

Fear and anxiety in professionals about COVID-19: Brazilian versions of measures

Medo e ansiedade de profissionais frente à COVID-19: versões brasileiras de medidas

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Abstract

The objective of this study was to adapt and verify the psychometric properties of the Fear of COVID-19 Scale and Coronavirus Anxiety Scale, from the data collection conducted with professionals who work directly in the fight against COVID-19 in Brazil. A total of 232 professionals participated ($M_{age} = 32.9$; $SD = 7.6$), most of them female (68.1%), who answered the Fear of COVID-19 Scale, the Coronavirus Anxiety Scale, and the Depression, Anxiety, and Stress Scale instruments and a sociodemographic questionnaire. The adaptation process allowed identifying the content validity of the Brazilian versions and exploratory factorial analyses, followed by correlation studies showing evidence of internal structure validity and in relation to other (convergent) Fear of COVID-19 Scale and Coronavirus Anxiety Scale variables, which presented equally satisfactory reliability rates. Thus, the Brazilian versions of the Fear of COVID-19 Scale and Coronavirus Anxiety Scale scales were made available with satisfactory psychometric qualities for use in the research and assessment of psychological aspects of health professionals.

Keywords: COVID-19; Emotional experiences; Psychological tests.

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Resumo

Objetivou-se adaptar e verificar as propriedades psicométricas das escalas Fear of COVID-19 Scale e Coronavirus Anxiety Scale a partir da coleta de dados realizada com profissionais que atuam diretamente no combate à COVID-19 no Brasil. Participaram do estudo 232 profissionais ($M_{idade} = 32,9$ anos; $DP = 7,6$), sendo a maioria do sexo feminino (68,1%), que responderam aos instrumentos Fear of COVID-19 Scale, Coronavirus Anxiety Scale, Depression, Anxiety and Stress Scale e um questionário sociodemográfico. O processo de adaptação permitiu identificar a validade de conteúdo das versões brasileiras e análises fatoriais exploratórias, seguidas de estudos de correlação que atestaram evidências de validade de estrutura interna e em relação com outras variáveis (convergente) da Fear of COVID-19 Scale e da Coronavirus Anxiety Scale, as quais apresentaram índices de confiabilidade igualmente satisfatórios. Dessa forma, foram disponibilizadas versões brasileiras das escalas Fear of COVID-19 Scale e Coronavirus Anxiety Scale com qualidades psicométricas satisfatórias para o uso em pesquisas e avaliação de aspectos psicológicos de profissionais de saúde.

Palavras-chave: COVID-19; Vivências emocionais; Testes psicológicos.

An outbreak caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) virus Coronavirus Disease 2019 (COVID-19) spread in China in late 2019 (Zwielewski et al., 2020). This new viral strain belongs to the coronavirus family and can cause respiratory problems, with symptoms that involve fever, fatigue, dry cough, and complications that can lead to death (Simonetti et al., 2020). Linked to these symptoms, the rapid contamination of a substantial number of people beyond the Chinese borders has led the World Health Organization to recognize its transmission as a pandemic (Xiang et al., 2020).

With an exponential incidence, COVID-19 reached on February 5, 2021, a total of 104,370,550 confirmed cases and 2,271,180 deaths, distributed in 216 areas, territories, and countries, in the American continents there are 15,466,584 confirmed cases and 527,837 deaths. In Brazil, the numbers reached 9,339,420 confirmed cases and 227,563 thousand deaths (World Health Organization, 2021). In this scenario, disease management has become an emerging global challenge, with mental health among the main concerns (Enumo & Linhares, 2020), which has promoted a mobilization of government authorities, construction of care facilities (e.g., new hospitals, including field hospitals), in addition to the need for a high contingent of health professionals and workers engaged in the fight against COVID-19 (Ozamiz-Etxebarria et al., 2020).

This unprecedented reality has been accompanied by a fear of the new, of the unknown, of the uncertainty of assessment and intervention protocols, both by the general population and health professionals. This fact can lead to the development of psychological disorders such as stress, anxiety, and depression (Asmundson & Taylor, 2020; Shigemura et al., 2020; Wang et al., 2020; Zhu et al., 2020).

