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VALIDATION OF THE HUNGARIAN VERSION OF BEHAVIOR RATING INVENTORY OF EXECUTIVE FUNCTION - ADULT VERSION QUESTIONNAIRE

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INTRODUCTION

- Executive functions (EF): a complex cognitive construct, including several interrelated skills and cognitive functions that affect the way behavior is organized [5], [15].
- EF: mental abilities which help us plan and set goals, then execute the behaviours needed to achieve these goals, solve complex tasks [3].
- 3 main domains: cognitive flexibility, inhibitory control, working memory (WM) [2].

- Several studies integrate a lot more components into executive functions: planning and organising, problem solving, emotion regulations or decision making [3], [11].
- Malfunctioning of EF can be linked to different types of clinical disorders [15].
- If the dysfunction affects cognitive flexibility or inhibitory control: higher chance that the person will experience symptoms of OCD. WM deficits are more apparent in populations with attention disorder and hyperactivity [10], [14].

- Dysfunction of inhibitory processes and emotion regulation: higher tendencies of conduct disorder[4].
- People affected by substance use, anxiety or depression, show significantly lower levels of emotion regulation, inhibition functions and shifting mechanisms [10], [13].
- Dysfunction of inhibitory processes is a risk factor of overweight and obesity [2], [14].
- EF deficits can affect behavioral organization negatively [1], [5].

MATERIALS AND METHODS
Participants

289 adults

the participants were between 18 and 47 years old

the average age in the sample group is 24.19 years (SD = 5.05)

among the participants, there were significantly more females (N = 242) than males (N = 47)

MATERIALS AND METHODS
Instruments

Demographic questionnaire

- questions regarding:
  - gender
  - age
  - occupation
  - relationship/marital status

Behavior Rating Inventory of Executive Functions - Adult Version

- 75 items
- Likert-scale of 1-3 (1 - never, 2 - sometimes, 3 - often)
- 9 subscales: shifting, inhibitory functions, emotion regulation, self-monitoring, initiating, working-memory, planning/organizing, task-monitoring and organization of materials
- Higher scores indicate higher probability of problems present in executive functions

MATERIALS AND METHODS
Procedure

The BRIEF - A questionnaire is translated and adapted to Hungarian language following the specifications of the International Test Commission Guidelines

Data was collected online, then the statistical evaluation process consisted of two parts.

1. We used the IBM SPSS 20 software package to create the shorter version of the questionnaire, and to perform the exploratory factor analysis (EFA) to verify content validity.

2. Then, we subjected the scale to confirmatory factor analysis (CFA) to verify construct validity. This process was conducted using the SPSS Amos 18 software.

RESULTS

- the tool is reliable, since the Cronbach α of all 9 measured factors is above .700 [6]
- for the complete questionnaire, Cronbach α=.912
- Bartlett test are significant ($p < .001$) and the Kaiser-Meyer-Olkin (KMO) value is .912

⇒ meaning that the variables can be used to perform a factor analysis [12]

- during the EFA we determined 3 factors using the principal component method and Varimax rotation
- we organized the remaining 33 items around the 3 factors resulting from the EFA, as presented in Table 1.

RESULTS

Table 1

Exploratory factor analysis - 3 factor model

Items	Cogn. reg.	Em.reg.	Behav. reg.
3. Szétszórt volt.	**.528**	0.182	0.128
4. Koncentrációs problémái voltak feladatvégzés közben (pl. házimunka, olvasás vagy munkavégzés során).	**.621**	0.213	0.010
11. Problémái voltak azokkal a munkákkal vagy feladatokkal, amelyek több mint egy lépésből álltak.	**.555**	.236	.065
14. Nehézségei voltak azzal, hogy felkészüljön a napra.	**.591**	.299	.037
15. Problémái voltak azzal, hogy prioritásokat állítson fel tevékenységeiben.	**.567**	.132	.170

RESULTS

20. Sok időt töltött otthon semmittevéssel.	**.564**	.146	.112
25. Nehézségei voltak azzal, hogy önállóan elkezdjen valamit.	**.555**	.218	.191
35. Rövid ideig tudott figyelni.	**.578**	.210	.083
49. Nehézségei voltak azzal, hogy elkezdje feladatait.	**.671**	.170	.121
52. Problémái voltak a feladatok befejezésével (pl. házimunka, munka).	**.607**	.121	.205
53. Utolsó pillanatban fogott neki a dolgainak (pl. feladatoknak, házimunkának).	**.555**	.171	.226
58. Felületesen végezte a dolgait.	**.534**	.117	.257
63. Nem tervezte meg előre feladatait.	**.530**	-.007	.212
66. Nehézséget okozott tevékenységeinek megszervezése.	**.651**	.122	.238
68. Gondot okozott az, hogy egy időben egyszerre több mindent csináljon.	**.506**	.246	.138
1. Dühkitörései voltak.	.106	**.554**	.269
12. Erzelmileg túlreagált dolgokat.	.139	**.717**	.077
19. Érzelmi kitörései voltak apró dolgok miatt.	.148	**.762**	.242
28. Erősebb érzelmi reakciói voltak bizonyos helyzetekben, mint a barátainak.	.158	**.660**	.306
33. Túlreagált apró problémákat.	.167	**.736**	.174
42. Könnyedén vált érzelmileg feldúlttá.	.224	**.730**	.213

