Gender-Related Measurement Invariance on the Self-Reporting Questionnaire (SRQ-20) With Older Adults in Puerto Rico

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Abstract

Purpose

Using an intersectional approach to the detection of common mental disorders based on age, gender, and culture, this study: 1) examined the factor structure of the 20-item version of the SRQ (SRQ-20) and 2) explored gender-related measurement invariance in the instrument's performance with older adults in Puerto Rico.

Methods

We merged data from two cross-sectional studies on mental health status and needs of older adults in Puerto Rico (N = 367). The first study was in 2019, two years after Hurricane María devastated the island (N = 154); the second study, in 2021, assessed knowledge, attitudes and practices (KAP) concerning COVID-19 (N = 213). We used chi-square and t-tests to examine gender differences in each SRQ item and assessed internal consistency reliability with Cronbach's alpha and McDonald's omega (values > .70). We ran two CFA models, then multigroup CFA to test for gender-related measurement invariance. We used weighted least square mean and variance adjusted (WLSMV) estimation to account for the binary response options in the SRQ-20 and Mplus version 8.4 for analyses. We interpreted standardized factor loadings. There were no missing data for any SRQ-20 items.

Results

The SRQ-20 had strong internal consistency reliability ($\alpha = .89$; omega = .89). Female scores were higher than males ($t = -2.159$, $p = .031$). Both unidimensional and two-factor models fit the data well. We selected the unidimensional model, which is most widely used in practice. Standardized factor loadings were 0.548 to 0.823 and all were statistically significant ($p < .001$). We tested gender invariance with the one-factor model. Our findings did not support invariance.

Conclusion

We favored the unidimensional model for several reasons. First, the SRQ-20 was designed to assess global distress. Also, physical symptoms have both somatic and psychological components, so their co-occurrence makes a single-factor model more meaningful. Finally, since older adults experience more physical health problems, instruments that emphasize both types of distress may provide a more accurate measure than those that exclude somatic symptoms. Using the unidimensional model, the SRQ-20 was not invariant, meaning that it performed differently for male and female participants. Future studies of common mental disorders with older adults in Puerto Rico should consider using the SRQ-20 for research and practice and should determine appropriate threshold scores for men and women.

Contributions to the literature

- Common mental disorders (CMD) are highly prevalent worldwide, yet few psychometric studies of assessment instruments focus on older adults or Latin American populations.
- The World Health Organization's Self-Reporting Questionnaire (SRQ-20) is among the most widely used and well-validated instruments for assessing CMD.
- Cultural factors, including gender socialization, may contribute to measurement variance on CMD measures, including the SRQ-20.
- The SRQ-20 should be considered for future research and practice with older adults in Latin America and should test for gender invariance and establish appropriate clinical thresholds scores.

Introduction

An estimated 4.0% and 3.8% of the global population suffer from depressive and anxiety disorders, respectively (Institute for Health Metrics, 2019). These disorders often co-occur and both are associated with somatoform disorders, which lack an identifiable pathological basis but are commonly seen in routine clinical practice (Shidhaye et al., 2013). The prevalence and presentation of these
common mental disorders (CMD), i.e., anxiety, depression, and somatic disorders, vary across age groups and cultures, but women are consistently more likely than men to report each disorder (Kiely et al., 2019; Riecher-Rössler, 2017; Seedat et al., 2009).

Excluding headache disorders, more than 20% of persons aged 60 years and over experience a mental or neurological disorder, and these disorders account for 6.6% of Disability Adjusted Life Years and 17.4% of Years Lived with Disability (WHO, 2017). Persons in this age group also represent about a quarter of deaths from self-harm, and those aged 85 and over have the highest suicide rates of any age group. Yet, despite the high prevalence and burden of CMDs in later life, detection rates are lower than for all other age groups, and only one in three persons aged 60 and over with a mental disorder receives the treatment they need.

To determine which older adults are not reaching needed mental health services and why this is the case requires a better understanding of this treatment gap (Werlen et al., 2020). Factors that contribute to low detection rates pervade societies and care systems and include stigma and ageism, low mental health literacy, and lack of access to effective, appropriate care (Bor, 2015). Another barrier to timely, accurate detection is the vast array of assessment and outcome measures that are in use (Boyce et al., 2021). The need for efficient, psychometrically sound, culturally appropriate measures of CMDs within and among populations is especially pressing in low-resource settings. To address this gap, Harding et al. (1980) developed the Self-Reporting Questionnaire (SRQ) in collaboration with the WHO, which later endorsed it as a universally applicable case-finding instrument for probable CMD in primary care settings in less developed countries (Beusenberg & Orley, 1994). Studies on the performance of the SRQ in different populations and settings have since reported different factor structures and mixed findings on gender differences. There is very little research with Latin American populations, and we found only one study, set in Brazil, that reported exclusively on older adults (Scazufca et al., 2014).

