ORIGINAL RESEARCH

Psychometric properties of the Norwegian version of the General Health Questionnaire (GHQ-30) among older people living at home

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Introduction: The incidence and prevalence of mental problems among older people are difficult to map because the causes are often complex and the symptoms manifest in a range of ways. Therefore, there is a need for robust and useful instruments for screening mental problems in this group. One instrument used in Norway and around the world is the 30-item version of the General Health Questionnaire (GHQ-30). Nevertheless, studies testing reliability and validity of the Norwegian version are scarce.

Aim: The aim of this study was to test the psychometric properties, by means of reliability and construct validity, of the Norwegian version of the GHQ-30 in a sample of older people living at home.

Methods: A cross-sectional design was used. A postal questionnaire including background variables and a range of health related questions, including the GHQ-30, was mailed to 6033 older people (age 65 years or more) who lived in their own homes in southern Norway. A final sample of 2106 persons (34.9%) responded to and returned the questionnaire. Data were analyzed statistically regarding reliability and construct validity of the GHQ-30.

Results: The reliability of the instrument, reflecting its homogeneity, was shown in a Cronbach's alpha coefficient of 0.93 and in significant item-to-total correlations. Construct validity was supported as the GHQ-30 demonstrated robustness in separating groups with known mental problems. Construct validity was also demonstrated in a logical four factor solution, which accounted for 50.0% of the variance in the study group. The factor structure supported previous testing studies of the instrument.

Conclusion: The GHQ-30 showed satisfactory psychometric properties regarding reliability and construct validity in this study group, which may indicate that the instrument is suitable for use in screening mental problems in older people living at home.

Keywords: factor analysis, mental problems, psychological screening, reliability, validity

Introduction

Mental problems, especially anxiety and depression, among older people are likely to be of great concern in years to come. The incidence of these problems among older people is difficult to map because the causes are complex and multifaceted and the symptoms manifest in a range of ways.[1] In addition, problems associated with anxiety and with depression are often concurrent, as anxiety may indicate underlying depression.[1] Nevertheless, the literature is not consistent regarding the incidence and prevalence of mental problems of older people. Some authors argue that there are no reasons for assuming that older people have more mental problems than does the population in general. For instance, Fiske and Jones[2] claimed that depression is less common in this

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group than in any other group of adults. On the other hand, the World Health Organization[3] has estimated that, by 2020, depression will be the second most important reason for health decline. In addition, mental problems in older people are often unrecognized and underestimated because they are hidden behind somatic symptoms or cognitive decline.[4] Mental problems,[5] particularly depression,[6] may also be viewed as a normal consequence of the aging process, and older people tend to associate mental illness and treatment with a strong stigma.[7] Thus, an important presumption for detecting mental illness or symptoms in older individuals is the availability of useful screening instruments.

Several instruments have been developed for assessing mental illness in different populations. One instrument that is widely used for screening mental symptoms in older people and in community samples is Goldberg's General Health Questionnaire (GHQ).[8] This instrument was designed for use in population surveys, for example, primary medical care settings, and the questions asked reflect whether the respondents have recently experienced a specific symptom or type of behavior.[9] Several versions of the original comprehensive 60-item version (GHQ-60) have been developed,[8,9] including the 30-item version (GHQ-30),[10] which was used in the present study. Most of the items reflecting somatic symptoms in the GHQ-60 are removed in the GHQ-30, and the remaining items include dimensions of mental and social functioning and well-being and coping abilities.[8–10] According to Goldberg and Williams,[8] the GHQ is among the most thoroughly tested health instruments. The GHQ-30 has been used and tested in several former studies in different populations,[8,9] including in older people in community settings.[11–15] The testing studies have shown values for sensitivity and specificity between 71% and 91%,[8] and a Cronbach's alpha coefficient at 0.90 or above reflecting the internal consistency have often been reported.[8,9] The factor structure of the GHQ-30 has also been thoroughly studied and the extracted factors tend to be consistent, covering items reflecting anxiety, depression, sleep disturbance, social dysfunction, coping difficulties, and a feeling of incompetence.[8,9] The results indicate that the instrument could be useful for screening mental illness in older people living in the community.

