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## Factor structure of the Cybersex Motives Questionnaire

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**Background and aims:** The Internet is widely used for sexual activities and pornography. Little is known, however, about why people look for meetings and sexual interactions through the Internet and about the correlates of cybersex addiction. The goal of this study was to construct a questionnaire for cybersex motives [Cybersex Motives Questionnaire (CysexMQ)] by adapting the Gambling Motives Questionnaire to cybersex use and validating its structure. **Methods:** Two online samples of 191 and 204 cybersex users were collected to conduct a principal component analysis (PCA) on the first sample and a confirmatory factor analysis (CFA) on the second. Cronbach's  $\alpha$  and composite reliability were computed to assess internal consistency. Correlations between the CysexMQ and the Sexual Desire Inventory (SDI) were also evaluated. **Results:** Two competing models were retained from the PCA, one with two factors and the other with three factors. The CFA showed better fit for the three-factor solution. After three cross-loading items were removed, the results showed that a final 14-item three-factor solution (enhancement, coping, and social motives) was valid (adjusted goodness-of-fit index: 0.993; normed-fit index: 0.978; Tucker–Lewis index: 0.985; comparative fit index: 0.988; root mean square error of approximation: 0.076). Positive correlations were found between the different motives and the subscales of the SDI. **Discussion:** The results suggest that the CysexMQ is adequate for the assessment of cybersex motives.

**Keywords:** cybersex, motives, pornography, Internet addiction, Gambling Motives Questionnaire

## INTRODUCTION

The significant expansion of the Internet in recent decades and its widespread use in everyday life in most societies has raised debate in the scientific community. Although the Internet might be considered a powerful tool that provides access to a wide variety of information and therefore aids globalization, it has also quickly become a kind of refuge where people's fantasies flourish without real-life consequences and where some people with important health issues get lost in its depths. Only a few studies have focused on one particular use of the Internet that has succeeded from the beginning and continually grown in popularity: cybersex (Gmeiner, Price, & Worley, 2015). Cybersex can be defined as the use of online sexual activities, such as pornography, live sex shows, webcams, or chat rooms. It has been argued that everything that can be done sexually in real life can be done on the Internet (Carnes, 2001).

The Internet is commonly used for sexual activities (Grubbs, Volk, Exline, & Pargament, 2015), the close link between the two having developed pervasively. The accessibility, affordability, and anonymity of the Internet encourage repeated sexual interactions and disempowerment owing to the illusive appearance of such behind-the-screen

interactions, wherein the virtual world seems less real. People more easily allow personal fantasies when they cannot affect someone physically, leading to a pernicious feeling of safety and disinhibition (Young, Griffin-Shelley, Cooper, O'mara, & Buchanan, 2000).

Although several users have reported a positive impact of cybersex (Groß, Gillespie, Royce, & Lever, 2011), some have perceived themselves as having an addictive use of cybersex products (Bothe et al., 2018; Grubbs et al., 2015; Kor et al., 2014). Internet addiction related to sexual content seems to affect a small but significant proportion of the Internet-using population (Dufour et al., 2016; Frangos, Frangos, & Sotiropoulos, 2011; Grubbs et al., 2015; Kafka, 2010; Ross, Mansson, & Daneback, 2012). Negative consequences of excessive cybersex, also designated as cybersex addiction, are associated with psychological distress and disturbances in sleep and day-to-day life responsibilities, or with psychosocial dysfunction (Grubbs et al., 2015; Tsimitsiou et al., 2014; Twohig, Crosby, & Cox, 2009). Because motives are known to be of great

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influence in behavioral addictions (Billieux et al., 2011; Clarke et al., 2007; Hilgard, Engelhardt, & Bartholow, 2013; Kiraly et al., 2015; Kuss, Louws, & Wiers, 2012; Zanetta Dauriat et al., 2011), the main goal of this study was to assess cybersex motives and to validate the Cybersex Motives Questionnaire (CysexMQ).

