Comparing the psychometric properties of the EQ-5D-5L between mental and somatic chronic patients populations

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Background

The validity and reliability of the EQ-5D-5L in comparison with the standard 3L has been tested through the analysis of psychometric properties making use of different samples of patients. However, it is likely that the condition of the illness may affect the power of the 5L version with respect to the 3L one

Objective

Here we report on parallel testing of EQ-5D-5L and 3L administered to a sample of chronic patients of both somatic and mental illness. The aim of this study is to check some psychometric properties in both subsamples

EQ-5D description and uses

About EQ-5D

EQ-5D™ is a standardised instrument for use as a measure of health outcome.

Applicable to a wide range of health conditions and treatments, it provides a simple descriptive profile and a single index value for health status.

Simple and quick

EQ-5D is primarily designed for self-completion by respondents and is ideally suited for use in postal surveys, in clinics and face-to-face interviews. It is cognitively simple, taking only a few minutes to complete. Instructions to respondents are included in the questionnaire.

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EQ-5D-5L

Health Questionnaire

English version for the UK

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Under each heading, please tick the ONE box that best describes your health TODAY

MOBILITY
I have no problems in walking about ☐
I have slight problems in walking about ☐
I have moderate problems in walking about ☐
I have severe problems in walking about ☐
I am unable to walk about ☐

SELF-CARE
I have no problems washing or dressing myself ☐
I have slight problems washing or dressing myself ☐
I have moderate problems washing or dressing myself ☐
I have severe problems washing or dressing myself ☐
I am unable to wash or dress myself ☐

USUAL ACTIVITIES *(e.g. work, study, housework, family or leisure activities)*
I have no problems doing my usual activities ☐
I have slight problems doing my usual activities ☐
I have moderate problems doing my usual activities ☐
I have severe problems doing my usual activities ☐
I am unable to do my usual activities ☐

PAIN / DISCOMFORT
I have no pain or discomfort ☐
I have slight pain or discomfort ☐
I have moderate pain or discomfort ☐
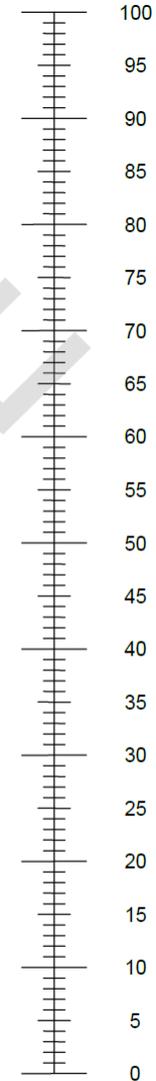I have severe pain or discomfort ☐
I have extreme pain or discomfort ☐

ANXIETY / DEPRESSION
I am not anxious or depressed ☐
I am slightly anxious or depressed ☐
I am moderately anxious or depressed ☐
I am severely anxious or depressed ☐
I am extremely anxious or depressed ☐

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- We would like to know how good or bad your health is TODAY.

- This scale is numbered from 0 to 100.

- 100 means the <u>best</u> health you can imagine.
  0 means the <u>worst</u> health you can imagine.

- Mark an X on the scale to indicate how your health is TODAY.

- Now, please write the number you marked on the scale in the box below.

YOUR HEALTH TODAY =

The best health
you can imagine

100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0

The worst health
you can imagine

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EQ-5D
Cuestionario
de Salud

Su estado de salud, hoy

MOVILIDAD

- No tengo problemas para caminar ☐
- Tengo problemas leves para caminar ☐
- Tengo problemas moderados para caminar ☐
- Tengo problemas graves para caminar ☐
- No puedo caminar ☐

AUTO-CUIDADO

- No tengo problemas para lavarme o vestirme ☐
- Tengo problemas leves para lavarme o vestirme ☐
- Tengo problemas moderados para lavarme o vestirme ☐
- Tengo problemas graves para lavarme o vestirme ☐
- No puedo lavarme o vestirme ☐

ACTIVIDADES COTIDIANAS

(p. ej., trabajar, estudiar, hacer las tareas domésticas, actividades familiares o actividades durante el tiempo libre)

