BMC Psychology

RESEARCH

Open Access

Risk perception and coping mechanisms by gender identity and education level during the COVID-19 syndemic in Spain

Matthew Bennett[1,2,3], Tomàs López-Jiménez[1,4], Laura Medina-Perucha[1,3,4], Brenda Biaani León-Gómez[5,6], Anna Berenguera[1,3,4,7] and Constanza Jacques-Aviñó[1,3,4*]

Abstract

Background It is important to have a detailed understanding of the association between risk perception, coping mechanisms, and mental health outcomes during the COVID-19 syndemic across axes of inequity such as gender identity and education level.

Methods We conducted a cross-sectional study among 2,066 adults (≥ 18 years) living in Spain via an online survey from April 8 to May 28, 2021. Anxiety and depression were the main outcomes considered to assess mental health, measured with the Generalized Anxiety Disorder 7 item (GAD-7) and Patient Health Questionnaire 9 item (PHQ-9), respectively. We analyzed the distribution of anxiety and depression levels across risk perception and coping mechanism variables, stratifying by gender identity and education level.

Results Anxiety and depression levels were associated with age in a gradient fashion, with the 18–30 age group reporting the highest anxiety levels in both women (aOR: 3.11, 95% CI: 1.57–6.17) and men (aOR: 4.92, 1.90–12.74). This gradient was maintained especially in individuals with university level studies. For women, higher anxiety levels were associated with perceived risk in meeting up with friends and family (aOR: 1.73, 1.12–2.67) and being out in public (aOR 2.98, 2.15–4.14), whereas men perceived more risk in occupying closed public spaces and using public transportation (e.g., aOR: 2.14, 95% CI: 1.09–4.22). Connecting with friends and family was the most effective coping mechanism. In general, women reported more effective coping mechanisms than men and findings were strongest in the population with university level studies. Likewise, men with university level studies reported more effective coping mechanisms than men without university level studies.

Conclusions Women and men with university level studies reported higher risk perception and more effective coping mechanisms during the COVID-19 syndemic than individuals without a university level education. These findings reveal possible strategies for primary care and public health agencies to follow to improve mental health outcomes along different axes of inequity, especially in the case of future syndemics and public health crises.

Keywords Educational level, Social class, Health inequities, Mental health

*Correspondence:
Constanza Jacques-Aviñó
cjacques@idiapjgol.org
Full list of author information is available at the end of the article

Background

During the first quarter of 2021, Spain was implementing numerous restrictions in order to control and contain the spread of COVID-19, including restricted mobility between regions and closures to bars, restaurants, sporting, cultural, and leisure facilities [1]. These restrictions exacerbated pre-existing social inequities in mental and physical health outcomes, triggering a spike in mental health symptoms with differential outcomes along axes of social inequity [2, 3]. For example, mobility restrictions forced people to remain at home, where inequitable housing conditions disproportionately harmed the mental and physical health of the most oppressed populations [4]. Evidence shows that women [3, 5], individuals of a low socioeconomic status (SES) [3, 6], and younger adults [3] have had worse mental health outcomes throughout the COVID-19 syndemic.[1]

The COVID-19 syndemic and the resulting public health restrictions have influenced individuals' perceived risk in activities which previously did not require much forethought, such as occupying public spaces or meeting up with friends and family. Risk perception can motivate preventive behavior, such as adherence to preventive health measures [7], though extreme fear or perceived risk due to lack of awareness may have the reverse effect [8, 9]. Gender, education level, and SES are important axes which have historically influenced risk perception and the protective health measures which individuals were able to adopt during past health crises [10, 11]. For example, during the H1N1 pandemic, women were more willing and likely to adopt protective health measures than men [10] while lower SES was associated with lower risk perception and lower compliance with protective measures [11]. Therefore, different populations may understand and internalize the stress of a syndemic in differing ways as a result of their sociostructural circumstances.

To manage the psychological stress which has accompanied the COVID-19 syndemic, individuals consciously or unconsciously use coping mechanisms. Coping is defined as the cognitive and behavioral efforts adopted to reduce unpleasant emotions and minimize stress, a process which ultimately depends on the context and resources available to each individual [12]. There are many different classifications of coping mechanisms: such as problem-focused, emotion-focused, social support, avoidance, or meaning making, all of which have advantages and disadvantages. For example, problem-focused coping mechanisms which aim to address and resolve stress may be more beneficial to mental health in the long run [13]. Alternatively, avoidance may result in short-term stress reduction, while increasing stress and harming mental health over time [14].

Coping does not depend merely on individual choices and mechanisms. Individuals live in social contexts where structural and material determinants and axes of inequity such as gender identity, education level, and SES influence coping during times of psychological stress. The social construct of the gender binary affords women the social permission to be more sensitive and emotionally expressive and, as a result, women may be more likely to employ emotion-focused coping mechanisms [15, 16]. Men, on the other hand, tend to use problem-focused coping mechanisms or emotional inhibition as a result of the social expectations of hegemonic masculinity [16, 17]. Furthermore, SES determines the time, resources, and energy that can be devoted to coping, thus especially influencing what individuals of a low SES can do to cope [18]. Studies on coping during the COVID-19 syndemic have consistently identified coping via social support as a protective factor for mental health [19–21]. Social connection and support were associated with improved mental health outcomes among Australian [20] and German [21] healthcare workers. On the other hand, problem-, avoidant- or emotion-focused coping mechanisms were not associated with mental health improvements during the COVID-19 lockdown in the United Kingdom (UK) [19].

To our knowledge, few studies have used gender-based approaches or taken into account SES when analyzing and understanding differing risk perceptions or the specific coping mechanisms employed during the COVID-19 syndemic that may harm or protect against negative mental health outcomes. It is important to take both of these axes of inequity into account to understand the association between risk perception, coping mechanisms, and mental health in as much detail as possible. Understanding potential differences along these axes is important for social justice and health equity: the COVID-19 syndemic has shown that protecting the health and safety of the most at-risk groups is vital for protecting community health and safety as a whole, which is an important pillar of the field of public health [22]. To that end, our study aimed to analyze the association between risk perception, coping mechanisms, and mental health outcomes during the COVID-19 syndemic in Spain while considering possible differences across the axes of gender and education level.

[1] As a research team, we view epidemiology, social and citizen sciences, and biomedical research as inherently political tools that can be used to advance social justice and equity [66–68]. Thus, we have chosen to reflect on and identify COVID-19 as a syndemic [23]. to highlight the importance of exploring the many ways that COVID-19 has impacted society, while giving special attention to its intersection with social identity, axes of social inequity, and other diseases, both mental and physical [69].

Methods

This study forms part of a larger, ongoing project about the psychosocial impact of the COVID-19 syndemic being conducted in Spain and several Latin American countries (Brazil, Ecuador, Mexico, Peru, and Chile) [3, 23].

Study design and population

We designed a cross-sectional study among adults (≥18 years) living in Spain. To collect the data for this study, an online survey was conducted between April 8 and May 28, 2021. Data were stored and managed using REDCap (Research Electronic Data Capture), an electronic data capture tool. REDCap is a secure, web-based software platform designed to collect data for research studies, providing: 1) an intuitive interface for data collection; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for data integration and interoperability with external sources [24, 25].

Study participants were recruited using online platforms, social media, contact with community-based organizations, including mental healthcare advocacy groups and social services throughout Spain, and snowball sampling. First, the survey was piloted among a diverse population. On average, it took 10 min to answer all the questions, which was specified on the first page of the survey. Data collection ceased when mobility restrictions were lifted and travel between regions of Spain was allowed by Spanish authorities, beginning with the end of the national state alarm on May 9, 2021. After the national state of alarm was lifted, though mobility restrictions ended, restrictions to the capacity of bars, restaurants, and indoor sports and cultural facilities remained in place [26]. Given that the evolving sociopolitical context would inevitably shape our findings, the study was specifically designed to examine how these contextual factors during the defined period of the COVID-19 syndemic influenced mental health and coping mechanisms during this period of the syndemic.

Study variables

Anxiety and depression were the main outcomes considered to assess mental health. The Generalized Anxiety Disorder 7-item (GAD-7) and the Patient Health Questionnaire 9-item (PHQ-9) were used to measure symptoms of anxiety and depression, respectively. The Spanish-language versions of both of these measures have been validated in Spanish-speaking populations in various contexts [27–29]. These scales are symptom-based and self-administered, which makes them particularly suitable for studies like ours, as their effectiveness has been widely demonstrated. Symptom severities are categorized as normal [1–4], mild [5–9], moderate [10–14], or severe (15+), following currently accepted categorizations [30, 31]. For our analyses, we dichotomized the scales, categorizing individuals with moderate or severe levels of anxiety and/or depression as having anxiety or depression, which helped enhance the statistical analyses and align with our focus on more clinically significant cases.