Thus, it seems evident that the virus does not cause damage only at the biological level, it lacks attention dedicated to people's mental health, especially to high risk COVID-19 groups and the triggering of consequent psychological symptoms, like professionals who they did not stop their activities and are working to fight against COVID-19. Such people deal with infected patients on a daily basis, which certainly increases the fear of continuing to work due to the real threat of infection and, consequently, the possibility of infecting family and friends (Andrade et al., 2015; Kang et al., 2020).

These professionals, remaining on the front line, are currently the best tools for fighting against the disease. However, it is important to emphasize their vulnerability as negative psychological consequences, which may involve feelings of loneliness and helplessness or a series of dysphoric emotional states such as stress, irritability, mental fatigue, and despair (Huang et al., 2020). Such aspects, in addition to effectively influencing the performance of their everyday activities, can contribute to the intention of taking a leave of absence, a decision that, when implemented, makes it difficult to provide adequate treatment in such a high demand for specialized care, further impacting the disastrous situation of healthcare services provided in Brazil (Ornell, Halpern, et al., 2020).

Therefore, it is possible to indicate that continuous exposure to the pandemic enhances risk factors for emotional problems for professionals who work in COVID-19 care facilities (e.g., hospitals, basic healthcare units, field hospitals) and experience this reality daily. Along these lines, Ornell, Halpern, et al. (2020) pointed out that in outbreaks of other diseases, belonging to the coronavirus family and also causing severe acute respiratory syndrome, health professionals experienced serious psychiatric problems, with experiences involving dysphoria and stress. Therefore, it is essential to assess the psychological status of these professionals to conduct guidelines with appropriate clinical and mental health interventions (Shigemura et al., 2020).

Considering the entire context, it is necessary to have effective measuring instruments that help in the assessment of fear and screening for anxiety symptoms. To accomplish this task, scales with proven psychometric qualities are important tools. Therefore, after a in the scientific literature survey, the Fear of COVID-19 Scale (FCV-19S) and the Coronavirus Anxiety Scale (CAS) were selected, which present satisfactory validity evidence in other cultures, thus deserving attention and efforts to adapt and verify psychometric properties for the Brazilian population.

Fear of COVID-19 Scale (FCV-19S) e Coronavirus Anxiety Scale (CAS)

Ahorsu et al. (2020), developed the COVID-19 Fear Scale aiming to assess individuals regarding the fear they are experiencing in the pandemic caused by the new coronavirus. Initially, they gathered 28 items from general scales on fear, of which 11 were excluded based on the assessment of health experts (doctors, psychologists, virologists, and psychiatrists). Then, after a second round of analysis by independent judges, 10 items remained. After that, a pilot study (with 16 men and 20 women with a mean age of 39.63 years) attested the intelligibility of the items. In the study, with the general population of Iran ($n = 717$), to gather evidence of validity and accuracy, three items were eliminated in the previous analytical steps, while the remaining seven items had factor loadings between 0.66 and 0.74 and a Cronbach's alpha of 0.82).

Finally, the authors assessed the validity of the measure in relation to other variables through correlations with the Hospital Anxiety and Depression Scale and the Perceived Vulnerability to Disease Scale, and the results indicated significant positive correlations between fear of COVID-19 and depression ($r = 0.43$; $p < 0.001$), anxiety ($r = 0.511$; $p < 0.001$), perception of infections ($r = 0.48$; $p < 0.001$), and aversion to germs ($r = 0.46$; $p < 0.001$). In short, the measure presented evidence of psychometric adequacy and unidimensional structure, becoming widely used throughout the world, with psychometric studies in Turkey (Haktanir et al., 2020), Italy (Soraci et al., 2020), Russia and Belarus (Reznik et al., 2020), Bangladesh (Sakib et al., 2020), Israel (Bitan et al., 2020), Saudi Arabia (Alyami et al., 2020), Japan (Masuyama et al., 2020), and Spain (Barrios et al., 2020).

In turn, Lee (2020) developed the CAS, and it is a measure that assesses individuals' levels of anxiety regarding the new coronavirus. Its items express anxiety manifested in four dimensions: 1) cognitive, characterized by repetitive, negative thoughts, cognitive biases, concerns related to the coronavirus and dysfunctional thoughts; 2) behavioral, described by compulsive and dysfunctional avoidance and escape behaviors; 3) emotional, represented by feelings of fear, anger, disgust, and anxiety; in addition to 4) physiological, specified by sleep disturbances, palpitations, hyperventilation, and shivering. It should be noted that the measure was created based on the criteria of the transversal symptoms scale of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), in a self-report version for adults (American Psychiatric Association, 2014).