The current study aims to: 1) examine the factor structure of the 20-item version of the SRQ (SRQ-20) with older adults in Puerto Rico two years after a calamitous hurricane and during the COVID-19 pandemic and 2) explore measurement-related gender differences in the instrument’s performance with this population. We begin with a brief overview of the study context, the data source, and the sample. We then describe the SRQ-20 and, following Boyce et al. (2021), we justify our selection of this instrument as a mental health assessment and outcome measure with the study population and our focus on gender as an important source of measurement-related variance. We then present our findings and conclude with discussion and implications for using the SRQ-20 to improve the detection of CMDs among older adults in low-resource settings, notably in the Caribbean and other parts of Latin America.

Study Context

Puerto Rico, an unincorporated territory of the United States, is a member of the United Nations Economic Commission for Latin America and the Caribbean (ECLAC)—one of five regional commissions established in 1948 to work with regional governments to raise standards of living and strengthen trade relations elsewhere in the world. It is the island most impacted by hurricanes in the Caribbean. Economic, political, and social contexts of natural and human-made disasters profoundly affect damage and recovery, including health and mental health outcomes of residents (Benedek et al., 2007). In the months leading up to Hurricane María in September 2017, a decade-long economic recession forced Puerto Rico into bankruptcy (Brown, 2017). In July 2019, the governor was ousted for scandal and corruption and late that year and into early 2020, major earthquakes wracked the island. Within 6 months of the hurricane, an estimated 2,975 people, mostly older adults, had died (Santos-Burgoa et al., 2018) and nearly 200,000, mostly working-age adults and families, had migrated to the U.S. mainland. Between 2017 and 2020, the population declined from 3.16 million to 2.86 million (10%) and the median age rose from 39.2 to 44.5 years (Worldometer, 2021); fully 23.5% of the population is now aged 65 or over (U.S. Census Bureau, 2023).

In this context, the first case of COVID-19 in Puerto Rico was detected in March, 2020. The pandemic disproportionately affected Latinos, older adults, and persons with chronic health conditions (Garcia et al., 2021). However, Puerto Rico’s government implemented early, aggressive public health measures and by May 2022, 83.7% of the population was fully vaccinated and 95.7% had received at least one dose of vaccine (Centers for Disease Control and Prevention, 2021). The rapid succession of these devastating events, coupled with severe U.S. restrictions on aid to the island (U.S. Government Accounting Office, 2020) created new and worsened existing mental health risks for older adults.

The Self-Reporting Questionnaire (SRQ-20)

The full SRQ consists of 25 items derived from four psychiatric morbidity measures that are used across a wide range of cultural settings: 20 items assess neurotic symptoms, 4 measure psychotic symptoms, and 1 evaluates convulsions. The SRQ-20 comprises
the neurotic items, which assess depressive symptoms, anxiety, and psychosomatic complaints during the past 30 days. Items are scored 'yes' (symptom present = 1) or 'no' (no symptom present = 0), then summed. In a systematic review of assessment instruments for CMDs in low resource settings, Ali (2016) recommended the SRQ-20 because of its ease of administration, broad applications, and extensive psychometric testing. The instrument has also been used to assess CMDs in the immediate and long-term aftermath of disasters (Stratton et al., 2014).

The SRQ-20 has been widely validated in primary care, community screening, and epidemiological population surveys and in multiple languages and cultural settings. It was developed as a unitary measure of CMDs, but studies report multifactor structures ranging from 2 to 7 factors, depending on context and cultural understanding of scale items (Scholte et al., 2011; Ventevogel et al., 2007). Consistent with the SRQ's original intent, studies that report 3 or more factors regularly describe components that reflect depressive, anxiety and / or somatoform symptoms (Chen et al., 2009; Harpham et al., 2003). Similarly, while a cut-off score of 7 / 8 is often used to indicate probable mental disorder (Harpham et al.), optimal clinical thresholds vary by population characteristics, especially gender (WHO, 2002). Table 1 summarizes the performance of the SRQ-20 with adults in different populations and settings, showing different factor structures and mixed findings on gender-related measurement invariance.
Table 1
Factor Structure and Gender-Related Findings on the SRQ-20

