

Assessing the validity of the SF-36 General Health Survey

S. A. Stansfeld,* R. Roberts and S. P. Foot†

The Department of Epidemiology and Public Health, University College London Medical School, London, UK (S. A. Stansfeld, S. P. Foot); Division of Psychology, University of Westminster, London, UK (R. Roberts)

Our objective was to assess the validity of the SF-36 General Health Survey against the Social Maladjustment Schedule (SMS) and two questionnaire measures, the Social Problem Questionnaire and the Nottingham Health Profile (NHP) in a random subsample of 206 men and women from the Whitehall II study, a longitudinal survey of health and disease amongst 10,308 London-based civil servants. We found that social functioning on the SF-36 correlated significantly with social contacts, total satisfaction and total management scores on the SMS, and social isolation and emotional reactions on the NHP. General mental health on the SF-36 was associated with marriage, social contacts, leisure scores, total satisfaction and total management scores on the SMS, and emotional reactions, energy level and social isolation on the NHP. Conversely, physical functioning and physical role limitations were generally not associated with the SMS but were associated with physical abilities and pain on the NHP. In conclusion, this study offers evidence of the discriminant validity of the general mental health and physical functioning scales of the SF-36. We also found moderate construct and criterion validity for the social functioning scale of the SF-36 and considerable overlap between the general mental health and social functioning scales.

Key words: Health status assessment; mental health; quality of life; questionnaires; SF-36; validity.

† S. P. Foot is currently affiliated with Clinical Counselling Psychology Services, Queen Mary's University Hospital London.

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* To whom correspondence should be addressed at Department of Epidemiology and Public Health, University College London Medical School, 1–19 Torrington Place, London, WC1E 6BT, UK.

Introduction

In recent years there has been a search for brief, yet comprehensive, health outcome measures suitable for assessing health in both clinical trials and general populations. There are currently at least seven long, comprehensive measures of overall health status available. These include the Sickness Impact Profile,¹ the Rand (HIE) measures,² the Index of Well-being (QWB)³ and the Nottingham Health Profile.⁴ These are well-tested measures with high levels of reliability and validity but are not suitable for use in epidemiologic studies either because of their length or because they concentrate on severe disease and as such are unsuitable for the low level of morbidity expected in population surveys. On the other hand there are difficulties of reliability and validity with single item assessments of overall health status.

Thus, there has been a need for a short but comprehensive scale, able to distinguish healthy from disabled individuals, sensitive to change and using separate scales to accurately represent different features of functional impairment associated with illness. The Medical Outcomes Study Short Form 36 General Health Survey (SF-36)^{5,6} is one such instrument developed in the USA, which is intended to provide measures of general health for use with both general and clinical populations. The questionnaire consists of 36 items which generate eight dimensions of functioning: Physical Functioning, Social Functioning, Role Limitations caused by Physical Problems, Role Limitations caused by Emotional Problems, General Mental Health, Vitality, General Health Perceptions and Pain. The questions on social functioning and role limitations are very brief and although there is evidence of their reliability, and some evidence of construct and convergent validity from the USA^{7,8,9} and in the UK,^{10,11} fairly little has been reported on the criterion validity of this scale against interview measures. This is particularly true

for the social functioning scales.

This study reports on the validation of the SF-36 General Health Survey against an interview measure, the Social Maladjustment Schedule (SMS),¹² and two questionnaire measures, the 33-item Social Problem Questionnaire¹³ and the Nottingham Health Profile (NHP)⁴ in a subsample from the Whitehall II study, a longitudinal survey of health and disease amongst 10,308 London-based male and female civil servants.¹⁴

Materials and methods

Participants and design

All non-industrial civil servants aged 35–55 years working in the London offices of 20 departments were invited to participate in the study. The overall response rate was 73% (74% for men and 71% for women). The true response rates are likely to be higher, however, because around 4% of those on the list of employees had in fact moved before the study and were thus not eligible for inclusion. In total, 10,308 civil servants participated, of whom 66.9% (6,895) were men and 33.1% (3,413) were women. Between 1991 and 1993 a further period of data collection was undertaken. Subjects who had participated in earlier phases of the study were recontacted and asked to attend a medical screening examination and to complete a self-administered questionnaire. Within this questionnaire a standard UK version of the SF-36 was included, in addition to questions providing information on a range of social and demographic variables. Of those recontacted 8,355 responded (5,786 males and 2,589 women), yielding a response rate of 81.1%. Of this number 8,213 (98.3%) yielded complete scores on all the SF-36 scales.

