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The Factor Structure of the General Health Questionnaire (GHQ–30)

A Reliability Study on 6317 Community Residents

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An individual's responses to Goldberg's 30-item General Health Questionnaire are usually represented as a single score which provides a measure of the number of psychiatric symptoms reported. No account is taken of the nature of the symptoms. Factor analyses of the GHQ–30 were undertaken in ten randomly selected samples of 600 adults each, and also on 12 age–sex groupings covering the age range 18–98. The results indicate an impressive degree of consistency of the factor structure, and the identification of five distinct factors corresponding to anxiety, feelings of incompetence, depression, difficulty in coping, and social dysfunction.

The instrument of choice for screening psychiatric disorder in patient and community samples is the General Health Questionnaire (GHQ; Goldberg, 1972). The widespread use of this instrument means that methods for increasing the amount of information yielded by the questionnaire would be of great value in advancing research. The traditional way of scoring the GHQ is to rate each response in terms of whether the symptom is present or absent, and to sum the number of symptoms. Although this simple, additive approach is useful as a measure of the number of psychiatric symptoms declared by an individual, it neglects qualitative aspects of the data, i.e. the nature of the symptoms. The list of questions in the GHQ covers many different types of behaviour, including sleep patterns, worries, relationships, depressed mood, etc. Therefore, it may be possible to derive subscales, each concerned with a particular type of symptom, and subsequently to derive a score for each individual on each of these subscales.

An objective approach to deriving subscales is factor analysis. This is a statistical method for determining which items cluster together to form 'factors'. Sometimes factors are easy to interpret, because the items in the cluster bear a meaningful relationship to each other. At other times it is difficult to understand why a group of items cluster together to form a factor. One reason why interpretative difficulties often arise following factor analysis is limited sample size. When a sample is small, random fluctuations can have a marked effect. Moreover, with small samples, it is rarely possible to examine the reliability of the factor structure.

The exceptionally large database which we have established provides a unique opportunity to investigate the factor structure of the GHQ. We administered the GHQ to an adult sample of the British population participating in the Health and Lifestyle Survey (Cox *et al*, 1987). The survey collected a great deal of information on physical health and health-related behaviour. In selecting an instrument to measure mental health we wanted to focus on psychological and psychosocial symptoms rather than somatic symptoms. For this reason we selected the 30-item version of the GHQ (GHQ–30), which was derived from the original 60-item version by excluding symptoms that were commonly present in subjects with entirely physical illness. The other version which we considered was the GHQ–28, which has been derived from the GHQ–60 on the basis of factor analysis. A quarter of the items in the GHQ–28 are concerned with somatic symptoms and a further quarter with severe depression, which we felt to be unsuitable for a normal population sample.

The number of respondents who completed the questionnaire was 6317, which is by far the largest sample ever studied with this instrument, and is a good representation of the British population (see below). Basic descriptions of the GHQ scores and their relationship to socio-demographic and other variables are available elsewhere (Huppert *et al*, 1987). A comparative study of the conventional GHQ score and a score taking account of chronic symptoms (CGHQ) has also been reported on this population sample (Huppert *et al*, 1988).

Method

The 30-item GHQ was introduced to respondents in their own home by a nurse at the conclusion of a series of physiological measurements and simple tests of cognitive function (see Cox *et al*, 1987; Huppert *et al*, 1987). The nurse's visit was the second phase of the Health and Lifestyle Survey and took place 1–2 weeks after an extensive initial interview. The GHQ was accepted by 7304 participants, who were instructed to complete it on their own and return it in a stamped, addressed envelope. The questionnaire was returned by mail by 6572 participants (88.6%). Only

complete questionnaires were analysed, the final figure being 6317 (86.5%). To determine if the sample was representative of the British population, the age and sex distribution of our sample was compared with figures from the 1981 census (Blaxter, 1987). Overall, our sample was found to be a good representative sample, with the exception of men aged 18–29, who were under-represented (21.3% *v.* 24.8%), as were women aged 70 plus (9.2% *v.* 16.2%).