Initially, the CAS had a set of 20 items answered based on the manifestation of symptoms in the last two weeks. Through Principal Component Analysis and Confirmatory Factor Analysis, the validity of the measure was evidenced, with a unidimensional structure consisting of 5 items. It presented a satisfactory

internal consistency index (Cronbach's alpha equal to 0.93), and through the Receiver Operating Characteristic curve evidence of diagnostic accuracy was verified. In addition, the CAS presented adequate psychometric properties in different samples and contexts, such as in the American work context (Lee, Mathis, et al., 2020) and a general population sample in Poland (Skalski et al., 2020) and Turkey (Evren et al., 2020). These studies, as well as those mentioned above regarding the FCV-19S demonstrate acceptable psychometric properties that support its use as a mental health screening measure with people involved in the COVID-19 context.

Considering the above, it was found that such instruments showed relevant applicability to different populations, being used in different countries. Thus, as no Brazilian studies were found with both scales, the relevance of adapting and verifying evidence of validity and accuracy of the FCV-19S and CAS instruments for health professionals working to fight COVID-19 was identified.

Method

Participants

The sample consisted of health professionals, most of them nurses (28.0%), nursing technicians (19.5%), psychologists (13.0%), physiotherapists (11.0%), and physicians (11.0%), who are working in the fight against COVID-19. In all, 232 professionals answered the survey, mostly from states in the Northeastern region of Brazil, in the following states: Piauí (38.8%), Ceará (21.7%), Maranhão (8.3%), and Bahia (7.4%). They self-identified as single (53.9%), childless (57.3%), and female (68.1%) individuals, with a mean age of 32.94 years ($SD = 7.67$).

Procedures

The research was approved by the Ethics Committee for Research with Human Beings of the *Universidade Federal do Piauí* (UFPI, Federal University of Piauí), Opinion nº 4.062.796, considering the ethical aspects required by Resolution nº 510/16. In its execution, the FCS-19S and CAS were initially adapted to the Brazilian context (Borsa et al., 2012) and, subsequently, the instruments were applied using the Qualtrics online research platform <www.qualtrics.com>, providing an access link by email and various social networks (e.g., Facebook, WhatsApp, and Instagram). At the time, people were invited to participate in the research and informed about the general objective of the study, its voluntary nature, anonymity, and the possibility of quitting at any time, without any consequences. Before answering the instruments, they were asked to certify that they accepted to participate through the Informed Consent Form, requiring a mean time of 10 minutes to complete the participation.

Instruments

Fear of COVID-19 Scale (FCV-19S): Consisting of seven items that assess fear of COVID-19 (e.g., item 4. I am afraid of losing my life because of COVID-19), it is answered on a five-point scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). In its conception (Ahorsu et al., 2020) acceptable psychometric evidence was gathered (unifactorial structure and Cronbach's alpha = 0.82).

Coronavirus Anxiety Scale (CAS): Consisting of five items that include cognitive, behavioral, emotional, and physiological aspects of dysfunctional anxiety facing the coronavirus (Lee, 2020). Each item (e.g., 2. I had difficulty falling asleep or sleeping because I was thinking about the coronavirus.) is answered on a

5-point scale referring to symptom frequency, ranging from 0 (*nothing*) to 4 (*almost every day*) regarding the previous two weeks. Specifically in its elaboration study, the scale showed satisfactory precision (Cronbach's alpha = 0.93).

Depression, Anxiety and Stress Scale (DASS-21): It is an instrument with 21 items (Lovibond & Lovibond, 2004) with a Brazilian Portuguese version (Vignola & Tucci, 2014) that assesses negative affectivity or aversive states (anguish, sadness, anger, guilt, fear, etc.), defined in three emotional states: anxiety, depression, and stress. With three subscales of seven items each (stress [e.g., item 1. I had difficulty calming down] anxiety [e.g., item 2. My mouth felt dry], and depression [e.g., item 3. I could not feel any positive feelings]), it is answered on a four-point scale ranging from 0 (*It did not apply to me at all*) to 3 (*It applied to me very much*).

