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=Abstract=

Reliability and Validity on Measurement Instrument for Health Status Assessment in Occupational Workers

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In order to test scaling assumption, and to assess the validity, reliability, and acceptability of the Short Form 36(SF-36) health survey questionnaire, we conducted a survey. Samples were 296 workers who had been employed in small sized companies. All scale passed for item internal consistency(100% success rate) and item discriminant validity(100% success rate). Reliability coefficients were ranged from a low of 0.51 to a high of 0.85. For 87.5% of the total workers, inconsistent responses were not observed. Only 3.0% of the total workers failed two or more checks. Factor analysis was performed using principal axis factor method and quartimax rotation.

In this survey, the SF-36 retained available psychometric properties even when used in a generally healthy worker group. But further study with some consideration to develop health status measurement is expected ; first, the definition of health status should be rationalized. Second, the measurement of outcome is an important consideration in evaluations of quality of care. But ambiguities hinder understanding of this important topic. Third, internal consistency should be interpreted with caution as an indication reliability because it ignores potentially important sources of variation that can occur over time.

Key Words: health status, measurement instrument, scaling assumption, reliability, validity

I.

(Greenfield
Nelson, 1992). (medical intervention)

가 ,
가 (Ware, 1981;
Wasson, 1992). 가 가

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Sheldon (1935) Disability Index, Moskowitz (1957)
PULSES profile, Steinbrocker (1949) American Rheumatism Association Classification
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가 Beck (1961), Zung (1965), Hamilton (1967)

Ware (1979) Mental Health Inventory, Goldberg (1979) General Health
Questionnaire 가

(Geigle Jonnes, 1990), (unidimensional)

Fanshel Bush(1970) Quality of
Well-Being Scale, Bergner(1976) Sickness Impact Profile(SIP), RAND General Health
Measure(1979) Health Insurance Experimental(1980) (multidimensional)

가

(Jenkinson , 1993; Ware, 1993). Health Insurance

(Stewart, 1988).

Notingham Health Profile(Hunt, 1981), COOP Charts(Nelson, 1990), Medical Outcome Study Short Form 36(Ware, Sherbourne, 1992)

가 .
가 가
가 .
SF-36(Short Form-36) 8 36

, 가,
,
가
가 (Brazier, 1992 ; Ware, Sherbourne, 1992; Garrat, 1993; Ware, 1993; Jenkinson, 1993; Perneger, 1995)
(Ziebland, 1995).

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가
가 SF-36
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II.

1.

W 50 100
 1996 8 1 1996 11 30
 1608 W 5
 가 310 . 310
 14 296
 206 (70.8%), 85 (29.2%)
 , 35.4 (9.8) , 34 가 149 (50.3%) 가 , 35-44
 가 93 (31.4%), 45-54 가 31 (10.5%), 55 23 (7.8%) . 88
 (29.7%), 127 (42.9%), 81 (27.4%) . 111 (37.5%),
 () 185 (62.5%) .

2.

() , ,
 가(SF-36) , 가 (functional status),
 (well-being), 가(overall evaluation of health) 3
 1 .
 9 36 (PF),
 (SF), (RP), (RE), (MH), (VT), (BP),
 (GH) 8 8 .

3.

1) 가 (Scaling assumption)

가 8 Likert . ,
 가 1 2 6 .
 100 .
 100 (Ware, 1993).
 가 (scaling assumption) (Ware, 1993; Mchorney
 , 1994).

(item internal consistency)
Howard Forehand(1962)가 Ware(1993)가
, 가 8
(item-total correlation) 가 .
가 SF-36 ,
(overlap) 가 0.40 가 가 .
(item discriminant validity)
(8)
가 SF-36 ,
가 가 .
2) (reliability) (validity)
가 ,
Cronbach's
, (Response Consistency Index; RCI) . Cronbach's
가 8 SPSS/PC
Ware(1993)가 , 15
(construct validity)
(quartimax) 1.0 가 .

III.

1. 가 (scaling assumption)

가 가 가 가

2

8 2 3

가 0.10 가 가

0.40 100%

2

1 0.61 가

100% 3

2.

Cronbach 4

가 0.85 가 가 0.51 가 . 8

296 259 (87.5%)

9 3.0% (5).

가 1.0

8 62.4% 1 1,2,4, 3,4, 2가

1 8 2 (3) , 4

(4) , 5 3,4, 1,2가 6

1 , 7 4, 3

, 8 1 (6).

3.

