

A Scale for Measuring Mental Strain in Employees – Findings from a Company Survey

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I have no conflicts of interest to declare.

Introduction

According to EN ISO 10075-1 standard, mental stress is the totality of all measurable external influences that affect a human being mentally. Mental strain can be distinguished from this as an immediate effect of mental stress in the individual depending on his or her current conditions, e. g. individual coping strategies (International Organization for Standardization, 2017). Strain can lead to several consequences, such as fatigue, exhaustion or acute stress disorder (International Organization for Standardization, 2017). Also turn-over-intentions, job dissatisfaction, poor general health and burnout symptoms can be related to strain (Nübling et al., 2006).

As part of the project “Healthy Working in Thuringia”, risk analysis for the participating model companies were conducted in order to show them their current status. The aim of this work was to test the adapted scale for measuring strain concerning its usability in terms of empirical quality criteria.

Methodology

Data was collected via employee surveys in 18 micro, small, and medium sized enterprises between June 2019 and February 2020 by paper and pencil and online questionnaires (n=530). After data cleansing, the data set (n = 486) contained 55.97% men (n = 272), 43.21% women (n = 210) and 0.82% non-binary persons (n = 4).

To assess mental strain, the scale “psychomental strain” of Nowak et al. (2007), which was used in several company surveys, was modified from a dichotomous (yes and no/no answer) to a 6-level answer scale. The last two items were newly added.

Item	Item-No.
• <i>nervously tense</i>	D107001
• <i>under time pressure</i>	D107002
• <i>exhausted/tired</i>	D107003
• <i>unconcentrated</i>	D107004
In relation to the work, I am:	
• <i>bored</i>	D107005
• <i>frustrated</i>	D107006
• <i>internally restless</i>	D107009
• <i>not able to switch off</i>	D107011

Answer options:

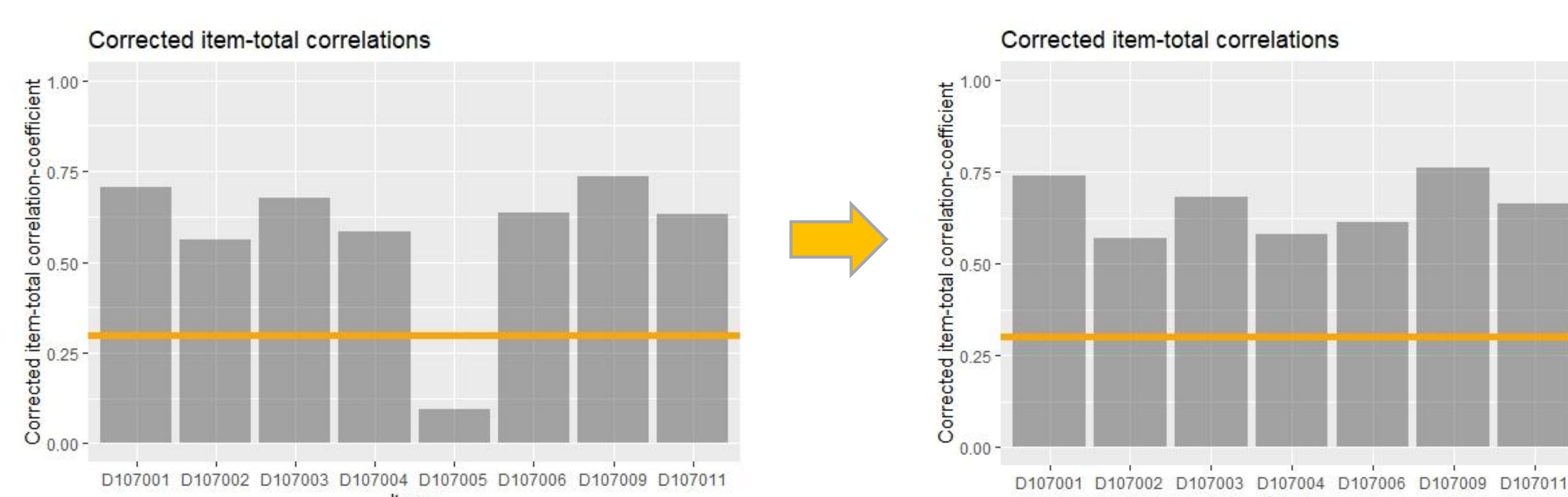
1 = almost never 2 = Once in a month 3 = Two to three times a month 4 = About once in a week
5 = Several times a week 6 = daily

Corrected item-total correlations, internal consistency, inter-item correlations, and the exploratory factor analysis (EFA) with principal axis factoring (PAF) were calculated. Moreover, the personal burnout scale from the Copenhagen Burnout Inventory (CBI) (Borritz & Kristensen, 1999) was used to examine content validity. The requirements of EN ISO 10075-3 standard were used for evaluation (International Organization for Standardization, 2004). Data analysis was done with R Studio based on R (version 4.0.4).

