Shortening of the Burnout Assessment Tool (BAT) using content and Rasch analysis

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Aims

- To shorten the original 23-item version of the BAT to a version that includes only 12 items, 3 items for each subscale
- To evaluate construct validity of the BAT12
- To evaluate whether the items of the BAT12 - like those of the BAT23 - can be combined into a single burnout score
- To evaluate possible differential item functioning of the BAT12 regarding gender, age and country

Study design and population

- Original Dutch version of the BAT
- Representative samples or working populations in NL and FL
- Cross-validation strategy (two random samples, 800 respondents each)
- Qualitatative (subject matter analysis) and quantitative (Rasch analysis) methods

Methods

Subject matter analysis

1) no problems with the item
2) wording errors
3) wording similar to one or more other items
4) item measures the same characteristic as one or more other items
5) item is an unclear measure of the construct

Rasch analysis

Item fit indicators:

1) item fit residuals
2) threshold ordering
3) residual correlations
4) differential item functioning (DIF)

Model fit indicators:

1) the item-trait interaction statistic
2) person and item fit residuals
3) person separation index (PSI) (internal consistency)
4) dimensionality

Shortening proceduce

- Iteratively, one item at a time from each subscale (BAT23, BAT19…)
- Elimination of items based on item fit indicators and/or subject matter analysis
- Additional criteria:

a) the spread of the items along the burnout continuum

b) meaning and the content of the items (theoretically important items)

Results - the BAT12

Exhaustion

EX1	At work, I feel mentally exhausted
EX3	After a day at work, I find it hard to recover my energy
EX4	At work, I feel physically exhausted

Mental distance

MD1	I struggle to find any enthusiasm for my work
MD3	I feel a strong aversion towards my job
MD5	I'm cynical about what my work means to others

Cognitive impairment

CI1	At work, I have trouble staying focused
CI4	When I'm working, I have trouble concentrating
CI5	I make mistakes in my work because I have my mind on other thing

Emotional impairment

EI1	At work, I feel unable to control my emotions
EI2	I do not recognize myself in the way I react emotionally at work
EI5	At work I may overreact unintentionally

