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Analyzing Models of Work Addiction: Single Factor and Bi-Factor Models of the Bergen Work Addiction Scale

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Abstract Work addiction ('workaholism') has become an increasingly studied topic in the behavioral addictions literature and had led to the development of a number of instruments to assess it. One such instrument is the Bergen Work Addiction Scale (BWAS - Andreassen et al. 2012 *Scandinavian Journal of Psychology, 53,* 265-272). However, the BWAS has never been investigated in Eastern-European countries. The goal of the present study was to examine the factor structure, the reliability and cut-off scores of the BWAS in a comprehensive Hungarian sample. This study is a direct extension of the original validation of BWAS by providing results on the basis of representative data and the development of appropriate cut-off scores.

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The study utilized an online questionnaire with a Hungarian representative sample including 500 respondents (F = 251; M_{age} = 35.05 years) who completed the BWAS. A series of confirmatory factor analyses were carried out leading to a short, 7-item first-order factor structure and a longer 14-item seven-factor nested structure. Despite the good validity of the longer version, its reliability was not as high as it could have been. One-fifth (20.6 %) of the Hungarians who used the internet at least weekly were categorized as work addicts using the BWAS. It is recommended that researchers use the original seven items from the Norwegian scale in order to facilitate and stimulate cross-national research on addiction to work.

Workaholism has emerged as a prominent topic in the last 20 years (Andreassen 2014). Due to rapid technological development, increasing numbers of employees are able to work outside their offices, quite often from their homes (Salanova et al. 2014). This changing nature of contemporary working life coupled with the fact that boundaries between work and personal life are becoming more blurred are good reasons as to why we need to increase our understanding of workaholism. Workaholism was initially defined by Oates (1971) and was simply defined as a continuous and uncontrollable need to work (Oates 1971). On the basis of previous research, workaholism as a construct can be viewed both positively and negatively. On one hand, workaholics are viewed as addicts who cannot control their work behavior; on the other hand, they can be perceived as unusually hard-working and dedicated workers (Ng et al. 2007). Although workaholism has been approached in many different ways over the years – both as an attitude, a behavior, a compulsion and/or obsession - Ng et al. (2007) re-defined workaholism in order to reflect the three core dimensions of addiction, namely affect, cognition, and behavior. Due to the initial understanding of the phenomenon and parallels to more traditional substance addictions, other scholars have come to view workaholism in line within an addiction framework and as "being overly concerned about work, to be driven by strong and uncontrollable work motivation, and to spend so much energy and effort into work that it impairs private relationships, spare-time activities, and/or health" (Andreassen et al. 2014b, p.8).

Building on the previous addiction conceptualizations and measures, Andreassen et al. (2012) created the Bergen Work Addiction Scale on the theoretical basis of Brown's (1993) behavioral addiction theory and Griffiths' addiction components model (2005). Accordingly, work addiction – similarly to all addictions – include seven core elements: (1) salience (activity dominates thinking and behavior); (2) mood modification (the activity modifies/improves mood); (3) tolerance (increasing amounts of the activity are required to achieve initial effects); (4) withdrawal (occurrence of unpleasant feelings when the activity is discontinued); (5) conflict (compromising social relationships and other activities); (6) relapse (tendency for reversion to earlier patterns of the activity after abstinence or control); and (7) health and/or other problems. As withdrawal and tolerance is usually understood as "dependence" (O'Brian et al. 2006), addiction is a broader construct involving all the seven symptoms described above – in line with diagnostic addiction criteria employed in modern psychiatric nosology (American Psychiatric Association 1994; World Health Organization 2013). Thus, unlike most other workaholism scales, the BWAS assesses workaholism as a behavioral addiction, and comes with a suggested cut-off (endorsement of at least 4 of 7 items) for categorization as a workaholic (Andreassen et al. 2012). Its psychometric properties have

been demonstrated in several studies (Andreassen et al. 2012; Andreassen et al. 2013; Andreassen et al. 2014a; Molino 2013). Against this backdrop, the goal of this study was to test the BWAS in an online representative Hungarian sample and clarify the psychometric properties and inner structure of the BWAS.

