

## Positive Effect of Manipulated Virtual Kinematic Intervention in Individuals with Traumatic Stiff Shoulder: Pilot Study

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**Abstract :** Virtual Reality allows to manipulate the patient's perception, thereby providing a motivational addition to real-time biofeedback exercises. We aimed to test the effect of manipulated virtual kinematic intervention on measures of active and passive Range of Motion (ROM), pain, and disability level in individuals with traumatic stiff shoulder. In a double-blinded study, patients with stiff shoulder following proximal humerus fracture and non-operative treatment were randomly divided into a non-manipulated feedback group (NM-group; N=6) and a manipulated feedback group (M-group; N=7). The shoulder ROM, pain, and the Disabilities of the Arm, Shoulder and Hand (DASH) scores were tested at baseline and after the 6 sessions, during which the subjects performed shoulder flexion and abduction in front of a graphic visualization of the shoulder angle. The biofeedback provided to the NM-group was the actual shoulder angle and the feedback provided to the M-group was manipulated so that 10° were constantly subtracted from the actual angle detected by the motion capture system. The M-group showed greater improvement in the active flexion ROM, with median and interquartile range of 197.1 (140.5-425.0) compared to 142.5 (139.1-151.3) for the NM-group (p=.046). Also, the M-group showed greater improvement in the DASH scores, with median and interquartile range of 67.7 (52.8-86.2) compared to 89.7 (83.8-98.3) for the NM-group (p=.022). Manipulated intervention is beneficial in individuals with traumatic stiff shoulder and should be further tested for other populations with orthopedic injuries.

**Keywords :** virtual reality, biofeedback, shoulder pain, range of motion

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