The first factor analysis was carried out on a randomly selected sample of 6000 individuals which was taken from the complete database of 6317 individuals. The size of this sample was adjusted for the convenience of the following subsampling. These 6000 individuals were then randomly allocated to one of 10 subsamples of 600 adults, and factor analyses were carried out on each of the 10 subsamples. Factor analyses were also carried out on the 12 groups of individuals obtained when the main sample of 6000 was divided by sex and by age into the following groupings: 18–24, 25–34, 35–44, 45–54, 55–64, 65+. These last analyses were carried out in order to explore any variation in factor structure due to sex and/or age.

Orthogonal varimax rotation facilitates the identification of factors that are uncorrelated. Although this can simplify interpretation of what the factors mean, it is likely that in the real world factors are correlated. For this reason the factor analysis on the whole sample was repeated using an 'oblimin' (oblique) rotation which does not retain the orthogonality of the factors. All analyses were carried out on the raw data (Likert scores).

Results

It should be appreciated at the outset that there will always be a measure of subjectivity in the number of factors selected, and in the items considered to be making an important contribution to a factor. This is an inevitable result of the data set containing no *a priori* classification of either cases or items. The criterion for identifying

TABLE I
Varimax rotated factor structure of the GHQ-30 (n = 6000)[1,2]

Item		*Factor*				
		A	*B*	*C*	*D*	*E*
1	Could not concentrate	39	45	01	09	15
2	Lost sleep	*66*	10	09	09	08
3	Restless nights	11	−09	01	38	17
4	Not busy or occupied	−04	*59*	22	01	28
5	Not out of the house	15	39	02	03	*54*
6	Not managing well	09	*55*	18	08	00
7	Not doing things well	24	*75*	07	06	05
8	Not satisfied with task	20	*74*	02	13	05
9	No warmth and affection	13	12	09	03	15
10	Could not get on with others	14	07	12	06	*61*
11	Not chatting with others	09	08	06	09	*79*
12	Not playing a useful part	11	48	26	07	45
13	Could not make decisions	04	16	06	*50*	07
14	Felt under strain	*82*	06	00	09	06
15	Could not overcome difficulties	*68*	20	22	13	03
16	Found life a struggle	21	02	04	*69*	04
17	Not enjoying activities	05	12	−10	*66*	04
18	Taking things hard	*72*	05	11	14	07
19	Scared or panicky	27	03	22	*55*	−03
20	Could not face problems	25	34	36	09	07
21	Felt everything on top	*80*	13	17	12	07
22	Unhappy and depressed	*75*	15	28	09	10
23	Lost confidence	*62*	23	41	08	08
24	Felt worthless	44	20	*61*	04	08
25	Felt life hopeless	21	00	*59*	42	−03
26	Not hopeful about future	15	23	*53*	11	17
27	Not feeling happy	01	04	27	*61*	−01
28	Nervous and strung up	*75*	12	30	11	05
29	Felt life not worth living	36	12	*70*	04	10
30	Nerves too bad	49	17	*52*	05	06
% variance accounted for		28.9	7.6	6.2	4.1	3.8