7

85.7(0-100) , 가

23.4%가 , 75 percentile 95

72.2(0-90) , 0

0.4% 75 percentile 0.5 0.2%

0-100) , 18.1% , 0.3% .
 75 percentile 80 . 58.1(10-100) ,
 1.0%가 , 75 percentile 70 .
 61.8(0-100) , 2.4%가 , 0
 0.7% . 75 percentile 80 .
 80.0(37.5-100) , 18.7%가 , 75
 percentile 87.5 . 73.3(0-100) ,
 57.6%가 , 0 12.4% .
 60.0(12-100) , 2.8% , 75
 percentile 76 .

V.

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가 , 가
가 , 가
가 가
가 가

(medical outcome)

(Ware, 1993).

condition) (disability) (medical 가

가 가 (Geigle Jones, 1990; Ware, 1992)

가 (SF-36)

310
14 296
7.8%, 3.0%, 1.0%, 2.0%, 1.7%, 4.4%,
4.4%, 3.7%

가 가 , 가
가 가 , 가
가 가 , 가

가

가 0.40

100%

가

2

0.61

100%

가

가

(internal consistency reliability)

(, 1995).

Cronbach's

가

8

Cronbach's

0.85 가

0.51 가

Nerenz (1992)

(0.43-0.90), Brazier

(1992) (0.60-0.81),

Jenkinson (1993)

(0.76-0.90), McHorney

(1994) (0.63-0.94)

가 0.90

가

0.50 0.70

(Helmstadter, 1964; Nunnally, 1978;

Ware, 1993).

0.70

, 0.50

가

(Macmillan, 1957; Tyler Fiske, 1968).

가

가

8

가

가

가

, 가

10

8

가

가

가

가 가

가

(Ware,

1993).

가

가

, 36

15

'4-5 (1Km)

87.5%가 , (Ware, 1993)
90.3% , 3.0%

가 .
가 가 가
가 가 가

가 ,
(content validity), (criterion validity), (construct validity)
(Streiner Norman, 1989; Ware, 1993).

가 , , ,
(, 1995).
가 , (8)
(Ware, 1993).

가 (; concurrent validity)
(; predictive validity)
가 가 ,
(severity)

가 가
가 가 ,
(, 1995). 가 가 8
, Pernegner (1995) 가 (internal validity)

가
, (underlying structure)
(, 1990). 36 (common factor)
가 8

가 1.0 8 , 62.4%
가 1 (1) , 2 1,2,4

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 1,2가 . 6 1 , 7
 4, 3 , 8 1 .
 SF-36 8 ,
 . Garratt (1993)
 SF-36 가 , Garratt (1993) , 가 1
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 가 ,
 가
 . Gronlund Linn(1990) “
 ,
 ” 가 .
 가 가
 . , (norms) (criteria) .
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 (Jenkinson
 , 1993; Garratt , 1993; Ware, 1993; Perneger , 1995).
 , , (criterion variables)
 (stewart , 1989; Mchorney , 1993; Ware, 1993).
 가 .
 8 , (Jenkinson , 1993;
 Garratt , 1993), (Ware, 1993), (Perneger , 1995)
 .
 가 가
 가 .
 Dickinson (1993)
 (typology) 가 가
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 , 가 가 가 .
 Hunt McKenna(1993) SF-36 ‘ , ‘ ,
 가 . , .
 가 .
 . 가 가 . Ware (1993)
 .
 (Christie Watt, 1993). Ware

가 , (net treatment effect) .
가 가
가 , 가
가 ,
가 ,
SF-36 가 Garratt (1993)
가 ,
가 , SF-36
가 가
가 가 (Sheldon, 1993).
가 , Streiner Norman(1989)
가
가 .
가 가
가 가

V.

- , . SAS . , , 1990
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Table 1. Dimension of the health status evaluation

Area		Dimension	No. of questions
General characteristics			14
Health status (SF-36)	Functional status	Physical functioning (PF)	10
		Social functioning (SF)	2
		Role limitation-Physical (RP)	4
		Role limitation-Emotion (RE)	3
	Well-being	Mental health (MH)	5
		Vitality (VT)	4
		Bodily pain (BP)	2
	Overall evaluation of health	General health (GH)	5
		Health change	1

Table 2. Item Mean, Standard Deviation, and Correlations Coefficients^a between SF-36 Items and Hypothesized Scales

