et al., 2018). It is characterised by features such as uncontrollable urges to use the internet, and excessive time spent online (Moreno et al., 2013; Spada, 2014). Global PUI

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prevalence rates vary widely, ranging between 1% and 36.7% (Pan et al., 2020) and vary considerably across countries. Partly this variation in apparent prevalence reflects the lack of consensus on how it should be defined, as well as the wide variety of measurement tools. Interestingly, low or lower-and middle-income countries (LMIC) seem to have a higher burden of maladaptive digital use, with the highest prevalence in the African region (Meng et al., 2022), but ironically PUI in these areas remains understudied. According to a report on internet use among 2000 South Africans, 50% of participants indicated that the internet interfered with their daily lives, and 39% logged on to the internet to relieve stress and anxiety (Malinga, 2016). Furthermore, 67% of respondents experienced the impulse to use the internet each day, and 64% indicated signs of dysphoria when offline. Geyer et al. (Geyer et al., 2018) conducted a study on internet use among South African university students and found escapism (approximately 71.5% of participants) and experiencing loss of control (46.8% of participants) were strong motivators for excessive internet use. Elsewhere it was also found that as the severity of PUI increases, anxiety, depression, obsessive-compulsive symptoms and interpersonal sensitivity increase as well (Goel et al., 2013; Taymur et al., 2016). Clearly, the association appears to be complex; i.e., PUI may in some individuals precipitate psychiatric symptoms and disruption of relationships, which in turn, may lead to PUI (Kumar and Mondal, 2018).

Some groups may be more vulnerable to developing PUI than others; for example, younger age has been associated with PUI. Young adults between the ages of 18 and 30 years have shown increased risk for PUI (Anderson, Steen, & Stavropoulos, 2017; Marzilli et al., 2020). Moreover, in youth in particular, family factors, such as family communication patterns, could potentially influence people's susceptibility to PUI. Several studies have shown a strong relationship between increased time spent on internet gaming and unhealthy family functioning, for example (Mesch, 2006a, 2006b; Nie, Hillygus, & Erbring, 2002). Comparing adolescent gamers and healthy controls in terms of family functioning, Bonnaire and Phan (2017) demonstrated that the former group showed weaker family cohesion, more family conflict, and more defective family relations. Similarly, the study of Li et al. (2021) showed a moderate, negative correlation between PUI in general and family functioning, where increased PUI severity was associated with deteriorated family functioning. This is consistent with findings from a longitudinal study that showed that healthy family functioning deteriorated significantly as individuals developed PUI (Ko et al., 2015). The relationship between internet use in youth and family dynamics is complex however, and the influences likely bidirectional, and individual experiences may vary, warranting further research.

In conclusion, PUI is a growing concern in many countries, particularly in LMIC countries and among younger generations, i.e., groups in which internet usage is on the increase, and is associated with compromised family relationships. Using a cross-sectional study design, we investigated the rate of PUI and the association between PUI and family functioning in a South African sample between the ages of 18 and 30 years. We hypothesized that there would be a significant association between PUI and worse family functioning.

2. Methods

2.1. Procedures and participants

The study was approved by the Health Research Ethics Committee (HREC) of the Faculty of Medicine and Health Sciences of Stellenbosch University, South Africa (reference number: N19/07/079). All participants provided written consent before they could continue with the data collection survey. The consent form clearly stated that data would be confidential and anonymized, and that they have the right to withdraw from the study at any point.

Members of the general public and university students were invited to take part in an online survey on internet use and mental health hosted on the Qualtrics platform. The survey link was active from July to November 2020. Recruitment was a blended sampling approach (a combination of convenience and snowball sampling via email and social media). Note that this study was conducted during the first few months of the COVID-19 pandemic and lockdown periods, which were associated with an increased reliance on and use of technological devices and the internet worldwide (e.g., Alimoradi et al., 2022). Initially, a total of 3648 participants submitted survey responses. For the current study, 2834 participants were excluded since 560 participants were not between 18 and 30 years, 434 were not South African citizens, and 1840 failed to complete all of the relevant measurement instruments. Subsequently, the final sample included 814 South African respondents.

