Stressed and distressed: How is the COVID-19 pandemic associated with sexual frequency,

sexual satisfaction, and relationship satisfaction?

Conflict of Interest: None.

Abstract

Background: The Canadian government's response to the ongoing COVID-19 pandemic includes the implementation of several restrictive measures since March 2020. These actions sought to decrease social contact and increase physical distancing, including within universities. Such constraints were required to impede the transmission of the virus; however, concerns about their impact on the sexual and intimate relationships of university employees and students remain.

Aim. This study examined the associations between the COVID-19-related stress and sexual frequency, sexual satisfaction, and relationship satisfaction, also testing the mediating role of psychological distress.

Methods. The models were tested using Canadian data collected from university employees and students in two phases: the first wave (T1) related to data collected in April–May 2020 (N = 2754) and the second wave (T2), with data pertaining to November–December 2021 (N = 1430), 18 months afterward. Participants completed self-report questionnaires online. Path analyses were performed to test the associations of the mediation models.

Outcomes. The principal outcomes included psychological distress determined via the Patient Health Questionnaire-4, relationship satisfaction measured via the Dyadic Adjustment Scale, sexual satisfaction and sexual frequency both ascertained through a single item.

Results. Overall, COVID-19-related stress was associated with higher psychological distress, which in turn was related to lower sexual frequency, sexual satisfaction, and relationship satisfaction. Similar results were obtained with T1 and T2 data, indicating the mediating effect of psychological distress.

Clinical implications. These findings increase scholarly comprehension of the negative associations between stress and distress and sexual and romantic relationships. Sexuality and close relationships are vital to the quality of human life; thus, targeted interventions should be developed to reduce COVID-19-related stress and its impact on sexual and relationship to mitigate the long-term influences of this unique global challenge.

Strengths & Limitations. To our knowledge, this study is the first to use a large sample size and replicate findings in two waves. Nonetheless, the study is limited by the use of cross-sectional data. Longitudinal studies with the same participants are mandated to better understand the evolution of these outcomes.

Conclusion. COVID-19-related stress and psychological distress were found among participating university students and employees and were associated with lower sexual satisfaction, sexual frequency, and intimate relationship satisfaction. These results were observed both at the early onset of the pandemic and 18 months afterwards, suggesting that the stress generated by the pandemic were not mere reactions to the onset of the pandemic, but persisted over time.

Introduction

The first outbreak of coronavirus disease 2019 (COVID-19) occurred in Wuhan, China in December 2019.[1] It caused the current pandemic, which is exhibiting deleterious consequences on human life worldwide. In March 2020, the Canadian province of Québec responded to the emerging health crisis by instructing its population to limit social contact.[2] Thus, all non-essential businesses, schools, and daycare services were shut down for 7 weeks. Many people experienced a drastic shift in lifestyles, facing temporary unemployment or having to work at home in the presence of children, becoming isolated at home for a long period, or being affected by financial anxieties. Studies conducted in different countries reported increased levels of stress – which can be defined as "the non-specific response of the body to any demand"[3] – since the beginning of the COVID-19 pandemic.[4,5,6,7,8] Stress can impact individuals' interactions, specifically within the romantic and sexual spheres. Studies conducted before the COVID-19 pandemic have evidenced that sexual frequency, sexual satisfaction, and relationship satisfaction decrease with increasing stress levels.[9,10] Stress is thus negatively related to the sexual and romantic relationships of couples. For example, a multilevel cyclic analysis study using a daily diary approach to record subjective stress levels and sexual activities reported that external stressors lowered the frequency of sexual encounters and reduced satisfaction in relationships.[11]

Hence, in the public discourse, different narratives have been posited, for instance, that there would be a baby boom as a result of couples sheltering in place during the early phase of the COVID pandemic,[12] or that once restrictions diminish, individuals would engage more in sexual activities to "making up for lost time".[13] However, although some studies indicate that around 3% to 26% of the participants reported an increase in sexual frequency or relationship satisfaction during the lockdown, a higher percentage (6% to 53%) reported a decrease in these

