




A longitudinal study of the influence of concerns about contagion on negative affect during the COVID-19 lockdown in adults: The moderating effect of gender and resilience

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Abstract

The COVID-19 global pandemic has had psychological consequences worldwide. The aim of the present study was to analyze the effect of concerns about contagion on negative affect (NA) according to resilience, gender and age by using a longitudinal methodology that evaluated the participants 4 months before the COVID-19 outbreak and during the resulting lockdown situation imposed by the Spanish government. About 102 participants from a community sample were assessed. The results revealed higher levels of NA during the lockdown, as well as a positive relationship between age and the increase in NA. In addition, we found that a positive relationship between contagion concern and increase in NA was only observed in women with low resilience.

Keywords

Age, contagion concern, COVID-19, gender, negative affect, resilience

Introduction

The World Health Organization (WHO) declared COVID-19 a pandemic on March 11, 2020, affecting 210 countries and territories. COVID-19 has had a powerful global impact, disrupting many lives worldwide. Millions of people have been infected and many thousands of have lost their lives due to this virus. To fight the transmission of COVID-19, many countries have implemented unprecedented non-pharmaceutical interventions such as the closure of schools, restrictions to ensure social distancing, and national lockdowns.

Similarly, the Spanish authorities imposed strict lockdown measures on the entire population from March 15 to May 4, 2020.

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Recent research evaluating the effectiveness of these interventions based on combined data from 11 European countries suggests lockdown measures have been successful in reducing the transmission levels of the pandemic, and that approximately 3.1 million deaths have been avoided due to these non-pharmaceutical measures (Flaxman et al., 2020). However, lockdown measures, while necessary and effective, also have negative economic, social and personal consequences. Specifically, this radical change in everyday personal and social behavior has had various psychological repercussions. The COVID-19 lockdown measures have resulted in general changes to various health behaviors such as dietary habits, increased substance use, decreased physical activity, a rise in sleep disturbances, all of which have contributed to a decline in mental health (Di Renzo et al., 2020; Sher, 2020; Vanderbruggen et al., 2020). A review of 24 publications on the psychological impact of quarantine from various fields of study showed that periods of quarantine are associated with negative psychological effects, including post-traumatic stress symptoms, confusion, and anger. Stressors during quarantine included longer quarantine duration, fears of infection, frustration, boredom, inadequate supplies, inadequate information, financial loss, and stigma (Brooks et al., 2020). Moreover, a more specific systematic review of 43 studies showing current evidence on the psychological consequences of the COVID-19 pandemic revealed an increase in psychiatric symptoms and a decrease in psychological well-being of the general community, when compared with levels in the pre-pandemic population (Vindegaard and Benros, 2020; more specifically see Sonderskov et al., 2020). Risk factors for poorer mental health and well-being include the female gender, poor self-related health, and having relatives infected with COVID-19; however, reports on age as a risk factor have been inconsistent (Vindegaard and Benros, 2020). In this regard, a large cross-sectional study conducted in the general population of China found that individuals aged between 18 and 30 years or above 60 presented

the highest levels of psychological distress (Qiu et al., 2020). In contrast, another cross-sectional study carried out in China indicated that depression was greater among those aged between 31 and 40 years compared with those aged 18–20 years (Gao et al., 2020), while an extensive cross-sectional study conducted in Italy found no association between age and depression (Mazza et al., 2020).

Furthermore, it is interesting to highlight that many of these studies have shown that COVID-19 has generated an additional risk factor for the negative psychological effects associated with periods of quarantine, that is, contagion concern, or the fear and worry of one's self, family, or friends becoming infected (Brooks et al., 2020; Vindegaard and Benros, 2020). In particular, contagion concern is a significant psychological variable to study because it could intensify the destructive outcomes of the COVID-19 epidemic. Several studies have indicated that contagion concern is positively associated with depression, anxiety, and suicidal behavior (Ahorsu et al., 2020; McKay et al., 2020).

In Spain, a cross-sectional study supports these ideas by finding evidence of an increase in anxiety, depression, and post-traumatic symptoms during the COVID-19 outbreak (González-Sanguino et al., 2020). As the authors of the aforementioned reviews have pointed out, most of the studies have used cross-sectional designs (Brooks et al., 2020; Vindegaard and Benros, 2020). One exception is a longitudinal study on the mental health of the general population during the COVID-19 pandemic in China (follow-up study with 333 participants) which found no difference in depression, anxiety, and stress in spite of the increase in COVID-19 cases in the sample during the second assessment (Wang et al., 2020a). However, the limitations of this study were that the participants evaluated during the two surveys were not the same, and both evaluations were carried out during the pandemic.