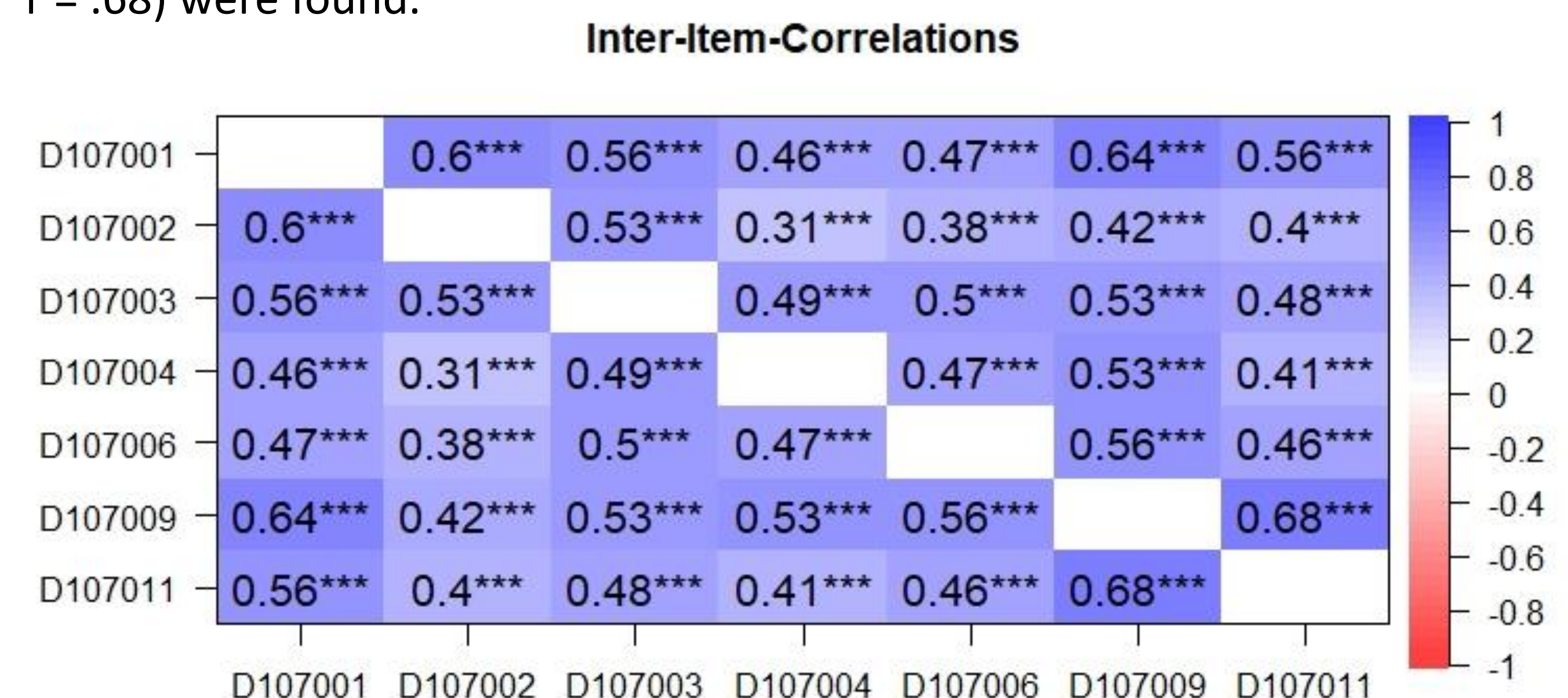
Results

Reliability

All items, except for Item D107005 “bored”, showed corrected item-total correlations over .50 which can be considered good (Schermmelleh-Engel & Werner, 2012). Therefore, item D107005 was removed from the final solution.



