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FULL-LENGTH REPORT



Gender differences in the association of psychological distress and sexual compulsivity before and during the COVID-19 pandemic

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ABSTRACT

Introduction: The COVID-19 pandemic had numerous consequences for general, mental and sexual health. As gender differences in sexual compulsivity (SC) have been reported in the past and SC has been connected to adverse events and psychological distress, the current study aims at investigating associations between these factors in the context of contact restrictions in the course of the COVID-19 pandemic in Germany. *Methods:* We collected data for five time points in four retrospective measurement points in an online convenience sample ($n_{T0} = 399$, $n_{T4} = 77$). We investigated the influence of gender, several pandemic-related psychosocial circumstances, sensation seeking (Brief Sensation Seeking Scale), and psychological distress (Patient-Health-Questionnaire-4) on the change of SC (measured with an adapted version of the Yale-Brown Obsessive Compulsive Scale) between T0 and T1 ($n = 292$) in a linear regression analysis. Additionally, the course of SC over the time of the pandemic was explored with a linear mixed model. *Results:* Male gender was associated with higher SC compared to female gender over all measurement points. An older age, being in a relationship, having a place to retreat was associated with a change to lower SC during the first time of the pandemic. Psychological distress was associated with SC in men, but not in women. Men, who reported an increase of psychological distress were also more likely to report an increase of SC. *Discussion:* The results demonstrate that psychological distress seems to correlate with SC differently for men and women. This could be due to different excitatory and inhibitory influences on men and women during the pandemic. Furthermore, the results demonstrate the impact of pandemic related psychosocial circumstances in the times of contact restrictions.

KEYWORDS

COVID-19, psychological distress, sexual compulsivity

INTRODUCTION

The COVID-19 pandemic has had economic (Pak et al., 2020), social (Abel & Gietel-Basten, 2020) as well as mental health consequences (Ammar et al., 2021) all over the world. When the World Health Organisation (WHO) declared the COVID-19 outbreak a pandemic on March 11th 2020, many countries reacted by decreeing measures to minimize social mobility

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(“lockdowns”). These contact restrictions ranged from mere recommendations for people to stay at home to severe curfews. Most social events were postponed or cancelled. The goal of these restrictions was to slow down infection rates (“flatten the curve”) via restriction of mobility and social restrictions. In April 2020 “half of humanity” was on lockdown (Sandford, 2020). From 22nd of March to the 4th of May, the German government decreed contact restrictions that involved not meeting with groups of people, no “unnecessary” contacts in general and for a lot of individuals working from home. In times of crisis, individuals are affected differently and use different coping strategies. In the ongoing COVID-19 crisis, there were reports of a surge of social problems like domestic violence (Ebert & Steinert, 2021) as well as an increase in the consumption of alcohol (Morton, 2021).

Due to isolation, (fear of) job loss and economic crisis (Döring, 2020) the outbreak of COVID-19 constituted a stressful life event for many humans. There is some evidence, that the pandemic and its lockdowns might affect men and women differently. In most households in Germany, care work was not shared equally among both partners (Hank & Steinbach, 2021), leading to different demands in coping with the pandemic. In a study on the cognitive dimension of pandemic distress, Czymara, Langenkamp, and Cano (2021) report that women were more concerned with the handling of childcare during lockdown than men, who were more concerned with the economy and paid work (Czymara et al., 2021). Additionally, in a US study, mothers reported that they reduced their working hours four or five times more than fathers during contact restrictions (Collins, Landivar, Ruppner, & Scarborough, 2021). There is some evidence, that health anxiety affected women more than men during the pandemic (Özdin & Özdin, 2020).

As the pandemic influences large parts of the social lives of individuals, it is consequential to assume an influence on individuals’ sexual lives as well. Different scenarios of the influence of COVID-19 on peoples’ sex lives might have been expected theoretically: An increase in partnership sex (and a “corona baby boom”), but also a decline in partnership sex (due to more conflict as a result of confinement) and a decline in casual sex (Döring, 2020).

Some data has already been collected on the influence of the pandemic on sexual health. While some studies (e. g. Ferrucci et al., 2020; Fuchs et al., 2020) reported a decrease in sexual activity and sexual functioning, other studies painted a more complex picture. For example, Wignall et al. (2021) reported decreased levels of sexual desire in women during social restrictions, but an increase of desire in coupled individuals. Additionally, sexual minority participants reported an increase of desire, compared to heterosexual individuals.

