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Assessment of anxiety and fear of COVID-19 in the prison population

Psychometric properties of the AMICO_Inmates scale

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Abstract

The COVID-19 disease has entailed a public health challenge and an increased sense of uncertainty for the prison population, who have experienced restrictions on access to social contacts, communal areas, and information for a longer and more recent period than the general population, as well as increased levels of anxiety and fear associated with the COVID-19 disease. The objective of this study was the validation of the Anxiety and Fear of COVID-19 (AMICO) Assessment Scale to measure both anxiety and fear constructs in Spanish prison inmates. A descriptive psychometric validation study was carried out. A field study was conducted to perform univariate analyses, in addition to the exploratory and confirmatory factor analysis of the scale. The study sample consisted of 711 subjects over 18 years of age, inmates in Spanish prisons, 14.1% of whom were women with a mean age of 40.35 years (SD = 2.62). The construct validity study reported 2 factors and 16 items, with a Cronbach alpha value of 0.95, confirmed by McDonald Omega coefficient, with a value of 0.951. The AMICO scale is a valid and reliable tool for assessing the level of anxiety and fear of COVID-19 in the Spanish adult prison population and shows high sensitivity.

Abbreviations: CFA = Confirmatory Factor Analysis, ECV = Explained Common Variance, PUC = Percentage of Uncontaminated Correlations, RFI = Relative Fit Index, SAQ = Self-Appraisal Questionnaire.

Keywords: anxiety, COVID-19, criminals, fear, instrument development, mental health, prisons, public health

1. Introduction

People, as social beings, need interaction, which has a positive influence on their mental health.[1,2] Conversely, isolation may cause long-lasting negative consequences,[2–4] particularly in vulnerable populations.[5] In the long term, solitary confinement can be described as torture[6] and is associated with increased levels of anxiety and stress, sleep disturbances, loss of emotional control, paranoia, cognitive disturbances, increased self-harm and suicide,[2,3] depression, and aggression.[2,7]

Previous infectious outbreaks, such as severe acute respiratory syndrome, Influenza A/H1N1, and Ebola, have highlighted the psychological impact of such threatening scenarios. Research has documented an increase in mental health morbidity (particularly anxiety and depression) at the onset of these epidemics.[8–10] Moreover, studies have demonstrated the significant role of information in shaping fear, anxiety, and depressive responses, as well as its influence on adherence to adaptive protective behaviors.[10–12]

At the beginning of the COVID-19 epidemic and during the quarantine, research was conducted on the associated psychological effects on emotional well-being and sense of coherence.[13–15] Early data from the epidemic noted the importance of mental health interventions, as high levels of anxiety were being reported. In addition, protective factors such as adequate health information and protective measures were observed to be in place.[16]

Other emotional reactions, such as sadness, grief, and fear, have also been reported. The relationship between fear and the high rates of infection, morbidity, and mortality associated with the disease has been well-documented. Specifically, high levels of

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fear can lead to maladaptive behaviors and dysfunctional emotional responses.[17] To assess fear levels, the Fear of COVID-19 Scale has been validated in multiple languages, including English,[18] Italian,[19] and Spanish.[17]

Research on the consequences of COVID-19 on imprisoned populations has highlighted the impact of isolation and anxiety related to the risk of infection.[20] It has been noted that fear of COVID-19, the effects of social distancing and isolation, as well as the disruption of visits and reduced mental health services, likely had a negative impact on the mental well-being of incarcerated individuals.[21] Additionally, the situation is exacerbated by the fact that social isolation in prisons is known to worsen inmates' mental health issues and even contribute to higher suicide rates. Poor communication about the pandemic from prison staff further heightened stress and anxiety among inmates.[22] It is important to note that a typical day for an isolated prisoner would involve spending 22.5 to 24 hours in a single cell. The duration of solitary confinement can last for months or even years, with the length of confinement often remaining uncertain. This prolonged isolation can lead to a sense of helplessness and intensify hostile and aggressive behaviors.[23]

As such, the fear construct is defined as a cognitive response to threat, by means of which a person prepares for and adapts to certain dangerous situations.[24] However, the continued presence of this state of alertness over time may contribute to the development of physical illnesses and/or psychological disorders, which in turn may aggravate previous pathologies.[25] Anxiety shares characteristics with fear, but fear ceases when the triggering situation disappears whereas anxiety can last for a longer time.[26]

Research on mental health assessment in prisons is limited, with even fewer studies focusing on anxiety and fear, particularly in Spain. However, some notable studies can be referenced. For instance, Altamirano Argudo[27] found a link between a family history of mental health issues and the prevalence of anxiety and depression. Similarly, Zabala-Baños et al[28] reported a high percentage of mental disorders among inmates, most commonly mood disorders, substance abuse, anxiety, depression, and psychosis.

In terms of assessment instruments, one significant study is that of Castillo-Fernández,[29] which involved the validation of a computerized neuropsychological battery designed to predict impulsive and compulsive behaviors in cases of gender violence. This study also included the validation of the Spanish version of the Impulsive-Compulsive Behavior Checklist within the prison population.[29]

Another important contribution is the psychometric adaptation of the Self-Appraisal Questionnaire (SAQ) to assess the risk of recidivism in the prison population, conducted by Bello-Castillo.[30] This study focused on adapting the SAQ to the Spanish prison context, analyzing its internal consistency, reliability, construct validity, criterion validity, and diagnostic validity within the sample. It also compared the results to previous validation and replication studies of the SAQ in other population groups.[30]

In a previous study, Gómez-Salgado et al designed the Anxiety and Fear Assessment Scale for COVID-19 (AMICO) and developed the cross-cultural adaptation in other population groups.[31,32] The design of this scale was developed from the initial 10 items assessed by a panel of experts in the study by Ahorsu et al[18] following the methodology described by Epstein et al.[33] To these 10 items, 6 new ones were added, which also measured the presence of anxiety specific to COVID-19, as the aim was to complement the scale with the anxiety construct, along with the fear construct. The exploratory factor analysis resulted in a dimensional matrix of 16 items and 2 factors, which explained 64.8% of the variance (Kaiser–Meyer–Olkin test = 0.94; Bartlett test: $P = .001$). Reliability was studied and revealed a Cronbach α of = 0.95.[31] The response options on the AMICO scale range from 1 to 10 points, with 1 being "strongly disagree" and 10 being "strongly agree."[31]

This study aimed to validate the construct of the Anxiety and Fear of COVID-19 (AMICO) Assessment Scale through a new field study conducted among the incarcerated population. Establishing the validity of this instrument is crucial to ensuring a reliable tool for accurately assessing the levels of anxiety and fear linked to the pandemic within this specific group. The findings will serve as a basis for the development of mental health support and prevention strategies tailored to the prison environment. Furthermore, this research will not only enhance understanding of the psychological impact of the pandemic on inmates but may also provide a reference for future interventions designed to promote their mental well-being.

