








ORIGINAL ARTICLE

The repercussions of perceived threat from COVID-19 on the mental health of actively employed nurses

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ABSTRACT: In the confrontation with the COVID-19 pandemic, threat perceived by the nursing population, and its association with sociodemographic and contextual characteristics, must be measured and evaluated as well as their repercussions on their mental health. Therefore, the purpose of this study was to analyse the repercussion of perceived threat from COVID-19 on the mental health of actively employed nurses, considering a COVID-19 diagnosis, whether their own or of someone close to them. The sample was comprised of 351 nurses. Sociodemographic data were collected, and the Questionnaire on Perception of Threat from COVID-19 and the General Health Questionnaire were administered. The three demographic and contextual variables mentioned were related to mental health, mediated in some symptoms by perceived threat. These results provide important information for implementing measures or psychoeducational programs for nurses, essential in the present pandemic for improving psychological adaptation and reducing the effects on their mental health.

KEY WORDS: COVID-19, mental health, nurses, perceived threat, repercussion.

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INTRODUCTION

The pandemic caused by the SARS CoV-2 coronavirus (COVID-19) originated in Wuhan (China) at the end of 2019 (Huang *et al.* 2020; WHO, 2020; Zhu *et al.* 2020). Its powerful transmission and high infection rate have led to rapid worldwide growth in the number of cases (Lotfi *et al.* 2020), posing a severe public health problem (Wang *et al.* 2020) and challenging overloaded (Hong *et al.* 2020) healthcare systems (Nagesh, 2020). The scenario in which healthcare professionals have had to practice their profession has been very demanding (Lima *et al.* 2020), faced with lack of material resources such as personal protection equipment, beds available in the ICU, mechanical ventilators (Cacchione, 2020; del Rio & Malani, 2020; Saglietto *et al.* 2020), and an increasing number of infected healthcare workers, with their

consequent sick leave. All of this, along with the high influx of patients, has caused healthcare employees to have to work at high risk of contagion with the worldwide outbreak of COVID-19 (Nagesh, 2020).

In this critical situation, performing healthcare services has been enormously challenged (Jiang *et al.* 2020) by complicated decisions and work under extreme pressure (Greenberg *et al.* 2020). Firstline healthcare professionals, along with the patients, are the most vulnerable to the emotional impact of the pandemic (Braquehais *et al.* 2020; Lima *et al.* 2020; Xiang *et al.* 2020). This was also found in other epidemics such as the SARS in 2003 and Ebola in 2014 (Kisely *et al.* 2020; Maunder *et al.* 2003). In the current context, recovery, emotion regulation, and psychological adjustment (Castellano *et al.* 2019; Lai *et al.* 2020; Pérez-Fuentes *et al.* 2019) are of great concern for the mental health of healthcare professionals (El-Hage *et al.* 2020; León *et al.* 2020; Rodríguez-Leor *et al.*, 2020). Along this line, studies such as the one by Tirado *et al.* (2019) have underlined that overexertion by healthcare professionals is accompanied by an increase in their health complaints, especially if they feel excessively compromised by the work.

The impact of COVID-19 on the well-being of healthcare professionals is of additional concern, because their work is fundamental to both prevention and care of infected patients (Choi *et al.* 2020). This discomfort can be derived from the disease itself, uncertainty, confinement, and the perception of threat (Molero *et al.* 2020a; Pérez-Fuentes *et al.* 2020; Rodríguez-Leor *et al.* 2020). Previous studies have reported increased stress, anxiety, depression, and psychological distress during the pandemic (Duan & Zhu, 2020; Molero *et al.* 2020b).

However, before any intervention for healthcare workers or contribution to improvement in their mental health during the current COVID-19 pandemic can be proposed, the risk and protection factors for their psychological well-being must be known (Kisely *et al.* 2020; Soriano *et al.* 2019). Perceived threat is an important variable, because previous studies have shown that perceived threat from COVID-19 can generate severe psychological maladjustment (Lai *et al.* 2020; Pérez-Fuentes *et al.* 2020).

