Cybersex use and problematic cybersex use among young Swiss men: Associations with sociodemographic, sexual, and psychological factors

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Background and aims: Cybersex use (CU) is highly prevalent in Switzerland's population, particularly among young men. CU may have negative consequences if it gets out of control. This study estimated prevalence of CU, frequency of CU (FCU), and problematic CU (PCU) and their correlates. *Methods:* A non-selective sample of young Swiss men ($N = 5,332$, mean age $= 25.45$) completed a questionnaire assessing FCU and PCU, sociodemographics (age, linguistic region, and education), sexuality (being in a relationship, number of sexual partners, and sexual orientation), dysfunctional coping (denial, self-distraction, behavioral disengagement, and self-blame), and personality traits (aggression/hostility, sociability, anxiety/neuroticism, and sensation seeking). Associations were tested using hurdle and negative binomial regression models. *Results:* At least monthly CU was reported by 78.6% of participants. CU was associated positively with post-secondary schooling (vs. primary schooling), German-speaking (vs. French-speaking), homosexuality, bisexuality (vs. heterosexuality), more than one sexual partner (vs. one), dysfunctional coping (except denial), and all personality traits except sociability, but negatively with being in a relationship (vs. not), age, and sociability. FCU was associated positively with homosexuality, bisexuality, no or more than one sexual partner, dysfunctional coping (except denial), and all personality traits except sociability, but negatively with age, being in a relationship, and sociability. PCU was associated positively with bisexuality, four or more sexual partners, dysfunctional coping, and all personality traits except sociability, but negatively with German-speaking and sociability. *Discussion and conclusions:* CU should be viewed in light of its associations with sociodemographic, sexual, and psychological factors. Healthcare professionals should consider these aspects to adapt their interventions to patients' needs.

Keywords: cybersex, personality, coping, sociodemographics, sexuality, Cohort Study on Substance-Use Risk Factors

INTRODUCTION

Cybersex use (CU) refers to the use of the Internet to engage in sexually gratifying activities, including pornographic material or exchanging sexual messages (Carnes, Delmonico, & Griffin, 2007; Cooper, Delmonico, Griffin-Shelley, & Mathy, 2004; Cooper & Griffin-Shelley, 2002). Although CU is unproblematic for most users, the accessibility, anonymity, and affordability of Internet pornography may lead to problematic CU (PCU) with detrimental consequences on some individuals (Allen, Kannis-Dymand, & Katsikitis, 2017; Cooper, 1998; Cooper, Scherer, Boies, & Gordon, 1999). This study aimed to estimate the prevalence of CU, the frequency of CU (FCU), and PCU among young Swiss men, and their associations with sociodemographic, sexual, and psychological variables.

Prevalence of CU and PCU

Prevalence rates of CU vary considerably between studies from 33% to 75% (see Wéry & Billieux, 2017 for review).

However, most of the studies included in that review used small or non-representative samples. Although a large body of research suggests a positive association between CU and negative consequences and addiction symptoms, there is as yet no consensus regarding the concept and diagnosis of cybersex addiction or compulsion (Grubbs, Stauner, Exline, Pargament, & Lindberg, 2015; Wéry & Billieux, 2017). Different theoretical frameworks have led to different conceptualizations and terminology, e.g., Internet sex addiction, online pornography addiction, online sexual compulsivity (OSC), and compulsive CU (de Alarcón, de la Iglesia, Casado, & Montejo, 2019; Delmonico & Miller, 2003; Fernandez & Griffiths, 2019; Wéry & Billieux, 2017). In the literature, *problematic* use is often used instead of more specific terms such as *addiction* or *compulsion* (Fernandez

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& Griffiths, 2019). To encompass all the nuances of the concept, this paper uses the term *problematic cybersex use* (PCU). PCU refers to the excessive and uncontrolled use of cybersex leading to serious social, personal, and work problems, associated with symptoms similar to those of other addictions, i.e., persistent desire or unsuccessful efforts to control CU, persistent and intrusive thoughts related to CU, CU for mood regulation, withdrawal symptoms, tolerance, and other detrimental consequences (Carnes, 2000; Carnes et al., 2007; Grov et al., 2008; Wéry & Billieux, 2017). Prevalence rates of PCU range from 5.6% to 17% (see Wéry & Billieux, 2017 for review).

