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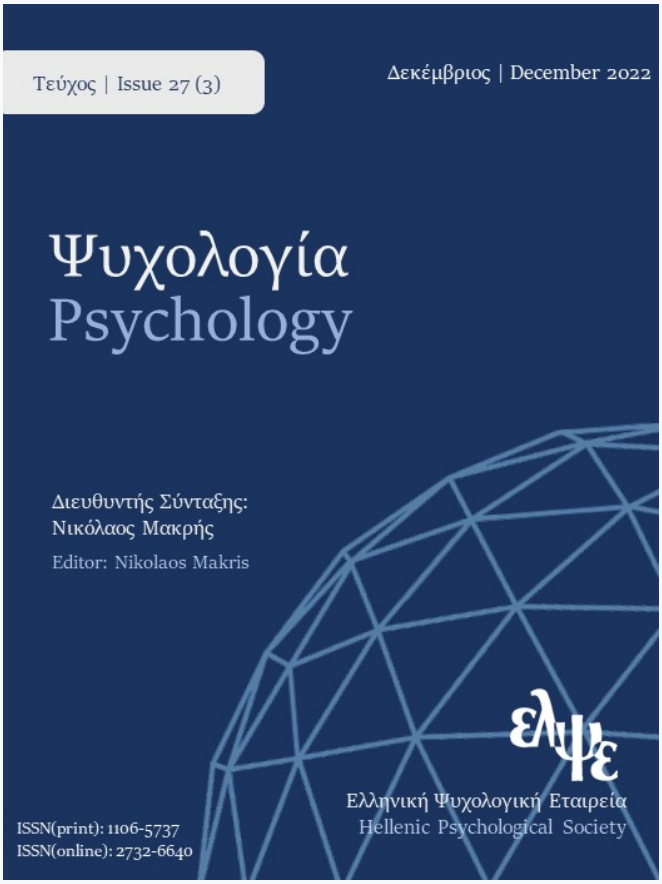

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Facemasks cannot kiss: the impact of the COVID-19 pandemic on the sexual behavior of Greek men and women

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KEYWORDS

COVID-19,
distress,
sexual behavior of men and women,
relationship status,
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ABSTRACT

COVID-19 pandemic affected the emotional state and the sexual behavior of people all around the world due to social distancing, quarantine restrictions and financial consequences. This quantitative study examines the effects of COVID-19 on the sexual behavior of the Greek population, considering the psychological distress, the cohabitation status and the relationship status. A set of questionnaires was administered to 221 Greek women and men, partnered and single, to scrutinize their perceived impact of COVID-19, their levels of distress, and their sexual behavior. Participants' responses were analysed via a three-way multivariate analysis of covariance. Results supported that the COVID-19 pandemic is negatively influencing their levels of distress and the sexual behavior of both women and men. Most of the participants reported mild levels of distress linked to COVID-19 which predicted their overall sexual behavior. Meanwhile, cohabitation was also associated with sexual behavior while the relationship status influenced both women and men in different ways. Further research could focus on the sexual behavior of Greek men and women using additional measures for potential emotional impact triggered by COVID-19 This research could also be further developed by looking into sexual behavior in minority groups such as people with special needs or psychiatric disorders.

Introduction

In March 2020, the World Health Organization (WHO) announced the outbreak of the COVID-19 pandemic, also known as coronavirus. At the same time, the regulatory agencies, the health authorities as well as the local authorities have laid strict policies. These new policies were put in place mainly to avoid contracting the virus and to contain its expansion. Many countries have imposed strict restrictions such as limiting people's mobility through the country or the mandatory rule to wear face masks (Mogi & Spijker, 2021). These restrictions also impacted the labor force and educational institutions as everyone was asked to work or continue their learning journey remotely from home. Moreover, countries with an ongoing transmission were closing their borders to delay the spread of COVID-19. While, world economies simultaneously faced a free fall, unemployment rates were rising in many countries (Jones et al., 2021). Overall, the COVID-19 pandemic created both a social tension and an economic depression that affect increasingly the entire globe (Chudik et al., 2020). Both outcomes along with social distancing practices imposed quarantines and the economic recession influenced individuals' emotional state and behavior. Financial instability has a major impact on mental health, especially in countries like Greece, which face economic instability. Relevant studies showed financial insecurity is positively associated with depression and anxiety (De Sousa, 2020). Furthermore, the social isolation (social impact) combined with the fear of contracting coronavirus seems to affect both physical and psychological health (personal impact, Lopes et al., 2020). In some cases, this impact is so radical that depressive symptoms and suicide rates have increased (De Sousa, 2020). All of the previous mentioned reasons show an imperative need to investigate the impact of COVID-19 on mental health in the Greek men and women.

The impact of COVID-19 on people's psychological state and sexual behavior

The coronavirus pandemic has had a significant impact on people's lives and posed a number of societal challenges. One of the major challenges of this specific stressor is maintaining interpersonal relationships, which are intricately linked to mental and physical health (Pietromonaco & Overall, 2021). Also, physical difficulties could infiltrate people's physical behavior: little to no physical contact that in some cases creates mental problems like emotional disturbances. As Pietromonaco & Overall (2021) mention, mental disorders like depression can lead to dysfunctional social interaction skills and relationship conflicts and issues. For instance, both depression and anxiety are related to a loss of sexual desire (Ibarra et al., 2020).

Focusing on close relationships and forms of communication, it would be purposeful to examine whether this disruption affects the sexual behavior of individuals regardless of their relationship status. Either way, human sexuality is a complicated phenomenon that is influenced by a variety of factors, such as psychological, biological and social (Ibarra et al., 2020). Lockdown restrictions and "social distancing" policies resulted in considerable changes in daily living, including sexual activities (Lehmiller et al., 2020). Furthermore, sexual desire over the period considered, is stifled by negative emotion, while low levels of desire have been linked to negative feelings including anxiety and depression (Eleuteri & Terzitta, 2021).