Although the topic of cybersex addiction is likely of clinical importance, it has rarely been studied (Brand et al., 2011; Doring, 2009). Little is known about why people look for meetings and sexual interactions through the Internet and about the correlates of cybersex addiction (Kafka, 2010). The expectation of sexual arousal and pleasure has been hypothesized to be a key motive for cybersex and may have a role in cybersex addiction (Young, 2008). Accordingly, several studies have shown that, compared with controls, people classified as having cybersex addiction reported having greater cue reactivity and sexual arousal from pornographic cue presentation (Laier, Pawlikowski, Pekal, Schulte, & Brand, 2013).

In particular, some studies found that negative consequences of cybersex use (i.e., addictive use) are associated with perceived sexual arousal when individuals view Internet pornographic material (Brand et al., 2011). Furthermore, such addictive use was associated with higher activation of neural regions associated with drug-cue reactivity, such as the dorsal anterior cingulate, ventral striatum, and amygdala (Voon et al., 2014). As expected, relative to healthy controls, people with cybersex addiction had greater desire but similar liking scores in response to sexually explicit video cues (Voon et al., 2014). Such results are in accordance with models suggesting that in addictive behaviors, “wanting” becomes dissociated from “liking” (Robinson & Berridge, 2008).

As reported in research on other behavioral addictions (Billieux et al., 2013; Khazaal et al., 2015; Zanetta Dauriat et al., 2011), cybersex addiction is mediated by coping (i.e., escape from real-life problems using pornography) through the use of online sexually related materials (Laier & Brand, 2014). For instance, the Hypersexual Behavioral Inventory, a self-reported questionnaire that assesses excessive and problematic use of sex in general, includes three subscales: one related to control, one to consequences, and one to coping (the use of sex to cope with aversive affective states or in response to stress; Reid, Li, Gilliland, Stein, & Fong, 2011). The Pornography Consumption Inventory (Reid et al., 2011) assesses motivations for using pornography with a 15-item self-reported questionnaire related to the following dimensions: emotional avoidance (i.e., coping), sexual curiosity, excitement seeking, and pleasure.

Despite the small number of studies in the field, published articles suggest that the two probable motives linked to cybersex addiction to cope with aversive emotions and real-life problems are sexual gratification and the use of Internet-related sexual activities (Laier & Brand, 2014). Unsurprisingly, as described in studies related to other behavioral addictions on the Internet (Carli et al., 2013; Geisel, Panneck, Stickel, Schneider, & Muller, 2015; Khazaal et al., 2012), cybersex addiction was found to be associated with psychological symptoms and distress; it was not, however, associated with offline sexual behaviors (Brand et al., 2011; Laier, Pekal, & Brand, 2015).

Previous theories and research in the field of cybersex addiction have mostly investigated on how the process and its consequences evolve, but a definition is lacking about the motivations driving such behaviors. In fact, motivations leading to addictive behaviors were first investigated in the field of alcohol-use disorders (Cooper, Russell, Skinner, & Windle, 1992), in which drinking motives were considered to involve a three-factor model: enhancement, social, and coping. Enhancement expresses an internal and positive reinforcement to raise positive emotions. The social factor refers to the external and positive reinforcement to increase social affiliation. Coping represents all of the internal strategies implemented by the individual to reduce negative effects.

It seems legitimate to doubt that the factors associated with drinking motives apply to an addiction without an intoxicating substance, such as gambling or cybersex. However, these factors have been demonstrated to be relevant for gambling motives, for example, in a study conducted by Stewart and Zack (2008). They validated the three-factor structure of the Gambling Motives Questionnaire (GMQ) on the basis of the same construct of 15 items with five items per factor. Further studies validated a modified version of the GMQ, including monetary motives as an additional drive specifically related to gambling (Dechant & Ellery, 2011). These findings suggest that the GMQ can be set in the context of the motives it is supposed to measure. It also shows that the questionnaire is plastic and that modifying its construct may be fruitful for assessing cybersex motives.

