Factor Structure and Invariance of the 12-Item General Health Questionnaire (GHQ-12) for a Sample of People in Situations of Homelessness

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Abstract. People in situations of homelessness (PSH) have high levels of psychological impairment. Few studies have analyse the suitability of the instruments used to measure these levels. The aim of this study was to analyse the factorial structure and invariance (sex, age, nationality and housing status) of the 12-item General Health Questionnaire (GHQ-12) for a sample of PSH (n = 603) living in the Community of Madrid (Spain). A quantitative study was designed using a survey that include the GHQ-12 and other health measures (self-assessed health and diagnosis of mental illness). A comparison of three models (unidimensional, two correlated latent factors and bi-factor) showed that the bi-factor model provided the best goodness-of-fit indicators. A latent structure was identified in which each item was loaded into a general factor measuring a single GHQ-12 factor. The number of latent factors and the structure of factorial loads for GHQ-12 items were similar between groups. The GHQ-12 can be used as a screening instrument rather than as an outcome measure in different clinical dimensions. It is an appropriate instrument for assessing psychological impairment among PSH regardless of sex, age, nationality or housing status.

Keywords: General Health Questionnaire (GHQ-12), factorial structure, invariance, mental health, homelessness.

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1. Introduction

Homelessness is a social, cultural, and historical phenomenon (Fitzpatrick, 2005; Sánchez Morales & Tezanos Vázquez, 2004) that affects 28,552 people in Spain (Spanish Statistical Office [SEO, 2022]). Of the people in a situation of homelessness (PSH), 25.5% live in the open or in makeshift accommodation, 39.7% live in shelters and 24.7% live in an apartment or pension provided by an organisation. Among the PSH in Spain, 76.7% are men and 23.3% are women. In terms of origin, 50.1% of PSH are Spanish-born and 49.9% are of foreign origin, mainly from Africa (26.6%). In terms of age, 25.4% of PSH living in Spain are under 30 years old, 26.1% are between 30 and 44 years old, 42.3% are between 45 and 64 years old and 6.2% are over 65 years old (SEO, 2022). The SEO (2022) also collects data on how long people have been homeless: 32.5% have been homeless for at least one year, 27% for three years and 40.5% for more than three years.

These data are similar to those found in other European countries. In this context, the European Federation of National Organisations Working with the Homeless (FEANTSA) and the Abbé Pierre Foundation (2023) draw attention to two common trends in the evolution of homelessness in Europe: the increase in the number of homeless people in most countries and the growing presence of three particularly vulnerable groups: women, people under 30 and people of foreign origin.

Existing estimates of the prevalence of mental health issues among PSH range from 25% to 70% (Navarro-Lashayas, 2018; Sánchez-Moreno & de la Fuente-Roldán, 2021). Other stressors have an impact too, meaning that although mental illness may be an element that drives extreme social exclusion, it can also appear as a consequence linked to the difficult living conditions experienced by PSH.

The impact and scale of mental health issues among PSH makes it particularly important to have instruments that are adapted to facilitate the examination and measurement of these issues in the context of homelessness. Although there are various instruments for evaluating mental health among the population, the General Health Questionnaire (GHQ; Goldberg & Hillier, 1979) has been one of the most commonly used (Hankins, 2008). The GHQ has been adapted to produce different versions, notably including the 60, 30, 28, 20 and 12-items GHQ (with the

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latter referred to as GHQ-12) (Goldberg & Williams, 1988). The GHQ-12 version has been widely used due to its brevity and ease of administration (Hystad & Johnsen, 2020).

The GHQ-12 was designed to identify the risk of common mental disorders and minor psychological issues (Böhnke & Croudace, 2016). It is not a diagnostic instrument; rather, it is a screening instrument that is intended to identify psychological morbidity and general mental health issues among the general public (Goldberg et al., 1997). Specifically, the GHQ-12 has been used with different sociocultural contexts and populations, including but not limited to students (El-Gabry et al., 2022), older adults (Mosquera Metcalfe et al., 2020), academic staff (Lütke Lanfer et al., 2022), migrants (Buchcik et al., 2023), the general public (Sánchez-López & Dresch, 2008) and PSH (Mastropieri et al., 2015; Navarro-Lashayas & Eiroa-Orosa, 2017; Savarkar, 2018).