The psychological consequences of COVID-19 have been compared to those of ecological disasters and terrorist attacks, and previous

research on how people coped in the aftermath of these traumatic events could provide important insights that may help to understand how to manage the psychological impact of COVID-19 quarantine (Bonanno et al., 2007; Galea et al., 2020; Morganstein and Ursano, 2020; Polizzi et al., 2020; Salguero et al., 2011). Specifically, these studies have shown that certain personal resources such as psychological resilience, which is generally defined as the ability to cope with and recover from significant stress or adversity (Connor and Davidson, 2003), were associated with low levels of depression, anxiety, and PTSD symptomatology after disasters (Blackmon et al., 2017; Bonanno et al., 2007).

Studies that have analyzed the influence of individual psychological factors that protect against the emotional impact of the COVID-19 pandemic are still very limited. A cross-sectional study conducted in mainland China in the early stages of the COVID-19 outbreak found that those members of the population with a negative coping style showed higher levels of psychological distress (Wang et al., 2020b). Two cross-sectional studies have analyzed the association between psychological resilience and emotional impact and mental health in young adults in the U.S. (Killgore et al., 2020; Liu et al., 2020), using a specific resilience measure (Connor-Davidson Resilience Scale; Connor and Davidson, 2003). Liu et al. (2020) showed that high levels of loneliness, COVID-19-specific worry, and low distress tolerance were related to higher levels of depression, anxiety, and PTSD symptoms, while resilience was linked to fewer depression and anxiety symptoms. Similarly, Killgore et al., (2020) found that lower resilience was associated with worse mental health outcomes, including more severe depression, anxiety, and suicidal ideation, and also with greater worry about the effects of COVID-19.

The present research

These interesting previous findings indicate that psychological resources such as coping style and resilience could be very important when it comes to mitigating the psychological

impact of COVID-19, particularly contagion concern. Nevertheless, these studies have used a cross-sectional design and are therefore unable to capture changes in emotional impact and its predictors throughout the COVID-19 outbreak. Moreover, these studies have not examined potential moderating effects in order to determine whether outcomes vary according to individual characteristics such as age and gender.

In the present study—using a community sample in Spain—we took advantage of measures of psychological resilience and negative affect (NA) obtained before the pandemic, and surveyed the same individuals again in the midst of the Spanish COVID-19 lockdown. First, we sought to determine whether people would report higher or lower levels of NA during the COVID-19 lockdown, in comparison with pre-pandemic levels. The second and main aim of this study was to investigate the influence of concerns about contagion on the increase in NA during the COVID-19 lockdown as a function of individual characteristics such as gender and age, along with previous levels of psychological resilience.

Methods

Procedure and participants

The research procedure was divided into two assessment phases. The first assessment was conducted before the COVID-19 pandemic (November 2019) while the second assessment took place during the period of lockdown in Spain that was implemented in response to the pandemic (April 2020). Only participants involved in both phases were included in the study. Hereinafter, the first assessment will be referred to as Timepoint 1 and the second as Timepoint 2.

Timepoint 1. The assessment carried out in Timepoint 1 was part of a larger project aimed at studying the relationship between emotional abilities and well-being (project UMA18-FED-ERJA-114). In this first phase, an adult community sample of 783 volunteers was recruited

by snowball sampling with the help of undergraduate students from the University of Málaga. Of this sample, 355 participants were men, and the age range was between 18 and 71 years, with a mean of 35.38 years ($SD = 14.58$). However, as previously described, only the participants involved in both Timepoint 1 and Timepoint 2 were included in the study; thus the sociodemographic characteristics of the final sample are described in the Timepoint 2 section. During this first assessment, the participants completed questions related to demographic variables (including gender and age) and were evaluated on negative affect and resilience. The survey opened on November 11, 2019 (4 months before the COVID-19 outbreak) and was available for a period of 2 weeks.

Timepoint 2. On April 1–16, 2020, we invited all participants who had completed the first assessment to complete the same measurement instrument of negative affect along with other items about their experiences during the COVID-19 lockdown, which included the level of concern about contagion. Participants were compensated for their involvement with a chance to win a €40 Amazon gift card. The final sample of the present study included 102 participants who completed both the Timepoint 1 and Timepoint 2 surveys. Thirty-five of these participants were men. The age range of the sample was between 19 and 67 years, with a mean of 29.59 years ($SD = 13.02$).