Methods

Participants

This research employed a nationally representative probability sample of 500 Hungarians aged between 15 and 59 years selected randomly from an internet-enabled panel including 88,000 members with the help of the *Ringier Publisher Hungary* in July 2013. For the preparation of the sample, a multiple-step, proportionally stratified, probabilistic sampling method was employed. Members of this panel used the internet at least once a week. The panel demography is permanently filtered. More specifically, individuals are removed from the panel if they give responses too quickly (i.e., without paying attention to their response,) and/or have fake (or not used) e-mail addresses. The questionnaire was appeared in a freQuest cawi system. The sample was nationally representative in terms gender, age, level of education, and type of residence for those Hungarians who used the internet at least once a week. The final sample comprised 500 respondents (M = 249, F = 251) aged between 15 and 59 years (M_{age} = 35.05 years; SD_{age} = 11.97 years). Regarding the highest completed level of education, 20.0 % of the respondents had primary level of education, 22.8 % had vocational school degree, 38.2 % graduated from high school, and 19 % had higher education degree. Regarding the place of residence 20.2 % of the respondents lived in the capital city, 20.1 % lived in the county towns, 34.6 % lived in towns, and 25.2 % lived in villages.

Measures

The *Bergen Work Addiction Scale* (Andreassen et al. 2012) was created to measure seven core elements of addiction (Brown 1993; Griffiths 2005). more specifically (1) salience, (2) mood modification, (3) tolerance, (4) withdrawal, (5) conflict, (6) relapse, and (7) health and other problems. Initially, two potential items measuring each component were constructed – yielding a pool of 14 items. Then, the item with the highest corrected item-total correlation from within each of the seven addiction components was selected for use in the final scale. Responses are provided on a 5-point Likert scale ranging from 1 (never) to 5 (always). Cronbach's alphas in the construction study were 0.80 and 0.84. Suggested cut-off for categorizing as a workaholic was the endorsement of at least four items as "often" or "always". In the present study, the initial 14-item pool was used in order to test whether the seven items of Andreassen et al.'s (2012) vs. alternative item sets – including the seven elements of addiction – were appropriate for the Hungarian data. Demographic questions were asked concerning age, gender, level of education, and completed level of education.

Procedure and Statistical Analysis

The participants volunteered for the study and gave their informed consent before participating in the study. The study was approved and given ethical clearance by the Institutional Review

Board of the local university. The BWAS was translated from Norwegian to Hungarian, and back translated, by following the protocol of Beaton et al. (2000). Confirmatory factor analysis (CFA) and Structural Equitation Modeling (SEM) were conducted using AMOS 17.0. CFA analyses were conducted on covariance matrices, and solutions were generated on the basis of maximum-likelihood estimation. There were no missing data in the current study. In the CFA analyses, first-order, higher-order, and nested-factor models (Brunner et al. 2012) were tested. Following the guidelines of Brown (2006) and Schreiber et al. (2006). several different indices of goodness of fit were taken into account including Chi-square degree of freedom ratio (χ^2/df), root mean square error of approximation (RMSEA), comparative fit index (CFI), and the Tucker–Lewis index (TLI). Guided by the suggestions provided of Hu and Bentler (1999). an acceptable model fit was defined by the following criteria: RMSEA (≤ 0.06,), CFI (≥ 0.95), and TLI (≥ 0.95). AIC and BCC was used for model comparison with lower values indicating better model fit (Kline 1998).