2.2. Measures

The Internet Addiction Test 10-item instrument (IAT-10; Tiego et al., 2021), an optimized and shortened version of the IAT 20-item instrument, was used to measure current internet use and PUI, (with the duration of "current" unspecified). The ten items were scored on a 5-point Likert type scale that ranged from 1 = *rarely* to 5 = *always,* yielding a total sum score of 10–50, with higher scores being indicative of more extensive internet-related problems. The 20-item IAT has been shown to have high internal consistency reliability within homogenous samples ($\alpha = 0.90$–.93) and test–retest reliability ($\rho = 0.83$) (Moon et al., 2018). More recently, summed scores on the IAT-10 demonstrated a strong correlation with the full-length IAT scores and comparable, or better, convergence with measures of impulsivity and compulsivity (Tiego et al., 2021). The instrument previously showed good psychometric properties in a South African sample (Tiego et al., 2019). A score of 24+ on the IAT-10 was taken to indicate possible problematic usage of the internet.

The 10 items of the Internet Activities Scale (IAS), Part B of the Internet Severity and Activities Addiction Questionnaire (ISAAQ) (Ioannidis et al., 2023), was used to assess the extent of time individuals spent on current non-work or study-related content-specific online activities, with "current" specified as during the six months preceding the completion of the survey. These online activities included: general surfing, internet gaming, online shopping, online gambling, social networking, pornography, streaming media, and cyberbullying. A 6-point Likert scale ranging from 0 = *not at all* to 5 = *all the time* was used to determine the extent of time spent on these activities. Increased scores indicated increased time spent on the specific activity in the preceding months. Cluster analyses have shown the replicability of clusters of the above-mentioned online activities across cultures (i.e., a SA sample and UK-US sample), suggesting reliability (Ioannidis et al., 2023). The ISAAQ has been psychometrically refined and validated, with the internal consistency of Part B shown to be excellent as shown by Cronbach's alpha, $\alpha = 0.92$ [0.916–0.924]) and Guttman's lambda-2 ($\lambda_2 = 0.92$ [0.916–0.924]) (Ioannidis et al., 2023; Omrawo et al., 2023).

The General Functioning Scale of the Family Assessment Device (GF-FAD) (Boterhoven de Haan et al., 2015), a sub-scale of the 60-item McMaster Family Assessment Device (FAD) (Epstein et al., 1983), is a 12-item self-report instrument which was used to determine perceived functioning level of, and health of a family. The individual items are formulated to enquire about *current* overall functioning. Six of the items were worded positively (e.g., "In times of crisis we can turn to each other for support") and the other six negatively (e.g., "There are lots of bad feelings in our family"). Items were rated on a 4-point Likert-type scale ranging from 1 = *strongly agree* to 4 = *strongly disagree* and negatively worded items were reverse scored. Responses were summed and divided by 12 (the number of test items) to produce a mean score ranging between 1 and 4. A cut-off score of 2 was used where a score of 2 and above (≥ 2) indicated unhealthy family functioning, while a score below two (<2) indicated healthy family functioning. Increases in scores on the GF-FAD suggested *unhealthier* or deteriorated family functioning. The GF-FAD has good psychometric properties, with satisfactory internal

consistency (Epstein et al., 1983), and it has been proven to be a valid single index of overall family functioning (SRMR = 0.03; RMSEA = 0.05) (Boterhoven de Haan et al., 2015). It has also shown high intercorrelations with the six dimensions of the FAD, as well as with the other 48 items of the FAD (Boterhoven de Haan et al., 2015).

2.3. Data analysis

Cross-sectional data was obtained and analysed quantitatively using SPSS version 27. The relationship between the quality of family functioning and PUI as well as the amount of time spent on various online activities were examined using Pearson's correlation coefficient (*r*). Additionally, the coefficient of determination (R^2) was used to determine variance in both cases. The difference in the quality of family functioning between those with and those without PUI was assessed using an independent samples *t*-test. Subsequently Cohen's d was used to indicate the standardised difference in the extent of family dysfunction between individuals who screened positive and those screening negative for PUI.

3. Results

3.1. Descriptive statistics

Of the 814 South African respondents included in this study, 531 (65%) self-identified as female, and 278 (34%) self-identified as male, while 5 indicated that they were transgender. Ages ranged between 18 and 30 years, with a mean age of 21 years (*SD* = 3 years). The majority of the sample had a college/university education (452 [55.5% of the total sample]; 75 [59.5%] of the PUI sample; 377 [54.8%] of the non-PUI sample). PUI scores on the IAT-10 ranged between a minimum of 18 and a maximum of 48 (*M* = 18.18; *SD* = 6.48). 126 participants (15.5%) had IAT-10 scores above 24 (75 female [59.5%]), 51 [40.5%] male), suggesting that one in six participants had PUI at time of survey completion, as operationally defined for the purposes of the study. Of the female respondents in the total sample, 9.2% reported PUI, compared to 6.3% of males (this difference was not statistically significant). Age, gender, and education level were similar between participants with and those without PUI (Table 1). Table 2 depicts the extent of time spent on diverse internet activities by participants with PUI and those without PUI (where a score of 0 suggests no time at all, ranging to a maximum of 5, indicating all of the time). Participants with PUI spent significantly more time online, in all online activities assessed here, than those without PUI.

