definition of key areas of involvement based upon regions of lesion overlap was lacking. In a series of consecutively admitted patients with visual-multimodal extinction, we found sixteen whose cortical lesions had no concurrent involvement of the basal ganglia or the thalamus. Their lesions were mapped and superimposed using MRicro software. We subtracted the superimposed lesions of the brain-damaged control group without extinction from the overlap image of the extinction group. The resulting lesion overlay revealed a circumscribed center covering the junction area between the caudal part of the temporal cortex and the inferior parietal lobule. A comparison of this area with the cortical correlate of spatial neglect found previously in the middle and rostral parts of the superior temporal gyrus showed clear anatomical differences. The findings suggest that neglect and extinction probably are caused by damage to different functional systems and thus should be treated as separate disorders.

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In a series of event-related fMRI studies, we investigated which brain areas support the reallocation of attentional resources between visual dimensions, such as color or motion. Target detection in visual singleton search is slowed when consecutive targets are defined in different visual dimensions. Behavioral data provide evidence that attentional weight needs to be shifted between dimension-specific processing modules. Depending on the type of search, these attentional weight shifts can occur stimulus-driven or top-down controlled. We found a double dissociation in anterior prefrontal cortex: left frontopolar cortex was selectively involved in stimulus-driven dimension changes but not in top-down controlled dimension changes, whereas the reverse was observed in pregenual frontomedian cortex. We then carried out a patient study to investigate the functional significance of the dimension-change-related activation in frontopolar cortex. Patients with frontopolar lesions showed significantly increased reaction times following stimulus-driven dimension changes. We conclude that anterior prefrontal cortex is actively involved in shifts of attention between visual dimensions, with lateral frontopolar cortex supporting stimulus-driven, and pregenual frontomedian cortex top-down-controlled shifts of attention.

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T. SCHUBERT, C. PREUSCHHOFF, & J. VOLKMANN. Effects of Pallidal and Subthalamic Brain Stimulation on Dual-Task Performance in Parkinson’s Disease.

Patients with Parkinson’s disease (PD) show severe impairments in the ability to coordinate sensorimotor tasks in dual-task situations. These impairments are often associated with dysfunctions of the basal ganglia-thalamo-cortical circuits. The aim of our project was to elucidate the function of different anatomical substrates of these circuits for the control of dual tasks. For that purpose, we changed the functional states of parts of the basal ganglia with deep brain stimulation (DBS) and investigated its effects on dual-task processing in patients with PD. DBS was targeted to the Globus Pallidus internus (GPi) and to the subthalamic nucleus (STN). 16 PD patients (8 GPI) performed an auditory and a visual choice reaction task either separately or concurrently as a dual task with varying intervals between both tasks (ITI). The manipulation of the ITI and a careful theoretical analysis of the involved processes allowed us separating effects of DBS on motor from that on cognitive components in dual-task performance. As a result DBS improved dual-task performance independently of the ITI in the GPi—as well as in the STN-group, which points to an effect of DBS on motor components during dual-task processing. Additionally, in the STN-group the amount of the improvement increased with increasing cognitive demands in the applied tasks. These results indicate a similar functional role of the GPi and the STN for the control of motor components during dual-task processing. Additional neural projections to the STN may be responsible for the additional DBS effects on performance control in the STN-group.

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The ability to prepare for different task situations is crucial for the voluntary control of our actions. It enables us to react flexibly and rapidly to a changing environment. In the present series of fMRI experiments we wanted to investigate the role of the fronto-lateral cortex in task-preparation. In the first experiment we isolated task-preparation related brain areas from task-execution related brain areas by using a task-cuing paradigm. This experiment showed that the fronto-lateral cortex at the junction of inferior frontal sulcus and inferior precentral sulcus (inferior frontal junction area, IFJ) is involved in task-preparation. In the second experiment we tested whether this involvement was related to the translation of the task-cue into the task-instruction or to the implementation of the task-set. It turned out that the IFJ is involved in the implementation of the task-set but not in the translation of the cue into the task-instruction. In sum, these results strongly indicate that the IFJ is the crucial frontal component for the implementation of task rules.

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EXECUTIVE FUNCTION I


Background: Verbal fluency tasks (VFT) are used in clinical and experimental practice. Most of the previous studies, in phonemic and semantic fluency tasks, considered a unique score: the number of correct items generated. Yet, this index doesn’t provide information about the cognitive processes involved on VFT, nor to dissociate the involvement of frontal and temporal lobes on these tasks. Troyer and colleagues proposed two additional indexes: switching and clustering, mediated by frontal and temporal lobes respectively. There are few VFT studies in childhood and none, to our knowledge, analyze Troyer’s proposal, since her work was exclusively done with adults. Objectives: to outline the developmental performance pattern on VFT in Portuguese population; and to evaluate Troyer’s proposal in children. Methods: At the moment, 178 children with 6–13 years old, from public and private schools, between 1st–6th grades were included. They performed five VFT: two semantic and three phonemic. Results: We’ve found no sex and school differences. The number of correct answers and number of switching in all VFT revealed the developmental pattern expected: significant differences for these scores in all age groups and educational levels. Switching has a strong correlation with the total number of items produced in all tasks, but it is the best predictor for phonemic tasks. Digit span is correlated with the number of correct items produced and switching in all tasks, but not with clustering. Discussion: This developmental analysis permits the comprehension of the VFT performance of healthy children and a better understanding of developmental neuropsychological cases.

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H. HILDEBRANDT, B. BROKATE, & T. TERNEK. Executive Functions in Multiple Sclerosis.

During the past years, research has focused the attention on the cognitive deficits in patients with MS. The present study compares how 40 MS