

# PROSPECTIVE VALIDATION OF A SHORT VERSION OF MSQOL-54 (MSQOL-29): PRELIMINARY FINDINGS



UNIVERSITÀ  
DEGLI STUDI  
DI TORINO

This study was supported by the Italian MS Society (AISM) through its foundation, FISM (Grant No. 2013/R/20)



R. Rosato<sup>1</sup>, S. Testa<sup>1</sup>, A. Bertolotto<sup>2</sup>, F. Scavelli<sup>2</sup>, P. Confalonieri<sup>3</sup>, A.M. Giovannetti<sup>3</sup>, F. Patti<sup>4</sup>, C.G. Chisari<sup>4</sup>, A. Lugaresi<sup>5</sup>, E. Pietrolongo<sup>5</sup>, M.G. Grasso<sup>6</sup>, I. Rossi<sup>6</sup>, A. Toscano<sup>1</sup>, B. Loera<sup>1</sup>, A. Giordano<sup>7</sup>, A. Solari<sup>7</sup>

1. Department of Psychology, University of Turin, Turin; 2. Clinical Neurobiology Unit, Regional Referral Multiple Sclerosis Centre (CRSM), University Hospital San Luigi Gonzaga, Orbassano (TO); 3. Unit of Neuroimmunology, Foundation IRCCS Neurological Institute C. Besta, Milan; 4. MS Centre, Neurology Clinic, University Hospital Policlinico Vittorio Emanuele, Catania; 5. Department of Neuroscience, Imaging and Clinical Sciences, G. d'Annunzio University of Chieti-Pescara, Chieti; 6. Multiple Sclerosis Unit, IRCCS S. Lucia Rehabilitation Hospital, Rome; 7. Unit of Neuroepidemiology, Foundation IRCCS Neurological Institute C. Besta, Milan; all in Italy

**Background.** We recently developed a short version of Multiple Sclerosis Quality Of Life-54 (MSQOL-54) using factor analysis and item response theory [1]. The short version, named MSQOL-29 (25 items grouped in 7 subscales, plus 4 single items) is also available in electronic, self-administered form, with automatic scoring (eMSQOL-29).

**Objective.** To prospectively assess the clinical and metric properties of the eMSQOL-29.

**Methods.** Patients from 5 Italian MS centers completed (in citation order) eMSQOL-29, Hospital Anxiety and Depression Scale (HADS) [2], Functional Assessment of Multiple Sclerosis (FAMS) [3], and European Quality of life Dimensions-3L (EQ-5D-3L) [4]. The neurologist administered the Extended Disability Status Scale (EDSS), the symbol digit modality test (SDMT) [5] and recorded patient general and clinical information. Correlations were assessed using Pearson's r. Cronbach's alpha and confirmatory factor analysis (CFA) of MSQOL-29 subscales were also performed

**Results (I).** Between September 2015 and May 2016, 623 MS patients were assessed (mean age 44.3 years; 68% women) in 5 Italian clinical centers. Median EDSS score was 2.5 (range 0–9.0), mean SDMT was 46.7 (SD=15.3, 46.9% had score <49). Mean FAMS score was 125.3 (SD=26.9); mean HADS-Anxiety score was 6.0 (SD=4.0, 28.2% had score >8), mean HADS-Depression score was 4.2 (SD=3.8, 15.8% had score >8); and mean EQ-5D-3L score was 0.8 (SD=0.2) (Table 1). 582 patients were included in the validation analyses, 41 were excluded because of incomplete data

**Results (III).** CFA of MSQOL-29 multi-item subscales showed good overall fit (RMSEA=0.033; CFI=1.00; SRMR=0.041) (Figure 2).