Correlates of CU and PCU

Previous studies indicated that CU and PCU were associated with a wide variety of sexual and sociodemographic variables. Rates were shown to be higher among men than women (Döring, Daneback, Shaughnessy, Grov, & Byers, 2017; Giordano & Cashwell, 2017; Luder et al., 2011; Morgan, 2011; Wolak, Mitchell, & Finkelhor, 2007) and among those reporting higher levels of education (Træen, Nilsen, & Stigum, 2006). CU was also associated with age. Prevalence rates were found to increase from 10 to 17 years old (Wolak et al., 2007) and to decrease after 18–24 years old (Daneback, Cooper, & Månsson, 2005). As for variables related to sexuality, it was found that being homosexual or bisexual (Cooper, Delmonico, & Burg, 2000; Daneback et al., 2005; Giordano & Cashwell, 2017; Peter & Valkenburg, 2011), being single (Ballester-Arnal, Castro-Calvo, Gil-Llario, & Giménez-García, 2014; Cooper et al., 2000; Cooper, Griffin-Shelley, Delmonico, & Mathy, 2001), and having multiple sexual partners (Braun-Courville & Rojas, 2009; Daneback et al., 2005) were all positively associated with CU or PCU.

As with substance-use disorders, such as alcohol-use disorder and cannabis-use disorder (e.g., Cooper, Frone, Russell, & Mudar, 1995; Zvolensky et al., 2007), the reasons for CU can be grouped into the two broad categories of positive and negative reinforcement (see Grubbs, Wright, Braden, Wilt, & Kraus, 2019 for review). On one hand, cybersex is often used for pleasure-oriented purposes, such as sexual gratification, entertainment, and enhancing arousal. Grubbs, Wright, et al. (2019) reported a series of studies, which showed that the personality traits linked to pleasure-seeking orientations, such as sensation seeking and narcissism, were consistently positively associated with CU. This supports that sensation seeking may predispose individuals to using cybersex for pleasure-oriented purposes. On the other hand, cybersex is also often used for coping and mood management purposes (Grubbs, Wright, et al., 2019). In line with this proposition, several studies have shown that not only stress, frustration, and relieving boredom are often motives for CU, but also conditions associated with negative affects, such as depressive symptoms (e.g., Varfi et al., 2019; Weaver et al., 2011) and low life-satisfaction (e.g. Peter & Valkenburg, 2011), are positively associated with CU.

Based on these findings, one might expect individuals using dysfunctional coping strategies or with personality traits linked to negative affectivity to be prone to CU and PCU. However, the review by Grubbs, Wright, et al. (2019)

reported no evidence for associations of personality traits underpinning coping and mood management motives (e.g., neuroticism) with CU. Nevertheless, three recent studies have reported such associations. Wéry, Deleuze, Canale, and Billieux (2018) found significant positive associations between PCU and high negative urgency, a facet of impulsivity reflecting the tendency to act rashly when faced with negative emotions. In addition, Egan and Parmar (2013) as well as Shimoni, Dayan, Cohen, and Weinstein (2018) showed significant positive associations between CU and high neuroticism. Thus, although the associations between personality traits linked to pleasure-oriented purposes and CU and PCU have been supported by several convergent sources, there is little evidence supporting associations between CU and PCU and dysfunctional coping strategies and personality traits linked to negative affectivity.

Aims and hypotheses

Previous studies have shown that CU and PCU were associated with a wide range of sociodemographic, sexual, and psychological factors. However, these studies are still scarce and are limited because most of them used small convenience samples. This study aimed to overcome these limitations using a large, non-selective sample of young Swiss men to estimate the prevalence rates of CU, FCU, and PCU and explore their associations with several sociodemographic, sexual, and psychological variables. With regard to sociodemographic and sexual variables, we hypothesize that high level of education, being single, non-heterosexual sexual orientation, more than one sexual partner will be positively associated with CU, FCU, and PCU, whereas age will be negatively associated. With regard to psychological variables, we expect positive associations of dysfunctional coping, personality traits related to pleasure-seeking orientations, and negative affectivity with CU, FCU, and PCU.