Table 1
PUI vs. non-PUI: Sociodemographic and family functioning characteristics of study participants.

	PUI (N=126; 15.5% of total sample)	*Non-PUI (N=688; 84.5% of total sample)*	Significance (P)
Mean age (SD)	21.29 (SD 2.75) years	21.41 (SD 2.86) years	NS
Gender:			NS
Male	51 (40.5% of PUI sample)	227 (33% of non-PUI sample)	
Female	75 (59.5% of PUI sample)	456 (66.3% of non-PUI sample)	
Transgender/other	0	5 (0.7% of non-PUI sample)	
Education (N):			NS
Completed grade 12 only	51 (40.5% of PUI sample)	311 (45.2% of non-PUI sample)	
College/university education	75 (59.5% of PUI sample)	377 (54.8% of non-PUI sample)	
General Functioning Scale of the Family Assessment Device (GF-FAD) score	2.57 (SD 0.51)	2.13 (SD 0.61)	P < .001; Cohen's d = −0.73

Table 2
PUI vs. non PUI: Extent of time on diverse internet activities (ISAAQ Part B).

	PUI vs. non-PUI	Mean score	Std. Deviation	t	P
General Surfing (includes any unstructured online activities)	Non-PUI	2.63	1.24	−6.51	<0.001
	PUI	3.38	1.18		
Internet gaming including Massively-Multiplayer-Online-Role-Playing-Games (includes online gaming and gaming with multiple other players and role-playing format)	Non-PUI	0.86	1.34	−3.71	<0.001
	PUI	1.41	1.59		
Skill games & Time wasters (includes games & applications on computer, tablet, mobile phone or similar for which activity is without specific benefit)	Non-PUI	1.70	1.40	−4.57	<0.001
	PUI	2.40	1.61		
Online Shopping (includes activity on online shopping platforms and auction websites)	Non-PUI	1.33	1.25	−3.0	0.003
	PUI	1.76	1.54		
Online gambling (includes any online activity in which there is a chance for monetary gain or other stakes)	Non-PUI	0.12	0.44	−3.53	<0.001
	PUI	0.48	1.14		
Social networking (includes browsing social media and messaging/ communicating over online social platforms)	Non-PUI	3.32	1.32	−7.32	<0.001
	PUI	4.13	1.12		
Health & medicine (includes any online activity relating to reading & researching medical facts, diagnoses, treatments and risks)	Non-PUI	1.89	1.35	−2.42	0.016
	PUI	2.25	1.57		
Pornography (includes cybersex, cyber-texting, viewing pornography and other online sexual activities)	Non-PUI	0.94	1.16	−6.48	<0.001
	PUI	1.92	1.62		
Streaming media (include music or video streaming activities on any platform)	Non-PUI	3.35	1.34	−4.43	<0.001
	PUI	3.89	1.23		
Cyberbullying (includes exchange of insults, nasty texts/emails, unpleasant media, pranks)	Non-PUI	0.07	0.36	−3.34	<0.001
	PUI	0.33	0.86		

3.2. PUI and family functioning

A significant, moderate positive correlation was shown between totals on the IAT-10 and FD-FAD (r = 0.33, $p < .001$), suggesting that an association between increasing PUI severity and worse family functioning. This was consistent with the results of the independent samples *t*-test, which indicated that individuals with PUI (*M* = 2.57, *SD* = 0.51) had significantly worse family functioning than individuals without PUI

($M = 2.13$, $SD = 0.61$); t (812) = −7.52, $p < .001$; Cohen's d = −0.73, 95% CI [-0.92, −0.54]) Table 1).

Pearson's r analyses showed significant correlations with small effect sizes between the quality of family functioning and time spent on various individual online activities; worse family relationships were associated with increasing time spent online, particularly on social networking (r = 0.11, $p = 0.003$), pornography (r = 0.20, $p < 0.001$), streaming media (r = 0.11, $p = 0.003$), and cyberbullying (r = 0.17, $p < 0.001$) (Table 3). According to the calculated effect sizes (Table 4), of these 4 online activities, increased time spent on pornography and cyberbullying correlated more strongly with deterioration in family functioning than social networking and streaming media.