Although the GHQ-12 has been used in studies with PSH, there has been no in-depth analysis of its validity and its psychometric properties in the case of PSH. In addition to the absence of validations of the scale among the homeless population, the empirical evidence does not reflect a consensus in terms of its factorial structure, with contradictory results regarding its dimensionality. In this regard, certain studies have defined it as unidimensional in nature, with the 12 items describing a single dimension of psychological distress (Solís Cámara et al., 2016; Pedrero Pérez et al., 2020). Others have reported that the scale has a bi-factor structure, identifying one factor of anxiety and another of depression (Andrich & van Schoubroeck, 1989; Oliveira et al., 2023). Other relevant research has pointed to the existence of three factors (social dysfunction, depression/anxiety and loss of confidence) (Graetz, 1991; Sánchez-López & Dresch, 2008; Padrón et al., 2011; Tomás et al., 2019). Developments in recent years have identified up to four factors in the GHQ-12 (lowered self-worth, social dysfunction, stress and emotional coping) (Griffith & Jones, 2019). The GHQ-12 was designed as a unidimensional measure of psychological distress (Goldberg & Williams, 1988) and its brevity has made it one of the most widely used instruments. However, the factor structure of the GHQ-12 remains unclear. The variability in scoring schemes, item wording (both positive and negative), and analytic methods employed (e.g., AFE and AFC) may account for the divergent findings regarding its dimensionality and complicate decisions regarding its utility as an assessment tool. The literature reflects numerous suggestions for its adaptation, with the predominant finding in many studies being the inability to establish a unifactorial structure (Hystad & Johnsen, 2020).

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Furthermore, the interpretation, distribution of items, and terminology of the various factors have varied across studies (Campbell et al., 2003; Hystad & Johnsen, 2020).

In this context, bifactor modelling has several advantages over traditional factor models. It allows an examination of whether a measure is essentially unidimensional or whether items have multidimensional properties. It also allows the assessment of whether subscale scores provide reliable additional information beyond the total score, and the determination of the proportion of shared variance attributable to the overarching factor in the model (Reise et al., 2007, 2013).

In summary, the GHQ-12 has been used in different cultural contexts and with different populations. In fact, it is one of the most widely used instruments in mental health research. In this context, the empirical evidence has shown varying results in terms of its dimensionality. It is also important to note that the GHQ-12 is a particularly appropriate instrument for evaluating mental health impairment in the case of PSH, owing to its simplicity and ease of application. Despite this, it has not been validated for the PSH population in Spain, which has particularly significant ramifications for research on homelessness. Therefore, the frequent use of the scale and the range of interpretations with relation to its factorial structure justify undertaking a psychometric analysis to clarify the validity of the instrument in the specifically unexplored context of PSH. In this regard, the aim of this study was to explore the factorial structure of the GHQ-12 for a sample of PSH living in the Community of Madrid (Spain), taking into account the invariance in different groups defined by the variables of sex, age, nationality and housing status.

2. Method

2.1. Participants

The population of PSH in the Community of Madrid (Spain) is 4.146 people (SEO, 2022). A sample of 573 PSH was calculated with a margin of error of 5% and a confidence level of 99%. Finally, the sample was made up of 603 PSH living in the Community of Madrid. The sample size requirements are met. Cortina (1993) establishes that for scales with 20 items, a sample size between 5 and 20 participants per item of the scale is acceptable, while Nunnally (1978) suggests at least 10 participants for each item of the scale.

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Convenience sampling was used by establishing three theoretical criteria (quotas). The first criterion consisted of the operational definition of homelessness, for which purpose the European Typology of Homelessness and Housing Exclusion (ETHOS) (Edgar & Meert, 2005) was used. ETHOS distinguishes four conceptual categories: rooflessness (ETHOS 1), houselessness (ETHOS 2), living in insecure housing (ETHOS 3) and living in inadequate housing (ETHOS 4). These categories have been grouped into two larger dimensions: literal homelessness (living on the street or in centres for PSH: ETHOS 1 and 2) and broader homelessness or housing exclusion (precarious housing, occupancy out of necessity, forced cohabitation, etc.: ETHOS 3 and 4) (Eyrich-Garg et al., 2008). This approach conceptualises homelessness by including more than the most visible forms of this phenomenon. The second and third criteria involved establishing quotas based on sex (male/female) and nationality (foreign/non-foreign). Therefore, the inclusion criteria for the sample were to live in one of the housing situations included in the ETHOS typology, to be male or female, and to be of Spanish or foreign origin.

As shown in table 1, the most frequent profile of participant was male, aged over 51 years, Spanish and in a situation of literal homelessness. The average age for the sample was 46.29 years (SD = 14.76; min. 19 - max. 80).

Insert table 1 here

Although homelessness is mainly a male reality, the participation of women has not been ignored. The participation of women has been guaranteed in a larger proportion than in the PSH in general (23.3% in Spain and 34% in this work). Moreover, the gender variable (male/female) has been a cross-cutting element in the analysis of each of the dimensions described in the following section. This means that the gender variable has been consistently and systematically included throughout the analysis. Thus, for each dimension of the study, the specific and differentiated reality of women has considered. This approach makes it possible to identify and better understand gender inequalities and, above all, how they affect the reality of PSH.