METHODS

Study design and participants

Data were drawn from the third-wave questionnaire of the Cohort Study on Substance-Use Risk Factors. In Switzerland, assessment for eligibility for military, civil, or no service is mandatory for all young men, offering a unique opportunity to enroll a non-selective sample of the country's population of 19-year-old men. Between August 2010 and November 2011, all young men reporting to the recruitment centers of Lausanne (French-speaking), Windisch, and Mels (German-speaking) were invited to participate in the study. A total of 7,556 gave their written consent. The C-SURF study was independent of the military's procedures: recruitment centers were used to inform and enroll participants, but they completed their questionnaires outside of the military context. Full information on enrollment procedures and the study in general have been reported previously (Gmel et al., 2015; Studer, Baggio, et al., 2013; Studer, Mohler-Kuo, et al., 2013). A total of 5,516 men (73.0% response rate) filled out the third-wave questionnaire between April 2016 and March 2018. Due to missing values for at least one

variable of interest, 184 respondents (3.3% of respondents) were excluded. The final sample for analysis comprised 5,332 participants (96.7% of respondents). Mean participant age was 25.45 years old. There were 3,046 (57.1%) French-speaking and 2,286 (42.9%) German-speaking participants. A total of 173 (3.2%), 2,156 (40.4%), and 3,003 (56.3%) participants reported primary schooling, vocational training, and post-secondary schooling as highest level of education, respectively (Table 1).

Measurements

Criterion variables. Participants were considered cybersex users if they were more than just sporadic users, because sporadic use is assumed to be relatively harmless. Participants were asked: "Have you visited pornographic web sites at least once a month in the past 12 months." Those who responded "yes" were considered cybersex users and were asked about

their monthly FCU using the following question: "How many days a month do you visit pornographic web sites usually?" FCU reflects the number of days of CU, ranging from 1 to 31. For non-users, the FCU variable was coded 0.

PCU was assessed using the OSC scale of the Internet Sex Screening Test (ISST; Delmonico & Miller, 2003) consisting of six true or false statements assessing the presence of classic symptoms of addiction (American Psychiatric Association, 2013; Baggio et al., 2018): continued use, mood modification, loss of control, preoccupation, withdrawal, and consequences. Since there is no validated cut-off for the ISST, PCU was not conceptualized as a dichotomous disorder (taxon), but rather as a dimensional behavior (i.e., the sum of endorsed statements) ranging from "*unproblematic*" (0) to "*problematic*" (6). Two categorical variables, reflecting the endorsement of (a) at least one symptom and (b) at least three symptoms, were also created for descriptive purposes.

Table 1. Descriptive characteristics of the sample ($N = 5,332$)

			Cronbach's α
Cybersex			
Cybersex use			
At least monthly (users; *N*, %)	4,190	78.6	
Less than monthly (non-users; *N*, %)	1,142	21.4	
Monthly frequency of cybersex use among cybersex users (*M*, *SD*)[a]	9.69	7.93	
Problematic cybersex use (PCU) among users			.63
Number of PCU statements endorsed (*M*, *SD*)	0.76	1.13	
No PCU statements endorsed (*N*, %)	2,397	57.2	
One or more PCU statement endorsed (*N*, %)	1,793	42.8	
Three or more PCU statements endorsed (*N*, %)	374	8.9	
Predictor variables			
Sociodemographic and sexual variables			
Linguistic region (German-speaking) (*N*, %)	2,286	42.9	
Age (*M*, *SD*)	25.45	1.25	
Highest level of education (*N*, %)			
Primary schooling	173	3.2	
Vocational training	2,156	40.4	
Post-secondary schooling	3,003	56.3	
Being in a relationship (*N*, %)	898	16.8	
Sexual orientation (*N*, %)			
Heterosexual	4,757	89.2	
Bisexual	450	8.4	
Homosexual	125	2.3	
Number of sexual partners in the last year (*N*, %)			
0	701	13.1	
1	2,879	54.0	
2–3	1,049	19.7	
4+	703	13.2	
Psychological factors			
Dysfunctional coping			
Denial (*M*, *SD*)	2.96	1.21	.64
Self-distraction (*M*, *SD*)	4.89	1.50	.43
Behavioral disengagement (*M*, *SD*)	3.22	1.27	.60
Self-blame (*M*, *SD*)	4.44	1.71	.78
Personality			
Neuroticism–Anxiety (*M*, *SD*)	2.19	2.17	.73
Aggression–Hostility (*M*, *SD*)	3.77	2.16	.60
Sociability (*M*, *SD*)	4.94	2.24	.65
Sensation seeking (*M*, *SD*)	2.99	0.81	.79

Note. *M*: mean; *SD*: standard deviation.
[a]In days of use.