24   parameters.[14,15,16,17,18] Similar results were also observed in other studies.[19,20,21,22,23] The decrease

25   in sexual frequency and/or satisfaction was higher in women than men and was felt more

26   strongly by those who experienced the pandemic negatively[14,18] rather than with positivity.[15]

27   Lower levels of sexual satisfaction or frequency were also associated with stress,[18]

28   manifestations of depression,[24] and anxiety.[16,22] Altogether, these results suggest that the

29   pandemic could influence the sexual and romantic lives of adult couples worldwide. The

30   examination of whether and how this stress relates to sexual satisfaction and pleasure in romantic

31   affiliations may increase our understanding of the impact of COVID-19-related stress. However,

32   studies that have investigated stress and sexuality during the pandemic were conducted outside

33   the university setting, and did not explore different phases of the pandemic. Moreover, no studies

34   have yet been conducted to specifically investigate the mechanisms linking COVID-19-related

35   stress to sexual frequency and satisfaction with sexual relations and romantic bonds.

36   This study posits that psychological distress could represent such a mechanism.[4,6,7,8]

37   Psychological distress is a crucial component of psychological functioning, and may be defined

38   as "a state of emotional suffering characterized by symptoms of depression and anxiety,

39   sometimes accompanied by somatic symptoms" (p.123)[25]. The Canadian province of Québec

40   reported the highest number of COVID-19 positive cases between March and June 2020, and

41   increased psychological distress was observed among its population,[26] like in other regions of the

42   world. This distress has remained palpable since the beginning of the pandemic.[27] Therefore, the

43   pandemic could have affected and may continue to affect the sexual and relational wellbeing of

44   couples because of the psychological distress it has generated. A previous study conducted in

45   Italy evinced the association of psychological distress with sexual health (including sexual

46   satisfaction) among women.[21] That study tested a model in which the lower frequency of sexual

47 activities during the COVID-19 pandemic was correlated to lower sexual health through

48 psychological distress.[21] The current study examines sexual frequency separately from sexual

49 and relationship satisfaction, as these variables are not always correlated.[28]The numerous

50 psychological issues characterizing the pandemic might have impacted the frequency of sexual

51 activities, sexual satisfaction, and intimate relationship satisfaction. Moreover, it is speculated

52 that these associations could still exist because the pandemic has endured for more than two

53 years.

54 Multiple institutions were affected by the COVID-19 pandemic; however, post-secondary

55 institutions were especially targeted by government regulations because they were required to

56 immediately cease their academic activities between March and June 2020. This sudden

57 alteration in the daily lives of university students and staff could have influenced their

58 physiological wellbeing in some manner. Universities have reopened since that time. Although

59 there was no official lockdown in November–December 2021 (apart from the imposition of

60 quarantines for people who contracted COVID-19 or had come into contact with a person

61 infected with the virus), telework persisted extensively during this period as the virus continued

62 to spread through communities. These factors, combined with the heavy reliance placed by the

63 education system on technology, justify the present study's decision to sample universities. To

64 the knowledge of the authors, no investigations have yet been conducted on this topic with

65 university employees or students.

66 **Research Aims**

67 The relationships between mental health, sexual vigor, and the wellbeing sensed by

68 couples are generally amply understood but are rarely examined in times of major crises such as

69 the current COVID-19 pandemic. Therefore, this cross-sectional study purposed to elucidate the

70   pathways connecting COVID-19-related stress and the sexual and romantic wellbeing among

71   employees and students during the pandemic. Specifically, the study's overarching objective was

72   to examine the mediating role of psychological distress in the associations between COVID-19-

73   related stress and three outcomes: sexual frequency, sexual satisfaction, and intimate relationship

74   satisfaction at the beginning of the pandemic, and 18 months later. Sociodemographic variables

75   such as age, having children, student status, and relationship status were also included as

76   covariates because these factors have been associated with distress in the outcomes of studies

77   conducted before the pandemic. For instance, being young, woman, single, student, or

78   unemployed are all factors deemed to increase distress levels.[29,30,31,32] It was hypothesized based

79   on previous findings that COVID-19-related stress would be associated with higher

80   psychological distress, which would then be connected to lower sexual frequency, lower sexual

81   satisfaction, and lower relationship satisfaction. It was also expected that these mediational

82   models would evince similar results for both rounds of data collection. The extant studies have

83   reported significant differences between men and women in their reactions to the pandemic.[14,18]

84   Therefore, this study also examined whether the models exhibited differences with respect to

85   men and women.