1. Loadings greater than 0.5 are in italics.
2. All decimal points on loadings are omitted.

TABLE II
Items making a significant contribution to GHQ factors

Factor [1]	*Total variance accounted for in subsamples (%)*	*Order of items* [2,3]			*GHQ item*	*Factor loadings for whole sample*
		Whole sample	*10 sub-samples*			
A	26.6–31.2	1	1	14	Felt constantly under strain?	0.82
		2	2	21	Found everything getting on top of you?	0.80
		3	3	28	Been feeling nervous and strung-up all the time?	0.75
		4	4	22	Been feeling unhappy and depressed?	0.75
		5	5	18	Been taking things hard?	0.72
		6	6	15	Felt you couldn't overcome your difficulties?	0.68
		7	7	2	Lost much sleep over worry?	0.67
		8	8	23	Been losing confidence in yourself?	0.63
		(9)	(9)	(30)	Found at times you couldn't do anything because your nerves were too bad?	(0.49)
		(10)	(10)	(24)	Been thinking of yourself as a worthless person?	(0.44)
B	7.2–8.3	1	1	7	Felt on the whole you were doing things well?	0.75
		2	2	8	Been satisfied with the way you've carried out your task?	0.74
		3	4	4	Been managing to keep yourself busy and occupied?	0.59
		4	3	6	Been managing as well as most people would in your shoes?	0.55
		(5)	(5)	(12)	Felt that you are playing a useful part in things?	(0.48)
		(6)	(7)	(1)	Been able to concentrate on whatever you're doing?	(0.45)
		(7)	(6)	(5)	Been getting out of the house as much as usual?	(0.39)
C	5.2–6.8	1	1	29	Felt that life isn't worth living?	0.70
		2	2	24	Been thinking of yourself as a worthless person?	0.61
		3	3	25	Felt that life is entirely hopeless?	0.59
		4	4	26	Been feeling hopeful about your own future?	0.53
		5	5	30	Found at times you couldn't do anything because your nerves were too bad?	0.52
		(6)	(6)	(23)	Been losing confidence in yourself?	(0.41)
D[4]	3.9–5.0	1	1	16	Been finding life a struggle all the time?	0.69
		2	2	17	Been able to enjoy your normal day-to-day activities?	0.66
		3	3	27	Been feeling reasonably happy, all things considered?	0.61
		4	4	19	Been getting scared or panicky for no good reason?	0.55
		5	5	13	Felt capable of making decisions about things?	0.50
		(6)	(7)	(25)	Been feeling that life is entirely hopeless?	(0.43)
		(7)	(6)	(3)	Been having restless, disturbed nights?	(0.38)
E	3.5–4.0	1	1	11	Spent much time chatting with people?	0.80
		2	2	10	Been finding it easy to get on with other people?	0.61
		3	3	5	Been getting out of the house as much as usual?	0.54
		(4)	(4)	(12)	Felt that you are playing a useful part in things?	(0.45)

1. The order in which the factors (A to E) are presented is the order obtained for the whole sample and for most subsamples.
2. The order of items within a factor is in descending order of importance for the whole sample. The most frequent item order for the subsamples is also indicated. Items were included until a natural break occurred in the factor loadings around 0.50.
3. Numbers in parenthesis indicate items which appeared in only a few (2–3) subsamples. The position and factor loadings of these items for the whole sample are also given in parenthesis.
4. For one subsample, D was split into two: D1 corresponds to questions 27, 17, 13; D2 corresponds to questions 16, 3, 19.

plausible factors was the standard SPSS-X property that the corresponding eigenvalues of the correlation matrix should be greater than unity. The number of items making an important contribution to the factor was determined by a visual inspection of the plots of the coefficient values corresponding to the item. Items were progressively included until there appeared to be a natural break in the coefficient values, which often occurred at approximately 0.50. All items with values of 0.50 or greater were included.

Large sample

The factor analysis using varimax rotation on the sample of 6000 cases identified six factors with eigenvalues greater than 1. The six factors combined accounted for 50.6% of the variance. We refer to these factors alphabetically in order of decreasing importance. Because the sixth factor contained only a single item (Question 9) which reached our inclusion criterion, details of the factor structure of only the five major factors are presented in Table I. The items contributing significantly to each factor, and the percentage of the variance they account for are presented in Table II.

The oblique rotation resulted in the same five main factors being identified in the same order of importance as in the varimax rotation, except that factor D (as identified by the varimax rotation) accounted for more of the variance than factor C. Table III shows the close similarity in the items which contribute significantly to oblique and varimax rotated factors.

TABLE III
Comparison of items making a significant contribution to varimax rotated factors and oblique rotated factors

Factor	*GHQ items making a significant contribution*							
Varimax A	14	21	28	22	18	15	2	23
Oblique 1	14	21	18	28	22	2	15	23
Varimax B	7	8	4	6				
Oblique 2	7	8	4	6				
Varimax C	29	24	25	26	30			
Oblique 4	29	25	24	26				
Varimax D	16	17	27	13	19			
Oblique 3	17	16	27	13	19			
Varimax E	11	10	5					
Oblique 5	11	10						

This demonstrates that the factors identified by the varimax rotation in this data set are a good summary of the structure of the GHQ, and that imposing orthogonality does not distort the results.

