

## ORIGINAL ARTICLE

# Effects of supervised home-based exercise therapy on disability and function in patients with shoulder pain

Emin Ulaş ERDEM<sup>1</sup>, Banu ÜNVER<sup>1</sup>

**Purpose:** Although home-based exercises are widely used in rehabilitation protocols, sometimes clinicians do not correctly check if patients perform the exercises properly. The objective of our study was to investigate the effects of supervised home exercise protocols on the disability and function in patients with shoulder pain.

**Methods:** Patients who have shoulder pain and scheduled to physiotherapy clinic for home-based exercises randomly assigned to Supervised Group (N=21) and Control Group (N=20). All volunteers were instructed "home-based exercises" program for shoulder including pendulum, wand and isometric exercises. Shoulder Pain and Disability Index (SPADI) was used for measuring disability and The Disabilities of the Arm, Shoulder and Hand (DASH) was used for assessing functions. All patients were evaluated at baseline and after six weeks exercise program. The Supervised Group was controlled biweekly whether they performed their exercises properly; mistaken or forgotten exercises were reminded again.

**Results:** After 6 weeks, there were significant improvements regarding shoulder disability and function in both of the groups ( $p<0.05$ ). There was no significant difference between the groups in terms of the DASH and SPADI score changes in six weeks ( $p>0.05$ ).

**Conclusion:** Although home-based exercises are useful tools in managing shoulder pain and functions, according to our results, auditing home-based exercises for shoulder pain could not contribute additional benefit in terms of disability and function.

**Keywords:** Shoulder pain, Exercise, Functional performance.

## Omuz ağırlı hastalarda denetimli ev egzersiz tedavisinin engellilik ve fonksiyona etkisi

**Amaç:** Ev egzersizleri rehabilitasyon protokollerinde geniş ölçüde kullanıldığı halde, klinisyenler bazen hastaların egzersizleri doğru bir biçimde yapıp yapmadığını kontrol etmede yetersiz kalabilirler. Çalışmamızın amacı, denetimli ev egzersiz protokollerinin omuz ağırlı hastalarda engellilik ve fonksiyon üzerine etkisini araştırmaktır.

**Yöntem:** Omuz ağırlı olan ve ev egzersiz program için fizyoterapi kliniğine yönlendirilen hastalar Denetim Grubu (N=21) ve Kontrol Grubuna (N=20) rastgele olarak ayrıldılar. Tüm gönüllülere omuz için Pendulum, Wand ve İzometrik egzersizleri içeren ev egzersiz program öğretildi. Engellilik değerlendirmesi için Omuz Ağrı ve Engellilik İndeksi (SPADI), fonksiyon değerlendirmesi için Kol, Omuz ve El Sorunları Anketi (DASH) kullanıldı. Tüm hastalar başlangıçta ve altı haftalık egzersiz program sonunda değerlendirildi. Denetim Grubu iki haftada bir egzersizleri doğru yapıp yapmadıkları açısından kontrol edildi ve yanlış ya da unutulmuş egzersizler yeniden hatırlatıldı.

**Bulgular:** Altı hafta sonrasında her iki grupta omuz engelliliği ve fonksiyonu açısından anlamlı gelişmeler oldu ( $p<0,05$ ). Altı hafta içerisindeki DASH ve SPADI puanlarının değişimi açısından gruplar arasında anlamlı fark yoktu ( $p>0,05$ ).

**Sonuç:** Ev egzersizleri, omuz ağırlı ve fonksiyonlarının yönetiminde yararlı araçlar olmasına rağmen, sonuçlarımız göre, omuz ağırlı için evde yapılan egzersizlerin denetlenmesi, engellilik ve fonksiyon bakımından ek fayda sağlamamıştır.

**Anahtar kelimeler:** Omuz ağırlı, Egzersiz, Fonksiyonel performans.

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1: Bülent Ecevit University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Zonguldak, Türkiye.