Participants were assured of the confidentiality and anonymity of the collected data, and all of them were treated in accordance with the Helsinki declaration (World Medical Association, 2008).

Instruments

The participants' levels of negative affect, psychological resilience, and contagion concern were evaluated through the online platform Lime survey (<http://limesurvey.org>). Details of the assessment instruments are described below.

Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) is a self-report

scale used to measure negative affect (NA) and positive affect (PA). In this study, we were interested only in the NA subscale. For each item, the participants were required to indicate the extent to which they had felt a particular emotion during the previous weeks (e.g., fear, shame, hostility, or anxiety) through a 5-point Likert scale ranging from 1 “not at all” to 5 “strongly.” The NA score is computed by summing the response to each item. We employed the Spanish version of the questionnaire (Sandin et al., 1999), which has shown a robust two-dimensional structure (PA and NA), adequate construct validity, and excellent internal consistency (NA: $\alpha = 0.90$). In our study, in Timepoint 1 and in Timepoint 2 the internal consistency of NA was evidenced by Cronbach's $\alpha = 0.71$.

Connor-Davidson Resilience Scale (10-item CD-RISC; Campbell-Sills and Stein, 2007; Connor and Davidson, 2003; Spanish version: Notario-Pacheco et al., 2011) is a self-report instrument that evaluates an individual's ability to cope with adverse experiences. Participants must indicate the level of agreement or disagreement with each item on a 5-point scale, where 0 = “not true at all” and 4 = “true nearly all the time.” Sample items include “Not easily discouraged by failure” or “Can handle unpleasant feelings.” The final scores are obtained by summing the response to each of the items, with higher values indicating higher levels of resilience. We used the Spanish version of the questionnaire (Notario-Pacheco et al., 2011) which has shown good psychometric properties (Cronbach's α coefficient = 0.85 and test-retest intraclass correlation coefficient = 0.71). For our study, in Timepoint 1 the internal consistency was evidenced by Cronbach's $\alpha = 0.82$.

Contagion concern. Participants indicated their concerns about themselves and their family members being infected by COVID-19 using a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree. The wording of the item assessing contagion concern was as follows: “I am worried that I or my family members could become infected by coronavirus (COVID-19)” (In Spanish: “Me

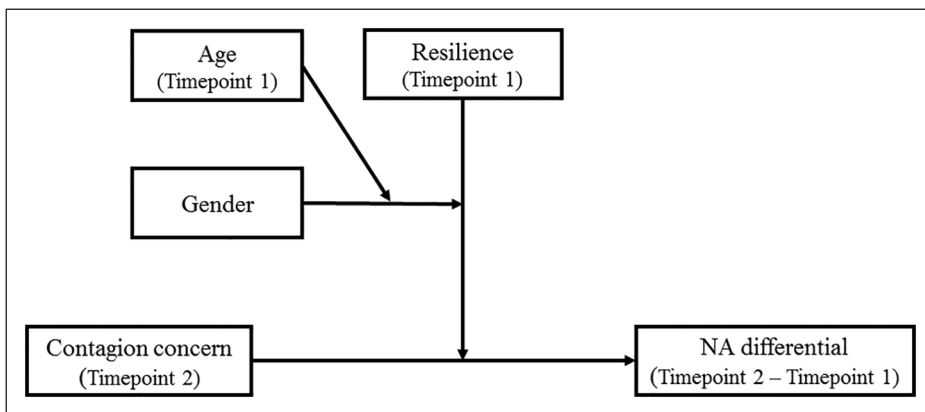


Figure 1. Graphical representation of the third-order interaction model including the interaction between contagion concern, resilience, gender, and age as predictor of NA differential. Timepoints when the variables were assessed are included along with the name of the variable.

preocupa contagiarme o que mis familiares se contagien con el coronavirus (COVID-19)").

Data analysis

First, a descriptive analysis was conducted to examine the scores obtained for each study measure, both in the total sample and divided by gender. Further, gender differences were contrasted using *t*-tests. Second, possible changes in the levels of NA during the lockdown (Timepoint 1) compared with the previous period (Timepoint 2) were analyzed by *t*-tests. Finally, in order to address the main objective of the study, we conducted a multiple regression analysis to identify the influence of contagion concern on the increase in NA as a function of resilience levels, gender and age (Figure 1 shows a graphical representation of the third-order interaction). To compute the increase in NA (hereinafter called NA differential) we subtracted the levels of NA during the lockdown from the levels of NA prior to the lockdown (NA differential = NA Timepoint 2 – NA Timepoint 1). All first, second, and third-order interactions were included in the model. Scores related to age, resilience and contagion concern (as predictor variables) were mean-centered prior to the regression analysis. In order to further explore significant interactions, a pick-a-point approach was employed by using SPSS

PROCESS macro 3.4 (Hayes, 2018). Descriptive, *t*-test, and multiple regression analyses were conducted using SPSS 24 (IBM corp., USA).