Table 4
Effect sizes of the relationship strength between quality of family functioning and time spent on online activities.

Online activities	*Effect size* (R^2)	Effect size in percentage form	M	SD	C1%
Social networking	**0.01**	**1.2%**	**3.44**	**1.33**	**3.35–3.53**
Pornography	**0.04**	**4%**	**1.09**	**1.29**	**1.00–1.18**
Streaming media	**0.01**	**1.2%**	**3.43**	**1.34**	**3.34–3.53**
Cyberbullying	**0.03**	**2.9%**	**0.11**	**0.48**	**0.08–0.15**

4. Discussion

The present cross-sectional study examined the association between PUI and family functioning among South African youth. Our findings suggested PUI rate of 15.5% in our sample, using a practical operational threshold on the IAT-10, with no difference noted between the self-reported genders of the respondents. Consistent with our hypothesis, presence of PUI and higher PUI severity were significantly associated with worse family functioning, with medium effect sizes. The actual time spent engaging in specific individual online activities was also in some cases associated with worse family functioning, but with small effect sizes.

A 2022 meta-analysis showed higher rates of maladaptive digital use in LMIC countries, with the highest putative rate (34.53%) observed in the African region (Meng et al., 2022). This is more than double the 15.5% (i.e., 1 in 7) rate found in our LMIC study. Interestingly, our results correspond more with the mean *global* prevalence rate of 14.22% also shown by the 2022 meta-analysis. Our PUI rate is however consistent with PUI rates in Asian countries such as China (Ni et al., 2009), the Philippines (Mak et al., 2014), and South Korea (Park et al., 2008) that consider PUI among youngsters a serious health concern.

Our finding of an association between increased time spent on various online activities, and deterioration of family functioning is partly consistent with the internet use displacement hypothesis (Nie, Hillygus, & Erbring, 2002). This hypothesis suggests that the amount of time that an individual has is largely fixed, and when time spent on usage of the internet replaces face-to-face interaction, it may be detrimental to interpersonal relationships with friends and family in real life, resulting in a sense of alienation, and affected mental health. This hypothesis is reminiscent of the family systems theory (FST) which suggest that PUI, and in particular, increased time spent on online activities, may penetrate family boundaries, disrupt family functioning, and subsequently result in detached and enmeshed boundaries (Mesch, 2003, 2006a, 2006b). The small effect size of our finding suggest that time spent online explains a small part of the link between PUI and family relationship problems. Other variables should also be considered; for example, a study in Israeli adolescents showed that poor communication with parents resulted in increased PUI behaviours (Boniel-Nissim and Sasson, 2018). Another study that was conducted among Italian adolescents showed a similar trend, with family functioning and attachment style being important predictors of PUI (Cacioppo et al., 2019). Some online activities may correlate more strongly with worse family functioning than others. Our finding of an association between internet pornography and cyberbullying and worse family functioning is also echoed by other researchers. In a Chinese study on problematic internet pornography use (PIPU) among high school students, for example, a significant negative correlation between family functioning and PIPU was observed, while a significant positive correlation was shown between self-esteem and family functioning (Li et al., 2023). In Mexico, a study among adolescents showed that problematic family communication was associated with the perpetration of cyberbullying (Romero-Abrio et al., 2019). In contrast, social media use was not associated with changes in family functioning in middle school students in the USA (Simpson et al., 2023).

It is clear that the relationship between PUI and family functioning is complex and likely bidirectional. That is, PUI may precipitate psychiatric symptoms, disruption of relationships, and conflict, all of which may fuel PUI (Kumar and Mondal, 2018). Other factors may also play a role in this association; for example, socioeconomic status (SES) has also

Table 3
Person's correlations of the quality of family functioning and time spent on various online activities.