Internal consistency measures showed Cronbachs $\alpha = .88$ and McDonalds $\omega = .88$, respectively. Moderate to strong inter-item-correlations ($r = .31$ to $r = .68$) were found.

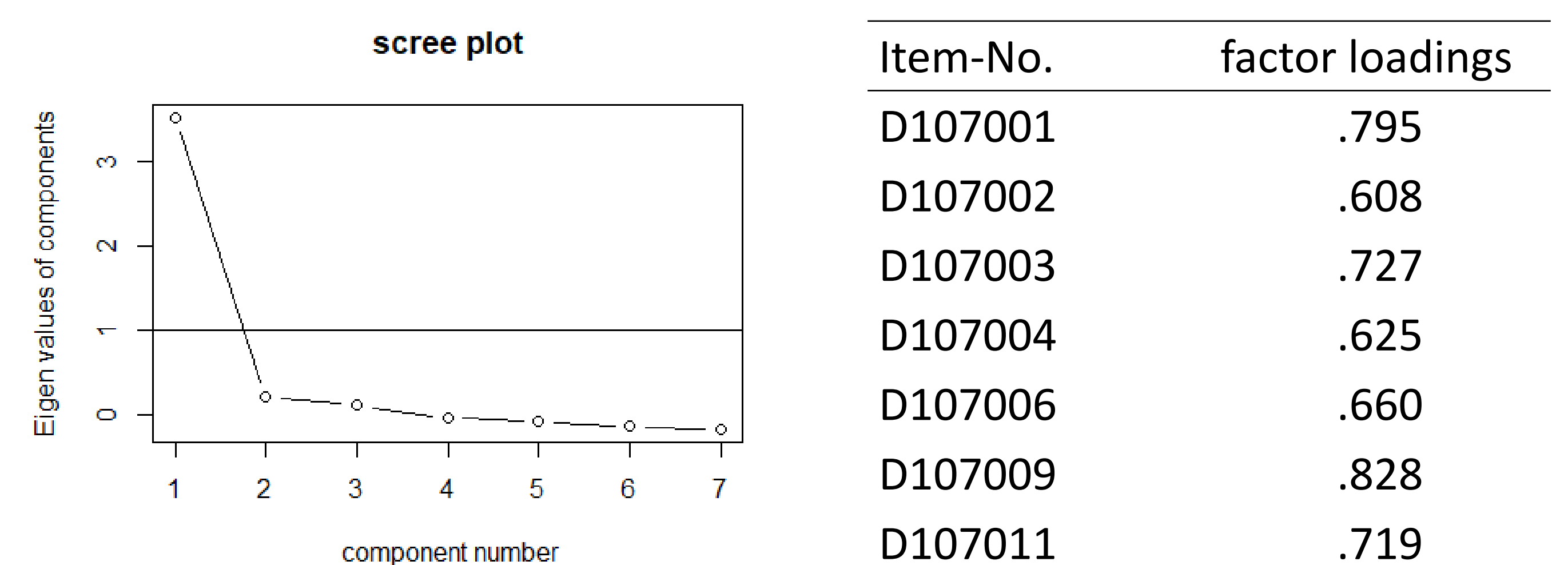


Objectivity

The scale was used in a standardised paper/pencil and online survey. Likert scales or rating scales which can be seen as such, and an instructional text were available for this purpose.

Validity

EFA showed one general factor with factor loadings over .60 for all 7 items. 51% explained variance was found for the one-factor-solution.



The relationship between the personal-burnout scale from the CBI and our adapted scale showed a strong, positive correlation between the constructs ($p < .001$, $r = .73$).

Discussion

The adapted scale was tested on an opportunity sample. Thus, it is conceivable that the sample is biased. A representative sample, possibly also longitudinal data, should be considered in the future. The values of the EFA give a first, good impression about construct validity, but should be checked with structural equation modelling (SEM) or confirmatory factor analysis (CFA) in a further survey. It could also be useful to check the content validity with other similar constructs in a future survey.

Conclusion

The results show that the adapted scale is sufficiently suitable for the measurement of mental strain in accordance with EN ISO 10075-3 (for screening: $\alpha \geq .80$ and $r \geq .40$) and could be used for further assessment in the context of risk analysis for company surveys.

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