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Internet Use and its Correlation with Psychiatric Symptoms – Results of an Online Survey Based on Psychometric Risk Profiles of the German Version of the "Compulsive Internet Use Scale"

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Abstract

Aims: Increased co-morbidity rates of affective and anxiety disorders as well as ADHD have been reported in the context of excessive and addictive internet use. The "Compulsive Internet Use Scale" (CIUS) provides a promising conceptualization for the assessment of compulsive internet use behaviour. The aim of the present study was the investigation of psychopathological abnormalities in a student's sample with high values on the CIUS within the scope of an online survey in a cross-sectional design.

Participants: N=2,506 German students of the University of Tuebingen participated in the online survey. Based on CIUS-values students were divided into two subgroups, with high values (CIUS group, N=90, CIUS > 28), and low values (control group, N = 90).

Measurements: In addition to the CIUS, depressive and manic episodes, quality of life and psychopathological abnormalities were explored.

Findings: Participants with high CIUS-values showed increased depressive and manic affect profiles, lower quality of life and augmented difficulties in coping with study requirements compared to the control group. Furthermore, the high scorers reported more depressive episodes, anxiety disorders, ADHD and suicidal ideation in their lifetime.

Conclusion: Compulsive internet use is related to increased psychopathological abnormalities current and lifetime.

Keywords: Excessive internet use; Addictive internet use; Co-morbidity, Psychopathology; Internet/Computer game addiction

Introduction

There is increasing evidence during the past 20 years, that a subpopulation of internet users uses the internet in a way that leads to negative mental, psychological and social consequences [1-3]. Within a telephone survey in the US, 5.9 % of 2,513 internet users reported, that their social relationships suffered due to excessive internet use[4]. Relating to different use options other studies showed that excessive computer gaming correlated with low educational performance [5,6]. There is some evidence that specific internet applications, such as online gambling [7], online pornography [8,9], online computer gaming [10] and messaging (e.g. chat, social media; [11]) are associated with an increased risk for the development of an internet addiction.

Furthermore, increased comorbidity rates were reported between internet addiction and affective and anxiety disorders [12-14], as well as ADHD [15,16].

There is some disagreement on the theoretical conceptualization concerning the no sological classification and the terminology to be used. While some authors describe a "non chemical addiction, involving human machine interaction" concerning pathological use [2] or "internet addiction" [17-20] others call it "pathological internet use" [21], respectively "problematic internet use" [11]. In an up-dated conceptualization of the "Compulsive Internet Use"[1], the authors claim that it is not the internet itself that is addictive but certain specific online activities (e.g. pornography, gaming or chatting). The addictive use of those online activities leads to a compulsive use of the internet.

While there seems to be a connection between negative mental and psychological consequences and compulsive internet use, it still remains unclear whether these findings are associated with the duration of internet use itself or with a behavioural disorder showing the characteristics of a compulsive behaviour. Whereas some studies

could demonstrate a correlation between depressiveness and daily internet use [22-24], earlier studies failed [25,26]. A 1-year longitudinal study [27] demonstrated that a more frequent internet use is associated with increased feelings of loneliness and depressiveness. However, this effect could not be shown in a follow-up study examining the same sample another two years later [27,19].

Thus it may be assumed that the assessment of the duration and frequency of internet use does not adequately allow the identification of a problematic use pattern. Within a sample of Korean adolescents relations between problematic internet use, bipolar disorder and suicidal ideation were found [28]. In a Dutch sample of 7,888 adolescents it was reported, that daily internet use itself only negligibly correlated with a low quality of life [29]. The authors suggested that the concept of "Compulsive Internet Use (CIU)" which refers to difficulties to control the preoccupation with the internet use can be related to social isolation, depressiveness, and psychosocial difficulties, rather than the amount of time spent online.

Goals

In line with the concept of van der Aa et al. [29] the aim of this survey was to investigate the relation between CIUS scoring and affective symptoms in terms of self-reported increased depressiveness and mania as well as other psychopathological abnormalities, occurring currently and lifetime. Therefore German student high-scorers on the CIUS were compared with a matched control sample (low values on the CIUS). Furthermore, the current study carried out a linear regression with depressiveness as dependent variable. The independent variables included in the analysis were taken from existing theory and research. Duration of daily internet use, CIU, use of online pornography, online gambling, online gaming [30] instant messengers (chat; [23,31] and social communities were included. The variable difficulties in coping with study requirements"was chosen because there is evidence that poor school achievement and depression are correlated [32] as well as using Facebook for socializing with others is correlated with poor study requirements [33]. Supplementary gender [34] and age were considered as influencing variables on depression.

