

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.

Keywords: sexuality, marital relationships, COVID-19, anxiety, depression, university employees, students, couple life

1 **Introduction**

2 The first outbreak of coronavirus disease 2019 (COVID-19) occurred in Wuhan, China in
3 December 2019.¹ It caused the current pandemic, which is exhibiting deleterious consequences
4 on human life worldwide. In March 2020, the Canadian province of Québec responded to the
5 emerging health crisis by instructing its population to limit social contact.² Thus, all non-
6 essential businesses, schools, and daycare services were shut down for 7 weeks. Many people
7 experienced a drastic shift in lifestyles, facing temporary unemployment or having to work at
8 home in the presence of children, becoming isolated at home for a long period, or being affected
9 by financial anxieties. Studies conducted in different countries reported increased levels of stress
10 – which can be defined as “the non-specific response of the body to any demand”³ – since the
11 beginning of the COVID-19 pandemic.^{4,5,6,7,8} Stress can impact individuals’ interactions,
12 specifically within the romantic and sexual spheres. Studies conducted before the COVID-19
13 pandemic have evidenced that sexual frequency, sexual satisfaction, and relationship satisfaction
14 decrease with increasing stress levels.^{9,10} Stress is thus negatively related to the sexual and
15 romantic relationships of couples. For example, a multilevel cyclic analysis study using a daily
16 diary approach to record subjective stress levels and sexual activities reported that external
17 stressors lowered the frequency of sexual encounters and reduced satisfaction in relationships.¹¹

18 Hence, in the public discourse, different narratives have been posited, for instance, that
19 there would be a baby boom as a result of couples sheltering in place during the early phase of
20 the COVID pandemic,¹² or that once restrictions diminish, individuals would engage more in
21 sexual activities to “making up for lost time”.¹³ However, although some studies indicate that
22 around 3% to 26% of the participants reported an increase in sexual frequency or relationship
23 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.²⁸The 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 Scale³³ 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 anxiety³⁶
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 ($\alpha =.81$ 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	T2
		(<i>N</i> = 2754) <i>M</i> (<i>SD</i>) or %	(<i>N</i> = 1430) <i>M</i> (<i>SD</i>) 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***

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

191

192

193 Mediation Models

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

197

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

Model 1	Psychological distress			Sexual frequency		
	<i>b</i>	<i>p</i>	β	<i>b</i>	<i>p</i>	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

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		$\beta = -.04, 95\% \text{ CI } [-.07, -.02]/\beta = -.04, 95\% \text{ CI } [-.06, -.02]$				

Model 2	Psychological distress			Sexual satisfaction		
	<i>b</i>	<i>p</i>	β	<i>b</i>	<i>p</i>	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		$\beta = -.12, 95\% \text{ CI } [-.15, -.09]/\beta = -.07, 95\% \text{ CI } [-.09, -.05]$				

Model 3	Psychological distress			Relationship satisfaction		
	<i>b</i>	<i>p</i>	β	<i>b</i>	<i>p</i>	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		$\beta = -.17, 95\% \text{ CI } [-.20, -.14]/\beta = -.09, 95\% \text{ CI } [-.12, -.07]$				

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

	Psychological distress			Sexual satisfaction		
	<i>b</i>	<i>P</i>	β	<i>b</i>	<i>p</i>	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
<i>R</i> ²		33.8%/39.9%			9.6%/16.9%	
Indirect effect		$\beta = -.11, 95\% \text{ CI } [-.14, -.07]/\beta = -.15, 95\% \text{ CI } [-.21, -.10]$				

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 noteworthy 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.

336

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341

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