Psychometric properties and psychological correlates of the COVID-19 Anxiety Syndrome Scale:

A comprehensive systematic review and meta-analysis

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**Abstract**

COVID-19 has led to the demise of millions of people worldwide; additionally, it has resulted in a significant economic and mental health burden. Since the onset of the COVID-19 pandemic, various measures have been constructed to evaluate pandemic-related fear and anxiety. The COVID-19 Anxiety Syndrome Scale (C-19ASS) is a promising measure which assesses coping strategies (e.g., avoidance, checking, worrying, and threat monitoring), termed ‘COVID-19 Anxiety Syndrome’, in response to COVID-19 fear and anxiety. The measure has been broadly welcomed, leading to its use in Brazil (Portuguese), China, Greece, Indonesia, the Philippines, Iran (Farsi), Italy, Saudi Arabia (Arabic), Turkey, the United Kingdom, and the United States. To gain a better understanding of the relevance of the COVID-19 Anxiety Syndrome, we conducted a systematic review and meta-analysis to explore the psychological correlates and psychometric properties of the C-19ASS. Through the analysis of a total of 17,789 individuals (age range 19 to 70; female = 33% to 85%), the C-19ASS demonstrated a consistent factor structure, measurement invariance across gender, and acceptable reliabilities. Furthermore, a significant association with COVID-19 anxiety, depressive symptoms, generalized anxiety, health anxiety, psychological distress, and functional impairment (work and social adjustment) during the COVID-pandemic was observed. When considering the Big Five personality traits, the C-19ASS and its subscales were only significantly and negatively associated with extraversion; only the total score on the measure was associated with neuroticism. The observed effect sizes ranged from very small to medium. Given that all included studies (*K* = 24) were cross-sectional, and due to the nature of the COVID-19 Anxiety Syndrome which may well persist after the pandemic ends, it is recommended to continue screening society for the persistence of this syndrome.

***Keywords*:** COVID-19 Anxiety Syndrome; COVID-19 Anxiety Syndrome Scale; COVID-19 pandemic; meta-analysis; systematic review.

**Key Practitioner Message**

* The COVID-19 Anxiety Syndrome Scale (C-19ASS) assesses coping strategies (e.g., avoidance, checking, worrying, and threat monitoring), in response to COVID-19 fear and anxiety.
* The measure has been broadly welcomed, leading to its use in Brazil, China, Greece, Indonesia, the Philippines, Iran, Italy, Saudi Arabia, Turkey, the United Kingdom, and the United States.
* The C-19ASS has demonstrated consistent structure, measurement invariance, validity, and reliability across different languages and cultures.
* The C-19ASS has demonstrated a significant association with COVID-19 anxiety, depressive symptoms, generalized anxiety, health anxiety, psychological distress, and functional impairment in various countries.
* COVID-19 Anxiety Syndrome may persist in some individuals beyond the acute stage of the COVID-19 pandemic.
* It is plausible that C-19ASS may serve as a source for measuring anxiety in future potential viral pandemics, perhaps by substituting the keyword "coronavirus" with a new-pandemic-relevant one.

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**Introduction**

Coronavirus disease-19 (COVID-19) was classified as a pandemic by the World Health Organization (WHO) on March 11, 2020. By October 2022, over 623,893,894 confirmed infections and 6,553,936 deaths worldwide were recorded ([World Health Organization, 2022](#_ENREF_66)). COVID-19 caused an unprecedented public health threat and led governments across the world to request peoples’ strict adherence to a number of mitigation measures to minimize the spread of the infection such as lockdowns, school and business closures, quarantine, frequent testing, social distancing, specific hygiene practices and travel bans ([Wilder-Smith & Freedman, 2020](#_ENREF_65)). Such measures led to a significant disruption in people’s lives, with associated psychological, social, and economic consequences.

**The COVID-19 pandemic and its consequences**

A wide range of adverse psychological outcomes has been reported during the COVID-19 pandemic ([Wang, et al., 2021](#_ENREF_60)). Strategies such as mandatory lockdowns and quarantine, which forced people to stay in their homes and maintain physical distance, led to exhaustion, detachment from others, anxiety, stress responses, and irritability ([Bonanno, 2004](#_ENREF_9); [Rubin & Wessely, 2020](#_ENREF_52)). Elevations in depression and anxiety ([Huang & Zhao, 2020](#_ENREF_25); [Lei et al., 2020](#_ENREF_34)), obsessive-compulsive symptoms ([Guzick et al., 2021](#_ENREF_22)), posttraumatic stress symptoms ([Cénat et al., 2021](#_ENREF_13); [Janiri et al., 2021](#_ENREF_27)), sleep problems ([Jahrami et al., 2021](#_ENREF_26)), boredom, irritability and disappointment ([Brooks et al., 2020](#_ENREF_11)), health anxiety ([Akbari et al., 2021](#_ENREF_4); Mohammadkhani et al., 2022), substance use ([Wei & Shah, 2020](#_ENREF_63)), grief and complicated grief ([Diolaiuti et al., 2021](#_ENREF_16); [Wallace et al., 2020](#_ENREF_59)), suicide ([Sher, 2020](#_ENREF_54)), and worsened quality of life ([Melo-Oliveira et al., 2021](#_ENREF_39)) are some of the adverse psychological outcomes that have been reported by researchers across different countries. Such adverse mental health consequences were evident and reported in all segments of the populations e.g. the general population ([Béland et al., 2020](#_ENREF_8); [Wang et al., 2020](#_ENREF_61)), individuals affected by COVID-19 ([Nguyen et al., 2020](#_ENREF_45); [Zhao et al., 2020](#_ENREF_68)), healthcare workers ([Cao et al., 2020](#_ENREF_12); [Huang et al., 2020](#_ENREF_24)), and individuals with severe mental illness ([Li et al., 2020](#_ENREF_35)).

Apart from the psychological distress, the COVID-19 pandemic has also led to various socio-economic consequences such as a decline in income, an increase in unemployment, job losses, a reduction in working hours ([Forsythe et al., 2020](#_ENREF_20)), and the interruption of routine workflow in the industrial sector ([Mishra et al., 2020](#_ENREF_40)). It has also been recognized that public health control measures of social distancing and lockdown have differentially impacted the labor market, with gender, racial, and class inequity becoming apparent ([Brodeur et al., 2021](#_ENREF_10)).

**Measures of COVID-19 psychological distress**

One of the most commonly observed psychological responses to COVID-19 has been fear and anxiety. Given the novelty of the threat, research efforts were made in different countries, to assess such psychological responses to COVID-19, and a number of new, specific measures, were developed. They include the Coronavirus Anxiety Scale ([CAS; Lee, 2020](#_ENREF_33)), the COVID-19 Anxiety Scale ([CAS; Silva et al., 2020](#_ENREF_55)), the COVID-19 Phobia Scale ([C19P-S; Arpaci et al., 2020](#_ENREF_7)), the COVID Stress Scales ([CSS; Taylor et al., 2020](#_ENREF_57)), the Perceived Coronavirus Threat Questionnaire ([PCTQ; Conway III et al., 2020](#_ENREF_15)), the Fear of COVID-19 Scale ([FCV-19S; Ahorsu et al., 2020](#_ENREF_2)), and the COVID-19 Anxiety Syndrome Scale ([C-19ASS; Nikčević & Spada, 2020](#_ENREF_47)).

The Coronavirus Anxiety Scale, one of the earliest measures of anxiety specifically related to COVID-19, was developed by [Lee (2020)](#_ENREF_33); it is a five-item measure that assesses anxiety symptoms such as dizziness, sleep disturbances, tonic immobility, appetite loss, and abdominal distress. The COVID-19 Anxiety Scale ([Silva et al., 2020](#_ENREF_55)) is a unidimensional seven-item measure that was developed according to the operational and constitutive definition of Generalized Anxiety Disorder symptoms based on the DSM-5 ([American Psychiatric Association, 2013](#_ENREF_6)), and specifically focuses on the type of anxiety caused by the pandemic. The COVID-19 Phobia Scale ([Arpaci et al., 2020](#_ENREF_7)) is a 20-item measure developed to assess the severity of COVID-19 phobia in terms of psychological, psychosomatic, economic, and social factors. The COVID Stress Scales, ([Taylor et al. (2020)](#_ENREF_57) is a 36-item measure that assesses the features of stress or anxiety-related responses to COVID-19 across five factors: (1) COVID-19 danger and contamination fears; (2) COVID-19 fears about economic consequences; (3) COVID-19 xenophobia; (4) COVID-19-compulsive checking and reassurance seeking; and (5) COVID-19 traumatic stress symptoms. The Perceived Coronavirus Threat Questionnaire ([PCTQ; Conway III et al., 2020](#_ENREF_15)) assesses the perceived Coronavirus threat, and the seven-item Fear of COVID-19 Scale assesses the fear of COVID-19 ([Ahorsu et al., 2020](#_ENREF_2)).