Data sharing statement

The dataset used in the current study, after de-identification, is available in Supplemental material.

Results

Table 1 displays the descriptive statistics of the variables included in the study for both the total sample and separated by gender.¹ The normality assumption was reasonably satisfied for all the variables (skewness coefficients varied between -0.69 and of 0.90 and kurtosis coefficients varied between -0.39 and of 0.81). Independent sample *t*-tests for gender revealed no significant differences between men and women in any of the study variables (all *p*-values >0.05). When comparing the levels of NA during the lockdown (Timepoint 2) with the previous period (Timepoint 1), the paired sample *t*-test revealed higher levels of NA during the lockdown ($t(101)=3.87$; $p < 0.001$; Cohen's $d=0.38$).

Next, we focus on the main aim of the research, namely, to study the influence of the

Table 1. Means and standard deviations (SD) of the study variables for the total sample of participants who were involved in both phases (i.e., in both Timepoint 1 and Timepoint 2). Results are also shown separately for each gender.

	Total sample		Men		Women	
	Mean	SD	Mean	SD	Mean	SD
NA Timepoint 1	1.92	0.65	1.88	0.67	1.93	0.65
NA Timepoint 2	2.22	0.75	2.11	0.66	2.28	0.79
NA differential	0.31	0.80	0.23	0.66	0.34	0.86
Contagion concern	5.31	1.56	5.60	1.50	5.16	1.58
Resilience	27.66	5.48	27.51	6.87	27.73	4.65

NA differential: NA Timepoint 2 – NA Timepoint 1.

Table 2. Summary of the multiple regression analysis.

Predictor	B	SE	β	t	p
Constant	0.24	0.35		0.69	0.49
Contagion concern	-0.26	0.22	-0.50	-1.15	0.25
Resilience	-0.13	0.05	-0.89	-2.50	<0.001**
Gender	0.05	0.19	0.03	0.28	0.78
Age	0.06	0.03	1.03	2.18	0.03*
Contagion concern \times resilience	0.10	0.04	0.93	2.37	0.02*
Contagion concern \times gender	0.18	0.12	0.60	1.43	0.16
Contagion concern \times age	-0.02	0.02	-0.44	-0.83	0.41
Resilience \times gender	0.08	0.03	0.91	2.59	0.01**
Resilience \times age	-0.01	0.01	-0.76	-1.69	0.10
Gender \times age	-0.03	0.02	-0.73	-1.71	0.09
Contagion concern \times resilience \times gender	-0.07	0.02	-1.16	-3.09	< 0.01**
Contagion concern \times resilience \times age	0.01	0.00	0.81	1.87	0.07
Contagion concern \times gender \times age	0.01	0.01	0.44	0.90	0.37
Resilience \times gender \times age	0.01	0.00	0.69	1.66	0.10
Contagion concern \times resilience \times gender \times age	-0.00	0.00	-0.72	-1.81	0.07

$F(15, 86) = 2.02$; $R^2 = 0.26$; $p = 0.02$.

* $p < 0.05$. ** $p < 0.01$.

contagion concern on the increase in the NA as a function of the levels of resilience, gender, and age. The multiple regression analysis with NA differential (NA Timepoint 2 – NA Timepoint 1) as criterion variable revealed that this variable was significantly related to age, resilience, the interaction of contagion concern and resilience, the interaction of resilience and gender, and the second-order interaction between contagion concern, resilience, and gender (see Table 2). With regard to the

significant relationship with age, the results showed that this variable was positively related to the NA differential, that is, the higher the age, the higher the increase in NA levels during the lockdown in comparison with the pre-lockdown period. The remaining significant relationships were part of the significant second-order interaction; therefore, we will only describe the latter. To explore the source of this second-order interaction, a pick-a-point approach was employed. The effect of contagion concern on