The civil service identifies 12 non-industrial grades on the basis of salary. There was a steep increment in salaries from an annual salary in 1987 of between £3,061–£5,841 in the clerical and office support grades to between £18,020–£62,100 in the unified grades 1–6. Besides the steep increment in salaries there were also marked differences in other socio-economic indicators (education, housing tenure, car ownership and father's occupation) by grade of employment.¹⁴ A random sample of 206 civil servants were selected from the follow-up study sample for interview, stratified by employment grade and sex. For this sample we selected civil servants from a three-level employment grade classification: Administrative, Executive/Professional and Clerical/Support. The sample included 108 men and 98 women who were

classified by employment grade as follows: Administrative — 32 men, 29 women; Executive/Professional — 48 men, 39 women; Clerical/Support — 28 men, 30 women. There were no refusals.

Instruments

Social Maladjustment Schedule (SMS). Measurement of validity by interview allows assessment of response bias related to denial or exaggeration in self-report questionnaires. Social and occupational functioning are measured by the Social Maladjustment Schedule¹² which is a comprehensive standardized instrument for assessing social maladjustment and dysfunction in general populations. This schedule attempts to combine the interviewer's objective assessment of the subject's material circumstances and performance with the subject's own satisfaction with performance. The assessment of the subject's satisfaction with their own social circumstances permits comparison across social groups in which norms and expectations differ. The schedule gathers data regarding housing, economic situation, (10 ratings); social role, leisure and social activities, family relationships and marriage (14 ratings), material conditions and satisfaction. Clare and Cairns¹² report a number of measures for assessing reliability of the questionnaire. In their study, coefficients of agreement between pairs of raters for items on the questionnaire applying to all subjects ranged between 69.6–95.8%. Weighted kappa's ranged from 0.55–0.94 (median = 0.76). In the current study the Social Maladjustment Schedule may be seen as a criterion for the validity of the SF-36 Social Functioning subscale.

The Social Maladjustment Schedule was rated in two different ways, according to the original scoring instructions, to give alternative methods for validation. In rating scale 'A' satisfaction with personal interaction at work, social contacts, marital harmony and leisure activities were measured. In rating scale 'B' there are three overall scores representing (1) opportunities or material conditions, (2) management of social affairs, activities and relationships and (3) satisfaction in all spheres of life. These three scores represent (1) what an individual has in terms of living conditions, (2) what they do with their life, how they cope (corresponding to instrumental role performance) and (3) how they feel about it in terms of satisfaction.¹²

The Social Problems Questionnaire (SPQ). The 33-item Social Problem Questionnaire¹³ was derived from the Social Maladjustment Schedule as a self-report

measure of social and occupational functioning. Though this instrument has not been widely used the authors report indices of agreement between 0.60–0.93 (median = 0.83) in a group of attendees at General Practice where scoring was made on the basis of the presence or absence of a major problem.

The Nottingham Health Profile (NHP). The NHP is a well-validated, established, 38-item self-report scale measuring overall health status with separate subscales measuring physical abilities, energy level, emotional reactions, social isolation, sleep and pain.⁴ Increasing scores in SF-36 scales signify improving health, whereas in the NHP they denote poorer health, hence the associations between the NHP and the SF-36 dimensions are negative.

Short Form 36 (SF-36). The SF-36 can be scored as eight subscales. Each scale score is constructed from a varying number of items. These are Physical Functioning (10 items), Social Functioning (two items), Role Limitations due to Physical Problems (four items), Role Limitations due to Emotional Problems (three items), Vitality (four items), Bodily Pain (two items), General Health Perceptions (five items), and General Mental Health (five items). One item concerns change in health and is not scored as a separate dimension.