<table>
<thead>
<tr>
<th>Authors</th>
<th>Sample</th>
<th>Analysis</th>
<th>Reliability</th>
<th>Factor Domains</th>
<th>Implications</th>
</tr>
</thead>
</table>
| Chen et al. [24]   | China          | PCA      | Primary care α = .90 (test-retest) | 1. Depression  
2. Anxiety  
3. Somatic symptoms | SRQ-20 is a reliable, valid measure of CMD.                                  |
|                    | Primary Care N = 959  
Community N = 60  
Age: 18–64  
56% female |          |                   |                                |                                                                              |                                                                               |
2. Social disability | SRQ20 is a valid tool.  
Must consider context. |
|                    | Primary care N = 400  
Age: 16–67  
58% female |          |                   |                                |                                                                              |                                                                               |
| Hanlon et al. [31] | Ethiopia        | EFA      | α = .90           | 1 factor model | Advantage of SRQ20 is routine item on suicidal ideation.                       |
|                    | Primary care N = 306  
Age unspecified  
62% female |          |                   |                                |                                                                              |                                                                               |
| Kootbodien et al. [23] | South Africa    | CFA:     | α = .84           | 1 factor model  
Males, α = .81  
Females, α = .84 | All 3 models fit data well.  
No gender invariance  
SRQ-20 may perform better with women than men. |
|                    | Community N = 360  
Age: 18+  
37.1 (14.1)  
58% female | Tested 1, 2, 3 factor models  
Tested gender invariance on 1 factor model |                   |                                |                                                                              |                                                                               |
| Netsereab et al. [47] | Eritrea         | PCA      | α = .78           | 2 factor model  
Items specified  
Factors not labeled | SRQ-20 performs well. |
|                    | Primary care N = 266  
Age: 32 (11.1)  
Range 18-65  
55% female |          |                   |                                |                                                                              |                                                                               |
| Rasmussen et al. [48] | Afghanistan    | EFA  
CFA | - | 3 factors:  
1. Somatic complaints  
2. Negative affect  
3. Emotional numbing | Transcultural validation of mental distress measures must consider gender |
|                    | Community N = 1003  
Age: 35.1 (6.6)  
50% female |          |                   |                                |                                                                              |                                                                               |
<table>
<thead>
<tr>
<th>Authors</th>
<th>Sample</th>
<th>Analysis</th>
<th>Reliability</th>
<th>Factor Domains</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scholte et al. [21]</td>
<td>Rwanda Intervention</td>
<td>EFA</td>
<td>Male</td>
<td>5 factors:</td>
<td>SRQ-20 effective for screening</td>
</tr>
<tr>
<td></td>
<td>N = 418</td>
<td>CFA</td>
<td>Female</td>
<td>1. Emotional/ bodily symptoms depression</td>
<td>Factor structure is time invariant</td>
</tr>
<tr>
<td></td>
<td>Age: 16–87</td>
<td></td>
<td>α = .81</td>
<td>2. Disability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>61% female in baseline sample</td>
<td></td>
<td>α = .85</td>
<td>3. Digestive complaints</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4. Lack energy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5. Self-esteem</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stratton et al. [29]</td>
<td>Vietnam Community</td>
<td>EFA</td>
<td>α = .84</td>
<td>Bi-factor model:</td>
<td>Bi-factor model fit data as well or better than 3-factor model.</td>
</tr>
<tr>
<td></td>
<td>N = 4,980</td>
<td>CFA</td>
<td></td>
<td>1. General distress vs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Age: 18–96</td>
<td>Latent variable modeling</td>
<td></td>
<td>2. Subdomains of negative affect; somatic complaints; hopelessness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean = 41.5 SD = 16.3</td>
<td></td>
<td></td>
<td>Correlated 3 factor model:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>54% female</td>
<td></td>
<td></td>
<td>1. Negative affect</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. Somatic complaints</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3. Hopelessness</td>
<td></td>
</tr>
<tr>
<td>van der Westhuizen et al. [37]</td>
<td>South Africa Emergency care</td>
<td>PCA</td>
<td>α = .84</td>
<td>Overall Sample:</td>
<td>Different factor structure for males and females.</td>
</tr>
<tr>
<td></td>
<td>N = 200</td>
<td></td>
<td></td>
<td>2 Factors:</td>
<td>SRQ-20 is useful for emergency settings in South Africa.</td>
</tr>
<tr>
<td></td>
<td>Age: 18+</td>
<td></td>
<td></td>
<td>1. Depression and anxiety</td>
<td></td>
</tr>
<tr>
<td></td>
<td>33% female</td>
<td></td>
<td></td>
<td>2. Somatic symptoms</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Males:</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>1. Depression; somatic symptoms</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>2. Anxiety; depression</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Females:</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>1. Depression; anxiety</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. Somatic symptoms</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3. Lethargy</td>
<td></td>
</tr>
<tr>
<td>Ventevogel et al. [22]</td>
<td>Afghanistan Primary care</td>
<td>EFA</td>
<td>-</td>
<td>2 factors:</td>
<td>No gender differences.</td>
</tr>
<tr>
<td></td>
<td>N = 116</td>
<td></td>
<td></td>
<td>1. Common disorders</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Age: 17–80</td>
<td></td>
<td></td>
<td>2. Social disability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>54% female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. PCA = principal component analysis  
EFA = exploratory factor analysis  
CFA = confirmatory factor analysis*
There is very little research on use of the SRQ-20 with Latin American and/or older adult populations. We identified only one validation study using the Spanish-language SRQ-20, set in Colombia (Fischer et al., 2019) and one with older adults, in Brazil (Scazufca et al., 2014) – a sample in Vietnam (Richardson et al., 2010) did include older adults. We did not identify any psychometric studies using the Spanish version of the SRQ-20 with older adults. The current study thus aims to: 1) assess the factor structure of the 20-item SRQ (SRQ-20) with older adults in Puerto Rico, and 2) explore measurement-related gender differences in the instrument's performance with this population.