The Common Sense Model of Self-Regulation (CSM) explains the processes by which people perceive threat to their health, derived perceptions, their corresponding affective responses, and how they cope with that threat (Leventhal *et al.* 2016). Thus, the perception of threat depends on the interpretation of experience and individual action, which influences one's psychological state

(Pérez-Fuentes *et al.* 2020). Perceived threat is, therefore, a key component in individual response (Barr *et al.* 2008). Previous studies have analysed perception of threat and its relationship with mental health (Duan & Zhu, 2020; Pérez-Fuentes *et al.* 2020). Perception of high risk of illness, which could have very negative consequences, in particular, has been associated with the presence of hypochondriac, peritraumatic distress, depression, and anxiety symptoms (Arnáez *et al.* 2019; Pakenham *et al.* 2020). In view of the above, the first hypothesis posed in this study was that there is a relationship between perceived threat and the presence of mental health symptoms (H1).

Another factor related to perceived threat, as in previous pandemics (Barr *et al.* 2008; De Zwart *et al.* 2007), is gender, as women seem to perceive a greater threat from the virus (Molero *et al.* 2020a). Other studies have not found this variable to be relevant in the perception of threat from COVID-19 (Mertens *et al.*, 2020). Aksoy and Hoçak (2020) showed that among nurses, women perceive more danger from COVID-19 than men. So it is important to know whether fear of the virus affects men and women differently and to what extent, to be able to propose and implement effective action based on its effects on individuals (Wenham *et al.* 2020). Rodríguez-Rey *et al.* (2020) also suggested a greater need for attention to those individuals who perceive themselves to be vulnerable. Perceived risk to loved ones and anxiety about one's own health has been linked to an increase in fear and threat from COVID-19 (Mertens *et al.* 2020) as well. This leads to another of our hypotheses, that female professionals who have themselves been diagnosed as COVID-19 positive or someone personally close to them has, will perceive stronger threat from the virus (H2). Studies, such as the one by Pakenham *et al.* (2020), have suggested that even though there are certain sociodemographic and contextual variables, such as being a woman, having been diagnosed with COVID-19 oneself or having an infected family member, that affect one's psychological health, other individual factors also affect that relationship. Therefore, our third hypothesis was that perceived threat is a mediating variable in the relationship between a positive diagnosis of COVID-19 (the worker or someone close) and the manifestation of psychological symptoms (H3).

The purpose of this study was to analyse the repercussion of perceived threat from COVID-19 on the mental health of actively employed nurses, considering the presence of a COVID-19 positive diagnosis or someone personally close diagnosed as positive. All

this, understanding the importance of the threat perceived in the psychological regulation and well-being of health professionals, and its decisive role in the fight against the current pandemic.

Figure 1 shows the hypothesized mediation model.

METHOD

Participants

Originally, a total of 505 nurses agreed to fill out the questionnaire. After review, 154 questionnaires had to be discarded because 148 were unfinished and six had incoherent answers to the control questions inserted at random throughout the questionnaire.

Thus, the study sample was made up of a total of 351 nurses aged 22 to 64, with a mean age of 40.91 ($SD = 10.98$), all of them residents of Spain. Of the total sample, 86% ($n = 302$) were women, with a mean age of 40.81 ($SD = 11.16$) years, and 41.49 ($SD = 9.88$) for men. The marital status of the sample was 61.3% ($n = 215$) married or with a common-law partner, 32.5% ($n = 114$) single, 5.1% ($n = 18$) separated or divorced, and 1.1% ($n = 4$) widowed.

COVID-19 had been diagnosed in 9.1% ($n = 32$) of the participants (90.6% women and 9.4% men), and all were asked whether anyone close to them had been diagnosed as positive, which was the case for 62.7% ($n = 220$) (85.9% women and 14.1% men).

Instruments

An ad hoc questionnaire collected the sample sociodemographic data, including sex, age, and marital status. They were also asked if they had ever been diagnosed with COVID-19 and whether anyone close to them had been.

The *Questionnaire on Perception of Threat from COVID-19* (Pérez-Fuentes *et al.* 2020) was applied to evaluate perceived threat and worry about COVID-19 in the adult Spanish population. It consists of five items

(e.g. *How much is the disease affecting your life?*), which are answered on a 10-point Likert-type scale, providing a single dimension: perceived threat from the disease, where higher scores show greater perceived threat. In this study, the instrument showed a reliability of $\omega = 0.69$; $GLB = 0.74$.