In a large multi-country assessment of Štulhofer et al. (2022), most participants reported unchanged sexual interest (53%), but almost one third (28.5%) reported an increase of sexual interest during the pandemic. In the group of individuals with an increase in sexual interest, no gender effect was reported, whereas women reported a decrease of sexual interest more often than men (Štulhofer et al., 2022).

In a study with a Turkish female clinical sample, Yuksel and Ozgor (2020) found an increase in the average frequency of sexual intercourse in couples during the pandemic. At the same time, study participants reported a decrease in quality of their sexual lives (Yuksel & Ozgor, 2020). On the contrary to these findings, Lehmillier, Garcia, Gesselman, and Mark (2021) reported that nearly half of their US-American online sample ($n = 1,559$) reported a decrease of their sexual activity. At the same time, younger individuals living alone and being stressed, expanded their sexual repertoire with new sexual activities (Lehmillier et al., 2021). Furthermore, some studies have reported an increase of sexual activities and sexual compulsivity (SC) during the lockdown periods. For example, in a longitudinal study of pornography use in American adults, researchers reported an increase in pornography consumption during the first lockdown. Elevated levels of pornography consumption decreased to normal levels up until August 2020 (Grubbs, Perry, Grant Weinandy, & Kraus, 2022). In their study, problematic use of pornography trended downwards over time for men and remained low and unchanged in women. One could speculate that the reported worldwide spike in use of pornography in the early weeks of the pandemic, could at least in part be due to a free offering of one of the most popular pornography websites (Focus Online, 2020). An increased interest in pornography in general was reported in nations with a strict lockdown policy (Zattoni et al., 2021).

As sexual behavior changes during the pandemic, it is important to look into the cases where sexual behavior can become problematic, for example in the case of Compulsive Sexual Behavior Disorder (CSBD). Since 2018, CSBD is an official diagnosis in the ICD-11 (World Health Organization, 2019). Individuals with CSBD report problems controlling their sexual urges and experiencing distress due to their sexual behavior. The following other labels have been used for this sexual disorder in the past: hypersexuality, out of control sexual behavior, sexual impulsivity and sexual addiction (Briken, 2020). The diagnosis is justified by the inability of the affected individuals to control their sexual urges and behaviors, which affects several areas of life. As the concept of compulsive sexual behavior has been debated in the past (Briken, 2020; Grubbs et al., 2020), these constructs are not completely congruent. Additionally, not all research used formal diagnoses (e.g. an in-person assessment or a questionnaire cut-off), often merely reporting compulsive sexual behavior dimensionally (Kürbitz & Briken, 2021). We will use the term sexual compulsivity (SC) in the current work, as we assess not only compulsive behavior, but also compulsive thoughts with an adapted Yale-Brown Obsessive Compulsive Scale (Y-BOCS).

SC has been connected to mental health issues in the past. For example, a greater burden with psychological problems has been associated with higher rates of SC and more SC symptoms. SC has been connected to mood disorders (Bóthe, Tóth-Király, Potenza, Orosz, & Demetrovics, 2020; Carvalho, Štulhofer, Vieira, & Jurin, 2015; Levi et al., 2020; Walton, Lykins, & Bhullar, 2016; Zlot, Goldstein, Cohen, & Weinstein, 2018), substance abuse (Antonio et al.,

2017; Diehl et al., 2019), Obsessive-Compulsive Disorder (OCD) (Fuss, Briken, Stein, & Lochner, 2019; Levi et al., 2020), high distress rates (Werner, Stulhofer, Waldorp, & Jurin, 2018), and high rates of psychiatric comorbidity (Ballester-Arnal, Castro-Calvo, Giménez-García, Gil-Juliá, & Gil-Llario, 2020).

Furthermore, some gender differences in the correlates of SC have been reported (for a thorough discussion see Kürbitz & Briken, 2021). For example, psychological distress has been found to be more strongly associated with SC symptom severity in men compared to women (Levi et al., 2020). In their study, Levi et al. reported that OCD, anxiety and depression accounted for 40% of the SC variance in men but only 20% of the SC variance in women (Levi et al., 2020). Sensation seeking is usually described as the tendency of an individual to seek stimulating events and surroundings (Zuckerman, 1979). Gender differences in SC associated personality facets, like sensation seeking, have been reported in the past. For example, Reid, Dhuffar, Parhami, and Fong (2012) found that conscientiousness is more associated with SC in men, whereas impulsivity (excitement-seeking) is more strongly associated with SC in females (Reid et al., 2012).