Our team understands gender identity as an individual's personal experience and presentation of their gender [32]. In our survey, participants selected their gender identity from the options: woman, man, non-binary, or other. We also collected data on sex assigned at birth to cross-check with gender identity in order to identify transgender respondents (those whose gender identity does not correspond to their sex assigned at birth). Due to the small sample size of non-binary and gender-diverse participants (n=39, 1.9% of total respondents), these individuals were excluded from the current study, as the limited sample size restricted the statistical power for meaningful analysis. However, we plan to conduct a separate analysis of LGBTQI+participants, including transgender respondents, in the future, employing methodologies that will allow for a more in-depth exploration of this population. All other participants aged 18 years or older, and residing in Spain, were included. Final analyses were therefore stratified by binary gender identity (cisgender women and men).

Our study considered the following independent variables as sociodemographic variables: age, birthplace, education level, receiving mental health treatment since the start of the syndemic, and current work status. We used individual educational level as a proxy variable for SES. Educational level is a commonly used proxy for SES, as higher levels of education are associated with better economic and psychological outcomes (i.e., more income, and more social power) in western countries, including Spain [33, 34]. The educational levels collected by the survey included no formal education, primary education, secondary education, vocational training, university or higher education, other, or not sure. We further dichotomized educational level into individuals with and without university level studies.

In this study, we assessed risk perception by asking participants to rate their level of concern regarding specific activities during the COVID-19 pandemic. These activities included using public transportation, visiting public spaces, and meeting with friends and family. Participants rated their concern on a 5-point Likert scale ranging from 'not concerned at all' to 'very concerned,' enabling us to capture the perceived risks associated with each activity. Additionally, we inquired about the coping

mechanisms participants utilized, such as connecting with friends and family, exercising, practicing yoga or meditation, watching movies or television, and engaging with nature, among others. To assess the frequency of these coping mechanisms and behaviors, participants responded to the question, "During the pandemic, have you altered the frequency with which you engage in these activities?" with the options "I don't partake," "increased activity," "maintained the same activity," or "decreased activity."

Understanding risks conceptually as collective and personal is aligned with existing literature, where risks to others (e.g., potential transmission to vulnerable populations) were classified as collective, and risks to one's own health (e.g., self-isolation or reducing personal social activities) were categorized as personal risks [35–37]. Specific survey items were framed according to these categories, such as "avoiding large gatherings" in the collective risk category and "self-isolation" in the personal risk category.

Data analysis

First, a descriptive analysis was performed stratifying by binary gender identity (cisgender women and men). Then, the distribution of anxiety and depression levels was analyzed across the aforementioned sociodemographic, risk perception, and coping mechanism variables, stratifying only by gender identity (cisgender women and men). Finally, the distribution of anxiety and depression was analyzed across the sociodemographic, risk perception, and coping mechanism variables while stratifying by education level (university level studies and non-university level studies) in addition to gender identity. Differences between groups were assessed using a two-tailed chi-square test. A Mann–Whitney U-test was used to test differences by age. Then, logistic regression models including the aforementioned variables were used to calculate odds ratios, given the binary nature of the outcome variables. All analyses were performed using Stata 17.0.

Ethical considerations

The study was designed in accordance with the Guide to Good Practice in Health Science Research and the principles of the Declaration of Helsinki of the World Medical Association. It was approved by the Clinical Research Ethics Committee of the IDIAPJGol (Project approval code: 20/063-PCV). Participant confidentiality was ensured and maintained throughout the entirety of the project. The submission of the questionnaire served as the individual consent to participate in the study.

Results

Descriptive analysis

Our study sample included 2,066 individuals, of whom 73.5% identified as women and 26.5% identified as men. 33.4% and 26.5% of our total study sample reported moderate to severe anxiety levels and depression, respectively, with a higher percentage of women than men reporting anxiety (35.2% vs. 28.3% of women versus men, respectively) and depression (28.4% versus 21.2% of women versus men, respectively). The median age of the population was 46 years (IQR: 35–55), with 89.5% of the population being born in Spain. 81.4% of the population had university level studies, corresponding to 82.7% and 77.9% of women and men, respectively. 23.7% of the population had received mental health treatment since the start of the syndemic, 26.2% and 17.0% of women and men, respectively. 12.4% of the population was not receiving income via formal or self-employment or retirement pension at the time of the study. The full population descriptive can be found in Table 1.

The settings in which the greatest proportion of our study sample perceived the greatest risk were when occupying closed public spaces (including using public transportation) (56.6%) and while being out in public (57.7%). The most frequently employed coping mechanisms among our study sample were connecting with friends and family (74.4%), performing physical activity (69.5%) and watching movies and television (67.3%). More women than men connected with friends and family to cope (76.2% and 69.7% of women and men, respectively), whereas more men than women used physical activity to cope (67.7% and 74.5% of women and men, respectively).

Anxiety and depression by gender

The 18–30 age group reported the highest anxiety levels in both women (aOR: 3.11, 95% CI: 1.57–6.17) and men (aOR: 4.92, 95% CI: 1.90–12.74) (Table 2). The 31–50 age group also reported significantly high anxiety levels in both women (aOR: 2.50, 1.31–4.74) and men (aOR: 2.99, 1.26–7.10) For both genders, there is an inverse effect gradient by age: the younger the age group, the higher the reported anxiety and depression levels. Not being formally employed was associated with higher depression levels in men (aOR: 2.01, 1.01–3.99) (Table 3).

Greater perceived risk in occupying closed public spaces (including using public transportation) was associated with higher anxiety (aOR: 2.14, 1.09–4.22) and depression (aOR: 3.29, 1.42–7.64) levels only in men, whereas greater perceived risk in meeting up with friends and family ($aOR_{anxiety}$: 1.73, 1.12–2.67 and $aOR_{depression}$: 2.14, 1.30–3.52) and being out in public ($aOR_{anxiety}$: 2.98, 2.15–4.14 and $aOR_{depression}$: 2.38, 1.70–3.34) were associated with higher anxiety and depression levels only in

Table 1 Mental health scale, sociodemographic characteristics, risk perception, and coping mechanisms of participants by binary gender identity (cis-women and cis-men) ($N = 2,066$)

	Women ***N*** **= 1,518 (73.5%)**	**Men** ***N*** **= 548 (26.5%)**	**Total** ***N*** **= 2,066**	***p*-value**[a]
Mental Health				
GAD-7 (anxiety)				
Normal/mild	980 (64.8%)	392 (71.7%)	1372 (66.6%)	0.004*
Moderate/severe	532 (35.2%)	155 (28.3%)	687 (33.4%)	
PHQ-9 (depression)				
Normal/Mild	1049 (71.6%)	419 (78.8%)	1468 (73.5%)	0.001*
Moderate/Severe	417 (28.4%)	113 (21.2%)	530 (26.5%)	
Sociodemographic Characteristics				
Age				
18–30 years	259 (17.1%)	100 (18.2%)	359 (17.4%)	< 0.001*
31–50 years	731 (48.2%)	208 (38.0%)	939 (45.5%)	
51–64 years	449 (29.6%)	185 (33.8%)	634 (30.7%)	
> = 65 years	79 (5.2%)	55 (10.0%)	134 (6.5%)	
Median (p25-p75)	45 (35–54)	48 (35–56)	46 (35–55)	0.009[1],*
Birthplace				
Spain	1349 (88.9%)	500 (91.2%)	1849 (89.5%)	0.120
Other countries	169 (11.1%)	48 (8.8%)	217 (10.5%)	
Education level				
University	1255 (82.7%)	426 (77.9%)	1681 (81.4%)	0.011*
Secondary	239 (15.8%)	104 (19.0%)	343 (16.6%)	
Primary	23 (1.5%)	17 (3.1%)	40 (1.9%)	
Received mental health treatment since the start of the syndemic				
No	1117 (73.8%)	455 (83.0%)	1572 (76.3%)	< 0.001*
Yes	396 (26.2%)	93 (17.0%)	489 (23.7%)	
Current work status				
Employed/retired/ self-employed	1328 (87.6%)	480 (87.8%)	1808 (87.6%)	0.926
Unemployment/informal employment/ unemployed/ housekeeping/student	188 (12.4%)	67 (12.2%)	255 (12.4%)	
Risk Perception				
Occupying closed public spaces and using public transportation				
Not at all/a little	291 (19.3%)	114 (21.0%)	405 (19.8%)	0.679
Moderately	355 (23.6%)	128 (23.6%)	483 (23.6%)	
Very much/ considerably	858 (57.0%)	300 (55.4%)	1158 (56.6%)	
Meeting with friends and family				
Not at all/a little	446 (29.5%)	213 (39.1%)	659 (32.0%)	< 0.001*
Moderately	517 (34.2%)	149 (27.3%)	666 (32.4%)	
Very much/ considerably	550 (36.4%)	183 (33.6%)	733 (35.6%)	
Being out in public				
Not at all/a little	269 (17.7%)	106 (19.4%)	375 (18.2%)	0.664
Moderately	366 (24.1%)	132 (24.2%)	498 (24.2%)	
Very much/ considerably	881 (58.1%)	308 (56.4%)	1189 (57.7%)	