RESULTS

51. Intenzív dühöt érzett, viszont ez hamar elmúlt.		**.515**	
57. Mások azt mondták Önre, hogy túl érzékeny.	.154	**.542**	.403
59. Irritált volt.	.245	**.577**	.216
67. Ha problémája adódott, nehezen tette túl magát rajta.	.384	**.566**	.128
69. Gyakran változott a hangulata.	.263	**.653**	.131
13. Nem vette észre, hogy valaki kellemetlenül érezte magát Ön miatt vagy mérges lett volna Onre, csak amikor már túl késő volt.	.422	.245	**.531**
23. Olyankor beszélt, amikor nem kellett volna.	.405	.248	**.597**
36. Nem helyénvaló, szexuális megjegyzéseket tett.	.385	.124	**.567**
37. Nem értette miért haragudott meg Onre valaki.	.433	.120	**.591**
50. Gondolkodás nélkül mondott dolgokat.	.485	.151	**.586**
64. Mások azt mondták Önre, hogy nem gondolkodik, mielőtt cselekszik.	.479	.160	**.544**
70. Nem gondolt a következményekre mielőtt csinált valamit.	.322	.106	**.569**

Notes. Cogn. reg. = Cognitive regulation, Em. reg. = Emotion regulation, Behav. reg. = behavior regulation

RESULTS

After reducing the number of factors to 3 and the number of items to 33, we conducted a CFA on the new tool, to examine model fit, and verify construct validity.

For this structure, **goodness of fit indices resulting from the CFA could not be accepted**, since not all of these indeces were in the acceptable range defined by [8].

To correct this, we conducted further item selections, excluding items with lower factor weights. The new, 17-item structure is presented on Figure 1.

RESULTS

Indices among all four dimensions were acceptable:

- $\chi 2=218.972$ (df = 116, $p<.001$), $\chi 2/df = 1.88$
- comparative fit index (CFI) = .946
- root mean square error of approximation (RMSEA) = .056 and the goodness of fit index (GFI) = .918, which show that there is an absolute fitness [8]
- as we can see, all four criteria meet the standards

  ⇨ **we have found a model that fits our data**

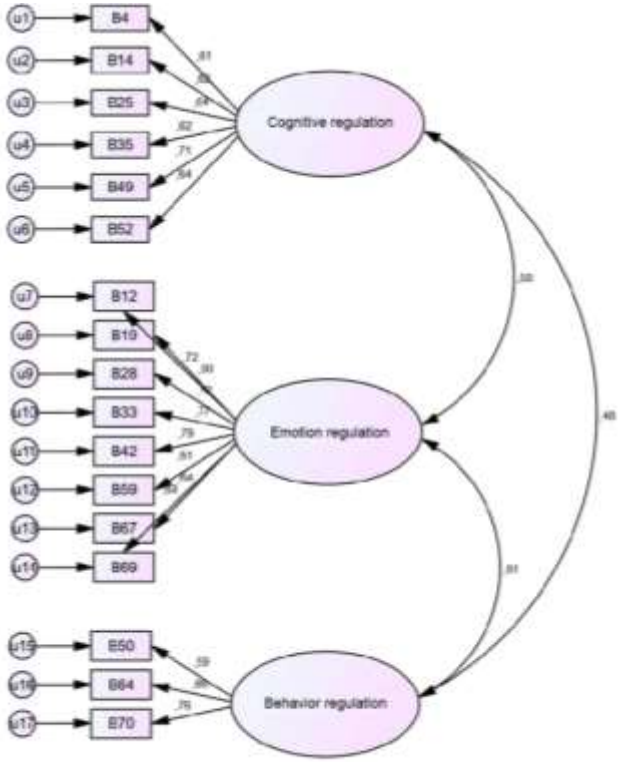

Figure 1. *BRIEF - A 17-item version*

RESULTS

Reliability of the new model

Results show acceptable Cronbach α values for the three subscales, as well as the full scale.

Cognitive regulation α = .806

Emotion regulation α = .894

Behavior regulation α = .701

Full scale α = .898

→ **the factor structure of the new scale is reliable** [6]

Correlation analyses between factors show a strong positive correlation between each of the factors in the new structure (Table 2)

Table 2

Descriptive Statistics and Correlations between Cognitive, Emotion and Behavior regulation factors

Variable	*n*	*M*	*SD*	1	2	3
Cognitive regulation (1)	289	10.477	2.839	–		
Emotion regulation (2)	289	15.612	4.237	.515**	–	
Behavior regulation (3)	289	4.702	1.502	.355**	.498**	–

**p<0.01

the more negatively affected one dimension of executive functions is, the more severe problems will appear among the other two dimensions as well.

DISCUSSION AND CONCLUSION

The primary goal of this research was to translate the BRIEF - A self-reporting questionnaire to Hungarian, and create a shorter version while preserving the main structure and constructs.

This was achieved successfully, since following the item- and factor reductions, the subscales of our 3-factor model matched the indices resulting from the original questionnaire (cognitive-, behavior-, and emotion regulation index).

Correlation studies between items and factors during the EFA contributed to the examination and confirmation of content validity.

The CFA of our first model did not show acceptable fit indices, thus we accepted a second, 17-item model. This second model showed to be acceptable among all indices (CFI = .946, $\chi 2/df = 1.88$, RMSEA = .056, GFI = .918).

The short version proved to be reliable, besides this, all three factors are positively correlated.

We can conclude that we created a tool that is a valid and reliable self-reporting measure of executive functions in the Transylvanian Hungarian adult population.

Results shows that the problems of emotion regulation, behavior regulation and cognitive regulation are interrelated, which means that functional impairment in one area may be a risk factor for the proper functioning of the other two dimensions.

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