COVID-19

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COVID-19 related mental health issues: a narrative review of psychometric properties of scales and methodological concerns in scale development

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Abstract

Objectives: The global crisis of COVID-19 and its consequential strict public health measures placed around the world have impacted mental health. New scales and tools have been developed to measure these mental health effects. This narrative review assesses the psychometric properties of these scales and tools and methodological aspects of their development.

Methods: PubMed, PubMed Central, and Google Scholar were searched for articles published from 15 May 2020 to 15 August 2020. This search used three groups of terms ("tool" OR "scale" AND "mental" OR "psychological"; AND "COVID-19" OR "coronavirus"). The identified scales were further evaluated for their psychometric properties and methodological aspects of their development.

Results: Though the studies developing these scales (n = 12) have demonstrated their robust psychometric properties, some methodological concerns are noteworthy. Most of the scales were validated using internet-based surveys, and detailed descriptions of the mode of administration, sampling process, response rates, and augmentation strategies were missing.

Conclusions: The heterogeneous and inadequate reporting of methods adopted to evaluate the psychometric properties of the identified scales can limit their utility in clinical and research settings. We suggest developing guidelines and checklists to improve the design and testing, and result in reporting of online-administered scales to assess the mental health effects of the COVID-19 pandemic.

Keywords: COVID-19, mental health, tools, instruments, assessment

Coronavirus disease-19 (COVID-19) pandemic and consequential public health measures have led to a rapid increase in the prevalence of COVID-19 related mental health issues.[1] These issues, which include psychological distress, psychopathological symptomatology, and full-blown psychiatric disorders, are heterogeneous and complex; they are also difficult to identify, interpret, and measure.[2] Researchers worldwide have attempted to address these critical issues by developing new scales or tools.[2]

A previous study reviewed scales developed prior to 15 May 2020.[2] This review focused on their psychometric properties and multi-language availability, without a thorough discussion of methodological concerns (e.g. factor structure or item–response ratio). A timely review of these aspects was warranted, as methodological flaws in the development of clinical instruments could limit their real-world usefulness, bias future psychometric research, and hinder the delivery of appropriate mental health care to populations globally.

Our review

The present narrative review provides an updated overview of the clinical scales developed since the above-mentioned overview and prior to 15 August 2020. Our areas of focus were: (1) psychometric properties, and (2) methodological aspects of the development and reporting of those scales.

We searched PubMed, PubMed Central, and Google Scholar databases for studies reporting psychometric properties of COVID-19-related mental health scales during the period from 15 May 2020 to 15 August 2020. This search used three groups of terms in [Title/Abstract]: "tool" OR "scale" AND "mental, OR psychological," AND "COVID-19" OR "coronavirus" in different combinations.

Articles were included if they described the development and psychometric properties of original scales. Articles were excluded if they just described the translation or validation of existing original scales in different languages or settings. Abstracts without full text, non-English articles, and conference proceedings were also excluded. Two authors (RSR and ED) independently completed the screening, assessed, and extracted data about the psychometric properties (reliability, validity) and methodological aspects (e.g. sample size, population, data collection methods, and methods adopted to improve the data collections) in individual studies. Then, another two authors (SR and RAR) reassessed the data for any discrepancies; these discrepancies were solved in discussions with other co-authors.

We found 12 original scales developed during the study period, assessing constructs such as organizational support of healthcare workers,[3] psychological destruction,[4] fear,[5] COVID-19-related anxiety,[6] COVID-19 anxiety syndrome,[7] preventive behaviors related to COVID-19 among individuals with mental illness,[8] coronavirus reassurance-seeking behaviors,[9] the impact of event,[10] and quality of life[11] (Table 1).

Psychometric properties of scales

Most studies demonstrated acceptable psychometric properties (reliability or validity) for the scales. The majority of scales were not tested against gold-standard diagnostic interviews and criteria for psychiatric disorders (such as ICD-10/11, DSM-5/IV-TR, SCID-I, Diagnostic criteria for research); the Multidimensional Assessment of COVID-19-Related Fears (MAC-RF) was the exception.[12] Rather, they were generally tested against other scales already validated to screen for mental health symptoms (e.g. DASS-21 or GAD-7), which yielded proxy-diagnosis of underlying disorders.[3,10] It should be noted that use of such scales can result in high

Table 1. Empirically validated scales that measure COVID-19-related mental health issues