Correlations between the MSQOL-29 and FAMS subscales addressing similar domains ranged from 0.60 (Energy vs Emotional Wellbeing) to 0.86 (Physical Function vs Mobility); Social Function have instead low correlation with Family/Social Well-Being (0.38). Correlation of MSQOL-29 Emotional Wellbeing with HADS-Anxiety and HADS-Depression was respectively: -0.61 and -0.57. Correlation of MSQOL-29 Cognitive Function with SDMT was 0.26 (Table 3)

Figure 1. Study flow chart

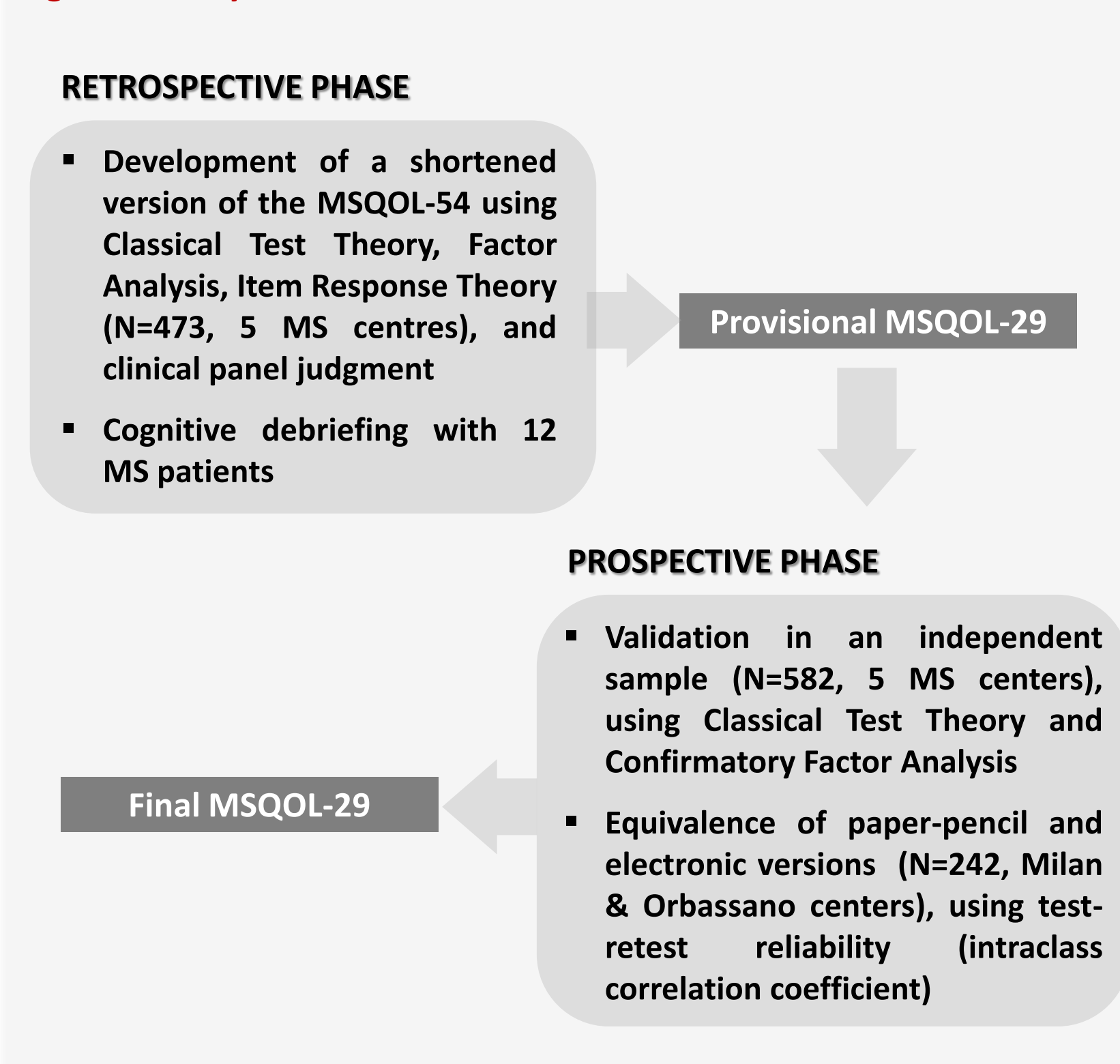


Table 2. Summary statistics of MSQOL-29 subscale scores

MSQOL-29 subscales	Valid cases	Mean	SD	Q1	Q3	Cronbach alpha	Min score (%)	Max score (%)
Physical Function	582	66.8	35.7	41.7	100	0.88	9.8	36.8
Bodily Pain	582	76.6	25.1	60.0	100	0.89	0.5	36.9
Emotional Wellbeing	581	65.0	18.8	53.3	76.7	0.88	0.2	2.8
Energy	581	52.0	20.6	41.7	66.7	0.88	1.2	1.0
Cognitive Function	582	67.8	22.7	53.3	85.0	0.89	0.2	12.9
Health Distress	581	74.5	23.0	60.0	93.3	0.88	1.2	20.3
Sexual Function	581	79.5	29.6	66.7	100	0.89	5.5	54.7
Sexual Function <sup>§</sup>	309	88.0	19.6	83.4	100	0.90	0.3	59.2
Health Perceptions*	581	48.8	30.7	33.3	66.7	-	18.9	10.8
Social Function*	579	63.5	27.4	50.0	75.0	-	4.2	22.1
Overall Quality of Life*	549	66.1	17.3	50.0	80.0	-	0.7	0.9
Change in Health*	582	52.0	23.7	50.0	75.0	-	4.5	9.3

\*single item  
§ Values of patients who completed all the four questions about sexual functioning.  
SD, standard deviation; Q1, lower quartile; Q3, upper quartile.