Predictor variables

Sociodemographic and sexual variables. Sociodemographic and sexual variables included age, linguistic region (French-speaking, German-speaking), highest level of education achieved (primary schooling, vocational training, and post-secondary schooling), number of sexual partners in the previous 12 months (0, 1, 2–3, 4 or more), being in a relationship (married or living with a partner vs. single, divorced, separated, or widowed), and sexual orientation (heterosexual, bisexual, or homosexual).

Psychological factors. Neuroticism–anxiety, aggression–hostility (related to negative affect), sociability (related to pleasure-oriented purposes) personality traits were assessed using the French and German versions of the cross-cultural, shortened form of the Zuckerman–Kuhlman Personality Questionnaire (Aluja et al., 2006). Each trait was measured using 10 true or false statements, and the possible score of endorsed statements ranged from 0–10. Sensation seeking (related to pleasure-oriented purposes) was measured using the 8-item Brief Sensation Seeking Scale (BSSS; Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002). Participants answered each item on a 5-point Likert-type scale (from "*strongly disagree*" to "*strongly agree*"). Scores ranging from 1 to 5 were computed by averaging responses to the eight items.

Participants' use of dysfunctional coping strategies was measured using the denial, self-distraction, behavioral disengagement, and self-blame scales from the Brief COPE questionnaire (Carver, 1997; German version: Knoll, Rieckmann, & Schwarzer, 2005; French version: Muller & Spitz, 2003). Each scale comprises two statements regarding how individuals cope with stress, and statements are rated on a 4-point scale ranging from "*I usually don't do this at all*" to "*I usually do this a lot.*" Scale scores were the sum of the two statement scores and ranged from 2 to 8.

There were no French and German versions for the OSC scale and the BSSS at the beginning of the study. For these scales, original English versions were first translated to French and German by the C-SURF team. Then, French and German versions were back-translated by bilingual persons of the team. Discrepancies between the original versions and the translated versions were discussed until a consensus was found.

Statistical analyses

Descriptive statistics were used to characterize the sample. Reliability of each multi-item scale was examined using Cronbach's α. FCU reflected the usual number of days of CU per month (non-users were coded 0), and PCU reflected the number of symptoms endorsed. FCU was analyzed using Hurdle models, which were preferred over the more habitual Poisson, negative binomial (NB), or zero-inflated count models because the same model allows an analysis of both cybersex users versus non-users and the FCU among cybersex users. In Hurdle models, the binary part – differentiating between non-zero and zero observations (i.e., cybersex users and non-users) – uses logistic regression, whereas the count part uses a zero-truncated count distribution (Poisson or NB). Based on the

Bayesian Information Criterion (BIC), the zero-truncated NB distribution was retained. PCU was analyzed among cybersex users only ($N = 4,190$). Several different count distributions [i.e., Poisson, zero-inflated Poisson (ZIP), NB, and zero-inflated NB (ZINB)] were evaluated for fit using the BIC, and NB regression models were retained to analyze PCU. SPSS version 25 (IBM Corp., Armonk, NY, USA) was used for data coding and descriptive statistics and Stata 15 (StataCorp LP, College Station, TX, USA) was used for Hurdle and NB models.

Two models were tested for the FCU and PCU. Model 1 tested the bivariate associations of each predictor variable, whereas Model 2 tested the associations of each predictor variable, adjusted simultaneously for sociodemographic and sexual variables, that is, highest level of education, linguistic region, being in a relationship, sexual orientation, number of sexual partners, and age. Associations were reported as odds ratios (ORs), for the first parts of the Hurdle models analyzing cybersex users versus non-users. Incidence rate ratios (IRRs) were reported for the NB models. To enable a comparison of the strength of associations, continuous predictor variables were z-standardized (i.e., $M = 0$, $SD = 1$).

Ethics

C-SURF was approved by Lausanne University Medical School's Ethics Committee for Clinical Research (research protocol number: 15/07).

RESULTS

About 78.6% of the sample reported at least monthly CU in the previous 12 months. Cybersex users reported a mean 9.69 days of CU per month and endorsed an average of 0.76 PCU statements. More than half of cybersex users (57.2%) endorsed zero PCU statements, whereas 42.8% endorsed one or more statements; 8.9% endorsed three or more statements (Table 1).