Table 1 (continued)

	Women *N* = 1,518 (73.5%)	Men *N* = 548 (26.5%)	Total *N* = 2,066	*p*-value[a]
Coping Mechanisms				
Connecting with friends & family				
No	362 (23.8%)	166 (30.3%)	528 (25.6%)	0.003*
Yes	1156 (76.2%)	382 (69.7%)	1538 (74.4%)	
Physical activity				
No	490 (32.3%)	140 (25.5%)	630 (30.5%)	0.003*
Yes	1028 (67.7%)	408 (74.5%)	1436 (69.5%)	
Yoga/meditation				
No	1117 (73.6%)	493 (90.0%)	1610 (77.9%)	< 0.001*
Yes	401 (26.4%)	55 (10.0%)	456 (22.1%)	
Watching movies/TV shows				
No	502 (33.1%)	173 (31.6%)	675 (32.7%)	0.521
Yes	1016 (66.9%)	375 (68.4%)	1391 (67.3%)	
Gaming				
No	1213 (79.9%)	395 (72.1%)	1608 (77.8%)	< 0.001*
Yes	305 (20.1%)	153 (27.9%)	458 (22.2%)	
Nature				
No	839 (55.3%)	310 (56.6%)	1149 (55.6%)	0.600
Yes	679 (44.7%)	238 (43.4%)	917 (44.4%)	
Reading				
No	709 (46.7%)	262 (47.8%)	971 (47.0%)	0.657
Yes	809 (53.3%)	286 (52.2%)	1095 (53.0%)	
Listening to music/dancing/singing				
No	746 (49.1%)	255 (46.5%)	1001 (48.5%)	0.295
Yes	772 (50.9%)	293 (53.5%)	1065 (51.5%)	

[a] Except othewise noted, *p*-values derived from Chi-square test

[1] Mann-Whitney U test

[*] Indicates statistical significance, $p < 0.05$

women. There were no coping mechanisms that were associated with lower anxiety or depression levels for men. Coping through connecting with friends and family ($aOR_{anxiety}$: 0.55, 0.42–0.72 and $aOR_{depression}$: 0.62, 0.47–0.83) and by performing physical activity ($aOR_{anxiety}$: 0.67, 0.53–0.87 and $aOR_{depression}$: 0.59, 0.46–0.77) were associated both with lower anxiety and depression levels in women. Reading (aOR: 0.78, 0.62–0.99) and listening to music, dancing, or singing (aOR: 0.75, 0.59–0.96) were associated only with lower anxiety levels only in women. However, watching movies and television were associated with higher anxiety levels in women (aOR: 1.32, 1.02–1.70).

Anxiety and depression by gender and education level

When stratifying additionally by education level in women, we found that age gradient for anxiety and depression levels was maintained especially in women with university level studies (Tables 4 & 5). Current employment status was not associated with anxiety or depression levels in women of either education level. Perceiving higher risk in meeting up with friends and family was associated with higher anxiety levels (aOR: 1.82, 1.11–2.96) and depression (aOR: 1.91, 1.11–3.28) in women with university level studies, whereas perceiving higher risk in being out in public was associated with higher anxiety levels in women with university level studies (aOR: 2.75, 1.90–3.99) and women without university level studies (aOR: 4.38, 2.05–9.34), but only with higher depression levels in women with university level studies (aOR: 2.69, 1.84–3.94).

Coping by connecting with friends and family was associated with lower anxiety and depression levels both in women with university level studies ($aOR_{anxiety}$: 0.57, 0.42–0.78 and $aOR_{depression}$: 0.71, 0.52–0.98) as well as in women without university level studies ($aOR_{anxiety}$: 0.44, 0.23–0.85 and $aOR_{depression}$: 0.37, 0.19–0.72). Performing physical activity was associated with

Table 2 Association between sociodemographic characteristics, risk perception, coping mechanisms, and anxiety (GAD-7)[a] among cisgender women and men ($N = 2,041$)

	Women ($N = 1,501$)			Men ($N = 540$)		
	OR	**95% CI**	***p*-value**	**OR**	**95% CI**	***p*-value**
Age						
> = 65 years	1.00		< 0.001*	1.00		0.001*
51–64 years	1.59	0.83–3.06	0.163	1.71	0.72–4.06	0.225
31–50 years	2.50	1.31–4.74	0.005*	2.99	1.26–7.10	0.013*
18–30 years	3.11	1.57–6.17	0.001*	4.92	1.90–12.74	0.001*
Education						
Primary/secondary level	1.00			1.00		
University level	0.88	0.65–1.20	0.429	1.15	0.70–1.88	0.588
Current work status						
Employed/retired/self-employed	1.00			1.00		
Unemployment/informal employment/unemployed/ housekeeping/student	1.24	0.88–1.77	0.221	1.77	0.94–3.32	0.075
Risk perception						
Occupying closed public spaces and public transportation						
None/little	1.00		0.098	1.00		0.088
Moderately	0.91	0.61–1.35	0.628	1.74	0.85–3.57	0.130
Very much/considerably	1.23	0.85–1.78	0.265	2.14	1.09–4.22	0.028*
Meeting with friends or family						
None/little	1.00		< 0.001*	1.00		0.011*
Moderately	0.86	0.53–1.39	0.529	0.51	0.23–1.12	0.095
Very much/considerably	1.73	1.12–2.67	0.013*	1.18	0.57–2.42	0.661
Being out in public						
None/little	1.00		< 0.001*	1.00		0.022*
Moderately	1.66	1.25–2.19	< 0.001*	1.95	1.17–3.26	0.010*
Very much/considerably	2.98	2.15–4.14	< 0.001*	1.71	0.95–3.09	0.073
Coping mechanisms						
Connecting with friends & family	0.55	0.42–0.72	< 0.001*	0.73	0.46–1.15	0.175
Physical activity	0.67	0.53–0.87	0.002*	0.82	0.51–1.31	0.404
Yoga/meditation	1.01	0.77–1.33	0.929	0.48	0.22–1.06	0.069
Watching movies/TV	1.32	1.02–1.70	0.035*	1.09	0.69–1.73	0.717
Gaming	0.85	0.63–1.15	0.299	0.73	0.45–1.19	0.205
Nature	0.99	0.78–1.27	0.961	0.72	0.47–1.11	0.141
Reading	0.78	0.62–0.99	0.043*	0.99	0.65–1.52	0.971
Listening to music/dancing/singing	0.75	0.59–0.96	0.021*	1.05	0.68–1.64	0.815

[a] GAD-7: Generalized Anxiety Disorder 7 item

[†] The ORs presented were estimated using logistic regression models

[*] Indicates statistical significance, $p < 0.05$

lower depression levels both in women with university level studies (aOR: 0.63, 0.47–0.84) as well as in women without university level studies (aOR: 0.48, 0.26–0.89), though only with lower anxiety levels in women with university level studies (aOR: 0.68, 0.51–0.89). Reading (aOR: 0.73, 0.56–0.95) and listening to music, dancing, or singing (aOR: 0.70, 0.54–0.92) were associated with lower anxiety levels in women with university level studies. Watching movies and television was associated with higher anxiety levels in women with university level studies (aOR: 1.34, 1.01–1.77). No additional coping mechanisms were associated with lower depression levels in women of either education level.

Table 3 Association between sociodemographic characteristics, risk perception, coping mechanisms, and depression (PHQ-9)[a] among cisgender women and men ($N = 1,981$)

