Electronic supplementary material

Ictal postural phantom limb sensation is associated with impaired mental imagery of body parts

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1. Case report

1.1 Semiology

The seizures are characterized by a stereotypic „sensation of becoming crazy"[patient's own words], followed by the unspecific impression „that her right hand does no longer belong to her" while "being in a strange and physiologically impossible position and angle with respect to the rest of the her body during several minutes" (i.e. as if her hand was coming directly out of her trunk). The experience was non-visual (the patient also indicated that she was too frightened to look at the hand) and no voluntary or involuntary movement of the phantom was reported.

2. Methods

2.1 Experiment

To further investigate the functional mechanisms of ictal postural phantom limb and body awareness we compared the patient's performance in a mental rotation task involving body parts (i.e. the right arm, body condition) with the performance using a non-corporeal external object (i.e. the letter "F"; object condition, for details refer to [1, 2]). Both types of stimuli were presented at 5 different angles (0°-120°) and were either in a normal view or in an inverse view (i.e. the contralateral hand was attached to the ipsilateral arm; the letter „F" was presented in a mirror-reversed view). The participants had to determine as quickly as possible whether the stimulus was presented in the correct or the inverse view. We predicted reaction times (RTs) to be longer as a function of degree of the deviation from normal upright view, i.e. higher deviations resulting in longer RTs [1, 2]

1.2 Participants

The behavioural data of the patient were compared to a control group of 8 healthy individuals (all female), matched for age (mean age: 25.7 years, range: 23-28 years) and handedness (all subjects were right-handed, as evaluated using the Oldfield-Edinburgh questionnaire [3]). All participants had normal or corrected-to-normal vision, were not under any medication and had no history of neurological or psychiatric disease. The study was approved by the ethical committee of the University Hospital of Geneva and written informed consent was obtained from all participants, including the patient.

1.3 Statistical analysis

We first performed an ANOVA with factors task (body, object) and angle (0°,30°,60°,90°,120°). We then extracted the intercept values (value at which the slope crosses the Y axis, e.g. high value referring to a high general reaction time) using least-square linear fits and the slope value (a high value for the slope refers to RTs change as a result of the degree of mental rotation) for the patient and each of the controls in order to compare the control subjects with the patient using t-tests [4].

2. Results

We found that participants were generally slower in the body condition as compared to the object condition (main effect of task, F=37,73, p<0.001). The effect of degree was present in both the body condition and the object condition (main effect of angle, F=17, p<0.001). We found that the patient had, in general, significantly longer RTs for both conditions, as compared to the control participants (intercept value for the arm condition: patient=728.9; controls=415.3; t=-10.2, p<0.001, intercept value for the control condition: patient=359.8, controls=268.9, t=-6.5, p<0.001). However, while RTs depended on the angle of rotation in the object condition in both the patient and the control participants (slope value patient=0.9, controls=0.52, t=-1.8, p=0.12), this effect was not present in the patient when carrying out the body condition. The patient's performance on judging the accuracy of the shown stimuli (normal vs. inverse view of the arm) was independent of the angle (slope value 0.6). This was significantly different from the control participants for whom RTs depended on the angle of rotation (slope value= 2.6; t=7.3, p<0.001). Error rates were generally low and not different for the patient and the control participants. For illustration of the behavioural results please refer to Figure 2.

References

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