Associations with CU and FCU

In Hurdle models, post-secondary schooling (vs. primary) and living in the German-speaking region (vs. French-speaking) were significantly associated with higher odds of CU, but not with FCU (Table 2). Age and being in a relationship were significantly associated with lower odds of CU and lower FCU. As opposed to a heterosexual orientation, bisexual and homosexual orientations were significantly associated with higher odds of CU and higher FCU. Reporting more than one sexual partner in the past 12 months (vs. one) was significantly associated with higher odds of CU and higher FCU. On the contrary, reporting zero sexual partners was significantly associated with higher FCU but not with CU. Dysfunctional coping strategies and all the personality trait variables except denial were significantly associated with CU and FCU. Specifically, self-distraction, behavioral disengagement, self-blame, neuroticism–anxiety, aggression–hostility, and sensation

Table 2. Hurdle models for associations with cybersex use (CU) and frequency of cybersex use (FCU)

	Model 1 (unadjusted)				Model 2 (adjusted)			
	Logistic part (CU)		Negative binomial part (FCU)		Logistic part (CU)		Negative binomial part (FCU)	
	OR	[95% CI]	IRR	[95% CI]	OR	[95% CI]	IRR	[95% CI]
Sociodemographic and sexual variables								
Highest level of education (ref. primary schooling)								
Vocational training	1.18	[0.84–1.66]	0.94	[0.78–1.12]	1.09	[0.77–1.55]	0.96	[0.81–1.15]
Post-secondary schooling	**1.96**	**[1.40–2.76]**	1.08	[0.90–1.29]	**1.80**	**[1.27–2.56]**	1.09	[0.91–1.29]
German-speaking (ref. French-speaking)	**1.47**	**[1.28–1.68]**	0.99	[0.94–1.05]	**1.44**	**[1.24–1.66]**	0.98	[0.92–1.04]
Being in a relationship (ref. not in a relationship)	**0.50**	**[0.43–0.59]**	**0.75**	**[0.69–0.82]**	**0.66**	**[0.55–0.79]**	**0.83**	**[0.76–0.91]**
Sexual orientation (ref. heterosexual)								
Bisexual	**2.46**	**[1.81–3.34]**	**1.33**	**[1.21–1.47]**	**2.18**	**[1.60–2.98]**	**1.31**	**[1.19–1.44]**
Homosexual	**2.33**	**[1.33–4.08]**	**1.35**	**[1.12–1.61]**	**1.94**	**[1.10–3.44]**	**1.27**	**[1.06–1.51]**
Number of sexual partners (ref. 1)								
0	1.12	[0.93–1.37]	**1.24**	**[1.14–1.36]**	0.91	[0.74–1.11]	**1.17**	**[1.06–1.28]**
2–3	**2.21**	**[1.82–2.69]**	**1.24**	**[1.15–1.34]**	**2.00**	**[1.64–2.45]**	**1.19**	**[1.11–1.29]**
4+	**2.24**	**[1.78–2.83]**	**1.43**	**[1.31–1.55]**	**2.02**	**[1.59–2.57]**	**1.36**	**[1.24–1.48]**
Age[a]	**0.85**	**[0.80–0.91]**	**0.95**	**[0.93–0.98]**	**0.93**	**[0.87–0.99]**	**0.97**	**[0.94–1.00][b]**
Psychological factors								
Dysfunctional coping								
Denial[a]	1.03	[0.97–1.11]	1.00	[0.97–1.03]	1.06	[0.99–1.13]	1.00	[0.98–1.03]
Self-distraction[a]	**1.35**	**[1.26–1.44]**	**1.05**	**[1.02–1.08]**	**1.34**	**[1.25–1.43]**	**1.04**	**[1.01–1.07]**
Behavioral disengagement[a]	**1.20**	**[1.12–1.28]**	**1.05**	**[1.02–1.08]**	**1.17**	**[1.09–1.26]**	**1.04**	**[1.01–1.07]**
Self-blame[a]	**1.33**	**[1.25–1.43]**	**1.09**	**[1.06–1.12]**	**1.30**	**[1.21–1.40]**	**1.08**	**[1.05–1.11]**
Personality								
Neuroticism–Anxiety[a]	**1.35**	**[1.25–1.45]**	**1.11**	**[1.08–1.14]**	**1.33**	**[1.23–1.44]**	**1.09**	**[1.06–1.13]**
Aggression–Hostility[a]	**1.23**	**[1.15–1.31]**	**1.05**	**[1.02–1.09]**	**1.28**	**[1.19–1.37]**	**1.06**	**[1.03–1.09]**
Sociability[a]	**0.84**	**[0.79–0.90]**	**0.96**	**[0.93–0.99]**	**0.82**	**[0.76–0.88]**	**0.95**	**[0.93–0.98]**
Sensation seeking[a]	**1.51**	**[1.41–1.61]**	**1.07**	**[1.04–1.11]**	**1.41**	**[1.31–1.51]**	**1.06**	**[1.03–1.09]**

