Size-weight illusion and anticipatory
grip force scaling following unilateral
cortical brain lesion.

Abstract:
The prediction of object weight from its size is an important prerequisite of skillful object manipulation. Grip and load forces anticipate object size during early phases of lifting an object. A mismatch between predicted and actual weight when two different sized objects have the same weight results in the size-weight illusion (SWI), the small object feeling heavier. This study explores whether lateralized brain lesions in patients with or without apraxia alter the size-weight illusion and impair anticipatory finger force scaling. Twenty patients with left brain damage (LBD, 10 with apraxia, 10 without apraxia), ten patients with right brain damage (RBD), and matched control subjects lifted two different-sized boxes in alternation. All subjects experienced a similar size-weight illusion. The anticipatory force scaling of all groups was in correspondence with the size cue: higher forces and force rates were applied to the big box and lower forces and force rates to the small box during the first lifts. Within few lifts, forces were scaled to actual object weight. Despite the lack of significant differences at group level, 5 out of 20 LBD patients showed abnormal predictive scaling of grip forces. They differed from the LBD patients with normal predictive scaling by a greater incidence of posterior occipito-parietal lesions but not by a greater incidence of apraxia. The findings do not support a more general role for the motor-dominant left hemisphere, or an influence of apraxia per se, in the
scaling of finger force according to object properties. However, damage in the vicinity of the parietal-occipital junction may be critical for deriving predictions of weight from size.