The generic impact of COVID-19 and the possibility of infection are considered the main indicators of sexual behavior change. Although the virus is not detected in semen or vaginal secretions, infected people even asymptomatic, could spread the virus through respiratory secretions onto their skin and personal objects, and transmit it to their sexual partner (Turban et al., 2020). These facts may affect how people build sexual relationships, define their sexual routine, or even influence the development of a sexual behavior of an existing relationship. Meanwhile, people who live alone have also been impacted since sexual contact has been discouraged with the purpose of decreasing the risk of transmission of the coronavirus (Lopes et al., 2020). During a pandemic, abstinence is the most basic strategy to sexual health; masturbation is an additional safe solution for people to satisfy their sexual needs without risking coronavirus infection (Ibarra et al., 2020). However, dyadic sexual activities is preferred over masturbation for many people (Turban et al., 2020). On the other hand, fear and anxiety, caused by the pandemic, can degrade pleasure and result in sexual dysfunctions such as performance anxiety (Ibarra et al., 2020). Several consequences in both social and personal life could potentially be seen in people's sexual life over the duration of the pandemic. The different ways this may impact single individuals or people in a relationship is still questionable.

People living alone during the COVID-19 pandemic

COVID-19 has created a depressed state, anxiety, fear, and a variety of feelings that could change or even shape someone's sexual life (Ibarra et al., 2020; White (2020). Emotional and social well-being are associated with sexual health; thus, all negative emotions have a severe impact on intercourse (Eleuteri & Terzitta, 2021). In addition, loneliness is increased by social distancing techniques, mainly for single people and couples living apart (Lopes et al., 2020). Especially for singles, the physical contact, from kissing to sexual intercourse, has been reduced (Ibarra et al., 2020). Additionally, there were fewer opportunities to meet new partners taking into account the restrictions in mobility for several months. People who live alone for example, may be more inclined to use sextech (i.e., any technology designed to enhance sexuality) (Lehmiller et al., 2020) since they have fewer opportunities for in-person interaction. Despite this, while it is usual to employ technology-mediated sexual practices, those who report to make more use, do not proclaim these practices to be as satisfying as in-person activities (Lehmiller et al., 2020).

Furthermore, those living alone are effectively required to practice celibacy to limit the pandemic. Nonetheless, for people with unrestricted sociosexuality (i.e., willingness to be involved in uncommitted sexual relationships), casual sex is desirable and is positively correlated with well-being, while restraining from these routines may have a negative impact (Vrangalova & Ong, 2014). Because of the lockdown measures, casual sex between non-cohabiting individuals has been essentially decreased with people exhibiting higher levels of sociosexuality to be more affected (Wignall et al., 2021). Also, for people who normally engaged in "risky" sexual practices (such as casual sexual engagements or several sexual partnerships) their sexual behavior altered dramatically (Bowling et al., 2021). According to a preliminary report from China, the number of sexual partners

among young people has decreased and so did the frequency of sexual activity in all types of relationships (Wignall et al., 2021). Finally, masturbation rates have risen probably because people were unable to have sex with their partner. Although masturbation may have helped some persons obtain sexual gratification without the risk of contracting COVID-19, a high masturbation rate is linked to declines both in quality of life and sexual satisfaction (Li et al., 2020).

Couples cohabitating during the COVID-19 pandemic

Apart from singles, COVID-19 also affects people in a relationship. According to Ibarra et al. (2020), many people's relationships were undermined due to the pandemic which led to home confinement and feelings of uncertainty for the future. Recent studies have proved that people who lived together during the pandemic era have had some repercussions on their sexual lives (Lopes et al., 2020; Ibarra et al., 2020). According to Eleuteri and Terzitta (2021), being restricted at home for 24 hours a day, with space constraints, and the cohabitant quarrels, have weakened couples' bond either way. Furthermore, external stressors such as unemployment, economic instability, and work stress also affected the quality of a couple's interactions (Pietromonaco & Overall, 2021). Many couples were feeling more exhausted, distracted, or overwhelmed, making it difficult to interact with each other, while their relationship was more prone to deteriorate (Pietromonaco & Overall, 2021).

Several stressors linked to the COVID-19 pandemic could negatively impact the adaptive relationship processes. For instance, the everyday almost all-day long interaction could have increased sexual intimacy, but in practice sex intercourse became more a humdrum routine (Wignall et al., 2021). In addition, for couples that are parents, daily routine is more demanding since they struggle to balance their professional and family life. While children were in quarantine, many parents were facing several everyday life challenges: work-related obligations, ensuring that their children complete homework, whereas at the same time they had to carry out other activities and handle household duties. This is the main reason why parents report feeling significantly more stressed than nonparents (Pietromonaco & Overall, 2021). Moreover, the constant presence of children at home as a result of school closures had a negative impact on partners' sexual life, while it increased stress directly affecting sexual behavior (Ibarra et al., 2020; Muise, et al., 2016). Furthermore, as for parents that are already facing difficulties, such as coping with low income, may be more prone to relationship and sexual difficulties (Pietromonaco & Overall, 2021). As Ibarra et al. (2020) claim, the pandemic affects the sexual satisfaction or changes the sexual habits of the couple overall.

The current study

These findings seem to be confirmed in any country massively affected by the COVID-19 pandemic. Though, Greece is considered to have difficult living conditions at European level, since it appeared to have one of the strictest restrictive measures (Hong et al., 2021) and one of the countries with the highest mortality rates among 53 countries around the world according to the economic site Bloomberg (Hong et al., 2021). With respect to the economy, Greece is placed in the 10th worst position of the predictions concerning the future of the economy for the year 2021 (Hong et al., 2021). Since Covid-19 has affected variously Greek population and will continue to do so, it could be a great case study for further investigation focusing on sexual behavior and interaction.

The strict measures combined with the economic downturn due to the COVID-19 pandemic may affect the sexual function and quality of life of both women and men in Greece. In general, unemployment influences the physical and mental well being of people (Chatzisarantis, et al., 2021). At the same time, the economic strain limits the physical health and the emotional functioning (De Sousa, 2020). Apart from the financial factors, the fear of the pandemic and the inflection changed people's daily routine (personal and social life). In this study, firstly it will be examined whether the dimensions of sexuality are affected by the psychological distress due to COVID-19 controlling for the relationship status (single or partnered) and type of cohabiting (living alone or with the partner). Secondly, it will be examined whether the relationship status (single or partnered) and the type of cohabitation (partners living together and apart) influenced the dimension of sexuality directly during the period of the pandemic. The two research hypotheses are:

H_1: Psychological distress due to COVID-19 along with changes in personal and social life affects dimensions of sexuality.