Semi-structured interview. A short additional semi-structural interview was used to tease out ambiguities in some of the SF-36 items, particularly pertaining to the short Pain subscale.

Procedure

Initially the interviews were piloted in 10 subjects. Subjects attending the main interviews were randomly allocated to one of two interviewers (one male, one female). The presentation order of the SMS and the semi-structured interview was randomized. The other two short questionnaires (SPQ and NHP) were administered between the above, also in random order. The interviews were carried out by two interviewers trained in the use of the Social Maladjustment Schedule. A random set of 33 interviews were taped and blindly rated by both observers.

Analysis

Pearson correlation coefficients were computed between all SF-36 scales and: (1) Summary satisfaction

scores pertaining to *Personal Interaction at Work, Social Contacts, Marriage and Leisure* on the Social Maladjustment Rating Schedule; (2) *Total Satisfaction, Total Management and Total Opportunities* scores from the SMS; (3) Satisfaction scores from the SPQ for Work, Social Contacts and Marriage. (As higher scores on the SMS reflect decreasing satisfaction positive relationships will be indicated by negative correlations.) and (4) All subscales from the NHP except sleep.

Pearson correlations were also computed between interview measures of severity and frequency of pain SF-36 scale scores for bodily pain. This will ascertain whether the SF-36 measure of bodily pain is a better measure of severity rather than frequency of pain.

As a further method of comparing the SF-36 and the NHP and establishing underlying common dimensions, we carried out a factor analysis of the SF-36 and the NHP in the sample using VARIMAX rotation. Previous factor analytic work⁹ suggests a two-factor structure alluding to physical and psychological well-being underlies the SF-36. If the NHP replicates the health constructs available in the SF-36 we would expect the same factor structure to be confirmed.

Results and discussion

Table 1 shows correlations between the SF-36 scales with personal interaction at work, social contacts, marital harmony and leisure activities from the SMS. Incomplete answers on some of the items meant that correlations were computed on the basis of either 185 or 186 subjects. Statistically significant correlations of moderate strength are found for Social Functioning with Satisfaction with Social Contacts ($r = -0.31$, $p < 0.0001$) and Satisfaction with Marriage ($r = -0.22$). This supports the validity of the Social Functioning subscale for both intimate and wider social contacts against the SMS criterion interview. These results are not entirely specific as General Mental Health is also significantly related to Social Contacts ($r = -0.33$, $p < 0.0001$), Marriage ($r = -0.36$, $p < 0.01$) and Leisure ($r = -0.32$, $p < 0.0001$). Vitality shows correlations of similar magnitude with these constructs. Role Limitations due to Emotional Problems are significantly related to Work ($r = -0.16$, $p < 0.05$), Social Contacts ($r = -0.30$, $p < 0.0001$), Marriage ($r = -0.30$, $p < 0.0001$) and Leisure ($r = -0.29$, $p < 0.0001$). General Health Perceptions show very weak correlations with Social Contacts ($r = -0.20$, $p < 0.01$) and Leisure ($r = -0.203$, $p < 0.01$). Finally Role Limitations due to Physical Problems are weakly associated with Leisure satisfaction ($r = -0.15$, $p < 0.05$).

The more general rating scales from the Social

Table 1. SF-36 Scale scores by Social Maladjustment Rating Schedule A. Satisfaction Scores in validation interviews (*n* = 186)

SF-36	Work	Social contacts	Marriage (<i>n</i> = 129) ^a	Leisure
PF	-0.112	0.069	-0.097	-0.040
SF	-0.087	-0.309****	-0.221*	-0.087
RLPP	-0.041	-0.088	-0.022	-0.148*
RLEP	-0.158*	-0.296****	-0.296***	-0.292****
GMH	-0.106	-0.334****	-0.364****	-0.322****
GHP	-0.037	-0.203**	-0.164	-0.203**
V	0.008	-0.295****	-0.248**	0.303****
P	-0.028	-0.059	-0.053	-0.034

^a Only those living with a partner were included in the analysis.