The above-mentioned measures were utilized by numerous researchers in the field and led to a better understanding of fear, anxiety, and other related phenomena (e.g., xenophobia, checking, and reassurance seeking) associated with COVID-19. The C-19ASS, which is the focus of the current review and meta-analysis, is a measure developed by [Nikčević & Spada (2020](#_ENREF_47)), that assesses various aspects of maladaptive coping (e.g., avoidance, checking, worrying, and threat monitoring – the COVID-19 Anxiety Syndrome) in response to the threat of COVID-19. As such, this measure differs from most of the above-described measures as it taps into coping responses in relation to the fear and threat posed by COVID-19. The C-19ASS consists of two dimensions: perseveration and avoidance. Perseveration refers to checking, worrying, and threat monitoring in relation to COVID-19 fear and threat, and avoidance refers to the tendency to stay away from public places and avoidance of COVID-19 transmission ([Nikčević & Spada, 2020](#_ENREF_47)).

The C-19ASS is conceptually aligned with the Self-Regulatory Executive Function (S-REF) model of psychopathology ([Wells, 2011](#_ENREF_64)). According to this model, psychopathology results from the adoption of a maladaptive pattern of coping in response to a perceived threat, termed Cognitive-Attentional Syndrome (CAS). The CAS includes cognitive, behavioral, and attentional responses such as worry, rumination, threat monitoring, avoidance, and suppression. Instead of experiencing transient distress responses in relation to a perceived threat, through the CAS, an individual becomes ‘locked’ into a more permanent distressing state which consequently inhibits the person from returning to normal functioning ([Wells, 2011](#_ENREF_64)). Aligning with the concept of CAS, [Nikčević and Spada (2020)](#_ENREF_47) proposed that the COVID-19 Anxiety Syndrome may persist in some individuals beyond the acute stage of the COVID-19 pandemic.

## **Aim of the current study**

The current study sought to investigate the psychometric properties of the C-19ASS through a meta-analysis/systematic review. The measure has been broadly welcomed, leading to its use in Brazilian ([Coelho et al., 2022](#_ENREF_14)), Chinese ([Xin et al., 2022](#_ENREF_67)), Greek (Seydavi et al., 2023), Indonesian ([Muthiah et al., 2022](#_ENREF_44)), Iranian (Akbari et al., 2021), Italian ([Mansueto et al., 2022](#_ENREF_38)), Saudi Arabian (Alhakami, 2022), Turkish (Ünal-Aydın et al., 2022) and US ([Nikčević & Spada, 2020](#_ENREF_47)) populations. Generally, good psychometric properties were reported across these different populations. The current review and meta-analysis examine in detail the psychometric properties of the C-19ASS, and its associations with other related psychological variables including personality traits, COVID-19 anxiety, depressive symptoms, generalized anxiety, health anxiety, psychological distress, and work and social adjustment.

**Method**

This is a systematic review and meta-analysis conducted and reported based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines ([PRISMA; Page et al., 2021](#_ENREF_50)).

**Search strategy and study selection**

From commencement until September 30, 2022 (updated on January 3, 2023), PsycINFO (using the Ovid platform), Google Scholar, ScienceDirect, and PubMed were carefully searched. A manual search for reference lists from all chosen articles, full-text reviews, and relevant reviews was conducted. The investigation was done using the following terms ("COVID-19 anxiety" OR "COVID-19 anxiety syndrome" OR "COVID-19 anxiety syndrome scale" OR "COVID-19 anxiety scale"); also, these terms were independently and concurrently searched. The scope of the literature review was restricted using the following criteria: (a) English language articles published in peer-reviewed journals; (b) articles on the COVID-19 Anxiety Syndrome Scale; (c) research conducted using a case-control design/prospective cohort studies/experimental research/large population-based cross-sectional studies/psychometric evaluation; and (d) research that reports Pearson's r or Spearman's r correlation coefficients for the variables of interest, or any data that can be converted to *r*. Unless otherwise specified, each study's participants were presumed to be devoid of neurological or cognitively organic disability.

**Data collection process**

Two reviewers determined the research eligibility using the following criteria: title screening, abstract screening, and full article screening. Initially, titles and abstracts were evaluated. Then, each reviewer independently conducted a thorough review of the articles that appeared pertinent. The authors' disagreements on eligibility were resolved by consensus. Moreover, the reference lists for eligible publications were also checked for potential studies to include. When necessary, if data or findings were missing, we contacted the authors to obtain them. In this process, 13 corresponding authors were contacted, and 5 replied.

**Data extraction and operational definition**

The following was extracted: titles, authors' names, number of participants, gender proportions, year of publication, mean age, sample type, data collection method, study design, psychometric properties (if any), the association between C-19ASS and other variables, a summary of findings and their limitations.

 The C-19ASS contains nine items of which six pertain to the perseveration subscale (I have checked myself for symptoms of COVID-19; I have been concerned about not having adhered strictly to social distancing guidelines for COVID-19; I have read about news relating to COVID-19 at the cost of engaging in work (such as writing emails, working on word documents or spreadsheets); I have checked my family members and loved one for the signs of COVID-19;  I have been paying close attention to others displaying possible symptoms of COVID-19; I have imagined what could happen to my family members if they contacted COVID-19) and three pertain to the avoidance subscale (I have avoided using public transport because of the fear of contracting COVID-19; I have avoided going out to public places (shops, parks) because of the fear of contracting COVID-19; I have avoided touching things in public spaces because of the fear of contracting COVID-19).

In the included studies, the personality traits were measured by the Big Five Inventory-10 ([BFI-10; Rammstedt & John, 2007](#_ENREF_51)), COVID-19-related psychological distress was measured by the C-19ASS ([Nikčević & Spada, 2020](#_ENREF_47)), the Coronavirus Anxiety Scale ([CAS; Lee, 2020](#_ENREF_33)), and the COVID-19 Anxiety Scale ([C19AS; Silva et al., 2020](#_ENREF_55)). Depressive symptoms were measured by the Patient Health Questionnaire-9 ([PHQ-9; Kroenke et al., 2001](#_ENREF_29)) and the Patient Health Questionnaire-2 ([PHQ-2; Kroenke et al., 2003](#_ENREF_30)). Generalized anxiety was measured by the General Anxiety Disorder-7 Scale ([GAD-7; Spitzer et al., 2006](#_ENREF_56)). Health anxiety was measured by the Whiteley-7 Index ([WI-7; Fink et al., 1999](#_ENREF_19)), the Health Anxiety Questionnaire ([HAQ; Lucock & Morley, 1996](#_ENREF_37)), and the Short Health Anxiety Inventory ([SHAI; Abramowitz et al., 2007](#_ENREF_1)). General psychological distress was measured by the Patient Health Questionnaire Anxiety and Depression Scale ([PHQAD; Kroenke et al., 2016](#_ENREF_31)) and the Patient Health Questionnaire-GAD (reported in Ünal-Aydın et al., 2022). Work and social adjustment as an index for functional impairment was measured by the Work and Social Adjustment Scale ([WSAS; Mundt et al., 2002](#_ENREF_43)).

**Data analysis**

Using Comprehensive Meta-Analysis Software, the random-effects model was utilized to determine the overall pooled correlations between the C-19ASS and the relevant variables (CMA-Version 3.3.070). To find outliers, sensitivity analysis using the one-study removal technique was performed. The provided statistics strictly adhered to Borenstein's (2019) suggestions for avoiding common meta-analysis errors.