Sr no	*Authors*	*Scale*	*Sample size, age (mean ± SD), country, duration of data collection, population*	*Method of data collection, sampling, response rate*	*No of items*	*Psychometric properties of scale*	*Dimensions/factors*
1	Zhang et al., 2020	The measure of COVID-19 Organizational Support (COVID-OS)	$n = 712$; age: 38.9 ± 10.1 years; country: 35% were from Ecuador, 34% from Bolivia, and 31% were from Peru; duration: April 10 to May 2, 2020; population: health care workers (HCWs)	Online survey, region-stratified, two-stage cluster sampling. Response rate: 59.2%	8	**Reliability:** Cronbach's alpha = 0.93 **Validity:** predictive validity with GAD-7 and SWLS-5 (Satisfaction with Life Scale-5) AUC: 0.61; Sensitivity: 66%; Specificity: 56%.	Three factors/ dimensions: 1.Work support 2. Personal support 3. Risk support
2	Chandu et al., 2020	COVID-19 Anxiety Scale (CAS-I)	$n = 307$; age: 35.32 ± 10.9 years, India; duration: February to March 2020; general population	NA	7	**Reliability:** Cronbach's alpha = 0. 0.736 **Validity**: Negatively correlated with single self-rated mental health ($r = –0.417$), good contract, face and content validity, temporal stability, and ICC: 0.91	Two factors/ dimensions: 1.Fear of social interaction 2. Illness anxiety
3	Repišti et al., 2020	COVID-19 – Impact on Quality of Life (COV19-QoL)	**Non-clinical sample:** $n = 1346$, Croatia; age: 40.28 ± 11.34 years; four European countries (Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia); duration: NA; general population, 371 (27.6%) men and 975 women (72.4%)	Online survey (Google form), distribution through channels: (1) webpages of the professional and educational associations, (2) e-mail contacts from the professional associations, (3) public platforms (Facebook), (4) social media contacts (WhatsApp, Viber, SMS)	6	**Non-clinical sample** **Reliability:** Cronbach's alpha = 0.885 **Validity:** good construct validity	NA
			Clinical sample: $n = 201$; age: 44.62 ± 12.06 years; patients with severe mental illness (schizophrenia and psychotic disorder = 159); 94 men (46.8%) and 107 women (53.2%)	Phone call or video call (5 and 10 min per patient)		**Clinical sample:** **Reliability:** Cronbach's alpha = 0.885 **Validity:** good construct validity	
4	Almeida et al., 2020	SARS-CoV-2 Fear Scale (SCoV-2-FS)	$n = 1332$; age (IQR): 36.29 (26.74; 49.95); Brazil; duration: April 30 to June 9, 2020; general population (female 974 (73.12%), male 353 (26.50%), other 5 (0.36%))	Online survey, Google form (accessed only once by each Google email address, QR code), random distribution in personal and professional networks (communities and web groups), and email	11	**Reliability:** Cronbach's alpha = 0.93. **Validity:** good reliability, details NA	Single factor (unidimensional)

(continued)

Table 1. (Continued)

Sr no	*Authors*	*Scale*	*Sample size, age (mean ± SD), country, duration of data collection, population*	*Method of data collection, sampling, response rate*	*No of items*	*Psychometric properties of scale*	*Dimensions/factors*
5	Chang et al., 2020	Believing COVID-19 Information Scale (BCIS)	$n = 400$; age: 46.91 ± 10.92 years; Taiwan; duration: March 23 to April 23, 2020; individuals with mental illness from daycare, outpatient units, and inpatient rehabilitation programs (schizophrenia, $n = 242$; 60.5%)	NA	6	**Reliability (internal consistency):** Cronbach's alpha = 0.91 **Path model:** BCIS positively associated with FCV-19 (standardized coefficient [β] = 0.28)	Single factor (unidimensional)
6	Chang et al., 2020	Preventive COVID-19 Infection Behaviors Scale (PCIBS)	$n = 400$; age: 46.91 ± 10.92 years; Taiwan; duration: March 23 to April 23, 2020; individuals with mental illness from daycare, outpatient units, and inpatient rehabilitation programs (schizophrenia, $n = 242$; 60.5%)	NA	5	**Reliability (internal consistency):** Cronbach's alpha = 0.82 **Path model:** FCV-19S negatively associated with PCIBS (β = – 0.11)	Single factor (unidimensional)
7	Lee et al., 2020	Coronavirus Reassurance-Seeking Behaviors Scale (CRBS)	$n = 453$, median age: 33 years; United States; duration: April 15, 2020; adult MTurk workers	Online survey, incentives ($0.50)	5	**Validity:** Incremental validity with neuroticism, anxiety (health, generalized, and death)	NA
8	Vanaken et al., 2020	Impact of Event Scale With Modifications for COVID-19 (IES-COVID19)	$n = 380$; mean age: M = 19.44 ± 1.40 years; Belgium; duration: March 23 to March 27, 2020; university students Follow-up measurement: $n = 246$, April 22 and April 29, 2020, university students	Online survey: e-mail invitation via the university's Experiment Management System Follow-up measurement Online survey: email invitation via the university's Experiment Management System. Response rate: 64.74%	15	**Reliability:** **Internal consistency:** Total IES-COVID19 (α = 0.75), Intrusion subscale (α = 0.67) Avoidance subscale (α = 0.59) **Test–retest reliability (1 month):** Total IES-COVID19 ($r = 0.62$), Intrusion subscale ($r = 0.47$) Avoidance subscale ($r = 0.54$) **Validity:** Convergent validity of IES-COVID19 with depression sub-dimension of DASS ($r = 0.27$), anxiety sub-dimension of DASS ($r = 0.31$), stress subdimension of DASS ($r = 0.34$), SSLN ($r = 0.17$), and SRRS ($r = 0.50$)	Two factors: 1. Intrusion (7 items) 2. Avoidance (8 items)
9	Akan, 2020	COVID-19 Psychological Destruction Scale (CPDS)	$n = 1604$, age: 28.7 (range: 18–50 years); Turkey; duration: NA; general population; CFA: $n = 597$	Online survey, convenience sampling	18	**Reliability: Overall CPDS** (α = 0.95) and CPDS-C (α = 0.937) and CPDS-F (α = 0.791) **Validity:** Concurrent validity with overall DASS ($r = 0.748$), depression sub-dimension ($r = 0.689$), anxiety sub-dimension ($r = 0.59$), and stress subdimension ($r = 0.68$)	Two factors: 1. Collapse (14 items) 2. Fear (4 items)

