Introduction

The two cerebral hemispheres are differently involved in cognitive processes (e.g. language in left hemisphere).

Thus, what is the evolutionary advantage of having a lateralized brain?

We tested two hypotheses:
I: Stronger lateralization → better specialization → better cognitive performance in single tasks.
II: Stronger lateralization → better capacity to process two things simultaneously (dual task) [1,2].

We examined whether this is true for two cognitive functions that are normally attributed to different hemispheres: language (left hemisphere) and visuo-spatial orientation (right hemisphere).

We assessed strength of lateralization by means of functional transcranial Doppler (fTCD) recordings, which measure blood flow to the left and right hemisphere during task performance.

Materials & Methods

• 43 university students, 19 ♂, 24 ♀ (mean age 21.0 years ± 1.98 SD)
• Word generation task
• Mental rotation task
• Word generation task + Mental rotation task (fig.1)
• Determination of lateralization by fTCD (functional transcranial Doppler) → analysis of change in blood flow velocity in left/right middle cerebral artery
• Backwards regression analysis

Results

Single-task condition

Strength of lateralization positively correlates with performance for the language task in single condition (fig.2).

Strength of lateralization positively correlates with performance in dual-task condition, i.e. simultaneous task execution (fig.3).

The correlation between strength of lateralization and performance in the mental rotation just missed significance by a narrow margin (p = 0.064).

Dual-task condition

Conclusions

Strength of lateralization has a positive influence on task performance.

This effect is present in single-task performance and dual-task performance.

In humans, strength of lateralization may be under natural selection.

Literature