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Home-Based Neck Stabilization Exercise Program Among Female College Students With Non-Specific Neck Pain – A Pilot Study In Saudi Arabia

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ABSTRACT

Background: Neck pain is a common musculoskeletal problem that significantly causes disability. Exercise therapy is effective in decreasing pain and improving the functional ability among patients with neck pain. In this study, we evaluated the effectiveness of a home-based neck stabilization exercise program in pain and neck disability among female college students with non-specific neck pain (NSNP).

Methods: A quasi-experimental study with a single group pre-test post-test was conducted in Jazan, Saudi Arabia. Sixteen participants with NSNP underwent six weeks of training, which included one face-to-face session and 17 sessions of home-based exercise training. The pre-test and post-test values were obtained before and after six training sessions using the Numerical pain rating scale and neck disability index for pain intensity and neck disability, respectively.

Results: A significant reduction in neck pain intensity and disability was observed, with a mean difference of 2.88 and 12.4, respectively. The calculated 't' value using the paired 't' test for the numerical pain rating scale was 10.022 ($p<0.01$), and the neck disability index was 4.934 ($p<0.01$).

Conclusion: Based on the statistical analysis and clinical significance, the present study provides preliminary evidence that a home-based neck stabilization exercise program reduces pain and neck disability among female college students with NSNP.

Keywords: Non-specific neck pain, exercise therapy, neck stabilization exercise, home-based exercise, neck disability index, numerical pain rating scale.

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INTRODUCTION

Neck pain is a widespread and disabling musculoskeletal problem, and most people suffer from it at one point in their lives [1, 2]. This poses significant disability and severe socioeconomic challenges, which lead to public health problems [3].

Neck pain without specific underlying pathology is non-specific neck pain (NSNP) [2,3]. NSNP is defined as simple neck pain without underlying disease with varying symptoms with physical activity and overtime. About 64% of individuals go through this pain at some age in their life, especially during their middle age [4,5].

However, increasing evidence suggests that undergraduate college students have a high prevalence of musculoskeletal symptoms in the neck and upper extremities, which ranges from 48-78% [6,7]. This could be because of using computers and other electronic gadgets for prolonged periods during their study duration [8]. This prolonged exposure to unusual/asymmetric posture increases muscle activity in the neck-shoulder region [9]. The deep cervical muscles like Longus capitus and Longus coli are essential in maintaining segmental stability [10, 11].

Patients with cervical neck pain have reduced superficial and deep cervical flexor muscle activity (e.g., sternocleidomastoid and anterior scalene muscles) while performing the craniocervical flexion test [12].

Overall, neck pain leads to absenteeism from the college and can impair their functional capacity and quality of life. This will simultaneously lead to anxiety and depression [13,14]. To reduce the physical, psychological, and social burden, efficient and cost-effective treatment is needed to manage the NSNP [15].

Neck stabilization exercises are commonly used to train the superficial and deep cervical stabilizer muscles and improve their coordination. These exercises require patients to control neutral spine alignment with the activation of stabilizer muscles in various conditions, with gentle cervical nods and proceeding through increased levels of extremity loading [16]. In the present day, the COVID-19 pandemic has forced us to focus more on telerehabilitation and home-based exercise programs for all non-emergency medical ailments.

We aimed to evaluate the effectiveness of home-based neck stabilization exercises for female college students with NSNP. No studies proved the effectiveness of home-based neck stabilization exercise on pain and neck disability among female college students with NSNP. So, we hypothesized that home-based neck stabilization exercises help reduce pain and neck disability among university students with NSNP.

MATERIALS & METHODS

Study design:

A quasi-experimental study with a single group pre-test post-test was conducted in Jazan, Saudi Arabia. Participants were involved in 6 weeks of exercise program. Pre-test and post-test were taken at week 0 and week 6, respectively. All participants were advised to follow the interventions and not to get any other interventions.

Interventions:

The primary investigator conducted the baseline assessment in a face-to-face session, and the exercise regime was taught to the participants. All the participants were instructed on how to perform the home exercise program. Each exercise session comprises a 10-minute warm-up, 30-minute neck stabilization, and 10-minute cool-down and stretching exercises for the neck and shoulder girdle muscles. After 10 minutes of warm-up, the session starts with postural education in front of a mirror, followed by cervical bracing techniques in positions like supine, prone, and quadrupedal to activate the deep neck flexors [20-22]. All these exercises are done for ten repetitions, held for 10 seconds, and progressed from 15 to 20 reps. Cervical isometric exercises and scapulothoracic stabilization exercises were encouraged. The progression of exercises has been done using dumbbells (2 kg) or elastic bands for the scapular muscles. The total treatment duration was 50 minutes per session, three days per week for six weeks (appendix 1). The participants are provided with instructional videos and exercise protocol sheets. The investigator periodically checked the participant's adherence to and correctness of exercises by using the smartphone texting app (WhatsApp) twice weekly. The participants maintained an exercise log note with the recordings of the date and number of repetitions.

