

# Predicting Compulsive Internet Use: It's All about Sex!

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## ABSTRACT

The objective of this research was to assess the predictive power of various Internet applications on the development of compulsive Internet use (CIU). The study has a two-wave longitudinal design with an interval of 1 year. The first measurement contained 447 adult heavy Internet users who used the Internet at least 16 h per week and had Internet access at home for at least 1 year. For the second measurement, all participants were invited again, of whom 229 responded. By means of an online questionnaire, the respondents were asked about the time spent on various Internet applications and CIU. On a cross-sectional basis, gaming and erotica seem the most important Internet applications related to CIU. On a longitudinal basis, spending a lot of time on erotica predicted an increase in CIU 1 year later. The addictive potential of the different applications varies; erotica appears to have the highest potential.

## INTRODUCTION

THE CONSTRUCT of compulsive Internet use (CIU)—also referred to as Internet addiction,<sup>1,2</sup> Internet dependence,<sup>3,4</sup> problematic Internet use,<sup>5,6</sup> or pathological Internet use,<sup>7,8</sup> has gained considerable acceptance within the last decade. Since the first parodying report by Goldberg,<sup>9</sup> some 10 years ago, increasing numbers of studies have addressed the phenomenon that certain persons use the Internet compulsively, which can lead to serious problems with regard to psychosocial and professional functioning. Most commonly, the behavior is referred to as “Internet addiction,” suggesting that it is the Internet in itself that is addictive, rather than the actual application with which the user is involved. On the other hand, several researchers have differentiated between various forms of CIU. Young et al.,<sup>10,11</sup> for example, conducted a survey among 35 therapists who have treated clients suffering from cyber-related problems. Qualitative results gleaned from the study suggest that five specific subtypes of CIU can be categorized: cyber-sexual addiction, cyber-relationship addiction, net compulsion (obsessive online gambling, shopping, or day trading), in-

formation overload (compulsive web surfing or database searches), and computer addiction (obsessive computer game playing). Similarly, Davis<sup>7</sup> distinguishes (in his Cognitive-Behavioural Model of Pathological Internet Use) specific pathological Internet use (PIU) and generalized PIU, where the former refers to pathological use of the Internet for a particular purpose (such as online sex or online gambling), and the latter to a general, multidimensional overuse of the Internet. According to Davis, specific PIU is content-specific and exists independent of multiple Internet functions; it would also exist in the absence of the Internet. Generalized PIU, on the other hand, involves a general, multidimensional overuse of the Internet and may include online procrastination. Generalized PIU is often associated with chatting and related to the social aspect of the Internet. Davis<sup>7</sup> says, “The need for social contact and reinforcement obtained online results in an increased desire to remain in a virtual social life.” Several authors have suggested that particular applications that involve social interaction constitute a risk for developing CIU. For example, Caplan<sup>12</sup> found in a sample of 386 undergraduate students that the preference for social benefits available

online accounted significantly for the negative outcome of Internet use and suggested that the preference for computer-mediated social interaction plays a role in the etiology, development, and outcomes of generalized PIU. Chou and Hsiao<sup>13</sup> found in a large sample of 910 university and college students that the Internet Communication Pleasure Score (a measure relating, among others, to the use of the Internet for interpersonal communication) was the most powerful predictor of Internet addiction. Li and Chung<sup>14</sup> studied in a relatively small sample of 76 college students the relationship between Internet function and Internet addictive behavior, and found that the social function played the core role in Internet addictive behavior. Ward<sup>15</sup> studied 112 undergraduate and graduate students and found that communication applications were the central focus associated with problematic use. Young<sup>16</sup> found in a convenience sample of 396 dependent Internet users and a control group of 100 non-dependent Internet users that non-dependents predominantly used those aspects of the Internet that allowed them to gather information (i.e., Information Protocols and the World Wide Web) and e-mail, whereas dependents predominantly used the two-way communication functions available on the Internet (i.e., chat rooms, MUDs, news groups, or e-mail). Finally, a longitudinal study among 663 Dutch adolescents from our own research group showed that instant messenger (IM) use and chatting in chat rooms were related to increases in CIU 6 months later.<sup>17</sup> Contrary to these findings, Widyanto and McMurrin<sup>18</sup> found no correlation between the type of Internet functions and participants' CIU in a convenience sample of 86 self-selected Internet users. In general, several studies have shown associations between the social function of the Internet and CIU; however, as far as we know only one study used a longitudinal design, allowing for more definite conclusions on the direction of causation. Therefore, the present study aims to assess the addictive potential of the various Internet applications by examining the predictive power of the time spent on the various applications on the development of CIU within a longitudinal design. The results may contribute to the further understanding of the mechanisms behind CIU.