The current research therefore deals with two different topics. First the $CIUS_{Risk}$ group and the control group are compared referring to their psychopathology, assuming that subjects in the $CIUS_{Risk}$ group show higher rates and more severe psychopathological abnormalities than control subjects. Second the linkage between depressiveness and different influencing factors was analyzed, assuming that CIU, duration of internet use, usage of instant messengers, online pornography, online gaming and online gambling could have an influence on depressiveness. As well as further variables aside from internet use, like gender, age and difficulties in coping with study requirements are expected to influence depressiveness.

Methods

Sample

E-mail invitations asking for participation in an online surveywere sent to all students of the University of Tuebingen that are registered with an email-accountusing the central mailing service. Respondents could win one of five 100 Euro Amazon vouchers. The online survey was carried out using the commercial online portal www.2ask\\.de via a secure connection. A total of 24,072 students were invited. 2,533 students (10.5%) participated in the survey. Due to missing values 27 respondents were excluded from further statistical analysis, a sample of N = 2,506 was available for evaluation. The sample consisted of 970 male participants and 1,536 female subjects. The mean age was 23.9 years (SD = 3.85, range: 18-54). For linear regression analysis the whole sample was used, for the analysis of group differences a subset of 180 participants was divided into two matching groups.

Respondents were divided into CIUS high scorers ($CIUS_{Risk}$: CIUS mean score = 33.54, SD = 4.71) and a control group (CIUS mean score = 7.93, SD = 4.58). In line with current research protocols [35] students with CIUS scores > 28 were defined as high scorers. For the control group the condition [x ≤ x_{krit} + 0.5 SD]was used. Within the total of 2,506 participants 90 participants fulfilled the condition for the $CIUS_{Risk}$ group, another 90 participants were randomly drawn and matched by age and gender to form the control group.

Questionnaires

The applied German version of the Compulsive Internet Use Scale (CIUS [1,36] consists of 14 items using a 5-point Likert scale (0 = not at all – 4 = very often). The 14 items cover the following fields:

Continuation of internet use in spite of the intention to stop it

The internet use dominates behaviour and thinking

Experience of unpleasant negative conditions, if the internet is not used

The internet is used in order to alleviate emotional conditions

The internet use leads to intrapersonal or interpersonal conflicts

The current work is based on a former analysis of the same sample covering the psychometric properties of the German version of the CIUS. Methods and results have been published elsewhere [36]. The following section provides the relevant information for the current analysis of association of the CIUS with psychometric risk profiles.

The analysis revealed high internal consistency (Cronbach Alpha=. 89) and good discriminatory power with indices ranging from .45 to . 64. Confirmatory factor analysis on the 14 items and one factor showed a homogenous factor with good fit ($\chi^2(72)$ = 502.781, RMSEA = .049, CFI = .969) and factor loadings from .47 to .91 [36].

For further assessment of the current depressive/manic affect the German Depression Scale (CES-D), including 9 additional items for the assessment of manic symptoms [37-39] had been applied. The Depression Scale consists of 20 items with a 4-point Likert scale ("rarely" – "most often"). The CES-D is a short and reliable instrument (Cronbach Alpha = .88 - .95) for the assessment of depressive and manic symptoms.

The German version of the European Addiction Severity Index (Europ ASI [40]) records, besides the query for substance abuse, the lifetime-psychopathology concerning depression, obsession, anxiety states, psychotic symptoms, suicidal ideation, and suicide attempts in dichotomised form. This procedure, originally developed as an interview, provides a sufficient to very good internal reliability (Cronbach Alpha = .62 - .99 [40]).

Additionally, quality of life (0 = very dissatisfied – 4 = very satisfied) and difficulties in coping with the study requirements (0 = no difficulties – 4 = extreme difficulties) were inquired via visual analogue scales where participants indicate their position between two end-points on a continuous line.

Furthermore, the daily average internet use duration in minutes was assessed by the following question: How much time do you on average spend on active internet use per day? Most importantly we asked for the active internet use to exclude activities like listening to the radio via internet without really sitting in front of the computer.