2. Materials and methods

2.1. Design

Cross-sectional descriptive and psychometric validation study, based on questionnaires.

The study was conducted in 3 phases: (1) adaptation of the AMICO scale to a sample of Spanish prison inmates by a panel of experts; (2) data collection phase, from May 26, 2022 to February 23, 2023 in 3 Spanish Penitentiary Institutions (P.I.): Albolote P.I. (Granada), Jaén P.I., and Córdoba P.I.; (3) data analysis phase, during the months of November 2023 to January 2024.

2.2. Participants

The study population included inmates of Spanish prisons. The total population is estimated at 49,998.[34] To ensure the significance of the data, the required sample size was calculated according to the size of the study population. Thus, a sample of at least 450 subjects was required, with a confidence level of 95%, precision of 3%, and an expected proportion of losses of 25%.

For the calculation of the sample size, the criterion used was a minimum of 10 subjects for each item of the scale, with a sample success rate of 25%, the required sample size being 200 subjects.[35]

Finally, a total sample of 711 subjects was obtained, inmates from penitentiary institutions in Spain, which was the inclusion criterion for the sample, specifically from the penitentiary institutions of Albolote (Granada), Jaen, and Cordoba.

The sample was selected by means of non-probabilistic convenience sampling. Access to the sample was gained through official and permitted channels, via the staff working in the penitentiary institutions, who distributed the questionnaire among the inmates or made calls or group data collection sessions. These professionals were instructed by the research team on the objectives of the study and the specific data collection procedure.

2.3. Instrument

The Anxiety and Fear of COVID-19 (AMICO) assessment scale[31] was cross-cultural adapted and evaluated by a panel of experts for this study. It was composed of 10 members, professors, and researchers from Spanish universities, with an academic level of PhD or Official Master's Degree. Their areas of expertise were public health, family medicine, clinical psychology, nursing, and social work. The panel agreed, using the Delphi technique, on the validity of the scale and the integration of the 16 items (overall value of Kappa = 0.89; $P < .05$) through an interobserver concordance analysis. The wording of the items was refined to better align with the prison context; however, their underlying concept and meaning remained

unchanged. Experts assessed the revised wording using a five-point scale: (1) not relevant at all, (2) slightly relevant, (3) moderately relevant, (4) highly relevant, and (5) extremely relevant. The final instrument kept the Likert-type response options of the AMICO scale,[31] which ranged from 1 to 10 points, with 1 being "strongly disagree" and 10 being "strongly agree." The finalized version of the questionnaire, as determined by the panel of experts, was tested on a group of 10 individuals in prison selected based on recommendations from prison staff. The pilot study was conducted smoothly, with no issues reported, and no adjustments to the wording of the items were found to be necessary.

2.4. Variables

The questionnaire included socio-demographic variables: sex, age, province of residence, marital status, children, income, degree of sentence, number of people in their cell, perception of health, chronic illness, and substance use; scale variables: AMICO scale, 12-item General Health Questionnaire; and COVID 19 variables, including 14 items: diagnosis of subject or environment and related deaths, isolation, hospitalization, risk group, information received and source, impact of working conditions, protective measures provided, specific training, perceived safety and protection, vaccination, dose and side effects.

2.5. Data collection

The questionnaire was hetero-administered and in physical form in virtually all of the so-called "*Respect areas,*" *a tool implemented in Spanish prisons to foster socio-educational well-being of inmates, and in the nursing units of the participating penitentiary institutions. A* "Respect area" is a unit of internal separation in a penitentiary institution, of voluntary participation and which entails the acceptance of the rules that regulate the following areas: 1. personal care, hygiene, appearance, clothing, and cell maintenance. 2. Care of the environment, use and maintenance of common areas. 3. Interpersonal relations, both with other inmates and with the staff. 4. Programming of activities for each inmate, independent of the tasks specific to their assigned group of inmates, including and respecting leisure time.[36]

2.6. Procedure

The necessary permissions to carry out the survey were obtained from the General Secretariat of Penitentiary Institutions of the Ministry of the Interior and from the Management Board of each penitentiary institution.

To access the premises, the collaboration of the Medical and/or Treatment Sub-Management of each institution was provided, which in turn facilitated the relationship with health workers, educators, or civil servants responsible for each module where the data collection was done. For this purpose, these professionals gathered as many people as possible in the common room of each module, where the members of the research team handed out the paper questionnaires assisted by the institution's professionals. Then, the researchers gave explanations and answered any doubts about how to fill in the questionnaires.

The sampling sessions started at the Jaen P.I. on 26, 27 May and June 1, 2022, followed by 23, 26 and 29 September, 3 and October 5, 2022 at the Albolote P.I. in Granada, and ending in Cordoba on February 23, 2023.

2.7. Data analysis

SPSS Statistics© v26 software was used for the univariate descriptive analysis.[37] The normality of the distribution of the scores was analyzed using the Kolmogorov–Smirnov test, obtaining a significance of 0.01, which indicates non-normality. Nonparametric tests (Mann–Whitney *U* and Kruskal–Wallis) were used in the contrast analysis.