The *General Health Questionnaire* (GHQ-28; Goldberg & Hillier, 1979; Spanish adaptation validated by Lobo *et al.* 1986) was used as a measure of mental health. It has 28 items with four answer choices. Likert-type scoring was used, rating each answer choice from 0 to 3. In addition to a total score on general mental health, the questionnaire provides information on subscales: somatic symptoms (e.g. *Have you felt exhausted and unable to do anything?*), anxiety and insomnia (e.g. *Have you had trouble staying asleep all night long?*), social dysfunction (e.g. *Have you been able to enjoy your normal day-to-day activities?*), and depression (e.g. *Have you felt that life is not worth living?*). The instrument's reliability in this study was $\omega = 0.92$ and $GLB = 0.95$ for the complete scale, and the following on each of the subscales: somatic symptoms ($\omega = 0.87$; $GLB = 0.91$), anxiety and insomnia ($\omega = 0.89$; $GLB = 0.94$), social dysfunction ($\omega = 0.75$; $GLB = 0.82$), and depression ($\omega = 0.88$; $GLB = 0.93$).

Procedure

A CAWI survey (Computer Aided Web Interviewing) was used for data collection. Participation was voluntary. Information on the study and its purpose was presented on the first page, before the questionnaire itself. The participants gave their informed consent by marking a box designed for the purpose, which then gave them access to the questionnaire. They were asked to answer sincerely and the anonymity of their answers was guaranteed. Random or incongruent answers were detected with control questions included throughout the questionnaire. This study was approved by the University of Almeria Research Ethics Committee (Ref. UALBIO2020/032).

Data analysis

Reliability of the instruments used for data collection was estimated using the McDonald's Omega, following Ventura-León and Caycho (2017). The Greatest Lower Bound (GLB) was also calculated.

Descriptive and correlational (Pearson's) analyses were performed. For between-group comparisons (sex, COVID-19 positive diagnosis and someone close

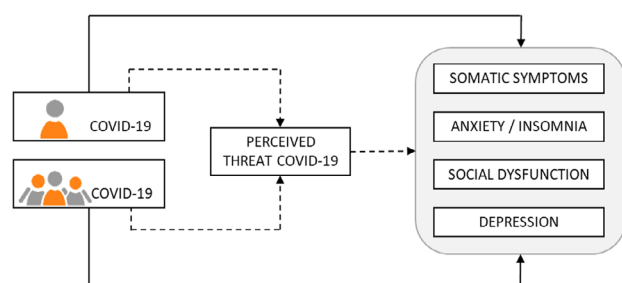


FIG. 1 Hypothesized mediation model.

positive) of perceived threat from the disease, an independent samples *t*-test was applied and the effect size was determined with Cohen's *d* (1988): <0.50 small, 0.50–0.80 medium, and ≥0.80 large effect.

The Bayesian alternative was also computed to estimate evidence in favour of the hypotheses using the Bayes Factor.

Then mediation analyses were performed with a predictor for each model (COVID-19 positive diagnosis, personally close positives), perceived threat from COVID-19 as the mediator, and as result variables, the GHQ-28 dimensions: somatic symptoms, anxiety/insomnia, social dysfunction, and depression. JASP ver. 0.11.1 (2019), based on lavaan software (Rosseel, 2012), was used. To test the indirect effects, bias-corrected percentile bootstrap confidence intervals were calculated following Biesanz *et al.* (2010).

RESULTS

Perceived threat from COVID-19 and mental health of nurses

First, the sociodemographic characteristics were examined. No correlation was found between perceived threat and participant age ($r = 0.02$, $P = 0.658$). However, statistically significant differences were found by sex ($t_{(349)} = 2.28$, $P < 0.05$, $d = 0.35$), where women had a higher mean score ($M = 33.26$, $SD = 6.28$) than men ($M = 31.06$, $SD = 5.93$). To test the weight of the evidence available in favour of the alternative hypothesis (H_1) of between-group differences compared to the null hypothesis (H_0), the Bayes Factor was calculated ($BF_{10} = 1.863$), revealing evidence 1.86 times higher in favour of H_1 over H_0 . The marital status variable was dichotomized for group comparison into partner (married or common-law partner) and no partner (single, separated/divorced or widowed). No significant between-group differences were found ($I_{(349)} = 0.40$, $P = 0.683$).