86   **Materials and Methods**

87   **Participants**

88   The first round of a questionnaire-based survey (T1) was filled between April and May

89   2020 by 2754 students and employees of 11 universities across the province of Québec in

90   Canada. The same questionnaire was distributed again through multiple data collection phases.

91   The last round was administered between November and December 2021 (T2) to all the students

92   and employees of 12 universities. Only participants currently involved in a romantic relationship

93 completed the measures on sexual satisfaction, sexual frequency, and relationship satisfaction at

94 T2 and were thus included in our analyses of the aggregate of 1430 participants who completed

95 the survey. Overall, 29.1% (T1) and 22.4% (T2) respondents identified as men, 69.6% (T1) and

96 76.5% (T2) identified as women, and 1.3% (T1) and 1.1% (T2) identified as nonbinary. The

97 respondents ranged in age from 18 to 82 years ($M = 37.2$, $SD = 12.8$) in T1 and from 18 to 80

98 years ($M = 39.3$, $SD = 11.2$) in T2. A total of 57.0% (T1) and 51.1% (T2) were students. In terms

99 of romantic relationships, 71.4% (T1) and 100.0% (T2) reported currently being in a romantic

100 relationship, 23.7% (T1) were single, and 4.7% (T1) were separated or divorced. Moreover,

101 46.0% (T1) and 57.1% (T2) of the respondents were parents. Only 151 participants reported

102 undergoing a COVID-19 test at T1, and only 8 of them testified to testing positive during the

103 past month. At T2, only 25 participants stated that they were infected by COVID-19 over the

104 past month.

105 **Procedure**

106 This cross-sectional study was part of a larger online survey that purposed to elucidate

107 the impact exerted by the COVID-19 pandemic on psychological, social, physical, and spiritual

108 existence. The survey was sent to students and staff members in 11 (12 at T2) university

109 institutions all across the province of Québec (Canada) by professional and school unions and

110 associations and took approximately 25 minutes to complete. The pool of participants was

111 eligible to enter a lucky draw of twenty gift cards of 50 CAN$ as compensation for their

112 engagement with the study. This study was approved by the Université du Québec à Chicoutimi

113 and by the 11 other Institutional Review Boards of the participating universities. The current

114 study used data of the first (T1) and last (named T2 to simplify) waves. The same target audience

115 comprising students and university employees was approached, but different participants could

116   complete the survey in every round. Some participants offered their email addresses and agreed

117   to be contacted again, but only 8.4% of the participants in T1 also completed T2 ($n = 120$ of

118   those in a romantic relationship). Therefore, it was not possible to longitudinally follow the same

119   participants and the two samples were examined independently.

120   **Measures**

121   Sociodemographic data were collected (e.g., age, gender, relationship status, occupation

122   as student or employee, parenthood status).

123   **COVID-19-related stress**. This study used four of the five items of the Primary Stress

124   Appraisal and Coping Scale[33] adapted for the COVID-19 pandemic to assess stress levels

125   associated with the pandemic. The items were rated on a 5-point Likert-type scale (from "not at

126   all" to "entirely") evaluating the degree to which respondents felt that the following situations

127   related to the COVID-19 crisis applied to them: (1) "This event was stressful for me," (2) "This

128   event stopped me from performing an activity or a project that was important to me," (3) "I

129   thought this event could harm me in the future," and (4) "This event made me lose something

130   important to me." The questionnaire exhibited adequate internal consistency for the current study

131   ($\alpha = .76$ and $.82$ for T1 and T2, respectively).