The GHQ was translated into Norwegian in 1978,[16] and the GHQ-30 has been used in several studies in various settings in Norway.[17–19] Nevertheless, to our knowledge, the only testing of the Norwegian version of the instrument was performed by Dale et al[20] in a sample of care-dependent, home-living older people. This study showed acceptable values of reliability and validity, and that this instrument could be appropriate for screening mental health for older people living at home. However, the sample included in that study was rather small, and additional testing is needed.

Aim

The aim of this study was to test the psychometric properties, by means of reliability and construct validity, of the Norwegian GHQ-30 in a sample of older people living at home.

Methods
Study design and participants

The present study is a part of a larger project focusing on self-care and health among older people living at home in southern Norway. Other parts of this project have been reported in other studies.[21,22] A cross-sectional design was used, and a randomized sample of 6033 persons of age 65 years or more in five counties received a postal questionnaire, information about the study, and an invitation to participate. The National Directory of Residents accomplished the randomization, according to their common procedures. The questionnaire was completed and returned by 1671 persons in the first round. After one reminder another 435 persons responded, resulting in a total of 2106 individuals who answered and returned the questionnaire. Thus, the study group constituted 34.9% of those initially invited.

Instruments and variables

In addition to questions from the GHQ-30 and about demographic variables (age and sex), the questionnaire included questions about the perceived overall health and perceptions of anxiety, sadness, helplessness, and loneliness.

The 30-item General Health Questionnaire (GHQ-30)

The instrument GHQ-30 contains 30 statements reflecting the mental state (ie, depressive moods, sleeping problems, and anxiety), social functioning and well-being, and coping abilities of the participant.[9,10] Fifteen of the statements are negatively worded and 15 are positively worded. A four-point Likert-type scoring system is used for each statement, ranging from 0 (=less than usual) to 3 (=much more than usual).[23] The minimum obtainable score is 0 and the maximum obtainable score is 90, with higher scores reflecting more declined mental health. Among the several versions of the GHQ, the GHQ-30 is shown to be the most stable and to have the highest validity.[8]

The Norwegian version of the instrument has been tested in a sample of care-dependent, older, home-living people.[20]

The Cronbach's alpha coefficient[25] in that study[20] was 0.92, and the total GHQ score was clearly correlated with perceived health ($P = 0.004$), a feeling of loneliness ($P < 0.001$), anxiety ($P = 0.005$), and depression ($P < 0.001$).

Analyses

The reliability of the GHQ-30 was assessed by estimating the internal consistency (homogeneity) with item-to-total correlations, calculated by Spearman's rank correlations (r_s) between each item and the total scale. Each item was excluded from the total scale score when that particular item was analyzed.[24] Internal consistency was also estimated with the Cronbach's alpha coefficient.[25]

Construct validity of the GHQ-30 was assessed by comparing "known groups" of individuals who were expected to have high scores (ie, those who perceived themselves to be in ill health and those who were perceived as having helplessness, loneliness, anxiety, and depressive mood), with "known groups" of individuals with expected low scores (ie, those who perceived themselves to be in good health and those who did not perceive themselves as having helplessness, loneliness, anxiety, and depressive mood). The determination of these group characteristics relied on their expected relationships to mental health. Differences in median GHQ scores between these groups were calculated using the Mann–Whitney U-test for independent samples.

Construct validity of the GHQ-30 was also assessed by performing an explorative factor analysis, to investigate to what degree the Norwegian version of the instrument fitted with the factor structures obtained in the English version, which have been widely studied.[8,9] The extraction method used was the principal components analysis with varimax rotation and Kaiser normalization. As recommended,[26,27] factor loadings greater than 0.40 were used as cut-off values for including the items in a factor. The eigenvalue was set to ≥ 1.

The chi-square test was used to examine sex differences, and the t-test for unrelated samples was used to test differences in age between the study participants and the dropouts.

PASW Statistics version 18 (IBM Corporation, Armonk, NY) was used for performing statistical analyses. A P-value of <0.05 was considered significant.

