



ELSEVIER

## ORIGINAL ARTICLE

# Progressive conscious control of scapular orientation with video feedback has improvement in muscle balance ratio in patients with scapular dyskinesis: a randomized controlled trial

Tsun-Shun Huang, PT, PhD<sup>a</sup>, Wan-Yu Du, PT, MS<sup>a</sup>, Tyng-Guey Wang, MD<sup>b</sup>,  
 Yung-Shen Tsai, PT, PhD<sup>c</sup>, Jing-Lan Yang, PT, MS<sup>d</sup>, Cheng-Ya Huang, PT, PhD<sup>a</sup>,  
 Jiu-Jenq Lin, PT, PhD<sup>a,d,\*</sup>

<sup>a</sup>School and Graduate Institute of Physical Therapy, College of Medicine, National Taiwan University, Taipei, Taiwan

<sup>b</sup>Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital, Taipei, Taiwan

<sup>c</sup>Graduate Institute of Sports Sciences, University of Taipei, Taipei, Taiwan

<sup>d</sup>Division of Physical Therapy, Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital, Taipei, Taiwan

**Background:** Video feedback (VF) can guide patients to consciously control scapular orientation without inappropriate substitution. This study investigated whether progressive conscious control with VF improves scapular muscle activation and movements during arm elevation in patients with subacromial impingement and scapular dyskinesis.

**Methods:** The study recruited 38 amateur overhead athletes with subacromial impingement and scapular medial border prominence who were randomly assigned to the VF or control group. The participants in both groups controlled the scapular position and progressively practiced from 0° to 45° and from 0° to 90° of arm elevation. Participants in the VF group also controlled the scapular position with a video presentation of the scapula on a screen. We investigated the scapular kinematics, muscle activation, and balance ratio for outcome collection in the preintervention and postintervention conditions with and without VF conditions.

**Results:** Decreased upper trapezius (UT) activation (3%-13%,  $P < .0083$ ), increased lower trapezius (LT) activation (3%-17%,  $P < .0083$ ), restored UT/LT ratios (0.67-3.13,  $P < .0083$ ), and decreased scapular internal rotation (1.8°-6.1°,  $P < .003$ ) relative to the preintervention condition were demonstrated in the 2 postintervention conditions in both groups. The VF group also demonstrated decreased UT/serratus anterior ratios (0.21-0.30,  $P < .0083$ ) in 2 postintervention conditions relative to the preintervention condition.

**Conclusions:** The progressive control of scapular orientation with or without VF can be used to reduce the UT/LT ratio and improve scapular internal rotation during arm elevation. Control training with VF can further decrease the UT/serratus anterior ratio.

The National Taiwan University Hospital Human Subject Research Ethics Committee approved this study (201412043RINA). Trial registration: NCT03252444 at [ClinicalTrials.gov](http://ClinicalTrials.gov).

\*Reprint requests: Jiu-Jenq Lin, PT, PhD, School and Graduate Institute of Physical Therapy, College of Medicine, National Taiwan University, Taipei, Taiwan.

E-mail address: [jiujlin@ntu.edu.tw](mailto:jiujlin@ntu.edu.tw) (J-J. Lin).

**Level of evidence:** Level II; Randomized Controlled Trial; Treatment Study

© 2018 Journal of Shoulder and Elbow Surgery Board of Trustees. All rights reserved.

**Keywords:** Subacromial impingement; scapular dyskinesis; kinematics; muscle activation; feedback; conscious control

Scapular dyskinesis is defined as altered scapular position and movement relative to the thoracic cage.<sup>12,17</sup> A high percentage of patients with shoulder disorders, including rotator cuff injuries, glenohumeral instability, and labral tears, have scapular dyskinesis.<sup>1,23,24</sup> A recent study reported that the prevalence of scapular dyskinesis was 61% in overhead athletes, which was significantly higher than that in nonoverhead athletes (33%).<sup>1</sup> The scapulothoracic joint is believed to be essential to the restoration of function in patients with shoulder disorders, especially in the overhead population.