132   **Psychological distress.** Psychological distress was assessed using the 4-item Patient

133   Health Questionnaire (PHQ-4), a widely used and validated measure.[34,35] The PHQ-4

134   encompasses the 2-item Generalized Anxiety Disorder Screener (GAD-2) to measure anxiety[36]

135   and the 2-item Patient Health Questionnaire (PHQ-2) to determine depression.[37,38] The

136   respondents indicated the frequency of being concerned by any of the listed problems over the

137   last two weeks on a 4-point Likert-type scale (from "not at all" to "nearly every day"). The items

138   were: (1) "Feeling nervous, anxious, or on edge," (2) "Not being able to stop or control

139   worrying," (3) "Little interest or pleasure in doing things," and (4) "Feeling down, depressed, or

140   hopeless." The total scores ranged from 0 to 12 and higher scores indicated greater psychological

141   distress. This questionnaire demonstrated adequate internal consistency for the current study (α

142   =.86 and.85 for T1 and T2, respectively).

143   **Sexual frequency.** A single question was asked to assess sexual frequency: "In the past

144   month, how many times have you had sex with a partner (including, but not limited to oral sex,

145   manual stimulation, and vaginal or anal penetration)." Participants could answer on a scale

146   ranging from 1 ("never") to 8 ("many times a day").

147   **Sexual satisfaction.** Sexual satisfaction was evaluated using a single 5-point Likert-type

148   scale question (ranging from "very dissatisfied" to "very satisfied"): "To what degree were you

149   sexually satisfied during the last month?" Higher scores indicated greater satisfaction with sex

150   life.

151   **Relationship satisfaction.** Relationship satisfaction was assessed among participants

152   currently in a romantic relationship using the 4-item version of the Dyadic Adjustment Scale

153   (DAS-4).[39] The first three items presented the same 6-point Likert-type scale (from "never" to

154   "always") while the fourth item explored degrees of happiness on a 7-point scale (from

155   "extremely unhappy" to "perfectly happy"). The total scores ranged from 0 (dissatisfaction) to 21

156   (utmost level of satisfaction). This questionnaire is widely used and evinced adequate internal

157   consistency for the current study (α =.81 and.76 for T1 and T2, respectively).

158   **Statistical Analyses**

159   Descriptive analyses were conducted using SPSS version 27 to examine the distribution

160   and the associations between the study variables. The three hypothesized mediational models

161   were then tested using path analyses with Mplus 8.[40] Specifically, the study examined whether

162   psychological distress mediated the associations between COVID-19-related stress and the three

163   dependent variables (sexual frequency, sexual satisfaction, and relationship satisfaction). Age,

164   parenthood (0 = no child 1 = at least one child), status as student (0 = not a student; 1 = student),

165   and relationship status for T1 (0 = not in a romantic relationship; 1 = currently in a romantic

166   relationship) were entered as control variables. The models were tested using the maximum

167   likelihood (ML) estimator and missing data were handled using the full information maximum

168   likelihood (FIML) estimation method.[40] Indirect effects were examined via the calculation of

169   bias-corrected bootstrap (10,000 iterations) at 95% confidence intervals (CI).[41,42,43] A multiple-

170   group gender-invariance path analysis was conducted using a corrected chi-square difference test

171   (Satorra-Bentler scaled chi-square) to evaluate the gender moderation hypothesis for the

172   mediational models: a significant chi-square difference between the configural and the

173   constrained models indicated the existence of differences between men and women. The six

174   (three for T1 and three for T2) mediational models were first estimated using path analyses and

175   differences between women and men were then examined as a potential moderator. The small

176   subsample of nonbinary individuals rendered it impossible to estimate mediational models for

177   such respondents. The models were fully saturated, as the associations between all variables

178   were estimated ($\chi^2 = 0$; $df = 0$, Comparative Fit Index (CFI) = 1.00; Tucker-Lewis Index (TLI) =

179   1.00; Root-Mean-Square Error of Approximation (RMSEA) = 0.00).