**Results (II).** Three of the four Sexual Function items were preceded by a filter question, and were filtered out in 273 patients (47%). Of the remaining items, missing replies ranged from 2.4% (item 1) to 8% (item 29). Multi-item subscales with maximum score >10% were Physical Function, Sexual Function, Cognitive Function, Pain and Health Distress. No multi-item subscales had minimum score >10%. Cronbach alpha showed good values (Table 2)

Table 1. Characteristics of study participants by MS centre

Characteristic	Milan (n=100)	Orbassano (n=147)	Catania (n=166)	Rome (n=110)	Chieti (n=100)	Total (n=623)
Women <sup>1</sup>	66 (66.0)	94 (63.9)	120 (72.3)	78 (70.9)	66 (66.0)	424 (68.1)
Age (years) <sup>2</sup>	39.2, 9.4 (22-59)	46.9, 12.2 (21-77)	42.0, 10.6 (20-69)	51.8, 11.2 (28-78)	40.9, 9.0 (22-61)	44.3, 11.5 (20-78)
Years from diagnosis <sup>3,*</sup>	7 (1-31)	11 (1-47)	7 (1-32)	18 (1-42)	7 (1-26)	10 (1-47)
EDSS score <sup>3,*</sup>	1.5 (0.0-8.0)	2.0 (0.0-7.5)	2.0 (0.0-7.0)	6.0 (1.0-9.0)	2.5 (0.0-6.5)	2.5 (0.0-9.0)
SDMT score <sup>2,*</sup>	51.0, 14.2 (17.0-93.0)	44.5, 14.7 (0.0-84.0)	50.3, 11.2 (19.0-71.0)	32.5, 15.1 (1.0-68.0)	56.4, 10.7 (28.0-81.0)	46.7, 15.3 (0.0-93.0)
HADS-Anxiety <sup>2,^</sup>	7.0, 4.1 (0.0-17.0)	6.5, 4.1 (0.0-19.0)	4.5, 3.4 (0.0-11.0)	6.0, 4.2 (0.0-18.0)	6.7, 3.8 (0.0-14.0)	6.0, 4.0 (0.0-19.0)
HADS-Depression <sup>2,^</sup>	4.2, 3.8 (0.0-19.0)	3.9, 3.3 (0.0-15.0)	3.8, 3.8 (0.0-13.0)	4.1, 3.8 (0.0-16.0)	5.4, 4.2 (0.0-18.0)	4.2, 3.8 (0.0-19.0)
FAMS Total score <sup>2,†</sup>	131.3, 29.3 (37.0-176.0)	126.8, 25.4 (49.0-169.0)	126.5, 26.2 (49.0-169.0)	113.5, 27.0 (45.0-163.0)	128.0, 24.2 (77.0-174.0)	125.3, 26.9 (37.0-176.0)
EQ-5D-3L <sup>2,‡</sup>	0.9, 0.1 (0.0-1.00)	0.8, 0.2 (-0.1-1.00)	0.9, 0.1 (0.7-1.00)	0.7, 0.3 (-0.4-1.00)	0.9, 0.1 (0.3-1.00)	0.8, 0.2 (-0.4-1.00)