Outcome measures:

Numerical Pain Rating Scale (NPRS):

The numerical pain rating scale (NPRS) was used to assess the pain intensity. NPRS is a unidimensional measurement of pain intensity in adults with chronic pain. This 11-point ordinal scale ranges from '0' representing one pain extreme (e.g., "no pain"), to '10' representing the other pain extreme (e.g., "pain as bad as you can imagine" or "worst pain imaginable") [17]. The reliability of NPRS is r = 0.96 for literates, and the validity ranges from 0.86-0.95 [18].

Neck disability index (NDI):

A neck disability was assessed using the Arabic version of the neck disability index (NDI). The test-retest reliability value of the Arabic version of NDI is 0.96 [18]. NDI is the most commonly used self-reporting measure for neck pain [19]. This questionnaire has ten items: pain, personal care, lifting, reading, headaches, concentration, work, driving, sleeping, and recreation. This is the most commonly used self-report measure for neck pain. The scores expressed in percentage and interpreted as 0-8% - no disability, 10 – 28% -mild disability, 30-48% - moderate disability, 50-64% - severe disability, and 70-100% - complete disability.

Participants:

Female college students studying in university college – Al Ardah, Jazan University KSA, from 18 to 25 years of age, with a history of NSNP for more than three months, pain

severity between 4 and 8 in numerical pain rating scale (NPRS) and neck disability index (NDI) score between 28 and 64% were included in this study. Participants with any history of neck trauma, spinal deformity, spinal surgeries, signs of cervical radiculopathy, myelopathy, and myofascial pain syndrome were excluded from this study. A college notice board was used to recruit the participants. Twenty-one participants were enrolled in this study and screened for eligibility. Four participants were excluded because they did not meet the inclusion criteria, and one participant withdrew due to a lack of time. 16 Participants were included in this study. Written informed consent was obtained from all participants.

Statistical Analysis:

The data were analyzed using SPSS version 16.0 (SPSS Inc. Chicago, IL, USA). The distribution of data was examined before analysis using Kolmogorov-Smirnov test. The data were presented as a mean ± standard deviation (SD) for continuous variables and as frequency and percentage for noncontinuous variables. A paired 't' test was used for the pre-test and post-test values of NPRS and NDI. A *p*-value of < 0.05 was considered as significant.

RESULTS

Twenty-one participants were enrolled for this study; however, 4 participants were excluded because of not meeting the inclusion criteria. One participant withdrew because of lack of time. The remaining 16 participants (age:21.6±1.45 y, height: 154±5.3 cm, weight:50.5±9.1 kg, and BMI: 21.29±2.2 kg/m^2) underwent a home-based neck stabilization exercise program for six weeks. (Table 1) The pre-test and post-test values were obtained before and after six weeks of training sessions using NPRS and NDI for pain intensity and neck disability, respectively.

Table 1: Anthropometric and baseline variable of the participants (n=16)

Variables	Mean ± SD, Percentage (range)
Age	21.6±1.45 y
Height	154±5.3 cm
Weight	50.5±9.1 kg
BMI	21.29±2.2 kg/m^2
NPRS Moderate pain Severe pain	 62.5% (4-6) 37.5% (7-8)
NDI Mild disability Moderate disability Severe disability	 31.25% (22-27) 62.5% (31-43) 6.25%

62.5% (n=10) of participants reported moderate pain (range 4-6), and 37.5% (n=6) reported severe pain (range 7-8). 31.25 % (n=5) of participants reported mild disability (NDI: range 22 to 27%), 62.5% (n=10) reported moderate disability (range 31 to 43%), and 6.25 % (n=1) reported severe disability.

NPRS

The pre-test and post-test scores of NPRS for all participants are shown in table 2 and graph 1. The mean (pre-test and post-test), standard deviation, mean difference, and paired 't' test values were used to determine any statistically significant change between pre-test and post-test values of NPRS (Table 3). After six weeks of intervention, NPRS scores were significantly reduced by a mean difference of 2.88. (Graph 2).