Item	Mean	S.D	PF	RP	BP	GH	VT	SF	RE	MH
PF1	2.14	.63	.61*	.30	.29	.43	.33	.26	.30	.33
PF2	2.63	.54	.78*	.27	.32	.34	.22	.24	.19	.24
PF3	2.78	.45	.71*	.30	.35	.33	.21	.25	.26	.23
PF4	2.57	.56	.70*	.28	.22	.41	.26	.24	.22	.26
PF5	2.83	.41	.64*	.21	.23	.33	.18	.16	.21	.17
PF6	2.65	.55	.69*	.26	.23	.22	.08	.19	.23	.17
PF7	2.73	.48	.66*	.19	.34	.29	.20	.23	.14	.23
PF8	2.88	.36	.66*	.24	.23	.12	.16	.24	.17	.25
PF9	2.93	.30	.67*	.22	.24	.14	.18	.23	.20	.28
PF10	2.94	.28	.60*	.25	.24	.23	.16	.19	.19	.21
RP1	1.79	.41	.36	.79*	.32	.21	.41	.34	.62	.26
RP2	1.79	.41	.20	.72*	.16	.18	.17	.22	.51	.17
RP3	1.48	.50	.28	.73*	.31	.32	.26	.39	.37	.24
RP4	1.81	.39	.30	.78*	.32	.18	.32	.33	.47	.27
BP1	4.68	1.12	.34	.31	.91*	.44	.32	.46	.32	.27
BP2	4.34	.91	.39	.35	.87*	.39	.34	.39	.23	.29
GH1	3.36	.90	.34	.21	.32	.70*	.28	.25	.24	.27
GH2	3.81	.89	.42	.25	.30	.60*	.30	.24	.21	.39
GH3	3.27	.99	.28	.21	.36	.76*	.32	.24	.29	.33
GH4	3.20	1.05	.21	.23	.22	.59*	.21	.30	.16	.25
GH5	3.25	1.03	.33	.16	.43	.81*	.43	.31	.25	.38
VT1	3.75	1.57	.10	.17	.23	.27	.74*	.22	.25	.38
VT2	3.40	1.58	.21	.26	.28	.37	.76*	.31	.34	.46
VT3	4.90	1.13	.26	.34	.26	.23	.60*	.37	.27	.45
VT4	4.29	1.35	.34	.36	.29	.39	.72*	.38	.42	.54
SF1	3.67	1.07	.19	.34	.42	.29	.32	.88*	.33	.34
SF2	4.48	.67	.37	.32	.30	.33	.37	.61*	.29	.47
RE1	1.78	.41	.27	.58	.29	.22	.45	.30	.76*	.30
RE2	1.75	.44	.23	.52	.21	.26	.22	.28	.83*	.27
RE3	1.65	.48	.27	.47	.25	.31	.42	.39	.82*	.41
MH1	4.36	1.26	.32	.32	.30	.31	.36	.40	.31	.65*
MH2	4.66	1.31	.24	.17	.20	.28	.26	.32	.21	.61*
MH3	3.06	1.67	.16	.16	.21	.36	.59	.29	.32	.68*
MH4	4.68	1.28	.26	.26	.16	.32	.43	.36	.34	.69*
MH5	3.19	1.59	.23	.16	.19	.28	.43	.30	.18	.69*

^aItem-Total correlation for overlap.

*Correlation between an item and its hypothesized scale (overlap)

PF; Physical functioning SF; Social functioning RP; Role limitation-Physical

RE; Role limitation-Emtion MH; Mental health(MH) VT; Vitality

BP; Bodily pain GH; General health

Table 3. Results of Item Internal Consistency and Discriminant Validity

Scale	k ^a	Range of Correlation		Internal consistency ^d		Discriminant Validity ^e	
		Item Internal Consistency ^b	Item Discriminant validity ^c	Success/ Total	Success Rate (%)	Success/ Total	Success Rate (%)
PF	10	.60 - .78	.08 - .43	10/ 10	100	80/ 80	100
RP	4	.72 - .79	.16 - .62	4/ 4	100	32/ 32	100
BP	2	.87 - .91	.23 - .46	2/ 2	100	16/ 16	100
GH	5	.59 - .81	.16 - .43	5/ 5	100	40/ 40	100
VT	4	.60 - .76	.10 - .54	4/ 4	100	32/ 32	100
SF	2	.61 - .88	.19 - .47	2/ 2	100	16/ 16	100
RE	3	.76 - .83	.21 - .58	3/ 3	100	24/ 24	100
MH	5	.61 - .69	.16 - .59	5/ 5	100	40/ 40	100

^aNumber of item and number of item-internal consistency tests per scale.