## METHODS

### *Procedure*

This study had a two-wave longitudinal design with an interval of 1 year. The data were gathered in the Netherlands by means of two online mea-

surements (at T1 and at T2), carried out among a representative sample of adult and experienced heavy users of the Internet: aged 18 years and older, having access to the Internet at home for at least 1 year, and using the Internet on average 16–100 h per week.<sup>19</sup> In November 2002, participants received an email which invited them to surf to a website where the questionnaire could be completed in about 10 min. Non-responders received reminders after 2 and 4 weeks. At 1 year after the first measurement, the procedure was repeated (T2), and all respondents to the first measurement received an email, inviting them to visit a website to fill out an online questionnaire following the same procedure as during the first measurement.

### *Instruments*

The online questionnaires at T1 and T2 contained, among others, the following variables: demographics, Internet use, and the Compulsive Internet Use Scale (CIUS<sup>20</sup>).

Internet use was measured by asking the respondents "How many days per week are you online for private purposes?" (8-point scale: "every day" to "less than once a week") and "How many hours do you spend online for private purposes on a typical day that you use the Internet?" (8-point scale: "seven hours or more" to "less than one hour"). Based on these two questions, the average number of hours per week was calculated by multiplying the number of days per week by the number of hours per typical day. Furthermore, the respondents were asked how much time they spent on 11 (12 at T2) specific Internet applications (7-point scale: "none" to "more than 40 hours per week")—that is, email, searching for information on the Internet, surfing the Internet, online gaming, chatting, buying on the Internet, gambling on the Internet, downloading from the Internet, Usenet, searching for erotic stimuli (erotica), dating on the Internet, and, at T2, participation in an online forum.

A recently developed and validated scale, the CIUS,<sup>20</sup> assessed CIU (see Appendix). The CIUS has 14 items on a five-point Likert scale ("Never" to "Very often") and scores of 0–56. The scale has a high reliability (T1 and T2 Alpha = 0.89) and includes the aspects of loss of control, preoccupation, withdrawal symptoms, coping, and conflict with regard to the use of the Internet.<sup>20</sup>

### *Sample and non-response*

Of the 1,000 participants who received an invitation to volunteer in the first measurement (at T1),

447 (44.7%) responded. Because all participants were part of an access panel, information on age, gender, and education level was available from previous surveys. An attrition analysis was conducted to test for possible differences between the responders and non-responders. Logistic regression analyses revealed significant differences between responders and non-responders for all three variables. Responders were slightly older (38.5 vs. 36.9 years, OR 1.01, 95% CI 1.00, 1.02), more often female (51% vs. 43%, OR 1.37, 95% CI 1.06, 1.77), and slightly higher educated (4.2 vs. 4.0, OR 1.09, 95% CI 1.00, 1.18, on a 7-point scale ranging from "Lower education" to "University education").

For the second measurement (at T2), at 1 year after the first measurement, all 447 respondents of the first measurement were approached again and invited to fill out the second online questionnaire. About half of them (51%,  $n = 229$ ) responded and filled out the questionnaire. An attrition analysis was conducted to test for possible differences between the responders and dropouts ( $n = 218$ ). The logistic regression analyses revealed no differences in the demographic variables of age, gender, and education level, nor on the score on the CIUS, score on the OCS,<sup>21</sup> and number of years with Internet connection at home. A small difference was found for number of hours online per week; responders spent on average more time online than non-responders (26.6 h per week vs. 24.2 h per week, OR 1.02, 95% CI 1.00, 1.04).