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2.2. Instruments

The main instrument was the version of the GHQ-12 (Goldberg & Williams, 1988) adapted into and validated for Spanish by Rocha et al. (2011). This version of the GHQ is made up of 12 items, of which half are negative statements and half positive (see table 2). Each item is answered using a 4-point Likert-type scale (0-1-2-3; Likert score) which ranges from a minimum of 0 points (no mental health impairment) to a maximum of 36 (mental health impairment). The total score of the scale is obtained by simply summing the scores of each item. In this sense, this form of scoring provides an average mental health score, so that the higher the average score, the greater the possible mental impairment. In addition, the Likert score allows the population to be classified into two groups: case of mental health impairment and not case of mental health impairment. Following Goldberg et al. (1997) the criteria for a potential case of mental health impairment is associated with scores equal to or higher than 12 points.

Insert table 2 here

Other measures were included in addition to the GHQ-12:

- Sociodemographic aspects. For this study, sex (male/female), age (below 36 years/between 36 and 50/over 50), nationality (Spanish/foreign) and housing status (literal homelessness/housing exclusion) were highlighted.
- Self-assessed health. This is a significant variable in terms of describing living conditions and health, including mental health, among PSH (Fajardo-Bullón et al., 2019). This variable was addressed through a single question: “currently, how would you describe your health?” Five response options were offered, ranging from “very poor” (1) to “very good” (5). This variable was dichotomised into good self-perceived health (very good and good) and poor self-perceived health (average, poor and very poor). This is a widely used form of asking about self-perceived general state of health (Schnittker & Bacak, 2014).
- Diagnosis of mental illness. The participating PSH were asked if they had previously been diagnosed with any mental illness at the time of interview. The following response

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options were included: “yes, I have been diagnosed with a mental illness”; “no, I have not been diagnosed with any mental illness; and “don’t know/no answer”.

2.3. Procedure

The data were gathered as part of a larger study intended to examine the state of health and quality of life of PSH living in the Community of Madrid in depth. The study was transversal, descriptive and correlational, involving the administration of a questionnaire. This design corresponds to the associative strategy (Ato et al., 2013) for exploring comparisons of participant groups that are evaluated at a particular time and examining the differences between them.

The questionnaire was developed using the LimeSurvey research platform and administered by research team members between February and May 2021. This administration involved a face-to-face personal interview lasting around 60 minutes, conducted at various social care facilities located in the Community of Madrid (shelters, hostels, drop-in centres and meal centres). Professionals from these facilities provided support in recruiting participants. The facilities and help offered by the professionals of the resources where PSH were recruited have led to a 100% response rate to the questionnaire. In other words, all the people who were invited to participate agreed to do so.

Participation in the research was voluntary and assurances were provided regarding the anonymity and confidentiality of information. Each participant gave their informed consent prior to taking part in the study, which was approved by the Research Ethics Committee of Complutense University of Madrid (Report ref: CE_20210415-02_SOC).

2.4. Data Analysis

First, a univariate and descriptive analysis was performed for the variables included in the study. Second, the Chi-squared statistic was used to analyse the relationship between the categorical variables and Student’s t-test was used to evaluate the different averages of the relevant groups. The factorial structure of the GHQ-12 scale was reviewed and the degree of factorial invariance was estimated for the bi-factor model at configural, metric and scalar levels for the variables of sex, age, housing situation and nationality. Latent averages in the general GHQ-12 factor were also compared. Group averages in the general GHQ-12 factors were compared for the diagnosis

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of mental health and self-assessed health variables. The fit of the models was evaluated using the following indices: RMSEA (Root Mean Square Error of Approximation), CFI (Comparative Fit Index), and NNFI (Non-Normed Fit Index, also known as TLI). For RMSEA, values below .05 indicate a good fit, while values of .08 or lower suggest an acceptable fit. For CFI and TLI, values above .95 suggest a good fit, while values above .90 imply an acceptable fit (Hu & Bentler 1999; Steiger 2007). It is challenging to propose statistical standards for testing measurement invariance; however, testing invariance is the initial step in group comparisons. Some guidelines derived from the studies of Cheung (2002) and Chen (2007) can be useful in suggesting critical values for the goodness-of-fit index increments to assist the researcher in the decision-making process when investigating measurement invariance. Along these lines, Putnick and Bornstein (2016) assessed the level of achieved invariance based on established criteria, with a non-significant $\Delta\chi 2$ and $\Delta CFI < 0.01$. In the study of the homeless population, Farero et al. (2022) and Goldstein et al. utilize the same criteria. The following criteria were employed: $\Delta CFI > .01$, $\Delta RMSEA > .015$, $\Delta SRMR > 0.015$ (Chen, 2007), and non-significant $\Delta\chi 2$ (Putnick and Bornstein, 2016). We explore valuable statistical indices that substantially improve the psychometric analysis of the GHQ-12. The Hierarchical Omega statistic (ωH) reports the total variance attributed to the general factor and the two specific factors ωHs the proportion of reliable variance independent of the general factor (Rodriguez, et al., 2016a). Values ≥ .70 of (ωH) support the unidimensionality of the factor; and values ≥ .30 for ωHs can be considered significant (Domínguez-Lara & Rodríguez, 2017). The H coefficient is a measure of construct replicability (Hancock & Mueller 2001); high values of H (> .80) indicate a well-defined latent variable. ECV represents the common variance explained by the factor; scores >.60 indicate that the common variance between factors is small. PUC is the percentage of correlations uncontaminated by multidimensionality (Rodriguez, et al., 2016a), and helps to interpret ECV. Rodriguez et al. (2016a) conclude that values for ECV> .70 and PUC >. 70 support unidimensionality (Reise et al., 2013; Hankins, 2008).