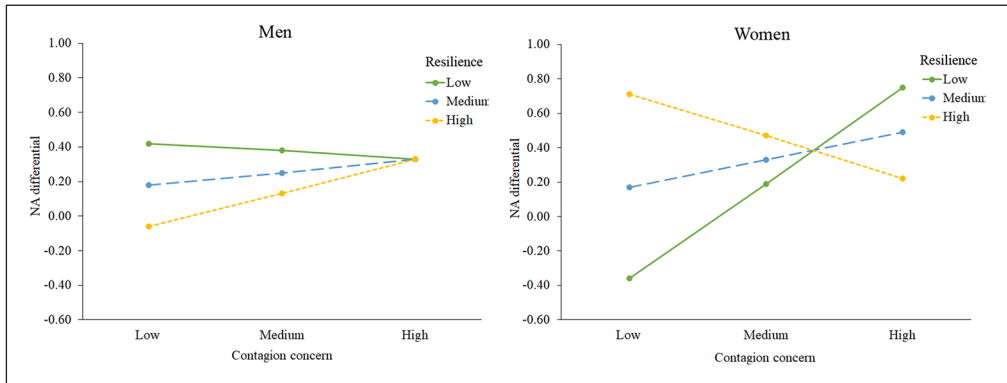


Figure 2. Graphical representation of the results of the second-order interaction between contagion concern, resilience, and gender as a predictor of the NA differential (NA Timepoint 2 – NA Timepoint 1). Both panels show the value of the NA differential as a function of contagion concern and resilience level for men (left-hand panel) and women (right-hand panel). Values for contagion concern and resilience are mean-centered. Values for each level of contagion concern correspond to -1.56 (low), 0 (medium), and 1.56 (high); for levels of resilience the correspondence is -5.48 (low), 0 (medium), and 5.48 (high).

NA differential was studied at three levels of resilience (low (mean -1 SD), medium (mean), and high [mean $+1$ SD]) and by gender. According to the results of the pick-a-point approach, the relationship between contagion concern and NA differential was only observed in women with low resilience ($p < .001$). No relationship was found for men regardless of the level of resilience or in women with medium and high resilience ($p > 0.05$). Figure 2 graphically displays the results of the second-order interaction.

Discussion

The lockdown measures implemented in response to the global COVID-19 pandemic have had a number of psychological consequences for the population. Both previous and current quarantines have been shown to have an impact on NA (Brooks et al., 2020; Vindegaard and Benros, 2020). Since the emergence of this pandemic, some studies have attempted to identify the individual factors that could protect against the emotional impact of this situation. However, these studies employed cross-sectional methodologies. The present study investigated the effect of contagion

concern on NA according to resilience, gender and age through a longitudinal methodology that evaluated the participants before and during the lockdown situation in Spain.

With regard to the first aim of our study, we observed an impact of the COVID-19 pandemic and quarantine on NA levels. Specifically, participants showed higher levels of NA during the lockdown in comparison with pre-lockdown. This finding is consistent with two reviews suggesting that quarantine provokes negative emotions such as anger, fear, anxiety, or depression (Brooks et al., 2020; Vindegaard and Benros, 2020). Although the present study is focused on negativity and not on psychopathologies, we think it is particularly important to take into account this increase in emotional negativity in the general population during the COVID-19 lockdown, since the maintenance of this emotional valence has shown to be a risk factor for developing future psychopathologies (Liu et al., 2020). Moreover, while previous cross-sectional studies have reported mixed findings with regard to age as a risk factor (Gao et al., 2020; Mazza et al., 2020; Qiu et al., 2020; Vindegaard and Benros, 2020), we have found that this factor plays a role in the increased negativity observed during lockdown, that is, the

higher the age, the greater the increase in negative emotions. One possible explanation for our findings is that the highest mortality rate occurred among the elderly during the pandemic in Spain has caused older people to feel more exposed and vulnerable and thus feel more negative emotions such as anxiety, sadness, or fear. In addition, previous research has revealed that older adults are at higher risk for mental health disorders when forced to live in conditions of social isolation (Armitage and Nellums, 2020).