<sup>1</sup>Number (%); <sup>2</sup>Mean, standard deviation (min-max); <sup>3</sup>Median (min-max); \*Valid cases N=606; ^ Valid cases N=614; † Valid cases N=620

Table 3. Pearson correlations between MSQOL-29 subscales and FAMS, HADS, EQ-5D-3L and SDMT

MSQOL-29 Subscales	FAMS						HADS		EQ-5D-3L	SDMT
	Mobility	Symptoms	Emotional Wellbeing	General Contentment	Thinking/Fatigue	Family/Social Well-Being	Anxiety	Depression		
Physical Function	0.86	0.42	0.60	0.54	0.53	0.24	-0.35	-0.45	0.64	0.59
Bodily Pain	0.48	0.64	0.43	0.32	0.43	0.20	-0.46	-0.37	0.43	0.22
Emotional Wellbeing	0.46	0.38	0.63	0.57	0.49	0.39	-0.61	-0.57	0.37	0.24
Energy	0.64	0.51	0.60	0.55	0.61	0.28	-0.54	-0.54	0.51	0.32
Cognitive Function	0.39	0.42	0.42	0.45	0.78	0.35	-0.47	-0.52	0.22	0.26
Health Distress	0.58	0.44	0.71	0.60	0.50	0.35	-0.59	-0.56	0.43	0.31
Sexual Function	0.41	0.27	0.44	0.40	0.43	0.26	-0.40	-0.42	0.29	0.24
Health Perceptions	0.55	0.36	0.53	0.44	0.47	0.23	-0.39	-0.40	0.40	0.27
Social Function	0.59	0.37	0.57	0.51	0.52	0.38	-0.45	-0.50	0.42	0.36
Overall Quality of Life	0.63	0.45	0.65	0.65	0.62	0.44	-0.52	-0.63	0.48	0.36
Change in Health	0.46	0.39	0.41	0.33	0.45	0.16	-0.28	-0.33	0.36	0.28

MSQOL-29, Multiple Sclerosis Quality Of Life-29; FAMS, Functional Assessment of Multiple Sclerosis; HADS, Hospital Anxiety and Depression Scale; EQ-5D-3L, European Quality of life Dimensions-3L; SDMT, symbol digit modality test