Although the *I*2 is frequently used as a measure of heterogeneity, it is a proportion rather than an absolute value (Borenstein et al., 2017; Borenstein, 2019). Therefore, it only reveals the extent to which a portion of the variation in effect sizes can be explained by factors other than sampling error. We have presented a random-effects model-based estimate of between-study heterogeneity, tau, in addition to *I*2 and *Qbetween*. (Johnson, 2021). We also estimated the prediction interval (PI) using the Borenstein et al. (2017) method, which could account for real heterogeneity and show the anticipated true effect in 95% of subsequent studies with a similar design. For example, the effect-sizes in some populations (identical to those of included studies) may be as low as -0.20 and as high as +0.80, according to a PI range of -0.20 to +0.80, which is more informative than *I*2.

The effect-sizes for each subgroup were pooled using the mixed-effects model (Borenstein et al., 2009), the differences between subgroups were assessed using the fixed-effect model, and the effect-sizes within each subgroup were aggregated using the random-effect model. For omnibus testing and the statistical significance of differences, we have provided *Q*, *df*, and the corresponding p-value.

Cumulative analysis was used to examine the small-study effect (Borenstein, 2019). According to this methodology, there is reason to believe publication bias is at play if studies with a smaller sample size provide higher estimates. Egger's regression test was used; however, it can only reveal the fundamentals of publication bias. Duval and Tweedie's trimmed method was used to calculate how effect-sizes might change if publication bias was considered. The absence of a continuous or categorical moderator analysis was caused by the small number of studies (*K* = 10) for each variable.

Evans (1996) has suggested cutoff points as follows: *r* < 0.2 very small, 0.2 < *r* < 0.4 small, 0.4 < *r* < 0.6 medium, 0.6 < *r* < 0.8 strong, and *r* > 0.8 very strong. These thresholds were used to interpret the observed associations.

**Results**

**Selection and inclusion of studies**

Two independent authors examined the titles and abstracts of the 948 articles for a primary evaluation which led to the retrieval of 35 articles for full-text screening, and finally, 24 articles met the inclusion criteria. Please see Figure 1 for the selection and inclusion of articles as a PRISMA chart.

**Sensitivity analyses**

Sensitivity analyses were undertaken to see if the pooled effect-sizes were robust or affected by outliers. Using the one-study removed method and cumulative analysis method, there was no evidence of influential cases that could be responsible for the observed heterogeneity. Thus, the analyses were conducted without omitting any study.

**Publication bias**

Considering the studies included, we have checked for publication bias using Egger's regression test for variables studied at least three times, and whenever the publication bias was significant, we added the adjusted effect-size in Table 1. However, the publication bias was significant only for the avoidance factor of the C-19ASS as associated with agreeableness and health anxiety. Also, publication bias was significant for the association between the perseveration factor of the C-19ASS and COVID-19 anxiety and the total score of the C-19ASS in the association with agreeableness and COVID-19 anxiety. However, adjusting for publication bias using Duval and Tweedie's trim and fill method, there were no significant differences in the effect-sizes with and without publication bias.

**Study characteristics**

Articles were published between 2020 and 2022. The total sample included in the meta-analysis was 17,798 participants, and the number of participants was as low as 104 and as high as 5179. The female gender proportion ranged between 33% and 85%. The mean age ranged between 19 and 70 years. Regarding the origin of the articles, these came from the United Kingdom (*k* = 4), the United States (*k* =1), Indonesia (2), Italy (*k* =2), Turkey (*k* =1), China (*k* =1), Iran (*k* =5), Brazil (*k* =1), Saudi Arabia (*k* =2), Greece (*k* =1), the Philippines (*k* =2), and international studies (*k* = 2). Regarding data collection, all included articles used an online method, and the study designs were cross-sectional.

**Risk of bias assessment**

Two independent reviewers evaluated the risk of bias using the Risk of Bias Utilized for Surveys Tool (ROBUST; Nudelman & Otto, 2020). ROBUST contains 8 items (sampling frame, participant recruitment, exclusion rate, sample size, sample characteristics, measurement validity, setting, and data management) which are scored as yes (0) or no (1); the higher score (close to eight) represents higher confidence in the result and lower risk of bias. The included articles were rated from three to seven, and the reviewers’ agreement was satisfactory (interclass correlation, *ICC* = 0.85). Of this, approximately 70% of the articles did not report data cleaning and management procedures. Up to 70% of the articles did not conduct the study in a controlled setting. More than 62.5% used a convenience sample for participant recruitment or did not report their method of recruitment, and about 50% of the articles did not report the exclusion rate of participants.

**Psychometric properties of the C-19ASS**

***Factor structure and fit indices***

The two-factor model of C-19ASS comprising the avoidance and perseveration factors provided by the parent study (Nikcevic & Spada, 2020) has been confirmed by various versions of the English (Nikcevic & Spada, 2020), Persian (Akbari et al., 2021), Brazilian (Coelho et al., 2022), Italian (Mansueto et al., 2022), Arabic (Alhakami, unpublished), Turkish (Ünal-Aydın et al., unpublished), and Greek (Seydavi et al., unpublished) measure. However, Hoseinzadeh et al. (2022) also validated another Persian version of C-19ASS. The researchers confirmed the two-factor model, but item number four from the perseveration factor was found to load on the avoidance factor. Also, the Indonesian version of the C-19ASS identified three factors, terming the extra factor "checking". This includes items two and seven from the perseveration factor. All versions of the C-19ASS have reported acceptable item loadings ranging from 0.30 to 0.84, except for the Brazilian version, which reported loadings ranging from 0.25 to 0.81 (for the perseveration factor). Moreover, the mentioned articles reported acceptable fit indices, SRMR ranging from 0.02 (Nikcevic & Spada, 2020) to 0.06 (Muthiah et al., 2021), RMSEA ranging from 0.02 (Nikcevic & Spada, 2020; Mansueto et al., 2022) to 0.07 (Muthiah et al., 2021; Akbari et al., 2021), CFI ranging from 0.95 (Coelho et al., 2022) to 0.99 (Mansueto et al., 2022), and TLI ranging from 0.90 (Muthiah et al., 2021) to 0.99 (Alhakami et al., unpublished). In addition, a Chinese version only has reported internal consistency for the total C-19ASS. More details on fit indices are presented in Table 2.

***Measurement invariance***

Of the included studies, only four versions (Persian, Turkish, Italian, and Greek) have conducted measurement invariance analysis using multigroup confirmatory factor analysis, and all have confirmed that the C-19ASS has measurement invariance across gender. Measurement invariance was tested in terms of configural invariance (i.e., where the items load on the same factors across genders - supported by good fit indices), metric invariance (i.e., where the factor loadings are constrained to be equal across genders), and scalar invariance (i.e., where item intercepts were constrained to be equal across genders).

 The Persian version (Akbari et al., 2021) has reported full configural (*χ*2 = 204.456, *df* = 52, *χ*2/*df* = 3.932, *RMSEA* = 0.051, *SRMR* = 0.050, *GFI* = 0.960, *CFI* = 0.947) and metric invariances (*χ*2 = 214.693, *df* = 61, *χ*2/*df* = 3.520, *RMSEA* = 0.051, *SRMR* = 0.054, *GFI* = 0.966, *CFI* = 0.951). However, they have reported partial scalar invariance given that items number 3,4, and 6 were variant across gender, once these become unconstrained, full scalar invariance was obtained (*χ*2 = 23.293, *df* = 15, *p* = 0.078). Also, the Italian version (Mansueto et al., 2022), has reported full configural (χ 2 = 42.464, *df* = 52, p = 0.825, *CFI* = 1.000, *RMSEA* = 0.000 90%*CI* [0.000–0.026]), metric (χ 2 = 60.844, df = 59, p = 0.409, *CFI* = 0.999, *RMSEA* = 0.011 90%*CI* [0.000–0.042]), and scalar (χ 2 = 63.798, df = 66, p = 0.554, *CFI* = 1.000, *RMSEA* = 0.000 90%*CI* [0.000–0.036]) invariance. The Greek version (Seydavi et al., unpublished), have reported that they found evidence of full configural (*χ*2 =154.191, *df* = 52, *χ*2/*df* = 2.96, *RMSEA* =0.047, *SRMR* = 0.049, *GFI* = .961, *CFI* = .953) and metric invariance (*χ*2 = 171.7, *df* = 61, *χ*2/*df* = 2.81, *RMSEA* = 0.045, *SRMR* = 0.072, *GFI* = .957, *CFI* = .949.). However, they found partial evidence for scalar invariance due to that item number 9 was vary across males and females, however, once this item become unconstrained, the full scalar invariance was obtained (*χ*2 = 4.975, *df* = 8, *p* = 0.760). The Turkish version (Ünal-Aydın et al., unpublished), however, only reported that the C-19ASS demonstrated an invariance structure across males and females.

