Small tool use without a tool: kinematic characteristics of pantomiming as compared to actual use and the effect of brain damage.

Movement goals and task mechanics differ substantially between actual tool use and corresponding pantomimes. In addition, apraxia seems to be more severe during pantomime than during actual tool use. Comparisons of these two modes of action execution using quantitative methods of movement analyses are rare. In the present study, repetitive scooping movements with a ladle from a bowl into a plate were recorded and movement kinematics was analyzed. Brain-damaged patients using their ipsilesional hand and healthy control subjects were tested in three conditions: pantomime, demonstration with the tool only, and actual use in the normal context. Analysis of the hand trajectories during the transport component revealed clear differences between the tasks, such as slower actual use and moderate deficits in patients with left brain damage (LBD). LBD patients were particularly impaired in the scooping component: LBD patients with apraxia exhibited reduced hand rotation at the bowl and the plate. The deficit was most obvious during pantomime but actual use was also affected, and reduced hand rotation was consistent across conditions as indicated by strong pair-wise correlations between task conditions. In healthy control subjects, correlations between movement parameters were most evident between the pantomime and demonstration conditions but weak in correlation pairs involving actual use.
From these findings and published neuroimaging evidence, we conclude that for a specific tool-use action, common motor schemas are activated but are adjusted and modified according to the actual task constraints and demands. An apraxic LBD individual can show a deficit across all three action conditions, but the severity can differ substantially between conditions.