Results – construct validity of the BAT12

BAT12 results – item fit statistics

Sample 1

Ordered thresholds all items

Out of bound residuals

EX3

MD1, MD3

EI5

DIF

Age: none

Gender: MD3

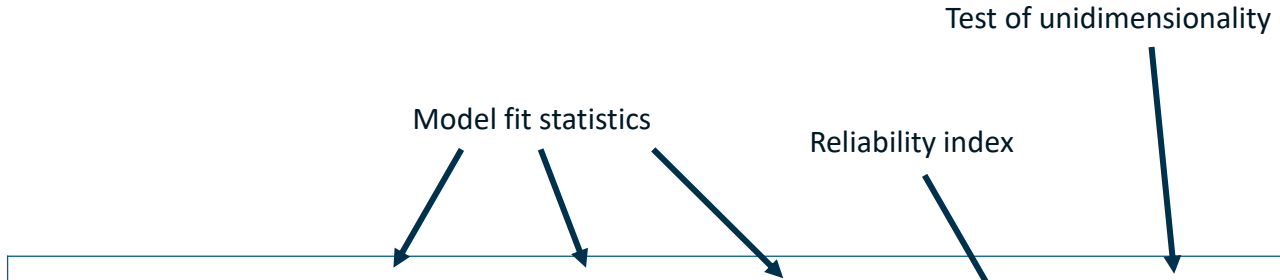
Country: none

Problems with local dependency

BAT12 results – residual correlation matrix

Item	EX1	EX3	EX4	MD1	MD3	MD5	CI1	CI4	CI5	EI1	EI2	EI5
EX1	1.00											
EX3	0.16	1.00										
EX4	0.21	0.19	1.00									
MD1	-0.10	-0.17	-0.12	1.00								
MD3	-0.02	-0.10	-0.08	0.28	1.00							
MD5	-0.12	-0.08	-0.14	0.21	0.11	1.00						
CI1	-0.15	-0.24	-0.19	-0.07	-0.16	-0.18	1.00					
CI4	-0.15	-0.26	-0.16	-0.14	-0.20	-0.16	0.42	1.00				
CI5	-0.23	-0.21	-0.23	-0.16	-0.19	-0.22	0.20	0.27	1.00			
EI1	-0.20	-0.15	-0.25	-0.23	-0.19	-0.20	-0.13	-0.13	-0.06	1.00		
EI2	-0.22	-0.21	-0.20	-0.22	-0.14	-0.20	-0.16	-0.14	0.01	0.34	1.00	
EI5	-0.24	-0.18	-0.23	-0.21	-0.22	-0.18	-0.18	-0.16	-0.04	0.36	0.28	1.00

BAT12 results – model fit statistics



	Item residual		Person residual		Chi square			Unidemensionality
	Mean	**SD**	**Mean**	**SD**	**Value**	**P**	**PSI**	**Test % (95% CI)**
BAT 23 items*	-0.15	2.91	-0.86	2.86	416.51	<0.0001	0.95	20.9 (18.2;23.9)
BAT12 (sample 1)	-0.19	2.32	-0.78	2.07	159.74	0.0009	0.91	13.0 (10.8;15.6)
BAT12 (sample 2)	-0.07	1.96	-0.67	1.85	163.31	0.0004	0.90	14.1 (11.8;16.8)
Ideal values	***0.0***	***<1.4***	***0.0***	***<1.4***		***>0.01***		***(LCI <5%)***

*The BAT23 results are previously published in Hadžibajramović, E., W. Schaufeli, and H. De Witte, *A Rasch analysis of the Burnout Assessment Tool (BAT).* PLOS ONE, 2020. **15**(11): p. e0242241.

Table 1**.** Model fit statistics, subsample 1 (n=800)

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	Item residual		Person residual		Chi square		Unidimensionality	
Analysis name	**Mean**	**SD**	**Mean**	**SD**	**Value**	**p**	**PSI**	**Test % (95% CI)**
BAT 23 items*	-0.15	2.91	-0.86	2.86	416.51	<0.0001	0.95	20.9 (18.2;23.9)
BAT19	-0.12	2.55	-0.85	2.46	314.34	<0.0001	0.94	15.8 (13.4;18.6)
BAT15a	-0.12	2.32	-0.80	2.26	192.35	0.0001	0.93	13.4 (11.2;16.4)
BAT15b	-0.19	2.25	-0.79	2.23	205.71	<0.0001	0.93	13.8 (11.5;16.0)
BAT14	-0.10	2.21	-0.78	2.17	170.67	0.005	0.92	13.0 (10.8;15.6)
BAT13	-0.15	2.26	-0.80	2.18	156.73	0.008	0.91	12.1 (10.0;14.7)
BAT12	-0.19	2.32	-0.78	2.07	159.74	0.0009	0.91	13.0 (10.8;15.6)
BAT12 4 testlets	0.27	1.28	-0.51	1.14	45.06	0.14	0.82	4.4 (3.1;6.2)

Results - the construct validity of the BAT12

- Local dependency between items within each subscale (no cross-loadings)
- Good fit to the Rasch model of the BAT12 – the four subscales model
- The four subscales structure with a strong general factor (The average latent correlation between the four testlets was 0.71, explained common variance was 93%)
- No problems with DIF

Strenghts and limitations

+ large, representative samples of the working population

+ cross-validation strategy

+ focus on the content coverage of the BAT12

+ combination of different approaches

- results from previous studies do not automatically transfer to the short version of BAT12
- the participants in this study have answered all 23 items
- the scale's invariance property under the reduced number of items (same conclusions from long and short versions)

Conclusions

- The new BAT12 is developed and tested psychometrically
- The BAT12 maintains the breath of item content of the original version of the BAT
- The shorter version of the BAT has sound psychometric properties
- The four subscales can combined into a single burnout score
- The scale works invariantly for women and men, older and younger and across both countries
- The BAT12 is timesaving compared to the BAT23 and can be used in e.g., employee surveys

Thank you for your attention!