#### *Statistical analysis*

To analyze the addictive potential of the different applications, first Pearson correlation analyses were conducted with time spent on the different applications at T1 and T2, duration of Internet access at home, and CIUS scores as variables. Duration of Internet access at home was included because this variable may have an influence on CIU as exemplified in "beginner's fascination." To check for multicollinearity, correlations between the various applications were calculated. Next, cross-sectional predictors of CIU were determined at T1 and T2, by conducting linear regression analyses with CIU at T1 and T2, respectively, as dependent variable, and time spent on the 11 Internet applications as independent variables. To control for demographic factors and duration of Internet access at home, the demographic variables gender, age and educational level, and access time were entered in step 1 of the regression equation. To determine possible longitudinal predictors of CIU, linear regression analyses were conducted with

CIU at T2 as dependent variable, and CIU at T1 and time spent on the 11 Internet applications at T1, as independent variables. Again, to control for demographic factors and duration of Internet access at home, the demographic variables gender, age and educational level, and access time were entered in step 1 of the regression equation. In all analyses,  $p < 0.05$ , unless otherwise noted. Statistical program was SPSS 12.0.

## RESULTS

### *Internet applications*

There were large differences in the time spent on the various Internet applications. Table 1 shows that some applications are hardly used (e.g., 97.5% of the respondents never gambles online and 84.5% never dates online), whereas other applications are used by almost all respondents (e.g., email, information searching, and surfing). Much time is spent on email, downloading, chatting, and surfing. Remarkable is the fact that relatively few respondents report spending a lot of time on searching the Internet for sexual stimuli, although the pursuit of sexual interests over the Internet is reported to be very common among Internet users.<sup>22,23</sup> The inter-correlations between the various applications are generally weak (Table 2), ranging from 0.431 (email-information seeking) to near zero (e.g., gaming-erotica). This indicates that the applications are relatively independent from each other and that multicollinearity will not disturb the prediction analyses.

### *Cross-sectional associations between Internet applications and CIU*

Cross-sectional Pearson correlation analyses demonstrated large differences in the correlation between time spent on the applications and CIU (Table 3). Relatively high cross-sectional correlations (from 0.261 to 0.203 at T1, and from 0.270 to 0.204 at T2) were found between CIU and chatting, gaming, and, dating.

Cross-sectional linear regression analyses were conducted to find predictors of CIU in terms of time spent on the different applications. The results (Table 4) showed positive associations at T1 for gaming, chatting, and erotica. In addition, there was a negative association between age and CIU, indicating that the older the Internet user, the less likely that person is to show signs of CIU. The application factors explained 14% of the variance in

TABLE 1. TIME SPENT ON INTERNET APPLICATIONS IN PERCENTAGE OF RESPONDENTS AT T1

	<i>Time (in hours) spent on application per week</i>				
	0	<4	5–10	11–20	>21
Email	0.2	48.8	27.4	9.8	13.8
Information	1.8	61.6	23.3	9.7	3.6
Surfing	3.4	58.8	21.9	10.0	5.9
Gaming	37.8	41.4	11.0	5.9	3.8
Chatting	30.6	36.7	13.3	8.6	10.8
Buying	42.4	54.6	2.0	0.7	0.2
Gambling	97.5	2.2	0.2	0	0
Downloading	17.4	46.4	15.6	11.1	9.5
Usenet	51.7	38.1	4.3	3.8	2.0
Erotica	65.7	28.7	3.6	1.6	0.4
Dating	84.5	12.1	1.8	1.1	0.4

T1, time 1.

CIU at T1. The results indicate that the more time spent on gaming, chatting, and erotica, the more likely it is that the Internet user shows signs of CIU. The same analysis conducted with T2 variables showed a somewhat different pattern of results. Again, positive associations were found for gaming and erotica, but no association was found for chatting; however, a positive association was found for dating. No effects were found for the demographic variables. The application factors explain 15% of the variance in CIU at T2. The results of both cross-sectional regression analyses indicate that particularly gaming and erotica are associated with CIU. In other words, those who spent a lot of time on gaming and erotica have a higher risk to show signs of CIU. The evidence for chatting and dating is less evident.