Analysis of random subsamples

Varimax rotation in each of the 10 random subsamples of 600 cases, revealed six significant factors (eigenvalues greater than 1) in each subsample. Factor A was the strongest factor in every subsample and included the same eight items as in the total sample, although in three of the subsamples one or two additional items made a significant contribution. Factors B, C and D were also identifiable in all ten subsamples although in one sample, D was split into two. Factor E was present in nine subsamples. For Factors B, C, D and E there were slight variations in which items contributed significantly to each factor. The order in which the factors emerged (i.e. their strength) differed to some extent from sample to sample. This is depicted in Table IV. For all subsamples, there were only one or two items which made a significant contribution to the sixth factor. The question numbers corresponding to these items are shown in parentheses.

It can be seen that the extent of overall agreement between the 10 subsamples and between the subsamples and the large sample (Table II) inspires confidence that the factors are robust and that the items which constitute each factor are consistent to an acceptable degree.

TABLE IV
Order of factors for each subsample

Subsample	*Order of factors*[1]					
1	A	B	C	E	D1	D2
2	A	C	B	D	E	(9)
3	A	B	C	D	E	(3)
4	A	B	D	C	E	(9)
5	A	C	B	E	D	(4, 5)
6	A	B	D	C	E	(9, 10)
7	A	C	B	D	E	(3)
8	A	C	B	D	E	(9, 10)
9	A	B	D	C	E	(9)
10	A	B	C	D	(9)	(13)

1. Numbers in parentheses are question numbers.

Analysis by age–sex groupings

Principal-components factor analysis followed by a varimax rotation was repeated for each of the 12 age–sex groups. All groups had at least six significant factors; additional factors usually contained only one or two significant items. The data are presented in Table V. Factor A was the strongest factor in each of the 12 groups and contained the same eight items as in the total sample. Although the order in which the other main factors emerged varied to some extent from group to group, all of the factors identified in the large sample and the ten subsamples also appeared in each of the 12 age–sex groups. This suggests that the factors described in Tables I and II are not only robust for the population as a whole but also for individual sections of the population designated by age and sex.

Interpretation of the factors

Deciding what a particular factor means and applying a suitable label is a rather subjective affair. We have attempted to do this in a commonsense fashion, rather than being influenced by theory or diagnostic conventions, since

TABLE V
Order of factors for each age–sex grouping

Sex	*Age*	n	*Order of factors*								
Men	18–24	343	A	C	D2	B	E	(4, 5)	D1	(20)	(1)
	25–34	495	A	C	B	D	E	(9)	(6)	(5)	
	35–44	520	A	C	B	D	E	(3, 5)			
	45–54	403	A	B	C	D	E	(3)			
	55–64	451	A	D2	(4, 5)	C	B	E	D1		
	65+	437	A	B	D	C	E	(3)	(13, 1, 9)		
Women	18–24	406	A	C	B	D	E	(3)	(4, 5)	(9)	
	25–34	688	A	C	E	D	B	(3)			
	35–44	710	A	C	B	E	D	D2			
	45–54	552	A	B	D	C	E	(3)			
	55–64	490	A	B	C	E	(26)	D	(3)		
	65+	505	A	B	C	D	E	(9, 10)	(3)		

our respondents would have used a lay or commonsense interpretation of the questions. The five factors have accordingly been labelled as follows:

Factor A	anxiety, worry and tension
Factor B	feelings of incompetence, low self-esteem
Factor C	depression, hopelessness
Factor D	difficulty in coping, dispirited
Factor E	social dysfunction

The first three items in Factor A (see Table II) were clearly related to feelings of anxiety, worry and tension, and the last four items could also be interpreted as reflecting these feelings. The only item which presented difficulty was the fourth item (Q. 22: "Been feeling unhappy and depressed?"). However, we did not feel justified in labelling this factor anxiety/unhappiness on the basis of a single item. It is noteworthy that this item does not have a significant loading on the depression factor in our study.