An exploratory factor analysis was carried out to explore the factor structure of the AMICO scale, using maximum likelihood, as this is appropriate when the distribution of the data does not follow normality, and varimax rotation criteria to correlate the factors. Items with a weight of <0.5 were excluded from the final factor solution. The Kaiser–Guttman criterion was used to determine the number of factors, considering eigenvalues >1.[38,39]

Additionally, for the study of criterion validity, a confirmatory factor analysis (CFA) was carried out using the AMOS© software.[40] As the observed indicators did not follow a continuous normal distribution, an unweighted least squares estimation procedure was followed.[41,42] To assess the goodness of fit of the confirmatory model, the following were used: the Root Mean Square Error of Approximation index (values ≤ 0.05 or 0.08 indicated a good fit); the Incremental Fit Index; >0.90 is a good fit; the normed fit index (Normed Fit Index; value closer to 1 indicates a good fit); Relative Fit Index (RFI) (RFI close to 1 indicates a good fit); Comparative Fit Index (value ≥ 0.90 indicated a good fit); Tucker-Lewis Index (values ≥ 0.96 indicated a good fit); and the Standardised Root Mean square Residual (values ≤ 0.80 indicated a good fit).

To assess the unidimensionality of the scale, a bifactor model was examined, incorporating the same first-order factors confirmed in the recent CFA, along with a second-order (bifactor) component encompassing all items. The model's fit indices were computed using Dueber[43] bifactor index calculator. Specifically, the percentage of uncontaminated correlations (PUC) was analyzed, representing the proportion of variance attributable solely to the general factor. Additionally, the explained common variance (ECV) was assessed, indicating the share of total variance explained by both the general and specific factors, along with the Omega Hierarchical, which quantifies the proportion of systematic variance in the total score attributable to the general factor. According to Reise et al,[44] if PUC exceeds 80, ECV surpasses 60, and Omega Hierarchical is >80, the presence of multidimensionality is not substantial enough to invalidate the scale's unidimensionality.

To assess reliability, Cronbach alpha was computed. Additionally, following the latest recommendations for evaluating the reliability of measurement scales, McDonald omega coefficient was calculated, as it provides a more robust estimate of scale reliability by confirming the premise of tau-equivalence. Furthermore, the omega coefficient was adjusted to account for the influence of correlated errors on reliability indices.

2.8. Ethical considerations

The Helsinki Declaration of 2004 was followed for the present study[45,46] and explicit permission was obtained from the participants through an informed consent for the use and processing of the data in a confidential manner in accordance with the Digital Rights Protection Act[47] and state regulations on biomedical research.[48] Data will be duly protected by the research team.

This study is part of the IMPACTCOVID-19 project, which aims to assess the impact of the COVID-19 pandemic on the emotional well-being and psychological adjustment of the general population in Spain, and which was authorized by the Ethics Council and Research Committee of the Regional Government of Andalusia (Ref. PI 036/20-2).

Authorisation for research was obtained from the Subdirectorate General for Institutional Relations and Territorial Coordination, as well as from the General Secretariat of Penitentiary Institutions of the Spanish Ministry of the Interior.

All the subjects in the sample confirmed their voluntary and confidential participation in the study by ticking a specific box on the informed consent form. Additionally, the informed consent form provided participants with information on the possibility to contact the main researcher if they needed psychological support after completing the questionnaire. The full name and email address of the main researcher were provided.

3. Results

3.1. Descriptive analysis

As regards the process of completing the online questionnaire, a 100% response rate was obtained, so that no subject was excluded from the sample. The mean time required to complete the questionnaire was 24 minutes.

The total sample consisted of 711 people over 18 years of age and resident in prisons in Spain (Table 1). Of this sample, 14.1% were women with a mean age of 40.35 years (SD = 2.62). 19.3% were married, 39.1% were single, and 46.8% had another status (divorced, separated, widowed, living with a partner). In addition, 67.5% had children and 32.5% did not have children. In terms of the type of sentence, 1.7% belonged to first grade, with more restrictive control and security measures (closed regime), 96.3% to second grade, or ordinary regime, and 2% belonged to third grade, or open regime. 16.2% received a social or noncontributory benefit, while 83.8% did not receive any benefit. 71.5% shared a room and 28.6% did not share a room with others. 45.1% did not use any type of substance, 52.7% used tobacco, and 41.4% used other legal or illegal substances.

3.2. Psychometric analysis

Regarding the construct validity and reliability, the exploratory factor analysis resulted in a dimensional matrix of 16 items and 2 factors (Table 2). This 2-factor solution explains 64% of the variance (Kaiser–Meyer–Olkin test = 0.94; Bartlett sphericity test: $P = .001$). In relation to the bifactor parameters, values of PUC = 0.52, ECV = 0.64, and Omega H = 0.82 were obtained, suggesting that the presence of some multidimensionality is not severe enough to disqualify the interpretation of the instrument as primarily unidimensional.

For the study of the construct validity, a CFA was carried out, which yielded the following values: Incremental Fit Index = 0.919; Normed Fit Index = 0.909; RFI = 0.906; Tucker-Lewis Index = 0.908; Comparative Fit Index = 0.918; Root Mean Square Error of Approximation = 0.078; and Standardised Root Mean square Residual = 0.037 (Fig. 1).

As for the criterion validity, this could not be studied by comparison with another tool as a gold standard, but the mean score and its distribution in quartiles was used to suggest levels of anxiety and fear in the study sample. Thus, a score of 4.31 was obtained in quartile 1, and a score of 6.4 in quartile 2. Considering these values, the research team hypothesized that 0 to 3.4 points could be a low level of anxiety and fear as measured by the AMICO scale; an intermediate level was assigned to 3.5 to 5.5 points; and a high level, to a score above 5.5. Figure 2 shows the distribution of the sample in the 3 suggested levels of anxiety, using a box-and-whisker plot. The analysis of the statistical significance of the differences between the various levels identified, using the Mann Whitney *U*-statistic for each pair of levels tested, always yielded a value of $P < .001$. Therefore, there are significant differences between the levels identified, so that their consideration and identification can be found in the AMICO scale correction scale.

