Supplementary material for "Preoperative Cognitive Profile Predictive of Cognitive Decline after Subthalamic Deep Brain Stimulation in Parkinson's Disease"

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In this supplementary material we present additional information to manuscript *"Preoperative Cognitive Profile Predictive of Cognitive Decline after Subthalamic Deep Brain Stimulation in Parkinson's Disease"* including further presentation of the results that was not included in the main text due to space constraints. All procedures described in this supplementary material are accompanied by R code used to implement the steps described herein and Stan code for Bayesian generalized linear mixed models (GLMMs) fitted during this project. The R code and Stan models as well as raw files containing all images and tables are available at https://github.com/josefmana/dbs_longCOG. Since the data used for model fitting in our study contain medical records of included patients, they are not publicly available for privacy reasons. Moreover, because the GLMMs reported in this article are exceedingly large for purposes of online storage (> 2 GB each), only the R and Stan codes are included.

Pre-surgery cross-sectional exploratory factor analysis

Data pre-processing

For exploratory factor analyses (EFAs) we first log transformed all response time-based tasks (i.e., Trail Making Test and Stroop test), then standardized (i.e., mean-centered and scaled by their in-sample standard deviation) all variables before applying multiple imputations for missing values. EFA was then fitted on each imputed data set via ordinary least squares to find the minimal residual (minres) solution. This procedure was repeated for three up to eight factor solutions.

Supplementary presentation of results

Supplementary EFA results are presented in Table 1 and Figure 1 (see below). Table 1 presents numerical summary of fit indexes of each three to eight factor solutions across one hundred imputations. Note that Tucker-Lewis Index (TLI) was above the threshold implying good fit (TLI > 0.9) in only three out of four six-factor models, but

it was above this threshold in all but three out of one hundred seven-factor models. Similar information is visually presented in Figure 1 which depicts density plots of TLI and upper 90% confidence interval boundary of root-mean-square-error approximation (RMSEA) of all models across imputations. This clear improvement in fit of seven- compared to six-factor model, only modest improvement of eight- compared to seven-factor model, and overall theoretical plausibility of factors identified by the seven-factor model led us to retain seven factors for further analyses.

Longitudinal generalized linear mixed models

Data pre-processing

To simplify the process of choosing appropriate prior distributions and minimize multicollinearity, all variables were standardized (i.e., mean-centered and scaled by their in-sample standard deviation) before the analyses. The only variable that was not pre-processed this way was time after surgery. This variable was entered into all models in its raw scale (i.e., years after surgery) shifted forward by a median time of pre-surgery assessment (i.e., 0.30 years). Consequently, model intercepts represent estimates of patients' cognitive performance in Mattis Dementia Rating Scale (DRS-2) at pre-surgery assessment (0.30 years before surgery) and time slopes represent DRS-2 annual post-surgery cognitive decline. Before they were entered into the models, all pre-surgery cognitive functions' scores were coded such that higher values indicated poorer performance.

Table 1

?(caption)

(a)

Model	TLI	RMSEA	RMSEA 90% CI (upper bound)	Total variance accounted for
3-factor	0.68 (0.03)	0.09 (0.00)	0.11 (0.00)	0.38 (0.01)
4-factor	0.81 (0.03)	0.07 (0.01)	0.09 (0.00)	0.44 (0.01)
5-factor	0.87 (0.03)	0.06 (0.01)	0.08 (0.01)	0.48 (0.01)
6-factor	0.92 (0.03)	0.04 (0.01)	0.07 (0.01)	0.52 (0.01)
7-factor	0.96 (0.03)	0.03 (0.01)	0.06 (0.01)	0.55 (0.01)
8-factor	0.99 (0.03)	0.02 (0.01)	0.05 (0.01)	0.58 (0.01)

Values represent mean (SD) or percentages if indicated in brackets.

TLI Tucker-Lewis Index. RMSEA root-mean-square-error approximation. CI confidence interval

Figure 1

Factor analyses fit indexes. Density plots of (A) Tucker-Lewis Index (TLI) and (B) upper boundary of 90% confidence interval (CI) of the root-mean-square-error approximation for three- to eight-factor solutions of factor analysis of pre-surgery cognitive profile. Density plots are taken over one hundred imputed datasets. Vertical lines represent boundaries of good fit according to TLI (i.e., TLI > 0.9) and RMSEA (i.e., RMSEA < 0.08).