The only other factor which presented interpretive difficulties was Factor D, where the items were rather inhomogeneous. It was particularly difficult to accommodate Q. 19: "Been getting scared or panicky for no good reason?" On the whole, however, it was concluded that in a general population sample, this item probably bears little relationship to diagnosable phobias or panic attacks and could be subsumed under difficulty in coping.

Factor scores

Although we have found a great deal of consistency in the underlying factor structure of the GHQ for different age–sex groups, the scores of these groups on individual factors may show different patterns. Figure 1 presents the mean values of the standardised factor scores (overall mean = 0, s.d. = 1) for each age–sex group, calculated on the basis of the orthogonal factor structure of the sample as a whole.

It can be seen that for four factors and the majority of age groups women have higher factor scores than men, reflecting the fact that women tend to obtain higher scores on the GHQ as a whole (e.g. Goldberg, 1972; Huppert *et al*, 1988). However, the advantage of producing individual factor scores is that we can provide a more detailed characterisation of age and sex differences on the GHQ. For example, it can be seen that scores on Factor A decrease with age, while scores on the other four factors increase with age. Factor A also shows the most pronounced sex difference, particularly for the younger age groups, while Factor F shows a reversal of the usual sex-difference, with women obtaining lower scores than men except in the oldest age group.

Discussion

There have been a number of factor analyses carried out on the General Health Questionnaire, mostly using a varimax rotation. Burvill & Knuiman (1983) employed the full 60-item GHQ and examined a community sample of 2044 in Perth, Australia. They identified five factors which were, in order, physical illness, sleep disturbance, social dysfunction, anxiety/dysphoria, and suicidal ideation. Goldberg & Hillier (1978) chose a four-factor solution for the GHQ-60 on a sample of 523 general-practice patients in Manchester. The factors were, in order, somatic symptoms, anxiety/insomnia, social dysfunction, and severe depression.

The shorter 30-item GHQ was derived from the GHQ-60 by excluding symptoms that were commonly present in subjects with entirely physical illness. Thus the GHQ-30 could be regarded as a measure of more purely psychological or psychosocial symptoms. There have been several factor analyses of the GHQ-30 in relatively large community samples. Goldberg *et al* (1976) report data from a sample of 1310 whites and 1310 blacks in the USA. For both groups, the main factor was labelled depression and anxiety, and it accounted for about 21% of the variance. The authors comment that no matter how many factor solutions they examined (up to seven factors) it was not possible to separate anxiety and depression on the GHQ-30. It is interesting to compare their findings with our own results. An examination of the nine items which make up their anxiety/depression factor shows that