Sociodemographic Questionnaire: Composed of questions related to age, sex, and work-related aspects, with the aim of characterizing the sample.

Data Analysis

With the Factor software, version 10.10.03 (Ferrando & Lorenzo-Seva, 2017), the dimensionality of the scales (FCV-19S and CAS) was investigated in order to gather evidence of internal structure, taking into account the Hull Comparative Fit Index method (Lorenzo-Seva et al., 2011) as a decision criterion for how many factors to retain (Lorenzo-Seva et al., 2011), based on a Diagonally Weighted Least Squares (DWLS), categorical Exploratory Factor Analysis (EFA) implemented in the polychoric correlation matrix, due to the fact that the scales cannot be considered continuous, as they are Likert type, composed of ordered categories (Holgado-Tello et al., 2010; Lara, 2014). Furthermore, Cronbach's alpha and McDonald's omega were calculated in order to verify the accuracy of the scales. The R software was used to characterize the participants through descriptive and dispersion statistics, item discrimination through the Item Response Theory (IRT), in addition to correlations for evidence of convergent validity.

Results

In view of the cross-cultural adaptation of the instruments, based on the recommendations of the authors of the scales and the proposal by Borsa et al. (2012), at first, the measures were translated into Brazilian Portuguese, with two English proficient professionals conducting the process. Subsequently, information from the original and translated versions was compiled in order to check for semantic, idiomatic, contextual, and linguistic differences. For that, professionals with expertise in the researched phenomena were asked to decide, alongside the responsible researchers, about the maintenance of each item in the version to be adapted. At the time, the items suggested by the translators were maintained.

Once this stage had been completed, the compiled version was distributed for analysis by expert researchers in the area, who checked the structure of the scales. Thus, these experts verified the semantic and theoretical equivalence regarding the items that make up each scale (FCV-19S and CAS). The next step undertaken was the back translation, which consisted of translating the compiled version back into the original language and having it analyzed by experts and the public, in order to verify whether the items reflected what they were intended to measure. In this case, this step had the participation of another translator and a meta-researcher. Finally, and before proceeding with the techniques and statistical analyses, a pilot study was again applied with a small sample of health professionals representing the target population. Thus, 20 professionals, evenly distributed according to sex and different functions (e.g., physicians, nurses, psychologists, physiotherapists) were asked to verify possible difficulties in understanding the item and adequacy of the instrument versions. In this case, there were also no suggestions for changes and the final versions were obtained, as shown in Table 1.

Table 1*Adapted items and factor structures with scale discriminations (FCV-19S and CAS)*

Fear	Robust EFA - FCV-19S			IRT
	F1	95% CI	h ²	a
7- My heart speeds up or flutters (palpitation) when I think about getting infected with COVID-19	0.90	0.83 – 0.93	0.81	2.04
6- I cannot sleep because I am worried about getting COVID-19	0.88	0.82 – 0.92	0.77	1.81
3- My hands get sweaty when I think about COVID-19	0.76	0.67 – 0.81	0.58	1.18
1- I am very afraid of COVID-19	0.72	0.64 – 0.80	0.53	1.07
5- When I watch news and stories about COVID-19 on social media, I get nervous and anxious	0.71	0.60 – 0.78	0.50	1.01
4- I am afraid of losing my life because of COVID-19	0.65	0.53 – 0.75	0.43	0.86
2- I feel uncomfortable when I think about COVID-19	0.62	0.48 – 0.72	0.39	0.80

Anxiety	Robust EFA - CAS			IRT
	F1	95% CI	h ²	a
5- I felt nauseous or had stomach problems when I thought about or was exposed to information about the coronavirus	0.92	0.86 – 0.96	0.84	2.31
4- I lost interest in eating when I thought about or was exposed to information about coronavirus	0.90	0.79 – 0.94	0.80	2.01
2- I had trouble falling or staying asleep because I was thinking about the coronavirus	0.87	0.80 – 0.92	0.75	1.73
1- I felt dizzy, lightheaded, or faint when I read or listen to news about the coronavirus	0.83	0.72 – 0.91	0.69	1.49
3- I felt paralyzed or frozen when I thought about or was exposed to information about the coronavirus	0.79	0.67 – 0.87	0.62	1.27

Note: a: discrimination; CAS: Coronavirus Anxiety Scale; CI: Confidence Interval; EFA: Exploratory Factor Analysis; FCV-19S: Fear of COVID-19 Scale; F1: factor loading; IRT: Item Response Theory.