**** *p* < 0.0001 *** *p* < 0.001 ** *p* < 0.01 * *p* < 0.05

PF = physical functioning; SF = social functioning; RLPP = role limitations due to physical health problems; RLEP = role limitations due to emotional problems; GMH = general mental health; GHP = general health perceptions; V = vitality; P = pain.

Table 2. SF-36 Scale scores by social maladjustment rating schedule summary scores for subsample of interviewees

SF-36	Social maladjustment rating scale			<i>n</i>
	Total satisfaction	Total management	Total opportunities	
PF	-0.009	-0.002	-0.058	185
SF	-0.389****	-0.253***	-0.194**	186
RLPP	-0.1	-0.086	-0.119	186
RLEP	-0.474****	-0.258***	-0.197**	186
GMH	-0.494****	-0.417****	-0.278****	186
GHP	-0.309****	-0.209**	-0.173*	186
V	-0.411****	-0.309****	-0.242***	186
Pain	-0.107	-0.146*	-0.174*	186

**** *p* < 0.0001; *** *p* < 0.001; ** *p* < 0.01; * *p* < 0.05

Problems Questionnaire shows similar relationships. Social Functioning, General Mental Health, Vitality and Role Limitations due to Emotional problems, are significantly related to Satisfaction, Management and Opportunities. Significant Correlations range from -0.19 (Social Functioning with Total Opportunities; *p* < 0.05) to -0.49 (General Mental Health with Total Satisfaction; *p* < 0.0001).

In general, the correlations are largest with the satisfaction and management scales which are closest to a measure of functioning and smallest with the Opportunities scale which measures availability of resources rather than functioning. General Health Perceptions are also moderately associated with Satisfaction and Management while, as expected, Physical Functioning, and Role Limitations due to Physical Functioning are not related to the SMS ratings and Pain shows weak associations with

Management and Opportunities.

The results from the Social Problems Questionnaire, using problems with work, social contacts and marriage, in a questionnaire rather than interview form, largely replicate the results found with the Social Maladjustment Schedule. These are shown in Table 3. This is not unexpected as the SPQ is derived from the SMS.

The SF-36 was also compared to the Nottingham Health Profile, in which all dimensions were used except sleep. The results demonstrate relationships largely as predicted (see Table 4). Social Functioning correlates best with Emotional Reactions (*r* = -0.40, *p* < 0.0001) and Social Isolation (*r* = -0.35, *p* < 0.0001). The association between Social Functioning and Social Isolation supports the construct validity of Social Functioning. As with the SMS there is also a moderately strong association between the mental

Table 3. SF-36 scale scores by social problems questionnaire for subsample of interviewees ($n = 186$)

SF-36	Social problems questionnaire		
	Work	Social contacts	Marriage
PF	0.103	-0.006	-0.027
SF	-0.247***	-0.342****	-0.236**
RLPP	0.003	-0.121	-0.014
RLEP	-0.309****	-0.323****	-0.282****
GMH	-0.388****	-0.391	-0.318****
GHP	-0.089	-0.208**	-0.159*
V	-0.284****	-0.341****	-0.232**
Pain	-0.023	-0.141	-0.054

**** $p < 0.0001$; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

health and social functioning measures. SF-36 General Mental Health correlates best with NHP Emotional Reactions ($r = -0.57, p < 0.0001$), Energy Level ($r = -0.35, p < 0.0001$) and Social Isolation ($r = -0.32, p < 0.0001$). Vitality correlates best with NHP Energy Level ($r = -0.56, p < 0.0001$) and Emotional Reactions ($r = -0.41, p < 0.0001$). SF-36 Vitality is once again shown to be related as much to the emotional and social, rather than the physical domains of the NHP. Physical Functioning ($r = -0.52, p < 0.0001$) and Pain ($r = -0.34, p < 0.0001$) correlate most strongly with physical abilities on the NHP.

