Original Article

A Study of Short-Term Effects of Using Shoulder-Posture-Corrector Belts Combined with Stretching Exercise in the Management of Chronic Neck Pain in Office Workers: A Single-Blind Randomized Controlled Trial

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ABSTRACT

Objectives: To investigate the short-term effects of combining shoulder-posture-corrector belts with stretching exercise in the management of chronic neck pain in office workers, compared with stretching exercise alone.

Study design: Single-blind randomized controlled trial

Setting: Outpatient Unit, Department of Rehabilitation Medicine, Siriraj Hospital, Thailand

Subjects: Sixty patients, aged 20 to 50, with a moderate degree of nonspecific neck pain lasting for at least three months

Methods: Sixty participants were randomly assigned to a control group or an intervention group. All participants were instructed to perform a neck stretching program at home for two weeks. The intervention group received the additional use of the shoulder-posture-corrector belts while sitting at work for two weeks. The primary outcome was the improvement in the management of chronic neck pain, measured using a visual analogue scale (VAS). Secondary outcomes were evaluated using the Neck Disability Index-Thai version (NDI-TH) score, cervical range of motion (CROM), and craniovertebral angle (CVA). Data collection also included compliance, satisfaction, and adverse effects. The outcome measurement was evaluated at baseline and after two weeks.

Results: The study outcomes revealed no statistically significant differences between groups in terms of VAS, NDI-TH (total) scores, CROM (all movement directions), or CVA ($p = 0.244, 0.140, 0.119–0.836$, and 0.207, respectively). The intervention group demonstrated greater improvements than the control group, with a statistically significant difference only in NDI-TH (pain domain) score ($p = 0.010$). However, both groups showed improvements in VAS, NDI-TH (pain domain), and NDI-TH (total) scores ($p < 0.05$). Regarding patients' compliance and satisfaction, subjects from both groups showed comparable good compliance and satisfaction. There were no serious adverse effects reported by either group.

Conclusions: The use of shoulder-posture-corrector belts combined with stretching exercises demonstrated a significant improvement only in the pain domain of the Thai version of the Neck Disability Index (NDI-TH) compared with stretching exercises alone in the management of chronic neck pain in office workers after two weeks of treatment.

Keywords: neck pain, shoulder brace, muscle stretching exercises, office workers

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Introduction

For the majority of neck disorders, the identifiable underlying disease or abnormal anatomical structure remains inconclusive. As a result, these conditions are categorized as nonspecific neck pain (NS-NP).[1] Various factors can precipitate NS-NP. For individuals who work in office settings, improper sitting posture and sitting for extended periods are the main risk factors contributing to neck pain.[2] Examples of poor posture include forward head posture (FHP) and rounded shoulder posture (RSP). Previous research has revealed a significant correlation between neck pain and FHP.[3] Nearly half of office workers experienced neck pain within the past year.[4] Additionally, neck pain plays a major role in these employees' absences from work.[5]

There are several non-surgical methods for the management of NS-NP. These include patient education, stretching exercise, strengthening or endurance training of neck muscles, medication use, physical therapy, and ergonomic interventions. Various methods can be combined to help alleviate neck pain.[6] According to a study by Tunwattanapong P and colleagues in 2016, the impacts of neck muscle stretching exercise on office workers were examined. The findings revealed that a four-week program of regular stretching exer-

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cises significantly reduced neck and shoulder pain, improved cervical function, and enhanced quality of life among office workers experiencing chronic moderate-to-severe neck or shoulder pain. Nevertheless, neither postural changes nor changes in neck range of motion were measured.[7]

Another treatment involves organizing the work environment and adjusting workers' physical posture. Nowadays, ergonomics is widely used in neck pain treatment. By ensuring proper posture and positioning of work tools like chairs, tables, and computer monitors.[8] A randomized controlled trial by Mahmud et al. demonstrated that office ergonomics training led to improved work habits and significant reductions in neck, upper back, and lower back pain among workers. However, this study did not measure pain intensity, postural changes, or range of motion.[9] In 2018, a randomized trial by Shariat et al. found that both exercise and a combination of exercise and ergonomic modifications were effective in reducing neck pain among desk workers over six months. However, the combination did not outperform exercise alone. Additionally, the ergonomic modifications did not involve the use of any devices.[10] One commonly used ergonomic tool is the lumbar roll. A 2010 study by Horton demonstrated that attaching a lumbar roll to an office chair significantly improved head and neck posture, as measured by the craniovertebral angle (CVA). However, this study has two limitations. First, it only evaluated posture immediately after chair adjustments, without a follow-up period to assess the effects over the short and long term. Second, it did not study patients with neck pain.[11] A 2023 review by Dandale indicated that ergonomic training, when paired with therapeutic exercises, can alleviate pain, enhance posture, and decrease impairment in the neck area. However, since no ergonomic equipment was used, the impact of posture correction could not be determined.[12]

