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Comparison of virtual reality exergaming and home exercise programs in patients with subacromial impingement syndrome and scapular dyskinesis: Short term effect

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ABSTRACT

Objective: The aim of this study was to compare the short term effects of home exercise program and virtual reality exergaming in patients with subacromial impingement syndrome (SAIS).
Methods: A total of 30 patients with SAIS were randomized into two groups which are Home Exercise Program (EX Group) (mean age: 40.6 ± 11.7 years) and Virtual Reality Exergaming Program (WII Group) (mean age: 40.33 ± 13.2 years). Subjects were assessed at the first session, at the end of the treatment (6 weeks) and at 1 month follow-up. The groups were assessed and compared with Visual Analogue Scale (based on rest, activity and night pain), Neer and Hawkins Tests, Scapular Retraction Test (SRT), Scapular Assistance Test (SAT), Lateral Scapular Slide Test (LSST) and shoulder disability (Shoulder Pain and Disability Index (SPADI)).
Results: Intensity of pain was significantly decreased in both groups with the treatment ($p < 0.05$). The WII Group had significantly better results for all Neer test, SRT and SAT than the EX Group ($p < 0.05$).
Conclusion: Virtual reality exergaming programs with these programs were found more effective than home exercise programs at short term in subjects with SAIS.
Level of Evidence: Level I, Therapeutic study.

Introduction

Shoulder impingement symptoms in particular appear to be affected by scapular position and motion. Scapular dyskinesis is probably a potential impairment to optimum shoulder function which should be evaluated and treated as part of comprehensive treatment protocol. As a compensatory strategy, scapular dyskinesis is described as the abnormal rhythm of the scapula during shoulder movements.[1,2] Scapular dyskinesis is associated with impingement by altering arm motion upon dynamic elevation and scapular position at rest.[3] Scapular dyskinesis can be treated conservatively and shoulder problems related can be avoided. The goal of treatment is to maintain the optimal function of scapular position.[1] Exercise approaches such as core stability, open and closed kinetic chain exercises and scapular stabilization exercises are used for the rehabilitation progressions of scapular dyskinesis. The aim of these exercise approaches is to restore the optimal functional position of the scapula and to eliminate muscular imbalance.[4–6]

Rehabilitation of these problems should include patient management trends and newest advances in rehabilitation medicine. Virtual reality exergaming is a newly used method and increases motivation of the subject and participation to exercise better than conventional treatments. Virtual reality exergaming program is a three-dimensional and computer-aided program which is built with a system that creates virtual reality movements. This creates high amount of visual and sensory feedback during exercise. Created screen avatar allows subjects to detect movement through remote control.[7] To the best of our knowledge, there is a lack of literature about virtual reality exergaming in subjects with orthopedic problems, the aim was to investigate the short term effects of virtual reality exergaming program and home exercise program approaches on scapular dyskinesis in subjects with SAIS.

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Patients and methods

The study protocol was approved by the University Ethics Committee (LUT 12/131-28). An informed consent form was taken from all subjects. 30 volunteered subjects diagnosed with SAIS and scapular dyskinesis were randomly divided into 2 groups which are Group 1 – Virtual Reality Exergaming Program (WII) and Group 2 – Home Exercise Program (EX). None of the subjects were affected by any rotator cuff problem. The subjects were randomly assigned to the one of the groups using an online random allocation software program (GraphPad Software QuickCalcs, GraphPad Software Inc., La Jolla, California, USA). All groups were taken into a 6 week treatment program. At the end of the treatment process, 1 month of control period was given to subjects including home exercise program aiming scapular muscles.

Exclusion criteria were if subject; had any other soft tissue or bone problems affecting shoulder, had any neurologic problems, had scoliosis, had any systematic rheumatic problems, other orthopedic problems or surgery affecting neck, obesity (BMI > 30). The ages of 18–60 years were included in the study (Fig. 1). All patients were diagnosed with type 2 SAIS which was confirmed with MRI.

Subjects were assessed before, at the end of the treatment (6 weeks) and at control period (1 month after the end of treatment). Assessments included the severity of pain (at rest, during activity and at night) which was evaluated by Visual Analog Scale (VAS). VAS is a 100 mm line with no marks along them, anchored with the words “no pain” on one hand, and “the most severe pain” on the other. Subjects were simply instructed to place a mark along the line at a level representing the intensity of their pain at rest, during activity and at night for the past one month.[8–10]

Neer and Hawkins tests were performed for evaluation of SAIS. To perform Neer test, subject sat in upright position. Examiner raised the testing arm to flexion in scapular plane passively. In this way subacromial space was narrowed, and if there is a pathology, pain is provocated. It shows that the test is positive.[11] To perform Hawkins test, subject sat in same position. Examiner passively put the subjects' upper extremity in 90° shoulder flexion, maximum internal rotation and 90° elbow flexion. In this way subacromial space was narrowed, and if there is a pathology, pain is provocated. It shows that the test is positive.[2,12]