As a further method of comparing the SF-36 and the NHP and establishing underlying common dimensions, we carried out a factor analysis of the

Table 4. SF-36 scale scores by Nottingham Health Profile scores in validation interviews ($n = 186$)

SF-36	Physical abilities	Energy level	Pain	Emotional reactions	Social isolation
PF	-0.518****	-0.299****	-0.315****	-0.156*	-0.087
SF	-0.099	-0.220**	-0.000	-0.400****	-0.348****
RLPP	-0.115	-0.281****	-0.034	-0.115	-0.060
RLEP	-0.059	-0.213**	-0.031	-0.386****	-0.251***
GMH	-0.156*	-0.350****	-0.042	-0.568****	-0.318****
GHP	-0.144*	-0.459****	-0.051	-0.407****	-0.274****
V	-0.134	-0.557****	-0.154*	-0.414****	-0.255***
Pain	-0.339****	-0.342****	-0.183*	-0.144*	-0.063

**** $p < 0.0001$; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Table 5. Factor analysis of SF-36 and Nottingham Health Profile

	Factor 1	Factor 2	Factor 3
SF-36			
Physical Functioning	-0.159	0.386	-0.657
Social Functioning	-0.464	0.637	0.093
Role Limitations Physical	-0.027	0.861	-0.111
Role Limitations Emotional	-0.434	0.466	0.198
Bodily Pain	-0.089	0.604	-0.444
Vitality	-0.670	0.280	-0.167
General Health Perceptions	-0.549	0.299	-0.140
General Mental Health	-0.721	0.195	-0.032
Nottingham Health Profile			
Emotional Reactions	0.813	-0.055	0.057
Social Isolation	0.676	0.050	-0.078
Energy Level	0.565	-0.233	0.277
Sleep	0.528	-0.017	0.295
Physical Abilities	0.093	-0.077	0.786
Pain	0.049	0.122	0.748

Bold Factor loadings > 0.50

SF-36 and the NHP in the sample. After VARIMAX rotation a three-factor solution (eigen values > 1) was found to account for 55% of the variation (see Table 5).

General Mental Health, Vitality and General Health Perceptions from the SF36 and Emotional Reactions, Sleep and Social Isolation from the NHP loaded on the first factor (loadings > 0.50). This could be seen as a mental health/well-being factor. To a lesser extent, Social Functioning and Emotional Role Limitations from the SF-36 and Energy Level from the NHP also loaded on this factor (loadings > 0.40).

Physical Role Limitations, Social Functioning and Bodily Pain from the SF-36 loaded on the second factor (loadings > 0.60), as did, to a lesser extent, Emotional Role Limitations and Physical Functioning (loadings > 0.30). This factor is less clearly defined but factor scores would seem to represent good Social Functioning with few physical or emotional limitations on role functioning.

Physical Abilities (0.79) and Pain (0.75) from the NHP and Physical Functioning (-0.66) and Bodily Pain (-0.44) from the SF-36 load on the third factor. This seems more clearly than the second factor to represent poor physical functioning and pain.

The differential loadings of the pain scales from the SF-36 and the NHP on the second factor indicate that these are probably not measuring the same aspects of pain. Semi-structured Interview measures of severity of pain had higher correlations with SF-36 Bodily Pain ($r = -0.47$, $n = 205$, $p = 0.0001$) than did frequency of pain experienced ($r = 0.20$, $n = 154$, $p = 0.011$). Thus this suggests that the SF-36 measure of bodily pain is a better measure of severity rather than frequency of pain.

Conclusions

The current analysis provides supportive evidence for the validity of several of the SF-36 subscales — particularly those concerned with social and psychological functioning. We believe the evidence presented may considerably assist the interpretation of several of the SF-36 subscales. Moderate correlations between the Social Functioning subscale on the SF-36, capturing the quantity and quality of social activities, and the Social Maladjustment Schedule and the Social Isolation and Emotional Reaction subscales of the Nottingham Health Profile support the construct validity of SF-36 Social Functioning subscale. This is in keeping with the Social Functioning scale being strongly associated with the similar social functioning scale on the Sickness Impact Profile.¹⁵ The

implication of the association between Social Functioning and General Mental Health is that it may not be possible, or indeed desirable, to separate these subscales on the SF-36. If the effect of social functioning due to impairment of physical health, independent of general mental health, is to be examined it may be necessary to adjust for general mental health simultaneously in any analyses. On the other hand, assessment of impairment of social functioning is an important part of the measurement of psychiatric disorder and it may be most appropriate to use the social functioning scales in this way.