Corresponding Author: Emin Ulaş Erdem: e\_ulaserdem@yahoo.com

ORCID ID: 0000-0002-6736-6512

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As a complex structure, advanced motion capability and being a critical passage from trunk to arm, shoulder problems consist of 5% of all general medical practice consultation and 48% of patients visit their practitioners more than once.<sup>1,2</sup> Of all musculoskeletal problems, shoulder problems are the fourth most common disease behind neck, back and knee problems and are tend to rise with aging.<sup>2,3</sup> Common symptoms are lateral pain, worsen in pain with overhead activity, mild to moderate restrictions during arm movements.<sup>4</sup> Shoulder complex is the basic guide of arm and hand activities. Therefore, patients' daily living activities are limited such as dressing, eating, hygiene and working.<sup>4,5</sup> Moreover, they suffer from inadequate sleep, mood and concentration problems.<sup>1,6,7</sup>

Yet the "shoulder pain" is one of the most common symptoms of shoulder, it is widespread to use it as an umbrella term to integrate the most of the shoulder disorders.<sup>8-10</sup> Rotator cuff tendinitis, impingement syndrome, rotator cuff lesions, adhesive capsulitis and subacromial bursitis are the most common disorders which fall in the scope of shoulder pain.<sup>9,10</sup> Management is composed of a wide spectrum including manipulation, medications, exercise therapy, physiotherapy modalities and medication for the management.<sup>11-14</sup> At the initial phases the problem can be managed with conservative approaches such as resting, pain reliefs, activity modifications and therapeutic exercise in most cases.<sup>1,9,10</sup>

In the management of shoulder pain, home-based exercises are frequently utilized in terms of alleviating pain, encouraging pain-free motion and controlling abnormal muscle activity.<sup>15-17</sup> The content of home-based training are strengthening, stretching and isometric exercise protocols and posture exercises. These exercise protocols also help to control inflammation, diminish the over-activity of upper trapezius to facilitate correct scapula rotation, facilitate and encourage correct movement and further contribute to daily living activities.

One of the critical point of home-based exercises is to instruct to the patient for correct training.<sup>18,19</sup> This topic is almost subjective aspect of home-based exercises. Success of the home-based exercise therapy depends on cooperation, motivation, intellectual level,

socioeconomic class, age, beliefs about exercise therapy of the patients as well as the capability of instruction or "patience" of physiotherapist.<sup>20</sup> So, the physiotherapist may never know exactly if the patient performs the exercises accurately and regularly. Nearly half of the patients do not adherence to their protocols.<sup>18,21</sup> Clearly explanation of the exercises by the instructor, correctly comprehension of the exercises by the patients and checking the patients in terms of appropriate performing are the considerable factors that affect the management.<sup>20,22</sup> Therefore; the aim of this study was to investigate the effects of supervised home exercise protocols on the disability and function in patients with shoulder pain. Our hypothesis was that auditing would contribute home exercises to improve shoulder function in patients with shoulder pain.

## METHODS

This prospective study was carried out in Bülent Ecevit University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation. Ethical approval was obtained from the Bülent Ecevit University Clinical Researches Ethical Committee (ID:2017-70-09/08). All participants were informed about the study, and each participant signed the 'informed consent form'.

### Participants

Patients with shoulder pain who referred to physiotherapy clinic were examined by physician and diagnosed properly. The patients who were diverted to physiotherapist for home-based exercise program were invited to attend to the study. Inclusion criteria were having shoulder pain, positive painful arc test, and extreme sensation to palpation of biceps or rotator cuff tendons, pain aggravation due to resisted range of shoulder movements. Exclusion criteria were shoulder surgery and/or dislocation history, having cervical spine problems and having a previous traumatic injury of shoulder.<sup>9,16</sup>

### Study design

Voluntary patients were randomly assigned to Supervised Group (SG) or Control Group (CG). Shoulder home exercise protocol was instructed to all participants carefully by

an experienced physiotherapist. Both groups performed the exercises for six weeks. SG was appointed biweekly in order to check whether they perform the exercises correctly. Disability and shoulder functions of all the participants' were assessed at the baseline and the endpoint. A flow-chart was figured to describe study and indicate drop-outs (Figure 1).

