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Technical Notes on R-based Reanalysis of the Brief Mood Introspection Scale (BMIS) of Mayer & Gaschke, 1998, Study 1

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Scale (BMIS) of Mayer & Gaschke, 1998, Study 1

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Part 1. The original Scale is reproduced here

An image of the original scale

An image of the original scale is shown in Figure 1.1.

Figure 1-1: A copy of the BMIS as administered

Brief Mood Introspection Scale (BMIS)
by John D. Mayer

INSTRUCTIONS: Circle the response on the scale below that indicates how well each adjective or phrase describes your present mood.

(definitely do not feel) (do not feel) (slightly feel) (definitely feel)

	XX	X	V	VV		XX	X	V	VV
Lively	XX	X	V	VV	Drowsy	XX	X	V	VV
Happy	XX	X	V	VV	Grouchy	XX	X	V	VV
Sad	XX	X	V	VV	Peppy	XX	X	V	VV
Tired	XX	X	V	VV	Nervous	XX	X	V	VV
Caring	XX	X	V	VV	Calm	XX	X	V	VV
Content	XX	X	V	VV	Loving	XX	X	V	VV
Gloomy	XX	X	V	VV	Fed up	XX	X	V	VV
Jittery	XX	X	V	VV	Active	XX	X	V	VV

Part 2: The Canonical Order of Adjectives

The exact order of adjectives is shown in Figure 1.2.

Figure 1-2. Canonical order of adjectives across studies:

lively
happy
sad
tired
caring
content
gloomy
jittery
drowsy
grouchy
peppy
nervous
calm
loving
fedup
active
overall

(“Overall”—the “17th” item was a 21-point Unpleasant (-10) to Pleasant (10) scale added later).

Part 2. The Original Factor Analysis Reported in JPSP

Table 2-1

Results of Principle Factor Analysis of the BMIS
(N = 457) as Reported in JPSP, 1998 (Table 1).

	Unrotated		Rotated	
	Pleasant- Unpleasant	Arousal- Calm	Positive- Tired	Negative- Calm
Lively	0.71	0.31	0.75	-0.20
Peppy	0.62	0.42	0.75	-0.06
Active	0.59	0.45	0.74	-0.01
Happy	0.69	0.06	0.56	-0.39
Loving	0.43	0.24	0.48	-0.08
Caring	0.36	0.25	0.45	-0.04
Drowsy	-0.36	-0.18	-0.39	0.09
Tired	-0.29	-0.21	-0.36	0.02
Nervous	-0.36	0.63	0.11	0.72
Calm	0.41	-0.43	0.06	-0.59
Gloomy	-0.62	0.26	-0.32	0.59
Fed up	-0.49	0.35	-0.16	0.58
Sad	-0.58	0.22	-0.31	0.53
Jittery	-0.23	0.46	0.11	0.5
Grouchy	-0.6	0.15	-0.38	0.5
Content	0.57	-0.09	0.39	-0.43
Variance Explained	30.10%	14.50%	30.10%	14.50%

Table 2-2

Factor analysis of the BMIS, from the original submitted manuscript, with items reordered to match the order of administration (Modified from Table 1)

	Unrotated		Rotated	
	Pleasant- Unpleasant	Arousal- Calm	Positive- Tired	Negative- Calm
Lively	0.71	0.31	0.75	-0.2
Happy	0.69	0.06	0.56	-0.39
Sad	-0.58	0.22	-0.31	0.53
Tired	-0.29	-0.21	-0.36	0.02
Caring	0.36	0.25	0.45	-0.04
Content	0.57	-0.09	0.39	-0.43
Gloomy	-0.62	0.26	-0.32	0.59
Jittery	-0.23	0.46	0.11	0.5
Drowsy	-0.36	-0.18	-0.39	0.09
Grouchy	-0.6	0.15	-0.38	0.5
Peppy	0.62	0.42	0.75	-0.06
Nervous	-0.36	0.63	0.11	0.72
Calm	0.41	-0.43	0.06	-0.59
Loving	0.43	0.24	0.48	-0.08
Fed up	-0.49	0.35	-0.16	0.58
Active	0.59	0.45	0.74	-0.01
Variance Explained	30.10%	14.50%	30.10%	14.50%

Part 3. The Original Assignment of Items to Factor Scales Based on Various Factor Analyses for the BMIS

The text from Mayer & Gaschke, 1998, p. 104, column 2, explains the specific criteria used for placing items on scales. The criteria were somewhat different between the two unrotated scales (Pleasant-Unpleasant and Arousal-Calm) and the two rotated scales (Positive-Tired, Negative-Calm). For the unrotated scales, adjectives were selected if they exhibited loadings $> |.20|$ on their factor. For the rotated scales, two-fold criteria were used: loadings of $> |.35|$ on the primary factor and $< |.35|$ on the secondary factor.