There is initial evidence that pandemic-related stress might specifically affect SC. In a study of university students, Deng, Li, Wang, and Teng (2021) examined sexual compulsivity in relation to COVID-19 related stress. At the first point in time (February 2020), COVID-19 related stress was correlated positively with psychological distress (depression and anxiety), but correlated negatively with symptoms of sexual compulsivity. In June 2020, individuals who reported higher COVID-19 related stress in February, also reported higher rates of SC.

As SC has been connected to gender, sensation seeking and psychological distress, it can be assumed that these factors are associated with SC, especially during times of a pandemic, where individuals experience higher levels of distress and fewer opportunities to act on a tendency for sensation seeking. In the current study we therefore explored (1) whether age, sensation seeking, conformity to contact restrictions, psychological distress, living in a place without option of personal retreat or relationship status are associated with the change in SC at the beginning of the pandemic; (2) we examined

whether gender is a moderator for these associations; and (3) we hypothesized that SC symptoms changed over the time of the pandemic, with higher SC symptoms in men.

METHODS

Study design

We examined 404 participants via an anonymous longitudinal online survey via Qualtrics during contact restrictions for COVID-19 in Germany. Only a small number ($n = 5$) of participants indicated identifying as neither male nor female, which impedes valid statistical analysis of this group. Thus, this subgroup was excluded from the analyses. The study information was distributed via social media and various email distributors. Inclusion criteria were informed consent to participate in the study and being of at least 18 years of age. We registered 864 clicks on our landing page. 662 individuals accessed the survey. In four measurement points (see Table 1), we asked the participants retrospectively to assess their sexual experiences and behavior on five time points during the begin of the pandemic. T0 and T1 were assessed at the same time.

Measures

To measure SC, we used the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS; Goodman et al., 1989) which is usually used to measure symptom severity in obsessive-compulsive disorders. The scale was modified to investigate obsessive sexual thoughts and compulsive sexual behaviors with 20 items on a Likert Scale from 1 (no activity/no impairment) to 5 (more than 8 h/extreme). The Y-BOCS has been used in another study on a sample of compulsive pornography users, where the authors reported good internal consistency ($\alpha = 0.83$) and good test-retest reliability ($r(93) = 0.81$, $P < 0.001$) (Kraus, Potenza, Martino, & Grant, 2015). The Y-BOCS questionnaire was chosen, because it allows to differentiate between sexually compulsive thoughts and behaviors. Y-BOCS measures the time spent for obsessions and compulsions, subjective impairment, control attempts and the subjective experience of control. It differs from scales

Table 1. Study design

	Measurement point (month/year)	Frame of Reference	Months surveyed	Extent of contact restrictions	N
T0	06/2020	3 months before pandemic	12/2019–02/2020	No contact restrictions	399
T1	06/2020	3 months during pandemic	03/2020–06/2020	Severe restrictions, home office, closing of non-essential workplaces, no mandatory masks	399
T2	09/2020	3 months during pandemic	07/2020–09/2020	Relaxation of Restrictions	119
T3	12/2020	3 months during pandemic	10/2020–12/2020	Reintroduction of restrictions, “lockdown light”*	88
T4	03/2021	3 months during pandemic	01/2021–03/2021	Restrictions, “lockdown light”	77

Note. All measurement points were assessed retrospectively. The “lockdown light” in Germany was defined by restricting social contacts to two households, closing of the retail trade, service industry, and gastronomy but opening of schools and daycares. Home office was suggested.



measuring CSBD, by not focussing on adverse consequences, as well as using sexual thoughts and behaviors as coping strategies. To rate the severity of SC, we used the Y-BOCS cut-off scores (analogous to Kraus et al., 2015). The German translation of the Y-BOCS questionnaire (Hand & Büttner-Westphal, 1991) was used and modified for compulsive sexual behaviors, exactly as in the work of Kraus et al. (2015).

The Brief Sensation Seeking Scale (BSSS) measures sensation seeking as a personality dimension with 8 items on a Likert Scale from 1 (do not at all agree) to 5 (agree strongly). The BSSS has been validated for different populations and has a good internal consistency ($\alpha = 0.76$) and validity (Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002). The BSSS was translated to German by the authors via the translation – back translation method and evaluated by a proficient English speaker.

The Patient-Health-Questionnaire-4 (PHQ-4; is an economic questionnaire containing 4 items, measuring psychological distress in terms of depression and anxiety symptoms with a 4-point Likert scale from 1 (not at all impaired) to 4 (severely impaired). The PHQ-4 has been validated with good internal reliability ($\alpha = 0.78$) (Löwe et al., 2010) and validity (Kroenke, Spitzer, Williams, & Löwe, 2009). The PHQ-4 has been originally published in German language.