Statistical evaluation

Differences between $CIUS_{Risk}$ and control group were calculated by means of Pearsons-χ^2 and ANOVA with the factors group and gender for the assessment of psychometric affect variables of the CES-D. Additionally, a linear regression was administered with depressiveness as dependent variable.

Results

Duration of internet use, quality of life and difficulties in coping with the study requirements

Participants of the $CIUS_{Risk}$ group reported significantly longer internet use durations than the control group ([F (1,176) = 40.41, p < .

001] (table 1). The difference between male and female students did not reach significance [F (1,176) = 1.27, p = .294]. Participants of the $CIUS_{Risk}$ group described themselves significantly more dissatisfied with their lives [F (1,176)=86.09, p < .001] without showing a gender [F (1,176) = 0.10, p = .793] or interaction effect [F (1,176) = 0.10, p =. 749]. At the same time participants of the $CIUS_{Risk}$ group reported significantly more difficulties in coping with their studies [F (1,176) = 60.06, p < .001]. Again, there was no gender [F (1,176) = 0.14, p = .750] or interaction effect [F (1,176) = 0.08, p = .712].

	Group affiliation		Sig.
	Control group [a]	$CIUS_{Risk}$ group [a]	
	M (SD)	M (SD)	
Active internet use duration (min.):	111.73 (10.84)	209.14 (10.84)	F_{Group}(1;176) = 40.41, p < .001
male:	119.83 (16.79)	218.28 (16.79)	F_{Sex} (1;176) = 1.27, p = .294
female:	103.62 (13.71)	200.00 (13.71)	
Quality of life:	3.78 (0.82)	2.31 (1.22)	F_{Group}(1;176) = 86.09, p < .001
male:	3.78 (0.83)	2.25 (1.34)	F_{Sex} (1;176) = 0.10, p = .793
female:	3.78 (0.82)	2.35 (1.15)	$F_{Group \times Sex}$ (1;176) = 0.10, p = .749
Difficulties in coping with the requirements of the studies :	1.86 (1.28)	3.40 (1.35)	F_{Group}(1;176) = 60.06, p < .001
male:	1.78 (1.20)	3.39 (1.42)	F_{Sex} (1;176) = 0.14, p = .750
female:	1.91 (1.34)	3.41 (1.52)	$F_{Group \times Sex}$ (1;176) = 0.08, p = .712
[a] N control group = 90; N CIUS – group = 90			

Table 1: Internet use duration, quality of life and difficulties in coping with the studies.

Affective symptoms current profile

By assessing current affective symptoms using the cut-off values for clinical relevant depressiveness (analogously the cut-off value of the obsession scale was extrapolated based on the distribution characteristics, score > 10), the $CIUS_{Risk}$ group showed significantly higher depression values [F (1,176) = 89.38, p < .001]. There was no

gender [F (1,176) = 3.46, p = .134] or interaction effect [F (1,176) = 0.30, p = .064].

The $CIUS_{Risk}$ group described themselves as significantly more obsessive compared to the controls [(F (1,176) = 8.00, p < .005)], while neither gender [F (1,176) = 0.04, p = .851] nor interaction effects emerged [F (1,176) = 0.87, p = .847] (Table 2).

	Group affiliation		Sig.
	Control group [a]	$CIUS_{Risk}$ group [a]	
	M (SD)	M (SD)	

ADMS – depressiveness :	11.51 (7.92)	26.12 (11.87)	$F_{Group}(1,176) = 89.38$, p < .001
male:	10.31 (8.02)	23.92 (10.73)	$F_{Sex}(1,176) = 3.46$, p = .134
female:	12.31 (7.83)	27.59 (12.46)	$F_{Group \times Sex}(1,176) = 0.30$, p = .064
ADMS – obsession:	4.34 (4.07)	6.16 (3.80)	$F_{Group}(1,176) = 8.00$, p < .05
male:	4.61 (5.12)	5.75 (3.42)	$F_{Sex}(1,176) = 0.04$, p = .851
female:	4.17 (3.23)	6.43 (4.04)	$F_{Group \times Sex}(1,176) = 0.87$, p = .847
	Control group [a] N (%)	CIUSRisk group [a] N (%)	Sig.
ADMS – depressiveness > 23[1] :	8 (8.9%)	51 (56.7%)	x^2
ADMS – obsession > 10[2] :	4 (4.4%)	13 (14.4%)	x^2
(1) > 23 & (2) > 10 :	2 (2.2 %)	8 (8.9%)	x^2
[a]N control group= 90; N CIUS – group= 90			

Table 2: ADMS – depressiveness respectively ADMS – obsession depending on group affiliation and gender.