#### *Longitudinal associations between Internet applications and CIU*

The longitudinal design of the study enables to determine predictors of CIU over a 1-year period. First, Pearson correlation analyses were conducted showing significant correlations between chatting, gaming, dating, buying, and erotica at T1, and CIU at T2 (Table 3). The results of the subsequent longitudinal regression analyses are shown in Table 4. The factors explain 61% of the variance in CIU at T2. Not surprisingly, the strongest association was found for the CIUS score at T1. In addition, a positive association was found for erotica. Apparently, spending a lot of time searching for erotic stimuli predicts an increase in CIU 1 year later. None of the

other application factors reached significance, nor did the demographic factors add to the prediction of CIU.

## DISCUSSION

The main goal of the present study was to assess the relative addiction risk of several Internet applications. First of all, large differences were found in the popularity of the various applications. In terms of time spent on the application, e-mailing, downloading, chatting, and surfing are among the most popular. Consistently over the two measurements, the cross-sectional analyses demonstrated that CIU was associated with gaming and searching for erotic stimuli. In addition, CIU was associated with chatting at the first measurement, and dating at the second measurement. It appears that Internet users who spent a lot of time on particularly gaming and erotica, are at higher risk to use the Internet compulsively. The results of the longitudinal analyses are partly in line with these conclusions and demonstrated a clear association between CIU and searching for erotic stimuli; searching for erotic stimuli predicted an increase in CIU 1 year later. Using the Internet for sexual gratification should therefore be regarded as the most important risk factor for the development of CIU.

These findings are only partly in line with the findings of other studies, which reported that particularly applications that involve social interaction are associated with CIU.<sup>12–17</sup> Clearly, searching for sexual stimuli on the Internet may involve social

TABLE 2. CORRELATIONS BETWEEN TIME SPENT ON INTERNET APPLICATIONS AT T1

	Email	Information	Surfing	Gaming	Chatting	Buying	Gamble	Downloading	Usenet	Erotica	Dating
Email	1										
Information	0.431**	1									
Surfing	0.267**	0.386**	1								
Gaming	0.077	0.067	0.135*	1							
Chatting	0.363**	0.202**	0.343**	0.250**	1						
Buying	0.058	0.170**	0.182**	0.034	0.104	1					
Gamble	-0.017	0.008	-0.008	0.003	0.070	0.136*	1				
Downloading	0.220**	0.320**	0.222**	0.047	0.244**	0.203**	-0.031	1			
Usenet	0.261**	0.316**	0.128	-0.027	0.076	0.162*	-0.010	0.193**	1		
Erotica	-0.019	0.039	0.242**	0.003	0.043	0.088	0.014	0.164*	0.110	1	
Dating	0.060	0.058	0.110	-0.013	0.176**	0.114	0.039	-0.028	0.144*	0.263**	1

\* $p < 0.05$ .

\*\* $p < 0.01$ .

T1, time 1.

TABLE 3. PEARSON CORRELATIONS BETWEEN TIME SPENT ON APPLICATIONS AND COMPULSIVE INTERNET USE (CIU) AT T1 AND T2

	<i>Cross-sectional correlations with CIU T1</i>	<i>Cross-sectional correlations with CIU T2</i>	<i>Longitudinal correlation with CIU T2</i>
Chatting	0.261**	0.223**	0.226**
Gaming	0.216**	0.204**	0.173**
Dating	0.203**	0.270**	0.158*
Email	0.199**	0.163*	0.124 n.s.
Erotica	0.189**	0.193**	0.147*
Surfing	0.171**	0.152*	0.051 n.s.
Information search	0.165**	0.127 n.s.	0.089 n.s.
Usenet	0.122*	0.099 n.s.	0.056 n.s.
Downloading	0.115*	0.048 n.s.	0.021 n.s.
Buying	0.105*	0.149*	0.155*
Gambling	0.066 n.s.	0.108 n.s.	0.044 n.s.
Forum	n.a.	0.189**	—
Access time at home	-0.088 n.s.	-0.093 n.s.	—

\* $p < 0.05$ .\*\* $p < 0.01$ .

T1, time 1; T2, time 2 (1 year after T1).

