

## Effectiveness of Gamified Virtual Physiotherapy Patients with Shoulder Problems

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**Abstract :** Introduction: Physiotherapy is an essential part of the treatment of patients with shoulder problems. The focus of treatment is usually centred on addressing specific physiotherapy goals, ultimately resulting in the improvement in pain and function. This study investigates if computerised physiotherapy using gamification principles are as effective as standard physiotherapy. Methods: Physiotherapy exergames were created using a combination of commercially available hardware, the Microsoft Kinect, and bespoke software. The exergames used were validated by mapping physiotherapy goals of physiotherapy which included; strength, range of movement, control, speed, and activation of the kinetic chain. A multicenter, randomised prospective controlled trial investigated the use of exergames on patients with Shoulder Impingement Syndrome who had undergone Arthroscopic Subacromial Decompression surgery. The intervention group was provided with the automated sensor-based technology, allowing them to perform exergames and track their rehabilitation progress. The control group was treated with standard physiotherapy protocols. Outcomes from different domains were used to compare the groups. An important metric was the assessment of shoulder range of movement pre- and post-operatively. The range of movement data included abduction, forward flexion and external rotation which were measured by the software, pre-operatively, 6 weeks and 12 weeks post-operatively. Results: Both groups show significant improvement from pre-operative to 12 weeks in elevation in forward flexion and abduction planes. Results for abduction showed an improvement for the interventional group ( $p < 0.015$ ) as well as the test group ( $p < 0.003$ ). Forward flexion improvement was interventional group ( $p < 0.0201$ ) with the control group ( $p < 0.004$ ). There was however no significant difference between the groups at 12 weeks for abduction ( $p < 0.118067$ ), forward flexion ( $p < 0.189755$ ) or external rotation ( $p < 0.346967$ ). Conclusion: Exergames may be used as an alternative to standard physiotherapy regimes; however, further analysis is required focusing on patient engagement.

**Keywords :** shoulder, physiotherapy, exergames, gamification

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