(continued)

Table 1. (Continued)

Sr no	*Authors*	*Scale*	*Sample size, age (mean ± SD), country, duration of data collection, population*	*Method of data collection, sampling, response rate*	*No of items*	*Psychometric properties of scale*	*Dimensions/factors*
10	Nikčević and Spada, 2020	COVID-19 Anxiety Syndrome Scale (C-19ASS)	*n* = 292, age: 37.2 ± 10.9 years; United States; duration: first week of June 2020, MTurk workers (PCA) *n* = 492, age: 38.6 ± 11.2 years; United States; duration: second week of June 2020; MTurk workers (CFA)	Online survey, convenience sampling, incentive ($1.0) Online survey, convenience sampling, incentive ($1.0)	9	**Reliability:** C-19ASS-P (α = 0.86) and the COVID-19ASS-A (α = 0.77) **Validity:** Concurrent validity with CAS (*r* = 0.37), PCTQ (*r* = 0.48), WSAS (*r* = 0.02), and BFI-10 (*r* = 0.02 to –0.08)	Two factors: 1. Perseveration (C-19ASS-P; 6 items) 2. Avoidance (C-19ASS-A; 3 items)
11	Qiu et al., 2020	COVID-19 Peritraumatic Distress Index (CPDI)	*n* = 52,730, age: NA; China; duration: January 31, 2020 to February 10, 2020; general population	Online survey, QR codes	24	**Reliability (internal consistency):** (α = 0.95) **Validity**: NA	NA
12	Schimmenti et al., 2020	Multidimensional Assessment of COVID-19-Related Fears (MAC-RF)	*n* = 623, age: 35.67 ± 12.93 years; Italy; duration: April 27, 2020 to May 5, 2020; general population	Online survey, distribution through social media platform (not specific information available), completed forms: 99.20%, No compensation	8	**Reliability (internal consistency):** (α = 0.84) **Validity:** Convergent: CCSM total scores (*r*s = 0.31 to 0.47)	Single factor (unidimensional)

Note. IQR = interquartile range; QR code = quick response code; r = Pearson's correlation coefficient; rs = Spearman's correlation coefficient; α = Cronbach's Alpha; GAD-7 = General Anxiety Disorder-7; NA = not available in published manuscript; BFI-10 = Big Five Inventory-10; PCTQ = Perceived Coronavirus Threat Questionnaire; CAS = Coronavirus Anxiety Scale; WSAS = Work and Social Adjustment Scale; PWB = psychological well-being; DASS = Depression Anxiety and Stress Scales; SSLN = social support list: negative interactions; SRRS = stress-reactive rumination; PCA = principal components analysis; CFA = confirmatory factor analysis; CCSM = Cross-Cutting Symptom Measure-Adult (CCSM) DSM-5 Self-Rated Level 1.

false-positive or negative rates due to non-psychiatric conditions such as COVID-19 itself (and its complications) or preexisting diseases (e.g. uncontrolled hypertension, diabetes, or anemia)[13]; consequently, reliance on these non-gold standard tools as validators in the development of new scales may compromise the psychometric properties (reliability and validity) of those new tools.