According to previous studies on cybersex addiction, specifically on the use of pornography (Brand et al., 2011; Laier & Brand, 2014; Laier et al., 2015; Reid et al., 2011), it is plausible to hypothesize that the GMQ and its related factors, enhancement (a gratification-like motive) and coping, may be involved in cybersex motives.

It also makes sense to consider the involvement of the social motive in cybersex behavior. For instance, studies on online dating highlighted the importance of motives related to socializing for romantic or casual sex purposes (Sumter, Vandenbosch, & Ligtenberg, 2017). The three-factor model of the GMQ adapted from the Drinking Motives Questionnaire thus seems relevant for cybersex motivations. First, the enhancement factor as a cybersex motive would capture the fact that users frequently report feeling excited, attractive, uninhibited, and thrilled when online (Young, 2008). Second, cybersex users explore a new social world, where the cyberspace culture offers encouragement and acceptance of even their deepest fantasies on the hazardous route to social affiliation (Young, 2008), which illustrates the relevance of the social factor in cybersex motives. Third, the coping dimension could apply to cybersex motives, given that cybersex users often relate that they experience a breach with reality followed by oblivion to real-life concerns when engaged in cybersex activities (Laier & Brand, 2014).

Cybersex activities differ, however, from gambling activities. For instance, motives assessed with GMQ items, such as “It is something to do on a special occasion” or “It’s what most of your friends do when you get together,” do not appear to be appropriate for cybersex assessment. Furthermore, specific cybersex motives (i.e., masturbation) were not evaluated with the GMQ. A specific CysexMQ is thus needed.

The aim of this study was to investigate and validate the factor structure of the motives for cybersex in an adapted version of the GMQ: the CysexMQ.

## METHODS

### Participants

Recruitment was carried out through advertisements posted on specialized forums and websites. Inclusion criteria were being 18 years and older and a user of websites with sex-related content.

Two distinct samples were recruited. Among the 774 subjects who clicked on the link to the study, 640 of them gave their consent to participate. After removing cases with missing values on the GMQ, we included 395 subjects in the analyses. In Sample 1 ( $n = 191$ ), 137 (71.7%) were males. The age range was between 18 and 69 years, with a median of 32. Males were older than females (median age of males: 34; median age of females: 27; Wilcoxon test:  $W = 3,247$ ;  $p < .05$ ). Seventy-six subjects (39.8%) were single, 72 (37.7%) were in a relationship, 42 (22.0%) were married, and 1 was widowed. Regarding sexual orientation, 145 (77.5%) declared themselves to be heterosexual, 11 (5.9%) to be homosexual, and 31 (16.6%) to be bisexual. In Sample 2 ( $n = 204$ ), 76 subjects (37.6%) were males. The age range was between 18 and 58 years, with a median of 31. Males were younger than females (median age of males: 29; median age of females: 32.5; Wilcoxon test:  $W = 3,790$ ;  $p < .05$ ). Forty subjects (19.7%) were single, 107 (52.7%) were in a relationship, 54 (26.6%) were married, and 2 were widowed. Regarding sexual orientation, 172 (84.7%) declared themselves to be heterosexual, 8 (3.9%) to be homosexual, and 23 (11.3%) to be bisexual.

### Measurements

All participants first filled out a general questionnaire on their personal data (sex, age, nationality, sexual orientation, etc.) and a 24-item form about their experience with the Internet and sexuality (time spent online on sexual websites, satisfaction with meetings on the Internet, frequency of sexual activity during the last month, etc.).

Gathering of demographic and specific information was followed by completion of different self-rating questionnaires: the Sexual Desire Inventory (SDI) and the CysexMQ. The SDI (Spector, Carey, & Steinberg, 1996) is one of the most commonly used instruments for assessing sexual desire (Mark, Toland, Rosenkrantz, Brown-Stein, & Hong, 2018). The scale was developed in English and validated in different languages (King & Allgeier, 2000; Moyano, Vallejo-Medina, & Sierra, 2017; Ortega, Zubeidat, & Sierra, 2006; Spector et al., 1996). The psychometric characteristics of the SDI were also assessed among people with different sexual orientations, including lesbians and gay males (Mark et al., 2018).