The first-order models' reliability in terms of internal consistency was measured using Cronbach's alphas, taking into account Nunnally's (1978) suggestions concerning its values (0.70 is acceptable, 0.80 is good). However, regarding nested models, the guidelines of Brunner et al. (2012) were followed and computed omega (ω) coefficients for assessing reliability. This coefficient provides information concerning reliable variance accounted for by all general and specific latent variables of work addiction. Therefore, for evaluating reliability, the blend of general work addiction and its elements (i.e., the seven dimensions), the coefficient omega was used. For assessing reliability of its elements, the coefficient omega hierarchical (ω_h) was used. For identifying a cut-off regarding the at-risk group of Hungarian respondents, Andreassen et al.'s (2012) cut-off criteria were taken into account. All procedures were carried out with the required understanding and consent of the participants and with the approval of University of Szeged.

Results

Factor Structure

Confirmatory factor analyses were conducted on the BWAS items for comparing the fit of alternative models. Six alternative models were tested: (i) a *14-item 1 factor* model, in which all items which loaded on one common factor; (ii) a *14-item 7 factor first-ordered* model, in which first-ordered structure included all items which loaded on seven factors deriving from Brown's (1993) and Griffiths (2005) components; (iii) a *14-item 7 factor second-ordered* model which is different from the previous one regarding a higher-ordered latent variable that derives from the seven latent variables representing the seven dimensions of addiction; (iv) a *14-item 7 factor nested* model in which each of the 14 items loads on two factors simultaneously: one general latent variable representing work addiction as a whole (this latent variable is connected to all of the 14 items), and another specific latent variable that also represents one of the seven components (this latent variable is respectively connected to two items); (v) a *7-item Norwegian version* which includes the seven items chosen by Andreassen et al. (2012). and (vi) a *7-item Hungarian version* which includes the best fitting items of each elements.

The results demonstrated that two models showed equally appropriate model fit. The first was the *7-item Hungarian version* that had good model fit. The second one was the *14-item 7 factor nested* model that also showed similarly good model fit. In comparison with the other

alternative models, these results suggest that a short, 7-item version and a longer 14-item version have appropriate factor structure and acceptable internal consistencies (for descriptive data see Table 1). Unfortunately, the 7-item Norwegian version did not show good model fit on the Hungarian data, which makes difficult to conduct cross-cultural comparisons with the original short version of the scale. In short, there is no fundamental difference between the 7-item single factor Hungarian model (Fig. 1) and the bi-factor models (Fig. 2). Therefore, following the principle of parsimony, it is suggested that the shorter 7-item version be used.

Reliability

Cronbach's alpha was used for measuring reliability of the 7-item first-order model (Alpha = 0.76). For the 14-item nested model, omega scores referring to reliabilities of the work addiction elements are presented in Table 2. According to the results obtained, scale scores included a medium amount (0.38–0.71) of variance and is explained by the blend of general work addiction and specific work addiction elements. The Relapse and Salience dimensions had relatively low coefficients and Tolerance had a relatively good one. Omega hierarchical coefficients related to the Work addiction main factor varied in a relatively broad range (0.06–0.65) and suggests that Tolerance (0.06) did not, while Withdrawal (0.65) measures the Work Addiction main construct more precisely. Reliability regarding the Relapse element appears to be problematic due to the low values of both ω and ω_h coefficients.

Cut-off of the 7-Item BWAS

The cut-off score of Andreassen et al. (2012) was used in order to identify the percentage of workaholics in the Hungarian sample. For this purpose, the short, 7-item H-BWAS was used and required endorsement of at least four "often" or "always" responses (out of the seven items). On the basis of this cut-off, 104 individuals (20.6 % of the sample) were categorized as workaholics. In this subgroup the proportion of men (64.4 %, $N = 67$) was significantly higher $[\chi^2 (1, N = 500) = 11.38, p = 0.001]$ than the proportion of women (35.6 %, $N = 37$), but no significant differences were found regarding age, level of education, or place of residence.