Note. OR, IRR, and corresponding 95% CI in bold are significant at $p < .05$. OR: odds ratio; IRR: incidence rate ratio; CI: confidence interval. [a]Continuous variables were standardized ($M = 0$, $SD = 1$). [b]Before rounding, upper limit of 95% CI is 0.998431331648399. Model 2 is adjusted for highest level of education, linguistic region, being in a relationship, sexual orientation, as well as number of sexual partners and age.

seeking were significantly associated with higher odds of CU and higher FCU. By contrast, sociability was associated with lower odds of CU and lower FCU. Adjustment (Model 2) did not alter the results.

Associations with PCU

NB models for PCU showed that living in the German-speaking region (vs. French-speaking) was significantly associated with lower PCU (Table 3). Bisexual orientation (vs. a heterosexual orientation) was significantly associated with more PCU, whereas association of homosexual orientation did not reach significance. Reporting four or more sexual partners in the past 12 months (vs. one) was significantly associated with higher PCU, whereas no significant associations were found for reporting zero and two or three sexual partners. Regarding the associations of psychological factors, all the personality traits tested for and all the dysfunctional coping variables were significantly and positively associated with PCU, except the sociability trait, which exhibited a significant negative association. Adjustment (Model 2) did not alter these results.

DISCUSSION

This study estimated the rates of CU, FCU, and PCU and their associations with several factors among young Swiss men. The 12-month prevalence of at least monthly CU was 78.6% – a high rate relative to those observed in previous studies, ranging from 59.2% to 89.9% in men (Albright, 2008; Cooper, Månsson, Daneback, Tikkanen, & Ross, 2003; Goodson, McCormick, & Evans, 2001; Shaughnessy, Byers, & Walsh, 2011). This high rate, compared with other studies, may reflect both an age and cohort effect; CU is most prevalent during emerging adulthood (Daneback et al., 2005) and Internet use (in general and for pornography) has become more widespread in the past two decades (Lewczuk, Wojcik, & Gola, 2019; Office Fédéral de la Statistique, 2018). This may also reflect cultural differences. Although the prevalence of CU was high, more than half of cybersex users did not endorse any PCU statements. This finding is in line with the proposition of Cooper et al. (1999) that CU is unproblematic for the majority of users. However, the corollary is that more than 40% of cybersex users reported at least one symptom related to PCU, with 8.9% even reporting three or more symptoms.

Table 3. Negative binomial regression models for associations with problematic cybersex use (PCU)

	Model 1 (unadjusted)		Model 2 (adjusted)	
	IRR	[95% CI]	IRR	[95% CI]
Sociodemographic and sexual variables				
Highest level of education (ref. primary schooling)				
Vocational training	0.99	[0.75–1.32]	1.06	[0.80–1.41]
Post-secondary schooling	1.10	[0.83–1.45]	1.15	[0.87–1.53]
German-speaking (ref. French-speaking)	**0.89**	**[0.81–0.97]**	**0.89**	**[0.81–0.98]**
Being in a relationship (ref. not in a relationship)	1.00	[0.87–1.14]	1.04	[0.91–1.19]
Sexual orientation (ref. heterosexual)				
Bisexual	**1.48**	**[1.28–1.71]**	**1.46**	**[1.26–1.68]**
Homosexual	1.28	[0.98–1.68]	1.22	[0.93–1.61]
Number of sexual partners (ref. 1)				
0	1.14	[0.99–1.31]	1.14	[0.99–1.32]
2–3	1.07	[0.95–1.20]	1.05	[0.93–1.19]
4+	**1.24**	**[1.08–1.41]**	**1.21**	**[1.05–1.38]**
Age[a]	1.01	[0.97–1.06]	1.00	[0.96–1.05]
Psychological factors				
Dysfunctional coping				
Denial[a]	**1.17**	**[1.12–1.22]**	**1.18**	**[1.13–1.23]**
Self-distraction[a]	**1.14**	**[1.09–1.19]**	**1.13**	**[1.08–1.18]**
Behavioral disengagement[a]	**1.16**	**[1.10–1.21]**	**1.17**	**[1.11–1.22]**
Self-blame[a]	**1.27**	**[1.21–1.33]**	**1.26**	**[1.21–1.32]**
Personality				
Neuroticism–Anxiety[a]	**1.33**	**[1.27–1.39]**	**1.31**	**[1.26–1.37]**
Aggression–Hostility[a]	**1.09**	**[1.04–1.14]**	**1.09**	**[1.05–1.15]**
Sociability[a]	**0.83**	**[0.79–0.87]**	**0.83**	**[0.79–0.87]**
Sensation seeking[a]	**1.08**	**[1.03–1.13]**	**1.08**	**[1.04–1.14]**