- No tengo problemas para realizar mis actividades cotidianas ☐
- Tengo problemas leves para realizar mis actividades cotidianas ☐
- Tengo problemas moderados para realizar mis actividades cotidianas ☐
- Tengo problemas graves para realizar mis actividades cotidianas ☐
- No puedo realizar mis actividades cotidianas ☐

DOLOR / MALESTAR

- No tengo dolor ni malestar ☐
- Tengo dolor o malestar leve ☐
- Tengo dolor o malestar moderado ☐
- Tengo dolor o malestar fuerte ☐
- Tengo dolor o malestar extremo ☐

ANSIEDAD / DEPRESIÓN

- No estoy ansioso ni deprimido ☐
- Estoy levemente ansioso o deprimido ☐
- Estoy moderadamente ansioso o deprimido ☐
- Estoy muy ansioso o deprimido ☐
- Estoy extremadamente ansioso o deprimido ☐

Su estado de salud, hoy
Escala Visual Analógica

Nos gustaría conocer lo buena o mala que es su salud HOY.

- La escala está numerada del 0 al 100.

  100 (cien) representa la mejor salud que usted se pueda imaginar.

  0 (cero) representa la peor salud que usted se pueda imaginar.

- Marque con una X en la escala para indicar cuál es su estado de salud HOY.

- Ahora, en la casilla que encontrará a continuación escriba el número que ha marcado en la escala.

SU SALUD HOY →

La mejor salud que ud. se pueda imaginar

100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0

La peor salud que ud. se pueda imaginar

Methods

We check for the usual psychometric properties: feasibility, (in)consistency, ordinality (and transitivity), informativity, face validity and convergent validity

Also, we perform new analysis for checking transitivity and the Cronbach-α for convergent validity.

Finally, we proposed a complementary way for looking at the property of informativity through three different indexes (effective, absolute and overall) based on the statistical discriminatory power

Methods

The potential added value of EQ-5D-5L is studied looking at the following psychometric properties:

1. **Inconsistency**: For $d_i(x,y)$, where d_i represents each of the health dimensions, x the response the 3L questionnaire and y the response in the 5L, there are 8 inconsistent possible subgroups*: $d_i(1,3), d_i(1,4), d_i(1,5), d_i(2,1), d_i(2,5), d_i(3,1), d_i(3,2)$ and $d_i(3,3)$*

2. **Ordinality**: Individuals are ordered and evenly assigned to each of the 7 consistent subgroups, according to individuals' VAS reported values in each dimension. Then, a test is performed for strong and weak transitivity, comparing means and medians of the 5L values, respectively, between subgroups in each dimension, in order to check if worse health states show higher 5L means and medians than better ones

3. **Informativity**: The gains in terms of information captured by the instrument in each of the dimensions through the Shannon Index and Shannon Eveness Index

4. **Face Validity**: Which of the EQ-5D versions is simpler for individuals to answer and which one better reflects the individuals' health status?

5. **Other**: Percentage of missing answers in the two questionnaires; Spearman's Coefficient of Correlation; and, number of 11111 health state in each of the questionnaires

Methods

Respondents completed a questionnaire ordered as follows:

1st EQ-5D-5L

2nd Socio-demographic questions

3rd EQ-5D-3L

4th Visual Analogue Scale (VAS)

5th Two questions on easiness of response and ability to reflect the respondent's health state

Descriptive analysis

We have a total of 1002 questionnaires finally collected

444 (46.25%) chronic mental patients, 516 (53.75%) somatic patients, and 42 of unknown illness (dropped)

Mean VAS for the full sample is 60.93: difference is significant between mental (64.42) and somatic (56.83)

Although we are considering only chronic patients, lower levels (5L-1 and 5L-2) are systematically more often chosen than higher ones.