**Methods**

**Data Source and Sample**

Data are from two sequential cross-sectional studies with older adults in Puerto Rico. The aim of the first study was to assess mental health status and needs 2 years after Hurricane María. From September 2019 to early January 2020, our U.S. and Puerto Rican research team conducted face-to-face interviews with a non-probability sample of 154 adults aged 60 years and over in 5 of the island's 6 geographic regions. We could not access the south region due to earthquakes. The second study surveyed 233 same-aged adults about their knowledge, attitudes, and practices (KAP) concerning the COVID-19 pandemic in 2021. We recruited for both studies from community and senior centers, social service agencies, primary care clinics and public spaces. Interviews lasted about one hour, and participants were compensated for their time. The [blinded for review] Institutional Review Board approved this study.

To ensure an adequate sample for psychometric testing, we merged data from the 2 studies (N = 367). The average age of the combined sample was 72.7 years (SD = 8.7, range = 60–99). Most participants were female (58.3%), unmarried (65.6%) and living alone (67.6%). Half had completed high school (50.3%), and the median annual household income was $9,552–43.5% reported incomes below the federal poverty threshold, compared to 13.1% of mainland U.S. citizens (U.S. Census Bureau, 2024). We used the WHO Spanish version of the SRQ-20 (Climent & DeArango, 1983; Fischer et al., 2019), which performed well in our initial pilot with 10 older adults in Puerto Rico.

**Data Analysis**

Table 1 presents findings of previous psychometric studies of the SRQ-20. We drew on several to guide our analyses. Hanlon et al. (2015) identified 2 factors with eigenvalues > 1, but they opted for a single factor solution due to significant cross-loading of items. Kootbodien et al. (2015) used confirmatory factor analysis to compare one-, two-, and three-factor models, each of which fit the data well. They then tested for gender invariance using the one-factor model based on its intended use and extensive application in clinical and research settings.

We used SPSS (IBM SPSS Statistics, ver. 29.0) for data management and univariate analyses. We used chi-square (item scores) and t-tests (total scale) to examine gender differences on the SRQ-20, and assessed internal consistency reliability with Cronbach's alpha (Nunnally & Bernstein, 1994) and McDonald's omega (Brown, 2015), with values of ≥ .70 deemed acceptable (Nunnally & Bernstein). We ran two CFA models with the full sample, followed by multigroup CFA to test for gender-related measurement invariance. We used weighted least-square mean and variance adjusted (WLSMV) estimation to account for the binary response options in the SRQ-20 [35] and Mplus version 8.4 (Muthén & Muthén, 2019). We interpreted standardized factor loadings. There were no missing data on any SRQ-20 items.