^bCorrelation between items and hypothesized scale corrected for overlap.

^cCorrelation between items and other scale.

^dNumber 0.40.

^eNumber of correlations significantly higher/total number of correlations.

PF; Physical functioning SF; Social functioning RP; Role limitation-Physical

RE; Role limitation-Emtion MH; Mental health(MH) VT; Vitality

BP; Bodily pain GH; General health

Table 4. Cronbach's coefficients for subscales of SF-36

Scale	Cronbach's
PF	.85
RP	.74
BP	.75
GH	.72
VT	.65
SF	.51
RE	.75
MH	.70

PF; Physical functioning SF; Social functioning RP; Role limitation-Physical
 RE; Role limitation-Emtion MH; Mental health(MH) VT; Vitality
 BP; Bodily pain GH; General health

Table 5. Frequency distribution for the Response Consistency Index(RCI)

Inconsistent Responses	f	%	Cum %
0	259	87.5	87.5
1	28	9.5	97.0
2	6	2.0	99.0
3	2	0.7	99.7
4	0	0.0	99.7
5	1	0.3	100.0

Table 6. Fator analysis for the SF-36

Factor coefficients of individual questionnaire after rotation												
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8				
PF2	.64	MH1 .63	RP1 .74	GH1 .69	MB .79	BP1 .69	GH4 .54	PF1 .51				
PF3	.67	M2 .61	RP2 .76	GH2 .42	M5 .63	BP2 .71						
PF4	.49	M4 .73	RP4 .62	GH3 .73				RP3 .43				
PF5	.59			GH5 .70	VT1 .73	SF1 .50						
PF6	.66	VT3 .72	RE1 .70				VT2 .75					
PF7	.63	VT4 .69	RE2 .76									
PF8	.82	RE3 .58										
PF9	.83	SF2 .63										
PF10	.74											
Eigenvalue	9.17	3.14	2.33	1.95	1.70	1.35	1.12	1.09				

PF; Physical functioning SF; Social functioning RP; Role limitation-Physical
 RE; Role limitation-Emotion MH; Mental health(MH) VT; Vitality
 BP; Bodily pain GH; General health

Table 7. Normative data for the workers (Total sample)

	PF	RP	BP	GH	VT	SF	RE	MH
Percentage nonrespondent	7.8	3.0	1.0	2.0	1.7	4.4	4.4	3.7
Mean	85.7	72.2	68.2	58.1	61.8	80.0	73.3	60.0
Percentile: 25 th	80.0	50.0	60.0	45.0	50.0	62.5	33.3	48.0
50 th	90.0	100.0	70.0	60.0	60.0	75.0	100.0	60.0
75 th	95.0	100.0	80.0	70.0	80.0	87.5	100.0	76.0
S.D.	15.4	32.3	18.1	16.4	19.7	16.8	36.0	19.7
Range	10- 100	0-90	0- 100	10- 100	0- 100	37.5- 100	0- 100	12- 100
% Ceiling	23.4	0.0	18.1	1.0	2.4	18.7	57.6	2.8
% Floor	0.0	9.4	0.3	0.0	0.7	0.0	12.4	0.0

PF; Physical functioning SF; Social functioning RP; Role limitation-Physical
 RE; Role limitation-Emotion MH; Mental health(MH) VT; Vitality
 BP; Bodily pain GH; General health

Table 8. Comparison of content of Medical Outcome Study and other widely used health surveys*

concepts	Long-Form	SF-36	HIE	NHP	SIP	DUKE	COOP	MHIQ	QWA
Physical functioning									
Social functioning									
Role functioning									
Psychologic distress									
Psychologic well-being									
Health perception									
Pain									
Energy/Fatigue									
Report Health transition									
Symptom/Problem									
Sleep									
Cognitive functioning									
Sexual functioning									
Health distress									
Family functioning									
Self esteem									
Eating									
Recreation/Hobbies									
Communication									
Quality of Life									

Long Form: MOS 149-Item Functional Status and Well-Being Survey

SF-36: MOS 36-Item Short Form Health Survey, HIE: Health Insurance Experiment

NHP: Nottingham Health Profile, SIP: Sickness Impact Profile, DUKE: Duke Health Profile

COOP: Dartmouth COOP Function charts, MHIQ: McMaster Health Index Questionnaire,

QWB: Quality of Well-Being Scale

*Source; cited from SF-36 Health Survey-Table 8.1 (Ware, 1993)