H_2: Sexual function and satisfaction are influenced by relationship status and type of cohabitating during the period of the COVID-19 pandemic.

Methods

Design

In this study a between-subjects design was applied. The independent variables (IVs) were the psychological distress (variable IV_1), the relationship status (two levels: single or partnered) (IV_2) and the type of cohabiting (two levels: partnered people living together and partnered people living separately) (IV_3). The dependent variables (DVs) were the dimensions of sexuality of female: Desire, Arousal, Lubrication, Orgasm, and Satisfaction, while for male the dimensions of sexuality were the Erection and Satisfaction. Lastly, the changes in personal and social life due to COVID-19 were used as covariates.

Participants

Two hundred- and thirty-people participated in the study, but 12 participants were removed from further analysis as they did not report any sexual activity. The sample was consisted by 116 Greek females (53.2%) and 102 males (46.8%), and they were between 18 and 64 years old; most of them between the age of 25 and 34 years old (n = 149, 68.3%). Most participants were in a relationship (n = 148, 67.9%), while most of them were living with their partner (n = 122, 56.0%). Regarding their profession, the majority was working in private sector (n = 134, 61.5%). For detailed demographic characteristics, see Table 1.

Materials

For probing the research hypotheses, participants responded to the following tools: (a) a tool concerning the effects of the COVID-19 pandemic on social relationships, (b) the Kessler Psychological Distress Scale (K10), (c) Female Sexual Function Index (FSFI) for examining female sexuality (answered only by female participants), and (d) the Male Sexual Health Questionnaire (MSHQ) for assessing male sexuality (answered only by male participants).

Impact of COVID questionnaire. The questionnaire measuring impact of COVID was designed to assess the general impact of COVID-19 and is considered to be unidimensional (Naser et al., 2020). However, in the present study, a two-way solution was found with acceptable total variance explained (57.5%), using exploratory factor analysis with Varimax rotation (Brown, 2009) (Cronbach's alphas for both factors were α = .70). The first subscale included five questions about perceived impact of COVID-19 on relationships and more specifically in what extent Covid-19 has affected personal relationships (items 1, 2, 3, 4 and 7) and the second subscale assess the impact in social relationships during Covid-19 (items 5, 6 and 8). Responses for this impact were collected using a 4-point Likert scale with 0 indicating no impact due to COVID-19 and 4 indicating the highest possible impact due to COVID-19 (impact in personal life). Responses for the impact in social relationships were recorded using a 3-point Likert scale with 0 indicating no impact and 2 indicating high impact due to COVID (impact in social life).

Table 1
Descriptive statistics of demographic characteristics (n = 218)

Characteristic		***n* (%)**
Gender	Male	102 (46.8)
	Female	116 (53.2)
Age (*years*)	18-24	20 (9.2)
	25-34	149 (68.3)
	35-44	35 (16.1)
	45-54	9 (4.1)
	55-64	5 (2.3)
Cohabitation status	Living without a partner	96 (44.0)
	Living with a partner	122 (56.0)
Relationship status	Single	70 (32.1)
	Partnered	148 (67.9)
Professional status	Working in the Public Sector	20 (9.2)
	Working in the Private Sector	134 (61.5)
	Self-employed	34 (15.6)
	Retired	2 (0.9)
	Student	20 (9.2)
	Unemployed	7 (3.2)

**Note.* Values refer to absolute frequencies (n) and relative frequencies (%)

K10 questionnaire. The K10 is a commonly used tool for assessing psychological distress in general and clinical populations irrespective of cultural background (Easton et al., 2017). It contains 10 items to assess global discomfort (anxiety and depressive symptoms) and responses are collected using a 5-point Likert scale (1: "*Some of the time*", 5: "*All the time*"). The total score on the K10 is the sum of the 10 items with range from 10 to 50. Scores less than 20 indicate absence of distress; scores of 20-24 are display potential mild mental disorder; scores between 25 and 29 manifest potential moderate mental problem and those who score of 30 or higher are more likely to have a serious mental disorder (Easton et al., 2017). It is a clinically relevant and well-validated assessment of psychological symptoms (Stolk et al., 2014) with high reliability (Cronbach's α = .88, Sampasa-Kanyinga et al., 2018). In this research Cronbach's alpha was α = .92.

FSFI questionnaire. The FSFI is a simple, multidimensional self-report tool that examines important aspects of female sexual function (Rosen et al., 2000). The 19-item scale assesses sexual function over the last four weeks and produces domain scores in six subscales: Sexual Desire, Orgasm, Lubrication, Arousal, Pain, and Satisfaction (Rosen et al., 2000). The questions are scored from 0 (or 1) to 5. The scoring system adds up the items on each subscale and then scales the totals to a maximum score of 6 for each subscale after an appropriate multiplication. The subscale of pain was excluded since the research did not include clinical population while these particular questions concerned uncommon pathological symptoms. Higher scores indicate better sexual functioning (Corona et al., 2005). The FSFI has good psychometric properties (Wiegel et al., 2005) with high test – retest reliability coefficients ($r > .79$) and high internal consistency (Cronbach's alpha values of .82 and higher) (Rosen et al., 2000). In the present study the internal consistency were found generally high; Desire: α = .93, Arousal: α = .96, Lubrication: α = .94, Orgasm: α = .93, Satisfaction: α = .89.

MSHQ questionnaire. The MSHQ's initial questionnaire items were created to measure the male sexual dysfunction (Rosen & Seftel, 2008). MSHQ tool has three domains: Erection, Ejaculation, and Sexual Satisfaction, and it provides a comprehensive evaluation of ejaculatory function and sexual satisfaction (Rosen & Seftel, 2008). In this study, 9 questions were used. Questions concerning Ejaculation were not included as they concern clinical conditions. Questions 1, 3, 5 were related to Erectile capacity, whistle questions 2, 4, 6, 7, 8, 9 examined the Sexual Satisfaction. The questions are scored from 0 (or 1) to 5, and the higher scores imply better sexual functioning (Corona et al., 2005). Overall, the MSHQ is a short, validated questionnaire that can be used in both clinical and research settings (Rosen & Seftel, 2008). A high internal consistency (Cronbach's alpha = .81 – .93) and test-retest reliability (*r* between .84 and .94) were found in all domains (Rosen, 2006). In the present study Cronbach's alpha for Erection was α = .78, and for Satisfaction was α = .95.