We tested a standard unidimensional model with all 20 items and a two-factor model, one for psychological symptoms (items 5, 6, 8–16, 20) and another for somatic symptoms (items 1–4, 7, 17–19). Our rationale for testing a two-factor model was that symptoms of depressive and anxiety disorders often overlap while somatoform disorders may vary more by age, culture, and context (Bagayogo et al., 2013; van der Westhuizen et al., 2016). We examined model fit with χ² statistics, comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean squared residual (SRMR). A good fit is indicated by nonsignificant χ² values, CFI and TLI are > .95, RMSEA is < .06, and SRMR is < .08 (Brown, 2015; Hu & Bentler, 1999).

We next tested for measurement invariance on the SRQ-20 with men (n = 153) and women (n = 214). Following Brown (2015) and Muthén and Muthén (2017), we tested configural invariance and then scalar invariance. Configural invariance (or equal form), which examines whether the factor structure is equal for both groups, is deemed present if the number of factors and the pattern of factor loadings are identical for men and women as evidenced by satisfactory fit indices using the same thresholds as for the CFA.
Scalar invariance (or strong factorial invariance) assesses whether the indicator intercepts for the groups are equal. Statistically nonsignificant results of a $\chi^2$ difference test between the configural and scalar models indicate that the intercepts for the two groups are invariant, i.e., do not differ. We also used a CFI change criterion of greater than 0.01 (i.e., $\Delta$CFI > .01) for each level of invariance test to determine if the change in the fit indices was significant [40]. There were no significant changes in the fit indices ($\Delta$CFI = .006) when comparing the configural model and the unidimensional model.

We did not test for metric invariance, i.e., equality of factor loading of indicators between groups, because use of binary variables with WLSMV estimation in Mplus does not permit this testing (Muthén & Muthén, 2017, p. 542). But, as each test increases restrictions and constraints, satisfying scalar invariance also satisfies metric invariance (Brown, 2015). Finally, we tested for mean score differences in the SRQ-20 by gender using latent mean score comparison.

**Results**

The SRQ-20 had strong internal consistency reliability ($\alpha = .89; \omega = .89$). Table 2 shows descriptive statistics for the SRQ-20, overall and by gender. The most frequently reported symptoms were feeling nervous, tense, or worried (item 6; 54.0%), feeling unhappy (item 9; 48.5%), sleeping badly (item 3; 45.0%), and feeling tired all the time (item 19; 41.4%). Five items differed by gender. Women were more likely than men to report poor appetite, $\chi^2(1) = 12.134, p < .001$, sleep badly, $\chi^2(1) = 4.339, p = .04$, poor digestion, $\chi^2(1) = 12.201, p < .001$, feeling worthless person, $\chi^2(1) = 4.579, p = .04$, and uncomfortable feelings in the stomach, $\chi^2(1) = 16.947, p < .001$. The total score for females ($M = 6.53, SD = 5.03$) was significantly higher than that of males ($M = 5.38, SD = 4.98$), $t = -2.159, p = .031$. 