It is therefore interesting, but not surprising that the General Mental Health subscale on the SF-36 relates strongly to Social Contacts, Marriage, Leisure, Satisfaction and Management scores on the Social Maladjustment Schedule and Social Isolation on the Nottingham Health Profile. Similarly, as in earlier studies,¹⁰ we found the Social Functioning subscale on the SF36 was most strongly related to Emotional Reaction on the Nottingham Health Profile. What does this association mean? The questions on Social Functioning are worded in such a way as to link impairment of functioning with health. But why should social functioning be more strongly related to psychological than to physical functioning? First, psychiatric disorder, especially commonly encountered conditions such as depression and anxiety, lead to impairment of social functioning.¹⁶ Indeed, impairment of social functioning is almost an index for defining disorder as opposed to mere disturbance of mood.¹⁷ Secondly, social isolation, secondary either to environmental or personality factors may be an aetiological agent in psychiatric disorder.¹⁸ In a similar manner to the association between Social Functioning and General Mental Health there is an association between Role Limitations due to Emotional Problems and the social subscales on the Social Maladjustment Schedule. This is to be expected if the majority of roles likely to be impaired by emotional problems are social. That the Social Functioning subscale is not associated with the work interaction subscale on the Social Maladjustment Schedule, although demonstrating significant agreement with the work items on the SPQ, may partly be because the Social Functioning subscale focuses more on social interaction outside work rather than in work. This is an important distinction and suggests that social functioning is itself multidimensional — only some aspects of social functioning may be involved in the relationship with impairment of health.

Although Energy level, on the Nottingham Health Profile relates particularly strongly to Vitality, it also seems to be a common underlying factor in all the

SF-36 subscales.¹⁰ It seems that part of an overall self-assessment of functioning relates not only to health but to perceived fitness and capacity, a common theme underlying both physical and emotional functioning. In general, however, Vitality relates more strongly to Emotional Reactions than to Pain or Physical Abilities on the Nottingham Health Profile thus suggesting it is closer to a concept of psychological rather than physical capacity, and as such may be allied to motivation.

Like Vitality, the General Health Perceptions subscale, is more strongly associated with Energy level and Emotional Responses than with Physical Abilities. It also relates less strongly but fairly consistently to Social Functioning; thus it is fairly non-specific in nature.⁵ Pain is fairly consistently unrelated to Social Functioning except to Opportunities and Management and as expected is related to Physical Abilities, Pain and Energy level on the Nottingham Health Profile. These results confirm the specificity of the Physical Functioning, Role Limitations due to Physical Problems and Pain dimensions to detect physical health problems.

The results therefore suggest a clear distinction between the 'physical' subscales of the SF-36 namely Physical Functioning, Pain and Role Limitations due to Physical Functioning and the 'psychological/social' subscales, namely, General Mental Health, Role Limitations due to Emotional Problems, Social Functioning, General Health Perceptions and Vitality. This is demonstrated by the correlations between the Social Maladjustment Schedule scores and the 'psychological/social' subscales and the lack of association with the 'physical' subscales. We also found this distinction between physical and psychological/social scales of the SF-36 that was demonstrated by previous factor analysis⁹ and in the larger sample in this study.¹⁹ However, our own factor analysis in this sample suggests three rather than two factors. Incorporation of the Nottingham Health Profile means that in addition to the physical and psychological health factors, there is a third factor relating more to physical and psychological aspects of social functioning, although, as in other studies, Social Functioning still loads strongly on the psychological factor. This third factor may represent impairment of functioning within social roles more clearly than the other two 'health-related' factors. This result suggests that the underlying structure of the SF-36 may not be satisfactorily captured solely by reference to physical and psychological dimensions, and that important health concepts may not be fully distinguished within the current domains of the SF-36. Therefore we would argue that elaboration

of the Social Functioning and Pain subscales of the SF-36 is appropriate to improve the validity of the instrument within the current range of constructs it is attempting to assess.

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