The SDI was developed to assess the cognitive component of sexual desire. The instrument involves two dimensions: dyadic sexual desire (interest in sexual activity with a partner) and solitary sexual desire (interest in engaging in

sexual behavior by oneself). The solitary dimension is associated with the frequency of solitary sexual behavior, whereas the dyadic dimension is associated with the frequency of sexual activities with a partner (Spector et al., 1996). Good test-retest reliability (Spector et al., 1996) has been reported, as well as convergent validity with other measures of sexual desire and with sexual satisfaction (Mark et al., 2018).

The CysexMQ is a self-assessment scale (Supplementary Material) that is rated on a 5-point Likert scale from 1 (*never*) to 5 (*always or almost always*).

The authors modified items on the social motives subscale of the GMQ to better fit with cybersex activities. For example, the motives “As a way to celebrate,” “It’s what most of your friends do when they get together,” and “It’s something you do on special occasions” were removed. Other types of social motives such as “To meet somebody” and “Because I need to exchange with other people” were added. The motive “To be sociable” was modified to “For being sociable and appreciated by others.” For the GMQ enhancement motive, the item “To win money” was replaced by “To get entertained.” Other specific motives added related to cybersex activities were “For masturbation” and “For watching.” Items were generated via in-depth clinical interviews of patients regarding their motives related to cybersex use. These patients were consulting for addictive cybersex in the addiction facility of the Department of Mental Health and Psychiatry of the Geneva University Hospital. After several discussions with clinicians and between authors, the second, fourth, and fifth authors conducted thematic analyses of these qualitative responses. The items were then generated according to the principles of item generation (i.e., addressing a single issue, simple and short statements; Harrison & McLaughlin, 1993) and discussed until a consensus was reached among the authors.

The main outcome measure of this study was the CysexMQ.

### Data analysis

Despite the fact that a three-factor structure was expected, an exploratory analysis was first performed instead of a confirmatory analysis in order to allow a specific structure to emerge in this new framework. To achieve this goal, we performed a principal component analysis (PCA) followed by a varimax rotation on the original sample of 191. With the discrete nature of the GMQ items, a PCA is preferred over an exploratory factor analysis, because it does not assume any particular multivariate model, which is not the case for an exploratory analysis (Schneeweiss & Mathes, 1995). Moreover, when the same numbers of factors or components are extracted, both techniques yield highly similar results (Velicer & Jackson, 1990). The number of components to extract was determined by the scree test (Cattell, 1966), and Velicer’s (1976) minimum average partial (MAP) test was carried out on the correlation matrix. The MAP test was bootstrapped.

In a second step, we recruited a second sample of 204 in order to run a confirmatory factor analysis (CFA). Because of the discrete nature of the CysexMQ items, the unweighted



least squares (ULS) with robust standard errors (Li, 2016) method was chosen as the procedure for estimation.

Five preestablished criteria were selected as indicators of the goodness of fit to the data: (a) adjusted goodness-of-fit index (AGFI) > 0.80 (Joreskog & Sorbom, 1996); (b) normed-fit index (NFI) > 0.90 (Bentler & Bonnet, 1980); (c) Tucker–Lewis index (TLI) > 0.95 (Tucker & Lewis, 1973); (d) comparative fit index (CFI) > 0.95 (Bentler, 1990); and (e) root mean square error of approximation (RMSEA) < 0.06 (Hu & Bentler, 1999). The use and cutoff of the AGFI was recommended by Cole (1987), of the NFI by Bentler and Bonnet (1980), and of the RMSEA, TLI, and CFI by Hu and Bentler (1999).