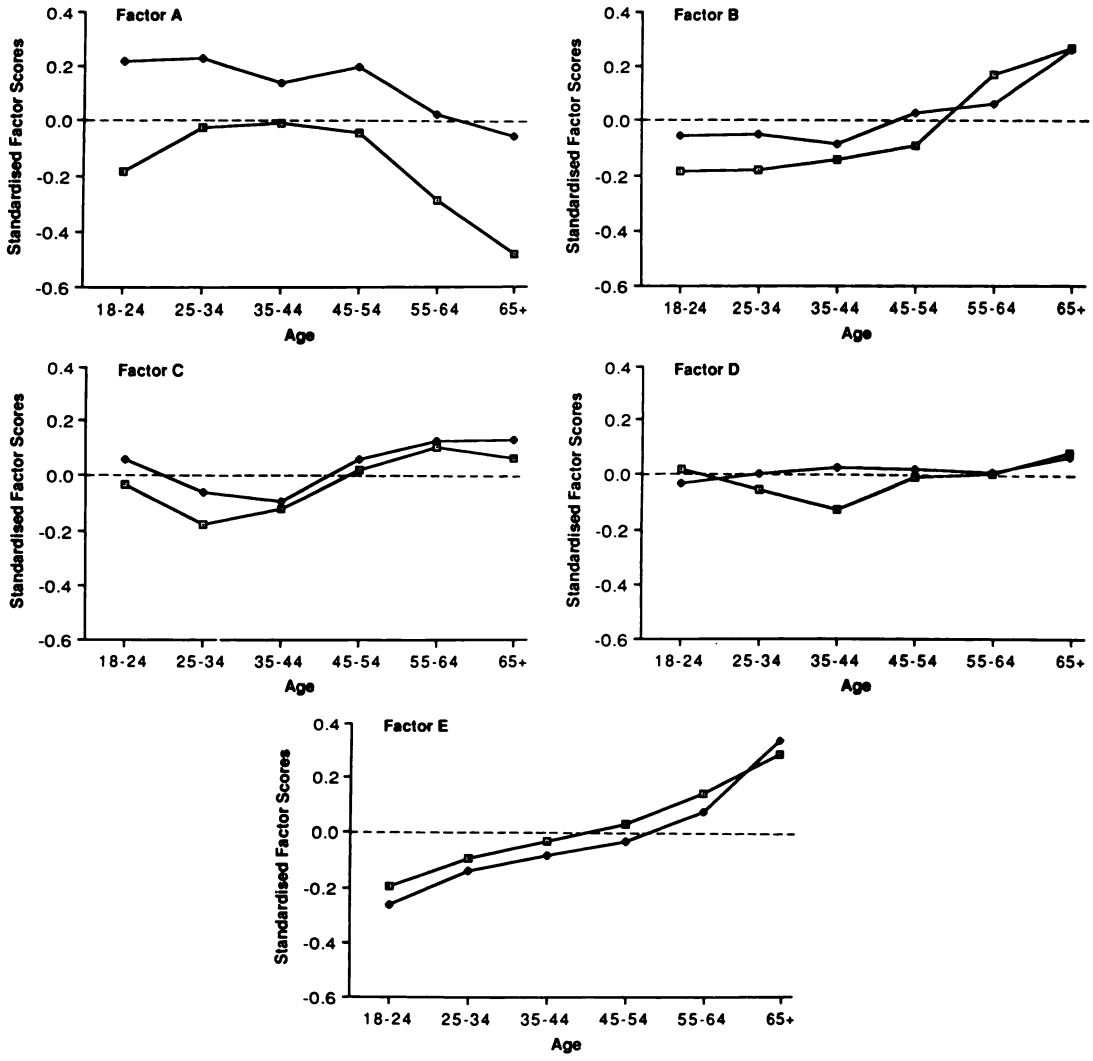

FIG. 1 Standardised factor scores as a function of age and sex (□ male, ■ female).

four items correspond to our anxiety factor, four correspond to our depression factor and one comes from our difficulty-in-coping factor. It is not clear why anxiety and depression were reliably separated in our analyses (and others mentioned below) but not in theirs. This difference is unlikely simply to reflect random fluctuation due to differences in sample size, since our subsamples of 600 are smaller than their samples and yet in each of our 10 subsamples, anxiety and depression emerged as separate factors (Table IV). The possibility of cultural differences in the factor structure or in the interpretation of the items cannot be excluded.

Another factor analysis of the GHQ-30 was undertaken in a community sample of 2000+ in Saskatchewan by D'Arcy (1982). The questionnaire was mailed to respondents and there was a 53% response rate. This raises the possibility that the sample was biased. Indeed, 47% of the sample reported no psychiatric symptoms, compared with only 29% in the Health and Lifestyle Survey, where the response rate was 86.5%. The four factors which D'Arcy identified were anxiety/insomnia, depression/anhedonia, anergia and social dysfunction. The first factor is a combination of our anxiety and difficulty-in-coping factors. Despite the large number of items

with significant loadings on D'Arcy's first factor (13 items), it accounts for only 16% of the variance. This contrasts with the eight significant items in our anxiety factor, which accounts for 28.9% of the variance. Five of the nine items in D'Arcy's depression/anhedonia factor clearly correspond to our depression factor, the remaining four not forming part of any coherent factor in our analyses. The anergia factor has no counterpart in our sample, largely because two of the items exist only in the North American version of the GHQ-30. The items which they replace in the original British version have the highest loading on our social dysfunction factor (item 11) and the second highest loading on our feelings-of-incompetence factor (item 8).