Ethics – Procedure

This study was approved by the ethical committee of the University of Central Lancashire. The participants gave their written agreement ahead of time, and the methods were carried out according to the approved guidelines. The questionnaire was created on Google Forms and was distributed via virtual snowball technique for a period of 1 month; March until April 2021. The participants were instructed through a debrief that explained to them the total procedure of the questionnaire. As the questionnaires were provided online, the consent was given by clicking continue. By clicking on "continue", the participants also agreed to share their personal data with the researcher and the supervisor. Afterwards, they provided a 4-digit code that they could use to withdraw from the study after their participation but before data analysis. After obtaining informed consent, each participant had to answer first a set of demographic questions, then the K10, the questionnaire about COVID-19 impact and finally depending on participants' sex either FSFI or MSHQ. Participation duration was 15 minutes.

Statistical analysis

For the statistical analysis SPSS program, version 27 was used (IBM Corp. Released, 2020). To determine whether there are any differences between independent groups on more than one continuous dependent variable a one-way Multivariate Analysis of Covariance (MANCOVA) was used (Howitt & Cramer, 2011). In addition, since there are two covariates regarding direct consequences of COVID-19 (impact on personal and social life), multivariate analysis of variance was applied, to dealing with multiple DVs (Tabachnick & Fidell, 2013). Moreover, a two way between subjects MANCOVA was used to examine whether cohabitation and relationship status combined with distress affect people's sexual behavior. Prior to the main statistical analyses, data screening techniques were applied. For conducting MANCOVA, the assumptions of normality, homogeneity of variance - covariance matrices, linearity and multicollinearity were checked and were found satisfactory. To investigate the impact of each effect on the individual dependent variables, a univariate Analysis of Variance (ANOVA) using an alpha level of .05 was performed with Post-hoc Bonferroni. The values for asymmetry and kurtosis between -2 and +2 were considered acceptable to prove normal univariate distribution (George & Mallery, 2010). Furthermore, for checking the internal consistency, Cronbach's alpha was used. Values greater than .70 indicated an acceptable subscale (DeVellis, 1997).

Results

Descriptive statistics of study's variables

In Table 2, the descriptive statistics of study scales and subscales are presented. For the global impact of the COVID-19 pandemic a mean score lower than the theoretical median (12) was found (M = 11.43, SD = 2.86), while for the time spend the mean score was identical to the median (M = 4.00, SD = 1.55). With respect to the distress levels, the mean score of the study sample was 23.94 (SD = 7.71), indicative of a mild distress levels (Victorian Population Health Survey, 2001). For female sexuality, the lowest mean is that of Satisfaction 3.55 (SD = 1.82), while the highest is the Orgasm 3.87 (SD = 1.88). The means of Desire is 3.68 (SD = 1.34), of Arousal is 3.64 (SD = 1.88) and Lubrication is 3.82 (SD = 1.92) which is in the upper half of the scale. With respect to men

sexuality, a mean of 4.10 (*SD* = 1.61) was found for erection, ranging from 0 – 5 and for satisfaction, a mean score of 3.45 (*SD* = 1.64) was found, indicating that the mean scores for both sexes irrespective of sexuality domain were identical.

Table 2

Descriptive statistics of the effect of the COVID-19 pandemic, distress scale, FSFI, MSHQ (n=221)

	M	Mdn	SD	Min	Max
COVID-19 personal life impact (sum)	11.43	12	2.87	2.00	17.00
COVID-19 social life impact (sum)	4.00	4.00	1.55	0.00	8.00
K10 (Distress, sum)	23.94	23.00	7.71	10.00	50.00
FSFI (female sexuality)					
Desire§	3.68	3.60	1.34	1.20	6.00
Arousal§	3.64	4.20	1.88	0.00	6.00
Lubrication§	3.82	4.20	1.92	0.00	6.00
Orgasm§	3.87	4.40	1.88	0.00	6.00
Satisfaction§	3.55	4.00	1.82	0.00	5.60
MSHQ (male sexuality)					
Erection‡	4.10	5.00	1.61	0.00	5.00
Satisfaction‡	3.44	4.00	1.64	0.00	5.00

**Note.* Values refer to mean (M), median (Mdn), standard deviation (SD), minimum (Min), maximum (Max); § N=124; ‡ N=97; FSFI, Female Sexual Function Index; MSHQ, Male Sexual Health Questionnaire

Multivariate Analysis of Covariance (two-way MANCOVA) (female sexuality)

To investigate the effect of the type of cohabitation and relationship status (IV_1) and the type of distress (IV_2) on the female sexuality (DVs), a two-way MANCOVA was performed. The variables of COVID-19 impact both in personal and social life were inserted as covariates to control for their effect.

First, the sample size across the groups of both independent variables were similar, allowing for meaningful comparisons and the dependent variables were found to be moderately to strongly correlated (*Pearson's* $r_{124} > .34$, $p < .001$) according to the criteria of Mukaka (2012). Pearson's correlation was applied, after checking for normality ($p >. 05$) and linearity (deviation from linearity $p >.05$). In addition, the analysis was found mediocre sensitive (*effect size* $f^2 = 0.35$) with adequate statistical power (80%). For assessing univariate outliers, scores in both dependent variables were transformed into z-scores and it was found that three participants in no victimization and two participants in the low victimization group were exceeding 3 SDs (Cousineau & Chartier, 2010). For assessing multivariate outliers, Cook's distance was calculated, and it was found that all values were < 3 (Hair et al., 2010), thus no multivariate outliers were detected. Both assumptions for univariate and multivariate normality were assessed with the use of Shapiro-Wilk and were found to be satisfied, as for all study's variables $p >.05$. Last, the Box's M test showed equality of covariance, *Box's M* = 91.81, $p > .05$.

A two-way between-subjects MANCOVA was performed on five dependent variables of FSFI, after controlling for the personal and social impact of COVID-19 Independent variables are levels of distress (No distress, Mild, Moderate and Severe) and the Relationship status X Cohabitation. With the use of Wilks' criterion, the effect of Relationship status X Cohabitation [Wilk's $\Lambda = .55$, $F(20, 302.76) = 2.96$, $p < .001$, partial $\eta^2 = .14$], and the levels of distress [Wilk's $\Lambda = .75$, $F(15, 251.61) = 1.84$, $p = .030$, partial $\eta^2 = .09$] were found to significantly affect the dimensions of female sexuality (see also Table 3).