#### Home exercise protocol

Home exercise protocol was composed of Pendulum exercises, wand exercises and isometric exercises. Pendulum exercises were instructed to all participants in order to relieve pain and facilitate painless motion in shoulder.<sup>23,24</sup> They were performed in the directions of flexion-extension, horizontal abduction-adduction and circumduction with holding a lightweight. Wand exercises were performed in all directions of movement using a bar or rod. Patients were recommended to mildly force movement against resisted shoulder motion. Isometric exercises were performed in the corner of a wall. The details of home exercise protocol were displayed in Table 1.

#### Assessment of disability and shoulder functions

In order to assess disability of shoulder; Turkish version of Shoulder Pain and Disability Index (SPADI) was used.<sup>25</sup> This index interrogates the pain in particular motion and surveys the level of daily living activity.<sup>26</sup> The Turkish version of Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire was utilized to evaluate shoulder functions.<sup>27,28</sup> This questionnaire is composed of 30 questions that survey physical function and symptoms of musculoskeletal problems of shoulder and upper extremity.

#### Statistical analyses

Statistical analysis was conducted by using the Statistical Package for Social Science 15.0 program for Windows. Normality of data distribution was checked by visual and analytical methods. Quantitative variables were not normally distributed. Demographic data, baseline scores of DASH and SPADI and differentiation of DASH and SPADI of intervention and control group were compared by Mann-Whitney U test. Wilcoxon test was used to analyze intra-group comparison of DASH and SPADI scores of baseline and after 6 weeks.

## RESULTS

The demographic data and baseline scores of DASH and SPADI of the both groups are displayed in Table 2. Both groups were similar in terms of demographic features, DASH and SPADI scores at the baseline ( $p>0.05$ ).

SG ( $p<0.001$ ) and CG ( $p=0.001$ ) showed significant improvements in shoulder disability and function after six weeks training. Intra-group comparisons of DASH and SPADI outcomes are displayed in Table 3. Inter-group analysis revealed that there was no significant difference between the improvements of the groups in terms of both DASH and SPADI scores ( $p>0.05$ ) (Table 4).

## DISCUSSION

This study was conducted to investigate the contribution of auditing to the effectiveness of home exercises on functional status in patients with shoulder pain. Our results indicated that home based exercise therapy is effective in improving shoulder function in patients with shoulder pain. However, improvement of shoulder function was similar in both supervised and control groups.

Smith et al. pointed out, 60% of the patients with osteoarthritis did not comply with their exercise protocol. In the same paper, a survey was conducted and it is reported that only 35% of patients fully attended their exercises.<sup>18</sup> This factor is the disadvantageous face of home exercises and directly affects the management of the disease. According to Campbell et al. most of the patients with knee osteoarthritis trusted oral drugs instead of exercise program and most of them did not comply exercise program.<sup>29</sup> Also the number of exercises is a critical factor in compliance. There is a negative correlation between number of exercise and compliance to exercise.<sup>30</sup> In our study; home exercises are composed of three main parts (pendulum, wand and isometric exercise) in order to provide maximal compliance.

The current study exhibited that six weeks home-based exercise therapy provides improvement in the patients with shoulder pain. Ludewig et al. indicated that supervised

home exercise program is effective in reducing symptoms and improving function in patients with shoulder pain.<sup>31</sup> Researches also showed that home based exercises were as effective as supervised exercise program in physiotherapy clinic in patients with shoulder impingement syndrome.<sup>32</sup> Our results are consistent in this regard with the literature.

One of the most reported factors of non-adherence to home based exercise program is poor guidance from physiotherapist.<sup>33</sup> However, there is limited evidence about the effects of auditing home exercise in patients with

shoulder pain. The current study showed that checking and identifying mistakes of home exercises biweekly could not provide additional benefit to the pain and function of the patients with shoulder pain. However, numbers of dropouts were more in CG with seven patients out of twenty (35%). Yet it could not be possible to identify the causes of insufficient attendance to the assessments, high rate of drop outs limits to exhibit the results exactly. But we can infer that, auditing contributes the compliance of the patients to the appointments.