Lateral Scapular Slide Test (LSST), Scapular Retraction Test (SRT) and Scapular Assistance Test (SAT) were used to determine scapular dyskinesis. LSST was performed in three positions. For test position one of the LSST, subjects were instructed to keep their upper extremities relaxed at their sides. The assessor obtained and confirmed the test position and then identified through palpation and marked the inferior aspect of the inferior angle of the scapula and the closest spinous process in the same horizontal plane. The distance between the two reference points was measured bilaterally with a tape measure. For test position two, the subject was instructed to actively place both hands on the ipsilateral hips, and consequently the humerus was positioned in medial rotation at 45° of abduction in the coronal plane. In test position three, subjects were instructed to actively extend both elbows and to elevate and maximally internally rotate (“thumbs down”) both upper extremities to 90° in the coronal plane. All scapular distance measurements were taken two times. A difference of 1.5 cm or more in any of the three positions was considered a positive result of the LSST.[1,3,10,13]

To perform SRT, the scapula is passively moved toward posterior tilt and external rotation with slight voluntary retraction. This test appears to be altering scapular kinematics by increasing posterior tilt, external rotation, and scapular retraction (defined as the projected angle in the transverse plane formed between the sternum and acromion relative to the frontal plane bisecting the sternal notch) as compared to elevation against resistance without the scapula stabilized.[13–15]

SAT was performed with scapular upward rotation manually assisted during arm elevation. It has demonstrated reliability and has been shown to reduce pain in approximately half of symptomatic subjects tested. This test appears to be altering scapular kinematics by increasing posterior tilt and decreasing scapular

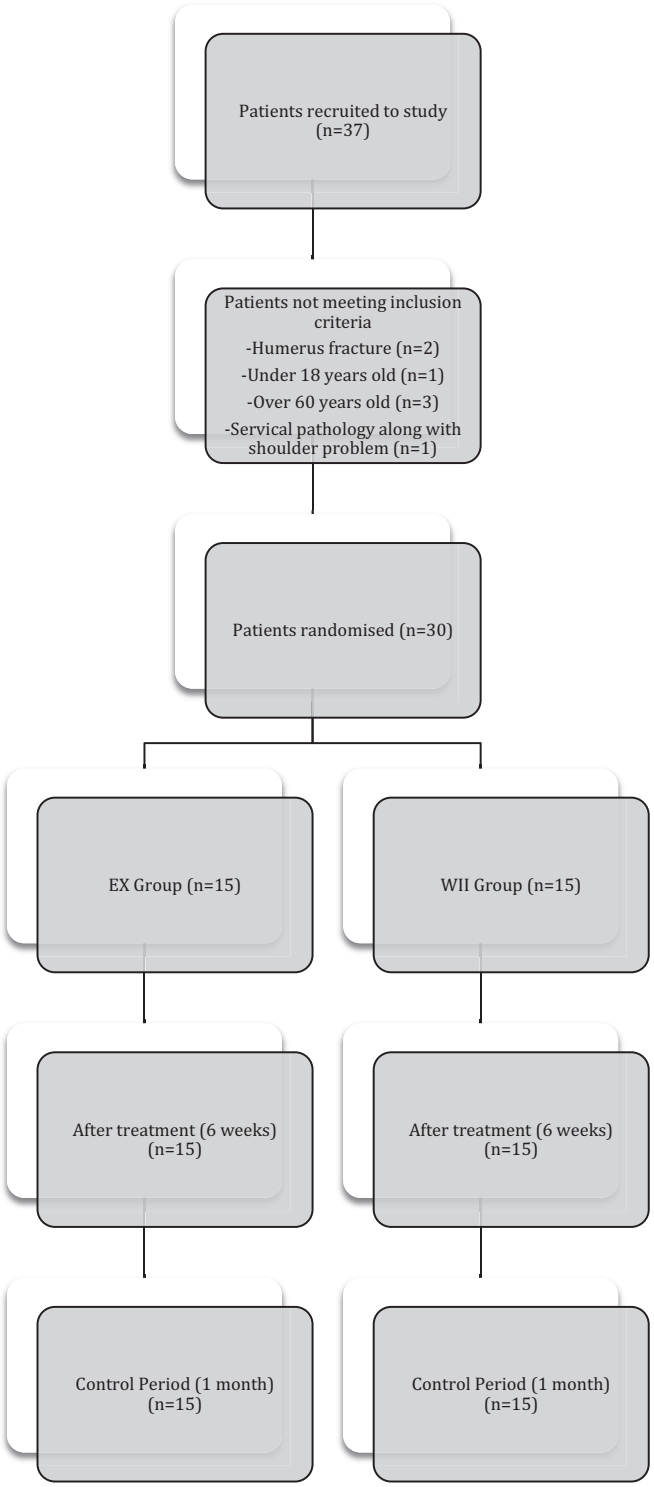

Fig. 1. Flow Chart of the study.

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