180   **Results**

181   Table 1 presents the descriptive statistics and Table 2 the bivariate correlations between

182   variables for each wave (T1 and T2). Results revealed preliminary associations mostly in line

183   with the proposed hypotheses. COVID-19–related-stress and psychological distress were

184 negatively associated with sexual frequency in T1 and with sexual and relationship satisfaction

185 in T1 and T2.

186 **Table 1.** Ranges, means, standard deviations, or percentages for the sociodemographic

187 characteristics of the study participants

Variable	Range	T1 (N = 2754) M (SD) or %	T2 (N = 1430) M (SD) or %
Age	18–82	37.2 (12.8)	39.3 (11.3)
Having children	0–1	46.0	57.1
Being a student	0–1	57.0	51.1
Gender			
Women		69.6	76.5
Men		29.1	22.4
Nonbinary		1.3	1.1
Being in a relationship		71.4	100.0
COVID-19-related stress	0–16	6.98 (4.03)	4.85 (4.23)
Psychological distress	0–12	5.28 (3.41)	5.87 (3.21)
Sexual frequency	1–8	3.61 (1.98)	4.02 (1.62)
Sexual satisfaction	1–5	2.99 (1.26)	3.22 (1.13)
Relationship satisfaction	0–21	16.26 (3.37)	15.45 (3.43)

188

189 **Table 2.** Correlations between T1 and T2 variables

T1 \ T2	1	2	3	4	5	6	7	8
1. COVID-19-related stress	–	.34***	.03	−.11***	−.11***	−.10***	−.06*	.15***

2. Psychological distress	.58***	–	–.04	–.18***	–.27***	–.25***	–.14***	.16***
3. Sexual frequency	–.08***	–.09***	–	.54***	.27***	–.25***	–.05*	.09**
4. Sexual satisfaction	–.22***	–.26***	.53***	–	.44***	–.12***	–.07**	.05*
5. Relationship satisfaction	–.18***	–.28***	.27**	.43***	–	–.07**	–.15***	.04
6. Age	–.19***	–.24***	–.07**	.03	–.07**	–	.42***	–.49***
7. Having children	–.15***	–.18***	.08***	.04*	–.13***	.58***	–	–.27***
8. Being a student	.17***	.21***	–.01	–.05*	.02	–.63***	–.45***	–
9. Being in a relationship	–.08***	–.09***	.48***	.20***	–	.15***	.29***	–.18***

Note. *$p < .05$, **$p < .01$, ***$p < .001$.

Mediation Models

All analyses were performed while controlling for age, parenthood status, status as a student, and relationship status for T1. The results of the models, including the bootstrapped indirect effects, are reported in Table 3 and are depicted in Figures 1–3.

Table 3. T1/T2 models of the mediating role of psychological distress in the associations between COVID-19-related stress and sexual frequency, sexual satisfaction, and relationship satisfaction

	Psychological distress			Sexual frequency		
Model 1	b	p	β	b	p	β
COVID-19-related stress	.50/.26	<.001/<.001	.55/.31	−.01/.02	.307/.051	−.02/.06
Age	−.03/−.06	<.001/<.001	−.09/−.20	−.03/−.05	<.001/<.001	−.19/−.31
Having children	−.06/−.25	.687/.188	−.01/−.04	.10/.18	.247/.068	.03/.05
Being a student	.39/.06	.013/.765	.05/.01	−.07/−.12	.433/.236	−.02/−.04

	b	p	β	b	p	β
Being in a relationship	− .11	.407	−.01	2.13	<.001	.49
Psychological distress				−.04/−.06	.001/<.001	−.07/−.13
R^2	35.7%/15.9%			25.6%/7.7%		
Indirect effect	$\beta = -.04$, 95% CI [−.07, −.02]/$\beta = -.04$, 95% CI [−.06, −.02]					