We hypothesized that ergonomic interventions, such as a device, may provide benefits in managing neck pain in office workers with poor sitting posture when combined with exercise. At present, shoulder-posture-corrector belts are becoming increasingly popular as a tool to help maintain proper posture while sitting. According to a 2020 study by Tae-Lim Yoon and colleagues, the use of shoulder-posture-corrector belts in dental hygiene practitioners while working was found to decrease upper trapezius muscle activity, as measured by surface EMG, and enhance thoracic and lumbar extension, leading to improved sitting postures. However, this study did not focus on workers with neck pain, and no assessments of pain scores or neck disability were conducted.[13]

In addition, research by Furukawa Y in 2020 investigated the effects of a Tasuki-style kimono strap, which resembles the shoulder straps, when used for one week in patients with neck pain. The study found that the group using the strap showed significant improvement in the modified neck disability index compared to the waiting list (control) group. However, this study has several limitations. First, the follow-up period was quite short. Second, this equipment is not widely available. Third, they did not measure the posture change. Finally, other key treatments, such as exercise, were not combined.[14]

Ergonomic changes in the workplace can be challenging to implement; using purpose-built devices may be more practical. Based on observations, it has been noted that a device commonly recommended and widely available in pharmacies and online shopping platforms is the shoulder-posture-corrector belts. This device is claimed to correct posture and alleviate neck pain. However, there has been no research investigating the effectiveness of the belt on pain relief or the impact on posture, especially in office workers who are suffering from chronic neck pain. As far as we know, there is no published evidence that posture-corrector belts alone can relieve neck pain. Adding them to stretching exercises, which have proven effective, may provide even greater relief of neck pain than stretching exercises alone. We use a two-week duration of intervention to assess the short-term effect. While exercise may take several weeks to show its effects, the use of an additional belt can immediately improve workers' posture while sitting at work, so the effects would be expected to be noticeable sooner. Moreover, since this device is relatively new and not commonly used for patient treatment, we are cautious about potential side effects if the study were to extend over a longer period. Based on this, our objective is to investigate the short-term effects of combining shoulder-posture-corrector belts with stretching exercises in the management of chronic neck pain in office workers, compared to stretching exercises alone. We hypothesize that combining shoulder-posture-corrector belts with stretching exercises for two weeks will lead to significant improvement in pain, function, posture, and range of motion in office workers, compared to stretching exercises alone. A survey of shoulder-posture-corrector belts on the market revealed that there are many brands and various styles, including commercial brands such as "Futuro", "Tynor", and "Elife". From consideration, it was found that the Futuro brand (Figure 1) has broad straps, soft edges, is easy to wear, and can be adjusted for a tight fit. Additionally, it is reasonably priced, so it has been considered as a prototype for use in the research. There is no conflict of interest between the researchers and the funding source.

Methods

Study design

The study design was a single-blind randomized controlled trial, which was conducted at the Outpatient Unit, Department of Rehabilitation Medicine, Siriraj Hospital, from September 2023 to March 2024. The study protocol was approved by the Siriraj SIRB (COA no. si 487/2023) on July 5, 2023. It was registered in the Thai Clinical Trials Registry (TCTR20230708001). The reporting of the research adhered to the CONSORT Guideline.