With content validity assured, we sought to gather evidence of the validity of the internal structure of the FCV-19S and CAS scales, through robust categorical factor analyses (500 Bootstrap resamplings), which corresponds to a procedure supported by the adequacy of Polychloric matrices to the EFA of the FCV-19S [KMO = 0.85 and χ^2 Bartlett (21) = 967.2 and $p < 0.001$] and CAS [KMO = 0.89 (95% CI = 0.859 – 0.914) and χ^2 Bartlett (10) = 953.6 and $p < 0.001$]. Using a categorical DWLS EFA, both scales resulted in a single factor with eigenvalue > 1 [FCV-19S (4.29) and CAS (3.94)], which explain 61% and 79% of the total variance, respectively. The unidimensionality of both scales was suggested or reinforced by the Hull method and unidimensionality indicators for the FCV-19S (UniCo [Unidimensional Congruence] = 0.98 and MIREAL [Mean of Item RESidual Absolute Loadings] = 0.27) and for the CAS (UniCo = 0.99 and MIREAL = 0.14). Finally, the IRT discrimination was used, with individual properties of the items, and the details of the scales can be found in Table 1.

From Table 1, it was possible to observe that all items were saturated in the Fear of COVID-19 factor, with factor loadings greater than 0.60, ranging from 0.71 (Item 2. I had trouble falling or staying asleep because I was thinking about the coronavirus) to 0.90 (Item 7 My heart speeds up or flutters [palpitation] when I think about getting infected with COVID-19). A similar pattern was found in the items that saturated the Anxiety factor against COVID-19, ranging from 0.79 (Item 3. I felt paralyzed or frozen when I thought about or was exposed to information about the coronavirus) to 0.90 (Item 4. I lost interest in eating when I thought about or was exposed to information about coronavirus). As for the IRT, the item's ability to differentiate people in the latent trait was specifically assessed. In the FCV-19S, it ranged from 0.80 (item 2) to 2.04 (Item 7), whereas in the CAS, it ranged from 1.27 (Item 3) to 2.31 (Item 5).

Furthermore, the internal consistency of the measures was assessed, showing a similar adequacy in the FCV-19S (Standardized Cronbach's Alpha [α = 0.89] and McDonald's Omega [ω = 0.90]) and the CAS (Standardized Cronbach's Alpha [α = 0.93] and McDonald's omega [ω = 0.93]). Furthermore, correlates between the FCV-19S, CAS, and Depression, Anxiety, and Stress Scale (DASS21), factors were conducted

to present evidence of convergent validity. From the results of the correlations, it was possible to verify that the Fear factor, assessed in the FCV-19S, has a positive and statistically significant correlation with the Anxiety factor in the CAS ($r = 0.73$; $p < 001$) and all DASS21 factors [Depression ($r = 0.54$; $p < 001$); Anxiety ($r = 0.64$; $p < 001$); and Stress ($r = 0.63$; $p < 001$)]. Similar relationship patterns were found in some CAS and DASS21 factors [Depression ($r = 0.62$; $p < 001$); Anxiety ($r = 0.70$; $p < 001$) and Stress ($r = 0.63$; $p < 001$)], thus suggesting that the more the experience of fear and anxiety with COVID-19, the greater the mental discomfort according to the DASS21 factors.

Discussion

We consider that the results allow us to conclude that the proposed objective has been reached, which was to adapt and verify psychometric evidences of the FCV-19S and CAS in a sample of professionals who are working in the fight against COVID-19. It is noteworthy that the objective was formulated based on evidence collected in the middle of a crisis that causes uncomfortable psychological symptoms, especially for professionals in healthcare settings, concomitant with that of COVID-19, lacking the psychological instruments to assist in the measuring task (Ornell, Halpern, et al., 2020).

Thus, in an attempt to provide effective assessment tools to quantify and understand the psychological repercussions of the pandemic and indices related to the mental health of professionals who continue to work to fight against the coronavirus, this investigation presented psychometric evidence of scales that measure fear (FCV- 19S) and anxiety (CAS), related to COVID-19. From the results, it was possible to observe that both measures presented factor loadings higher than those generally recommended in the specialized literature (>0.30); Pasquali, 2016).