Table 1 Comparison between alternative models of Bergen Work Addiction Scale

Model (N = 500)	χ^2	df	CFI	TLI	RMSEA	90 % CI$_{RMSEA}$	AIC	BCC
14 items 1 factor	829.10**	77	0.71	0.66	0.140	0.131–149	755.47	759.66
14 items 7 factors first-ordered	281.60**	56	0.91	0.86	0.090	0.080–0.100	407.12	411.50
14 items 7 factors second-ordered	578.88**	71	0.80	0.75	0.120	0.111–0.129	674.88	677.85
14 items 7 factors nested	86.17**	42	0.98	0.96	0.046	0.033–0.61	240.17	244.95
7 items Norwegian version	86.74**	14	0.89	0.84	0.105	0.084–0.126	128.75	129.47
7 items Hungarian version	35.70**	14	0.97	0.95	0.056	0.033–0.079	77.70	78.38

CFI comparative fit index, *TLI* Tucker–Lewis index, *RMSEA* root-mean-square error of approximation, *AIC* Akaike information criterion, *BCC* Browne-Cudeck criterion
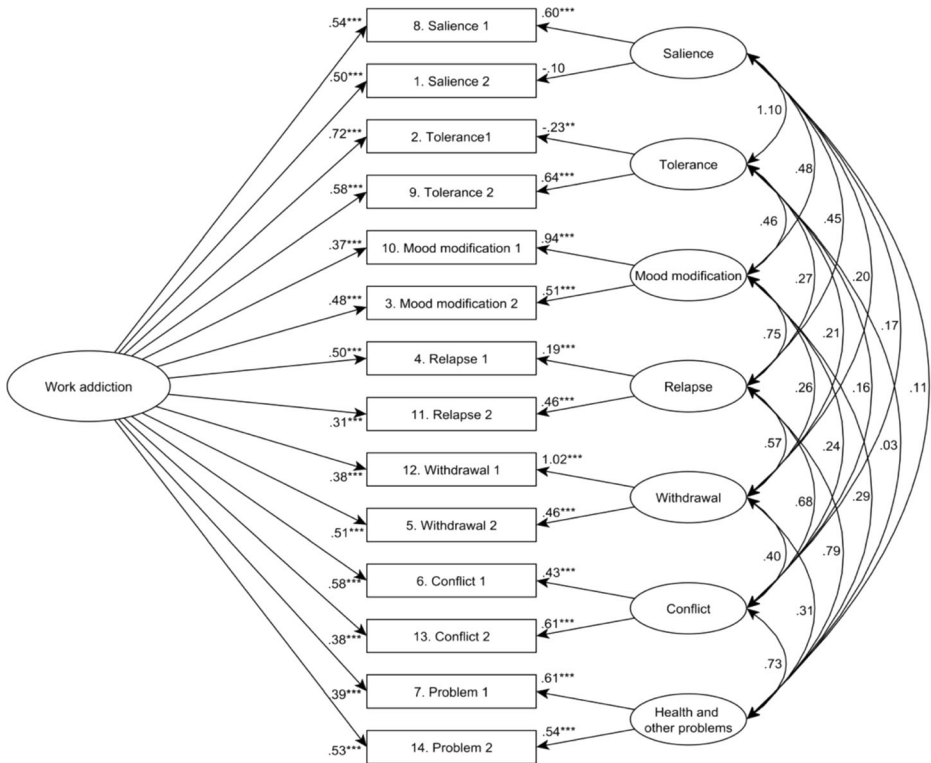
**$p < 0.01$

Fig. 1 Schematic illustration of the *14 items 7 factors nested* model of the *BWAS*. *Note* One-headed arrows between the latent and observed variables show the standardized regression weights. Two-headed arrows between the latent variables show standardized covariances. * $p < 0.05$ **$p < 0.01$ *** $p < 0.001$

Gender, Age, Educational Level and Place of Residence Differences

Men ($M_{7\ items} = 19.83$, $SD_{7\ items} = 5.24$) tended to report higher scores on the 7-item BWAS [$t(498) = 1.67$, $p = 0.096$]. Weak correlations were found between age and the 7-item BWAS [$r(500) = 0.14$, $p = 0.002$]. Using one-way ANOVA (with Bonferroni-corrected post-hoc test), there were no educational level-related and place of residence-related differences between the four examined groups (see 'Participants' section) using the 7-item BWAS.