In relation to the second and main aim of our study, our results revealed a significant second-order interaction between contagion concern, resilience and gender for the NA differential. The relationship between contagion concern and NA differential was only observed in women with low resilience. In particular, those women with low resilience that expressed a high concern about being infected with COVID-19 reported a higher increase in NA during the lockdown. This result is consistent with those of previous studies indicating that women have a higher risk of suffering from negative psychological consequences as a result of the pandemic (Vindegard and Benros, 2020). Although additional research is needed, these gender differences could be due to divergent gender roles. For instance, women often dedicate more time to informal care within families, which could limit their opportunities at work and render them more vulnerable to family-related distress (Wenham et al., 2020). Interestingly, we have shown how this risk factor could be mitigated if levels of resilience are not low. Previous studies have already shown the protective role of resilience for mental health; individuals with the ability to cope and recover from significant stress or adversity have shown lower levels of psychological problems when faced with previous disasters (Blackmon et al., 2017; Galea et al., 2020; Salguero et al., 2011) and during the COVID-19 pandemic (Bonanno et al., 2007; Killgore et al., 2020; Liu et al., 2020). However, we have gone a step further by reporting differential results as a consequence of gender. Our

findings suggest that men could be employing a different protective mechanism to women, which should be explored in future studies. Moreover, it would be interesting to follow up the low resilience women in order to observe their adaptation process in this stressful situation. Finally, future lines of research should be focused on clinical measures such as depression or anxiety, in order to explore the impact of the increase in NA as a risk factor for these variables.

Our study is not exempt from limitations. Only a proportion of the sample involved in Timepoint 1 participated in the assessment carried out at Timepoint 2 (13.02% of the original sample). While it is clear that a larger sample would have been desirable to avoid possible bias related to the representativeness of the sample, the difficulty in recruiting a greater number of participants lay in the fact that the assessment at Timepoint 1 was conducted prior to the COVID-19 outbreak and, therefore, participants were not committed to participate in a second assessment 4 months later. In any case, a strength of our study is that the analyses only included data from those participants involved in both assessment phases, avoiding thus the problems and bias that can result from comparing different samples between timepoints. A further limitation concerns the gender bias in our sample, with 65% of the participants being women. Moreover, the use of two assessment timepoints could mask points of inflection throughout time. In order to address this limitation, future investigations should employ instruments that allow for a continuous evaluation, such as diaries. Finally, it would be of interest for future studies to focus on an evaluation of the impact of contagion concern, resilience, gender, and age on discrete emotions.

In addition to the further lines of investigation already proposed, the study of additional sociodemographic variables should be included such as co-habitants in the home or income levels, among others, all of which could determine the psychological effects of the COVID-19 pandemic and lockdown (Brooks et al., 2020; Vindegard and Benros, 2020). Moreover,

future studies should examine in greater depth the variables that could underlie the gender differences observed here. In particular, it would be worthwhile to identify whether relevant variables related to gender roles could explain the fact that the relationship between contagion concern and NA was only significant for woman with low resilience (Wenham et al., 2020).

In spite of these limitations, our research has some notable strengths. The most relevant aspect of the present study is the use of longitudinal methodology. To our knowledge, this is the first study to adopt a longitudinal approach in the search for the emotional consequences of the COVID-19 pandemic and the protective psychological factors for mental health. We first evaluated our participants in November 2019, long before the emergence of COVID-19, after which a follow-up evaluation was carried out during lockdown. In addition, we recruited participants from an adult community sample, which allows our findings to be generalized to a wider section of the population.

Finally, our results have some practical implications. We do not know how long the COVID-19 pandemic is going to last or if we will have to deal with future pandemics. Thus, it would be important to develop brief interventions for risk populations. In particular, our results suggest the need to focus on ways of developing resilience in order to mitigate the increase in NA as a consequence of a stressful situation. In addition, such interventions could also include brief training programs in adaptive emotion regulation strategies for managing negativity and avoiding future psychopathologies (Schäfer et al., 2017).

In conclusion, the present study confirms that women with low levels of resilience are more vulnerable to the negative psychological impact of this unprecedented lockdown situation and pandemic, since they show higher NA when concerned about the possibility of being infected by COVID-19. Researchers and clinicians should therefore consider the gender perspective in order to better understand the psychological consequences of this pandemic. In this regard, we recommend the development

of prevention programs that include gender and resilience as key variables.

Declaration of conflicting interests

The authors declare that there is no conflict of interest.

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Supplemental material

Supplemental material for this article is available online.

Note

1. Pearson's correlations between the study variables are presented in Appendix (Table A1).

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Appendix

Table A1. Pearson correlations between the study variables.

	NA Timepoint 2	NA differential	Contagion concern	Resilience	Age
NA Timepoint 1	0.35**	-0.49**	-0.02	-0.17	-0.40**
NA Timepoint 2	–	0.65**	0.14	-0.14	-0.14
NA differential		–	0.15	0.01	0.19*
Contagion concern			–	-0.15	0.20*
Resilience				–	-0.06
Age					–

* $p < 0.05$. ** $p < 0.01$.