Alteration of periscapular muscle activation has been reported to be related to scapular dyskinesis.<sup>10</sup> Several studies have reported overactivation of the upper trapezius (UT) with inhibition of the middle trapezius (MT)/lower trapezius (LT) and serratus anterior (SA) in patients with shoulder impingement.<sup>4,5,15</sup> These changes in scapular muscle activation may lead to abnormal scapular movement, including reduced scapular upward rotation and posterior tipping, and increased scapular internal rotation.<sup>13,15</sup> Thus, one rehabilitation strategy for patients with shoulder impingement and scapular dyskinesis is scapular muscle training focused on the facilitation of inhibited/weaker muscles, with minimal activation of hyperactive muscles, during arm movements.<sup>4,5,15</sup>

In the early stage of scapular rehabilitation, evidence supports that conscious control of the scapular orientation can improve proprioception, normalize scapular kinematics, and restore scapular muscle balance during arm movements.<sup>19</sup> A previous study demonstrated that healthy people can perform scapular orientation exercises accurately by reproducing scapular posterior tipping and upward rotation after 5 minutes of training in conscious control.<sup>20</sup> Conscious control training can also significantly increase the MT and LT activities and decrease the UT/MT and UT/LT ratios during exercises in patients with shoulder disorders and scapular dyskinesis.<sup>22</sup>

This study tested a strategy of progressive conscious control and video feedback on scapular orientation during arm elevation. Although selected exercises are recommended for improving scapular muscle balance in the early stage of rehabilitation, high ratios (UT/MT, UT/LT, or UT/SA) of muscle balance during arm elevation indicate either high activity of the UT or low activity of the MT, LT, or SA.<sup>6,22</sup> Arm elevation overhead with gravity resistance may be challenging but is an essential movement during sports and daily activities.

On one hand, according to the concept of motor learning of new movement skills, it is necessary to progress from low to high elevation movement.<sup>19</sup> On the other hand, because the scapula is located behind the rib cage, people cannot observe their scapular movements during arm movements. Video feedback (VF) allowing simultaneous observation of scapular

orientation can guide patients to consciously control their scapular orientation without inappropriate substitution. The purpose of this study was to investigate whether progressive conscious control of scapular orientation with VF would improve scapular muscle activation and movements during arm elevation in patients with subacromial impingement and scapular dyskinesis.

## Materials and methods

### Study design

This study was a randomized controlled trial with single blinded assessment. Before the study began, participants were allocated to groups with block randomization (4 participants per block) by a person not involved in the recruitment of participants. The assessor who performed the clinical measurement, including posterior displacement of the scapula and rounded shoulder posture, was blinded to the group assignment. After completing the preintervention measurements, the first tester opened the sealed, opaque envelope and assigned each individual to the VF or the control group. The participants in both groups then received progressive conscious control training. The VF group received control training with VF of their scapular orientation during arm elevation. Assessments were taken at 1 preintervention and 2 postintervention phases. The procedures of the overall experiment are shown in Fig. 1.

### Participants

Participants were included if they (1) were aged 18 to 60 years old, (2) had subacromial impingement syndrome diagnosed by clinical examination, and (3) had obvious medial border prominence of the scapula at 90° of arm elevation during the visual examination. Subacromial impingement syndrome was confirmed by fitting at least 2 of the following criteria based on several previous studies<sup>8,11,18</sup>: (1) positive Neer test, (2) positive Hawkins-Kennedy test, (3) positive empty can test, (4) positive resisted external rotation test, and (5) tenderness of the rotator cuff tendons. We did not, however, choose painful arc as a criterion because participants needed to accomplish several arm elevation tasks during the experiment. Visual observation with palpation was used to confirm scapular dyskinesis as the medial border prominence pattern.

The evaluation procedure followed previously established methods.<sup>9</sup> In general, participants were asked to elevate their arms, using the thumb-up position, to the end range over a 3-second count and then to lower them over a 3-second count following the tempo of a metronome. During the movements, the assessor observed the pattern of the scapula with appropriate palpation and confirmed the medial border prominence dyskinesis.

Participants were excluded if they had (1) a history of shoulder dislocation, fracture, or shoulder surgery within the past year, (2)

Download English Version:

<https://daneshyari.com/en/article/8800721>

Download Persian Version:

<https://daneshyari.com/article/8800721>

[Daneshyari.com](https://daneshyari.com)