Discussion

The results of the present study suggest that two factor structures are appropriate regarding the BWAS. The short version has a first-order one-factor structure including seven items, and represent the seven elements of addiction (Brown 1993; Griffiths 2005). The second version has a nested seven-factor structure including 14 items in which each element of addiction belongs to a nested factor. Whereas the short version has good internal consistency, the reliability of the longer version was not as high as it could have been.

As reported above, the dimensions of Relapse ("*How often during the last year have you been told by others to cut down on work without listening to them*") and Salience ("*How often during*
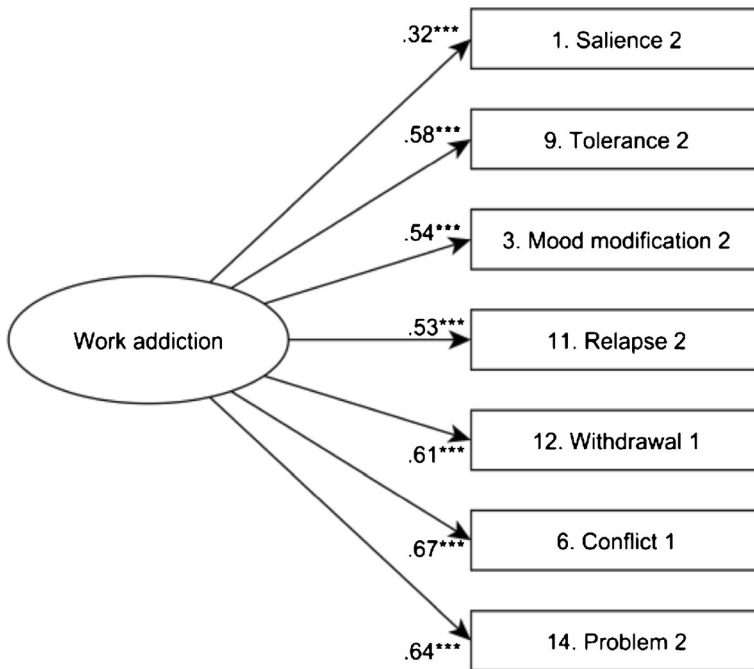
Fig. 2 Schematic illustration of the 7 items first-order model of the *BWAS*. *Note* One-headed arrows between the latent and observed variables show the standardized regression weights. *** $p < 0.001$

the last year have you thought of how you could free up more time to work") had relatively low coefficients, while Tolerance ("*How often during the last year have you spent much more time working than initially intended*") had a relatively good one. In the Hungarian sample, Withdrawal ("*How often during the last year have you become stressed if you were prohibited from working*") measured the Work Addiction main construct more precisely (Appendix).

According to the cut-off criterion used, one-fifth (20.6 %) of the nationally representative Hungarian online users were categorized as addicted to work. This high proportion is in line

Table 2 Descriptive Statistics of the BWAS versions and the dimensions of the 14 items nested model

Versions and factors of BWAS		N of items	Sum	SD$_{Sum}$	Mean	SD$_{Mean}$	Ω	ω_h
7 items Hungarian first-order		7	19.45	5.04	2.78	0.72		
14 items 7 factors nested		14	38.26	9.74	2.73	0.70		
14 items 7 factors nested factors	Salience	2	6.12	1.63	3.06	0.81	0.55	0.10
	Mood modification	2	4.87	2.22	2.43	1.11	0.80	0.59
	Tolerance	2	5.98	1.72	2.99	0.86	0.71	0.06
	Withdrawal	2	5.89	2.07	2.94	1.04	0.88	0.65
	Conflict	2	5.34	1.94	2.67	0.97	0.62	0.34
	Relapse	2	4.63	1.78	2.32	0.89	0.38	0.15
	Problems	2	5.43	2.05	2.72	1.02	0.64	0.39

Observed range is 1–5. ω = omega; ω_h = omega hierarchical

with the results of Salavecz et al. ([2011]) comprehensive cross-cultural study showing that Hungarians expressed particularly high levels of work stress and its strong effect on poor health. The proportion of work addicts was even higher among males. Therefore, these results suggest that while work-family conflict is more prevalent among Hungarian women (Makra et al. [2012]). work addiction is more prevalent among men.