The data analysis was carried out using the SPSS v.28 programme and the Mplus v. 8 programme

3. Results

3.1. Descriptive and bivariate results

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Taking into account the Likert form of scoring, there was a notably high average score for the GHQ-12 (M = 16.20; SD = 7.11), indicating high levels of psychological impairment. Using a cut-off point equal to or higher than a score of 11 (Goldberg et al., 1997), 73.6% of PSH participating in this study presented potential cases of poor mental health. In addition, 12.6% of participants stated that they had been diagnosed with a mental illness. However, a majority of participants provided a positive assessment of their general state of health (87.4%) (see table 3).

Insert table 3 here

Taking into account the relationships between impaired mental health and the other variables (table 4), the results showed that the presence of a potential psychiatric case is significantly higher among women ($\chi 2$ (1) = 9.76; Phi = .13; p <.002) and people with negative self-rated health ($\chi 2$ (1) = 7.82; Phi = .11; p <.005). Additionally, the percentage of people with poor mental health was significantly higher among participants aged under 36 years ($\chi 2$ (2) = 12.68; Phi = .15; p = .002). In this sense, assuming equality of variances (F = .04; p = .83), participants who presented a potential case of poor mental health were significantly younger (M = 49.87, SD = 14.94) than those without mental health impairments (M = 44.57; SD = 14.67); t(600) = 4.00; p < .001; d = .36).

Insert table 4 here

3.2. Factorial analysis. Dimensionality of the GHQ-12.

The factorial structure of three different models previously used and described in the literature was reviewed (Griffith & Jones, 2019; Hystad & Johnsen, 2020). M1 (figure 1) is a unidimensional model that explains covariance among all items. This model did not provide adequate goodness-of-fit indices.

Insert figure 1 here

M2 (figure 2) is a model with two correlated latent factors, one made up of positive statements and the other comprising negative statements. M2 also failed to provide adequate goodness-of-fit indices.

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Insert figure 2 here

The bi-factor model (M3) (figure 3) was identified as a latent structure in which each element is loaded into a general factor that measures a single GHQ-12 factor. It also specifies two orthogonal factors (positive and negative) that control variance owing to these additional factors (see table 5). The goodness of fit of the individual model was evaluated by examining the size and statistical significance of the factorial loads, the value of Chi-squared and commonly used goodness-of-fit statistics (Kline, 2023).

Insert figure 3 here

The bi-factor model provided better goodness-of-fit indices than the competing models. The Chi-squared difference test showed that the bi-factor model represents a statistically significant improvement compared to the model of two factors (see table 5).

Insert table 5 here

Taking into account the limitations of Cronbach's alpha coefficient (Revelle & Zinbarg, 2009; Trizano-Hermosilla & Alvarado, 2016; Yang & Green, 2011), omega (ω) reliability coefficients were calculated. As shown in table 6, new indices were obtained from the fit of the bi-factor model: determinant factor (DF), construct reliability (H), explained common variance (ECV) and percentage of uncontaminated correlations (PUC).

Insert table 6 here

The value obtained for the ωH permits a global explanation of the scale scores, with 85% of total variance explained by a single construct. The positive and negative factors have a lower ωHs coefficient because they are residualised factors (Reise, 2012). They cannot be considered significant as the values reached were <.30 (Smits et al., 2015). These group factors show apparently low reliability, which hinders a meaningful interpretation of the scores as unequivocal indicators of each factor (Rodriguez et al., 2016a, 2016b). As observed in table 5, ωH_{S1} ωH_{S2} returned far lower values in relation to ω_{S1} ω_{S2}, indicating that a substantial proportion of reliable variance in both group factors is attributed to the general factor.

ECV indexes the specific variance of the general factor, expressing 70% of explained common variance, with 30% distributed among the two group factors. $H_{H.FG}$ returned values of ≥ 0.70

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(Hancock & Mueller, 2001), showing that the latent variable is perfectly defined by its indicators and will be stable throughout all studies (Rodríguez et al., 2016b). However, the particular domains of the POS and NEG factors did not fulfil the criterion (.59 and .49, respectively) and cannot be considered robust factors, since the latent variable is not well defined by its indicators.