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Proportion of "no problems"

The complete "no problems" health profile is more frequent in the 3L than in the 5L, for both subsamples. By dimensions we also observe more 1s in the 3L questionnaire

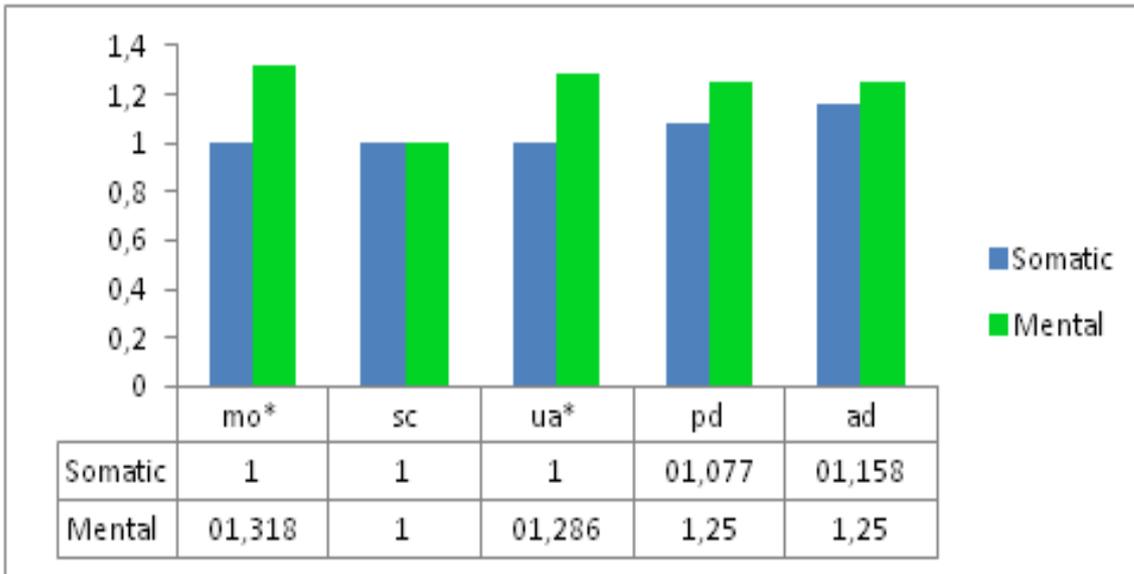|	Full Sample			Somatic			Mental		
	3L	5L	Change (%)	3L	5L	Change (%)	3L	5L	Change (%)
11111	14.98	12.6	-15.89***	14	12.4	-11.43**	16.1	12.84	-20.25***
Mo	55.3	52.29	-5.44***	42.35	38.37	-9.4***	70.07	68.47	-2.28
Sc	68.82	67.26	-2.27*	63.24	59.61	-5.74***	75.23	76.13	1.20
Ua	48.99	44.99	-8.16***	50.3	45.83	-8.89***	47.5	44.02	-7.33**
Pd	31.36	27.9	-11.03***	23.47	18.48	-21.26***	40.45	38.83	-4.00
Ad	35.74	31.17	-12.79***	42.15	37.04	-12.12***	28.41	24.38	-14.19***

* Difference between 3L and 5L significant at p<.1

** Difference between 3L and 5L significant at p<.05

*** Difference between 3L and 5L significant at p<.01

Feasibility

		5L				3L			
		% Missing	Std. Err.	[95% Conf. Interval]		% Missing	Std. Err.	[95% Conf. Interval]	
Full Sample	Profile **	0%	0	0%	0%	1.25%	0.00359	0.55%	1.95%
	Partial profiles **	0.94%	0.00311	0.33%	1.55%	2.50%	0.00504	1.51%	3.49%
	mo **	0%	0	0%	0%	1.67%	0.00413	0.86%	2.48%
	sc **	0%	0.00104	0%	0%	1.46%	0.00387	0.70%	2.22%
	ua **	0.21%	0.00147	-0.08%	0.50%	1.56%	0.004	0.78%	2.35%
	pd **	0.31%	0.00180	-0.04%	0.67%	1.35%	0.00373	0.62%	2.09%
	ad **	0.42%	0.00208	0.01%	0.82%	1.77%	0.00426	0.94%	2.61%
Somatic	Profile **	0%	0	0%	0%	1.74%	0.00577	0.61%	2.88%
	Partial profiles *	1.36%	0.00510	0.36%	2.36%	3.49%	0.00809	1.90%	5.08%
	mo **	0%	0.00000	0%	0%	2.52%	0.00691	1.16%	3.88%
	sc **	0%	0.00194	0%	1%	1.94%	0.00607	0.74%	3.13%
	ua **	0.19%	0.00194	-0.19%	0.57%	2.13%	0.00636	0.88%	3.38%
	pd *	0.39%	0.00274	-0.15%	0.93%	1.74%	0.00577	0.61%	2.88%
	ad **	0.58%	0.00335	-0.08%	1.24%	2.52%	0.00691	1.16%	3.88%
Mental	Profile	0%	0	0%	0%	0.68%	0.00389	-0.09%	1.44%
	Partial profiles *	0.45%	0.00318	-0.17%	1.08%	1.35%	0.00549	0.27%	2.43%
	Mo	0%	0	0%	0%	0.68%	0.00389	-0.09%	1.44%
	sc*	0%	0	0%	0%	0.90%	0.00449	0.02%	1.78%
	Ua	0.23%	0.00225	-0.22%	0.67%	0.90%	0.00449	0.02%	1.78%
	Pd	0.23%	0.00225	-0.22%	0.67%	0.90%	0.00449	0.02%	1.78%
	Ad	0.23%	0.00225	-0.22%	0.67%	0.90%	0.00449	0.02%	1.78%