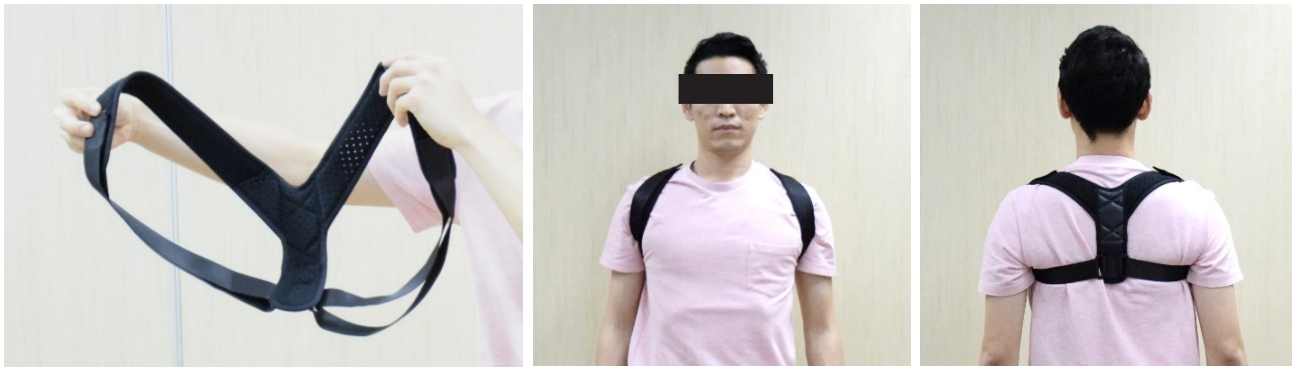

Figure 1. Shoulder-posture-corrector belt

Figure 2. Stretching exercise program (A) 1st position; (B) 2nd position; (C) 3rd position

Study participants

Patients diagnosed with nonspecific neck pain, aged 20-50 years, were recruited for the study. They had to experience sitting-related neck pain for at least 3 months. Their pain score, measured by the numeric pain rating scale (NRS), must range between 3 and 8 out of 10. They had to sit while working at least 4 hours per day. We excluded people with cervical disc herniation, cervical radiculopathy, cervical spondylotic myelopathy, rheumatoid arthritis, diseases of the shoulder such as adhesive capsulitis or rotator cuff syndrome, history of severe neck injury, history of neck or shoulder surgery, severe psychiatric disorder, and pregnancy. Patients who cannot take a questionnaire due to a communication problem and patients who plan to take a leave for 2 weeks of attendance would be excluded. In addition, all of them had to discontinue analgesic drugs, physical therapy program, massage, and dry needling at least 1 week prior to enrollment.

Sample size was calculated from the study of Tunwattanapong P7, which reported that a regular stretching exercise program performed for four weeks could decrease neck and shoulder pain better than the control group. In that study, the mean difference was -1.4 (95%CI: -2.2, -0.7) measured by VAS, and the SD was 1.8. Then, the sample size was 26 per group. When reassuring for a dropout by 10%, the total number of subjects was 60.

Study protocol

Sixty participants were enrolled in this prospective trial. All of them were provided with information regarding the study and had to complete the written informed consents. The block of four randomization method was used by computer-generated random numbers. The patients were then randomly allocated with sealed opaque envelopes into two groups by a third party who was not involved in the study. The control group was neck stretching exercise, while the intervention group was neck stretching exercise with the additional use of the shoulder belt during daily work. The demographic characteristics, including age, sex, sitting hours for work per day and week, and duration of neck pain, were assessed at baseline.

All participants received instructions to perform neck stretching exercises from a rehabilitation doctor who did not know which group the patient was in. The targeted muscles included the upper trapezius and levator scapulae. Three stretching exercises were instructed (Figure 2). Each was to be performed for 10 seconds, 5 repetitions, and 3 times a day bilaterally. The exercise was done for 14 consecutive days. The participants in the intervention group were additionally instructed to use the belt by a rehabilitation doctor. They were advised to use the belts while sitting during work for at least 2 hours each business day for 2 weeks. Complications such as wounds, numbness, motor weakness, or progressive neck or shoulder pain were recorded.

Each subject from both groups was asked not to use other treatments, including massage, physical therapy program, dry needling, acupuncture, and analgesic drugs, during their participation in the study. In case of severe pain exacerbation, a tablet of acetaminophen 500 mg was allowed one tablet every 4-6 hours as needed, with a maximum of 3,000 mg per day for rescue therapy, and the number of pills taken must be recorded in the logbook.

The logbook provided information regarding photos showing stretching exercises for both groups and steps for wearing a shoulder belt for the intervention group. The stretching frequency and time of using the shoulder belt had to be recorded in the logbook, including any additional drug use. We contacted the participants by telephone twice a week to monitor compliance and complications.