	Psychological distress			Sexual satisfaction		
Model 2	b	p	β	b	p	β
COVID-19-related stress	.50/.26	<.001/<.001	.55/.31	−.03/−.01	<.001/.072	−.09/−.05
Age	−.03/−.06	<.001/<.001	−.09/−.20	−.01/−.02	.041/<.001	−.06/−.15
Having children	−.07/−.25	.650/.193	-.01/−.04	-.08/−.08	.168/.236	−.03/−.04
Being a student	.39/.05	.014/.796	.05/.01	−.01/.02	.868/.728	−.004/.01
Being in a relationship	−.12	.391	−.02	.54	<.001	.19
Psychological distress				−.07/−.07	<.001/<.001	−.21/−.21
R^2	35.7%/15.8%			11.3%/6.5%		
Indirect effect	$\beta = -.12$, 95% CI [−.15, −.09]/$\beta = -.07$, 95% CI [−.09, −.05]					

	Psychological distress			Relationship satisfaction		
Model 3	b	p	β	b	p	β
COVID-19-related stress	.49/.26	<.001/<.001	.55/.31	−.03/−.02	.246/.338	−.03/−.03
Age	−.04/−.06	<.001/<.001	−.13/−.20	−.03/−.03	<.001/.003	−.10/−.09
Having children	−.15/−.23	.363/.221	−.02/−.03	−1.03/−1.08	<.001/<.001	−.15/−.16
Being a student	.19/.07	.260/.725	.03/.01	−.31/.02	.108/.905	−.05/.003
Psychological distress				−.29/−.30	<.001/<.001	−.31/−.30
R^2	35.9%/15.9%			12.1%/11.4%		
Indirect effect	$\beta = -.17$, 95% CI [−.20, −.14]/$\beta = -.09$, 95% CI [−.12, −.07]					

201   *Note*. Indirect effects were obtained through psychological distress.

202

203   The results revealed significant indirect effects in T1 and T2, i.e., the significant links

204   between COVID-19-related stress and our three outcomes via psychological distress (mediator).

205   More specifically, higher levels of COVID-19-related stress were associated with higher levels

206   of psychological distress, which was in turn related to a lower frequency of sexual activity (see

207   Table 3 and Figure 1), reduced sexual satisfaction (see Table 3 and Figure 2), and lesser

208   relationship satisfaction (see Table 3 and Figure 3). Overall, the three models explained between

209   15.9% and 35.9% of the variance in psychological distress and between 6.5% and 25.6% of the

210   variance of the three outcomes over the two waves.

211   Results evaluating whether the models would be different between men and women

212   revealed that the multi-group models were invariant between men and women (i.e., no

213   differences were detected between men and women) in T2 for sexual satisfaction and in both

214   waves for sexual frequency and relationship satisfaction. However, the model was significantly

215   different between men and women for sexual satisfaction in T1 (Table 4); yet, the results

216   indicated that the models for both men and women were similar to the exemplar encompassing

217   all participants (Table 4; significant differences were found only between covariables and

218   psychological distress).

219   T1 included participants currently in a relationship as well as single participants in

220   querying sexual satisfaction and sexual frequency; hence, we conducted an exploratory probe of

221   significant differences between the two groups vis-à-vis these models. Multi-group models

222   indicated the invariance of the models between singles and participants currently in a coupled

223   relationship. In other words, the links between COVID-related stress and the three outcomes (via

224   psychological distress) did not diverge as a function of the relationship status.

225   **Table 4.** Results from the mediation model of sexual satisfaction for women/men in T1

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	Psychological distress			Sexual satisfaction		
	b	P	β	b	p	β
COVID-19-related stress	.47/.56	<.001/<.001	.54/.58	−.03/−.03	.001/.052	−.09/−.09
Age	−.03/−.02	.001/.150	−.10/−.06	−.01/−.004	.169/.362	−.05/−.04
Having children	.06/−.46	.736/.109	.01/−.06	−.14/-.02	.055/.878	−.06/-.01
Being a student	.43/.12	.014/.679	.06/.02	−.02/.05	.815/.629	−.01/.02
Being in a relationship	.06/-.63	.729/.024	.01/-.08	.48/.65	<.001/<.001	.17/.23
Psychological distress				−.07/−.09	< .001/<.001	−.19/−.26
R^2		33.8%/39.9%			9.6%/16.9%	
Indirect effect		$\beta = -.11$, 95% CI $[-.14, -.07]/\beta = -.15$, 95% CI $[-.21, -.10]$				

226   *Note*. Indirect effects were obtained through psychological distress.