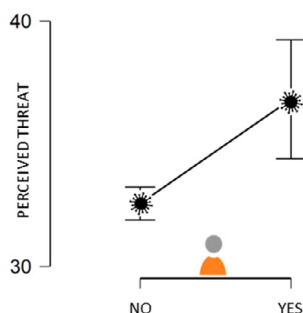
When perceived threat was compared by positive diagnosis or someone close diagnosed positive, statistically significant differences were found (Table 1). Both nurses who were COVID-19 positive (Figure 2a), and those who said someone close to them was positive (Figure 2b), perceived the most threat from COVID-19. In this case, the Bayes Factor revealed very strong evidence in favour of H_1 , COVID-19 positive, over H_0 ($BF_{10} = 98.888$), and strong for a positive diagnosis in someone close ($B_{10} = 27.722$).

TABLE 1 Perceived threat and presence of COVID-19 positive. Student's *t*-test

Have you been diagnosed as COVID-19 positive?					
No			Yes		
<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>
319	32.56	6.10	32	36.81	6.71
$t_{(349)} = -3.71$, $p < 0.001$, $d = -0.68$					
Has anyone close to you been diagnosed as COVID-19 positive?					
131	31.50	7.06	220	33.81	5.59
$t_{(349)} = -3.38$, $P < 0.001$, $d = -0.37$					

In addition, the correlation analysis (Table 2) showed a positive relationship between perceived threat and mental health problems, represented by the four GHQ-28 dimensions. Thus, high perceived threat from COVID-19 was related to high scores in somatic symptoms, anxiety/insomnia, social dysfunction, and depression.

(a) Perceived threat and personal COVID-19 diagnosis



(b) Perceived threat and someone close diagnosed with COVID-19

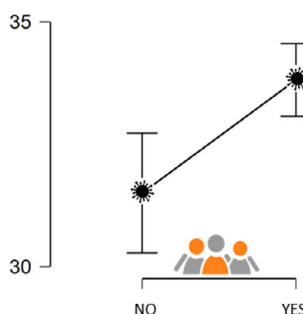


FIG. 2 (a) Perceived threat and personal COVID-19 diagnosis. (b) Perceived threat and someone close diagnosed with COVID-19.

TABLE 2 Perceived threat and health. Pearson's correlation pairs and descriptive statistics

BIP-Q	GHQ-28	Pearson's <i>r</i>	Lower 95% CI	Upper 95% CI	Mean	Stand. Dev.
Perceived Threat <i>M</i> = 32.95, <i>SD</i> = 6.27	Somatic symptoms	0.532***	0.453	0.603	9.64	4.82
	Anxiety/ insomnia	0.541***	0.463	0.611	10.61	5.00
	Social dysfunction	0.286***	0.186	0.379	8.02	3.20
	Depression	0.245***	0.144	0.341	2.21	3.42

****P* < 0.001.

COVID-19, Mental health and the mediating effect of perceived threat

A diagnosis of COVID-19 positive, as shown in Table 3, had a direct effect on two of the four health dimensions analysed, somatic symptoms, and social dysfunction.

The indirect effects, on the other hand, showed that perceived threat from COVID-19 mediated in the relationship between a positive diagnosis and mental health indicators, significant in all cases.

The total effects of the model showed significance for a COVID-19 diagnosis on somatic symptoms, anxiety/insomnia, and social dysfunction. Explained variance of endogenous variables included in the mediation model was: 30.2% ($R^2 = 0.302$) for somatic symptoms, 29.3% ($R^2 = 0.293$) for anxiety/insomnia, 10% ($R^2 = 0.100$) for social dysfunction, 6% ($R^2 = 0.060$) for depression, and 3.4% ($R^2 = 0.038$) with perceived threat as a mediator.

As observed in Table 4, someone close with COVID-19 as the predictor variable showed no direct significant effects on the health indicators. However, there were significant indirect effects with perceived threat as the mediator between the predictor variable and the four dimensions of the GHQ-28. Finally, the total effect of the model was only significant for anxiety/insomnia.