	General surfing	Internet gaming	Skill games and time wasters	Online shopping	Online gambling	Social networking	Health and medicine	Pornography	Streaming media	Cyber-bullying	Family functioning
General surfing	-										
Internet gaming	0.15**	-									
Skill games and time wasters	0.29**	0.38**	-								
Online shopping	0.24**	**0.06**	0.14**	-							
Online gambling	0.10**	0.16**	0.13**	0.16**	-						
Social networking	0.29**	**0.04**	0.13**	0.25**	**0.01**	-					
Health and medicine	0.13**	**0.02**	**0.03**	0.20**	0.15**	0.22**	-				
Pornography	0.22**	0.21**	0.18**	**0.04**	0.20**	0.14**	**0**	-			
Streaming media	0.30**	0.09**	0.17**	0.18**	**0.03**	0.37**	0.16**	0.22**	-		
Cyberbullying	**0.07**	0.10**	0.10**	**0.01**	0.16**	**0.04**	**0.04**	0.26**	**0.05**	-	
Family functioning	0.08*	**0.01**	**0.06**	**0.02**	**0.06**	0.11**	**0.06**	0.20**	0.11**	0.17**	-

**P < .001; *P < .01.

been shown to be a strong risk factor for PUI (Islam and Hossin, 2016), not only providing an explanation for the high rates of PUI observed in LMICs, but also further exacerbating the interplay between family functioning and PUI. Furthermore, a possible genetic or hereditary component to PUI has been suggested, further complicating the aetiology of PUI (Leeman and Potenza, 2013). More research is needed to fully elucidate the underlying causality.

The current findings may also have implications in terms of prevention of PUI, and mitigating its effects. Family plays a central role in the socializing processes of youth, and family-based interventions, also grounded in FST, may be key in preventing and ameliorating PUI in this age group. A solid family-based support system may be critical in maintaining any beneficial effects. The family system approach shifts the emphasis on individuals to the entire family as one unit and the dynamic interactions between family members (Dickerson and Crase, 2005). Participation of family members in interventions focused on PUI could decrease alienation, improve communication and create a more supportive environment in which the participants' behavioral changes including less time online and more offline activities, are supported and positive change reinforced (Liu et al., 2015; McDonell and Dyck, 2004). These potential therapeutic implications should be considered in future work using appropriately controlled designs.

5. Limitations

The cross-sectional research design of this study hampers the determination of causal pathways. Additionally, the use of non-probability recruitment methods (convenience and snowball sampling) may have contributed to sampling bias, potentially influencing or findings regarding PUI rate. The self-administered survey, exclusively available in English, could also have introduced a response bias and would have led to exclusion of participants not fluent in English. Additionally, the GF-FAD (that was used to measure the quality of family functioning) has not been validated within the South African context. Nevertheless, we chose this scale as it continues to be one of the most widely used measures of family functioning and has been in use for more than 30 years (Mansfield et al., 2015). Of note is that this investigation was conducted in youth, and that the assumption was made that most participants are part of a family, and living with parents and/or siblings. There are other permutations of family (e.g., a married individual, whose PUI affects the spousal relationship or children), that may be affected in different ways. The original sample on which the GF-FAD was developed consisted of a range of participants in diverse family roles (young students, parents, etc.) (Epstein et al., 1983) suggesting that the GF-FAD is unspecified in this regard, allowing the respondent to decide which context they choose to describe in their responses. It is recommended that future studies specify in advance of the assessment the specific family context they are interested in. The relative wide age range of participants (18–30 years) – i.e., including individuals from different developmental stages (e.g. late adolescence, early adulthood, etc), encompassing a range of experiences and transitions – may be limiting and warrants comment. It is indeed crucial to recognize the diversity of experiences and transitions within this age range. Nevertheless, the transition from late adolescence to early adulthood is a gradual and fluid process, often with significant overlap between these two developmental stages.

Finally, this study was conducted during the first few months of the COVID-19 pandemic and lockdown periods; this context likely had a pronounced impact on reported rates (Gjoneska et al., 2022; Lochner et al., 2022; Meng et al., 2022) influencing the generalizability of our results.

6. Conclusion

This quantitative, cross-sectional study showed a significant association between internet use and family functioning in the South African context. In particular, our findings suggested that presence of PUI, and increasing PUI severity, were associated with worse family functioning with medium effect sizes, whereas the link between absolute time spent on specific activities and family functioning had small effect sizes. The relationship between these variables is a complicated and likely bidirectional one. Future research is therefore needed, specifically longitudinal studies, to examine the causal mechanisms. This is especially necessary in LMICs like South Africa where high rates of PUI have been observed, but where it is still understudied. Given the centrality of family relationships within the context of PUI, use of family-based approaches should be evaluated with a view to preventing or reducing occurrence of PUI in young people, and mitigating its negative associations.