To assess pandemic related psychosocial circumstances, we asked participants if they have a place of retreat within their home. Conformity to contact restrictions was assessed with a single item on a 5-point Likert scale (“How much did you adhere to contact restrictions?”).

Statistical Analyses

In a linear regression model, we investigated the association of different independent variables with changes in sexual compulsivity. We defined the dependent variable as the pandemic related change of sexual compulsivity from T0 to T1 (T1-T0). Independent variables (compare Table 4) consisted of sociodemographic (gender, age), relationship (relationship status, place of retreat), COVID-19 (conformity with contact restrictions, fear of infection), and psychological factors (sensation seeking, changes in psychological distress). Differences in these factors between male and female participants were examined by interaction effects for the change in psychological distress, conformity with contact restrictions and sensation seeking with gender. We further tested the hypothesis of an interaction between the conformity with contact restrictions and sensation seeking in the regression model. We used a significance level of $\alpha = 0.05$. In our regression model we included only cases with complete data for all variables ($n = 292$). The change of the Y-BOCS score over five time points was modelled with a linear mixed model. The subject was treated as the random effect, as fixed effects gender, time and an interaction between gender and time were included into the model. With this likelihood based approach to missing data, unbiased parameter estimates and standard errors can be obtained (Graham, 2009). The computations were performed with IBM SPSS Statistics (Version 27) and SAS software (Version 9.4).

Ethics

The study has been approved by the local psychological ethics committee of the University Medical Center Hamburg-Eppendorf (reference: LPEK-0160). To investigate our research questions, standardized questionnaires were implemented via the online platform Qualtrics®. All participants provided online informed consent prior to participation.

RESULTS

Sample characteristics

The sample consisted of $n = 399$ individuals at T0. Of these, 24.3% reported subclinical level of SC, 58.9% individuals reported mild SC scores, and 16.8% reported moderate or severe impairment by SC. 29.5% of men and 10.0% of females were in the moderate/severe group, that was on average younger than the other groups (compare Table 2).

Most individuals reported a high level of education (indicating university attendance). In all three groups, most participants reported being in a relationship. Employment levels were generally high. Levels of sensation seeking were highest in the group with moderate or severe SC. The levels of psychological distress (PHQ-4) varied between timepoint T0 and T1 (compare Table 2).

Attrition analysis

Initially, 399 individuals participated in the study at T0/T1. At T2, only 119 individuals completed the questionnaire (29.8%, compare Table 1). The participation numbers kept declining over the measurement points at T3 (88 individuals, 22.1%) and T4 (77 individuals, 19.3%). As this resulted in more than 40% of missing data at T4, we decided against using imputations (compare Jakobsen, Gluud, Wetterslev, & Winkel, 2017; Madley-Dowd, Hughes, Tilling, & Heron, 2019). A comparison of the participants at baseline and the participants who completed the last follow-up revealed comparable distributions for the measured sample characteristics. Only for sensation seeking, differences between the two groups were found (Table 3). As the characteristics of the participants at the last measurement point were comparable to the distribution at baseline, a longitudinal mixed model analysis was chosen to report intra-individual courses of Y-BOCS over time.

Reliability

We calculated the reliability index Cronbach’s Alpha for the measures of psychological distress (PHQ-4), sexual compulsivity (Y-BOCS) and sensation seeking (BSSS) for all time points used in the statistical analyses. Reliability was good for the PHQ-4 at all time points (α between 0.80 and 0.84). Results were acceptable for Y-BOCS at timepoints T0 and T1 ($\alpha = 0.70$ and 0.74) and questionable at time points T2 to T4 (α between 0.63 and 0.68). For BSSS, reliability was acceptable at all timepoints (α between 0.77 and 0.79).



Table 2. Baseline sample characteristics of participants stratified by severity of sexual compulsivity