***Reliability***

All versions of the C-19ASS have reported Chronbach's alpha as a measure of reliability, ranging from 0.65 (Brazilian version) to 0.77 (English version) for the avoidance factor, 0.75 (Brazilian and Arabic versions) to 0.86 (English) for the perseveration factor, and 0.72 (Persian, Hoseinzadeh et al., 2022) to 0.83 (Chinese version) for the total scores. Also, some versions (Persian, Akbari et al., 2021; and Greek) have reported AVE ranging from 0.63 to 0.75 for the total score, and some versions (Persian, Hoseinzadeh et al., 2022; and Italian) have reported the AVE for the factors ranging from 0.41 to 0.49 for the avoidance factor and 0.45 to 0.57 for the perseveration factor. Also, some versions (Persian, Akbari et al., 2021; and Greek) have reported the composite reliability and maximal reliability for the total score ranging from 0.77 to 0.87. And the others (Persian, Hoseinzadeh et al., 2022; and Italian) have reported the composite reliability and maximal reliability for the factors ranging from 0.66 to 0.75 for the avoidance factor and 0.77 to 0.81 for the perseveration factor.

**C-19ASS and its correlates: Concurrent validity**

***C-19ASS and age***

Of C-19ASS, only the perseveration factor was significantly and positively associated with age; however, the association was very small (*r* = 0.06).

***C-19ASS and the Big Five personality traits***

There were no significant associations between the C-19ASS total score and its factors with agreeableness, conscientiousness, and openness; whereas the C-19ASS total score and its factors were negatively and significantly associated with extraversion (very small; *r* = -0.09 to -0.11), and only the total score was significantly and positively associated with neuroticism (very small, *r* = 0.12).

***C-19ASS and COVID-19 anxiety***

The total score and factors were significantly and positively associated with COVID-19 anxiety, while it was small for the avoidance factor (*r* = 0.24) and the total scale (*r* = 0.36), and medium for the perseveration factor (*r* = 0.46).

***C-19ASS and depressive symptoms***

Only the total score (*r* = 0.24) and the perseveration factor (*r* = 0.28) were significantly and positively associated with depressive symptoms.

***C-19ASS and generalized anxiety***

The avoidance factor was significantly and positively associated with generalized anxiety (very small, *r* = 0.15), while the perseveration factor (*r* = 0.32) and the total score (*r* = 0.26) were significantly and positively associated with generalized anxiety.

***C-19ASS and health anxiety***

The C-19ASS and its factors were positively and significantly associated with health anxiety, and the associations' strength was small (*r* = 0.23 to 0.38).

***C-19ASS and psychological distress***

The C-19ASS and its factors were positively and significantly associated with psychological distress; however, it was small for the avoidance factor (*r* = 0.19) and medium for the perseveration factor (*r* = 0.43) and the total score (*r* = 0.61).

***C-19ASS and work and social adjustment (functional impairment)***

The C-19ASS and its factors were positively and significantly associated with the work and social adjustment scale (functional impairment). The association was very small for the avoidance factor (*r* = 0.20) and small for the perseveration factor (*r* = 0.37) and the total scale (*r* = 0.37).

**C-19ASS and associations with one-off variables**

The C-19ASS was also associated with other variables that have only been reported once in the included studies, and consequently, it was impossible to conduct a meta-analysis. A summary of the associations and more details on the included articles is represented in Table 4.

***C-19ASS total score***

The C-19ASS total score was positively and significantly associated with *attentional bias* (*r* = .13, *N*= 286; Albery et al.,2021),*burnout* (*r* = 0.42, *N* = 251; Mousavi Asl et al., 2021), attachment style (RQ-RQ-fearful attachment, *r* = 0.201; RQ-preoccupied attachment, *r* = 0.14; RQ-dismissing attachment, *r* = 0.022; *N* = 330, Vismara et al., 2022),*loneliness* (*r* = 0.149, *N* = 330, Vismara et al., 2022), *mental health problems*(*r* = 0.240, *N* = 330, Vismara et al., 2022**)**, *mask effectiveness*, a component of mask-wearing (*B* = 0.08, *SE* = 0.23, *p*= 0.718, *N* = study 1a = 147, study 1b = 150; Krishna et al., 2021), *communication difficulties*, a component of mask-wearing (*B* = 0.20, *SE* = 0.17, *p* = 0.237, *N* = study 1a = 147, study 1b = 150; Krishna et al., 2021), *clinic nonattendance* (*OR* = 1.106, 95% *CI* = 1.047–1.17, *p* = 0.001), *burnout* (*r* = 0.37, *N*=251; Mousavi Asl et al., 2021),*psychological behavioral responses* (*r* = 0.767, *N* = 926, Sharif Nia et al., 2022), *dietary control* (Glucose management, *r* = 0.01; *N* = 314; Distaso et al., 2022), *pandemic fatigue* (*OR =* 1.030, 95% *CI* = 1.010 - 1.051), *p* = 0.003), and *perceived COVID-19 threat* (*r* = 0.48, *N* = 426, Nikčević &Spada, 2020).

Also, the C-19ASS- total score was negatively associated with*vigilance to threat* (Vigilance to threat, *r* = -0.03), *slowed disengagement*, *r* = -0.12, *N* = 286; Albery et al., 2021), *compassion* (*r* = -0.035, *N* = 251; Mousavi Asl et al., 2021), *attachment style* (RQ-secure attachment, *r* = -0.215, *N* = 330, Vismara et al., 2022),*explicit evaluation of (masked) faces* (*B* = − 0.45, *SE* = 1.97, *p* = 0.819; *N* = study 1a = 147, study 1b = 150; Krishna et al., 2021),*mask-related worrying*, a component of mask-wearing (*B* = − 0.04, *SE* = 0.23, *p* = 0.854, *N* = study 1a = 147, study 1b = 150; Krishna et al., 2021), *aesthetic appeal*, a component of mask-wearing (*B* = − 0.06, *SE* = 0.18, *p* = 0.746, *N* = study 1a = 147, study 1b = 150; Krishna et al., 2021), *resilience* (*r* = -0.110, *N* = 203, Oducado et al., 2021),*organizational change* (*b* = -0.27, *SE* = 0.10, *N* = 112, Larasatie et al., 2021), *perception of organizational politics* (*B* = -0.91, *SE* = 0.32, *N* = 112, Larasatie et al., 2021), and the *Diabetes Self-Management* (DSMQ global, *r* = -0.06, with Physical activity, *r* = -0.10, with Physician contact, *r* = -0.13, *N* = 314; Distaso et al., 2022).

***C-19ASS: The avoidance factor***

The C-19ASS avoidance factor was positively associated with *attentional bias-general* (Attentional bias-general, *r* = 0.09, *N* = 286; Albery et al., 2021),*peritraumatic distress* (CPDI, *r*  = 0.142, *p* = 0.018; *N* = 276; Muthiah et al., 2021)**,** *fear of COVID-19 (r =* 0.503, *N* = study 1 = 271, study 2 = 484, Mansueto et al., 2022), *dietary control (r =* 0.03;*Glucose management*, *r* = 0.05, *N* = 314; Distaso et al.,2022), *health anxiety* "Short Health Anxiety Inventory-5" (*r* = 0.196, *p* = 0.001, *N* = study 1 = 404, study 2 = 903, Alhakami et al., 2022), *perceived COVID-19 threat* (*r* = 0.47, *N* = 426, Nikčević, Spada, 2020).