Additionally, to study the reliability of the scale, Cronbach alpha coefficient was calculated, both for the factorial solution obtained by exploratory analysis and for the one obtained by confirmatory analysis, with a total value of Cronbach $\alpha = 0.95$. Also, based on new recommendations for the study on the reliability of measurement scales, the McDonald Omega coefficient was calculated, giving a total value of 0.951, which confirms the premise of Tau equivalence and is a stronger indicator of scale reliability[49]

4. Discussion

The aim of this study was, as mentioned above, the validation of the AMICO scale construct to assess fear and anxiety of the COVID-19 disease in the prison population. The results obtained have provided good goodness-of-fit rates, as well as a high Cronbach alpha internal consistency value. It has a final structure of 16 items and 2 factors, measuring anxiety and fear, respectively, extracted by means of an exploratory CFA,

Table 1

Description of the sample profile.

	Total sample (n = 711)	AMICO/S.D. mean score	Hypothesis testing
Sex			
Female	100 (14.1%)	6.57 (2.62)	$P < .01$*
Male	611 (85.9%)	5.42 (2.50)	
Marital status			
Married	137 (19.3%)	5.52 (2.72)	$P = .59$†
Divorced	90 (12.7%)	5.46 (2.63)	
Other	9 (1.3%)	4.48 (2.23)	
Single	278 (39.1%)	5.50 (2.53)	
With a partner	178 (25.0%)	5.85 (2.46)	
Widowed	19 (2.7%)	5.85 (2.23)	
Sentence serving			
First grade	12 (1.7%)	6.11	$P = .66$†
Second grade	685 (96.3%)	5.58	
Third grade	14 (2.0%)	5.17	
Children			
Yes	480 (67.5%)	5.74 (2.56)	$P = .25$*
No	231 (32.5%)	5.26 (2.50)	
Receiving social benefit			
Yes	115 (16.2%)	5.61 (2.56)	$P = .84$*
No	596 (83.8%)	5.58 (2.55)	
Sharing cell			
Yes	508 (71.5%)	5.32 (2.57)	$P = .09$†
No	203 (28.6%)	5.19 (2.50)	

*Mann–Whitney *U*.

†Kruskal–Wallis.

Table 2

Dimensional structure through exploratory factor analysis.

Items	Anxiety	Fear
ITEM 1	0.686	
ITEM 2		0.603
ITEM 3		0.725
ITEM 4		0.762
ITEM 5	0.719	
ITEM 6	0.624	
ITEM 7	0.860	
ITEM 8	0.874	
ITEM 9	0.691	
ITEM 10	0.667	
ITEM 11		0.642
ITEM 12		0.697
ITEM 13		0.702
ITEM 14		0.698
ITEM 15	0.618	
ITEM 16	0.694	

which explains 64% of the variance. Based on the distribution of mean scores according to quartiles, 3 levels of anxiety/fear were defined. Differences across these levels were statistically significant and can therefore be considered as an outcome scale.

The initial design of the AMICO scale was based on the FCV-19 questionnaire created by Ahorsu et al.[18] In this respect, FCV-19 only assesses the presence of the fear of COVID-19 construct, and has been extensively validated in different countries over the last few months: UK, Brazil, Taiwan, Italy, New Zealand, Cuba, Iran, Pakistan, Japan, and France.[50] Yet, the AMICO scale has an added value that differentiates it from the FCV-19 scale, as it not only assesses the fear construct but also anxiety.[31]

As for the items with the highest mean score, following a decreasing order, item 11 stands out with the highest score: "I am worried that a family member or friend might contract the COVID-19 disease," with a score of 8.11. This relates to the literature on increased anxiety about the impossibility of contact with infected or deceased relatives and friends due to the suspension of visits.[51]

Item 12 follows: "I am worried about how long the pandemic will last," with a score of 7.51, which suggests a connection to the attention deficit experienced and prolonged solitary confinement,[52] in addition to moderate to severe stress due to uncertainty. Stress is known to trigger negative emotions, anxiety, and depression[53] and to exacerbate generalized anxiety.[54]

Item 4: "The COVID-19 disease can be a cause of death, and this worries me," comes in third place with a score of 7.14, which could complement negative emotions already reported in other studies, such as worry, psychological pain, and fear,[20] and more specifically fear of dying.[55]

Item 14, "I am afraid to be around or care for a person who has or may have COVID-19," received a score of 6.66, followed by Item 13, "When someone coughs near me or when I feel they are too close, I am afraid of getting infected with COVID-19," which scored 6.20. Both items reflect distress associated with the risk of contagion and the imposed restrictions.[51]

In relation to levels of fear and anxiety regarding COVID-19, a recent study in Colombia showed that 72.9% of the adult population had symptoms of anxiety, of which 37.1% were afraid of COVID-19.[56] Fear of COVID-19 in the population has also been linked to an increase in the use of toxic substances such as alcohol or cannabis.[57] In addition, other studies have revealed the presence of psychological distress, anxiety, and work overload among healthcare professionals who were on the front line of care for patients with COVID-19, both in Spain and in other countries.[32,58]

However, these studies have not provided data on the levels of fear of COVID-19 within this population group. The findings of this study reveal a mean score of 5.58 points, which, according to the validated scale, corresponds to a medium-high level of anxiety and fear, as it exceeds the 5.50-point threshold. This suggests that the Spanish prison population experienced a significant emotional impact from the COVID-19 pandemic, particularly in terms of specific anxiety and fear. Notably, more than half of the sample (50.8%) reported high levels of anxiety and fear.

