

Supplementary Table 3. Details of the DBS-RTNT protocol and of the pre-surgery neuropsychological evaluation

DBS-RTNT LH/RH protocol	Domain	Test	Measure of	Researcher	DBS-RTNT n. items	Pre-surgical neuropsychological baseline
RH and LH	Executive function	Stroop test	Monitoring and inhibition skills	Brugnolo, et al. ¹	35 items	Entire test
RH and LH	Emotional perception	IAPS+ SAM	Subjective evaluation of the perceived emotional experience IAPS. The evaluation of pleasantness, activation of the IAPS images is carried out by means of the SAM	Lang, et al. ²	6 images (2 positive, 2 neutral, 2 negative)	Entire test
RH and LH	Executive function (comprehension and Inference)	Tomato and tuna test	Sequencing (understanding action goals and the sequential, logical order in which actions must be performed to reach these goals)	Danek, et al. ³	3 items	Entire test
RH	Memory	Visual working memory span	Visual-spatial working memory	Monaco, et al. ⁴	It depends on the patient's span	Entire test
RH	Memory	Visual short-term memory span	Visual-spatial short-term memory	Monaco, et al. ⁴	It depends on the patient's span	Entire test
RH	Memory	Learning of a series of faces	Learning and retrieval ability for visual items (faces)	Mina, et al. ⁵	5 items	Entire test
LH	Memory	Short-term memory span	Verbal short-term memory	Monaco, et al. ⁴	It depends on the patient's span	Entire test
LH	Memory	Verbal working memory span	Verbal working memory	Monaco, et al. ⁴	It depends on the patient's span	Entire test
LH	Memory	Learning of a list words	Learning ability for verbal items (words)	Mina, et al. ⁵	5 items	Entire test
LH	Executive function	Verbal fluency	Executive control ability and verbal ability, specifically lexical access ability.	Novelli, et al. ⁶	Letter P in 60 seconds	Entire test
-	Executive function	Story-based empathy task-SET	Understanding of intentions and attribution of emotions	Dodich, et al. ⁷	-	Entire test

The choice of cognitive domains to be investigated was made on the basis of the literature that emphasises the involvement of the basal ganglia, and in particular the STN, in attention and orienting processes,⁸ in reaction time tasks,⁹ and in executive functions like inhibition control, impulsivity and compulsive behavior.¹⁰ Given the central position of the STN in the brain network supporting emotions, with connections within the limbic circuit and projections to the basolateral amygdala, it was expected that the STN may play a key role in emotional processes.^{11,12} In a task probing probabilistic learning, memory retention and information integration¹³ authors found an involvement of dopamine in learning processes and observed the role of the STN in decision-making when more information needs to be combined.¹³ DBS-RTNT, deep brain stimulation-real-time neuropsychological testing; LH, left hemisphere; RH, right hemisphere; IAPS, International Affective Pictures System; SAM, Self Assessment Maniki; SET, Story-based Empathy Task.

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