Also, the C-19ASS avoidance factor was negatively associated with*vigilance to threat* (*r* = -0.06), *slowed disengagement* (*r* = -0.12, *N* = 286; Albery et al.,2021), *diabetes self-management (*DSMQ global, *r* = -0.03, Physical activity, *r* = -0.15, Physician contact, *r* = -0.04, *N* = 314; Distaso et al.,2022), and *social adaptation (r* = -0.07, *N* = 296, Ünal-Aydın, et al., 2022).

***C-19ASS: The perseveration factor***

The C-19ASSperseveration factor was positively associated with*attentional bias-general* (*r* = 0.12, *N* = 286; Albery et al.,2021), *peritraumatic distress* (*r* = 0.379; *N* = 276; Muthiah et al.,2021), *fear of COVID-19* (*r* = 0.611; *N* = study 1 = 271, study 2 = 484, Mansueto et al., 2022), *diabetes self-management-dietary control* (Dietary control, *r* = 0.01; *N* = 314; Distaso et al., 2022), *health anxiety* (*r* = 0.297, *N* = study 1 = 404, study 2 = 903, Alhakami et al., 2022), and *perceived COVID-19 threat* (*r* = 0.39, *N* = 426, Nikčević, Spada, 2020).

Also, it was negatively associated with*attentional bias* (Vigilance to threat, *r* = -0.01, Slowed disengagement, *r* = -0.10; *N* = 286, Albery et al., 2021); *diabetes self-management* (Physical activity, *r* = -0.06; Physician contact, *r* = -0.15; *N* = 314, Distaso et al., 2022), and *social adaptation* (*r* = -0.01, *N* = 296, Ünal-Aydın, et al., 2022).

**Discussion**

The current systematic review and meta-analysis sought to investigate the correlates and psychometric properties of the C-19ASS. The C-19ASS exhibited a consistent factor structure and acceptable reliability in Brazilian ([Coelho et al., 2022](#_ENREF_14)), Chinese (Xin et al., 2022), Greek (Seydavi et al., unpublished), Indonesian (Muthiah et al., 2022), Iranian (Akbari et al., 2021), Italian ([Mansueto et al., 2022](#_ENREF_38)), Saudi Arabian (Alhakami et al., unpublished), Turkish (Ünal-Aydın et al., unpublished) and US ([Nikčević & Spada, 2020](#_ENREF_47)) populations. In addition, it has been studied concerning a vast array of variables, as described above, which makes it a promising tool for assessing COVID-19 pandemic-related psychopathology.

 The COVID-19 Anxiety Syndrome has been described as a potential and key underlying construct for understanding pandemic-related psychopathology (Akbari et al., 2021), and the present review reveals that the higher COVID-19 Anxiety Syndrome, the higher COVID-19 anxiety, depressive symptoms, generalized anxiety, health anxiety, psychological distress, and work and social adjustment (functional impairment). The observed strengths of the associations between the C-19ASS (and subscales) and the above-mentioned variables were deemed to be small, indicating that the C-19ASS measures a distinct construct that warrants more attention given its low shared variance with anxiety and depressive symptoms, health, and generalized anxiety, and psychological distress.

Given the cross-sectional nature of the observed association between scores on the C-19ASS and the constructs listed above, it is impossible to draw a causative conclusion, but it is hypothesized that the persistence of this syndrome could lead to functional impairment, psychological distress, and therefore depressive symptoms. Regarding the positive associations between C-19ASS and COVID-19 anxiety and health anxiety, it could be interpreted as a two-way association in which people with health anxiety and COVID-19 anxiety are more likely to develop the COVID-19 Anxiety Syndrome, given that studies employing exploratory factor analysis have revealed that generalized anxiety is a separate entity from the COVID-19 Anxiety Syndrome (Akbari et al., 2021).

The COVID-19 Anxiety Syndrome may emerge as a separate construct that can manifest as a comorbid disorder, given that some individuals may continue to avoid situations that may expose them to COVID-19 due to receiving negative reinforcement, and exhibiting perseveration in behaviors (checking, worrying, and threat monitoring) that they believe may help prevent infection by COVID-19. Additionally, it may exacerbate health anxiety and functional impairment associated with the COVID-19 pandemic. It could be affected by the level of neuroticism in general, as we have found a significant positive association between C-19ASS total scores (and not subscales) and neuroticism. We did not find evidence of a significant association between C-19ASS scores and agreeableness, openness, or conscientiousness. However, C-19ASS total scores and its factors were significantly and negatively associated with extraversion. It could be argued that people who are more outgoing, active, and assertive, report lower levels of COVID-19 Anxiety Syndrome as they are more likely to find social support networks that may provide reassurance.

Due to the specific and COVID-19 pandemic-related nature of the COVID-19 Anxiety Syndrome, it is conceivable that as the threat from COVID-19 retracts so will the presence of the syndrome. However, we cannot be certain of this. It is possible to assume that the syndrome may ‘transmigrate’ to other threats (i.e., viral illnesses). We also do not know whether the presence of the COVID-19 anxiety syndrome may have facilitated the development of other forms of psychological distress, such as health anxiety or obsessional thinking and behavior.

**Limitations of the current study**

Almost half of the included studies employed self-report measures, which are susceptible to recall bias and social desirability. In addition, all of the studies were completed using online platforms, which may have resulted in bias or under/overestimation of the findings if not accessible to all participants. Uneven gender distribution, lack of randomization of the order of questionnaires, lack of participation of clinical samples, and lack of longitudinal follow-up could be considered key limitations. Furthermore, we found that approximately 70% of the studies did not report data cleaning and management procedures. Up to 70% of the studies did not conduct the study in a controlled setting. Almost a third (62.5%) used convenience sampling for participant recruitment or did not report their method, and about 50% of the studies did not report the exclusion rate of participants.

**Future directions**

Given the cross-sectional design of the included studies, studies employing a longitudinal design with large sample sizes would help to screen the temporality of the association between C-19ASS scores and psychopathology measures and provide more evidence about the life of the COVID-19 Anxiety Syndrome across different populations. Furthermore, different samples with different demographics and psychiatric histories (e.g., obsessive-compulsive disorder) should be considered to determine whether the C-19ASS would differ across a clinical population. It would be interesting to study the mediating processes underlying the association between C-19ASS scores and psychopathology measures. Given the satisfactory validity of the C-19ASS, it is plausible that it may serve as a source for measuring anxiety in future potential viral pandemics, perhaps by substituting the keyword "coronavirus" with a new-pandemic-relevant one.

**Conclusions**

The C-19ASS demonstrated consistent factor structure and reliability across different countries and exhibited significant associations with psychopathology measures. Given that there is a potential for maintenance and persistence of C-19 Anxiety Syndrome beyond the end of the COVID-19 pandemic, it is of utmost importance to continue research in the area.

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**CONFLICTS OF INTEREST**

Two authors were involved in developing the original version of the C-19ASS for English-speaking populations. The authors have no known competing financial interests or personal relationships that could have influenced this work.

**Contributors**

**Mehdi Akbari:** Conceptualization, Supervision, Methodology, Validation, Writing - Review and Editing; **Mohammad Seydavi:** Methodology, Formal analysis, Writing - Review and Editing; **Maryam Babaeifard:** Investigation, Data Curation, and Writing - Original Draft; **Mahsa Akbarian Firoozabadi:** Investigation, Data Curation, and Writing - Original Draft; **Ana V. Nikčević:** Validation, Writing - Review and Editing; **Marcantonio M. Spada:** Supervision, Validation, Writing - Review and Editing.

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Identification

Records identified through

database searching

(*n = 1050*)

Screening

Eligibility

Included

Records after duplicates removed

*(n = 948)*

Records screened

*(n = 948)*

Records excluded based on abstracts

*(n = 913)*

Full text articles assessed for eligibility

*(n = 35)*

Full text articles excluded, with reasons *(n = 18)*

*- did not respond to the emails (n = 8)*

*- did not provide pertinent data relative to other included studies, one-off variables (n = 10)*

Full text articles included in synthesis

*(n = 24)*

Additional records identified through other resources *(n = 7)*

Figure 1: The PRISMA flowchart of the search process.

Table 1: The COVID-19 Anxiety Syndrome Scale and its correlates, concurrent validity - Mixed-effects analysis.