In comparison to the control group, members of the $CIUS_{Risk}$ fulfilled the conditions "CES-D -depression" more often [$x^2 = 46.62$, df = 1, p<.001]. Concerning obsession the difference did reach statistical significance [$x^2 = 5.26$, df = 1, p<.05]. For the condition [CES-D – Depression > 23 & CES-D – Obsession > 10] it turned out that participants of the $CIUS_{Risk}$group fulfilled significantly more often both conditions [$x^2 = 3.81$, df = 1, p = .051]. Results are outlined in table 3.

	Control group [a] [N / %]	CIUSRisk group [a] [N / %]	Sig.
Depressiveness	18 (20 %)	66 (73.3 %)	$x^2= 51.43$, df = 1, p < .001
Obsession	15 (16.7 %)	32 (35.6 %)	$x^2= 8.32$, df = 1, p < .05
ADHD	7 (7.8 %)	39 (43.3 %)	$x^2= 29.90$, df = 1, p < .001
Anxiety	31 (34.4 %)	61 (67.8 %)	$x^2= 20.01$, df = 1, p < .001
Concentration problems	23 (25.6 %)	62 (68.9 %)	$x^2= 33.91$, df = 1, p < .001
Hallucinations	4 (4.4 %)	6 (6.7 %)	$x^2= 0.42$, df = 1, p = .308
Fears of persecution	2 (2.2 %)	13 (14.4 %)	$x^2= 8.80$, df = 1, p < .05
Impulsive behaviour	3 (3.3 %)	17 (18.9 %)	$x^2= 11.03$, df = 1, p < .05
Intake of psychotropic drugs	2 (2.2 %)	17 (18.9 %)	$x^2= 13.24$, df = 1, p < .001
Suicidal ideation	10 (11.1 %)	51 (56.7 %)	$x^2= 41.68$, df = 1, p < .001
Suicidal attempts	0 (0 %)	8 (8.9 %)	$x^2= 8.37$, df = 1, p < .05
[a]Ncontrol group = 90; N CIUS – group = 90			

Table 3: Psychopathological abnormalities [Europ ASI, Scheuerle et al., 2000] according to group affiliation.

Lifetime-psychopathology based on the Europ ASI[37]

Concerning lifetime psychopathology (EuropASI37), significantly more participants of the $CIUS_{Risk}$ group reported having suffered from depression [$x^2 = 51.43$, df = 1, p < .001], obsession [$x^2 = 8.32$, df = 1, p < .05], ADHD [$x^2 = 29.90$, df = 1, p < .001], anxiety [$x^2 = 20.01$, df = 1, p < .001], concentration problems [$x^2 = 33.91$, df = 1, p < .001], fears of persecution [$x^2 = 8.80$, df = 1, p < .05], suicidal attempts [$x^2 = 8.37$, df = 1, p < .05], impulsive behaviour [$x^2 = 11.03$, df = 1, p < .05.], and suicidal ideation [$x^2 = 11.03$, df = 1, p < .05].

Additionally, more participants in comparison to the control group reported to have taken psychotropic drugs due to mental problems [$x^2 = 13.24$, df = 1, p < .001]. The inquiry for hallucinations [$x^2 = 0.42$, df = 1, p = .308] did not show any group differences.

By evaluation of the total sample using the backward stepwise regression Wald-statistic statistical significance (0.05 value) resulted for the approximation values of the predictors gender, online-gambling, online-gaming, online pornography, CIUS and difficulties in coping with study requirements. Regression co-efficients, odd-ratios and Wald-statistic values are summarized in table 4.

		Unstandardized coefficients		Standardized coefficients		
	Variables	Regression coefficient B	Standard error	Beta	t	sig.
step5	CIUS	.339	.021	.291	15.890	.000
	diff. in coping with study requ.	.692	.117	.397	23.000	.000
	gender	2.681	.377	.138	7.106	.000
	online pornography	.447	.208	.043	2.152	.031
	online gaming	-.333	.149	-.039	-2.233	.026
	online gambling	.785	.370	.036	2.123	.034
	constant	-.646	.957		-.675	.500
variables of step 1: age, gender, time spend online, chat, social communities, online gaming, online gambling, online pornography, CIUS, difficulties in coping with study requirements.dependent variable: depression						

Table 4: Parameter estimates of the linear regression model.