3.3. Invariance

To show that the GHQ-12 scale has the same meaning for different groups (Byrne et al., 2010) the degree of measurement invariance based on the following variables was estimated: sex (male and female), age group (less than 36 years old, from 36 to 50 years, over 50 years), housing status (literal homelessness and housing exclusion) and nationality (Spanish or foreign). For this purpose, the configural (equivalence of form of model), metric (equivalence of factorial loads) and scalar (equivalence of intersections or thresholds of items) levels of the bi-factor model were evaluated. The model criteria used for each invariance test are shown in table 7.

Insert table 7 here

As observed in table 7, the number of latent factors and the structure of the factorial loads for the items of the GHQ-12 is similar in the different groups. In addition, adequate goodness-of-fit indices were observed for each invariance models tested in the four variables. The null hypothesis is accepted, since in all cases the *p value* for the comparison of models returned values lower than .05, in addition to some minor differences between the goodness-of-fit indices (Chen, 2007). A comparison of models of the indices of change in goodness of fit indicates that all models were supported, since ΔCFI, ΔTLI and ΔRMSEA did not exceed the proposed cut-off points (Cheung, 2002; Chen, 2007, Jiang et al., 2023) and $\Delta\chi 2$ did not show any significant difference.

3.4. Analysis of averages

Differences were found between the male and female groups when comparing latent averages in the GHQ-12, with the female group returning slightly higher values for the general factor (.69; $p < .001$), showing a worse state of mental health. In terms of age group, participants aged 51 years and older obtained a slightly lower average than the other groups (-0.31; $p < .01$), indicating a better state of mental health among older adults. The general factor average was

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higher for the group of Spanish nationals than for non-nationals (1.225; p <.001), showing higher levels of impairment in the former group's mental health. Statistically significant differences in GHQ-12 averages were not found for the groups established based on housing status. These results are in line with those described in table 4.

Contrasting the GHQ-12 averages against the mental health diagnosis variable reveals statistically significant differences between the groups. Scores for the group of participants diagnosed with mental illness (M = 20.65; SD = 7.74) were higher than for the group that had not received any such diagnosis (M = 15.63; SD = 6.83); t (79.89) = 5.64 p < .001; d = .69, showing a large effect size. Similarly, the self-assessed health variable also reveals statistically significant differences between the groups for the GHQ-12, with a large effect size: t (638) = 7.6, p < .001, d = .67. The average score for the group with good self-assessed health (M = 15.40; SD = 6.63) was lower than for the group reporting poor health (Me= 21.57; SD = 7.87).

4. Discussion

The aim of this study was to analyse the factorial structure of the GHQ-12 (Goldberg et al., 1997) and invariance for a sample of PSH living in the Community of Madrid (Spain). The results indicate the fundamentally unidimensional nature of the construct and the appropriateness of using a single factor score estimated from the total factor. This finding supports the practical use of the scale. In addition, the results regarding the invariance confirm the relevance of using the GHQ-12 with PSH independent of variables such gender, age, nationality, or housing status.

Despite the impact of impaired mental health on this population group, this is the first study conducted with this aim. A series of alternative factorial structures for the GHQ-12 scale were tested. The bi-factor structure, with a general factor and two specific factors, produced the best representation of the data from a statistical perspective. Taking this into account, the psychometric properties of the bi-factor model were analysed in depth, with the notable conclusions outlined below.

Empirical evidence does not demonstrate a consensus regarding the factorial structure of GHQ-12. As noted in the introduction of this work, some studies suggest a unidimensional nature (Pedrero Pérez et al., 2020); a bi-factor structure (Oliveira et al., 2023); the presence of three factors (Tomás et al., 2019) or four factors (Griffith & Jones, 2019).

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In this study, the decision between the competing models should be based on what each model implies about the underlying structure. The bifactor model is the most appropriate to evaluate the influence of the general factor and the specific factors on the variability of each item (Domínguez-Lara & Rodríguez, 2017). To evaluate the GHQ-12 scale, the goodness-of-fit indices used in structural equation models have been considered, and to ensure the correct evaluation of the model, values are provided to assess the robustness of the general factor and the two underlying factors.

In conclusion, the results obtained in our study suggest that we are dealing with a bifactorial structure. However, it is important to note that these two factors cannot be used to perform differentiated screenings in different clinical dimensions (Aguado et al, 2012). In other words, the use of the GHQ-12 as a screening tool should be carried out using all of the items which correspond to the underlying factor in figure 3 (see also the values in table 6).