The reliability of the questionnaire was assessed using the Cronbach’s  $\alpha$  coefficient (Cronbach & Meehl, 1985) and composite reliability (CR), which are measures of internal consistency. In order to assess convergent validity, we calculated Spearman’s correlations between the dyadic and solitary SDI subscales and the CysexMQ subscales. The PCA, CFA, and bootstrap were performed with R version 3.1.3, using the *psych* (Revelle, 2014), *bootstrap* (Kostyshak, 2015), and *lavaan* (Rosseel, 2012) packages.

### Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki. The ethical committee of the Geneva University Hospital gave approval for the study protocol. Participants were given detailed descriptions of the objectives and methods of the study. Following online informed consent, participants completed the questionnaires anonymously online via SurveyMonkey links.

## RESULTS

### Results from the PCA

**Number of factors retained.** The scree test (Figure S1 of Supplementary Material) clearly suggested retaining three factors, whereas the MAP test (Figure S2 of Supplementary Material) gave an ambiguous solution because either two or three factors had close values (0.0301 and 0.0302, respectively), knowing that the MAP test interpretation being done on the basis of the smaller the better. To disentangle the MAP test result, we applied a bootstrap technique (Efron, 1987), which confirmed the ambiguity. Among the 1,000 bootstrap samples, 52% suggested retaining two factors and

43% suggested retaining three factors; the boxplots from the bootstrapped MAP test (Figure S3 of Supplementary Material) for two and three factors overlapped almost completely.

**Factor loadings.** Three items were problematic within the three-factor solution, because they had loadings greater than 0.40 on more than one component: Items 2 and 17 on Factors I and II, respectively, and Item 16 on Factors II and III. The two-factor solution contained the smallest loading, with 0.37 on Item 13 (“For feeling confident about myself and upgrading my self-esteem”). Items 12, 15, and 17 were also problematic, because they had loadings greater than 0.40 on both components. The explained variance was about 0.47 for the two-factor solution and 0.55 for the three-factor solution. Factor loadings are shown in Tables S1 and S2 of the Supplementary Material.

A cross-loading was observed on enhancement and coping for Item 2 (“To relax”) and Item 17 (“Because it makes me feel good”). A different cross-loading on coping and social factors was observed for Item 16 (“For feeling confident about myself and upgrading my self-esteem”).

Because of the similarity in the cross-loading of Items 2 and 17, we decided to first test a model without these items (3F-a; Table 1), conserving, however, Item 16 related to cybersex use for self-esteem motives. Then, we tested a model without the three items concerned by cross-loading (3F-b; Table 1).

### Results from the CFA

In order to decide whether it is better to retain two or three factors, we first compared both models. The first part of Table 1 shows the fit indices of the two-factor and the three-factor solutions. Both models yielded excellent fit, except for the RMSEA, which is slightly larger than the cutoff of 0.06. The three-factor solution shows the best fit everywhere. Since fit indices were very close to each other for the two models, we compared them statistically, knowing that there is no standard and clearly validated procedure for models when the method of estimation is the ULS. We performed a significance test on the basis of the fitting function, which is equivalent to the well-known  $\chi^2$  test. The test showed that the model with three factors is better than the model with two factors (fitting-function difference = 67.18,  $df = 2$ ,  $p < .001$ ). In a second step, considering the cross-loading problems from the PCA and the clinical considerations mentioned above, we tested two additional models. The first (Model 3F-a) was the three-factor solution with Items 2 and 17 removed, and in the second (Model 3F-b), Item 16 was also

Table 1. Fit indices from ULS confirmatory factor analysis of the four models

	AGFI	NFI	TLI	CFI	RMSEA
Two-factor model	0.990	0.971	0.978	0.981	0.095
Three-factor model	0.991	0.976	0.983	0.986	0.084
Three-factor model with Items 2 and 17 removed (Model 3F-a)	0.993	0.979	0.986	0.988	0.077
Three-factor model with Items 2, 16, and 17 removed (Model 3F-b)	0.993	0.978	0.985	0.988	0.076

Note. ULS: unweighted least squares; AGFI: adjusted goodness-of-fit index; NFI: normed-fit index; TLI: Tucker–Lewis index; CFI: comparative fit index; RMSEA: root mean square error of approximation.