The relevance of the AMICO scale design and its construct validation in the present study is supported by recent

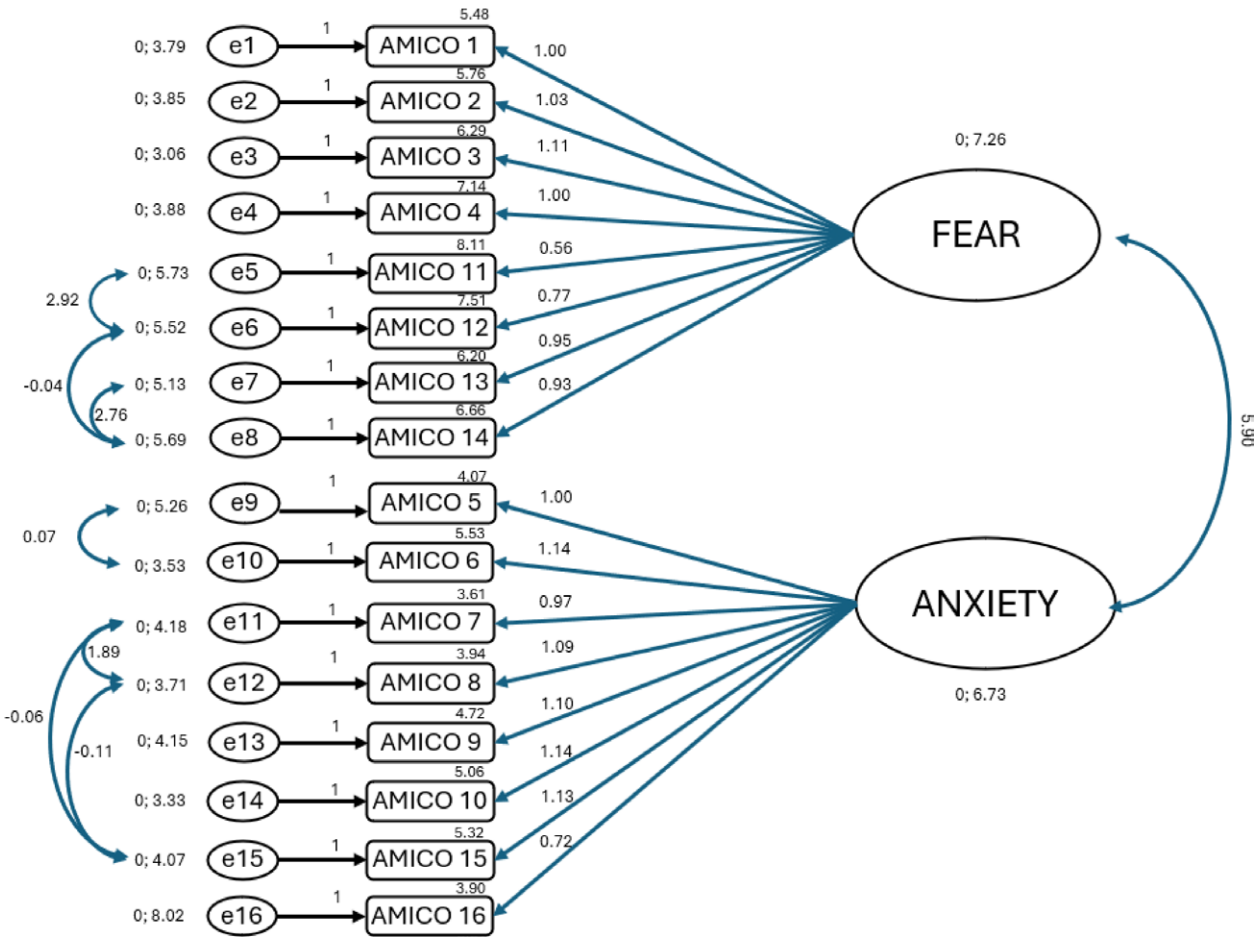

Figure 1. Dimensional structure using confirmatory factor analysis.

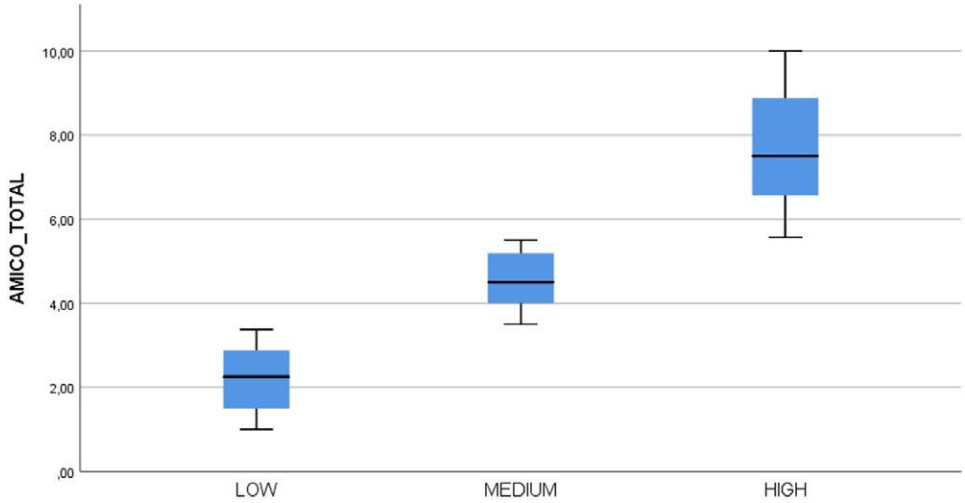

Figure 2. Box-and-whisker plot.

research highlighting high levels of concern, depression, and anxiety related to COVID-19 in the Spanish population. Moreover, this psychological burden has been linked to increased distress and appears to be a predictor of morbidity within this population.[32,59,60] In this sense, other authors have concluded that subjects with higher levels of anxiety and fear of COVID-19 show greater adherence to protective behaviors and exhibit them to a greater extent,[14,49] although other studies have found opposing results.[17,61] In the prison population, COVID-19 has been found to be closely linked to heightened anxiety,[62] with fear of infection being a commonly reported concern.[20] The distress and uncertainty surrounding the pandemic further intensified anxiety levels.[63] Additionally, factors such as social distancing, isolation, disruptions to visitation, and reduced access to mental health services likely had a negative impact on the mental well-being of incarcerated individuals.[21]