Inconsistencies

	mo*	sc	ua*	pd	ad
Somatic	1	1	1	01,077	01,158
Mental	01,318	1	01,286	1,25	1,25

Mental patients commit more inconsistencies and of higher level

		N	Proportion	Std. Err.	[95% Conf.Interval]	
Full Sample	Consistent	948	85.23%	0.01153	82.97%	87.49%
	Inconsistent		14.77%	0.01153	12.51%	17.03%
Somatic	Consistent	507	87.38%	0.01476	84.48%	90.27%
	Inconsistent		12.62%	0.01476	9.73%	15.52%
Mental	Consistent	441	82.77%	0.01800	79.23%	86.30%
	Inconsistent		17.23%	0.01800	13.70%	20.77%

Ordinality

Weak transitivity is satisfied in all dimensions for both subsamples. However the property of strong transitivity is not satisfied for the dimensions "mobility", "usual activities" and "pain-discomfort" for mental care subsample. On the contrary, for the somatic subsample, all dimensions hold strong transitivity

	3L	VAS subgroup	SOMATIC N	VAS mean	VAS p50	5L mean	5L p50	WEAK	STRONG	MENTAL N	VAS mean	VAS p50	5L mean	5L p50	WEAK	STRONG
MOBILITY	1	Upper	98	85.82	85	1.08	1	YES	YES	141	81.30	80	1.08	1	YES	YES
		Lower	112	62.65	65	1.16	1			160	45.73	50	1.09	1		
	2	Upper	66	78.41	78.5	2.42	2	YES	YES	40	71.25	70	2.43	2	YES	NO
		Middle	118	63.69	65	2.57	2			33	50.55	50	2.39	2		
		Lower	97	39.76	45	2.91	3			48	21.25	22.5	2.69	3		
	3	Upper	3	41.67	40	3.67	4	YES	YES	1	5.00	5	1.00	1	YES	YES
		Lower	5	14.00	10	4.60	5			5	0.00	0	2.60	2		
SELF-CARE	1	Upper	155	83.09	80	1.03	1	YES	YES	146	81.23	80	1.04	1	YES	YES
		Lower	162	59.59	62	1.14	1			174	46.53	50	1.06	1		
	2	Upper	43	74.12	71	2.19	2	YES	YES	32	70.88	70	1.94	2	YES	YES
		Middle	59	60.68	60	2.36	2			35	44.86	45	2.20	2		
		Lower	76	36.91	40	2.80	3			37	13.00	10	2.62	3		
	3	Upper	2	62.50	62.5	4.00	4	YES	YES	1	50.00	50	4.00	4	YES	YES
		Lower	6	29.17	37.5	4.17	4			2	0.00	0	4.50	4.5		
USUAL ACTIVITIES	1	Upper	110	85.55	85	1.04	1	YES	YES	1	4.00	4	1.01	1	YES	YES
		Lower	141	64.24	70	1.21	1			2	4.50	4.5	1.35	1		
	2	Upper	67	75.39	75	2.30	2	YES	YES	50	73.42	70	2.30	2	YES	YES
		Middle	73	60.84	60	2.34	2			70	53.11	50	2.59	2		
		Lower	88	41.98	45	2.75	3			63	27.40	30	2.73	3		
	3	Upper	11	47.27	40	4.45	5	YES	YES	19	36.05	35	4.21	4	YES	NO
		Lower	11	13.27	10	4.45	5			20	6.00	5	3.95	4		