Factor scales were calculated for all adjective checklists. The BMIS factor loadings are reproduced in Table 1 as an example of the factor solutions on which such scales were based. The scales were created by adding (or subtracting) a subject's responses on the 4-point response scale to (or from) each of the mood adjectives, using the following criteria for an adjective's inclusion. The unrotated Pleasant-Unpleasant (I) and Aroused-Calm (II) factor-based scales included all those adjectives loading above an absolute value of 0.20. (The number of adjectives loading on Factor I was, for the BMIS, 16; the MIS, 62; and the RAS, 44. The number loading on Factor II was, for the BMIS, 12; for the MIS, 42; and for the RAS, 43.) The rotated Positive-Tired (I') and Negative-Relaxed (II') scales were calculated by including those adjectives loading above an absolute value of 0.35 on the given factor and with a secondary loading (e.g., on the factor pair) below 0.35 (on the BMIS) or 0.20 (on the full length scales). (The number of adjectives loading on Factor I' was, for the BMIS, 7; for the MIS, 14; and for the RAS, 14. The number loading on Factor II' was, for the BMIS, 6; for the MIS, 10; and for the RAS, 10.) The more complex criterion for the rotated scales was used to reduce a tendency for them to intercorrelate. The resulting BMIS scales were constructed as follows:

Table 3-1

1998 Assignment of Items to Scales, Mayer & Gaschke (1988), rows re-ordered to match 2016 SPSS output. Green highlights indicate to add the adjective in, yellow to subtract the value. This table explains how the items were assigned to factors in the original report.

	Unrotated		Rotated	
	Pleasant- Unpleasant	Arousal- Calm	Positive- Tired	Negative- Calm
	> .20	> .20	.35 & < .35	
			or < .35 & .35	
	P-U	A-C	P	N
Lively	0.71	0.31	0.75	-0.2
Happy	0.69	0.06	0.56	-0.39
Sad	-0.58	0.22	-0.31	0.53
Tired	-0.29	-0.21	-0.36	0.02
Caring	0.36	0.25	0.45	-0.04
Content	0.57	-0.09	0.39	-0.43
Gloomy	-0.62	0.26	-0.32	0.59
Jittery	-0.23	0.46	0.11	0.5
Drowsy	-0.36	-0.18	-0.39	0.09
Grouchy	-0.6	0.15	-0.38	0.5
Peppy	0.62	0.42	0.75	-0.06
Nervous	-0.36	0.63	0.11	0.72
Calm	0.41	-0.43	0.06	-0.59
Loving	0.43	0.24	0.48	-0.08
Fed up	-0.49	0.35	-0.16	0.58
Active	0.59	0.45	0.74	-0.01
Number of items	16	12	7	6
Variance Explained	30.10%	14.50%	30.10%	14.50%

Textual description from the article:

Pleasant-Unpleasant scale. The adjectives added were *active, calm, caring, content, happy, lively, loving, and peppy*; those subtracted were *drowsy, fed up, gloomy, grouchy, jittery, nervous, sad, and tired*.

Arousal-Calm scale. The adjectives added were *active, caring, fed up, gloomy, jittery, lively, loving, nervous, peppy, and sad*; those subtracted were *calm and tired*.

Positive-Tired scale. The adjectives added were *active, caring, lively, loving, and peppy*; those subtracted were *drowsy and tired*.

Negative-Relaxed scale. The adjectives added were *fed up, gloomy, jittery, nervous, and sad*; the one subtracted was *calm*.

Part 4: Updating the Assignment of Items to Scales Using Contemporary Statistical Techniques

Working with the Original Reported Factor Analysis

Note on Table 3: It really isn't feasible to create two non-overlapping scales from the original 1998 solution in which the items meet any kind of good criterion. Basically, you end up with one pleasant-unpleasant scale. This is illustrated in Table 4-1.

Table 4.1. Assigning items each to one scale only fails to create scales with reasonable numbers of items.

This table shows the 1998 Assignment of Items to Scales, Mayer & Gaschke (1988) in order of item administration (see Table 3.1). Now, however, items with double-loadings are removed and retained items are allowed inclusion on only one factor (based on their highest loadings).

	Unrotated		Rotated	
	Pleasant- Unpleasant	Arousal- Calm	Positive- Tired	Negative- Calm
	> .20	> .20	.35 & < .35	
			or < .35 & .35	
	P-U	A-C	P	N
Lively	0.71	0.31	0.75	-0.2
Happy	0.69	0.06	0.56	-0.39
Sad	-0.58	0.22	-0.31	0.53
Tired	-0.29	-0.21	-0.36	0.02
Caring	0.36	0.25	0.45	-0.04
Content	0.57	-0.09	0.39	-0.43
Gloomy	-0.62	0.26	-0.32	0.59
Jittery	-0.23	0.46	0.11	0.5
Drowsy	-0.36	-0.18	-0.39	0.09
Grouchy	-0.6	0.15	-0.38	0.5
Peppy	0.62	0.42	0.75	-0.06
Nervous	-0.36	0.63	0.11	0.72
Calm	0.41	-0.43	0.06	-0.59
Loving	0.43	0.24	0.48	-0.08
Fed up	-0.49	0.35	-0.16	0.58
Active	0.59	0.45	0.74	-0.01
Number of items	9	3	7	5
Variance Explained	30.10%	14.50%	30.10%	14.50%

An Alternative Factor Analysis Used for Assignment
 Criteria for inclusion is all items on a scale (a) load highest on the scale (b) $> |.35|$, (c) $< |.40|$ on any other

Table 4.2

Three-factor maximum likelihood solution with item assignments from a psych package pa maximum likelihood 3-factor exploratory solution

	Unrotated		
	Pleasant- Unpleasant	Arousal- Calm	
	Factor1	Factor2	Factor3
lively	0.716	-0.199	0.264
happy	0.484	-0.395	0.305
sad	-0.384	0.549	
tired	-0.379		
caring	0.121		0.806
content	0.27	-0.444	0.323
gloomy	-0.338	0.601	
jittery	0.172	0.504	
drowsy	-0.433		
grouchy	-0.322	0.498	-0.166
peppy	0.742		0.227
nervous		0.68	
calm		-0.589	
loving	0.202		0.735
fedup	-0.174	0.584	
active	0.74		0.212
Number of items	6	8	2