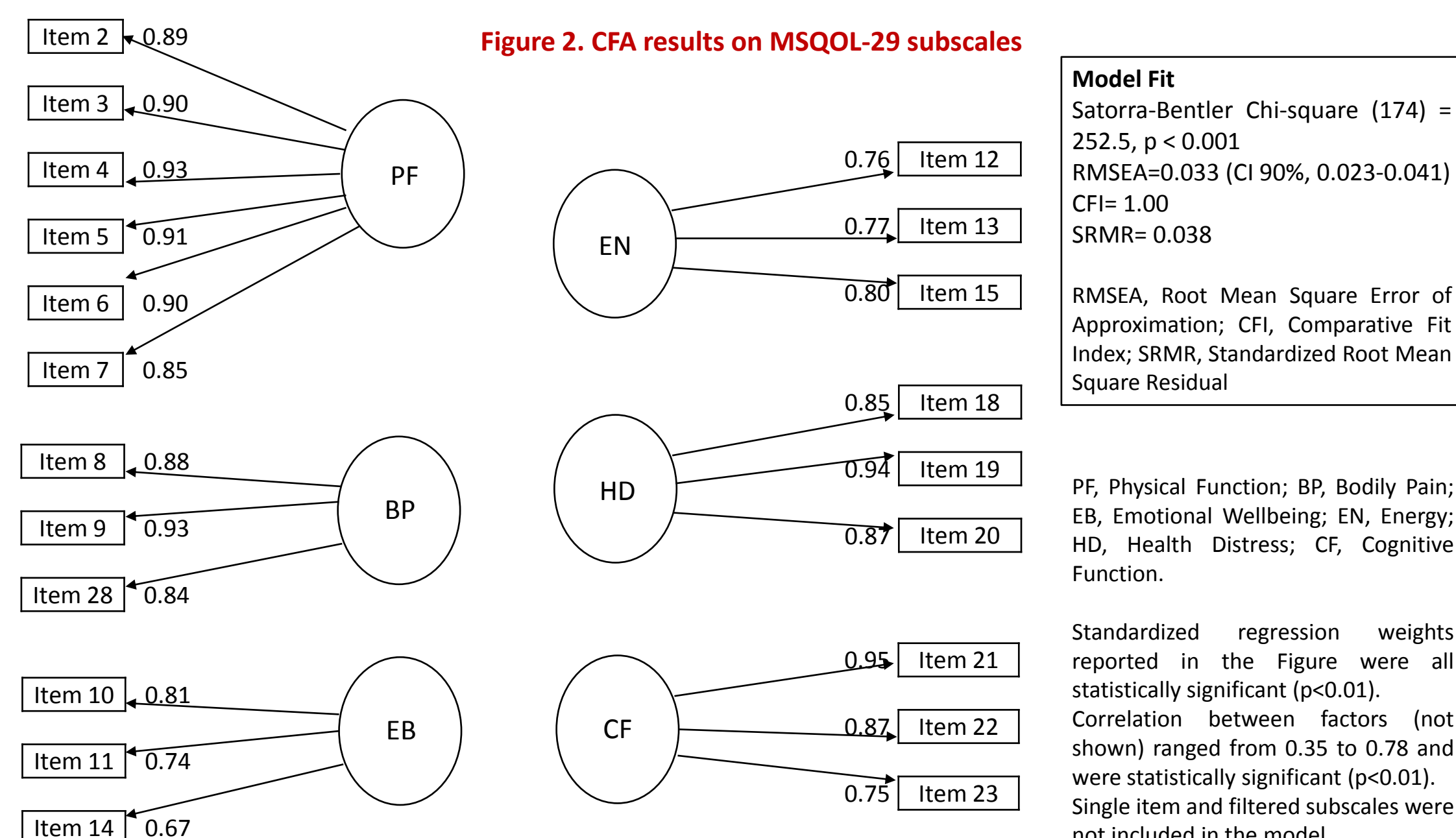
## Conclusions

MSQOL-29 showed good internal consistency, factor structure, and no floor effect, while most subscales had some ceiling effect. Concurrent validity was good except for low correlation for cognitive and social domain. Analysis of MSQOL-29 composite score(s) is ongoing

## REFERENCES

- Rosato R, Testa S, Bertolotto A, et al. Development of a Short Version of MSQOL-54 Using Factor Analysis and Item Response Theory. *PLoS One* 2016;11:e0153466. doi: 10.1371/journal.pone.0153466
- Costantini M, Musso M, Viterbori P, et al. *Support Care Cancer* 1999; 7: 121-7
- Drake AS, Weinstock-Guttman D, Morrow SA, et al. Psychometric and normative data for the Multiple Sclerosis Functional Composite: Replacing the PASAT with the Symbol Digit Modalities Test. *Mult Scler* 2010; 16: 228-37
- Scalone L, Cortesi PA, Ciampichini R, et al. Italian population-based values of EQ-5D health states. *Value Health* 2013; 16: 814-22
- Cella DF, Dineen K, Arnason B, et al. Validation of the functional assessment of multiple sclerosis quality of life instrument. *Neurology* 1996; 47: 129-39

Figure 2. CFA results on MSQOL-29 subscales



**Model Fit**  
Satorra-Bentler Chi-square (174) = 252.5, p < 0.001  
RMSEA=0.033 (CI 90%, 0.023-0.041)  
CFI= 1.00  
SRMR=0.038

RMSEA, Root Mean Square Error of Approximation; CFI, Comparative Fit Index; SRMR, Standardized Root Mean Square Residual

Standardized regression weights reported in the Figure were all statistically significant (p<0.01). Correlation between factors (not shown) ranged from 0.35 to 0.78 and were statistically significant (p<0.01). Single item and filtered subscales were not included in the model.