Table 2. Factor loadings for the three-factor solution from ULS with robust standard errors confirmatory factor analysis

	Estimate	SE	Z value	p (> z )
Factor I (enhancement)				
1. To get entertained	1.00			
4. Because I like the feeling	1.04	0.08	13.31	>.001
7. Because it's exciting	1.12	0.09	12.77	>.001
9. For watching	0.97	0.08	11.52	>.001
10. To get a "high" feeling	0.97	0.09	10.29	>.001
11. For masturbation	0.79	0.08	9.52	>.001
13. Simply because it's fun	1.18	0.08	14.40	>.001
Factor II (coping motives: escape)				
6. In order to forget my problems or worries	1.00			
12. Because it helps me when I'm depressed or nervous	0.95	0.07	14.30	>.001
15. It comforts me when I'm in a bad mood	1.01	0.07	14.18	>.001
Factor III (social motives)				
3. To meet somebody	1.00			
5. Because I need to exchange with other people	1.98	0.49	4.03	>.001
8. For being sociable and appreciated by others	2.07	0.55	3.78	>.001
14. Because it makes a social gathering more enjoyable	1.84	0.49	3.80	>.001
Covariances				
Enhancement with				
Coping motives	0.69	0.03	22.7	>.001
Social motives	0.25	0.02	13.3	>.001
Coping motives				
Social motives	0.30	0.02	12.8	>.001

Note. SE: standard error; ULS: unweighted least squares.

removed. Fit indices of the three models with three factors are presented in the second part of Table 1. Although excellent fits were found except for the RMSEA for Model 3F-a, it fit the data worse than the full model did, whereas Model 3F-b showed better fit on every index. Therefore, we removed Items 2, 16, and 17 from the questionnaire.

Table 2 shows the loadings of the three-factor solution with Items 2, 16, and 17 removed according to the above results. Every loading was significantly different from 0. The estimated correlations between the three factors were significant.

In accordance with the GMQ factors, the three retained factors were enhancement (first factor), coping (second factor), and social motives (third factor).

### Reliability

The internal consistency estimated by Cronbach's  $\alpha$  for the three-factor solution (Model 3F-b) was about 0.81 [95% confidence interval (CI): 0.79, 0.83] and 0.88 [95% CI: 0.86, 0.91] for the enhancement factor; 0.79 [95% CI: 0.76, 0.81] and 0.86 [95% CI: 0.83, 0.89] for the coping motives factor; and 0.74 [95% CI: 0.71, 0.77] and 0.76 [95% CI: 0.71, 0.81] for the social motives factor in the first and the second samples, respectively. Moreover, the CR (Bacon, Sauer, & Young, 1995) was performed because Cronbach's  $\alpha$  is known to underestimate the true reliability in specific situations (Raykov, 1998). CR provides almost the same coefficients as Cronbach's  $\alpha$  (enhancement: 0.81 and 0.89; coping motives: 0.82 and 0.86; and social motives: 0.73 and 0.79 in the first and the second samples, respectively). Cronbach's  $\alpha$  and CR suggest good reliability.

### Correlations

Moderate positive correlations were found between the SDI subscales and enhancement motives, whereas small correlations were found between these subscales and coping motives. Small correlations were found between social motives and the dyadic SDI subscale but not the solitary SDI (Table 3).

## DISCUSSION

Despite a three-factor structure standing out in the previous studies on the GMQ (Stewart & Zack, 2008) and the Drinking Motives Questionnaire (Cooper et al., 1992), we could not find such a well-defined structure by performing a PCA on the adapted 17-item version of the CysexMQ. In both the two- and the three-factor solutions, some items had high cross-loadings on more than one factor. In a second step, however, a CFA on a second sample suggested that a three-factor solution better fit the data.