Informativity

Shannon Index (H') and Shannon Eveness Index (J'): increase in 4 of 5 dimensions for somatic patients, but decrease in 4 of 5 dimensions for mental patients. However, in the relevant dimensions there is a gain

		5L			3L			
		H'	MaxH'	J'	H'	MaxH'	J'	Change
SOMATIC	mo	1.89	2.32	0.81	1.09	1.58	0.69	15.30%
	sc	1.55	2.32	0.67	1.04	1.58	0.66	1.14%
	ua	1.84	2.32	0.79	1.21	1.58	0.77	2.97%
	pd	1.90	2.32	0.82	1.15	1.58	0.73	10.80%
	ad	1.80	2.32	0.78	1.23	1.58	0.78	-0.34%
MENTAL	mo	1.37	2.32	0.59	0.96	1.58	0.61	-3.00%
	sc	1.13	2.32	0.49	0.85	1.58	0.54	-10.83%
	ua	1.98	2.32	0.85	1.35	1.58	0.86	-0.48%
	pd	2.01	2.32	0.87	1.38	1.58	0.88	-1.15%
	ad	2.21	2.32	0.95	1.45	1.58	0.92	3.41%

Usefulness

Informativity may be conditioned to the number of levels of the instrument itself, to correlations between dimensions and VAS, or to overlap between levels (sometimes we may not be able to allocate different mean VAS for different levels). We propose this new property to control Informativity from sample characteristics and instrument features.

	mo	sc	ua	pd	Ad	OI	mo	sc	Ua	pd	ad	OI
1	73.63	71.66	73.76	79.11	71.65		73.46	71.08	73.58	77.18	71.16	
2	65.37	60	63.38	67.47	64.92		58.89	53.77	57.83	62.46	60.59	
3	56.27	49.58	53.85	57.37	55.46		24.37	37.5	30.27	43.35	48.54	
4	45.77	37.21	38.48	47.93	45.67							
5	12.5	30	34	24	44.17							
Overlap	0	2 (3,5)(4,5)	1 (4,5)	0	3 (3,4)(3,5)(4,5)		0	0	0	0	0	
Not Over	10	8	9	10	7		3	3	3	3	3	
I^k	1	0.80	0.9	1	0.7	3.56	1	1.00	1	1	1	2.49
A^k	1.61	1.29	1.45	1.61	1.13		1.10	1.10	1.10	1.10	1.10	
Correlation with VAS	-0.4918	-0.5199	-0.562	-0.527	-0.392		-0.449	-0.471	-0.5367	-0.467	-0.345	

Somatic

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Usefulness

Mental

	mo	sc	Ua	pd	Ad	OI	mo	sc	ua	pd	ad	OI
1	61.33	61.71	71.51	70.08	74.09		62.40	62.36	70.26	70.26	73.59	
2	51.36	48.28	54.02	60.03	65.72		45.77	41.53	49.81	53.70	57.58	
3	48.00	35.00	45.01	47.91	52.90		0.83	16.67	20.64	23.33	29.14	
4	17.69	26.36	28.56	28.64	37.00							
5	51.25	2.50	27.84	19.15	22.48							
Overlap	5 (2,3)(1,5)(2,5)(3,5)(4,5)	4 (2,3)(3,4)(3,5)(4,5)	1 (4,5)	1 (4,5)	0		0	1 (2,3)	0	0	0	
Not Over	5	6	9	9	10		3	2	3	3	3	
I^k	0.5	0.60	0.9	0.9	1	3.23	1	0.67	1	1	1	2.48
A^k	0.80	0.97	1.45	1.45	1.61		1.10	0.73	1.10	1.10	1.10	
Correlation with VAS	-0.2861	-0.3458	-0.603	-0.552	-0.617		-0.336	-0.354	-0.5804	-0.527	-0.577	