The analysis of variance showed significant prediction through the underlying model F(6,2499) = 195.28; MSE = 11855.53; p < .001. The model equation shows a correlation of r = 0.57 with the criterion variable and was able to explain 32 % of variance.

The aim of the study was to investigate the linkage between "Compulsive Internet Use" [1] and the presence of current and lifetime psychopathological symptoms in a cross sectional design. Similar to earlier findings, which suggested that a compulsive internet use is often accompanied by comorbid psychiatric disorders [12,13,25,28], it was hypothesised that participants with high values on the CIUS show symptoms of depressiveness and mania more frequently, which was also assumed for the psychopathological lifetime survey.

Results indicated that the CIUS$_{Risk}$ group showed significantly more symptoms of depressiveness and mania. Significantly more participants of the CIUS$_{Risk}$ group exceeded the critical cut-off value of a clinical relevant depression and mania. A further inquiry revealed that more participants of the CIUS$_{Risk}$ group showed both affect poles during the same assessment period of two weeks. We interpreted this result as an indicator for an affective instability but it still remains unclear to what extent the results are associated with mood instability or dysregulation. In the case of an affective instability the frequency and/or the extent of fluctuation would be involved. Dysregulation means, that – independent from the frequency and/or intensity – the return to an individual base level does not happen in the expected time and/or extend. Concerning the diathesis stress model for affective disorders [41,42] it can be hypothesised, that mood instability can be regarded as phenotype of an underlying dysregulation respectively instability of the behaviour activation system. Therefore, future longitudinal studies are required in order to investigate the relation between compulsive internet use and affective dysregulation in the context of a diathesis-stress model.

In addition to that, the survey examined psychopathological abnormalities (lifetime) using the Europ ASI [40]. These results lead to the conclusion that – based on the life span – more participants of the CIUS$_{Risk}$ group suffered from depressiveness, mania, anxiety, ADHD, poor concentration, fears of persecution, hallucinations or suicidal ideations. The results of increased psychopathological abnormalities are in line with earlier findings showing a relation between addictive internet use and depressiveness [12,13,28], ADHD [14,15] and anxiety disorders [14]. Moreover, participants of the CIUS$_{Risk}$ group reported a lower quality of life and more difficulties in coping with study requirements, which is in line with earlier findings [24,33,43].

Furthermore we generated linear regression models with depressiveness as dependent variable. The independent variables and therewith influencing factors mentioned above included in the analysis where taken from existing theory and research. In line with van der Aa and colleagues [29] the linear regression model demonstrated a significant influence of CIU on depressiveness whereas the influence of the time spent online did not reach significance. This supports the hypothesis that loss of control as essential characteristic of compulsive internet use is associated with negative consequences and not the time spent online [1]. In line with Li and Lerner [32] the results show a significant relation between difficulties in coping with study requirements and depression. Another significant relation arose between gender and depressiveness which is in line with Van de Velde [34] who found that female subjects suffer significantly more often from depression. Within the analysis there also appeared a significant influence of online-gambling, online-gaming and online-pornography on depressiveness.

Limitations of the study

At first, the sample consists of students, which impedes generalisation of the results to the general population. So it would be necessary to evaluate representative samples prospectively using this concept. Second the data do not allow any statement on the causes of CIU. Although Van der Aa[29] suggested, that the concept of the "Compulsive Internet Use" can be regarded as moderator variable for depression and other psychosocial abnormalities, it still remains unclear if increased depression values and psychopathological abnormalities are the consequence or cause of problematic internet

use. Longitudinal studies are required in future to answer these questions.

Third it has to be noted that the applied study design defines risk and control groups based on a psychometric risk definition (analogue to other studies referred). Therefore no information is available on the clinical diagnostic status of members of the $CIUS_{Risk}$group.

Furthermore, application of the scale by using cut off-values does not permit diagnostic classification. So a future determination of norm and clinical cut-off values and validation with clinical samples and clinical interviews would be necessary.

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Dedication

This article is dedicated to the memory of our beloved friend and colleague Dr. Peter Peukert who passed away unexpectedly and far too soon in January 2013.

Author Disclosure Statement

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