In more detail, the type of cohabitation and relationship status affected all dimensions of female sexuality except for desire [Arousal: $F(4, 95) = 4.18$, $p < .01$, partial $\eta^2 = .15$, Lubrication: $F(4, 95) = 4.64$, $p < .01$, partial $\eta^2 = .16$, Orgasm: $F(4, 95) = 3.78$, $p < .01$, partial $\eta^2 = .14$ and Satisfaction: $F(4, 95) = 8.42$, $p < .001$, partial $\eta^2 =$

.26]. Overall, it seems that the highest levels are observed in singles cohabitating with someone and in partners living together. The same pattern was observed also for the levels of distress for all dimensions but desire [Arousal: $F(4, 95) = 4.75$, $p < .01$, partial $\eta^2 = .13$, Lubrication: $F(4, 95) = 4.73$, $p < .01$, partial $\eta^2 = .13$, Orgasm: $F(4, 95) = 3.62$, $p < .05$, partial $\eta^2 = .10$ and Satisfaction: $F(4, 95) = 4.12$, $p < .01$, partial $\eta^2 = .12$]. Lastly, the covariate COVID-19 personal life impact affected the dimensions of Lubrication [$F(1, 95) = 4.96$, $p < .05$, partial $\eta^2 = .05$] and Orgasm [$F(1, 95) = 4.47$, $p < .05$, partial $\eta^2 = .05$]. COVID-19 was only found to affect Lubrication and Orgasm but only with respect to the personal life impact (relationships with friends, family and partner). All the other effects and the interaction were not found significant.

Multivariate Analysis of Covariance (two-way MANCOVA) (male sexuality)

To investigate the effect of the type of cohabitation and relationship status (IV_1) and the type of distress (IV_2) on the male sexuality (DVs), a two-way MANCOVA was performed. The variables of COVID-19 personal life and social life impact were inserted as covariates to control for their effect.

First, the sample size across the groups of both independent variables were similar, allowing for meaningful comparisons and the dependent variables were found to be strongly correlated (*Pearson's* $r_{108} = .65$, $p < .001$) according to the criteria of Mukaka (2012). Pearson's correlation was applied, after checking for normality ($p > .05$) and linearity (deviation from linearity $p > .05$). In addition, the analysis was found mediocre sensitive (*effect size* $f^2 = 0.32$) with adequate statistical power (80%). For assessing univariate outliers, scores in both dependent variables were transformed into z-scores and it was found that three participants in no victimization and two participants in the low victimization group were exceeding 3 SDs (Cousineau & Chartier, 2010). For assessing multivariate outliers, Cook's distance was calculated, and it was found that all values were < 3 (Hair et al., 2010), thus no multivariate outliers were detected. Both assumptions for univariate and multivariate normality were assessed with the use of Shapiro-Wilk and were found to be satisfied, as for all study's variables $p > .05$. Last, the Box's M test showed equality of covariance, *Box's M* = 53.45, $p > .05$.

A two-way between-subjects MANCOVA was performed on five dependent variables of MSHQ, after controlling for the personal life impact and social life impact due to COVID-19 . Independent variables are levels of distress (No distress, Mild, Moderate and Severe) and the Relationship status X Cohabitation. With the use of Wilks' criterion, the effect of Relationship status X Cohabitation [Wilk's $\Lambda = .84$, $F(8, 170) = 4.39$, $p < .001$, partial $\eta^2 = .17$], the levels of distress [Wilk's $\Lambda = .84$, $F(6, 170) = 2.63$, $p = .018$, partial $\eta^2 = .09$] and the interaction between Relationship status X Cohabitation and levels of distress [Wilk's $\Lambda = .66$, $F(24, 170) = 1.66$, $p = .034$, partial $\eta^2 = .19$] were found to significantly affect the dimensions of male sexuality (see also Table 4). In more detail, the type of cohabitation and relationship status affected sexual satisfaction [$F(4, 86) = 7.49$, $p < .001$, partial $\eta^2 = .26$] but not erection [$F(4, 86) = 1.85$, $p = .128$, partial $\eta^2 = .08$]. It seems that partners living alone (without their partner) have the highest satisfaction compared to the rest of the groups. The reversed pattern was observed for the levels of distress as it was found to affect erection [$F(3, 86) = 4.66$, $p = .005$, partial $\eta^2 = .14$] but not satisfaction [$F(3, 86) = 1.68$, $p = .176$, partial $\eta^2 = .06$]. As expected, men who exhibit higher levels of distress also report lower levels of erectile function. Finally, the interaction of the two IVs was found to affect satisfaction [$F(12, 86) = 2.45$, $p = .009$, partial $\eta^2 = .26$] but not erection [$F(12, 86) = 0.98$, $p = .472$, partial $\eta^2 = .12$]. To further explore the interaction, a pseudo variable was created with 20 levels (5 levels of Type of cohabitation X Relationship status and 4 levels of distress) and inserted into a one-way ANOVA model with DV the male sexual satisfaction, with further use of the Bonferroni post-hoc test. Results showed that the biggest differences were observed between the different levels of distress in the group of partners' cohabitating with other than their partner. Those classified as suffering from mild distress reported less satisfaction than those without distress ($M_{difference} = 2.55$, $p = .001$) and than those with moderate levels of distress ($M_{difference} = 2.55$, $p = .006$). No other statistically significant differences were observed.