Explained variance for the endogenous variables in the model was 28.3% ($R^2 = 0.283$) of the variance for somatic symptoms, 29.3% ($R^2 = 0.293$) for anxiety/insomnia, 9.1% ($R^2 = 0.091$) for social dysfunction, 6.5% ($R^2 = 0.065$) for depression, and 3.2% ($R^2 = 0.032$) with perceived threat as the mediator.

DISCUSSION




This study analysed the repercussions of perceived threat from COVID-19 on the mental health of actively employed nurses, considering whether they had a positive COVID-19 diagnosis or someone close to them had. The results confirmed the original hypotheses.

Thus, women showed significantly higher perceived threat than men, and both nurses who had been diagnosed with COVID-19 and those who said they had someone close who was, perceived a stronger threat from the disease. Along this line, previous studies done both in the general population and with nurses have suggested that women show stronger perceived threat from COVID-19 (Aksoy & Hoçak, 2020; Molero *et al.* 2020a), and that fear of the virus increases when there is a positive diagnosis of either the individuals themselves or someone close to them (Pakenham *et al.* 2020).

According to our results, high perceived threat would be related to high scores on somatic symptoms, anxiety/insomnia, social dysfunction, and depression. Previous studies on the psychological impact during the first stages of the COVID-19 crisis have found that severity and perceived risk are significantly associated with stress, anxiety, and depression (Pakenham *et al.* 2020; Rodríguez-Rey *et al.* 2020). Pérez-Fuentes *et al.* (2020) also showed that perceived threat from COVID-19 was related positively to emotional states, such as sadness-depression, anxiety and anger-hostility, and these early data on the pandemic in the general population are in agreement with our results for nurses.

Finally, this study found that the presence of a positive diagnosis had a negative impact on mental health indicators, where the perceived threat of COVID-19 acted as a mediating variable. Thus COVID-19 nearby or in the workers themselves affected the level of perceived threat from the disease, and this in turn impacted on the mental health of the workers. With someone close diagnosed with COVID-19, the total effect of the model was significant for anxiety/insomnia. As far as we know, to date there are no previous studies analysing the relationship of these variables. Authors such as Pakenham *et al.* (2020) have shown that individual factors such as cognitive inflexibility, marked by harmful and uncontrollable thoughts and feelings, moderated the relationship between a COVID-19 positive diagnosis, or someone close who has been infected, and mental health. This study,

TABLE 3 COVID-19 positive diagnosis and mental health. Direct, indirect, and total effects

					95% CI	
	Estimate	Std. Error	z-value	P	Lower	Upper
<i>Direct effects</i>						
						
GHQ-SS	0.482	0.158	3.054	0.002	0.130	0.838
GHQ-AI	0.065	0.159	0.411	0.681	−0.273	0.346
GHQ-SD	0.485	0.179	2.710	0.007	0.070	0.948
GHQ-D	−0.053	0.183	−0.291	0.771	−0.353	0.347
<i>Indirect effects</i>						
						
PT _{COVID-19} → GHQ-SS	0.342	0.097	3.535	<0.001	0.135	0.557
PT _{COVID-19} GHQ-AI	0.364	0.102	3.554	<0.001	0.155	0.601
PT _{COVID-19} → GHQ-SD	0.175	0.058	2.990	0.003	0.066	0.341
PT _{COVID-19} → GHQ-D	0.168	0.058	2.923	0.003	0.068	0.322
<i>Total effects</i>						
						
GHQ-SS	0.824	0.180	4.580	<0.001	0.432	1.232
GHQ-AI	0.429	0.184	2.335	0.020	0.003	0.823
GHQ-SD	0.660	0.182	3.632	<0.001	0.253	1.120
GHQ-D	0.115	0.185	0.621	0.534	−0.223	0.595






 COVID-19 positive; GHQ-AI, Anxiety / insomnia; GHQ-D, Depression; GHQ-SD, Social dysfunction; GHQ-SS, Somatic symptoms; PT_{COVID-19}, Perceived Threat COVID-19. [Note. Delta method standard errors, bias-corrected percentile bootstrap confidence intervals].