Sample Characteristic	Subclinical (n = 97, 24.3%)	Mild (n = 235, 58.9%)	Moderate or Severe (n = 67, 16.8%)	Total (n = 399)
Gender, n (%)				
Female	72 (74.2)	162 (68.9)	26 (38.8)	260 (65.2)
Male	25 (25.8)	73 (31.1)	41 (61.2)	139 (34.8)
Age, Mean (SD)	33.3 (10.2)	31.8 (9.8)	30.9 (10.5)	32.0 (10.0)
Education, n (%)				
Middle School or less	0 (0)	2 (0.9)	1 (1.5)	3 (0.8)
Lower Secondary	10 (10.3)	24 (10.2)	6 (9.0)	40 (10.0)
Highschool Diploma	87 (89.7)	209 (88.9)	60 (89.6)	356 (89.2)
Relationship status, n (%)				
No relationship	33 (34.0)	57 (24.3)	24 (35.8)	114 (28.6)
In a relationship	64 (66.0)	178 (75.7)	43 (64.2)	285 (71.4)
Employment, n (%)				
Full-time	51 (52.6)	119 (50.6)	34 (50.7)	204 (51.1)
Part-time	33 (34.0)	93 (39.6)	25 (37.3)	151 (37.8)
Not employed	13 (13.4)	23 (9.8)	8 (11.9)	44 (11.0)
Sensation seeking, Mean (SD)	25.6 (8.4)	28.9 (7.9)	31.0 (8.4)	28.5 (8.3)
Psychological Distress at T0, Mean (SD)	2.4 (2.3)	2.3 (2.2)	2.7 (2.3)	2.4 (2.3)
Psychological Distress at T1, Mean (SD)	4.1 (3.2)	3.8 (2.7)	4.9 (3.4)	4.1 (3.0)

Note. Psychological Distress was measured with the Patient-Health-Questionnaire-4 (PHQ-4); Sensation Seeking was measured with the Brief Sensation Seeking Scale (BSSS).

Table 3. Attrition analysis

Sample Characteristic	Total (n = 399)	Follow-up completed at T4 (n = 77)	p
Gender, n (%)			.44
Female	260 (65.2)	46 (59.7)	
Male	139 (34.8)	31 (40.3)	
Age, Mean (SD)	32.0 (10.0)	32.5 (8.6)	.65
Education, n (%)			.88
Middle School or less	3 (0.8)	1 (1.3)	
Lower Secondary	40 (10.0)	8 (10.4)	
Highschool Diploma	356 (89.2)	68 (88.3)	
Relationship status, n (%)			.93
No relationship	114 (28.6)	23 (29.9)	
In a relationship	285 (71.4)	54 (70.1)	
Employment, n (%)			.64
Full-time	204 (51.1)	40 (51.9)	
Part-time	151 (37.8)	26 (33.8)	
Not employed	44 (11.0)	11 (14.3)	
Sensation seeking, Mean (SD)	28.5 (8.3)	26.7 (7.8)	.04
Psychological Distress at T0, Mean (SD)	2.4 (2.3)	2.4 (2.3)	.91
Psychological Distress at T1, Mean (SD)	4.1 (3.0)	4.3 (3.1)	

Note. Sensation Seeking was measured with the Brief Sensation Seeking Scale (BSSS); Psychological Distress was measured with the Patient-Health-Questionnaire-4 (PHQ-4).

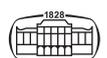
Sexual Compulsivity over time

Male participants showed significantly higher Y-BOCS scores compared to female participants ($p < .001$). While Y-BOCS scores differed significantly over the course of the study period ($p < .001$), the interaction between gender and time was not significant ($p = .41$). The marginal means from the linear mixed model show an initial increase of the Y-BOCS score from T0 to T1 for both men and women (Fig. 1). At later time points the average scores returned to levels that were comparable to the pre-pandemic measurement.

Linear regression model

We report findings of a multiple regression analysis on the association of several predictor variables with changes in sexual compulsivity in Table 4. A significant regression equation was found ($F(12, 279) = 2.79, p = .001$) with an R^2 of .107.

In the regression model ($R^2 = .107$), an older age was associated with a change to lower SC during the first lockdown. Also being in a relationship and having a place of retreat in one's home were associated with a change to less SC. Participants reported rather a decrease of SC from T0 to T1, when they were in a relationship or had a place of retreat within their home. A change in psychological distress from T0 to T1 (variable: change in PHQ) did not contribute significantly to the change in SC alone, but only in association with gender ($\beta = 0.43; 95\% \text{ CI } (0.06; 0.79)$). Men, who