### Table 2
Symptom Endorsement on the SRQ-20 by Gender

<table>
<thead>
<tr>
<th>Item</th>
<th>Male (n = 153)</th>
<th>Female (n = 214)</th>
<th>Total (n = 367)</th>
<th>t/χ²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you often have headaches?</td>
<td>Yes (20.3%)</td>
<td>Yes (27.6%)</td>
<td>Yes (24.5%)</td>
<td>2.575</td>
</tr>
<tr>
<td>2. Is your appetite poor?</td>
<td>Yes (11.8%)</td>
<td>Yes (26.6%)</td>
<td>Yes (20.4%)</td>
<td>12.134***</td>
</tr>
<tr>
<td>3. Do you sleep badly?</td>
<td>Yes (38.6%)</td>
<td>Yes (49.5%)</td>
<td>Yes (45.0%)</td>
<td>4.339*</td>
</tr>
<tr>
<td>4. Do your hands shake?</td>
<td>Yes (29.4%)</td>
<td>Yes (36.4%)</td>
<td>Yes (33.5%)</td>
<td>1.983</td>
</tr>
<tr>
<td>5. Are you easily frightened?</td>
<td>Yes (28.8%)</td>
<td>Yes (35.5%)</td>
<td>Yes (32.7%)</td>
<td>1.850</td>
</tr>
<tr>
<td>6. Do you feel nervous, tense, or worried?</td>
<td>Yes (49.0%)</td>
<td>Yes (57.5%)</td>
<td>Yes (54.0%)</td>
<td>2.568</td>
</tr>
<tr>
<td>7. Is your digestion poor?</td>
<td>Yes (17.6%)</td>
<td>Yes (34.1%)</td>
<td>Yes (27.2%)</td>
<td>12.201***</td>
</tr>
<tr>
<td>8. Do you have trouble thinking clearly?</td>
<td>Yes (24.8%)</td>
<td>Yes (22.9%)</td>
<td>Yes (23.7%)</td>
<td>.186</td>
</tr>
<tr>
<td>9. Do you feel unhappy?</td>
<td>Yes (45.8%)</td>
<td>Yes (50.5%)</td>
<td>Yes (48.5%)</td>
<td>.794</td>
</tr>
<tr>
<td>10. Do you cry more than usual?</td>
<td>Yes (26.8%)</td>
<td>Yes (30.4%)</td>
<td>Yes (28.9%)</td>
<td>.556</td>
</tr>
<tr>
<td>11. Do you find it difficult to enjoy your daily activities?</td>
<td>Yes (29.4%)</td>
<td>Yes (29.0%)</td>
<td>Yes (29.2%)</td>
<td>.008</td>
</tr>
<tr>
<td>12. Do you find it difficult to make decisions?</td>
<td>Yes (28.8%)</td>
<td>Yes (32.7%)</td>
<td>Yes (31.1%)</td>
<td>.651</td>
</tr>
<tr>
<td>13. Is your daily work suffering?</td>
<td>Yes (29.4%)</td>
<td>Yes (32.7%)</td>
<td>Yes (31.3%)</td>
<td>.451</td>
</tr>
<tr>
<td>14. Are you unable to play a useful part in life?</td>
<td>Yes (20.9%)</td>
<td>Yes (19.6%)</td>
<td>Yes (20.2%)</td>
<td>.092</td>
</tr>
<tr>
<td>15. Have you lost interest in things?</td>
<td>Yes (24.2%)</td>
<td>Yes (29.0%)</td>
<td>Yes (27.0%)</td>
<td>1.039</td>
</tr>
<tr>
<td>16. Do you feel that you are a worthless person?</td>
<td>Yes (14.4%)</td>
<td>Yes (7.5%)</td>
<td>Yes (10.4%)</td>
<td>4.579*</td>
</tr>
<tr>
<td>17. Are you easily tired?</td>
<td>Yes (35.3%)</td>
<td>Yes (39.7%)</td>
<td>Yes (37.9%)</td>
<td>.743</td>
</tr>
<tr>
<td>18. Do you have uncomfortable feelings in your stomach?</td>
<td>Yes (19.1%)</td>
<td>Yes (39.3%)</td>
<td>Yes (30.9%)</td>
<td>16.947***</td>
</tr>
<tr>
<td>19. Do you feel tired all the time?</td>
<td>Yes (35.9%)</td>
<td>Yes (45.3%)</td>
<td>Yes (41.4%)</td>
<td>3.235</td>
</tr>
<tr>
<td>20. Has the thought of ending your life been on your mind?</td>
<td>Yes (8.5%)</td>
<td>Yes (7.5%)</td>
<td>Yes (7.9%)</td>
<td>.128</td>
</tr>
<tr>
<td>Total Score (range = 0–20)</td>
<td>M = 5.38 (SD = 4.98)</td>
<td>M = 6.53 (SD = 5.03)</td>
<td>M = 6.05 (SD = 5.04)</td>
<td>-2.159*</td>
</tr>
</tbody>
</table>

**Note.** Items are scored ‘yes’ (symptom present = 1) or ‘no’ (no symptom present = 0). Total score is sum of each item.

### Confirmatory Factor Analysis

Table 3 presents CFA results for the unidimensional and two-factor models. The unidimensional model had an acceptable fit ($\chi^2(170) = 411.899, p < .001, \text{CFI} = .943, \text{TLI} = .936, \text{SRMR} = .088, \text{RMSEA} = .062, 90\% \text{CI} [.055, .070]$). The modification indices suggested that Item 7 ("Is your digestion poor?") and Item 18 (Do you have uncomfortable feelings in your stomach?) were highly correlated ($r = .73, p < .001$). It is reasonable to expect discomfort when digestion is poor. The revised unidimensional model had a good model fit, except for the $\chi^2$ p-value, $\chi^2(169) = 307.137, p < .001, \text{CFI} = .967, \text{TLI} = .973, \text{SRMR} = .079, \text{RMSEA} = .047, 90\% \text{CI} [.039, .056]$. The chi-square value may be significant when the sample size is large, as reported in many previous studies (Alavi et al., 2020).
Table 3