Gao et al. (2004) offer a similar conclusion, arguing that its use as a unidimensional measure is adequate from a pragmatic perspective. Hankins (2008) also proposes a unidimensional construct, insofar as the multidimensionality shown in the GHQ-12 can be an expression of the effects of the method, owing to bias in the drafting of the negative items and ambiguity of response options in the questionnaire. Little is known about the usefulness of the positive and negative group factors and whether they can reveal differences between people. There has been debate in the literature regarding the role played by group factors within bi-factor models (Bonifay et al., 2017; Rodriguez et al., 2016b) and the meaning of the variance they explain (Sellbom & Tellegen, 2019). In this regard, there is a confirmed consensus concerning the need to investigate the estimation, interpretation and evaluation of factor weights and scores associated with these factors (Bonifay et al., 2017; Reise et al., 2013).

The invariance is structural equality, equality of factor weights and equality of thresholds among the groups. The GHQ-12 is hence appropriate for use with the homeless population regardless of sex, age, housing status or nationality.

The results also confirm that PSH report high levels of psychological impairment, in line with the existing literature (Schiffler et al., 2023). They also support the position that there are higher levels of mental health impairment among the female (Guillén et al, 2023; Rea, 2022) and young (Guillén et al., 2020) homeless population.

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In terms of mental health among women, it can be noted that mental health issues are a characteristic of female homelessness (Warburton, 2022). One of the most widespread explanations for this is the fact that women experience more severely stressful life events than men when living in a situation of homelessness (Rodríguez-Moreno et al., 2021. With relation to age, along the same lines, one possible explanation for the higher levels of mental health impairment among younger people is that they face more risks from day to day (Calvo & Shaini, 2020), in addition to having fewer strategies and resources to cope with those situations (Heerde et al., 2020). As such, age and sex are confirmed as significant elements in analysing the social inequalities that define the mental health trajectories affecting PSH.

The findings with respect to mental health are based on a screening instrument but supported by other variables included in the study, such as pre-existing mental health diagnoses and PSH's self-assessments of their general state of health. In this regard, the measures obtained in the GHQ-12 were confirmed to be significantly higher among PSH who reported having been diagnosed with a mental illness, as well as among those who assessed their health more negatively.

5. Conclusions

Although the GHQ-12 is widely used, its dimensionality continues under debate. The results of this study confirm the relevance of using appropriate instruments to analyse the mental health of PSH. Given the reality of this population and the difficulties of bonding and contact imposed by the residential situations in which they live, the use of instruments such as the GHQ-12 acquire an important relevance to address, in a quick and simple way, one of the difficulties most present in this population: mental health problems. The results allow us to conclude that the GHQ-12 is a suitable instrument for this purpose.

In short, in line with the observations of Goldberg et al. (1997) when the scale was first developed and as confirmed in later research (Anjara et al., 2020; Brabete, 2014; Habibi Asgarabad et al., 2023; Rocha et al., 2011), these results show the appropriateness of administering the GHQ-12 as a screening instrument. This study also confirmed the suitability of using the GHQ-12 to report the mental health realities of PSH independently of variables such as sex, age, nationality and/or housing status. It is hence important to conduct further studies that use appropriate instruments to analyse mental health among PSH.

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6. Limitations of the study

Despite the fact that the findings confirm the suitability and usefulness of the GHQ-12 to examine mental health among PSH, certain limitations have been noted. First, there is no existing literature that analyses the factorial structure and invariance of this instrument when it is administered to PSH. This makes it difficult to compare the results obtained with similar studies. Second, although the instrument used to evaluate mental health has been extensively validated, in addition to being contrasted against the variable that included the mental health diagnoses reported by participants, the GHQ-12 is not a diagnostic instrument and so it does not provide epidemiological data. Finally, the sample was broad but geographically limited. This makes it difficult to generalise the results for PSH in a national and international context. In the same vein, the sample size may also have limited the results with respect to the invariance test. In this regard, studies examining psychometric properties and factorial structure among PSH with other profiles, such as women or young people in this situation, are recommendable.

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Table 1. Descriptive Analyses of the Sample.

Variables	Categories	*n*	%
Sex	Male	395	65.5
	Female	205	34.0
Age groups	35 or less	174	28.9
	36-50	147	24.4
	51 or more	281	46.6
Nationality	Spanish	227	37.6
	Foreign	376	62.4
Housing status	Literal homelessness	282	46.8
	Broader homelessness	318	52.7

Table 2. Descriptive Statistics for the GHQ-12 Items.

Items	Mean	SD	Skewness	Kurtois
1. Able to concentrate	1.43	.882	.266	-.639
2. Loss of sleep	1.57	1.102	-.102	-1.312
3. Playing a useful part	1.40	.974	.152	-.957
4. Capable of decisions	1.22	.892	.492	-.412
5. Constantly under strain	1.66	1.106	-.248	-1.269
6. Problem overcoming difficulties	1.37	1.060	.092	-1.230
7. Enjoy day-to-day activities	1.45	.924	.278	-.785
8. Ability to face problems	1.36	.904	.315	-.654
9. Feel unhappy/depressed	1.63	1.056	-.166	-1.182
10. Losing confidence	1.07	1.107	.522	-1.138
11. Think of self as worthless	.79	1.013	.976	-.352
12. Feeling reasonably happy	1.32	.892	.414	-.523

Note: Each item is answered using a 4-point Likert-type scale (0-1-2-3) (minimum of 0 points to a maximum of 3).