Table 3

Means, SDs and two-way MANCOVA results for female sexuality (FSFI)

		Levels of Distress (K10)				Two-way MANCOVA		
		No Distress	**Mild**	**Moderate**	**Severe**	**Effect**	***F***	**Partial η²**
Desire (FSFI)								
Relationship status X Cohabitation	Singles living alone	3.30 (0.42)	4.35 (1.24)	3.40 (1.25)	3.50 (1.88)	RSXC	$F(4,95) = 2.18$	.80
	Partners living alone	4.80 (0.11)	4.50 (2.12)	4.20 (0.49)	4.20 (0.34)	D	$F(3,95) = 2.15$	.06
	Partners living together	4.32 (0.91)	3.90 (1.12)	2.29 (1.03)	3.00 (1.22)	RSXC*D	$F(12,95) = 0.71$	.08
	Singles cohabitating	4.80 (0.84)	3.68 (1.71)	1.20 (0.00)	3.35 (1.43)	PLI (Cov)	$F(1,95) = 0.13$	<.01
	Partners cohabitating	4.20 (0.00)	4.68 (0.66)	4.80 (0.00)	4.20 (1.82)	SLI (Cov)	$F(1,95) = 0.41$	<.01
Arousal (FSFI)								
Relationship status X Cohabitation	Singles living alone	3.60 (1.70)	3.15 (2.46)	2.10 (2.67)	2.70 (1.81)	RSXC	$F(4,95) = 4.18^{**}$	.15
	Partners living alone	4.80 (0.85)	4.80 (0.42)	3.45 (2.41)	4.80 (0.84)	D	$F(3,95) = 4.75^{**}$	.13
	Partners living together	5.04 (0.52)	4.63 (0.88)	2.35 (1.44)	3.77 (1.62)	RSXC*D	$F(12,95) = 1.04$	.12
	Singles cohabitating	5.70 (0.42)	1.73 (2.39)	-	2.63 (2.06)	PLI (Cov)	$F(1,95) = 6.70^{*}$	.07
	Partners cohabitating	5.70 (0.00)	4.74 (0.86)	5.10 (0.00)	3.60 (2.10)	SLI (Cov)	$F(1,95) = 3.17$	.03
Lubrication (FSFI)								
Relationship status X Cohabitation	Singles living alone	3.90 (2.12)	3.68 (2.28)	2.60 (2.88)	2.20 (1.74)	RSXC	$F(4,95) = 4.64^{**}$	.16
	Partners living alone	4.95 (1.06)	4.95 (0.64)	3.53 (2.43)	4.35 (0.64)	D	$F(3,95) = 4.73^{**}$	.13
	Partners living together	5.52 (0.48)	4.76 (0.73)	2.84 (1.63)	3.96 (1.60)	RSXC*D	$F(12,95) = 0.77$	.09
	Singles cohabitating	4.95 (1.48)	1.80 (2.55)	-	2.68 (2.19)	PLI (Cov)	$F(1,95) = 4.96^{*}$	.05
	Partners cohabitating	6.00 (0.00)	5.04 (0.65)	4.80 (0.00)	3.70 (2.06)	SLI (Cov)	$F(1,95) = 3.17$	.03
Orgasm (FSFI)								
Relationship status X Cohabitation	Singles living alone	4.00 (1.70)	3.70 (2.36)	3.87 (1.15)	2.73 (2.12)	RSXC	$F(4,95) = 3.78^{**}$	.14
	Partners living alone	5.20 (0.57)	4.40 (1.13)	3.60 (2.55)	4.60 (0.85)	D	$F(3,95) = 3.62^{*}$	.10
	Partners living together	5.25 (0.50)	4.80 (0.90)	3.02 (1.64)	4.17 (1.53)	RSXC*D	$F(12,95) = 1.15$	.13
	Singles cohabitating	5.40 (0.85)	1.60 (2.33)	-	2.77 (2.19)	PLI (Cov)	$F(1,95) = 4.47^{*}$	.05
	Partners cohabitating	6.00 (0.00)	4.80 (0.40)	5.20 (0.00)	2.73 (2.08)	SLI (Cov)	$F(1,95) = 2.91$	.03
Satisfaction (FSFI)								
Relationship status X Cohabitation	Singles living alone	2.20 (1.41)	2.60 (2.28)	2.53 (1.97)	1.53 (1.61)	RSXC	$F(4,95) = 8.42^{***}$	.26
	Partners living alone	5.20 (0.57)	4.00 (1.13)	3.00 (2.08)	4.60 (0.85)	D	$F(3,95) = 4.12^{**}$	.12
	Partners living together	5.23 (0.35)	4.63 (0.85)	3.09 (1.51)	3.74 (1.60)	RSXC*D	$F(12,95) = 1.10$	.12
	Singles cohabitating	5.20 (0.57)	1.75 (2.16)	-	2.10 (1.75)	PLI (Cov)	$F(1,95) = 2.93$	.03
	Partners cohabitating	5.60 (0.00)	4.80 (0.57)	4.80 (0.00)	3.60 (2.02)	SLI (Cov)	$F(1,95) = 3.17$	.03

*Note. RSXC = Relationship status X Cohabitation, D = Distress (K10), RSXC*D = Relationship status X Cohabitation * Distress (K10), PLI = Personal Life Impact (covariate), SLI = Social Life Impact (covariate). MANCOVA model results: Relationship status X Cohabitation [Wilk's Λ = .55, $F(20, 302.76) = 2.96$, $p < .001$, partial $\eta^2 = .14$], Distress [Wilk's Λ = .75, $F(15, 251.61) = 1.84$, $p = .030$, partial

η^2 = .09], Relationship status X Cohabitation * Distress [Wilk's Lambda = 0.58, F(60, 429.90) = 0.90, p = .693, partial η^2 = .10], COVID-19 personal life impact [Wilk's Lambda = 0.92, F(5, 91) = 1.55, p = .182, partial η^2 = .08] and COVID-19 social life impact [Wilk's Lambda = 0.97, F(5, 91) = 0.62, p = .654, partial η^2 = .04]. ***p<.001, **p<.01, *p<.05

Table 4

Means, SDs and two-way MANCOVA results for male sexuality (MSHQ)