Other countries have designed intervention programmes to improve public health, as is the case of China. Some of the suggested measures include the evaluation of the information offered to the population and the improvement of the social support system, although prior knowledge of the mental health status of the population is needed for the design of these programmes.[64] Among the protective factors and strategies implemented to ensure the psychological well-being of the inmate population in the face of the pandemic, these measures have already been implemented in some cases, namely appropriate individual and community social distancing, clear communication with prisoners, release from prison, ensuring access to friends and family via telephone and video calls, effective mental health risk assessment for prisoners, teleconsultation, and mental health appointments.[21] Virtual or video meetings with family members to mitigate the stress experienced by people in prison were also outlined, as well as briefings to update inmates on COVID-19 and the measures taken to maintain their safety and security.[22] In the same line, the precarious conditions of prisons, the high rate of infections and psychopathology, and the lack of governmental assistance are agreed to be critical problems, which is why the development of prevention and health promotion policies focused on mental health is proposed,[55] especially for inmates with previous mental health disorders, who should be provided with psychotropic medication and psychotherapeutic support to cope with anxiety symptoms.[65]

In this context, a reliable tool is needed to assess the levels of anxiety and fear in the prison population in order to identify and measure the presence of these symptoms with a view to implementing specific intervention strategies.[66] The proposal of the research team is to use the AMICO scale as a screening tool in the different social and health centers and services in the country, thus allowing the early identification of critical situations. It is worth noting the need to implement specific individual or group interventions, with the ultimate aim of improving the public health of prison inmates.[66] Moreover, the AMICO scale could also be used as a quality assessment tool for these specific interventions, as it could become both a process and outcome indicator.[67] In addition, future research should examine the relationship between the emotional and mental health impact of COVID-19 and the consumption of toxic substances or the engagement in other risk behaviors in the Spanish population.[68]

4.1. Limitations

The present study has a number of limitations. Firstly, despite the time that has elapsed since the beginning of the pandemic, there are few studies on specific instruments that measure anxiety and fear and/or the effects on the mental health of inmates. Also, non-probability sampling should be considered for the selection of participants.

Finally, in contrast to the validation study of the Coronavirus Anxiety Scale in the general population,[69] concurrent validity analyses were not possible due to the lack of relevant variables that would allow a gold-standard measurement reference in the field of anxiety/fear. Thus, although the suggested cutoff points showed high reliability, it was not possible to rigorously establish optimal cutoff points by studying the sensitivity and specificity of the instrument with the corresponding Receiver Operating Characteristic curve, something that will be left for future research.

5. Conclusions

The AMICO scale is a valid and reliable instrument to measure anxiety and fear of COVID-19 in the Spanish prison population, with a robust bifactor structure (anxiety and fear) similar to that found in the general population. It consists of 16 items with a ten-point Likert response. It has also been shown to be highly sensitive for case detection.

The cutoff points would place fear and anxiety of COVID-19 at higher levels than in the general population, although clinical significance would probably tend to be at similar values. So, in this respect, specificity and sensitivity studies based on gold standards are needed.

Therefore, the Spanish prison population shows moderate to severe, if relevant, medium to high levels of anxiety and fear. This suggests that the Spanish prison population has suffered the emotional impact, in terms of specific anxiety and fear, of the COVID-19 pandemic. In fact, more than 50% of the sample, specifically 50.8%, showed high levels of anxiety and fear.

Author contributions

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References

[1] Coppola F. The brain in solitude: an (other) eighth amendment challenge to solitary confinement. J Law Biosci. 2019;6:184–225.

[2] Haney C. The psychological effects of solitary confinement: a systematic critique. Crime Justice. 2018;47:365–416.

[3] Grassian S. Psychiatric effects of solitary confinement. Wash Univ J Law Policy. 2006;22:325–83. Available at: https://openscholarship.wustl.edu/law_journal_law_policy/vol22/iss1/24.

[4] Resnik J, Albertson S, Li G, Taylor J. Time-in-cell: a 2021 snapshot of restrictive housing based on a nationwide survey of U.S. prison systems. New Haven, CT: The Correctional Leaders Association & The Arthur Liman Center for Public Interest Lawat Yale Law School. 2022. doi: 10.2139/ssrn.4206981.

[5] Yu X, Westrick AC, Kobayashi LC. Cumulative loneliness and subsequent memory function and rate of decline among adults aged ≥50 in the United States, 1996 to 2016. Alzheimers Dement. 2023;19:578–88.

[6] Reiter K, Ventura J, Lovell D, et al. Psychological distress in solitary confinement: symptoms, severity, and prevalence in the United States, 2017–2018. Am J Public Health. 2020;110(S1):S56–62.

[7] Kaba F, Lewis A, Glowa-Kollisch S, et al. Solitary confinement and risk of self-harm among jail inmates. Am J Public Health. 2014;104:442–7.

[8] Van Bortel T, Basnayake A, Wurie F, et al. Psychosocial effects of an Ebola outbreak at individual, community and international levels. Bull World Health Organ. 2016;94:210–4.

[9] Bish A, Michie S. Demographic and attitudinal determinants of protective behaviours during a pandemic: a review. Br J Health Psychol. 2010;15(Pt 4):797–824.

[10] Rubin GJ, Amlôt R, Page L, Wessely S. Public perceptions, anxiety, and behaviour change in relation to the swine flu outbreak: cross-sectional telephone survey. BMJ. 2009;339:b2651.

[11] Cowling BJ, Ng DM, Ip DK, et al. Community psychological and behavioral responses through the first wave of the 2009 influenza A(H1N1) pandemic in Hong Kong. J Infect Dis. 2010;202:867–76.

[12] Lau JT, Griffiths S, Choi KC, Tsui HY. Avoidance behaviors and negative psychological responses in the general population in the initial stage of the H1N1 pandemic in Hong Kong. BMC Infect Dis. 2010; 10:139.

[13] Gómez-Salgado J, Andrés-Villas M, Domínguez-Salas S, Díaz-Milanés D, Ruiz-Frutos C. Related health factors of psychological distress during the COVID-19 pandemic in Spain. Int J Environ Res Public Health. 2020;17:3947.

[14] Rubin GJ, Wessely S. The psychological effects of quarantining a city. BMJ. 2020;368:m313.

[15] Ruiz-Frutos C, Ortega-Moreno M, Allande-Cussó R, Domínguez-Salas S, Dias A, Gómez-Salgado J. Health-related factors of psychological distress during the COVID-19 pandemic among non-health workers in Spain. Saf Sci. 2021;133:104996.