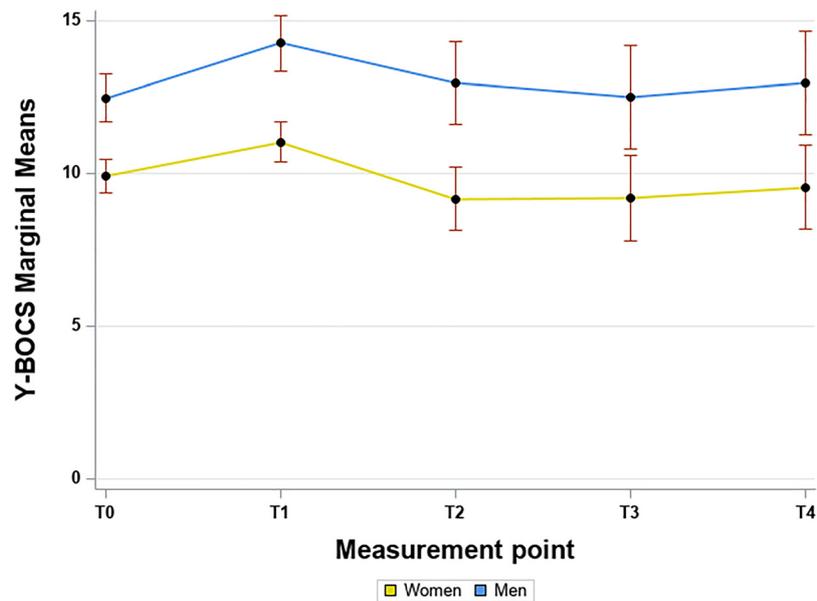


Fig. 1.

Note. Y-BOCS marginal means from a linear mixed model with the repeated measurements of the subjects as a random effect. Fixed effects were gender, time and an interaction between gender and time. Error bars represent the 95% confidence intervals for the marginal means. Y-BOCS: Yale-Brown Obsessive Compulsive Scale

Table 4. Multiple regression of different predictors on changes in sexual compulsivity (t1-t0, $n = 292$)

	β	95% CI	p
Intercept	3.71		
Male gender	0.13	(-2.83; 3.10)	.93
Age	-0.04	(-0.08; -0.00)	.042
In a relationship	-1.58	(-2.53; -0.62)	.001
Change in PHQ-4	0.01	(-0.16; 0.19)	.885
Change in PHQ-4 * Male gender	0.43	(0.06; 0.79)	.022
Compliance with COVID-19 regulations	2.67	(-1.11; 6.46)	.166
Compliance with COVID-19 regulations * Male gender	0.29	(-1.61; 2.18)	.767
Sensation seeking	0.02	(-0.04; 0.08)	.517
Sensation seeking * Male gender	-0.01	(-0.11; 0.10)	.900
Place of retreat	-1.43	(-2.32; -0.54)	.002
Fear of infection	0.18	(-0.26; 0.61)	.418
Compliance with COVID-19 regulations * Sensation Seeking	-0.08	(-0.20; 0.04)	.165

Note. PHQ: Patient-Health-Questionnaire; Sensation Seeking was measured using the Brief Sensation Seeking Scale.

reported an increase of psychological distress were also more likely to report an increase of sexual compulsivity ($R^2 = .21$ in the bivariate model), while this effect was non-significant for women ($R^2 = .004$). Psychological distress was associated with SC in men, but not in women (compare Fig. 2). Compliance to COVID-19 regulations, sensation seeking and fear of infection were not associated with a change in SC.

DISCUSSION

We investigated the association of psychological variables and changes in SC in men and women at the beginning of the COVID-19 pandemic. While most individuals reported

subclinical or mild SC symptoms, 29.5% of men and 10.0% of women reported moderate or severe SC symptoms before the begin of the pandemic. These percentages are somewhat lower to those of Engel et al. (2019) who reported 13.1% of women and 45.4% of males with increased SC levels in a pre-pandemic sample from Germany, measured with the Hypersexual Behavior Inventory (HBI-19, Reid, Garos, & Carpenter, 2011). Comparably high numbers are often reported in convenience samples (e.g. Carvalho 2015; Castro Calvo 2020; Walton & Bhullar, 2018; Walton et al., 2017). In our sample, men reported higher SC symptoms compared to women over all measurement points. These results are in line with previous findings on higher SC symptoms in men compared to women (Carvalho et al., 2015; Castellini et al., 2018; Castro-Calvo, Gil-Llario, Giménez-García, Gil-Juliá, &