		Levels of Distress (K10)				Two-way MANCOVA		
		No Distress	**Mild**	**Moderate**	**Severe**	**Effect**	***F***	**Partial η^2**
Erection (MSHQ)								
Relationship status X Cohabitation	Singles living alone	4.00 (2.24)	3.58 (2.41)	4.60 (0.60)	1.52 (1.81)	RSXC	F(4,86) = 1.85	.08
	Partners living alone	4.80 (0.30)	5.00 (0.00)	5.00 (0.00)	4.83 (0.24)	D	F(6,86) = 4.66**	.14
	Partners living together	4.85 (0.34)	4.56 (0.94)	3.67 (1.69)	2.40 (2.42)	RSXC*D	F(12,86) = 0.98	.12
	Singles cohabitating	3.42 (2.14)	4.67 (0.47)	4.00 (0.00)	3.33 (2.89)	PLI (Cov)	F(2,86) = 3.01	.03
	Partners cohabitating	4.95 (0.12)	4.83 (0.24)	4.58 (0.63)	3.42 (2.36)	SLI (Cov)	F(2,86) = 0.92	.01
Satisfaction (MSHQ)								
Relationship status X Cohabitation	Singles living alone	2.32 (2.20)	2.90 (1.94)	4.20 (0.63)	1.17 (1.83)	RSXC	F(4,86) = 7.49***	.26
	Partners living alone	4.56 (0.88)	5.00 (0.00)	4.00 (0.00)	4.40 (0.28)	D	F(3,86) = 1.61*	.06
	Partners living together	4.39 (0.69)	4.10 (0.77)	2.66 (1.50)	3.36 (2.15)	PLI*D	F(12,86) = 2.45**	.26
	Singles cohabitating	1.75 (1.67)	0.00 (0.00)	3.60 (0.00)	1.93 (1.90)	SLI (Cov)	F(1,86) = 1.72	.02
	Partners cohabitating	4.50 (0.44)	3.90 (1.27)	4.50 (0.76)	3.55 (0.44)	CTS (Cov)	F(1,86) = 0.20	<.01

*Note. RSXC = Relationship status X Cohabitation, D = Distress (K10), RSXC*D = Relationship status X Cohabitation * Distress (K10), PLI = Personal Life Impact (covariate), SLI = Social Life Impact (covariate). MANCOVA model results: Relationship status X Cohabitation [Wilk's Λ = .69, F(8, 170) = 4.39, p < .001, partial η^2 = .17], Distress [Wilk's Λ = .84, F(6, 170) = 2.63, p = .018, partial η^2 = .09], Relationship status X Cohabitation * Distress [Wilk's Lambda = 0.66, F(24, 170) = 1.66, p = .034, partial η^2 = .19], Personal Life Impact [Wilk's Lambda = 0.97, F(2, 85) = 1.55, p = .218, partial η^2 = .04] and Social Life Impact [Wilk's Lambda = 0.99, F(2, 85) = 0.47, p = .630, partial η^2 = .01]. ***p<.001, **p<.01, *p<.05

Discussion

People's current limitation of freedom and independence, combined with isolation, economic difficulties, and a general distressed environment seem to have affected mental health and by extension interpersonal relations. The present research focused on the COVID-19 pandemic influence on the sexual life of couples, as well as the sexual behavior of single women and men. It was found that COVID-19 affected Greek people's sexual behavior, interacting with the type of cohabitation and the relationship status. The time that people spent together during that period and the global impact of COVID-19 were used as covariates. Every dimension of female sexuality but Desire was affected by distress, the type of cohabitation and relationship status; women cohabitating with their partner or someone else were influenced the most. In addition, COVID-19 affected Lubrication and Orgasm but only as a consequence of the time spent together with people from personal life (personal life impact) rather than the global impact of the pandemic (social life impact). With respect to men, sexual satisfaction was affected by the type of cohabitation and relationship status; men living without their partner reported higher levels of satisfaction during intercourse. On the other hand, it shows that the type of cohabitation and the relationship status did not affect erectile function but this way rather influenced solely by psychological distress.

Furthermore, distress affected most of the participants of this research (on average they had a mild mental disorder possibly related to COVID-19 pandemic), influencing both women's and men's sexual behavior but mainly in regards to the perceived impact on the time spend with other person not through the general global impact of COVID-19. In Naser et al.'s (2020) investigation, it was thoroughly discussed that social distancing leads to feelings of boredom and loneliness resulting in high levels of anxiety. Ibarra et al. (2020) claimed that depression and anxiety could affect sexual behavior in many ways even reducing general sexual desire; a finding further supported in the present study as most of female sexuality dimensions were also affected.For women, all the other effects and interactions concerning Desire, Arousal and Satisfaction were however not found significant. Distress influenced only two sexual dimensions of Greek women, while according to Panzeri et al. (2020) Italian women are affected in several different ways. Desire, Arousal and Satisfaction were all lower among Italians during the period of lockdown, while the main causes that influenced their sexuality appeared to be disturbing thoughts, lack of privacy, and stress (Panzeri et al., 2020; Schiavi et al., 2020).

At the same time, regarding the male population of the current study, it was proved that the levels of distress affected Erection and not Satisfaction, which means that lower erectile function is linked to higher levels of distress. On the other hand, according to Wignall et al. (2021), the fact that casual sex has been significantly reduced due to restrictions in mobility and the high risk for COVID-19 infection, increased anxiety negatively influenced satisfaction. Nonetheless, in other counties like Germany, men's satisfaction remained the same during that period, while also intercourse frequency increased because of the psychological pressure (Mumm et al., 2021). According to Mumm et al. (2021), this increase was partially a result of boredom and a way to keep oneself busy to pass time. In case of Greek male population distress was found to affect only erectile function, while as detailed below psychological stressors has different affect in interaction with cohabitation and relationship status.

Apart from the various ways COVID-19 factors regulating female and male sexual function, the type of cohabitation and relationship status were also found to modify female and male sexuality. For women, the living conditions (living alone or with their partners/friends/parents), and the relationship status (singles or partnered) affected their sexual behavior. Single women that cohabitate with their partner or with someone else were shown to be affected the most, especially regarding all dimensions of female sexuality apart from Desire. In Turkey, during COVID-19 pandemic, sexual desire and frequency of intercourse increased greatly, although quality of one's sexual life declined significantly (Yuksel & Ozgor, 2020). Findings like Lopes et al.'s research (2020) proved that partners that live together face negative consequences on their sexual lives. More specifically, according to Wignall et al. (2021) assertion, everyday cohabitation could convert intercourse into a boring routine. The fact that cohabitation and forced continuous presence in the same place creates more responsibilities (household duties, childcare for parents, shared costs and several other issues) partners tend to focus more on these responsibilities, at the expense of their sexual needs which are usually neglected (Pietromonaco & Overall, 2021). COVID-19 pandemic had a significant impact on the quality of sexual life and the frequency of intercourse in other countries as well, such as Poland (Fuchs et al., 2020). Polish women who live with their parents had the most influence on every aspect of their sexual activity, followed by those who live alone, and finally those who live with their partner and a child (Fuchs et al., 2020). Overall, sexual behavior of Greek women seems to be influenced by factors that increase the distress, but they are also influenced by relationship and cohabitation status.