[16] Wang C, Pan R, Wan X, et al. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. Int J Environ Res Public Health. 2020;17:1729.

[17] Martínez-Lorca M, Martínez-Lorca A, Criado-Álvarez JJ, Armesilla MDC, Latorre JM. The fear of COVID-19 scale: validation in Spanish university students. Psychiatry Res. 2020;293:113350.

[18] Ahorsu DK, Lin CY, Imani V, Saffari M, Griffiths MD, Pakpour AH. The fear of COVID-19 scale: development and initial validation. Int J Ment Health Addict. 2022;20:1537–45.

[19] Conti A, Clari M, Arese S, et al. Validation and psychometric evaluation of the Italian version of the spinal cord injury secondary conditions scale. Spinal Cord. 2020;58:496–503.

[20] Kim H, Hughes E, Cavanagh A, et al. The health impacts of the COVID-19 pandemic on adults who experience imprisonment globally: a mixed methods systematic review. PLoS One. 2022;17:e0268866.

[21] Johnson L, Gutridge K, Parkes J, Roy A, Plugge E. Scoping review of mental health in prisons through the COVID-19 pandemic. BMJ Open. 2021;11:e046547.

[22] Li L, Taeihagh A, Tan SY. A scoping review of the impacts of COVID-19 physical distancing measures on vulnerable population groups. Nat Commun. 2023;14:599.

[23] Ghram A, Bragazzi NL, Briki W, et al. COVID-19 pandemic and physical exercise: lessons learnt for confined communities. Front Psychol. 2021;12:618585.

[24] Beck A, Emery G, Greenberg R. Anxiety Disorders and Phobias: A Cognitive Perspective. Basic Books, Harper & Row Ltd; 1985. pp. 368.

[25] Sylvers P, Lilienfeld SO, LaPrairie JL. Differences between trait fear and trait anxiety: implications for psychopathology. Clin Psychol Rev. 2011;31:122–37.

[26] Tomás-Sábado J. Miedo y ansiedad ante la muerte en el contexto de la pandemia de la COVID-19. Rev Enferm Salud Ment. 2020;16:26–30.

[27] Altamirano Argudo Z. El bienestar psicológico en prisión: antecedentes y consecuencias [Doctoral thesis]. Madrid: Universidad Autónoma de Madrid, Departamento de Psicología Biológica y de la Salud; 2013. Available at: http://hdl.handle.net/10486/13008.

[28] Zabala-Baños MC, Martínez Lorca M, Segura Fragoso A, et al. Medición de la calidad de vida en la población penitenciaria española.