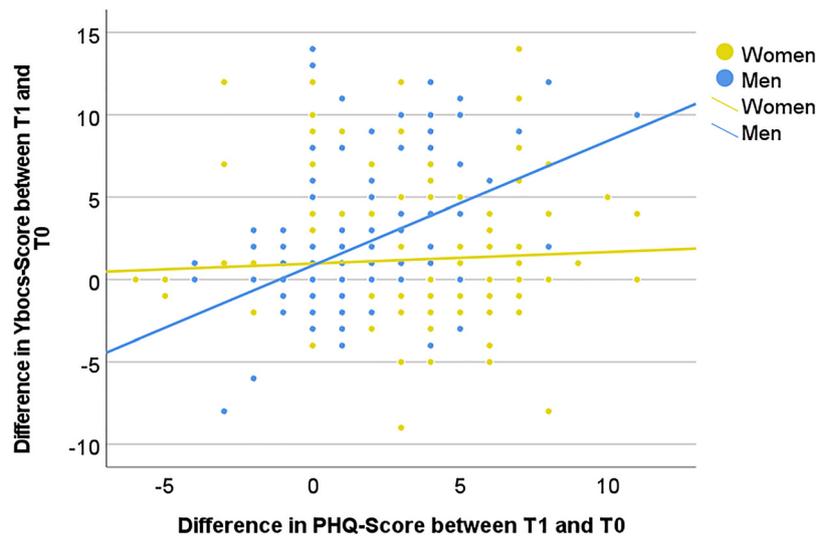


Fig. 2. Interaction of Psychological Distress and Gender on SC Scores

Note. PHQ: Patient-Health-Questionnaire; Y-BOCS: Yale-Brown Obsessive Compulsive Scale; Women: R^2 linear = 0.004; Men R^2 linear = 0.21

Ballester-Arnal, 2020; Dodge, Reece, Cole, & Sandfort, 2004; Engel et al., 2019; Walton & Bhullar, 2018). An comparable gender effect has been observed for sexual behavior in the general population (Oliver & Hyde, 1993), which is generally higher in men.

Interestingly, only 24.3% of our sample show subclinical levels of SC. This could be due to oversampling individuals struggling with their sexuality, as they could have felt particularly addressed by this research topic or by a study conducted by the Institute for Sex Research. Alternatively, the instrument Y-BOCS might not differentiate enough between different levels of symptom manifestation in terms of SC. Even though the adapted Y-BOCS has been used before to assess symptom severity in hypersexual men (Kraus et al., 2015), this instrument has been developed and validated for obsessive-compulsive disorder and not for SC. This limits the informative value of the reported cut-off scores, which have to be interpreted with caution. Further, a study of Hauschildt, Dar, Schröder, and Moritz (2019) suggests that the use of the Y-BOCS as a self-report measure instead of as a diagnostic interview might influence results in so far that symptom severity might be underrated. Further research should be undertaken to investigate the psychometric properties of the Y-BOCS adaptation for SC and standardize this instrument for populations with SC symptoms.

As expected, the current results indicate an association between psychological distress and SC during the pandemic-related contact restrictions. In the context of the COVID-19 pandemic, our findings are comparable to the findings of Deng et al. (2021), where psychological distress predicted sexual compulsivity. During the initial contact restrictions, men and women reported higher SC, compared to before the restrictions. These findings are in line with the findings of Grubbs et al. (2022), who reported elevated levels of pornography consumption during lockdown and a decrease of pornography consumption up until August 2020. In their

sample, pornography use remained low and unchanged for women. In the current study, men and women reported elevated levels of SC at T1, which decreased until T2. As this pattern might indicate the influence of psychological distress during lockdown and an attempt at coping via sexual outlets, it is important to keep other influences in mind as well, e.g. the pornography website Pornhub offering free memberships during the first lockdown (Focus Online, 2020).

Further, the results of the current study indicate that being in a relationship and having a place of retreat was associated with a decrease of SC. Psychological distress alone did not contribute significantly to the change in SC, but only in association with gender. An increase in psychological stress was associated with an increase in SC for men but not for women. This ties in with the study of Engel et al. (2019) who found a correlation of depressive symptoms with high levels of SC in men, when compared to women. Similarly, Levi et al. (2020) reported a high influence of OCD, depression and anxiety on SC in men. There was an increase in psychological distress at the beginning of the pandemic compared to before the pandemic in both genders, but this increase was not associated with an increase of SC in women. These results strengthen the assumption (compare Engel et al., 2019; Levi et al., 2020) that men are more prone to react to psychological distress with SC, as compared to women. When applying these findings to the Integrated Model of CSBD (Briken, 2020), it is plausible that the COVID-19 restrictions affected inhibitory and excitatory influences in sexual behavior different for men and women. While, according to this model, the inhibitory factors in women are often more pronounced, the excitatory factors were not as strong for them as for men. This could be explained by the assumption that psychological distress during the lockdown in females was rather associated with sexual inhibition (e.g. because of extra effort in childcare or anxiety, compare Stulhofer et al., 2022). For men, psychological distress was associated with an increase in SC. This could be explained by the assumption

that inhibitory influences (e.g. work commitments, time restraints) were omitted and therefore might have increased SC. These assumptions are strengthened by the findings of *Czymara et al. (2021)*, who reported that men were more concerned with economy and earnings than women, who were more concerned with handling childcare (*Czymara et al., 2021*).