Simultaneously, men's sexual behavior was affected by the type of cohabitation and their relationship status but also distress. This is proved since men that are living alone appeared to have more Satisfaction during sex compared to the rest of the groups. A research conducted in China (Li et al., 2020) proved that men's sexual activity and satisfaction had significantly declined, while sexual behavior was affected by poor sexual desire and unpleasant partner relationships. According to Eleuteri & Terzitta (2021), the limitation of mobility and the cohabitant quarrels have weakened couples' relationship, a finding that was also observed in Greece where the living situation was found to influence the sexual behavior. In research from Luetke et al. (2020) conducted in the United States, it was clear that overfamiliarity between partners living together can reduce sexual desire, hence strategies that balance connection with personal autonomy and self-differentiation were suggested. Meanwhile, Ibarra et al.'s (2020) research that was conducted in Iran, Italy and Spain stated that partners who live separately could be influenced either way: negatively by weakening the bonds between them or positively by renewing their sexual routine. In Germany, men indicated no significant changes in satisfaction levels, despite the considerable increase in sexual intercourse (Mumm et al., 2021). In general, there was not a substantial difference concerning Germans' satisfaction with the recent sexual life status and their satisfaction before the pandemic (Mumm et al., 2021). Last but not least, in this research men's satisfaction was slightly influenced negatively but only for those who had mild distress, and they were cohabitating with someone other than their partner. Panzeri et al. (2020) claimed that during the lockdown, people's sexual lives were further influenced by personal emotions and psychological challenges than by specific aspects of the couple's relationship. In the present research, it appeared that both psychological and relationship factors affected men's sexual behavior.

Limitations and recommendations for future studies

This survey was conducted online, and participation was anonymous to ensure spontaneous and honest responses; however even self-reported measurements online have been criticized for their response validity (Kreuter et al., 2008) due to a number of factors, such as sensitivity of the items and the circumstances under which participants responded. Furthermore, the number of scales used to investigate female and male sexuality were not similar; five as opposed to two respectively. As the present study did not aim at clinical population, many scales were discharged, such as Pain (FSFI) and Ejaculation (MSHQ); future studies could also include the rest of the scales for comparing general and clinical populations and additional measures for assessing men's sexuality such as desire. Also, further research should investigate the sexual behavior of the Greek population using additional measures to see if COVID-19 has influenced the sexual behavior of minorities including persons with special needs and psychiatric disorders.

Conclusion and practical implications

In this study, it is obvious that psychological difficulties are negatively affecting the relationships and the sexual behavior of both women and men. The average of participants had a mild mental disorder that is related to the COVID-19 pandemic, and influences couples' and singles' overall sexual function. Women's sexual behavior is strained by distress while cohabitation and relationship status influence all dimensions of sexuality apart from Desire. Single women who cohabitate with someone or with their partners are the most influenced. Meanwhile, men's erectile dysfunction is associated with higher levels of distress, while sexual behavior in total is affected apart from distress factors by the relationship and cohabitation status. Cohabitation status influences men's sexual satisfaction but not erectile function. Based on these results and as the pandemic is still ongoing, it is imperative to enhance communication along with conflict resolving strategies between the partners and to reconsider crucial phenomena, such as personal space and privacy. More studies, both quantitative and qualitative aimed at Greek population are required to further comprehend the complicated dynamics that influence intimate and sexual encounters in the dawn of a new reality during and in the post-COVID era.

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ΕΜΠΕΙΡΙΚΗ ΕΡΓΑΣΙΑ | RESEARCH PAPER

Οι μάσκες δεν φιλιούνται. Η επίδραση της COVID-19 στην σεξουαλική συμπεριφορά των Ελλήνων ανδρών και γυναικών

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ΣΤΟΙΧΕΙΑ ΕΠΙΚΟΙΝΩΝΙΑΣ

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ΠΕΡΙΛΗΨΗ

Η COVID-19 επηρέασε τη συναισθηματική κατάσταση καθώς και τη σεξουαλική συμπεριφορά των ανθρώπων σε όλον τον κόσμο εξαιτίας των συνθηκών κοινωνικής απομόνωσης, των περιορισμών της καραντίνας αλλά και των οικονομικών επιπτώσεων. Η παρούσα ποσοτική έρευνα εξετάζει την επίδραση της COVID-19 στην σεξουαλική συμπεριφορά του ελληνικού πληθυσμού, λαμβάνοντας υπόψη τη ψυχική δυσφορία, τον τύπο συγκατοίκησης και την οικογενειακή κατάσταση. Μία σειρά από ερωτηματολόγια χορηγήθηκε σε 221 Έλληνες, γυναίκες και άντρες, σε σχέση ή χωρίς, με σκοπό να μελετηθεί ο τρόπος που η COVID-19 έχει συμβάλλει στην ψυχική δυσφορία τους και έχει επηρεάσει τη σεξουαλική συμπεριφορά τους. Η μέθοδος που χρησιμοποιήθηκε είναι μία παραγοντική (με τρεις ανεξάρτητες μεταβλητές) πολυμεταβλητή ανάλυσης συνδιακύμανσης. Σύμφωνα με τα αποτελέσματα η πανδημία της COVID-19 επηρέασε αρνητικά τα επίπεδα ψυχικής δυσφορίας και τη σεξουαλική συμπεριφορά γυναικών και αντρών. Στην πλειοψηφία των συμμετεχόντων βρέθηκαν ήπια επίπεδα δυσφορίας τα οποία συνδέονται με την COVID-19 και επηρεάζουν τη συνολική σεξουαλική συμπεριφορά. Ταυτόχρονα, ο τύπος συγκατοίκησης συνδέεται άμεσα με τη σεξουαλική λειτουργία, ενώ η οικογενειακή κατάσταση επηρεάζει και τις γυναίκες και τους άντρες με διαφορετικό όμως τρόπο. Στο μέλλον θα μπορούσε να μελετηθεί η σεξουαλική συμπεριφορά του ελληνικού πληθυσμού χρησιμοποιώντας διαφορετικές μετρήσεις όσον αφορά την πιθανή συναισθηματική επιρροή του COVID-19, όπως επίσης να ερευνηθεί η σεξουαλική συμπεριφορά ατόμων με ειδικές ανάγκες και ψυχικές διαταραχές.