Table 2: Pre-test and Post-test values of NPRS score

Participant	Pre-Test	Post-Test
1	4	4
2	4	2
3	6	3
4	5	2
5	5	2
6	4	1
7	4	1
8	4	1
9	7	6
10	7	5
11	6	2
12	5	1
13	7	4
14	8	4
15	7	3
16	7	3

Graph 1: Pre-test and Post-test comparison of NPRS scores

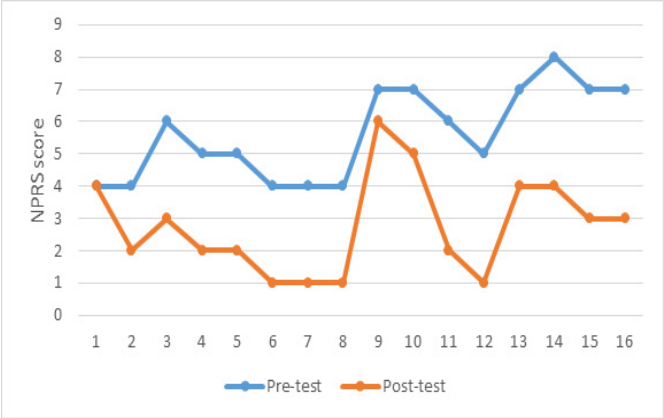
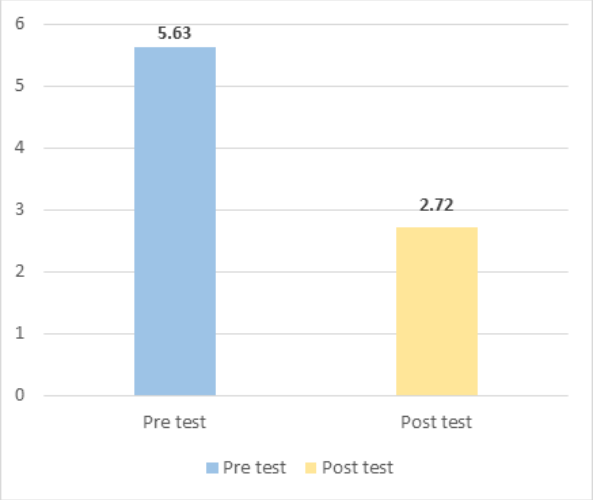


Table 3: Mean, SD, Mean difference and paired 't' test values of NPRS

Outcome measure	Mean	SD	Mean difference	't' value	df	'p' value
NPRS						
Pre-test	5.63	1.4	2.88	10.022	15	<0.01
Post-test	2.72	1.5				

Graph 2: Mean comparison of NPRS – Pre-test and Post-test comparison



Based on statistical analysis and the results shown in Table 3, the home-based neck stabilization exercises are effective in reducing neck pain (t (15) = 10.022; p<0.01) among female college students.

NDI

The pre-test and post-test scores of NPRS for all participants are shown in table 4 and graph 3. The mean (pre-test and post-test), standard deviation, mean difference, and paired 't' test values were used to determine any statistically significant change between pre-test and post-test values NDI (Table 5). After six weeks of intervention, NDI scores were significantly reduced by a mean difference of 12.4% (Graph 4).

Table 4: Pre-test and Post-test values of NDI scores

Participant	Pre-Test	Post-test
1	24%	20%
2	22.5%	20%
3	25%	23%
4	26.66%	20%
5	22.8%	20%
6	31.25%	28.5%
7	40%	20%
8	40%	26%
9	37.77%	35%
10	42.22%	20%
11	31.42%	20%
12	42.5%	28%
13	35%	20%
14	40%	20%
15	40%	20%
16	57.77%	20%

Graph 3: Pre-test and Post-test comparison of NDI score

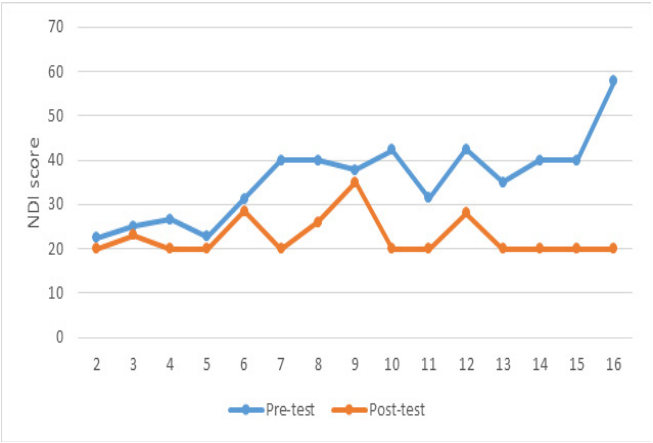
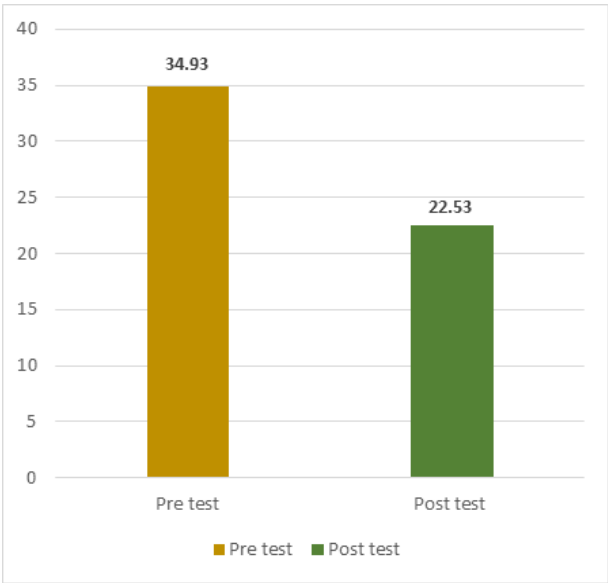