Results of Confirmatory Factor Analysis and Measurement Invariance Testing by Gender for SRQ-20

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>CFI</th>
<th>TLI</th>
<th>RMSEA [90% CI]</th>
<th>SRMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unidimensional</td>
<td>307.137***</td>
<td>169</td>
<td>.967</td>
<td>.973</td>
<td>.047 [.039, .056]</td>
<td>.079</td>
</tr>
<tr>
<td>Two-factor</td>
<td>208.033***</td>
<td>168</td>
<td>.973</td>
<td>.979</td>
<td>.043 [.034, .051]</td>
<td>.075</td>
</tr>
<tr>
<td>Configural</td>
<td>448.402***</td>
<td>338</td>
<td>.973</td>
<td>.970</td>
<td>.042 [.031, .052]</td>
<td>.096</td>
</tr>
<tr>
<td>Scalar</td>
<td>487.061***</td>
<td>356</td>
<td>.968</td>
<td>.966</td>
<td>.045 [.034, .052]</td>
<td>.099</td>
</tr>
</tbody>
</table>

Note. $N = 367$. CFI = Comparative Fit Index; TLI = Tucker–Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean squared residual.

Results of $\chi^2$ difference test between configural and scalar models: $\chi^2(18) = 41.733$, $p = .001$.

$^a$ Correlation between two factors (psychological and somatic), $r = .887$, $p < .001$.

$^b$ Congural and Scalar models based on the unidimensional model structure.

The two-factor model also fit the data well, $\chi^2(168) = 208.033$, $p < .001$, CFI = .973, TLI = .979, SRMR = .075, RMSEA = .043, 90% CI [.034, .051]); however, the correlation between the two factors was high $r = .89$, $p < .001$, suggesting that somatic and psychological symptoms co-exist and may conceptually overlap. Based on these findings and for reasons discussed above, we selected the unidimensional model. Figure 1 shows the model structure and its standardized factor loadings, which ranged from 0.55 to 0.82; all were statistically significant ($p < .001$).

Table 3 also presents the results of measurement invariance testing by gender for the unidimensional model. Configural invariance testing revealed no difference in factor structures for males and females. This finding was supported by fit statistics $t \chi^2(338) = 448.402, p < .001$, CFI = .973, TLI = .970, SRMR = .096, RMSEA = .042 [.031, .052]). Scalar invariance was not supported by results of the $\chi^2$ difference test between the configural and scalar models, $\chi^2(18) = 41.733$, $p = .001$, which differed significantly. These models suggest that the factor loadings and intercepts for males and females were not equivalent.

**Discussion**

The purpose of this study was to examine the factor structure and gender-related measurement invariance of the SRQ-20 with older adults in Puerto Rico. Factors are not always clear cut and multiple models may provide an equally good fit. Both the unidimensional and two-factor models fit the data well, but we favored the former model for several reasons. First, the SRQ-20 was designed to assess overall distress. Also, since physical symptoms involve both psychological and somatic components (Barskey et al., 2001), particularly among older adults (Dehoust et al., 2017) and in Hispanic cultures (Dunlop et al., 2020), their coexistence may make a one-factor model more meaningful (Hanlon et al., 2001). Lastly, since older adults have more physical health problems, instruments that emphasize both types of distress may provide a more accurate measure than those that exclude somatic symptoms (Drayer et al., 2005). Using the unidimensional model, internal consistency reliability of the SRQ-20 was strong, and the instrument was not invariant, meaning that it performed differently for men and women.

Because gender and age act and interact to influence the experience and expression of mental disorders, it is important to test for measurement invariance to determine whether the same construct is being measured across groups and whether different groups ascribe the same meanings to scale items (Milfont & Fischer, 2010). To our knowledge, only two studies have used CFA to examine gender invariance on the SRQ-20. Kootbodien et al. (2015) found that unidimensional and multidimensional models provided a good fit in a sample of younger adults in South Africa, and measurement between genders was not invariant. Stratton et al. (2014) used a latent variable modeling approach to examine psychometric properties of the instrument in a large community survey in Vietnam. They found that a bifactor model and a correlated three factor model fit the data equally well. Regarding, measurement invariance, they reported gender differences on factor loadings and thresholds of a single factor construct. On average, females and older persons reported more distress than males and younger individuals, respectively.
Consistent with these previous studies, our findings suggest that assessment of common mental disorders may differ for men and women. Our sample comprised adults aged 60 and over. Since older men and women have more physical health problems than younger adults, they may be more inclined to conflate their experience and reporting of psychological and somatic symptoms. This may be especially the case for women, who were more likely to report higher somatic symptoms in our data.