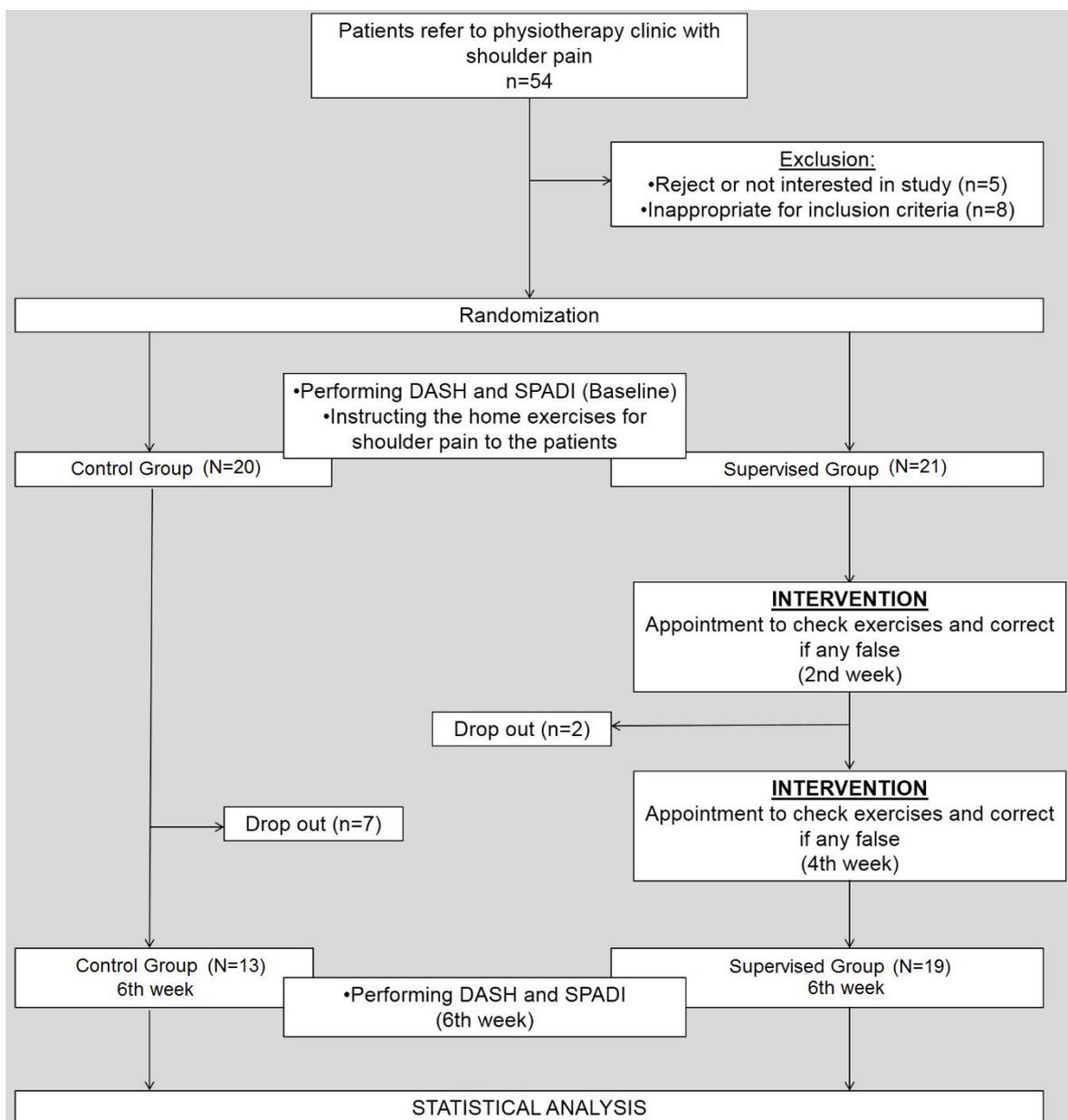


Figure 1. Flow-chart of the study.

Table 1. Home-based exercises protocol for shoulder pain.