227

228   As reported in Table 3, the results also demonstrated the negative association of age with

229   psychological distress: younger participants presented higher levels of psychological distress.

230   Age was also negatively associated with the three outcomes, especially for sexual frequency and

231   sexual satisfaction in T2. Parenthood was not significantly associated with psychological

232   distress, sexual frequency, and sexual satisfaction. However, parenthood was related to lower

233   relationship satisfaction in both waves. Enrolment as a student was associated with higher

234   psychological distress at T1. Finally, in T1, being in a relationship was associated with higher

235   sexual frequency and higher sexual satisfaction.

236   **Discussion**

237   The current study primarily purposed to examine the mediating role of psychological

238   distress in the associations between COVID-19-related stress and sexual frequency, sexual

239   satisfaction, and relationship satisfaction in a large sample of university employees and students

240   at the beginning of the pandemic, and to re-test these associations 18 months later. Overall, the

241   results supported the study hypotheses, suggesting that the stress induced by the COVID-19

242   pandemic in the university community was related to lower levels of relationship and sexual

243   satisfaction as well as lower sexual frequency via higher levels of psychological distress.

244   Moreover, although one mediational model varied for men and women, the results obtained from

245   the separated models indicated similar results. Therefore, the mediating role of psychological

246   distress appears to be similar for the entire university community and at two different times of

247   the pandemic: during the first lockdown, and 18 months later, when the lockdown was only

248   necessary for those who contracted COVID-19 or were in contact with a person infected with

249   COVID-19. Thus, the lockdown may have contributed in some ways to psychological distress

250   and may have impacted sexual activity and relationships; however, our results indicate that

251   COVID-19-related stress remained associated with sexual and relationships 18 months after the

252   pandemic began.

253   Controlling for age, parenthood, enrolment as a student, and relationship status, the

254   results indicated that COVID-19-related stress was directly and/or indirectly (through

255   psychological distress) associated with lower levels of sexual frequency, sexual satisfaction, and

256   relationship satisfaction. These findings align with previous studies conducted in China, Taiwan,

257   and Italy.[16,17,18] Karney and Bradbury's model of vulnerability, adaptation, and stress illuminates

258   that some factors that can potentially influence relationship satisfaction are related to stressful

259   events and special circumstances during a relationship (stress aspect), as well as emotions and

260   communication skills in a relationship (coping aspect).[44] Therefore, relationship satisfaction in

261   couples relies on how the partners cope with certain stressors during their relationship.[45] The

262   COVID-19 pandemic selected for this study certainly represented one such stressor. Our measure

263   assessed the stressfulness of this pandemic, whether it stopped participants from performing an

264   important activity/project and whether it could harm them in the future or make them lose

265   something important to them. We did not evaluate whether this stress was related to the fear of

266   becoming sick or being separated from friends and family. We also did not examine issues such

267   as whether students worried about being able to complete their program or about the quality of

268   education delivered via online/virtual methods. For example, a recent study investigated two

269   forms of COVID-19-related stress (health and isolation) and yielded different results even

270   though both investigations related to lower sexual and couple functioning. Such instances

271   indicate the importance of assessing various forms of stress.[24] Another study found that

272   contracting the virus and not completing the academic year denoted the strongest pandemic-

273   associated concerns among university staff members.[46] Similarly, our study found some evidence

274   that COVID-19 infections could adversely impact sexual function for both men and women even

275   though only a few participants reported being infected by the COVID-19.[47,48] This consideration

276   may be crucial for the future management of sexual health apprehensions and relationships.

277   Overall, our results, like the outcomes reported by Pollard et al., signify that higher stress levels

278   could result in reduced sexual pleasure or could make sexual intercourse more difficult,

279   diminishing an individual's interest in sex.[49] Thus, a decrease may be observed in sexual

280   frequency and sexual satisfaction.

