A Comparative Study of Virtual Hand Prosthesis Control Using an Inductive Tongue Control System


References:


Abstract:

Purpose: This study compares the time required to activate a grasp or function of a hand prosthesis when using an electromyogram (EMG) based control scheme and when using a control scheme combining EMG and control signals from an Inductive Tongue Control System (ITCS).

Method: Using a cross-over study design, 10 able-bodied subjects used both control schemes to control a computer model of a hand and completed simulated grasping exercise. The time required to activate grasps was recorded and analysed for both control schemes.

Results: End session mean activation times (seconds) for the EMG control scheme grasp 1-5: 0.80, 1.51, 1.95, 2.93, 3.42, and for the ITCS control scheme grasp 1-5: 1.19, 1.89, 1.75, 2.26, 1.80. The difference in mean activation time between control schemes for grasp 1 and 2 was statistically significant in favour of the EMG control scheme (p=0.030; p=0.004). For grasp 3 no statistical significance occurred, and for grasp 4 and 5 there was a statistical significance in favour of the ITCS control scheme (p=0.048; p=0.004). Conclusions: Based on the amount of training and the achieved level of performance, it is concluded that the ITCS control scheme can be used as a means of enhancing prosthesis control.

Keywords:

Myoelectric Control, Prosthesis Control Schemes, Upper Limb Prosthetics