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables** | **Effect-sizes and 95% interval** | **Heterogeneity** | **Prediction interval** |
| *K* | *n* | *r (Adj. r)* | Ll | Ul | *Q*-value (*df*) | *I2* | *T2* | Ll | Ul |
| **Age** |
| C-19ASS Avoidance | 1 | 1429 | -0.01 | -0.06 | 0.04 | 3.65 (2) = 0.16 | 0.00 | 0.000 | - | - |
| C-19ASS Perseveration | 1 | 1429 | 0.06\* | 0.01 | 0.11 | 0.00 | 0.000 | - | - |
| C-19ASS Total | 3 | 1910 | 0.01 | -0.07 | 0.09 | 46.21 | 0.002 | -0.64 | 0.65 |
| **Big Five Agreeableness** |
| C-19ASS Avoidance | 5 | 3537 | 0.01 (0.01) | -0.06 | 0.08 | 0.66 (2) = 0.71 | 72.54 | 0.004 | -0.21 | 0.23 |
| C-19ASS Perseveration | 5 | 3537 | -0.02 | -0.06 | 0.01 | 0.00 | 0.000 | -0.06 | 0.02 |
| C-19ASS Total | 5 | 3555 | -0.02 (-0.03) | -0.09 | 0.05 | 77.72 | 0.005 | -0.26 | 0.22 |
| **Big Five Conscientiousness** |
| C-19ASS Avoidance | 5 | 3537 | -0.02 | -0.09 | 0.05 | 0.14 (2) = 0.93 | 74.41 | 0.005 | -0.26 | 0.22 |
| C-19ASS Perseveration | 5 | 3537 | -0.04 | -0.10 | 0.03 | 71.33 | 0.004 | -0.26 | 0.18 |
| C-19ASS Total | 5 | 3555 | -0.03 | -0.07 | 0.02 | 37.25 | 0.001 | -0.15 | 0.09 |
| **Big Five Extraversion** |
| C-19ASS Avoidance | 5 | 3537 | -0.09\* | -0.12 | -0.05 | 0.43 (2) = 0.80 | 0.00 | 0.000 | -0.15 | -0.02 |
| C-19ASS Perseveration | 5 | 3537 | -0.11\* | -0.17 | -0.04 | 72.73 | 0.004 | -0.32 | 0.12 |
| C-19ASS Total | 5 | 3555 | -0.10\* | -0.13 | -0.06 | 8.11 | 0.000 | -0.16 | -0.03 |
| **Big Five Neuroticism** |
| C-19ASS Avoidance | 5 | 3537 | 0.01 | -0.09 | 0.09 | 7.63 (2) = 0.02 | 84.99 | 0.009 | -0.30 | 0.30 |
| C-19ASS Perseveration | 5 | 3537 | 0.01 | -0.17 | 0.16 | 95.81 | 0.036 | -0.56 | 0.57 |
| C-19ASS Total | 5 | 3555 | 0.12\* | 0.09 | 0.15 | 0.00 | 0.000 | 0.07 | 0.16 |
| **Big Five Openness** |
| C-19ASS Avoidance | 5 | 3537 | 0.02 | -0.05 | 0.09 | 0.49 (2) = 0.78 | 76.26 | 0.005 | -0.22 | 0.26 |
| C-19ASS Perseveration | 5 | 3537 | 0.01 | -0.05 | 0.06 | 67.42 | 0.003 | -0.18 | 0.19 |
| C-19ASS Total | 5 | 3555 | 0.02 | -0.01 | 0.06 | 0.00 | 0.000 | -0.04 | 0.08 |
| **COVID-19 anxiety** |
| C-19ASS Avoidance | 7 | 4109 | 0.24\* | 0.13 | 0.34 | 10.3 (2) = 0.01 | 91.05 | 0.019 | -0.13 | 0.55 |
| C-19ASS Perseveration | 6 | 3833 | 0.46\* (0.42\*) | 0.37 | 0.55 | 91.48 | 0.018 | 0.08 | 0.71 |
| C-19ASS total | 6 | 3759 | 0.36\* (0.32\*) | 0.32 | 0.41 | 51.19 | 0.002 | -0.02 | 0.65 |
| **Depressive symptoms** |
| C-19ASS Avoidance | 5 | 4097 | 0.07 | -0.10 | 0.24 | 4.75 (2) = 0.10 | 96.74 | 0.038 | -0.54 | 0.63 |
| C-19ASS Perseveration | 5 | 4097 | 0.28\* | 0.21 | 0.34 | 81.41 | 0.006 | 0.01 | 0.50 |
| C-19ASS Total | 3 | 2710 | 0.24\* | 0.16 | 0.31 | 74.34 | 0.004 | -0.60 | 0.82 |
| **Generalized anxiety** |
| C-19ASS Avoidance | 4 | 3728 | 0.15\* | 0.08 | 0.23 | 9.93 (2) = 0.01 | 82.01 | 0.005 | -0.20 | 0.46 |
| C-19ASS Perseveration | 4 | 3728 | 0.32\* | 0.25 | 0.39 | 83.24 | 0.006 | -0.04 | 0.60 |
| C-19ASS Total | 2 | 2341 | 0.26\* | 0.14 | 0.37 | 89.16 | 0.007 | - | - |
| **Health anxiety** |
| C-19ASS Avoidance | 7 | 4679 | 0.23\* (0.21\*) | 0.13 | 0.32 | 6.38 (2) = 0.04 | 91.65 | 0.018 | -0.13 | 0.53 |
| C-19ASS Perseveration | 7 | 4679 | 0.38\* | 0.31 | 0.45 | 85.65 | 0.010 | 0.11 | 0.59 |
| C-19ASS Total | 5 | 3498 | 0.32\* | 0.25 | 0.39 | 76.64 | 0.005 | 0.07 | 0.53 |
| **Psychological distress** |
| C-19ASS Avoidance | 2 | 582 | 0.19\* | 0.11 | 0.27 | 9.78 (2) = 0.01 | 0.00 | 0.000 | - | - |
| C-19ASS Perseveration | 2 | 582 | 0.43\* | 0.25 | 0.58 | 84.04 | 0.018 | - | - |
| C-19ASS Total | 2 | 788 | 0.61\* | 0.25 | 0.82 | 97.34 | 0.101 | - | - |
| **Work and social adjustment** |
| C-19ASS Avoidance | 4 | 3251 | 0.20\* | 0.10 | 0.29 | 10.1 (2) = 0.01 | 86.18 | 0.008 | -0.23 | 0.56 |
| C-19ASS Perseveration | 4 | 3251 | 0.37\* | 0.28 | 0.45 | 86.61 | 0.009 | -0.07 | 0.69 |
| C-19ASS Total | 2 | 1338 | 0.37\* | 0.30 | 0.43 | 47.87 | 0.002 | - | - |

*Note*. C-19ASS = COVID-19 Anxiety Syndrome Scale.

|  |
| --- |
| Table 2: The COVID-19 Anxiety Syndrome Scale fit indices. |
| Authors | Language | Number of factors | χ2 | df | χ2/df | SRMR | RMSEA | GFI | CFI | NFI | TLI | IFI | PCFI | PAMI |
| Nikčević & Spada (2020) | English | Two factors | 30.44 | 26 | 1.17 | 0.026 | 0.020 | - | 0.99 | - | 0.99 | - | - | - |
| Muthiah et al. (2022) | Indonesian | Three factors | - | - | - | 0.0649 | 0.0763 | - | 0.936 | - | 0.903 | - | - | - |
| Akbari et al. (2021) | Persian | One factor | 63.88 | 1 |  |  |  |  |  |  |  |  |  |  |
| Two factors | 130.363 | 26 | 5.014 | 0.0464 | 0.070 | 0.960 | 0.956 | 0.949 | 0.952 | 0.961 | - | - |
| Coelho et al. (2022) | Brazilian | Two factors | - | - | - | - | 0.05 | - | 0.95 | - | 0.93 | - | - | - |
| Hoseinzadeh et al. (2022) | Persian | Two factors | - | - | 2.107 | - | 0.033 | - | 0.957 | - | - | 0.957 | 0.691 | 0.672 |
| Mansueto et al. (2022) | Italian | One factor | 59.235 | 27 | 2.19 | 0.051 | 0.050 | 0.993 | 0.989 | 0.981 | 0.986 | 0.989 | - | - |
| Two factors | 33.746 | 26 | 1.29 | 0.040 | 0.025 | 0.996 | 0.997 | 0.989 | 0.996 | 0.997 | - | - |
| Xin et al. (2022) | Chinese | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Alhakami (Unpublished) | Arabic | One factor | 125.97 | 27 | 4.66 | 0.057 | 0.064 | 0.990 | 0.974 | 0.968 | 0.966 | 0.974 |  |  |
| Two factors | 55.08 | 26 | 2.12 | 0.039 | 0.035 | 0.995 | 0.992 | 0.986 | 0.990 | 0.992 |  |  |
| Ünal-Aydın et al. (Unpublished) | Turkish | Two factors | 58.43 | 26 | 2.25 | 0.05 | 0.064 | - | 0.96 | - | 0.95 | - | - | - |
| Seydavi et al. (Unpublished) | Greek | Two factors | 75.59 | 26 | 2.90 | 0.038 | 0.065 | 0.964 | 0.97 | 0.96 | 0.96 | 0.97 | - | - |
| *Note*. SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation; GFI = Goodness of Fit; CFI = Comparative Fit Index; NFI = Normed Fit Index; TLI = Tucker-Lewis’s Index; IFI = Incremental Fit Index; PCFI = Parsimony Comparative Fit Index; PAMI = Parsimony Adjusted Measures Index.  |