There may also be age-related cohort effects. The current cohort of older adults in Puerto Rico have experienced multiple political, economic, and environmental ordeals, including social, economic, and health losses associated with Hurricane María and the COVID-19 pandemic. The impact of cumulative stressors and social and psychological coping strategies may vary for men and women who came of age with different sociocultural scripts for males and females. The concept of machismo, for example, includes both positive and negative aspects of masculinity, e.g., courage, honor, dominance, aggression, sexism, and reserved emotions. Women, on the other hand may embrace values and behaviors associated with marianismo, honoring family- and home-centeredness and encouraging passivity, self-sacrifice, and chastity. Nuñez et al. (2016) provide a thorough review of the influence of these traditional gender roles on negative cognitions and emotions and help-seeking behaviors in Hispanic cultures.

Clinical somatoform disorders are widely neglected in research with older adults, yet as Azoulay and Gilboa-Schechtman (2022) note, they are prevalent and highly impairing in this age group, especially after heightened stress. Noting that women report greater post-traumatic distress than men after a physically threatening event, they suggest that gender differences in stress reactions may be related to loss of social status among men. This hypothesis warrants further examination, especially in more traditionally patriarchal cultures, as it is likely to be associated with distribution, assessment, and intervention in mental disorders.

This study has several limitations. First, the sample size was relatively small. However, adequacy depends on features such as study design, the strength of the relationships among the indicators, and the reliability of indicators and missing data patterns (Brown, 2015). The overall sample size and number of groups may not be related to level of invariance, and group differences are most problematic in invariance testing in cases of more severe imbalance of groups (Yoon & Lai, 2018). All absolute, parsimony, and comparative fit indices were acceptable in our data. And although our sample was purposive, the proportion of males and females was the same as persons aged 60 + in the 2022 American Community Survey (U.S. Census, 2022).

Our cross-sectional design negates our ability to evaluate psychometric properties of the SRQ-20 or to assess gender invariance over time. There is also potential for self-report bias due to factors such as cultural beliefs and behaviors, stigma, and social desirability, which lead to under-reporting of mental health conditions in community surveys (Hunt et al., 2003). Finally, Puerto Rico’s status as a U.S. territory may distinguish the experiences of its older adults from those in other countries in the region. Since the mid-twentieth century, for example, Puerto Ricans have engaged in extensive circulatory migration between the island and the mainland.

With respect to theory on psychosocial distress and its measurement, the co-occurrence of psychological and somatic symptoms observed in our data may be due to cultural context; this overlap of symptoms should be examined within and among other Latin American populations. Likewise, when assessing point prevalence and trajectories of symptom reporting for CMD, it will be important to consider the potential role of intersectional identities such as ethnicity, age, and gender (Azoulay et al., 2022). Due to lack of research on the SRQ-20 in Latin America, we could not compare our data with other studies in the region.

Conclusions

We conclude that the SRQ-20 is well suited for use with older adults in Puerto Rico. It is among the most widely used and rigorously tested instruments for measuring CMDs, especially in low-resource settings. Future research should re-evaluate our findings with a larger sample in Puerto Rico. As our findings suggest gender variance in the SRQ-20, optimal cutoff thresholds for older men and women should be determined for clinical and research purposes.

Most future global population aging will occur in low- and middle-income countries (LMIC), where CMDs are highly prevalent and burdensome to individuals and societies. This study joins a small but growing body of evidence that the SRQ-20 performs well with older adults. Future research should extend the scope of inquiry on this measure, including gender-related invariance testing, to this age group in other LMIC, including those in Latin America.

Declarations
All study participants provided signed informed consent and the study was approved by the (name omitted for review) Institutional Review Board.

**Authors’ Contributions:** DB designed the study and wrote the manuscript. KK and SK conducted data analysis and participated in writing and revising the manuscript. All authors contributed to the subsequent drafts, reviewed, and endorsed the final submission.

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Consent for publication: Not applicable

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**References**


**Figures**
Figure 1

Confirmatory Factor Analysis of SRQ-20

Confirmatory Factor Analysis and Standardized Factor Loadings of Unidimensional Model