Table 5: Mean, SD, Mean difference and paired 't' test values of NDI

Outcome measure	Mean	SD	Mean difference	't' value	df	'p' value
NDI						
Pre-test	34.93	9.5	12.4	4.934	15	<0.01
Post-test	22.53	4.5				

Graph 4: Mean comparison of NDI – Pre-test and Post-test comparison



Based on statistical analysis and the results shown in Table 5, the home-based neck stabilization exercises are effective in reducing neck disability (t (15) = 4.934; p<0.01) among female college students.

DISCUSSION

The study aimed to investigate the effectiveness of a home-based neck stabilization exercise program on pain and neck disability among female college students with non-specific neck pain. Home-based exercises are practical, economical, easy, and safe to follow up in the home settings during the COVID-19 pandemic. In our study, the participants were given a six-week home-based neck stabilization exercises program (18 sessions). After the six weeks of intervention, there was a significant reduction in pain and neck disability among the participants.

Boyoung Im et al., 2016 [20] conducted a study to determine

the effectiveness of scapular stabilization exercises in forward neck posture and non-specific neck pain. They have concluded that scapular stabilization exercises improved the forward neck posture and reduced pain in NSNP. Falla D et al., 2007 [21], in a study, compared the activation of some selected muscles in the cervical, thoracic, and lumbar region in participants with chronic neck pain during the postural correction exercises in sitting. The study's results found that specific postural correction exercises effectively activated the deep cervical flexors and multifidus.

Dusunceli Y et al., 2009 [22] determined the effectiveness of neck stabilization exercises in managing neck pain. A 3-week home training program followed by three weeks of supervised program has been given to the participants. This study concluded that neck stabilization exercises reduced the pain and neck disability in managing neck pain. However, in our study, the participants received one session of face-to-face training followed by a home exercise program for six weeks. Our study found that a home-based exercise program effectively reduced pain and neck disability among the participants.

In a systematic review, Emmerson KB et al., 2019 [23] emphasized that multimedia-based exercise training improved adherence to exercises, not clinical outcomes. In contrast, our results showed notable changes in clinical outcomes in the participants.

In our study, Kuo et al., 2020 [11], in a single-arm study, used home-based instructional videos to examine the effectiveness of neck stabilization exercises among university violinists with non-specific neck pain. They concluded that cervical stabilization exercises improve the physical health of university violinists with non-specific neck pain, which supports our findings.

The Minimal Clinically Important Difference (MCID) for NPRS demonstrated a reduction of 2 points for patients with chronic pain [24]. Our study was 2.88, which showed the participants had a clinically significant reduction in neck pain. Hence, we conclude that the home-based neck stabilization exercises effectively reduced the pain among female college students with non-specific neck pain.

The MCID for NDI was calculated as 3.5 points (7%) [25]. In our study, it was 12.4%, which shows that home-based neck stabilization exercises effectively reduced neck disability among young female students. However, the average mean difference among the participants categorized under mild disability is 3.592%, smaller than the previously reported MCID 7%. However, moderate and severe category participants showed an average mean difference of 14.266% and 37.22%, respectively, higher than the previously reported MCID. Therefore, considering our positive findings, we conclude that the home-based neck stabilization exercises provide better clinical outcomes among non-specific neck pain participants with moderate to severe neck disability than the mild category participants.

CONCLUSION

The study revealed the effect of home-based neck stabilization exercises on female college students with non-specific neck pain. As per the statistical analysis and clinical significance, we provide preliminary evidence that a home-based neck stabilization exercise program reduces pain and neck disability among female college students with non-specific neck pain.

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