CRediT authorship contribution statement

Christine Lochner: Writing – review & editing, Supervision, Project administration, Methodology, Funding acquisition, Data curation, Conceptualization. **Gizela van den Berg:** Writing – original draft, Investigation, Formal analysis, Data curation. **Samuel R. Chamberlain:** Writing – review & editing, Methodology, Conceptualization. **Clara Marincowitz:** Writing – review & editing. **Bronwyne Coetzee:** Writing – review & editing, Supervision, Methodology.

Declaration of competing interest

Drs Lochner and Chamberlain receive a stipend for associate editor work from Elsevier.

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The other authors declare no potential conflicts of interest.

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References

Alimoradi, Z., Lotfi, A., Lin, C.-Y., Griffiths, M.D., Pakpour, A.H., 2022. Estimation of behavioral addiction prevalence during COVID-19 pandemic: a systematic review and meta-analysis. Current addiction Curr. Adv. reports 9, 486–517. https://doi.org/10.1007/s40429-022-00435-6.

Anderson, E.L., Steen, E., Stavropoulos, V., 2017. Internet use and problematic internet use: a systematic review of longitudinal research trends in adolescence and emergent adulthood. Int. J. Adolesc. Youth 22, 430–454.

Boniel-Nissim, M., Sasson, H., 2018. Bullying victimization and poor relationships with parents as risk factors of problematic internet use in adolescence. Comput. Hum. Behav. 88, 176–183.

Bonnaire, C., Phan, O., 2017. Relationships between parental attitudes, family functioning and Internet gaming disorder in adolescents attending school. Psychiatr. Res. 255, 104–110. https://doi.org/10.1016/j.psychres.2017.05.030.

Boterhoven de Haan, K.L., Hafekost, J., Lawrence, D., Sawyer, M.G., Zubrick, S.R., 2015. Reliability and validity of a short version of the general functioning subscale of the McMaster Family Assessment Device. Fam. Process 54, 116–123. https://doi.org/10.1111/famp.12113.

Cacioppo, M., Barni, D., Correale, C., Mangialavori, S., Danioni, F., Gori, A., 2019. Do attachment styles and family functioning predict adolescents' problematic internet use? A relative weight analysis. J. Child Fam. Stud. 28, 1263–1271. https://doi.org/10.1007/s10826-019-01357-0.

Cai, Z., Mao, P., Wang, Z., Wang, D., He, J., Fan, X., 2023. Associations between problematic internet use and mental health outcomes of students: a meta-analytic review. Adolescent research J. Adolesc. Res.review 8, 45–62. https://doi.org/10.1007/s40894-022-00201-9.

Dalal, P.K., Basu, D., 2016. Twenty years of internet addiction quo vadis? Indian J. Psychiatr. 58, 6–11. https://doi.org/10.4103/0019-5545.174354.

Dickerson, A.D., Crase, S.J., 2005. Parent-adolescent relationships: the influence of multi-family therapy group on communication and closeness. Am. J. Fam. Ther. 33, 45–59. https://doi.org/10.1080/01926180590889194.

Epstein, N.B., Baldwin, L.M., Bishop, D.S., 1983. The McMaster family assessment device. J. Marital Fam. Ther. 9, 171–180. https://doi.org/10.1111/j.1752-0606.1983.tb01497.x.

Fineberg, N.A., Demetrovics, Z., Stein, D.J., Ioannidis, K., Potenza, M.N., Grünblatt, E., Brand, M., Billieux, J., Carmi, L., King, D.L., Grant, J.E., Yücel, M., Dell'Osso, B., Rumpf, H.J., Hall, N., Hollander, E., Goudriaan, A., Menchon, J., Zohar, J., Burkauskas, J., Martinotti, G., Van Ameringen, M., Corazza, O., Pallanti, S., Chamberlain, S.R., 2018. Manifesto for a European research network into problematic usage of the internet. Eur. Neuropsychopharmacol : J. Eur. Space Agency (ESA) 28, 1232–1246. https://doi.org/10.1016/j.euroneuro.2018.08.004.

Gjoneska, B., Potenza, M.N., Jones, J., Sales, C.M., Hranov, G., Demetrovics, Z., 2022. Problematic use of the Internet in low- and middle-income countries before and during the COVID-19 pandemic: a scoping review. Curr. Opin. Dent. 48, 101208 https://doi.org/10.1016/j.cobeha.2022.101208.

Goel, D., Subramanyam, A., Kamath, R., 2013. A study on the prevalence of internet addiction and its association with psychopathology in Indian adolescents. Indian J. Psychiatr. 55, 140–143. https://doi.org/10.4103/0019-5545.111451.