Ethical considerations

The Regional Committee for Medical Research Ethics in southern Norway approved the main project, which consisted of two studies among older people living at home in rural[21] and urban[22] areas (REK sør-øst D 2009/1299 and REK sør-øst A 2009/1321). Additional approval was given to use the obtained database in the present study (REK sør-øst D 2011/2588). The study was also designed and implemented according to common ethical principles for clinical research described in the Declaration of Helsinki[28] and by Beauchamp and Childress.[29]

Table I Item-to-total correlations (Spearman's r_s) of the GHQ-30

Item no	Item content	r_s	P-value
1	Been able to concentrate on whatever you're doing	0.31	<0.01
2	Lost much sleep over worry	0.49	<0.01
3	Been having restless, disturbed nights	0.32	<0.01
4	Been managing to keep yourself busy and occupied	0.37	<0.01
5	Been getting out of the house as much as usual	0.35	<0.01
6	Been managing as well as most people would in your shoes	0.28	<0.01
7	Felt on the whole you were doing things well	0.38	<0.01
8	Been satisfied with the way you've carried out your tasks	0.44	<0.01
9	Been able to feel warmth and affection from those near to you	0.22	<0.01
10	Been finding it easy to get on with other people	0.25	<0.01
11	Spent much time chatting with people	0.36	<0.01
12	Felt that you are playing a useful part in things	0.36	<0.01
13	Felt capable of making decisions about things	0.32	<0.01
14	Felt constantly under strain	0.45	<0.01
15	Felt you could not overcome your difficulties	0.59	<0.01
16	Been finding life a struggle all the time	0.64	<0.01
17	Been able to enjoy your normal day-to-day activities	0.22	<0.01
18	Been taking things hard	0.62	<0.01
19	Been getting scared or panicky for no good reason	0.56	<0.01
20	Been able to face up to your problems	0.28	<0.01
21	Found everything getting on top of you	0.63	<0.01
22	Been feeling unhappy and depressed	0.68	<0.01
23	Been losing confidence in yourself	0.63	<0.01
24	Been thinking of yourself as a worthless person	0.60	<0.01
25	Felt that life is entirely hopeless	0.66	<0.01
26	Been feeling hopeful about your own future	0.41	<0.01
27	Been feeling reasonably happy, all things considered	0.35	<0.01
28	Been feeling nervous and strung-out all the time	0.63	<0.01
29	Felt that life isn't worth living	0.52	<0.01
30	Found at times you couldn't do anything because your nerves were too bad	0.56	<0.01

Abbreviation: GHQ-30, 30-item version of the General Health Questionnaire.

Results

The age of the study group (n = 2106) ranged from 65 to 96 years, and the mean age was 74.5 years (standard deviation [SD] = 6.9 years). The mean age of the women (n = 1063) was 74.7 years (SD = 7.2 years) and the mean age of the men (n = 1043) was 74.2 years (SD = 6.7 years). There were more women in the dropout group (n = 3897) compared to the study group ($P < 0.001$), and their mean age was higher (mean = 77.3 years, SD = 8.0 years; $P < 0.001$).

The Cronbach's alpha coefficient for the total GHQ-30 was 0.93. The homogeneity of the scale was also shown in the item-to-total correlations as presented in Table 1.

Construct validity of the GHQ-30 was supported by significant differences between the groups with expected high scores and the groups with expected low scores on the scale. Median (Md) scores and interquartile range (iqr) for "known groups" are shown in Table 2.

Construct validity was also reflected in the factor analysis with a logical four-factor solution that explained 50.0% of the variance, and each factor with an eigenvalue greater than 1. Factor loadings and proposed assignment of the items to the factors, explained variance, and the Cronbach's alpha coefficients of each factor are shown in Table 3.

The first of the four extracted factors, which explained 33.48% of the variance, consisted of items reflecting depressive symptoms and anxiety. Factor 2 reflected a sense of coping, and Factor 3 included items related to satisfaction with life in general and relationships with other people. Factor 4 included two items reflecting sleeping disturbances.

Discussion

This study reports the results of psychometric testing with the Norwegian GHQ-30 in a sample of older people living at home.