	Women ($N = 1,455$)			Men ($N = 526$)		
	OR	95% CI	*p*-value	OR	95% CI	*p*-value
Age						
> = 65 years	1.00		0.004*	1.00		< 0.001*
51–64 years	1.37	0.71–2.62	0.347	4.26	0.94–19.24	0.059
31–50 years	1.43	0.75–2.72	0.272	8.44	1.89–37.7	0.005*
18–30 years	2.44	1.24–4.83	0.010*	25.83	5.41–123.2	< 0.001*
Education						
Primary/secondary level	1.00			1.00		
University level	0.75	0.55–1.04	0.081	1.13	0.64–1.99	0.677
Current work status						
Employed/retired/self-employed	1.00			1.00		
Unemployment/informal employment/unemployed/ housekeeping/student	1.40	0.97–2.01	0.074	2.01	1.01–3.99	0.047*
Risk perception						
Occupying closed public spaces and public transportation						
None/little	1.00		0.420	1.00		0.010*
Moderately	1.07	0.70–1.64	0.749	1.82	0.74–4.47	0.192
Very much/considerably	1.25	0.84–1.86	0.267	3.29	1.42–7.64	0.006*
Meeting with friends or family						
None/little	1.00		0.005*	1.00		0.018*
Moderately	1.53	0.89–2.62	0.124	0.63	0.23–1.71	0.366
Very much/considerably	2.14	1.30–3.52	0.003*	1.62	0.65–4.02	0.302
Being out in public						
None/little	1.00		< 0.001*	1.00		0.082
Moderately	1.28	0.95–1.72	0.102	1.91	1.06–3.44	0.031*
Very much/considerably	2.38	1.70–3.34	< 0.001*	1.54	0.78–3.03	0.210
Coping mechanisms						
Connecting with friends & family	0.62	0.47–0.83	0.001*	0.66	0.39–1.12	0.121
Physical activity	0.59	0.46–0.77	< 0.001*	0.73	0.43–1.25	0.258
Yoga/meditation	1.05	0.79–1.40	0.741	0.81	0.36–1.84	0.615
Watching movies/TV	1.17	0.90–1.54	0.243	1.29	0.75–2.21	0.361
Gaming	0.99	0.73–1.36	0.971	0.72	0.42–1.26	0.255
Nature	0.97	0.75–1.26	0.831	0.77	0.46–1.26	0.296
Reading	0.78	0.60–1.00	0.047*	0.80	0.49–1.31	0.368
Listening to music/dancing/singing	0.80	0.62–1.03	0.090	1.06	0.64–1.77	0.821

[a] PHQ-9: Patient Health Questionnaire 9 item

[†] The ORs presented were estimated using logistic regression models

[*] Indicates statistical significance, $p < 0.05$

When stratifying additionally by education level in men, we found that the inverse effect age gradient for both anxiety and depression was maintained in men with university level studies (Tables 6 & 7). Current employment status was not associated with anxiety or depression levels in men of either education level. Perceiving higher risk in occupying closed public spaces and using public transportation was associated with higher anxiety levels (aOR: 2.37, 1.06–5.26) and depression (aOR: 4.84, 1.68–13.92) in men with university level studies, whereas perceiving higher risk in being out in public was associated with higher anxiety levels (aOR: 2.33, 1.15–4.71) only in men with university level studies.

Table 4 Association between sociodemographic characteristics, risk perception, coping mechanisms, and anxiety (GAD-7)[a] among cis-women, stratified by education level ($N = 1,501$)

	University level studies ($N = 1,242$)			Secondary/primary level studies ($N = 259$)		
	OR	**95% CI**	***p*-value**	**OR**	**95% CI**	***p*-value**
Age						
> =65 years	1.00		0.001*	1.00		0.033*
51–64 years	1.45	0.70–3.01	0.322	1.99	0.45–8.75	0.364
31–50 years	2.09	1.02–4.28	0.043*	4.38	1.00–19.13	0.050
18–30 years	3.00	1.41–6.38	0.004*	2.13	0.41–11.09	0.368
Current work status						
Employed/retired/self-employed	1.00			1.00		
Unemployment/informal employment/unemployed/ housekeeper/student	1.24	0.81–1.92	0.323	1.27	0.67–2.39	0.465
Risk perception						
Occupying closed public spaces and public transportation spaces and public transportation						
None/little	1.00		0.252	1.00		0.259
Moderately	0.89	0.58–1.37	0.597	1.00	0.34–2.91	0.999
Very much/considerably	1.16	0.78–1.74	0.463	1.70	0.66–4.40	0.274
Meeting up with friends or family						
None/little	1.00		< 0.001*	1.00		0.665
Moderately	0.86	0.51–1.48	0.594	0.91	0.26–3.16	0.881
Very much/considerably	1.82	1.11–2.96	0.017*	1.34	0.49–3.64	0.573
Being out in public						
None/little	1.00		< 0.001*	1.00		0.001*
Moderately	1.64	1.20–2.24	0.002*	1.84	0.95–3.57	0.072
Very much/considerably	2.75	1.90–3.99	< 0.001*	4.38	2.05–9.34	< 0.001*
Coping mechanisms						
Connecting with friends & family	0.57	0.42–0.78	< 0.001*	0.44	0.23–0.85	0.014*
Physical activity	0.68	0.51–0.89	0.006*	0.63	0.34–1.16	0.137
Yoga/meditation	1.06	0.79–1.42	0.703	0.75	0.35–1.63	0.470
Watching movies/TV	1.34	1.01–1.77	0.043*	1.20	0.63–2.26	0.578
Gaming	0.86	0.62–1.21	0.388	0.86	0.41–1.80	0.686
Nature	0.97	0.74–1.27	0.827	0.91	0.48–1.71	0.761
Reading	0.73	0.56–0.95	0.019*	0.90	0.49–1.65	0.738
Listening to music/dancing/singing	0.70	0.54–0.92	0.010*	1.35	0.70–2.61	0.373

[a] GAD-7: Generalized Anxiety Disorder 7 item

[†] The ORs presented were estimated using logistic regression models

[*] Indicates statistical significance, $p < 0.05$

Coping through connecting with friends and family was associated with lower anxiety levels (aOR: 0.54, 0.32–0.92) and depression (aOR: 0.49, 0.27–0.91) only in men with university level studies. Moreover, gaming was associated only with lower depression levels only in men with university level studies (aOR: 0.49, 0.25–0.96). No other coping mechanisms were associated with anxiety or depression levels in men with university level studies, and none of the studied coping mechanisms were associated with lower anxiety or depression levels in men without university level studies.

Discussion

Our study suggests that both risk perception and coping mechanisms during the COVID-19 syndemic vary according to gender and education level. We observed a gradient of higher anxiety and depression levels among the youngest age groups, with the 18–30 and 31–50 age

Table 5 Association between sociodemographic characteristics, risk perception, coping mechanisms, and depression (PHQ-9)[a] among cis-women, stratified by education level ($N = 1,455$)

	University level studies ($N = 1,213$)			Secondary/primary level studies ($N = 242$)		
	OR	**95% CI**	***p*-value**	**OR**	**95% CI**	***p*-value**
Age						
> = 65 years	1.00		0.001*	1.00		0.487
51–64 years	1.49	0.70–3.16	0.303	0.99	0.24–4.10	0.984
31–50 years	1.45	0.69–3.04	0.324	1.60	0.39–6.62	0.516
18–30 years	2.87	1.32–6.24	0.008*	0.98	0.19–4.98	0.984
Current work status						
Employed/retired/self-employed	1.00			1.00		
Unemployment/informal employment/unemployed/ housekeeper/student	1.29	0.82–2.04	0.272	1.69	0.87–3.3	0.122
Risk perception						
Occupying closed public spaces and public transportation spaces and public transportation						
None/little	1.00		0.384	1.00		0.927
Moderately	1.09	0.68–1.73	0.729	1.19	0.39–3.62	0.762
Very much/considerably	1.30	0.84–2.00	0.237	1.22	0.44–3.41	0.698
Meeting up with friends or family						
None/little	1.00		0.029*	1.00		0.156
Moderately	1.35	0.76–2.42	0.309	3.45	0.80–14.83	0.097
Very much/considerably	1.91	1.11–3.28	0.020*	3.48	0.97–12.55	0.056
Being out in public						
None/little	1.00			1.00		0.078
Moderately	1.08	0.77–1.52	0.654	2.18	1.08–4.37	0.029
Very much/considerably	2.69	1.84–3.94	< 0.001*	1.87	0.85–4.12	0.122
Coping mechanisms						
Connecting with friends & family	0.71	0.52–0.98	0.038*	0.37	0.19–0.72	0.004*
Physical activity	0.63	0.47–0.84	0.002*	0.48	0.26–0.89	0.020*
Yoga/meditation	1.06	0.78–1.45	0.690	1.01	0.46–2.24	0.980
Watching movies/TV	1.17	0.87–1.58	0.296	1.35	0.69–2.66	0.383
Gaming	0.93	0.66–1.32	0.689	1.62	0.75–3.52	0.222
Nature	0.99	0.75–1.32	0.971	0.73	0.38–1.40	0.344
Reading	0.78	0.59–1.03	0.083	0.62	0.33–1.16	0.137
Listening to music/dancing/singing	0.81	0.61–1.07	0.144	0.92	0.46–1.87	0.828

[a] PHQ-9: Patient Health Questionnaire 9 item

[†] The ORs presented were estimated using logistic regression models

[*] Indicates statistical significance, $p < 0.05$

groups experiencing the worst mental health outcomes in both women and men. This gradient was most pronounced in individuals with university-level education, indicating that both age and education level may influence mental health outcomes. Women generally perceived more risk in collective spaces, such as meeting with friends and family or being out in public, whereas men perceived greater risk in settings that could increase personal infection risk, such as closed public spaces and public transportation. However, risk perception did not correlate with anxiety or depression levels in men without university-level education. Connecting with friends and family emerged as the most common coping mechanism, and women reported more coping strategies that reduced anxiety and depression than men. Stratifying by education level, we found that both women and men with university education reported more coping mechanisms that alleviated anxiety and depression compared to those without.