|  |  |
| --- | --- |
|  |  |
| **Authors** | **Factors No.** | **Factor loading** | **Cronbach alpha** | **CR** | **MR** | **AVE** |
|  | **C-19ASS-A** | **C-19ASS-P** | **Extra subscale** | **Total** | **C-19ASS-A** | **C-19ASS-P** | **C-19ASS-A** | **C-19ASS-P** | **C-19ASS-A** | **C-19ASS-P** | **C-19ASS-A** | **C-19ASS-P** |
| **Nikcevic & Spada (2020)** | 2 | 0.78-0.84 | 0.63-0.85 | - | - | 0.77 | 0.86 | - | - | - | - | - |
| **Muthiah et al. (2022)** | 3 | ITEM 1,3,50.31-0.77 | ITEM 4,6,8,90.41-0.67 | Checking 2,70.421-0.857 | 0.775 | - | - | - | - | - | - | - |
| **Akbari et al. (2021)** | 2 | 0.389-0.809 | 0.413-0.886 | - | 0.817 | 0.703 | 0.821 | 0.771 | 0.804 | 0.630 |
| **Coelho et al. (2022)** | 2 | 0.48-0.81 | 0.25-0.81 | - | - | 0.65 | 0.75 | 0.66 | 0.77 | - | - | - |
| **Hoseinzadeh et al. (2022)** | 2 | Equivalent to A:Self-care behaviors(items:3,1,5,4)**S**0.53-0.707 | Equivalent to P:COVID-19 anxiety(items:7,8,2,9,6)**Anx**0.494-0.932 | - | 0.72 | S0.721 | Anx0.844 | >0.85 | S0.417 | Anx0.573 | S0.417 | Anx0.576 |
| **Mansueto et al. (2022)** | 2 | 0.30-0.96 | 0.33-0.77 | - | - | 0.745 | 0.810 | 0.75 | 0.81 | - | 0.49 | 0.45 |
| **Xin et al. (2022)** | ? | - | - | - | 0.838 |  | - | - | - | - | - | - |
| **Alhakami et al. (**Unpublished**)** | 2 | - | - | - | - | 0.72 | 0.75 | - | - | - | - | - |
| **Ünal-Aydın et al. (**Unpublished**)** | 2 | - | - | - | - | 0.76 | 0.83 | - | - | - | - | - |
| **Seydavi et al. (**Unpublished**)** | 2 | - | - | - | 0.81 | 0.67 | 0.79 | 0.86 | 0.87 | 0.75 |

*Note.* CR = Composite Reliability; MR = Maximal Reliability; AVE = Average Variance Extracted; C-19ASS-A = COVID-19 Anxiety Syndrome Scale-Avoidance; C-19ASS-P = COVID-19 Anxiety Syndrome Scale-Perseveration.