This study is the first to investigate Work Addiction in Hungary. Consequently, several limitations can be noted. First, only one sample was measured. Comparing the model fit indices of several samples may provide further information of the appropriateness and utility of these factor structures. Second, convergent, divergent, predictive validity and temporal stability were not measured, and would be necessary for validating this scale. Third, the research team had no information concerning the weekly working hours and the occupation of the respondents. Fourth, the study utilized online representative data. Therefore, the percentage of those who has work addiction problems may be misleading if the whole Hungarian population is considered. Nevertheless, the scale will help researchers in future studies to investigate workaholism in Hungarian population (both in theory and practice). The research team also plans further investigation of BWAS in relation to other already existing measures. Finally, despite the fact that other workaholism items yielded better fit in Hungary than in Norway, it is recommend that researchers use the original seven items from the Norwegian scale in order to facilitate and stimulate cross-national research on workaholism.

Compliance with Ethical Standards

Conflict of Interest No conflict of interest. Author G. Orosz, author E. Dombi, author C. S. Andreassen, author M.D. Griffiths, and author Zs. Demetrovics declare that they have no conflict of interest.

Appendix The Hungarian Bergen Work Addiction Scale

Bergen Munkafüggőség Skála

Az alábbiakban 14 kérdést teszünk fel Önnek a munkájához való viszonyával kapcsolatban. A kérdések mellett X-szel jelölje meg az Önre leginkább jellemző választ ("soha" –"mindig"). Az elmúlt évben milyen gyakran....

	Soha	Ritkán	Néha	Gyakran	Mindig
Kitűnés – Salience					
1. gondolt a munkájára vagy egyéb megtervezett munkafolyamatokra?					
2.* gondolkodott azon, hogyan tudna még több időt a munkájának szentelni?					
Tolerancia - Tolerance					
3.* dolgozott többet, mint amennyit valójában eltervezett?					
4. érzett késztetést arra, hogy egyre többet és többet dolgozzon?					

	Soha	Ritkán	Néha	Gyakran	Mindig

Hangulatváltozás – Mood modification

5. *dolgozott azért, hogy elfelejtse szemelyes problémáit?*

6.* dolgozott azért, hogy csökkentse a bűntudatát, szorongását, kilátástalanságát vagy depresszióját?

Visszaesés - Relapse

7.* tapasztalta azt, hogy mások arra utasították, hogy kevesebbet dolgozzon, de Ön nem hallgatott rájuk?

8. *próbálta meg lecsökkenteni a munkával töltött idejét siker nélkül?*

Elvonás - Withdrawal

9. lett nyugtalan vagy ideges amikor akadályozták a munkavégzésében?

10.* *érzett stresszt, amikor megakadályozták a munkavégzésében?*

Konfliktus - Conflict

11.* *helyezte háttérbe hobbijait, szabadiős tevékenységét vagy edzését a munkája miatt?*

12. hanyagolta el partnerét, családtagjait vagy barátait munkája miatt?

Problémák - Problems

13.* *érezte azt, hogy a sok munka az egészsége rovására megy?*

14. *dolgozott olyan sokat, hogy ez negatív hatással volt az alvására?*

Evaluation: (1) soha, (2) ritkán, (3) néha, (4) gyakran, (5) mindig

*The Norwegian Item set

Italics – the Hungarian 7-item first-order version

The original version of the scale can be found in Andreassen, C. S., Griffiths, M. D., Hetland, J. & Pallesen, S. (2012). Development of a work addiction scale. *Scandinavian Journal of Psychology*, *53*, 265–272

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