Regarding the ability to differentiate people according to the latent trait in question (discrimination), both scales had properties which were always higher than what is considered mediocre ($\alpha \leq 0.65$; Baker, 2001), with all items showing moderate, high, and remarkably high discriminations, allowing to adequately differentiate the respondents along the assessed latent trait. Furthermore, internal consistency indices measured using Cronbach's alphas and McDonald's Omegas were equally favorable and in agreement with reference studies (α and $\omega > 0.70$; Cohen et al., 2014; Nunnally, 1978).

In addition to the evidence of internal structure validity, a positive correlation ($r = 0.73$) was observed between the measures in question, suggesting convergent validity (Souza et al., 2017). This fact complemented the positive relationships found between their total scores and the DASS-21 factors (depression, anxiety, and stress) which ranged from 0.54 (depression) to 0.64 (anxiety) for the FCS-19S and 0.62 (depression) to 0.70 (anxiety) for the CAS, higher than those suggested in the literature for indicators of convergent validity ($r \geq 0.50$; Hair et al., 2009; Urbina, 2007).

That said, it is evident that the present study provided evidence of the internal and convergent validity of versions of the scales, adapted to Brazilian Portuguese, also found in other studies worldwide. With the FCV-19S, versions with samples from Japan (Masuyama et al., 2020), Belarus (Reznik et al., 2020), and Spain (Barrios et al., 2020) presented bifactorial structures, with items referring to the emotional dimension and physiological responses. However, the unidimensionality found in the measure corroborates its original study (Ahorsu et al., 2020), as well as validations in other contexts (Alyami et al., 2020; Bitan et al., 2020; Haktanir et al., 2020; Reznik et al., 2020; Sakib et al., 2020; Soraci et al., 2020). While the CAS presented a structure like what was originally proposed (Lee, 2020), having been replicated in different samples (Everen et al., 2020; Lee, Mathis, et al., 2020; Skalski et al., 2020).

Self-report measures of constructs such as fear and anxiety symptoms are efficient and necessary screening tools. Especially in exceptional situations, such as a pandemic leading to psychological discomfort

(Ornell, Schuch, et al., 2020), these measures help in the task of predicting negative psychological reactions or effects (such as anxiety, depression, and stress), thus affecting people's life satisfaction and well-being (Alyami et al., 2020), especially for groups such as the professionals who keep fighting against COVID-19, as they have a high risk of contamination and experience uncomfortable psychological symptoms.

From the above, it is noteworthy that the present investigation contributes to the area and has advanced solid evidence of two measures with proven psychometric qualities, however, it is not without limitations. We point out convenience sampling bias, preventing the generalization of results (Breakwell et al., 2010). However, it is recognized that this was not the objective of the study. Another limitation refers to the impossibility of controlling the participants with clinical and non-clinical conditions, as well as not having controlled with variables that presented themselves as risk and protective factors for the mental health of professionals (e.g., resilience, personality, human values).

Future studies can also assess the relationship pattern of other psychological constructs such as personality, and investigate other aspects of the use of measures, considering different samples (e.g., general population, elderly, children, and adolescents) and analyses that seek to refine the scales (e.g., confirmatory analyses and multigroup invariance). With the assurance of invariance (e.g., sex, frontline professionals or not), it will be possible to compare levels between samples, aligning also experimental designs, using different procedures (e.g., focus groups or psychological and psychiatric interventions) to investigate their influences and propose efficient interventions with a specific action plan for each group involved with COVID-19.

Thus, the importance of aligning efforts to fight against the difficulties faced by professionals in their daily lives in the performance of their everyday activities is highlighted. It can help to avoid the intention to take a leave of absence, given the essential need to meet the huge demand caused by the pandemic, which continues to expand in the health services offered in Brazil (Ornell, Halpern, et al., 2020). At the same time, the aim is to minimize the fear of the new, the unknown, and the uncertainty of assessment and intervention protocols, with screening and the mental help options to maintain a healthy psychological state.

Contributors

R. N. COUTO conceived the study Design and Execution. E. D. MEDEIROS performed the data analysis. Í. M. SOUSA wrote the introduction of the article and contributed to the theoretical discussion. P. C. B. MEDEIROS contributed with data interpretation and assisted in the introduction of the article. T. A. CARVALHO contributed to the review and final version of the manuscript.

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