Table 6 Association between sociodemographic characteristics, risk perception, coping mechanisms, and anxiety (GAD-7)[a] among cis-men, stratified by education level ($N = 540$)

	University level studies ($N = 421$)			Secondary/primary level studies ($N = 119$)		
	OR	95% CI	*p*-value	OR	95% CI	*p*-value
Age						
> = 65 years	1.00		0.001*	1.00		0.369
51–64 years	2.28	0.78–6.64	0.130	0.56	0.10–3.15	0.513
31–50 years	4.98	1.71–14.46	0.003*	0.68	0.12–3.86	0.661
18–30 years	7.34	2.31–23.29	0.001*	2.02	0.27–15.01	0.493
Current work status						
Employed/retired/self-employed	1.00			1.00		
Unemployment/informal employment/unemployed/ housekeeper/student	1.74	0.79–3.85	0.168	2.07	0.68–6.28	0.199
Risk perception						
Occupying closed public spaces and public transportation spaces and public transportation						
None/little	1.00		0.107	1.00		0.857
Moderately	1.92	0.83–4.43	0.125	1.59	0.31–8.24	0.579
Very much/considerably	2.37	1.06–5.26	0.035*	1.37	0.31–6.03	0.675
Meeting up with friends or family						
None/little	1.00		0.028*	1.00		0.224
Moderately	0.61	0.24–1.53	0.288	0.26	0.04–1.65	0.151
Very much/considerably	1.39	0.58–3.32	0.457	0.84	0.18–3.88	0.822
Being out in public						
None/little	1.00		0.023*	1.00		0.185
Moderately	1.85	1.02–3.37	0.043*	3.00	0.92–9.77	0.068
Very much/considerably	2.33	1.15–4.71	0.019*	1.60	0.43–5.88	0.480
Coping mechanisms						
Connecting with friends & family	0.54	0.32–0.92	0.022*	1.64	0.51–5.30	0.405
Physical activity	0.87	0.50–1.50	0.620	0.56	0.18–1.69	0.301
Yoga/meditation	0.47	0.20–1.10	0.083	0.82	0.08–8.87	0.872
Watching movies/TV	1.36	0.79–2.35	0.267	0.47	0.15–1.49	0.197
Gaming	0.63	0.36–1.11	0.112	1.09	0.36–3.25	0.883
Nature	0.73	0.44–1.22	0.230	0.55	0.19–1.57	0.262
Reading	0.87	0.53–1.42	0.572	1.93	0.71–5.27	0.198
Listening to music/dancing/singing	1.02	0.62–1.68	0.937	1.06	0.35–3.22	0.923

[a] GAD-7: Generalized Anxiety Disorder 7 item

[†] The ORs presented were estimated using logistic regression models

[*] Indicates statistical significance, $p < 0.05$

Our results reveal significant gender differences in coping strategies during the COVID-19 syndemic. Women were more likely to cope by connecting with friends and family, which was associated with reduced anxiety and depression, regardless of education level. In contrast, men more often engaged in physical activity as a coping mechanism, also linked to lower anxiety and depression levels. However, men reported fewer coping strategies that effectively reduced mental health symptoms. This gender divergence aligns with prior research on coping during public health crises [10, 11]. These findings underscore the importance of tailoring mental health interventions to gender-specific coping strategies, particularly in the context of social and physical approaches.

Our study found the highest anxiety and depression levels were reported among young and middle-aged adults, especially for individuals with university level studies perhaps due to a larger sample size of individuals with university level studies. Regardless, this suggests that having university level studies is not a protective

Table 7 Association between sociodemographic characteristics, risk perception, coping mechanisms, and depression (PHQ-9)[a] among cis-men, stratified by education level ($N=526$)

	University level studies ($N=410$)			Secondary/primary level studies ($N=116$)		
	OR	95% CI	*p*-value	OR	95% CI	*p*-value
Age						
> =65 years	1.00		< 0.001*	1.00		0.011*
51–64 years	10.49	1.32–83.49	0.026*	0.45	0.03–7.07	0.572
31–50 years	16.22	2.04–129.3	0.009*	3.35	0.26–43.26	0.355
18–30 years	52.26	6.19–441.4	< 0.001*	8.88	0.54–144.93	0.125
Current work status						
Employed/retired/self-employed	1.00			1.00		
Unemployment/informal employment/unemployed/ housekeeper/student	2.15	0.90–5.11	0.083	3.80	0.83–17.44	0.086
Risk perception						
Occupying closed public spaces and public transportation spaces and public transportation						
None/little	1.00		0.009*	1.00		0.970
Moderately	2.68	0.89–8.10	0.080	0.90	0.11–7.20	0.924
Very much/considerably	4.84	1.68–13.92	0.003*	0.81	0.14–4.68	0.812
Meeting up with friends or family						
None/little	1.00		0.099	1.00		0.046*
Moderately	0.90	0.28–2.92	0.859	0.06	0.00–1.10	0.058
Very much/considerably	1.89	0.62–5.77	0.266	1.64	0.22–12.15	0.629
Being out in public						
None/little	1.00		0.070	1.00		0.280
Moderately	2.17	1.12–4.22	0.022*	2.49	0.49–12.75	0.275
Very much/considerably	1.41	0.62–3.19	0.414	3.89	0.72–21.06	0.115
Coping mechanisms						
Connecting with friends & family	0.49	0.27–0.91	0.023*	1.31	0.25–6.78	0.745
Physical activity	0.88	0.47–1.64	0.696	0.32	0.07–1.46	0.140
Yoga/meditation	0.83	0.34–2.02	0.676	1.95	0.11–33.84	0.646
Watching movies/TV	1.46	0.78–2.73	0.238	0.40	0.08–1.93	0.255
Gaming	0.49	0.25–0.96	0.037*	3.17	0.79–12.63	0.102
Nature	0.63	0.36–1.13	0.125	1.18	0.29–4.85	0.819
Reading	0.80	0.45–1.41	0.439	1.15	0.32–4.19	0.831
Listening to music/dancing/singing	0.88	0.50–1.58	0.678	3.03	0.63–14.57	0.166

[a] PHQ-9: Patient Health Questionnaire 9 item

[†] The ORs presented were estimated using logistic regression models

[*] Indicates statistical significance, $p < 0.05$

factor for worsened mental health, perhaps due to the precarious labor market in Spain [38, 39]. Studies have shown that merely having a job does not necessarily protect against poor mental health outcomes, but that the job must also have favorable and secure employment conditions [40, 41]. In recent decades, university enrollment has increased in Spain, as has the frequency of short-duration, temporary job contracts [38, 39]. As a result, young adults with university level studies are forced into jobs with precarious employment conditions and low wages which do not necessarily ensure economic stability or a satisfactory quality of life [39].

This job insecurity has occurred largely as the result of the 2012 Spanish labor reform put into place by the conservative Spanish government at the time, which aimed to improve corporate productivity and economic gains at the expense of favorable and secure employment conditions [42]. Our study found employment status to be associated with depression levels in men, perhaps due to the social expectations placed on men to be responsible

for being financial providers [43]. The harmful effects of inadequate employment conditions on mental health in young adults may be exacerbated by the economic uncertainty that has resulted from the COVID-19 syndemic, as the current labor market in Spain is not apt to guarantee economic security or quality of life for either women or men and much less in times of social and economic crisis.

Our results are consistent with other studies that have also reported worsened mental health outcomes among the young and middle-aged adult populations during the COVID-19 syndemic [3, 44, 45]. Furthermore, the gradient reflected in our results highlights the importance of giving visibility to the mental health outcomes specifically of middle-aged adults, as the economic uncertainty that has resulted from the COVID-19 syndemic has negatively impacted the mental health of all adults of a working age. The 31–50 age group includes the sandwich generation, which may also experience the additional financial stress of requiring a stable income in order to maintain a family while also having to financially support elderly parents, which could heighten the deterioration of mental health in working adults of this age [46, 47]. It is possible that there is an interaction between age and sex, as this burden of care falls disproportionately on women and caregivers who have consistently reported worsened mental health outcomes throughout the course of the pandemic due in part to the societal expectation placed upon them to maintain economies of care [3, 5].

Our results show an association between higher anxiety and depression levels and perceiving greater risk in meeting up with friends and family in women with university level studies. In men with university level studies, however, we found an association between higher anxiety and depression levels occupying closed public spaces and using public transportation. However, these results are consistent with psychological evidence on gendered differences in the construction of the self [48]. Through socialization processes inherent to western and patriarchal societies, men tend to construct and maintain an independent self, whereas women tend to construct and maintain an interdependent self in relation to others [48]. As a result, men may prioritize individual safety, leading them to perceive greater risk in situations that are more likely to affect their individual health and safety, as is the case in occupying closed public spaces and utilizing public transportation. Women, on the other hand, may prioritize the safety and well-being of other individuals in their community network when evaluating risk, thus causing them to perceive greater risk in meeting up with friends and family during the syndemic. Moreover, many of the care tasks that women are expected to carry out, such as childcare, eldercare, and household maintenance, are not compatible with low risk social interactions in the context of COVID-19. Our findings signal an interesting debate on the possible gendered differences between being infected with COVID-19 and infecting others.