Note. IRR and corresponding 95% CI in bold are significant at $p < .05$. IRR: incidence rate ratio; CI: confidence interval.
[a]Continuous variables were standardized ($M = 0$, $SD = 1$). Model 2 is adjusted for highest level of education, linguistic region, being in a relationship, sexual orientation, as well as number of sexual partners and age.

Sociodemographic and sexual variables' associations with CU, FCU, and PCU

In line with the results of Træen et al. (2006), this study showed that more educated participants were more likely to use cybersex. One potential explanation is that more educated individuals (vs. less educated) are more prone to CU because they have greater computer skills (Stack, Wasserman, & Kern, 2004). However, no evidence of any associations between education and FCU or PCU was found. Interestingly, compared with French-speaking participants, although German-speaking participants reported less PCU, they were more likely to report CU. One potential explanation is that CU may be more socially accepted in the German-speaking region than in the French-speaking region. If so, German-speaking individuals may be more inclined to disclose their CU, but perceive their CU as less problematic. In addition, differences in the understanding of the questions may exist between French- and German-speaking participants. Further research is needed to replicate and better understand this finding. Older (vs. younger) participants were less likely to use cybersex and used it less often. As Daneback et al. (2005) revealed, this suggests that CU decreases after 18–24 years. No significant association was found between age and PCU. This finding is in contrast with the negative association between age and problematic pornography use reported by Grubbs, Kraus,

and Perry (2019) in a representative sample of the US Internet users ($M_{age} = 44.8$, $SD = 16.7$). Possibly, the narrow age range of participants in the present study may be insufficient to capture age-related differences in PCU.

In line with the results of previous studies (Ballester-Arnal et al., 2014; Ballester-Arnal, Castro Calvo, Gil-Llario, & Gil-Julia, 2017), participants in a relationship had lower odds of CU and lower FCU (vs. those not in a relationship). Among cybersex users, being in a relationship was not significantly associated with PCU. This finding suggests that those not in relationships may use cybersex to satisfy their sexual needs and compensate for their lack of real-life sexual activity (Ballester-Arnal et al., 2014). This explanation is also consistent with the finding that reporting no sexual partners (vs. one) in the previous 12 months was associated with more frequent CU. In any case, reporting no sexual partners and not being in a relationship may not be problematic, since no significant association was found with PCU. Moreover, as shown previously (Braun-Courville & Rojas, 2009; Daneback et al., 2005), individuals reporting several sexual partners (vs. one) were more likely to use cybersex and used it more often. Those reporting four or more sexual partners also endorsed more than 20% more PCU statements. The associations of this variable were among the largest of all the predictor variables tested. As proposed by Daneback et al. (2005), this suggests that those with a high level of interest in all things sexual are more

likely to engage in cybersex and to have more sexual partners in real life.

The associations of sexual orientation were also among the largest observed in this study. Homosexual or bisexual orientations (vs. heterosexual) were positively associated with CU and FCU – a finding consistent with the results of previous studies (e.g., Daneback et al., 2005; Giordano & Cashwell, 2017; Peter & Valkenburg, 2011; Træen et al., 2006). Since non-heterosexual individuals may be more subject to the vulnerability of social marginalization (Takács, 2006), they may also be more prone to using cybersex because it offers more opportunities to find partners than does real life (Benotsch, Kalichman, & Cage, 2002; Clemens, Atkin, & Krishnan, 2015; Lever, Grov, Royce, & Gillespie, 2008). This finding may also reflect the greater openness of homosexual and bisexual individuals to less traditional types of sexual activity, such as cybersex (Daneback et al., 2005) and their greater risk of engaging in hypersexual behaviors (Bőthe et al., 2018). A non-heterosexual orientation was also associated with the endorsement of more PCU statements, but this was only significant for bisexual individuals. Non-heterosexual individuals (King et al., 2008), particularly those with a bisexual orientation (Gonzales, Przedworski, & Henning-Smith, 2016; Loi, Lea, & Howard, 2017), are generally more prone to reporting more mental health problems, including addictions, than heterosexual individuals. Thus, among individuals with a bisexual orientation, PCU may be a consequence of using cybersex to cope with the stress and negative emotions caused by social marginalization. This suggests that efforts to develop prevention measures targeting and adapted to individuals of a bisexual orientation may be promising.