The obtained Cronbach's alpha reliability coefficient of 0.93 indicated a high level of homogeneity of the scale, and this result is in accordance with several former studies testing reliability and validity of the GHQ-30. A Cronbach's alpha coefficient of 0.90 or above has often been reported.[8,9] A similar result was also found in another testing of the GHQ-30 ($r_s = 0.92$) in a comparable sample in Norway,[20] although the target group in that study was older people who were, to a variable degree, receiving formal care. However, as described by Streiner and Norman,[24] a very high Cronbach's alpha coefficient may indicate a possible overlap among the items, which should be taken into consideration when evaluating the instrument.

Homogeneity of the scale was also confirmed in the item-to-total correlations, which showed that all items correlated significantly to the total scale ($r_s \geq 0.22$). As recommended by Streiner and Norman,[24] the lowest value for item-to-total correlations should be $r_s = 0.20$. Furthermore, a general tendency was that the negatively worded items, reflecting mental distress or decline, had higher correlation values with the total scale than did the positively worded items which reflected coping abilities and social attachment.

Construct validity was clearly supported by significant differences in the total GHQ-30 scores between groups with expected high and low scores. The results indicate that the instrument could be suitable for screening mental conditions like depression and anxiety, perceived helplessness and loneliness, and perceived health in general. Somewhat corresponding results were found in the study by Dale et al[20] regarding scores for groups with good or poor health ($P = 0.004$), groups who perceived loneliness or not ($P < 0.001$), groups who perceived anxiety or not ($P = 0.035$) and groups who felt depressed or not ($P < 0.001$). All these dimensions are, to different extents and in different operationalized terms, included in the GHQ-30.[8,9]

Construct validity was also supported by a logical four factor solution that explained 50.0% of the variance. According to Goldberg and Williams,[8] most factor analyses of the GHQ-30 tend to yield between four and six factors that account for approximately half of the variance. In addition, the four factors extracted from the factor analysis in

Table 2 Differences in total GHQ-30 scores for groups with expected low and high scores

Groups with expected low scores	n	Md	iqr	Groups with expected high scores	n	Md	iqr	*P*-value
Being in good health	1664	22	18–27	Being in ill health	112	29.5	24–42	<0.001
Not perceiving helplessness	1658	21	18–27	Perceiving helplessness	170	34	28–45	<0.001
Not perceiving loneliness	1642	21	18–27	Perceiving loneliness	200	32	27–42	<0.001
Not perceiving anxiety	1664	21	18–27	Perceiving anxiety	176	33.5	28–42	<0.001
Not perceiving depressive mood	1597	21	18–26	Perceiving depressive mood	233	34	28–42	<0.001

Abbreviations: GHQ-30, 30-item version of the General Health Questionnaire; Md, median; iqr, interquartile range.

Table 3 Principal components analysis with varimax rotation of GHQ-30 for the study group

Item no and content	Factor 1	Factor 2	Factor 3	Factor 4
1. Been able to concentrate		0.65		
2. Lost much sleep over worry				0.62
3. Have had restless, disturbed nights				0.68
4. Managed to keep busy and occupied		0.72		
5. Getting out of the house		0.64		
6. Managed as well as most people				
7. Felt you were doing things well		0.60		
8. Satisfied with the way of doing things		0.59		
9. Felt warmth and affection from others			0.69	
10. Got on with other people			0.62	
11. Spent much time chatting with people		0.56		
12. Felt that playing a useful part in things		0.63		
13. Felt capable of making decisions		0.49		
14. Felt constantly under strain	0.47			
15. Felt you could not overcome difficulties	0.48			
16. Been finding life a struggle all the time	0.62			
17. Enjoyed normal day-to-day activities			0.66	
18. Been taking things hard	0.58			
19. Getting scared for no good reason	0.63			
20. Been able to face up to your problems		0.43		
21. Found everything getting on top of you	0.67			
22. Been feeling unhappy and depressed	0.74			
23. Been losing confidence in yourself	0.70			
24. Thinking you are a worthless person	0.73			
25. Felt that life is entirely hopeless	0.75			
26. Felt hopeful about your own future		0.46		
27. Felt happy, all things considered			0.47	
28. Felt nervous and strung-out all the time	0.76			
29. Felt that life isn't worth living	0.63			
30. Couldn't do anything – nerves too bad	0.76			
Percentage of the variance explained	33.48	8.34	4.58	3.60
Cronbach's alpha coefficients	0.92	0.84	0.56	0.58