These associations between risk perceptions and anxiety and depression levels were only found in women and men with university level studies. These differences in risk perception by education level may be explained in part by differences in which groups are able to evaluate risk and feasibly alter their daily activities, work, and personal responsibilities [49]. In the case of the COVID-19 syndemic, the dominant message from public health authorities was to stay home and avoid contact with others. However, low SES individuals are more likely to be employed in essential, service or caregiving occupations which, by nature, are not compatible with staying at home and social distancing, thus increasing the risk of COVID-19 exposure [49]. As a result, social distancing and isolation are not accessible, financially feasible, or available for everyone, potentially desensitizing those who are not able to comply with the public health recommendation to the risk of these activities.

Our results showed an association between higher anxiety levels and perceiving greater risk in being out in public in women both with and without university level studies and in men only with university level studies. Closures to bars, restaurants, and entertainment venues caused there to be less people out in public at night [50], which may lead to increased feelings of insecurity and danger [51]. Women are already at disproportionate risk of experiencing violence in public spaces [52] and, when there are less people out, there is a diminished communal sense of safety [51]. This same association may also be present in men with university level studies due to differing constructions of masculinity by SES. Strength, bravery, and aggression are the preferred socialized qualities of hegemonic masculinity, which may be more pronounced in men of a low SES who have fewer alternative avenues for exhibiting power and status than do middle-class or professional men [53]. Men of a low SES may perceive lower risk in the closure of public spaces due to these societal expectations, even in situations of stress or danger. Therefore, the closure of public spaces may have a differential effect on mental health by gender.

The most effective coping mechanism identified by our study found to be associated with lower anxiety and depression levels was coping through social connection with friends and family. However, social connection as a coping mechanism during the COVID-19 syndemic leads to an interesting paradox, given that social meetings have been targeted by public health authorities as one of the top risk factors throughout the course of the syndemic [54]. Other studies on coping and resilience during the COVID-19 syndemic have also highlighted

the importance of coping via social support and connection [19–21], affirming that self-care and coping are not just an individual act, but also a shared experience and responsibility. It is therefore important to shift our understanding of coping and self-care away from solely the individual and to understand coping as being rooted also in the public and social domains [55, 56].

In addition to being an important collective responsibility, coping and self-care are also limited by the tools, strategies, and resources that each individual has available to them [57]. Inequalities in the time and resources which can be dedicated to personal and self-care activities has been defined as time poverty, and disproportionately impacts women, specifically women of a low SES [58] and is reflected by the fact that our study found more coping mechanisms that protect against anxiety and depression in women and men with university level studies. For example, performing physical activity, reading, and listening to music, singing, or dancing were all associated with lower anxiety levels only in women with university level studies, but not in women without. Moreover, men with university level studies had more coping mechanisms that protected against anxiety (connecting with friends and family) and depression (connecting with friends and family and gaming). Our explanation stems from the social stress theory, which postulates that individuals of a low SES have higher exposure to stress, but lack the resources to be able to identify and carry activities that can reduce stress levels [59]. In other words, in addition to knowing what coping mechanisms to use to feel better, people with a higher education level have the economic resources and/or an employment situation that allow them the time, flexibility, and energy to carry them out.

Participation in online gaming is increasing in the past decades and past studies have identified online gaming as a way for people, especially men, to access social support and meet their companionship and intellectual needs [60, 61]. During lockdown when in-person social interactions were limited, online gaming may have been used to foster social connection, which we have already discussed as an important protective factor against anxiety and depression. On the other hand, our study found watching movies and TV shows to be associated with higher anxiety levels in women with university level studies. Watching movies and TV is an avoidance coping mechanism, which has been shown by other studies to increase stress and anxiety in the long-term [14]. Not all coping mechanisms can be considered equally productive or have the same beneficial effect on psychological stress and, moreover, not all populations have the same access whether social, economic, or material to carry out all coping mechanisms. Interestingly, our study found no coping mechanisms to be associated with lower anxiety or depression levels in men without university level studies. We hypothesize that this may be related to class-constructed masculinity which, as discussed above, may create differences by SES in the socially-acceptable ways in which men can cope [53].

Our findings shed light on how gender and education intersect to shape mental health outcomes and coping strategies during the COVID-19 syndemic, revealing the deep inequities in how different groups are impacted. Women, particularly those with university education, turn to social support as a coping mechanism, while men favor physical activity, highlighting the need for mental health strategies that address the differing ways these groups manage stress. The link between higher education and worsened mental health, often tied to job insecurity and precarious labor conditions, underscores the urgent need for policies that challenge current economic systems that drive economic hardship and exploitation [62]. Due to the individualistic nature of these systems, future policies should focus on fostering community care and community-based support networks and dismantling barriers to resources, ensuring that everyone has equitable access to real and effective support networks and coping mechanisms [63, 64]. Addressing these inequalities is essential to building a more just, cohesive, and solidaristic society that can better withstand future public health and social crises [65].

Limitations

Our study has several limitations that warrant discussion. Firstly, our sampling approach introduces potential biases. The reliance on self-reported data may be subject to social desirability and recall bias. Furtherm ore, our recruitment strategy, which utilized snowball sampling and word-of-mouth methods, coupled with the survey's availability only in Spanish, resulted in a sample that predominantly comprised professional, working individuals with access to computers and the internet. This approach likely excluded individuals with lower levels of education, those in rural areas, or non-Spanish-speaking populations, such as migrants and refugees. The digital divide, specifically, disparities in access to the internet and digital devices, impacted our sample, leading to the underrepresentation of populations facing digital access challenges. Consequently, our findings may not fully reflect the perspectives of individuals who experience barriers to technology and information access. Public health research benefits from the inclusion of diverse identities and populations, as their unique perspectives can provide invaluable insights into health inequities.

Secondly, the cross-sectional design of our study limits its ability to establish causality or capture the

dynamic, long-term effects of the COVID-19 syndemic. Additionally, the constrained recruitment window restricts the generalizability of our findings to other time periods or contexts. Although we recognize that evolving political and social contexts can influence individual perceptions, our data offer valuable insights for understanding health and social crises more broadly. However, caution is advised when interpreting the results, as they may not fully represent trends or changes in mental health over time.

Thirdly, our use of educational attainment as a proxy for socioeconomic status (SES) comes with notable limitations. Although educational level is a widely accepted indicator of SES, it does not capture other critical dimensions, such as income disparities, underemployment, or wage gaps, all of which significantly impact mental health, particularly among women. In this study, we dichotomized educational level into "university" versus "non-university" education due to the overrepresentation of participants with university degrees. Further subdividing the non-university group would have resulted in categories with insufficient statistical power, potentially compromising the reliability of our analyses. While necessary for ensuring robust statistical comparisons, this dichotomization likely resulted in some loss of information and limited our ability to fully explore the nuanced relationship between education and mental health outcomes.

Similarly, we acknowledge the limitations of dichotomizing mental health outcomes (anxiety and depression) into "moderate/severe" versus all other levels. This categorization aligns with established clinical thresholds, enhancing the interpretability and practical relevance of our findings for public health interventions. However, it simplifies the continuum of mental health symptoms, potentially overlooking subtle variations. A continuous analysis might have provided a more granular understanding of mental health dynamics.

We recognize the trade-offs inherent in dichotomization, including the loss of statistical power and nuanced information. These concerns are particularly relevant in studies focused on dose–response modeling or individual-level variability. However, our study's objective was to identify clinically and public health-relevant subgroups, such as individuals experiencing moderate to severe mental health symptoms, to inform actionable interventions. As Iacobucci et al. (2015) and others have suggested, dichotomization can be a valid methodological choice when the research focus is on group-level distinctions rather than fine-grained individual differences. This approach was especially appropriate given the time-sensitive context of the COVID-19 syndemic, where the need for practical and interpretable findings outweighed the potential benefits of greater statistical precision.

Conclusions

Our findings highlight how differences in gender identity and education level may influence risk perception and coping during the COVID-19 syndemic. Many of these differences in mental health outcomes across these axes of inequity were already present before the syndemic, though the syndemic has served to further reinforce them. Our study adds to the growing body of evidence that shifts the emphasis from self-care to the importance of community care, as individual circumstances do not always provide equal, optimal, or realistic opportunity for everyone to meet their needs. When individuals have the support, resources, and means to meet their needs, mental health outcomes improve as the toll of carrying out care and other everyday tasks is lessened. Policy makers must open spaces for citizen dialogue and take into the diverse needs of the population in order to work to solve disparities by gender and SES in the mental health crisis brought on by the COVID-19 syndemic. It is important to understand this association in as much detail as possible in order to design and implement future public health measures and interventions along these axes of social oppression, especially in the case of future syndemics, public health crises, or other public health and social disasters.