Table 3. Descriptive Analyses for Study Variables.

Variable	Categories	*n*	%
GHQ-12	Case of mental health impairment	444	73.6
	No case of mental health impairment	159	26.4
Self-rated health	Good	527	87.4
	Bad	76	12.6
Diagnosis of mental illness	With diagnosis	76	12.6
	Without diagnosis	527	87.4

Table 4. Relations found between GHQ-12 and other Study Variables.

Variable	Categories	GHQ-12				Total	
		Case of mental health impairment		No Case of mental health impairment			
		n	%	*n*	%	*n*	%
Sex***	Male	275	69.6	120	30.4	395	100
	Female	167	81.5	38	18.5	205	100
Age groups**	35 or less	143	82.2	31	17.8	174	100
	36-50	111	75.5	36	24.5	147	100
	51 or more	189	67.3	92	32.7	281	100
Nationality	Spanish	164	72.2	63	27.8	227	100
	Foreign	280	74.5	96	25.5	376	100
Housing status	Literal homelessness	216	76.6	66	23.4	282	100
	Broader homelessness	226	71.1	92	28.9	318	100
Self-rated health**	Good	378	71.7	149	28.3	527	100
	Bad	66	86.8	10	13.2	76	100

**p ≤ .01; ***p ≤ .001

Figure 1. Model 1: Unidimensional

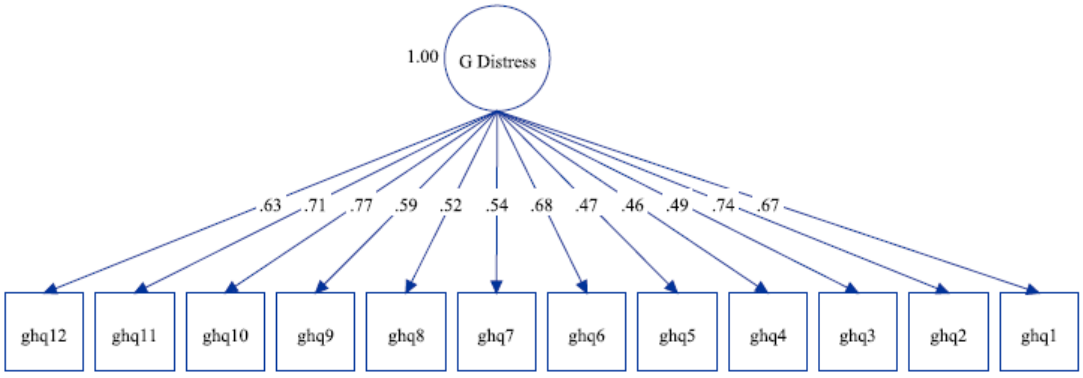

Figure 2. Model 2: Two Correlated Factors

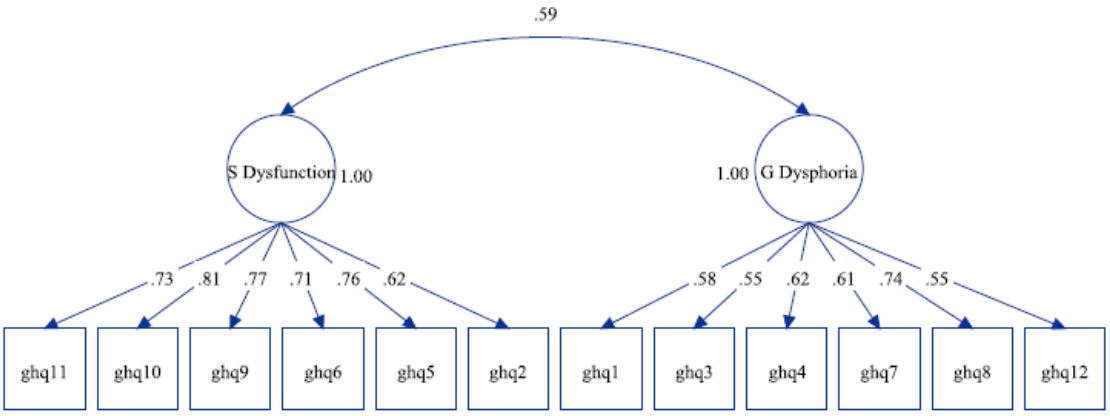

Figure 3. Model 3: Bi-Factor

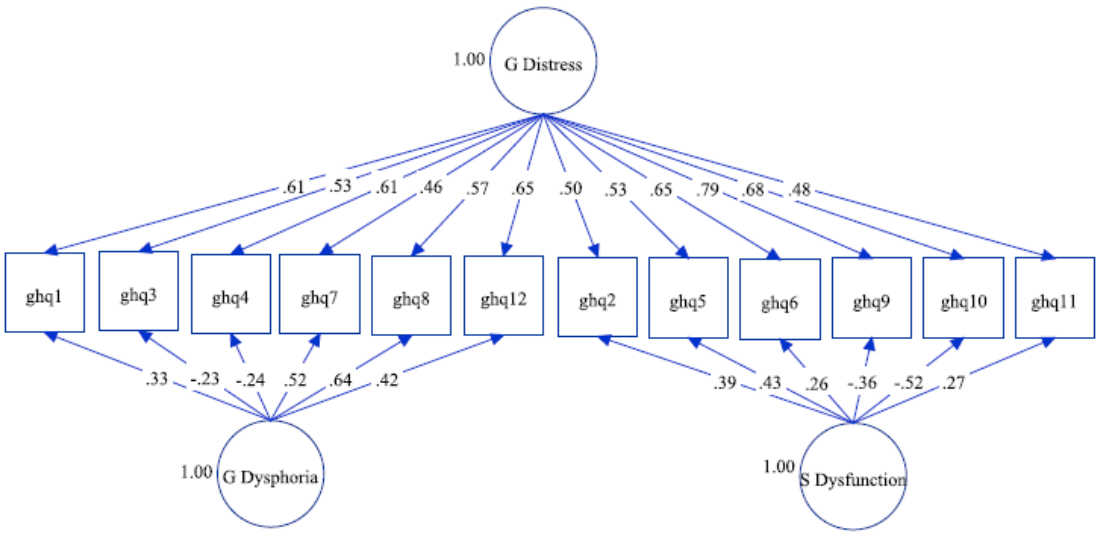

Table 5. Chi-Square Test and General Measures of Fit for Competing Models.

	χ2	Df	RMSEA	SRMR	CFI	TIL	χ2 diff	Df (diff)	p
M1	731.39*	54	.14	.08	.84	.80			
M2	308.89*	53	.09	.05	.94	.92	422.5	1	<.01
M3	210.65*	42	.07	.04	.96	.94	98.24	11	<.01

p≤ .001. M1: Unidimensional Model; M2: Two correlated factors Model; M3: Bi-factor Model.

Table 6. Fit Indices and Reliability Estimators for the Bifactor Model.