TABLE 4 Someone close who is COVID-19 positive and mental health. Direct, indirect, and total effects

	Estimate	Std. Error	z-value	P	95% CI	
					Lower	Upper
<i>Direct effects</i>						
 GHQ-SS	0.004	0.095	0.043	0.966	−0.183	0.213
GHQ-AI	0.035	0.094	0.373	0.709	−0.140	0.234
GHQ-SD	−0.202	0.107	−1.891	0.059	−0.424	−0.005
GHQ-D	−0.149	0.108	−1.376	0.169	−0.370	0.093
<i>Indirect effects</i>						
 PT _{COVID-19} → GHQ-SS	0.196	0.060	3.258	0.001	0.076	0.326
PT _{COVID-19} → GHQ-AI	0.198	0.061	3.263	0.001	0.082	0.332
PT _{COVID-19} → GHQ-SD	0.112	0.038	2.938	0.003	0.040	0.211
PT _{COVID-19} → GHQ-D	0.095	0.034	2.795	0.005	0.038	0.181
<i>Total effects</i>						
 GHQ-SS	0.200	0.110	1.822	0.068	−0.014	0.416
GHQ-AI	0.233	0.109	2.130	0.033	0.026	0.445
GHQ-SD	−0.090	0.110	−0.821	0.412	−0.297	0.128
GHQ-D	−0.054	0.110	−0.489	0.625	−0.273	0.189

 someone close COVID-19 positive; GHQ-AI, Anxiety / insomnia; GHQ-D, Depression; GHQ-SD, Social dysfunction; GHQ-SS, Somatic symptoms; PT_{COVID-19}, Perceived Threat COVID-19. [Note. Delta method standard errors, bias-corrected percentile bootstrap confidence intervals].

therefore, adds to the inquiry into variables exacerbating or mitigating the effects that a positive COVID-19 diagnosis of themselves or of someone close to them

can have on the psychological well-being of nurses, one of the labour groups most affected by the pandemic in Spain.

Our results contribute important information for designing intervention programs to reduce the level of perceived threat and its effects on the mental health of nurses, who are performing indispensable work during this pandemic, (Choi *et al.* 2020), demonstrating their capacity to cope with this unprecedented situation, and making complex decisions (Greenberg *et al.* 2020).

However, we should mention some limitations. In the first place, hospital, unit, or area where the nurses was working were not included. These job characteristics are related to admission of patients affected by COVID-19 and could, therefore, affect the level of threat and the psychological health of the nurses. Therefore, we recommend that they be included in future research. The measures used to evaluate the variables were self-reports, which although they are very useful for large samples and easily applied, and data processing is economical, could be completed with observational measures and interviews with participants, among other methods of collecting information. Another of the limitations of this study was the sex distribution in the sample. However, keeping in mind the general characteristics of the nursing population in Spain, it may be considered representative of a profession which at present is practiced more by women than men. Also, in spite of the large number of studies underway on COVID-19, to our knowledge, there are no previous studies relating the variables in this study in mediation models, limiting the possibility of comparing our results. Furthermore, its cross-sectional design did not permit conclusions to be drawn on the evolution of the variables analysed. A longitudinal study would enable progress in the analysis of the variables included in this study.

CONCLUSIONS

Perceived threat from COVID-19 was higher in nurses who had been diagnosed COVID-19 positive, those who had someone positive among friends and family, and women. There was also a positive relationship between the level of perceived threat and repercussions on their mental health (somatic symptoms, anxiety/insomnia, social dysfunction, and depression). The results of this study further showed that this threat mediated in the relationship between a positive diagnosis and the mental health indicators studied, but was limited to symptoms of anxiety/insomnia in nurses with someone COVID-19 positive close to them.

RELEVANCE FOR CLINICAL PRACTICE

Therefore, as nurses have been shown to perform an essential role during the pandemic, which to date is still punishing our country, and are one of the groups most vulnerable to contagion by COVID-19, knowing these data will enable measures to be implemented that help them cope and maintain their psychological well-being. In this sense, the formulation and implementation of psychoeducational actions for teaching coping strategies could benefit nurses, reducing perceived threat and the psychological symptoms derived from the pandemic.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was evaluated and approved by the University of Almeria Research Ethics Committee (Ref. UAL BIO2020/032).

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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