Abbreviations

GAD-7	Generalized Anxiety Disorder 7 item
H1N1	Influenza A virus subtype H1N1
LGBTQI+	Lesbian, gay, bisexual, transgender, queer, and intersex
PHQ-9	Patient Health Questionnaire 9 item
REDCap	Research Electronic Data Capture
SES	Socioeconomic status
UK	United Kingdom

Acknowledgements

We would like to thank everyone who participated in completing the survey.

Authors' contributions

Matthew Bennett: Conceptualization, Methodology, Visualization, Writing – Original Draft; Constanza Jacques-Aviñó: Methodology, Visualization, Writing – Reviewing & Editing; Tomás López-Jimenez: Conceptualization, Methodology, Data Curation, Formal analysis, Visualization, Writing – Review & Editing; Laura Medina-Perucha and Brenda Biaani León-Gómez: Conceptualization, Methodology, Visualization, Writing – Review & Editing; Anna Berenguera: Funding Acquisition, Conceptualization, Methodology, Writing – Review & Editing.

Funding

This work was supported by Spain's Ministry of Science and Innovation through the Carlos III Health Institute and European Union ERDF funds (European Regional Development Fund) and through the Research Network in Preventive Activities and Health Promotion in Primary Care (redIAPP, RD16/0007/0001).

Data availability

Data cannot be shared publicly due to ethical restrictions. The Ethics Committee does not allow for the public dissemination of these data, as they contain sensitive personal information and cannot be fully anonymized. Data may be

available from the Research Ethics Committee of the Institut de Recerca en Atenció Primària Jordi Gol i Gurina (IDIAPJGol) (contact: cei@idiapjgol.info) for researchers who meet the criteria for access to confidential data.

Declarations

Ethics approval and consent to participate

The study was designed in accordance with the Guide to Good Practice in Health Science Research and the principles of the Declaration of Helsinki of the World Medical Association, modified in 2013, and the applicable regulations. This study was approved by the Clinical Research Ethics Committee of the IDIAPJGol (Project approval code: 20/063-PCV). We have ensured the confidentiality of each respondent and the submission of the answered questionnaire was considered to be their consent to participate in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Fundació Institut Universitari Per a La Recerca a L'Atenció Primària de Salut Jordi Gol I Gurina (IDIAPJGol), Gran Via de Les Corts Catalanes 591 Àtic, Barcelona 08007, Spain. [2]Departament d'Antropologia, Filosofia I Treball Social, Universitat Rovira I Virgili (URV), Tarragona, Spain. [3]Network for Research on Chronicity, Primary Care and Health Promotion (RICAPPS), Bilbao, Spain. [4]Universitat Autònoma de Barcelona (UAB), Bellaterra, Spain. [5]Unitat de Suport a La Recerca Metropolitana Nord, Fundació Institut Universitari Per a La Recerca a L'Atenció Primària de Salut Jordi Gol I Gurina (IDIAPJGol), Mataró, Spain. [6]Institut Català de La Salut, Mataró, Spain. [7]Departament d'Infermeria, Universitat de Girona (UdG), Girona, Spain.

Received: 21 July 2022 Accepted: 13 March 2025
Published online: 04 June 2025

References

1. Ministerio de la Presidencia Relaciones con las Cortes y Memoria Democrática. Real Decreto 926/2020 de 25 de octubre: La declaración del estado de alarma para contener la propagación de infecciones causadas por el SARS-CoV-2. 2020.
2. Saunders R, Buckman JEJ, Fonagy P, Fancourt D. Understanding different trajectories of mental health across the general population during the COVID-19 pandemic. Psychol Med. 2020;1–9. Advance online publication. https://doi.org/10.1017/S0033291721000957.
3. Jacques-Avinõ C, López-Jiménez T, Medina-Perucha L, De Bont J, Gonçalves AQ, Duarte-Salles T, et al. Gender-based approach on the social impact and mental health in Spain during COVID-19 lockdown: a cross-sectional study. BMJ Open. 2020;10(11):e044617.
4. Keller A, Groot J, Matta J, Bu F, El Aarbaoui T, Melchior M, et al. Housing environment and mental health of Europeans during the COVID-19 pandemic: a cross-country comparison. Sci Rep. 2022;12(1):1–11.
5. Thibaut F, van Wijngaarden-Cremers PJM. Women's mental health in the time of COVID-19 pandemic. Front Glob Womens Health. 2020;8:17.
6. Ettman CK, Cohen GH, Abdalla SM, Sampson L, Trinquart L, Castrucci BC, et al. Persistent depressive symptoms during COVID-19: a national, population-representative, longitudinal study of U.S. adults. Lancet Reg Health Am. 2022;1(5):100091.
7. Rudisill C. How do we handle new health risks? Risk perception, optimism, and behaviors regarding the H1N1 virus. J Risk Res. 2013;16(8):959–80.
8. Kok G, Peters GJY, Kessels LTE, ten Hoor GA, Ruiter RAC. Ignoring theory and misinterpreting evidence: the false belief in fear appeals. Health Psychol Rev. 2018;12(2):111–25.
9. Ruiter RAC, Kessels LTE, Peters GJY, Kok G. Sixty years of fear appeal research: Current state of the evidence. Int J Psychol. 2014;49(2):63–70.
10. Van Der Weerd W, Timmermans DRM, Beaujean DJMA, Oudhoff J, Van Steenbergen JE. Monitoring the level of government trust, risk perception and intention of the general public to adopt protective measures during the influenza A (H1N1) pandemic in the Netherlands. BMC Public Health. 2011;11(1):1–12.
11. Peretti-Watel P, Verger P, Raude J, Constant A, Gautier A, Jestin C, et al. Dramatic change in public attitudes towards vaccination during the 2009 influenza A(H1N1) pandemic in France. Eurosurveillance. 2013;18(44):20623.
12. Lazarus RS, Folkman S. The concept of coping. Stress and coping: an anthology. 3rd ed. New York (NY): Columbia University Press; 1991. p. 189–206.
13. Taylor SE, Stanton AL. Coping resources, coping processes, and mental health. Annu Rev Clin Psychol. 2007;3:377–401.
14. Rippetoe PA, Rogers RW. Effects of components of protection-motivation theory on adaptive and maladaptive coping with a health threat. J Pers Soc Psychol. 1987;52(3):596–604.
15. Endler NS, Parker JD. Multidimensional assessment of coping: A critical evaluation. J Pers Soc Psychol. 1990;58(5):844–54.
16. Matud MP. Gender differences in stress and coping styles. Pers Individ Dif. 2004;37(7):1401–15.
17. Kelly MM, Tyrka AR, Price LH, Carpenter LL. Sex differences in the use of coping strategies: Predictors of anxiety and depressive symptoms. Depress Anxiety. 2008;25(10):839.
18. Estabrooks PA, Lee RE, Gyurcsik NC. Resources for physical activity participation: Does availability and accessibility differ by neighborhood socioeconomic status? Ann Behav Med. 2003;25(2):100–4.
19. Fluharty M, Bu F, Steptoe A, Fancourt D. Coping strategies and mental health trajectories during the first 21 weeks of COVID-19 lockdown in the United Kingdom. Soc Sci Med. 2021;1:279.
20. Lewis S, Willis K, Bismark M, Smallwood N. A time for self-care? Frontline health workers' strategies for managing mental health during the COVID-19 pandemic. SSM Ment Health. 2022;2:100053.
21. Frenkel MO, Pollak KM, Schilling O, Voigt L, Fritzsching B, Wrzus C, et al. Stressors faced by healthcare professionals and coping strategies during the early stage of the COVID-19 pandemic in Germany. PLoS ONE. 2022;17(1):e0261502.
22. Rose GA, Khaw KT, Marmot M. Individuals and populations. In: Rose's strategy of preventative medicine. New York (NY): Oxford University Press; 2009.
23. Jacques-Aviñó C, López-Jiménez T, Bennett M, Medina-Perucha L, León-Gómez BB, Berenguera A. Self-reported anxiety in Spain: a gendered approach one year after the start of the COVID-19 pandemic. Front Public Health. 2022;16(10):873891. https://doi.org/10.3389/fpubh.2022.873891.
24. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform. 2009;42(2):377–81.
25. Harris PA, Taylor R, Minor BL, Elliott V, Fernandez M, O'Neal L, et al. The REDCap consortium: building an international community of software platform partners. J Biomed Inform. 2019;95:103208.
26. Ministerio de la Presidencia Relaciones con las Cortes y Memoria Democrática. Real Decreto-ley 8/2021, de 4 de mayo, por el que se adoptan medidas urgentes en el orden sanitario, social y jurisdiccional, a aplicar tras la finalización de la vigencia del estado de alarma declarado por el Real Decreto 926/2020. 2021.
27. Casares MA, Díez-Gómez A, Pérez-Albéniz A, Lucas-Molina B, Fonseca-Pedrero E. Depressive and anxious symptoms in Spanish adolescents: normative data from the PHQ-9 and GAD-7. Clin Salud. 2024;35(2):77–83. https://doi.org/10.5093/clysa2024a13.
28. Cassiani-Miranda CA, Cuadros-Cruz AK, Torres-Pinzón H, Scoppetta O, Pinzón-Tarrazona JH, López-Fuentes WY, et al. Validez del Cuestionario de Salud del Paciente-9 (PHQ-9) para cribado de depresión en adultos usuarios de atención primaria en Bucaramanga, Colombia. Rev Colomb Psiquiatr. 2021;50(1):11–21. https://doi.org/10.1016/j.rcp.2019.09.001.
29. López-Guerra VM, López-Núñez C, Vaca-Gallegos SL, Torres-Carrión PV. Psychometric properties and factor structure of the Patient Health Questionnaire-9 as a screening tool for depression among Ecuadorian college students. Front Psychol. 2022;13: 813894. https://doi.org/10.3389/fpsyg.2022.813894.
30. Plummer F, Manea L, Trepel D, McMillan D. Screening for anxiety disorders with the GAD-7 and GAD-2: a systematic review and diagnostic metaanalysis. Gen Hosp Psychiatry. 2016;39:24–31.

31. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001;16:606–13.
32. Solomon M. Terminology surrounding gender identity and expression. OutRight action international; 2021. Available from: https://outrightinternational.org/content/terminology-surrounding-gender-identity-and-expression. Cited 2022 Feb 25.
33. Álvarez-Dardet C, Alonso J, Domingo A, Regidor E. La medición de la clase social en Ciencias de la Salud. Informe de un grupo de trabajo de la Sociedad Española de Epidemiología. Sociedad Española de Epidemiología Psiquiátrica SEE; 1995. p. 13–124.
34. Lynch JW, Kaplan GA. Socioeconomic position. In: Social epidemiology. New York: Oxford University Press; 2000. p. 13–35.
35. Bavel JJV, Baicker K, Boggio PS, Capraro V, Cichocka A, Cikara M, et al. Using social and behavioural science to support COVID-19 pandemic response. Nat Hum Behav. 2020;4(5):460–71. https://doi.org/10.1038/s41562-020-0884-z.
36. Bruine de Bruin W, Bennett D. Relationships between Initial COVID-19 risk perceptions and protective health behaviors: a national survey. Am J Prev Med. 2020;59(2):157–67. https://doi.org/10.1016/j.amepre.2020.05.001.
37. Dryhurst S, Schneider CR, Kerr J, Freeman ALJ, Recchia G, van der Bles AM, et al. Risk perceptions of COVID-19 around the world. J Risk Res. 2020;23(7–8):994–1006. https://doi.org/10.1080/13669877.2020.1758193.
38. Felgueroso F, García-Pérez JI, Jansen M, Troncoso-Ponce D. The surge in short-duration contracts in Spain. Economist. 2018;166(4):503–34.
39. Bentolila S, Felgueroso F, Jansen M, Jimeno JF. Lost in recessions: youth employment and earnings in Spain. SERIEs. 2021;26:1–39.
40. Kim TJ, Von Dem Knesebeck O. Is an insecure job better for health than having no job at all? A systematic review of studies investigating the health-related risks of both job insecurity and unemployment. BMC Public Health. 2015;29(15):1–9.
41. de Witte H, Pienaar J, de Cuyper N. Review of 30 years of longitudinal studies on the association between job insecurity and health and well-being: is there causal evidence? Appl Psychol. 2020;51(1):18–31. https://doi.org/10.1111/ap12176.
42. Felgueroso F, García-Pérez JI, Jansen M, Troncoso-Ponce D. Recent trends in the use of temporary contracts in Spain. 2017.
43. Cortès-Franch I, Escribà-Agüir V, Benach J, Artazcoz L. Employment stability and mental health in Spain: towards understanding the influence of gender and partner/marital status. BMC Public Health. 2018;18(1):1–11.
44. Sojli E, Tham WW, Bryant R, McAleer M. COVID-19 restrictions and age-specific mental health—U.S. probability-based panel evidence. Transl Psychiatry. 2021;11(1):1–7.
45. Nwachukwu I, Nkire N, Shalaby R, Hrabok M, Vuong W, Gusnowski A, et al. COVID-19 pandemic: age-related differences in measures of stress, anxiety and depression in Canada. Int J Environ Res Public Health. 2020;17(17):1–10.
46. Cheng Z, Mendolia S, Paloyo AR, Savage DA, Tani M. Working parents, financial insecurity, and childcare: mental health in the time of COVID-19 in the UK. Rev Econ Househ. 2021;19(1):123–44.
47. Boyczuk AM, Fletcher PC. The ebbs and flows: stresses of sandwich generation caregivers. J Adult Dev. 2015;23(1):51–61.
48. Cross SE, Madson L. Models of the self: Self-construals and gender. Psychol Bull. 1997;122(1):5–37.
49. Wenham C, Smith J, Morgan R. COVID-19: the gendered impacts of the outbreak. Lancet. 2020;395(10227):846.
50. Stickle B, Felson M. Crime rates in a pandemic: the largest criminological experiment in history. Am J Crim Justice. 2020;45(4):525–36.
51. Tandogan O, Ilhan BS. Fear of crime in public spaces: From the view of women living in cities. Procedia Eng. 2016;161:2011–8.
52. Onetto FMC. Hacia una reconceptualización del acoso callejero. Rev Estud Fem. 2019;27(3):e57206.
53. Craib I. Masculinity and male dominance. Sociol Rev. 1987;38:721–43.
54. Jacques-Aviñó C, Rodríguez Giralt I, Ruiz ME, Medina-Perucha L, Anigstein MS, Berenguera A. ¿Para cuándo el diálogo interdisciplinar en la gestión de la sindemia de la COVID-19?perspectiva25_jacques_avino_etal. Revista Española De Salud Pública. 2022;96.
55. Michaeli I. Self-care: an act of political warfare or a neoliberal trap? Dev. 2017;60(1–2):50–6.
56. Ward L. Caring for ourselves? Self-care and neoliberalism. In: Ethics of care: critical advances in international perspective. 2015. p. 45–56.
57. Ouwehand C, De Ridder DTD, Bensing JM. Who can afford to look to the future? The relationship between socio-economic status and proactive coping. Eur J Public Health. 2009;19(4):412–7.
58. Hyde E, Greene ME, Darmstadt GL. Time poverty: obstacle to women's human rights, health, and sustainable development. J Glob Health. 2020;10(2):20313.
59. Meyer IH, Schwartz S, Frost DM. Social patterning of stress and coping: does disadvantaged social statuses confer more stress and fewer coping resources? Soc Sci Med. 2008;67(3):368–79.
60. Vella K, Johnson D, Mitchell J. Playing support: social connectedness amongst male video game players. In: CHI PLAY 2016 - Proceedings of the Annual Symposium on Computer-Human Interaction in Play Companion. 2016. p. 343–50.
61. Colwell J. Needs met through computer game play among adolescents. Pers Individ Dif. 2007;43(8):2072–82.
62. Ringlein GV, Ettman CK, Stuart EA. Income or job loss and psychological distress during the COVID-19 pandemic. JAMA Netw Open. 2024;7(7):e2424601-.
63. Baskin C, Duncan F, Adams EA, et al. How co-locating public mental health interventions in community settings impacts mental health and health inequalities: A multi-site realist evaluation. BMC Public Health. 2023;23:2445. https://doi.org/10.1186/s12889-023-17404-x.
64. Castillo EG, Ijadi-Maghsoodi R, Shadravan S, et al. Community interventions to promote mental health and social equity. Curr Psychiatry Rep. 2019;21(5):35. https://doi.org/10.1007/s11920-019-1017-0.
65. Van Daalen RK, Bajnoczki C, Chowdhury M, et al. Symptoms of a broken system: The gender gaps in COVID-19 decision-making. BMJ Glob Health. 2020;5(10):e003549.
66. Shim JK. Understanding the routinised inclusion of race, socioeconomic status, and sex in epidemiology: the utility of concepts from technoscience studies. Sociol Health Illn. 2002;24(2):129–50.
67. Bavel JJV, Baicker K, Boggio PS, et al. Using social and behavioural science to support COVID-19 pandemic response. Nat Hum Behav. 2020;4(5):460–71.
68. Provenzi L, Barello S. The science of the future: establishing a citizen-scientist collaborative agenda after COVID-19. Front Public Health. 2020;5(8):282.
69. Horton R. Offline: COVID-19 is not a pandemic. Lancet. 2020;396(10255):874.

Publisher's Note