Usefulness

	Change Somatic						Change Mental					
	mo	sc	ua	pd	ad	OI	mo	sc	ua	pd	ad	OI
I^k	0,0%	-20,0%	-10,0%	0,0%	-30,0%		-50,0%	-10,0%	-10,0%	-10,0%	0,0%	
A^k	46,5%	17,2%	31,8%	46,5%	2,5%		-26,8%	31,8%	31,8%	31,8%	46,5%	
OI						43,1%						30,3%

General gain in usefulness when we control by overlaps, correlations and the variation of levels is observed for both, somatic and mental patients

Face validity

The distribution of somatic-inconsistent patients and of mental-inconsistent ones look so similar that we cannot reject that these are the same, i.e. we can assume that their distribution of responses are the same. However, we can reject the equality of distributions (p<.01) when we look only at consistent patients
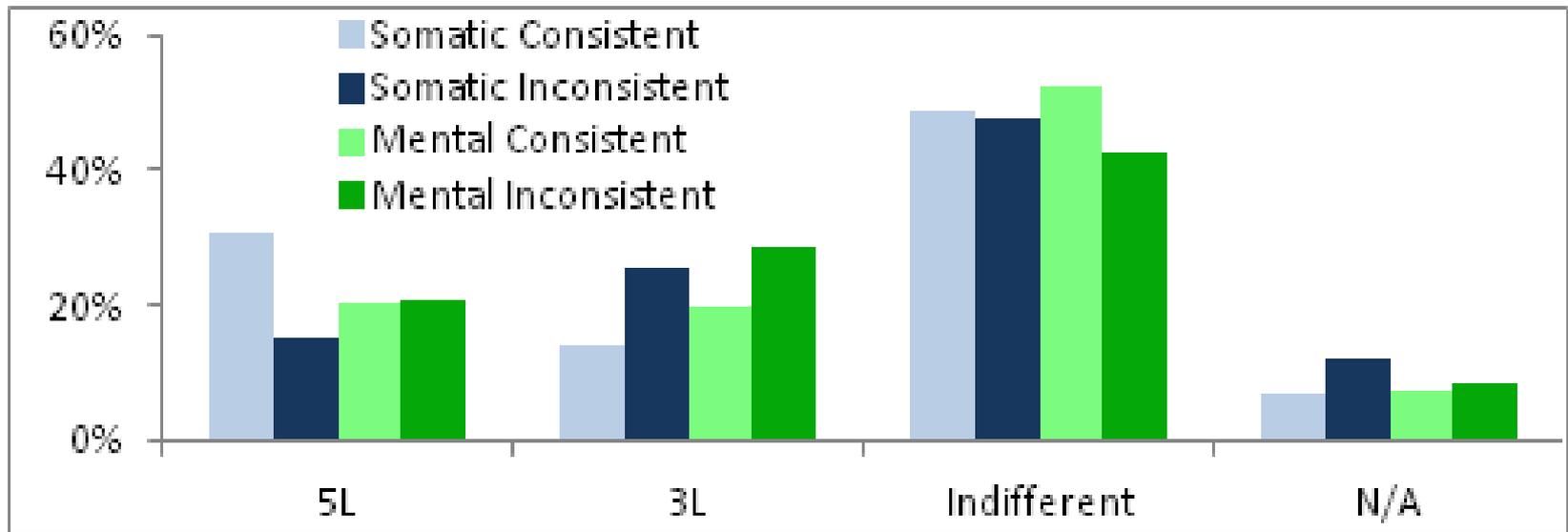
Results

In all dimensions, it seems that somatic patients take more advantage of the extra levels introduced by the EQ-5D-5L

This group reduces to a greater extent the missing response rate, commit less (and of lower importance) inconsistencies, get a higher correlation of the 5L scale and the VAS within the 3L levels, complements better the dimensions to get an overall score (measured through the Cronbach's alpha), reduces in a more significant way the "no problem" response and the Informativity gain is also superior (for both the Shannon Evenness Index and our Absolute Index).

This higher performance of the EQ-5D-5L on somatic patients is endorsed by a higher preference of somatic patients toward the 5L version of the questionnaire than to the 3L one

Conclusion

Results show the suitability of the 5L version in both subsamples, but it is much more effective for somatic patients.

These subsamples' differences may be of concern when aggregating and comparing different data

Thank you very much!

Comments and suggestions are welcome

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