Some factor-analytic studies of the GHQ-30 have examined data from highly selected groups. These include the study by D'Arcy & Siddique (1984) on 1038 Canadian adolescents and the study by Chan & Chan (1983) on 255 first-year undergraduates at the Chinese University of Hong Kong. The factor structures which they report are unlikely to be typical of the general adult population, which is the primary focus of this paper. However, it is worth noting that both studies report separate anxiety and depression factors.

None of the previous studies of the GHQ-30 has had a large enough sample size to examine the reliability of the factor structure in a representative population sample. Our study has demonstrated the reliability of a qualitative approach to analysing GHQ data, which yields information not only about the number of symptoms, but also about the nature of these symptoms. We have clearly identified five distinct and robust factors in the GHQ-30. The same factors have emerged in each of the following analyses:

(a) comparing 10 independent random samples of 600 cases each
(b) comparing men and women in each of six age groups from 18 to 98
(c) comparing orthogonal and non-orthogonal factor analyses.

The factors can be labelled anxiety, feelings of incompetence, depression, difficulty in coping, and social dysfunction.

Although age differences are minimal on conventional GHQ scores (e.g. Huppert *et al*, 1987), there are pronounced age differences on most of the factors. Anxiety shows a marked decrease with age, while the other four factors tend to increase with age. Middle-aged adults obtain high anxiety and low depression scores, while older adults obtain high depression and low anxiety scores. Another interesting comparison is between anxiety and feelings of incompetence. Levels of anxiety are very high at age 55-64 in both sexes, and show a marked drop in the age group 65-74. At the same time, feelings of incompetence show a marked rise, particularly in men. A likely explanation for the finding is that leaving paid employment is associated with reduced anxiety, but also with feelings of incompetence or low self-esteem.

The GHQ was developed as a screening instrument for minor psychiatric morbidity: when symptoms are added to yield a score ranging from 0-30 (the GHQ score) the GHQ has been found to have acceptable sensitivity and specificity when validated against clinical diagnosis (e.g. Tarnopolsky *et al*, 1979). We have previously shown that a different scoring method (the CGHQ, which takes account of the chronicity of symptoms) identified different individuals as cases (Huppert *et al*, 1988). The identification of a reliable factor structure for the GHQ-30 raises the possibility that the detection of cases might be improved by examining an individual's profile of scores on the different factors. Further validation studies are required to determine whether the effectiveness of the GHQ as a general psychiatric screening instrument can be improved in this way, and whether the factors relate to specific diagnostic categories.

The GHQ can also be used as a descriptive measure of psychiatric symptoms apart from its use as a screening instrument. The description can be sharpened by the development of empirically derived subscales corresponding to different types of psychiatric symptoms. We have recently derived five subscales based on our factor analysis. We have found that the profile of performance on these subscales varies between groups selected as having a high risk of psychiatric disorder (e.g. the elderly living alone, middle-aged unemployed men). Findings such as these indicate the potential value of GHQ subscales for refining the descriptions of psychiatric symptoms.

Our study, along with most other factor-analytic studies of the GHQ, shows a separation between symptoms of anxiety and symptoms of depression. These studies have been based on community samples, but similar findings have been reported in studies of patients with diagnosed affective disorders. Mullaney (1984) reviewed 40 factor-analytic studies of patients with affective disorders. Although a wide variety of interview schedules was used, all revealed a clear separation between anxiety and depression symptoms. Mullaney concluded that anxiety and depression are separate syndromes. A similar view is implicit in DSM-III-R (American Psychiatric

Association, 1987). There seems little doubt, therefore, that individuals are capable of recognising anxiety symptoms and differentiating them from symptoms of depression or hopelessness. Whether the processes underlying anxiety and depression are different cannot be determined by data of the type we have presented.

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