Exercises	Intensity	Frequency	Duration
<b>Pendulum exercises</b>			
<ul style="list-style-type: none"> <li>• Flexion-extension</li> <li>• Horizontal abduction-adduction</li> <li>• Circumduction (clockwise)</li> <li>• Circumduction (counter-clockwise)</li> </ul>	1-2 minutes (each exercise)	3 times/day	6 weeks
<b>Wand exercises (with a bar/rod)</b>			
<ul style="list-style-type: none"> <li>• Flexion</li> <li>• Abduction</li> <li>• External rotation</li> <li>• Internal rotation</li> </ul>	10 times (each exercise)	3 times/day	6 weeks
<b>Isometric exercises</b>			
<ul style="list-style-type: none"> <li>• Flexion</li> <li>• Abduction</li> <li>• External rotation</li> <li>• Internal rotation</li> </ul>	15 times (each exercise)	3 times/day	6 weeks

Table 2: Demographic features and baseline scores of DASH and SPADI of participants.

	Control Group (N=13) Median (min-max)	Supervised Group (N=19) Median (min-max)	p
Age (year)	43 (19-65)	47 (27-63)	0.426
Gender (female/male)	4 / 9	9 / 10	0.348
Body weight (kg)	75 (58-90)	80 (50-95)	0.065
Height (m)	1.73 (1.54-1.88)	1.68 (1.51-1.96)	0.323
Body mass index (kg/m <sup>2</sup> )	25.05 (19.81-32.89)	28.34 (19.53-35.76)	0.147
DASH score (baseline)	44.70 (12.50-70.00)	38.97 (1.47-73.30)	0.940
SPADI score (baseline)	55.90 (16.15-113.10)	96.20 (11.70-115.70)	0.054

DASH: The Disabilities of the Arm, Shoulder and Hand. SPADI: Shoulder Pain and Disability Index.

Table 3: Intra-group comparison of DASH and SPADI scores of baseline and after 6 weeks.

	Before Median (min-max)	After (6 weeks) Median (min-max)	p
<b>Control Group</b>			
DASH score (baseline)	44.70 (12.50-70.00)	17.64 (0.83-53.28)	<0.001
SPADI score (baseline)	55.90 (16.15-113.10)	24.70 (4.80-69.20)	<0.001
<b>Supervised Group</b>			
DASH score (baseline)	38.97 (1.47-73.30)	17.50 (0.74-41.60)	<0.001
SPADI score (baseline)	96.20 (11.70-115.70)	50.70 (7.80-96.20)	<0.001

DASH: The Disabilities of the Arm, Shoulder and Hand. SPADI: Shoulder Pain and Disability Index.

Table 4. Inter-group comparison of DASH and SPADI scores differentiation.

	Control Group (N=13)	Supervised Group (N=19)	
	Median (min-max)	Median (min-max)	p
Δ DASH score (baseline)	25.76 (5.00-36.22)	19.85 (0.73-40.00)	0.734
Δ SPADI score (baseline)	33.80 (5.75-78.00)	42.90 (3.90-79.30)	0.545

Δ: Before-After (6 weeks). DASH: The Disabilities of the Arm, Shoulder and Hand. SPADI: Shoulder Pain and Disability Index.

People's beliefs and perspectives about exercise are various from "exercise is helpful" to "exercise is a waste of time".<sup>21</sup> Most of the patients, particularly elders, do not remember their exercises adequately.<sup>18</sup> Controlling the "homework" exercises of the patients may contribute to motivation. Checking exercises properly, explaining mistakes and reminding the correct versions may influence the rehabilitation outcomes positively. According to our findings, significant improvements were detected in the both of the groups after six-week home-based exercise program, as expected. However, auditing the home exercise biweekly, did not contribute additional benefit to the shoulder function and disability level in patients with shoulder pain.

#### Study limitations

One of the limitations of the study is, we did not document the number of correctly or wrong performed and forgotten exercises in appointments. Since our main purpose was to demonstrate the effect of auditing home exercises, we did not collect such data from the groups. Another limitation is the difference between the numbers of participants included in the groups. Seven participants did not come to final assessments while this number was two in the supervised group. This also indicates that the compliance rate of patients with home exercises may decrease if not supervised.

#### Conclusion

Although home-based exercises are useful tools in managing shoulder pain and functions, auditing home-based exercises for shoulder pain biweekly did not seem to contribute additional benefit over CG in this study. Auditing may improve compliance with home exercises, but does not seem to provide any additional contribution to shoulder function in patients with shoulder pain.

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