Abbreviation: GHQ-30, 30-items version of the General Health Questionnaire.

the present study seemed to cover dimensions supported by former testing studies of the instrument in different countries and settings.[9] A specific factor reflecting social performance, social functioning, and coping has been found in almost all principal component analyses of the GHQ-30.[8] In the present study, items covering these dimensions were distributed on two factors, although most of the items were included in one factor explaining 8.34% of the variance. More than one social functioning factor was also isolated in the study by Chan and Chan.[30] The two items concerning sleep disturbances were isolated in a separate factor in the present study. According to Goldberg and Williams,[8] the sleep items have been included in the depression and/or anxiety factors in many studies, although other studies have separated a distinct sleep disturbing factor.[30–32] Initially, five factors were extracted in the component matrix. One of the two items in the fifth factor loaded higher on one of the other factors. As recommended by Pett et al,[27] each factor should contain at least two items, and the fifth factor was consequently excluded.

Unlike most of the testing studies of the GHQ-30,[9] including the Norwegian study performed by Dale et al,[20] the factor analysis in the present study yielded one common factor reflecting both the dimension of depression and the dimension of anxiety. This factor explained 33.5% of the variance. According to Goldberg and Williams,[8] there are a minority of studies that have found the dimension of anxiety to be included in the depression factor. One exception is the study by Goldberg et al,[33] where high correlations between the symptoms of anxiety and depression were found, and no factor solution with anxiety items on one single dimension, and depression items on another dimension, was produced. As pointed out by Huppert et al,[11] there is no obvious explanation of why the results vary according to one common or two separate factors for the depression and anxiety dimensions. Nevertheless, cultural differences across the study populations and the different interpretation of the items have been mentioned.[11] Another reason why the items reflecting these two dimensions yielded a common factor may be that

a person's anxiety and depression are often presented in combination and with a complex mixture.[34] The interrelationship between anxiety and depressive symptoms in older people is well known.[35,36] Further, although these symptoms, and the combination of symptoms, are commonly present in an early phase of dementia, many behavioral and psychological problems are also found to be present in the non-demented older population.[37] Although knowledge about the respondents' cognitive functioning in the present study was unavailable, it is likely that those who are responding in such postal surveys have good, or at least fairly good, cognitive capacity.

Conclusion and methodological reflections

The testing of the psychometric properties of the GHQ-30 in this study showed that the instrument may be suitable for screening mental health in a general population of older people living at home.

The study design was cross-sectional and data was assessed by use of self-report, and consequently, interrater reliability and stability of the instrument could not be tested. Neither was it possible to test the sensitivity and specificity due to the lack of another instrument which could be used as a "gold standard." Despite these limitations, the instrument was found to have satisfactory results according to reliability, in terms of internal consistency and construct validity.

The instrument is aimed to assess changes in a person's mental state, and some criticism has been raised towards the instrument's restricted possibility to map chronic conditions.[9] This has also been commented on by Goldberg and Williams,[8] who recommend an alternative adjustable scoring system for more stable conditions. The respondents in Goldberg and Williams' recommended system are asked how the symptom compares with "as usual," which may result in inaccurate scorings for persons who have suffered from a condition for so long that it has come to be considered "usual."[9]

Regarding the several versions of the GHQ that have been developed, the full 60-item version is ideally recommended when possible.[8] However, that version of the instrument is rather comprehensive, and a lot of physical items are included. In the abbreviated versions the physical symptoms are removed, and among the several existing versions, the 30-item GHQ has been used most. The 30-item version has been clearly recommended for use in general practice for screening mental illness,[9] and the testing of the Norwegian version presented in this study supports this recommendation, especially for use among home-living older people in community settings. This is simply because the items of the GHQ-30 cover areas that are relevant for older people living at home, such as social relationships, coping with daily life activities, depressive moods, and anxiety inclusive sleep pattern.

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Disclosure

The authors report no conflicts of interest in this work.

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