TABLE 4. CROSS-SECTIONAL AND LONGITUDINAL LINEAR REGRESSION ANALYSES FOR T1 AND T2

	<i>Cross-sectional T1</i>		<i>Cross-sectional T2</i>		<i>Longitudinal T1-T2</i>	
	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$
<b>Step 1</b>						
Age	-0.110*		-0.045		-0.044	
Gender	-0.031		0.046		0.032	
Education	-0.057		0.000		-0.008	
Access time	-0.068		-0.088		-0.086	
		0.023		0.015		0.012
<b>Step 2</b>						
CIU T1					0.761**	
Email	0.064		0.026		0.009	
Information	0.084		-0.002		0.021	
Surfing	0.026		-0.017		-0.086	
Gaming	0.143**		0.163*		0.043	
Chatting	0.130*		0.083		0.017	
Buying	0.070		0.072		0.033	
Gambling	0.057		-0.067		-0.025	
Downloading	-0.022		-0.015		-0.042	
Usenet	0.067		-0.035	-0.048		
Erotica	0.124*		0.175*		0.132*	
Dating	0.090		0.175*		0.011	
Forum	n.a.		0.119		n.a.	
		0.141		0.149		0.612

\* $p < 0.05$ .\*\* $p < 0.01$ .

T1, time 1; T2, time 2 (1 year after T1).

interaction, but may also exclusively involve non-interactive searching for pornography. Gaming may also involve social interaction, and social interaction appears to be one of the factors that motivates people to continue gaming (even when no monetary reward is involved)<sup>24,25</sup>; however, not all gaming implies social interaction. The finding that chatting was not always associated with CIU raises doubts about the relationship between social interaction and CIU. Further research is needed to study what qualities and aspects of social interaction contribute to the addictive potential of certain Internet applications.

The most relevant question with regard to the results of the present study relate to the how and why of the observed addictive potential of online sexual behavior. First, it is important to distinguish between the various sex-related uses of the Internet. Griffiths<sup>26</sup> describes a number of different ways the Internet can be used for sexually related purposes—for example, seeking out sexually related material for educational use, buying or selling sexually related goods for further use offline, seeking out material for entertainment/masturbatory purposes for use online, engaging in and maintaining online relationships via email and/or chat, seeking out sexual partners for a transitory or enduring relationship, seeking out individuals who then become victims of sexually related crime (e.g., online sexual harassment, cyber stalking), and exploring gender and identity roles. Not all of these activities may be done to excess or are potentially addictive; most likely using pornography for masturbatory purposes, engaging in online relationships, and engaging in sexually related Internet crime may be addictive.<sup>26</sup>

The specific features of the Internet that make sexuality on the Internet so tempting have been described by, for example, Cooper<sup>23</sup> and Young et al.<sup>11</sup> Cooper's "Triple A engine" describes three typical features of sexual behavior via the Internet that contribute to its tempting qualities: Access, Affordability, and Anonymity. Access refers to how easy it is to connect to the Internet and to find, with a finger click, a variety of sexually stimulating audio, video, or text items. Moreover, these sexual stimuli are in abundance, replenished daily, and often at no or little charge. Most importantly, one can engage in online sexual behavior anonymously (at least subjectively), which lowers thresholds and fosters disinhibition<sup>27</sup> without having to fear negative consequences. Young's "ACE model" (Anonymity, Convenience, and Escape), shares the anonymity feature and stresses furthermore the convenience of meeting others or finding sexually stimulating ma-

terial on the Internet within the safe environment of one's own house. In addition, Young stresses that sexuality on the Internet can be used as a coping strategy to escape daily sorrows, or ameliorate a negative mood. Some even experience a kind of "high" (see also the *flow* experience<sup>28</sup>).

Putnam<sup>29</sup> gives a good description of the pathogenesis of online sexual compulsions for persons who are vulnerable through biological, psychological and/or social characteristics, and how the behavior is reinforced through operant conditioning and classical conditioning learning mechanisms. In brief, Putnam states that the vulnerability for the development of compulsive sexual behavior may originate from biological factors such as deviant testosterone and serotonin levels, or may develop in response to physical, sexual, family, or social trauma. In addition, personality disorders, mood and anxiety disorders, and substance abuse and dependence may contribute to the vulnerability to develop compulsive sexual behavior. These personal factors can make a person vulnerable to develop compulsive sexual behavior; however, the compulsive behavior may stay latent in the "normal" offline world. The unique factors of the Internet (as described above as the Triple A engine and the ACE model) may trigger the latent compulsive behavior to become manifest when a predisposed person engages in sexual behavior on the Internet. Through operant conditioning, the online sexual behavior increases in frequency and duration. The sexual arousal (possibly followed by masturbation and orgasm) serves as a positive reinforcer, and the distraction from negative mood states (coping) serves as a negative reinforcer. The reinforcement may be particularly strong due to the variable-ratio schedule of reinforcement. Eventually, classical conditioning occurs when the online sexual behavior is repeated and computer use is paired to sexual arousal. As a result, using the computer may elicit craving to engage in online sexual behavior.<sup>29</sup>