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| Table 4: Summary of included studies. |
| **Risk of Bias\*** | **Limitations and Future Directions** | **Findings** | **%Female** | **Age Mean (SD)** | **Sample Size** | **Study design** | **Authors and Year** | **No** |
| 4/8 | **Limitations:** Self-report; non-representative sample (higher level of males and Caucasian participants).**Future Directions:** Using more objective measures; a larger sample size. | The C-19ASS-P was positively associated with anxiety, neuroticism and functional impairment, and was negatively associated with extraversion, whilst the C-19ASS-A was positively associated with agreeableness and openness. The C-19ASS-P and the C-19ASS-A were both positively associated with COVID-19 perceived threat and negatively correlated with conscientiousness. | study 1: 33.90study 2:38.96 | study 1: 37.2(10.9)study 2:38.6 (11.2) | study 1: 292study 2:426 | Cross- Sectional | [Nikčević & Spada (2020)](#_ENREF_47) | 0 |
| 6.5/8 | **Limitations:** Disregarding the possibility that individuals may deliberately avoid the stimuli; a single measure of attentional bias; providing only a 'snapshot' of the relationship between the measures.**Future Directions:** Ruling out the possibility that individuals may deliberately avoid the stimuli; using other relevant measures of attentional bias; providing the possibility of measurement at different points during the pandemic experience; detailing the possible changing relationship between the measures in the study and attentional biases; delineating indicative cutoffs of severity for the COVID-19 Anxiety Syndrome. | The C-19ASS predicted generalized anxiety and depression and attentional biases towards COVID-19-related stimuli. | 49.70 | 46.34(15.21) | 286 | Cross- Sectional | [Albery et al. (2021)](#_ENREF_5) | 1 |
| 3/8 | **Limitations:** Self-report.**Future Directions:** Using more objective measures; experimental designs. | C-19ASS was a reliable predictor in the path analysis model for burnout. | - | 27.52(4.87) | 251 | Cross- Sectional | [Mousavi-Asl, Boostani, et al. (2021)](#_ENREF_42) | 2 |
| 4/8 | **Limitations:** Self-report; using an uneven gender distribution.**Future Directions:** Using more objective measures; using longitudinal or experimental research; samples with more evenly distributed gender. | Loneliness positively associated with COVID-19 Anxiety Syndrome.Both loneliness and COVID-19 Anxiety Syndrome positively associated with mental health problems. The C-19ASS had a mediating role in the association between attachment styles and mental health problems. | 82.10 | 34.33 (13.17) | 330 | Cross- Sectional | [Vismara et al. (2022)](#_ENREF_58) | 3 |
| 5.5/8 | **Limitations:** Using a within-subjects design; using a relative avoidance bias measure; using a computerized reaction time task; online and non-representative sample.**Future Directions:** Using other AAT variants. | C-19ASS associated with explicit preference for spending time withmask wearing individuals. | Study 1a:40.81Study 1b:48 | Study 1a: 24(405)Study 1b:65.3(4.7) | Study 1a:147Study 1b:150 | Cross- Sectional | [Krishna et al. (2021)](#_ENREF_28) | 4 |
| 4.5/8 | **Future Directions**: Determining to what extent the reported higher levels of psychological distress translate into suboptimal economic behavior. | C-19ASS significantly associated with depression and anxiety. |  | mean ageChina= 34.5Germany=41.35Italy=42.78Sweden=40.42UK=40.44USA=40.02 | 5179 | Cross- Sectional | [Distaso, Nikčević, & Spada (2022)](#_ENREF_18) | 5 |
| 6.5/8 | **Limitations:** Potential of responder bias; selection bias; limitation related to the highly specific population. | Higher C-19ASS was predictor of clinic nonattendance inpatients with macular disease. | 46.20 | 70.9(14.3) | 104 | Cross- Sectional | [Liu et al. (2022)](#_ENREF_36) | 6 |
| 3/8 | **Future Directions:** Separating the two elements of the scale into several factors (because the Indonesian version consists of three factors including avoidance, perseveration,and checking). | C-19ASS-A was significantly associated with some of the COVID-19 Stress Scale dimensions (danger and contamination), while the C-19ASS-P was strongly associated with all of the COVID-19 Stress Scale dimensions. Both C-19ASS-A, C-19ASS-P were strongly associated with peritraumatic distress. |  |  | 276 | Cross- Sectional | [Muthiah et al. (2022)](#_ENREF_44) | 7 |
| 3.5/8 | **Limitations:** Non- representative sample; limited generalizability; online survey questionnaires. | Resilience was inversely associated with C-19ASS. | 77.3 | 31(8.68) | 203 | Cross- Sectional | [Oducado et al. (2021)](#_ENREF_48) | 8 |
| 3.5/8 | **Limitations:** Self-report; survey approach; nonrandom and purposive sample; limited generalizability.**Future Directions:** Studying the roles of organizational change in organizational politics, especially in the public sector; Studying the probability of changing in political variables forced by remote working. | C-19ASS predicted perception of organizational politics and it negatively moderated the effect of organizational change on perception of organizational politics. | 55.11 | 31(8.68) | 112 | Cross- Sectional | [Larasatie et al. (2022)](#_ENREF_32) | 9 |
| 6/8 | **Limitations:** Limited generalizability.**Future Directions:** Nursing colleges undertake quantitative and qualitative studies; creating new policies about NSs. | Gender, diagnosis of other illness, and place of residence didn't predict C-19ASS significantly. | 68.20 |  | 484 | Cross- Sectional | [Grande et al. (2021)](#_ENREF_21) | 10 |
| 3/8 | **Limitations:** Using convenience sampling; limited generalizability (only comparing the psychometric properties and suitability of the different COVID-19 anxiety measures); the influence of the order of the materials on results; the different answer scales used by the different measures.**Future Directions:** A more in-depth assessment of the specificities of the measures; using a more suitable questionnaire for the target population. | C-19ASS with its two factors was significantly associated with COVID-19 anxiety. | 62.74 | 26.04(14.15) | 204 | Cross- Sectional | Coelho et al., (2022) | 11 |
| 3/8 | **Limitations:** Self-report; non-representative sample; online study; limited generalizability.**Future Directions:** Examining the general population; assessing other communities and related samples. | The C-19ASS had a positive and significant association with COVID‑19 burnout. | - | 27.52(4.87) | 251 | Cross- Sectional | [Mousavi-Asl, Behrouzian, et al. (2021)](#_ENREF_41) | 12 |
| 7/8 | **Limitations:** Lack of longitudinal follow-up.**Future Directions:** Evaluating the psychometric features of the C-19ASS in Persian-speaking countries and probably test items 3, 4 and 6 for larger invariance across genders; investigating the mediating role of C-19ASS in the association between the Big Five personality traits and depressive and anxiety symptomology. | The C-19ASS significantly predicted COVID-19 anxiety, GAD, worrying about illness, and depression severity. As mediator variable the C-19ASS significantly mediated the relationship between the Big Five personality traits and psychopathology ((health anxiety, generalized anxiety, depression, and COVID-19 anxiety) | 52.1 | 35.83(12.89) | 1429 | Cross- Sectional | Akbari, et al., ([2021](#_ENREF_3)) | 13 |
| 3.5/8 | **Limitations:** Self-report; convenience sampling method; Limited generalizability.**Future Directions:** Developing interventions that foster positive coping; Generating strategies that promote mental health. | Nursing students experienced moderate to high levels of the COVID-19 Anxiety Syndrome, and anxiety levels of female students were higher. | 81 | 19.55(1.02) | 175 | Cross- Sectional | [Oducado (2021)](#_ENREF_49) | 14 |
| 3.5/8 | **Limitations:** Self-report; no means of assessing objective high-risk status; non-representative and homogenous sample; small number of ethnicities of non-Caucasian background.**Future Directions:** Using a more diverse sample of participant; using a larger sample size. | The C-19ASS was positively associated with generalized anxiety and depressive symptoms. The C-19ASS was also mediator in the relationship between the Big Five personality traits and generalized anxiety and depressive symptoms. | 46.61 | 39.3(11.8) | 502 | Cross- Sectional | [Nikčević et al. (2021)](#_ENREF_46) | 15 |
| 4/8 | **Limitation:** Online sampling.**Future directions:** Considering a wider age range. | The Persian version of the C-19ASS had an acceptableconstruct validity and reliability. It has two factors with nineitems that explained 48.70% of the total variance of the C-19ASSin the Iranian population during the COVID-19 pandemic. | 85.19 | 31.14(7.81) | 932 | Cross- Sectional | [Hoseinzadeh et al. (2022)](#_ENREF_23) | 16 |
| 3.5/8 | **Limitation:** Online data collection.**Future Direction:** Conducting longitudinal studies; conducting studies with mediating processes; using other forms of data collection. | The C-19ASS predicted psychological behavioral responses and perceived stress. | 85.2 | 31.12(7.62) | 926 | Cross- Sectional | [Sharif Nia et al. (2022)](#_ENREF_53) | 17 |
| 4/8 | **Limitations:** Non- representative sample; self-report; high proportion of females.**Future Directions:** The employment of a longitudinal study designs; ensuring a more diverse sample of participants. | The C-19ASS-P was significant predictor of COVID-19 anxiety and work and social adjustment, and also added significant additional variance in the prediction of COVID-19 anxiety over and above age, the Big Five personality traits, perception of being vulnerable to COVID-19, and COVID-19 fear. As mediator variable COVID-19 Anxiety Syndrome mediated the relationship between Big Five personality traits and psychological outcomes (i.e., depression, generalized anxiety, and health anxiety). | 67 | 31.71(15.24) | Study 1: 271study 2: 484 | Cross- Sectional | [Mansueto et al. (2022)](#_ENREF_38) | 18 |
| 5/8 | **Limitations:** Combining the outcomes from respondents with Type 1 and Type 2; limited generalizability; problems with sampling at a time of great challenge due to COVID-19; security of immunity as confounding factor.**Future Directions:** Screening for depressive symptoms; monitoring for the potential longer-term ramifications on diabetes self-management. | Higher C-19ASS-A sub-scores were linked to better diabetes self-management efficacy. | 52.90 | 50.5(16.0) | 369 | Cross- Sectional | Distaso. et al., ([2022](#_ENREF_17)) | 19 |
| 4/8 | **Limitations:** Online questionnaires; self-report; problems with sampling; non-representative sample. | The C-19ASS predicted COVID-19 pandemic fatigue. | 54 | 32 | 1500 | Cross- Sectional | [Xin et al. (2022)](#_ENREF_67) | 20 |
| 4/8 | **Limitations:** Non-representative sample; self- report; a high proportion of females.**Future Directions:** The employment of a longitudinal study design; a more diverse sample of participants. | Both the C-19ASS-A and C-19ASS-P were positively associated with generalized anxiety and health anxiety. The C-19ASS-A was negatively correlated with the PHQ-2 while the C-19ASS-P was positively correlated with the PHQ-2. | Study 1: 70.3Study 2: 85.3 | Study 1:-Study 2: 32.21(13.06) | Study 1: 404Study 2: 903 | Cross-Sectional | Alhakami et al. (Unpublished) | 21 |
| 4/8 | **Limitations:** Online sampling; small sample size; uneven distribution in terms of gender and age. | C-19ASS-P was a significant predictor of well-being. | 66 | 27 | 296 | Cross-Sectional | Ünal-Aydın et al. (Unpublished) | 22 |
| 7/8 | **Limitations:** Higher proportion of females; self-report.**Future Directions:** The employment of longitudinal study designs; targeting COVID-19 Anxiety Syndrome to reduce pandemic-related psychological distress.  | The Greek C-19ASS explained more variance in functional impairment and COVID-19 anxiety beyond generalized anxiety and depressive symptoms, health anxiety, the Big Five personality traits, pandemic-related factors, and demographic variables.  | 78 | 32.35 | 912 | Cross-Sectional | Seydavi et al. (Unpublished) | 23 |
| Note. C-19ASS = COVID-19 Anxiety Syndrome Scale; C-19ASS-A = COVID-19 Anxiety Syndrome Scale-Avoidance; C-19ASS-P = COVID-19 Anxiety Syndrome Scale-Perseveration.\* Higher points represent the higher level of confidence in the results (low risk of bias) and lower points represent the lower level (high risk of bias) |