Ioannidis, K., Tiego, J., Lutz, N., Omrawo, C., Yücel, M., Grant, J.E., Lochner, C., Chamberlain, S.R., 2023. Internet severity and activities addiction questionnaire (ISAAQ): psychometrics of item response theory and clustering of online activities. Compr. Psychiatr. 122, 152366 https://doi.org/10.1016/j.comppsych.2023.152366.

Islam, M.A., Hossin, M.Z., 2016. Prevalence and risk factors of problematic internet use and the associated psychological distress among graduate students of Bangladesh. Asian Journal of Cent. Asian J. Global Health and Public Health 6, 11. https://doi.org/10.1186/s40405-016-0020-1.

Ko, C.-H., Wang, P.-W., Liu, T.-L., Yen, C.-F., Chen, C.-S., Yen, J.-Y., 2015. Bidirectional associations between family factors and Internet addiction among adolescents in a prospective investigation. Psychiatr. Clin. Neurosci. 69, 192–200. https://doi.org/10.1111/pcn.12204.

Kumar, M., Mondal, A., 2018. A study on Internet addiction and its relation to psychopathology and self-esteem among college students. Ind. Psychiatr. J. 27, 61–66. https://doi.org/10.4103/ipj.ipj_61_17.

Leeman, R.F., Potenza, M.N., 2013. A targeted review of the neurobiology and genetics of behavioural addictions: an emerging area of research. Can. J. Psychiatr. 58, 260–273. https://doi.org/10.1177/070674371305800503.

Li, L., Wang, X., Tang, S., Wang, J., 2023. Family functioning and problematic internet pornography use among adolescents: a moderated mediation model. Front. Public Health 11. https://doi.org/10.3389/fpubh.2023.1199835.

Li, X.-K., Zhan, P.-S., Chen, S.-D., Ren, J., 2021. The relationship between family functioning and pathological internet use among Chinese adolescents: the mediating role of hope and the moderating role of social withdrawal. Int. J. Environ. Res. Publ. Health 18. https://doi.org/10.3390/ijerph18147700.

Liu, Q.-X., Fang, X.-Y., Yan, N., Zhou, Z.-K., Yuan, X.-J., Lan, J., Liu, C.-Y., 2015. Multi-family group therapy for adolescent Internet addiction: exploring the underlying mechanisms. Addict. Behav. 42, 1–8.

Lochner, C., Albertella, L., Kidd, M., Kilic, Z., Ioannidis, K., Grant, J.E., Yücel, M., Stein, D.J., Chamberlain, S.R., 2022. The COVID-19 pandemic and problematic usage of the internet: findings from a diverse adult sample in South Africa. J. Psychiatr. Res. 153, 229–235. https://doi.org/10.1016/j.jpsychires.2022.06.035.

Mak, K.-K., Lai, C.-M., Watanabe, H., Kim, D.-I., Bahar, N., Ramos, M., Young, K.S., Ho, R.C.M., Aum, N.-R., Cheng, C., 2014. Epidemiology of internet behaviors and addiction among adolescents in six Asian countries. Cyberpsychol., Behav. Soc. Netw. 17, 720–728. https://doi.org/10.1089/cyber.2014.0139.

Malinga, S., 2016. South Africans showing problematic internet use. ITWeb, Columinate.

Mansfield, A.K., Keitner, G.I., Dealy, J., 2015. The family assessment device: an update. Fam. Process 54, 82–93. https://doi.org/10.1111/famp.12080.

Marzilli, E., Cerniglia, L., Ballarotto, G., Cimino, S., 2020. Internet addiction among young adult university students: the complex interplay between family functioning, impulsivity, depression, and anxiety. Int. J. Environ. Res. Publ. Health 17. https://doi.org/10.3390/ijerph17218231.

McDonell, M.G., Dyck, D.G., 2004. Multiple-family group treatment as an effective intervention for children with psychological disorders. Clin. Psychol. Rev. 24, 685–706. https://doi.org/10.1016/j.cpr.2004.02.004.

Meng, S.-Q., Cheng, J.-L., Li, Y.-Y., Yang, X.-Q., Zheng, J.-W., Chang, X.-W., Shi, Y., Chen, Y., Lu, L., Sun, Y., Bao, Y.-P., Shi, J., 2022. Global prevalence of digital addiction in general population: a systematic review and meta-analysis. Clin. Psychol. Rev. 92, 102128.