Associations between psychological factors and CU, FCU, and PCU

The findings regarding the associations between various psychological factors and CU, FCU, and PCU were in line with the proposition of Grubbs, Wright, et al. (2019) that cybersex is used for two major reasons: pleasure and mood management. More specifically, the significant positive associations between sensation seeking and CU, FCU, and PCU were in line with the results of previous studies (Beyens, Vandenbosch, & Eggermont, 2015; Cooper et al., 2000; Peter & Valkenburg, 2011). This supports the hypothesis that sensation seeking may predispose individuals to CU for pleasure, but also to PCU. Since high sensation seekers need high levels of stimulation to reach their optimal level of arousal (Zuckerman, 1994), interventions providing alternative sources of stimulation, promoting attractive, alternative activities to CU may be effective in preventing PCU among high sensation seekers.

On the other hand, all dysfunctional coping strategies were positively related to CU, FCU (although not significant for denial), and PCU. This finding is consistent with the results of Laier and Brand (2014), showing that using sex to cope with aversive affective states and stress may play an important role in the development and maintenance of PCU. This study extends this finding to other dysfunctional coping strategies, as previously shown by Antons et al. (2019).

Moreover, the significant positive associations between the aggression–hostility (a personality trait almost the reverse of agreeableness) and the neuroticism–anxiety trait and CU, FCU, and PCU are in line with the results of previous studies showing cybersex's negative associations with agreeableness (Beutel et al., 2017) and positive associations with neuroticism (Egan & Parmar, 2013; Shimoni et al., 2018). Since both the neuroticism–anxiety and aggression–hostility traits are part of a larger construct, namely negative emotionality (Zuckerman, 2002), this finding indicates that these traits may predispose individuals to CU for mood management purposes, but also to PCU. Interventions such as reducing levels of stress, providing alternatives to coping using cybersex, and building self-esteem through life-skills training may be effective means of preventing PCU among those using cybersex for mood-management purposes.

Furthermore, significant negative associations were found between the sociability trait and CU, FCU, and PCU. This finding is in line with the negative associations between extraversion (a personality trait close to sociability; see Zuckerman, 2002) and sexual addiction (not specifically related to the Internet) observed by Egan and Parmar (2013). However, it contrasts with the non-significant associations observed by Shimoni et al. (2018) and with the significant positive association between extraversion and CU observed by Beutel et al. (2017). Further research is needed to better understand associations between sociability and CU and PCU.

Limitations

This study had several limitations. The cross-sectional design did not enable us to draw causal relationships or conclusions. The sample made up exclusively of young males renders any generalization of the findings to women and other age groups impossible. Several scales showed moderate reliability ($.60 < α < .70$; Robinson, Shaver, & Wrightsman, 1991), and the reliability of the Self-Blame Dysfunctional Coping Scale was suboptimal. Moreover, significant associations were at best indicative of small effect sizes (Olivier, May, & Bell, 2017). Finally, the use of self-reported measures may introduce some bias, especially given the sensitive nature of questions about CU. Further studies using longitudinal designs, also including females, considering the entire lifespan are needed to generalize the findings. Moreover, further studies are needed to investigate the associations of CU and PCU with mental health outcomes, substance use disorders, and other behavioral addictions.

CONCLUSIONS

This study suggests that CU and PCU should be considered in light of their associations with a wide range of variables covering sociodemographic, sexual, and psychological factors. The findings could be used to define groups of individuals at risk of PCU – e.g., individuals reporting a bisexual orientation, not in a relationship or reporting several sexual partners in the past 12 months – who could be targeted in preventive interventions. Healthcare

professionals are encouraged to consider these aspects and perhaps adapt their treatments by integrating specific interventions that meet their patients' needs. For example, patients exhibiting PCU, using dysfunctional coping strategies and predisposed to neuroticism and anxiety, may benefit from interventions targeting the development of more functional coping strategies to deal with stress and negative affectivity than using cybersex. In contrast, patients predisposed to high sensation seeking may benefit from interventions focusing on developing alternative sources of stimulation to CU.

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