The above makes plausible the notion that for some vulnerable persons the specific qualities of the Internet facilitates the development of sexual compulsive behavior or a sex addiction. Indications for this personal sensitivity or vulnerability may be found in the psychosocial problems like loneliness, low self-esteem, or depressive symptoms, often related to CIU.<sup>6,30-33</sup> In line with this are the statements of, for example, Shaffer et al.<sup>34,35</sup> and Griffiths,<sup>36</sup> who proclaim that CIU merely reflects other forms of psychopathology. This reasoning also shows that the term "Internet addiction" is inappropriate and misleading, as it is not the Internet in itself that is addictive, but the specific applica-

tion (e.g., searching for sexual stimuli). However, it is the Internet that is used compulsively to perform these behaviors, which legitimates the use of the term "Compulsive Internet Use."

Finally, some limitations of the present study need addressing. The first shortcoming concerns the division of the Internet activities into 11 (12 at T2) applications. Although carefully constructed, the division did not result in 100% unique and non-overlapping applications. For example, searching for sexual stimuli may include solistic activities like searching for erotic pictures, as well as engaging in a more interaction-oriented activity like maintaining an erotic online relationship through chat or other online communication channels. Furthermore, chatting was presented as one application, not differentiating between online communication with total strangers in public chat rooms, and online communication with friends through the use of messengers like MSN or Yahoo Messenger. Therefore, it is recommended that future research should further differentiate between the various applications to identify which aspects of Internet use are potentially addictive. A second limitation regards the reliability of the self-reports on searching sexual stimuli. Considering the vast supply of pornographic websites and the popularity of sex on the Internet,<sup>22,23</sup> one would expect spending time searching for erotic stimuli on the Internet to be mentioned more often than was the case in the present study. Socially desirable answer tendencies may have caused underreporting on searching for erotica and may have masked the effects of searching for erotica on CIU.

In conclusion, the present study demonstrated that not all applications of the Internet have an addictive potential. Using the Internet for predominantly sexual gratification could be empirically linked to an increase of CIU in a 1-year period. It may be that the persons who engage compulsively in searching sexual gratification through the Internet had a latent vulnerability for becoming overly attached to sexual explicit stimuli, but that this vulnerability would never have resulted in compulsive behavior if the Internet had not brought them in contact with an abundance of sexually explicit stimuli. Further research should therefore address the question whether biological deviances, personality disorders, and/or psychosocial problems are *a priori* more prevalent among persons developing CIU.

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#### APPENDIX: COMPULSIVE INTERNET USE SCALE (CIUS)

Instruction: Please answer the following questions about your use of the Internet for private purposes. Answers can be given on a five-point scale: (0) never, (1) seldom, (2) sometimes, (3) often, or (4) very often.

1. How often do you find it difficult to stop using the Internet when you are online?
2. How often do you continue to use the Internet despite your intention to stop?
3. How often do others (e.g., partner, children, parents, friends) say you should use the Internet less?
4. How often do you prefer to use the Internet instead of spending time with others (e.g., partner, children, parents, friends)?
5. How often are you short of sleep because of the Internet?
6. How often do you think about the Internet, even when not online?
7. How often do you look forward to your next Internet session?
8. How often do you think you should use the Internet less often?
9. How often have you unsuccessfully tried to spend less time on the Internet?
10. How often do you rush through your (home) work in order to go on the Internet?
11. How often do you neglect your daily obligations (work, school, or family life) because you prefer to go on the Internet?
12. How often do you go on the Internet when you are feeling down?
13. How often do you use the Internet to escape from your sorrows or get relief from negative feelings?
14. How often do you feel restless, frustrated, or irritated when you cannot use the Internet?

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