Mesch, G.S., 2006a. Family characteristics and intergenerational conflicts over the Internet. Information. Communication \& Society 9, 473–495. https://doi.org/10.1080/13691180600858705.

Mesch, G.S., 2006b. Family relations and the internet: exploring a family boundaries approach. Journal of Family Communication 6, 119–138. https://doi.org/10.1207/s15327698jfc0602_2.

Mesch, G.S., 2003. The family and the internet: the Israeli case. Social Science Quarterly 84, 1038–1050. https://doi.org/10.1046/j.0038-4941.2003.08404016.x.

Moon, S.J., Hwang, J.S., Kim, J.Y., Shin, A.L., Bae, S.M., Kim, J.W., 2018. Psychometric properties of the internet addiction test: a systematic review and meta-analysis. Cyberpsychology, behavior and social networking 21, 473–484. https://doi.org/10.1089/cyber.2018.0154.

Moreno, M.A., Jelenchick, L.A., Christakis, D.A., 2013. Problematic internet use among older adolescents: a conceptual framework. Computers in Human Behavior 29, 1879–1887. https://doi.org/10.1016/j.chb.2013.01.053.

Ni, X., Yan, H., Chen, S., Liu, Z., 2009. Factors influencing internet addiction in a sample of freshmen university students in China. Cyberpsychology & behavior : the impact of the Internet, multimedia and virtual reality on behavior and society 12, 327–330. https://doi.org/10.1089/cpb.2008.0321.

Nie, N.H., Hillygus, D.S., Erbring, L., 2002. Internet use, interpersonal relations, and sociability. In: The Internet in Everyday Life, pp. 215–243.

Omrawo, C., Ioannidis, K., Grant, J.E., Lutz, N., Chamberlain, S.R., Stein, D.J., Tiego, J., Kidd, M., Lochner, C., 2023. A cross-national validation of the internet severity and activities addiction questionnaire (ISAAQ). Comprehensive psychiatry 122, 152378. https://doi.org/10.1016/j.comppsych.2023.152378.

Pan, Y.-C., Chiu, Y.-C., Lin, Y.-H., 2020. Systematic review and meta-analysis of epidemiology of internet addiction. Neuroscience and biobehavioral reviews 118, 612–622. https://doi.org/10.1016/j.neubiorev.2020.08.013.

Park, S.K., Kim, J.Y., Cho, C.B., 2008. Prevalence of Internet addiction and correlations with family factors among South Korean adolescents. Adolescence 43, 895–909.

Romero-Abrio, A., Martínez-Ferrer, B., Musitu-Ferrer, D., León-Moreno, C., Villarreal-González, M.E., Callejas-Jerónimo, J.E., 2019. Family communication problems, psychosocial adjustment and cyberbullying. International Journal of Environmental Research and Public Health 16. https://doi.org/10.3390/ijerph16132417.

Simpson, E.G., Backman, A., Ohannessian, C.M., 2023. Family functioning and social media use in early adolescence. Journal of Child and Family Studies 32, 3459–3471. https://doi.org/10.1007/s10826-023-02625-w.

Spada, M.M., 2014. An overview of problematic internet use. Addictive behaviors 39, 3–6. https://doi.org/10.1016/j.addbeh.2013.09.007.

Taymur, I., Budak, E., Demirci, H., Akdağ, H.A., Güngör, B.B., Özdel, K., 2016. A study of the relationship between internet addiction, psychopathology and dysfunctional beliefs. Computers in Human Behavior 61, 532–536.

Tiego, J., Lochner, C., Ioannidis, K., Brand, M., Stein, D.J., Yucel, M., Grant, J.E., Chamberlain, S.R., 2019. Problematic use of the Internet is a unidimensional quasi-trait with impulsive and compulsive subtypes. BMC psychiatry 19, 348. https://doi.org/10.1186/s12888-019-2352-8.

Tiego, J., Lochner, C., Ioannidis, K., Brand, M., Stein, D.J., Yücel, M., Grant, J.E., Chamberlain, S.R., 2021. Measurement of the problematic usage of the Internet unidimensional quasitrait continuum with item response theory. Psychological assessment. https://doi.org/10.1037/pas0000870.

Wu, C.S.T., Wong, H.T., Yu, K.F., Fok, K.W., Yeung, S.M., Lam, C.H., Liu, K.M., 2016. Parenting approaches, family functionality, and internet addiction among Hong Kong adolescents. BMC pediatrics 16, 130. https://doi.org/10.1186/s12887-016-0666-y.