Many of the identified scales were not assessed for test–retest reliability, except CAS-I[6] and IES-COVID19.[10] This is a psychometric property that is important to evaluate when the underlying construct is stable over an adequate period.[14] In this regard, it should be considered that some psychological constructs related to COVID-19, such as uncertainty about the future or fear, including fear of death, may be dynamic, changing as the pandemic progresses, and influenced by the impact of environmental factors such as misinformation.[15,16] Given the instability of such constructs, assessments of test–retest reliability may not always be valid.

Methodological limitations of the identified studies

Although the developed scales demonstrated robust psychometric properties, the studies in which they were based presented noteworthy methodological limitations. Most studies recruited participants using internet-based surveys, which made it difficult to thoroughly characterize their samples (lacking information on total reach and response rates), leading to response bias.[17]

Specifically, uncontrolled circulation of links for data collection through social media (seeking a snowballing effect) was a commonly adopted strategy.[11,12] While increasing the potential reach of these surveys, this strategy risks missing responses from people with limited or no access to the internet, social media, or mobile devices, and authors cannot track and characterize the dissemination of the survey and the population reached, nor one can be sure of the representativeness of the responders in regards to the reached population.

Only a few of the publications about the scales development mentioned their sampling[5,10–12] and randomization[5] procedures. Most studies recruited participants using non-probability sampling (convenience or snowball), thus potentially compromising the generalization of their findings.[18] Some studies used a quick response (QR) code as an augmentation strategy during data collection,[5,19] and others mentioned the provision of reimbursements or incentives to participants.[7,9] However, a detailed description of the modes of administration (e.g. email, websites, social media, or a mixed or hybrid method) and factors related to it, such as type of respondents, the medium of survey/reminder, and the number of follow-up reminders were missing in most studies.

Finally, most studies did not discuss the length of the survey and the time required. All these methodological aspects should be taken into account in the interpretation of the psychometric properties of the identified scales, as these flaws may amplify response bias, skew the study findings, and compromise the developed scale's generalization to larger populations.[17,20]

Recommendations

We provide some alternatives to validate these scales so they can be used in clinical practice or research. The use of best-practices guidelines for scale development and reporting, defining well the larger population to which scales are intended to serve, and employing traditional validation approaches could improve the robustness of these scales. As for best practices, the Consensus-based Standards for the Selection of Health Measurement Instruments (COSMIN) guidelines assist in the process of designing and reporting of studies measuring psychometric properties of scales such as reliability and validity and are often used by reviewers to evaluate their methodological quality.[21] However, COSMIN was developed for traditional scales and are not necessarily applicable for those with online data collection[21]; therefore, we preferred not to use these guidelines in our review. As online-based research grows, we advocate for the development of new guidelines and checklists to assist the validation, reporting, and evaluation of online-based clinical scales. Table 2, albeit not comprehensive, may constitute a draft over which appropriate checklists can be developed.

Finally, the ongoing pandemic has limited the use of in-person clinical assessments and analogic data collection but harnessing these traditional methods where public health measures get eased and it is deemed safe could also help to improve the quality of scale development studies.

Conclusions

The present review examined the psychometric properties and methodological aspects of 12 clinical scales assessing COVID-19-related mental health issues. Although the studies developing those instruments have demonstrated their robust psychometric properties, clinicians and researchers should be aware of their methodological limitations, including sampling and reporting pitfalls. As online research grows, updated guidelines for the development, reporting, and evaluation of internet-based clinical instruments are needed; this review provides a draft for a model checklist.

Disclosure

The authors report no conflict of interest. The authors alone are responsible for the content and writing of the paper.

Table 2. Some items that should be included in the internet-based validation of scale checklist

1. Describe and define the exact study population (e.g. membership directory, patients records, census data, employees list)
2. Selection of appropriate sample using probability sampling methods
3. Selection of gold-standard scale or method for comparison (e.g. diagnostic interview, face-to-face or videoconferencing)
4. Selection of an appropriate survey dissemination approach (email or instant messaging): Avoid the dissemination on social media or mixing approaches, request to forward to others (snowballing)
5. Describe the length of the survey or required time of the survey: Recommended: 13 minutes to 20 minutes
6. Augmentation strategies: Incentives, no of reminders (maximum 3), or telephonic phone call
7. Other approaches: QR code, machine learning, artificial intelligence
8. Response ratio, acceptability

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