SRMR	ECV	PUC	ω	ω_{S1}	ω_{S2}	ωH	$\omega H._{S1}$	$\omega H._{S2}$	$H_{H.FG}$	$H_{H.S1}$	$H_{H.S2}$	FD	$FD._{S1}$	$FD._{S2}$
.04	.70	.55	.89	.80	.81	.85	.11	.10	.87	.59	.49	.94	.83	.77

Table 7. Adjustment of Invariance Models by Sex, Age, Housing Status and Nationality.

Variables	Model	χ2 (gl)	CFI	SRMR	RMSEA (90%CI)	ΔCFI	ΔSRMR	ΔRMSEA	Model comparison	Δχ2 (Δgl)	*p*
Sex	Configural	245.476* (84)	.902	.062	.077(066-.089)				Scalar vs Configural	34.10 (30)	.275
	Metric	257.132* (105)	.907	.070	.067(057-.078)	.005	.008	-.01	Metric vs Configural	18.48 (21)	.618
	Scalar	273.253* (114)	.903	.072	.066(056-.076)	-.004	-.001	-.001	Scalar vs Metric	16.21 (9)	.060
Age groups	Configural	268.963* (126)	.918	.061	.073(.061-.085)				Scalar vs Configural	25.262 (18)	.581
	Metric	309.134* (168)	.919	.071	.063(.052-.074)	.001	.01	-.01	Metric vs Configural	40.17 (42)	.333
	Scalar	335.232* (186)	.914	.075	.061(.051-.072)	-.005	.004	-0,002	Scalar vs Metric	26.01 (18)	.117
Housing Status	Configural	153.213* (84)	.960	.039	.051(.038-.063)				Scalar vs Configural	39.837 (30)	.051
	Metric	186.278* (105)	.956	.046	.049(.037-.061)	.004	.007	-0,002	Metric vs Configural	32.585 (21)	.108

	Scalar	194.199* (114)	.954	.047	.047(.035-.058)	.005	.001	-0,002	Scalar vs Metric	7.268 (9)	.609
	Configural	245.476* (84)	.902	.062	.077(.066-.089)				Scalar vs Configural	34.14 (30)	.275
Nationality	Metric	257.132* (105)	.907	.070	.067(.057-.078)	-.005	-.008	.01	Metric vs Configural	18.482 (21)	.618
	Scalar	273.253 (114)	.903	.072	.066(.056-.076)	.004	-.002	.001	Scalar vs Metric	16.306 (9)	.061

*$p \leq .0001$.