On the other hand, it is possible that men report their sexual compulsivity more openly, as this is culturally expected of men, referencing to the “sexual double standard” (*Carpenter, Janssen, Graham, Vorst, & Wicherts, 2008*). As we are still using the same questionnaires and cut-off scores for men and women, it is possible that current measurements result in underreporting of SC in women (compare *Kürbitz & Briken, 2021*). Little is known about physiological causes for the observed gender differences in SC. A dysregulation of the hypothalamo-pituitary-adrenal axis was shown in men with hypersexual disorder, indicating a stress response (*Chatzittofis et al., 2015*). In another study, no higher testosterone plasma levels were found in men with hypersexual disorder, compared to healthy men (*Chatzittofis et al., 2020*). However, the biological mechanisms underlying the sex differences in SC have not yet been adequately demonstrated.

In our study, a younger age was associated with an increase of SC from T0 to T1. As *Lehmiller et al. (2021)* found that especially younger and more stressed individuals living alone expanded their sexual repertoire, this could explain some variance in our sample with mild SC symptoms. As individuals in our sample were fairly young (mean age = 32.0, $SD = 10.0$), they could have used this time to experiment sexually and thus report a lot of sexual behavior and thoughts.

Interestingly, having a place of retreat was associated with less SC. This could be due to solitary sexual activity being a form of retreat by itself. Therefore, individuals who were not able to retreat, might feel a bigger urge to do so, resulting in higher SC. Not being able to retreat from other people could in turn also be a form of stressor, thus favoring a higher psychological burden in these individuals.

The current results did not show an association of sensation seeking, the interaction of sensation seeking and gender or the interaction of conformity and sensation seeking with SC, although previous research showed associations between sensation seeking and SC in females (*Reid, 2012*).

Implications

The findings of the current study suggest that men, individuals without partnership and individuals who do not have a place of retreat in their homes (e.g. socio-economically challenged individuals who share small living spaces), can be especially affected by sexual compulsivity.

Contact restrictions related to the pandemic have changed the lives and sexual lives of individuals all over the world. As SC seems to play a role in stress coping, it is advisable to assess changes in patients’ sexual health in counselling or therapeutic settings, particularly in patients who are men, single or live in confined spaces. As the

current results indicate pronounced SC in an online convenience sample, it can be hypothesized that SC serves as a coping mechanism for pandemic-related psychological distress, especially for men. The development of measures to prevent the development of compulsive sexual behavior disorder in individuals at risk is advisable for the future.

Strengths and limitations

One limitation of this study is the retrospective measurement of T0 (before the pandemic), because memory effects could have skewed the results to some extent. We used the Y-BOCS questionnaire to measure SC, which is not congruent with the diagnostic category of Compulsive Sexual Behavior Disorder in the ICD-11, thus these findings cannot be generalized to this diagnostic category. One strength, on the other hand, is that the adapted version of the Y-BOCS that was used in the current study was able to measure compulsive thoughts as well as behaviors in greater detail. We used the Y-BOCS cut-off scores with the cut-off scores as suggested by *Goodman et al. (1989)* for Obsessive-Compulsive Disorder as well as used by *Kraus et al. (2015)* in a population of hypersexual men. As there is no applicable norm data, the cut-offs might not be comparable.

In future studies, it would be interesting to investigate in further detail, which variables are associated with SC in women. As 10% of women report moderate or severe levels of SC, future research needs to include female participants. Other variables (such as stress vulnerability, physical health and social support) might be relevant predictors and should be investigated in future studies. Additionally, it would be interesting to reanalyze the hypotheses of the current study in a sample with CSBD.

Another limitation of the current study is the limited generalizability to the general population, as the sample is comparatively young, urban and educated. Furthermore, we were not able to report data for the whole gender spectrum. Additionally, many probable confounding variables (e.g. situation of employment, number of children, living arrangement, conflicts) have not been controlled for. This has to be kept in mind when interpreting the results.

Conclusions

The results of this study indicate that male gender was a risk factor for SC over the first phase of the COVID-19 pandemic. Particularly, men with increased psychological distress were affected. Additionally, a younger age, being single and having no privacy at home were risk factors for the development of SC. These findings may facilitate clinical work in terms of adaptive coping and paying attention to sexual reactions in the context of psychological distress.

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manuscript: LK, CW, JS. All authors had full access to all data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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