Effects of Post-Stroke Upper Extremity Assistance

Statistical Analysis Plan

NCT05036642

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A motion capture system (Impulse X2E, Phasespace, San Leandro, CA, USA) recorded motion data at 270 Hz with 8 LED markers placed at the Acromion, Humeral Head, C7, Sternoclavicular, Lateral Humeral Epicondlye, Olecranon, Medial Radial Styloid, and Ulnar Styloid. Gaps in the data, due to marker occlusions, were interpolated (interp1 function in MATLAB) if they occurred between recorded values. If a gap occurred at the beginning or end of the data, the first or last valid number was applied to fill the gap. Each bony prominence of interest (trunk, shoulder, elbow, wrist) had two markers, and the marker with the least interpolation was used for calculations. For area calculations, time instances in which any part of the arm (wrist, elbow) fell below 20 cm were removed as in Sukal et al.[1] Reachable workspace area was calculated as the concave boundary (boundary function in MATLAB) for all data points within 20 cm of shoulder level in accordance with prior work.[2] The wrist data used to determine the area and average height calculations were the wrist marker positions with respect to the trunk marker positions. Shoulder level was defined as the average height of the shoulder marker. The Shapiro-Wilk Test was used to determine which test (one-way repeated measures ANOVA or Wilcoxon Test) to use for the following data: % of successful motion, workspace area, average distance from trunk height for all motion and successful motion. P2, P3, and P10 were excluded from analysis of distance from trunk for successful motion because they only produced data in one condition.

[1] T. M. Sukal, M. D. Ellis, and J. P. A. Dewald, “Shoulder abductioninduced reductions in reaching work area following hemiparetic stroke: Neuroscientific implications,” Experimental Brain Research, vol. 183, no. 2, pp. 215–223, 2007.

[2] C. Simpson, B. Huerta, S. Sketch, M. Lansberg, E. Hawkes, and A. Okamura, “Upper Extremity Exomuscle for Shoulder Abduction Support,” IEEE Transactions on Medical Robotics and Bionics, vol. 2, no. 3, pp. 474–484, 2020.