281   Moreover, the links between stress and sexual and romantic wellbeing in couples were

282   mediated by psychological distress. Hence, the experience of higher levels of stress apropos the

283   COVID-19 pandemic was associated in participants with more intense psychological distress,

284   which was in turn associated with lower levels of sexual frequency, sexual satisfaction, and

285   relationship satisfaction. These results are congruent with previous findings indicating higher

286   levels of distress during the COVID-19,[6,50] and indicate that greater pandemic-generated stress is

287   related to stronger psychological distress. Consequently, university employees and students

288   highly stressed by the current pandemic situation could become more vulnerable to higher levels

289   of psychological distress, which could impede their capacity to experience sexual pleasure or feel

290   satisfied with a romantic relationship. These findings also align with studies that have previously

291   established the connections of psychological distress to lower sexual frequency,[24,51] lower sexual

292   satisfaction,[24] and lower relationship satisfaction.[52] That psychological distress associated with

293   the COVID-19-related stress can make it difficult to enjoy sexual experiences could denote a

294   possible explanation, either because of difficulties in letting go and appreciating the moment or

295   because of problems with emotion regulation, which can cause conflicts in relationships.[53]

296   The pandemic-related stress appears to increase psychological distress; however, pre-

297   pandemic studies have also noteworthily reported high levels of psychological distress in

298   university students. Such distress can be influenced by financial concerns, worries about

299   academic performance, and relationships with friends and family.[54,55] In addition, being away

300   from home for university and family incomes are also reported to impact the wellbeing of

301   university students.[54] Therefore, university students represent a very high-risk population and

302   may be more vulnerable than other university members such as research support staff or

303   researchers (even though researchers also experience psychological distress).[56] Nonetheless, the

304   current results suggest that COVID-related stress increases the burden on university students and

305   employees. The added pressure was observed at the beginning of the pandemic and remained

306   visible 18 months later, suggesting that the stress generated by the pandemic were not mere

307   reactions to the onset of the pandemic. Rather, the stress seems to persist over time.

308   **The Strengths and Limitations of the Study**

309   The results reported by the present study offer preliminary answers to current concerns

310   about the consequences of the pandemic vis-à-vis sexuality and relationships. Nevertheless,

311   some limitations of this study must be acknowledged. Although the study sample of students and

312   university employees was large, participation was voluntary and the survey comprised the

313   completion of a self-reporting instrument. In particular, the higher proportion of women, which

314   is quite commonplace in voluntary participation studies,[57,58,59,60] may limit generalizability.

315   Moreover, it is customary to reduce the number of items per construct in large-scale studies with

316   adults. Thus, sexual satisfaction and sexual frequency were each measured via one item and

317   could yield biased findings. Although the outcomes could be replicated using two different sets

318   of data collected at an 18-month interval, the prospective effect of the COVID-19-related stress

319   could not be measured, and no causal link could be derived from the study's methodology.

320   Longitudinal studies are therefore mandated to appropriately assess the potential long-term

321   outcomes of the COVID-19 pandemic on sexuality and intimate relationships. Such prospective

322   studies could incorporate a more refined assessment of intimate relationships and sexuality.

323   Nonetheless, the current results suggest that the sexual behaviors of the respondents did not

324   change substantially to adapt to the pandemic context.

325   **Conclusion**

326   Overall, the study's findings indicate that the stress and psychological distress

327   experienced by the university students and employees were indeed associated with reduced

328   sexual frequency, and lower sexual and relationship satisfaction. Connections with others are

329   crucial for human health and longevity,[61] and specially designed interventions are mandated for

330   adults reporting high levels of COVID-19-related stress to mitigate the negative impact of the

331   COVID-19-related stress on psychological distress and sexual and intimate relationships. Such

332 programs could help individuals more effectively regulate their negative emotions in stressful

333 situations and may also increase the satisfaction people sense with their sexual encounters and

334 romantic relationships. Therefore, sexual pleasure and intimacy can be ameliorated in pandemic

335 circumstances by attending to stress management.

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