Psicopatol Clin Legal Forense. 2016;16:34–47. Available at: https://dialnet.unirioja.es/servlet/articulo?codigo=6671982.
[29] Castillo Fernández E. Validación de una batería neuropsicológica computarizada (CoNTeBa) para predecir comportamientos impulsivos y compulsivos en la violencia de género [Doctoral thesis]. Granada: Universidad de Granada; 2022. Available at: https://hdl.handle.net/10481/77150.
[30] Bello Castillo IE. Adaptación psicométrica del Cuestionario de Riesgo de Reincidencia "SAQ" en población penitenciaria [Doctoral thesis]. Madrid: Universidad Complutense de Madrid; 2014. Available at: https://hdl.handle.net/20.500.14352/16061.
[31] Gómez-Salgado J, Allande-Cussó R, Domínguez-Salas S, García-Iglesias JJ, Coronado-Vázquez V, Ruiz-Frutos C. Design of fear and anxiety of COVID-19 assessment tool in Spanish adult population. Brain Sci. 2021;11:328.
[32] Gómez-Salgado J, Domínguez-Salas S, Romero-Martín M, Romero A, Coronado-Vázquez V, Ruiz-Frutos C. Work engagement and psychological distress of health professionals during the COVID-19 pandemic. J Nurs Manag. 2021;29:1016–25.
[33] Epstein J, Santo RM, Guillemin F. A review of guidelines for cross-cultural adaptation of questionnaires could not bring out a consensus. J Clin Epidemiol. 2015;68:435–41.
[34] Secretaría General de Instituciones Penitenciarias. Informe General de Instituciones Penitenciarias 2020. Madrid: Ministerio del Interior, Secretaría General Técnica; 2020. Available at: https://www.interior.gob.es/opencms/es/archivos-y-documentacion/documentacion-y-publicaciones/publicaciones/publicaciones-descargables/publicaciones-periodicas-anuarios-y-revistas/informe-general-de-instituciones-penitenciarias/
[35] Fox N, Hunn A, Mathers N. Sampling and sample size calculation. The NIHR Research Design Service for the East Midlands / Yorkshire & the Humber; 2009.
[36] Chiclana de la Fuente S, Galán Casado D, García-Vita MDM, De Juanas Oliva Á. Ocio y tiempo libre en prisión. Los módulos de respeto como espacios que generan bienestar en tiempos de pandemia. Edetania: Estudios y Propuestas Socioeducativos. 2021;60:165–86.
[37] IBM Corporation. IBM SPSS Statistics for Windows, Version 26.0. (26.0). Armonk, NY: IBM Corp; 2019.
[38] Guttman L. Some necessary conditions for common-factor analysis. Psychometrika. 1954;19:149–61.
[39] Kaiser HF. A second generation little jiffy. Psychometrika. 1970;35:401–15.
[40] Arbuckle JL. Amos (Version 23.0) [Computer Program]. Chicago, IL: IBM SPSS; 2014.
[41] Lloret-Segura S, Ferreres-Traver A, Hernández-Baeza A, Tomás-Marco I. El análisis factorial exploratorio de los ítems: Una guía práctica, revisada y actualizada. Anales de Psicología. 2014;30:1151–69.
[42] Prudon P. Confirmatory factor analysis as a tool in research using questionnaires: a critique. Compr Psychol. 2015;4:1–18.
[43] Dueber DM. Bifactor Indices Calculator: A Microsoft Excel-based tool to calculate various indices relevant to bifactor CFA models. UKnowledge: University of Kentucky's Institutional Repository; 2017.
[44] Reise SP, Scheines R, Widaman KF, Haviland MG. Multidimensionality and structural coefficient bias in structural equation modeling: a bifactor perspective. Educ Psychol Meas. 2013;73:5–26.
[45] Barrios Osuna I, Anido Escobar V, Morera Pérez M. Declaración de Helsinki: cambios y exégesis. Rev Cubana Salud Pública. 2016;42:132–42. http://scielo.sld.cu/scielo.php?pid=s0864-34662016000100014&script=sci_abstract&tlng=es.
[46] World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. JAMA. 2013;310:2191–4.
[47] Government of Spain. Organic Law 3/2018, of December 5, on the Protection of Personal Data and the Guarantee of Digital Rights. BOE no. 294, December 6. 2018. Available at: https://www.boe.es/eli/es/lo/2018/12/05/3/con. Accessed June 6, 2025.
[48] Government of Spain. Law 14/2007, of July 3, on Biomedical Research. Consolidated text. BOE no. 159, July 4. 2007:28826–48. Available at: https://www.boe.es/eli/es/l/2007/07/03/14. Accessed June 6, 2025.
[49] Tee ML, Tee CA, Anlacan JP, et al. Psychological impact of COVID-19 pandemic in the Philippines. J Affect Disord. 2020;277:379–91.
[50] Lin CY, Hou WL, Mamun MA, et al. Fear of COVID-19 Scale (FCV-19S) across countries: measurement invariance issues. Nurs Open. 2021;8:1892–908.
[51] Esteban-Febres S, Guzmán-Gamarra S, La Cunza-Peña M, Quispe-Gutiérrez Y. Psychological distress of inmates at a women's prison in Lima after the first wave of COVID-19 in November 2020. Rev Esp Sanid Penit. 2023;25:57–61.
[52] Wainwright L, Senker S, Canvin K, Sheard L. "It was really poor prior to the pandemic. It got really bad after": a qualitative study of the impact of COVID-19 on prison healthcare in England. Health Justice. 2023;11:1–14.
[53] Chimicz D, Lewicka-Zelent A, Lisiecka A. Mood and emotions among inmates after COVID-19 pandemic. Int J Environ Res Public Health. 2023;20:4856.
[54] DePalma A, Noujaim D, Coman E, Wakefield D, Barry LC. Older incarcerated persons' mental health before and during the COVID-19 pandemic. Int J Prison Health. 2022;18:138–48.
[55] Júnior JG, de Sales JP, da Silva FCT, et al. Analysis of the prison population's mental health in Sars-Cov-2 pandemic: qualitative analysis. Psychiatry Res. 2021;296:113669.
[56] Monterrosa-Castro A, Dávila-Ruiz R, Mejía-Mantilla A, Contreras-Saldarriaga J, Mercado-Lara M, Florez-Monterrosa C. Occupational stress, anxiety, and fear of COVID-19 in Colombian general practitioners. MedUNAB. 2020;23:195–213.
[57] Konstantinov V, Berdenova S, Satkangulova G, Reznik A, Israelowitz R. COVID-19 impact on Kazakhstan University student fear, mental health, and substance use. Int J Ment Health Addict. 2022;20:888–94.
[58] Mahmood QK, Jafree SR, Jalil A, Nadir SMH, Fischer F. Anxiety amongst physicians during COVID-19: cross-sectional study in Pakistan. BMC Public Health. 2021;21:1–10.
[59] Domínguez-Salas S, Gómez-Salgado J, Andrés-Villas M, Díaz-Milanés D, Romero-Martín M, Ruiz-Frutos C. Psycho-emotional approach to the psychological distress related to the COVID-19 pandemic in Spain: a cross-sectional observational study. Healthcare (Basel). 2020;8:190.
[60] Rodríguez-Rey R, Garrido-Hernansaiz H, Collado S. Psychological impact and associated factors during the initial stage of the coronavirus (COVID-19) pandemic among the general population in Spain. Front Psychol. 2020;11:1540.
[61] Spielberger C, Gorsuch R, Lushene R, et al. STAI: Cuestionario de ansiedad estado-rasgo: manual. 8th ed. TEA Ediciones; 2015.
[62] Zhang S, He J, Yang Q, et al. Anxiety during the COVID-19 pandemic in prisoners who had high risks to suffer from mood disorders: a longitudinal study before and during the COVID-19. Stress Health. 2023;39:162–8.
[63] Mendes R, Baccon WC, Laranjeira C. Fear of COVID-19, mental health and resilient coping in young adult male inmates: a Portuguese cross-sectional study. Int J Environ Res Public Health. 2023;20:5510.
[64] Bao Y, Sun Y, Meng S, Shi J, Lu L. 2019-nCoV epidemic: address mental health care to empower society. Lancet. 2020;395:e37–8.
[65] Fovet T, Lancelevée C, Eck M, et al. Prisons confinées: quelles conséquences pour les soins psychiatriques et la santé mentale des personnes détenues en France? [Mental health care in French correctional facilities during the Covid-19 pandemic]. Encephale. 2020;46(3S):S60–5. French.
[66] Kołodziej K, Kurowska A, Majda A. Intensity of perceived stress and control of anger, anxiety and depression of people staying in Polish penitentiary institutions. Int J Prison Health. 2022;18:83–96.
[67] Donabedian A. Evaluating the quality of medical care. Milbank Q. 2005;83:691–729.
[68] Cabrera-Léon A, Díaz-Romero S, Sánchez-Cantalejo C, Saez M, Robles B. Evolution of medication consumption during the covid-19: healthcare and social panel survey. Eur J Public Health. 2023;33(Suppl 2):ckad160.1593.
[69] Vélez-Morón A, Andújar-Barroso RT, Allande-Cussó R, García-Iglesias JJ, Aquino-Cárdenas G, Gómez-Salgado J. Measuring anxiety and fear of Covid-19 among older people: psychometric properties of anxiety and fear of Covid-19 scale (AMICO) in Spain. BMC Public Health. 2022;22:1589.