

Biomechanical Evaluation of the Chronic Stroke with 3D-Printed Hand Device

Authors : Chen-Sheng Chen, Tsung-Yi Huang, Pi-Chang Sun

Abstract : Chronic stroke patients often have complaints about hand dysfunction due to flexor hypertonia and extensor weakness, which makes it difficult to open their affected hand for functional grasp. Hand rehabilitation after stroke is essential for restoring functional independence. Constraint-induced movement therapy has shown to be a successful treatment for patients who have acquired certain level of wrist and finger extension. The goal of this study was to investigate the feasibility of task-oriented approach incorporating 3D-printed dynamic hand device by evaluating hand functional performance. This study manufactured a hand device using 3d printer for chronic stroke. The experimental group engaged task-oriented approach with dynamic hand device, but the control group only received task-oriented approach. Outcome measurements include palmar pinch force (PPF), lateral pinch force (LPF), grip force (GF), and Box and Blocks Test (BBT). The results of study revealed the improvement of PPF in experimental group but not in control group. Meanwhile, improvement in LPF, GF and BBT can be found in both groups. This study demonstrates that the 3D-printed dynamic hand device is an effective therapeutic assistive device to improve pinch force, grasp force, and dexterity and facilitate motivation during home program in individuals with chronic stroke.

Keywords : 3D printing, biomechanics, hand orthosis, stroke

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