Table 3. Spearman's correlations between CysexMQ and SDI subscales

	CysexMQ enhancement	CysexMQ coping	CysexMQ social
SDI dyadic	.46***	.18***	.18***
SDI solitary	.54***	.18***	.07

Note. CysexMQ: Cybersex Motives Questionnaire; SDI: Sexual Desire Inventory.

\*\*\* $p < .001$ .

To resolve the problem related to the items with cross-loadings, we assessed different models with three factors without two or three of the problematic items. The best fit indices were obtained for a three-factor model without the three problematic items. The final CysexMQ was a 14-item scale.

The names of the three retained factors, enhancement, coping, and social motives, are similar to those proposed for the GMQ because of the partial similarity in types of motives. This result is consistent with those of previous studies that supported the involvement of social (Sumter et al., 2017), coping (Laier et al., 2015), and enhancement motives (Reid et al., 2011) in cybersex. However, several items differ in some ways from those of the GMQ, reflecting the specificities of cybersex behaviors.

All loadings were statistically significant and had about the same magnitude. The three factors were moderately correlated, except for enhancement and coping motives, for which the correlations were high. This finding is concordant with results from studies on the GMQ and can be explained by a possible role for such motives in emotion regulation (Devos et al., 2017; Wu, Tao, Tong, & Cheung, 2011). These motives may play different roles in problem and non-problem cybersex use, as reported in studies on Internet gaming (Billieux et al., 2011; Zanetta Dauriat et al., 2011). As suggested by possible associations between behavioral addictions and mood disorders (Khazaal et al., 2016; Starcevic & Khazaal, 2017; Strittmatter et al., 2015), further studies on the possible links between the CysexMQ, psychiatric symptoms, and problem cybersex use are warranted.

Both Cronbach's  $\alpha$  and CR showed good internal consistency. Convergent validity was assessed using correlations with the SDI. Correlation levels were different across motives and dyadic and solitary sexual desire. Not surprisingly, there was no association between solitary desire and social motives. The strongest associations were found between the enhancement motives and the SDI subscales, which show the importance of such motives in cybersex use, in consistency with the enhancing and arousing effects of cybersex (Beutel et al., 2017; Reid et al., 2011). A correlation, albeit less strong, was also found between coping motives and the SDI subscales. Such motives are probably more important in subsamples of cybersex users who have anxious or avoidant attachment styles (Favez & Tissot, 2016). Further studies assessing attachment styles in cybersex use and cybersex motives are warranted to explore this hypothesis.

The results of this study should be considered in light of several main limitations. First, recruitment through online advertising is associated with possible self-selection biases (Khazaal et al., 2014). Second, as commonly reported in online studies and surveys (Fleming et al., 2016; Hochheimer et al., 2016), a substantial part of the initial sample dropped out (395 of 640 completed the study). Third, the questionnaire was generated by adapting the GMQ to cybersex. As described earlier, the adaptation was based on previous studies in the field, on clinical observations, and on the authors' consensus. We cannot exclude the possibility that other motives were involved in the behavior.

However, the CysexMQ seems to have captured at least part of the main motives involved in cybersex, as shown by the psychometric analyses and the correlations with the SDI subscales.

## CONCLUSIONS

This study confirmed the important involvement of enhancement (i.e., enhancement or sexual gratification), coping, and social motives in cybersex use in accordance with the results of previous studies (Brand et al., 2011; Laier & Brand, 2014; Laier et al., 2015; Reid et al., 2011; Sumter et al., 2017). This finding suggests that the three-factor solution is clinically more relevant than the two-factor solution. Furthermore, this is the first study, to the best of our knowledge, to assess an adaptation of the GMQ to cybersex. Further studies on the links between the CysexMQ and cybersex use would be of interest for a better understanding of the role of motives in this behavior.

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*Authors' contribution:* YK, FB-D, and SR: study concept and design. EF, SR, and YK: statistical analysis and interpretation of data. TL, KJ, and YK: recruitment. EF, YK, KJ, TL, SR, and FB-D: redaction of the manuscript.

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