The outcomes were assessed by a research assistant who was blinded to the patients' allocation groups. The primary outcome was pain score, measured by VAS.[15] The secondary outcomes were neck disability, neck range of motion, and degree of forward head posture. The neck function was assessed using the Neck Disability Index-Thai version (NDI-TH)[16], which measures neck pain and consequent disabilities. It is composed of ten-item questions. The scores range from 0 to 5 per question; the overall scores range from 0 to 50 or 0 to 100%. The higher score represents a more severe disability. We analyzed the NDI-TH pain domain separately from the NDI-TH total domain. The NDI-TH reported high test-retest reliability (ICC = 0.99), excellent internal consistency (Cronbach's alpha = 0.92), and a strong correlation with pain severity (r = 0.89, $p < 0.001$).16 For neck range of motion, we measured the cervical range of motion (CROM), including flexion, extension, lateral flexion, and rotation, by using inclinometers (Figure 3). The participant sat on a chair with a straight back and back support, and looked straight ahead at eye level. Flexion, extension, and lateral flexion were measured with a double inclinometer. For rotation, participants lay on a bed, and a single inclinometer was used. In each position, three measurements were made, and then the average was calculated. Cervical range of motion evaluation using inclinometers has shown good Inter-rater reliability in all directions (ICC = 0.89-0.93).[17] There is a correlation between forward head posture (FHP) and neck pain and disability. Thus, we evaluated FHP by using the craniovertebral angle (CVA). A smaller CVA indicates a greater FHP. A CVA less than 48°-50° is defined as FHP.[18] CVA was measured by taking lateral photographs (Figure 4), which have high reliability, test-retest reliability (ICC = 0.91), and intra-rater reliability (ICC = 0.86).[19] During measurement, the subject was in a straight back seated position with back support and looked at eye level. The spinous process of C7 and the tragus of the ear are marked with a sticker. A horizontal line is drawn passing through C7, making a right angle with the vertical. Then, the angle between the line connecting the C7 spinous process with the tragus of the ear and the horizontal line is measured using the smartphone application, Angle Meter 360. The average of 3 measurements was recorded. All outcomes were evaluated at baseline and the end of the second week.

Figure 3. Cervical range of motion measurement (A) flexion; (B) extension; (C) left lateral flexion; (D) right lateral flexion; (E) left rotation; (F) right rotation

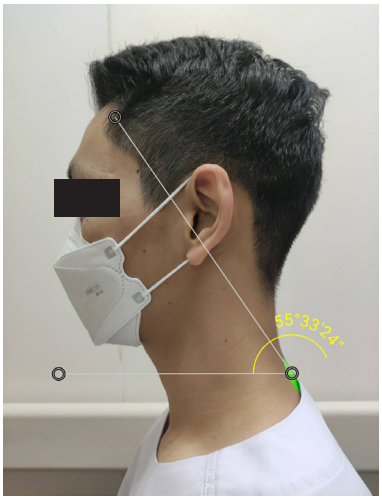

Figure 4. Craniovertebral angle measurement

Statistical analyses

Statistical analysis was performed using SPSS version 28. The continuous data with a normal distribution was demonstrated as mean and standard deviation, while continuous data with a non-normal distribution was demonstrated as median and interquartile range (IQR). The categorical data were shown as numbers and percentages. Independent sample t-test and Mann-Whitney U test were performed to compare the differences in continuous data between the two groups. A dependent sample t-test was used to compare the differences within groups. Chi-square or Fisher's exact test was used to compare categorical data between two groups. The mean difference between the intervention and the control group at the 2nd week, adjusted for baseline, was compared using analysis of covariance (ANCOVA). The $p < 0.05$ was set to consider a statistically significant difference. The primary and secondary outcomes were analyzed using the intention-to-treat population with the worst-case scenario. No interim analysis was performed.

Results

A total of 60 patients were screened and included, of whom 59 completed the trial, as will be seen in the flow diagram (Figure 5). One participant in the control group was lost to follow-up.

Baseline characteristics between groups were not significantly different in terms of age, sex, sitting time per day, sitting days per week, and duration of neck pain, as shown in Table 1.

In terms of pain reduction, both groups showed a significant decrease in VAS after 2 weeks of treatment, as shown in Table 2. However, the magnitude of improvement was not significantly different between groups ($p = 0.244$), despite the intervention group experiencing a greater percentage reduction (-34.3%) compared to the control group (-25.0%).

From the neck disability point of view, both groups showed a significant reduction in NDI-TH total scores after 2 weeks ($p < 0.05$), with greater improvement in the intervention group

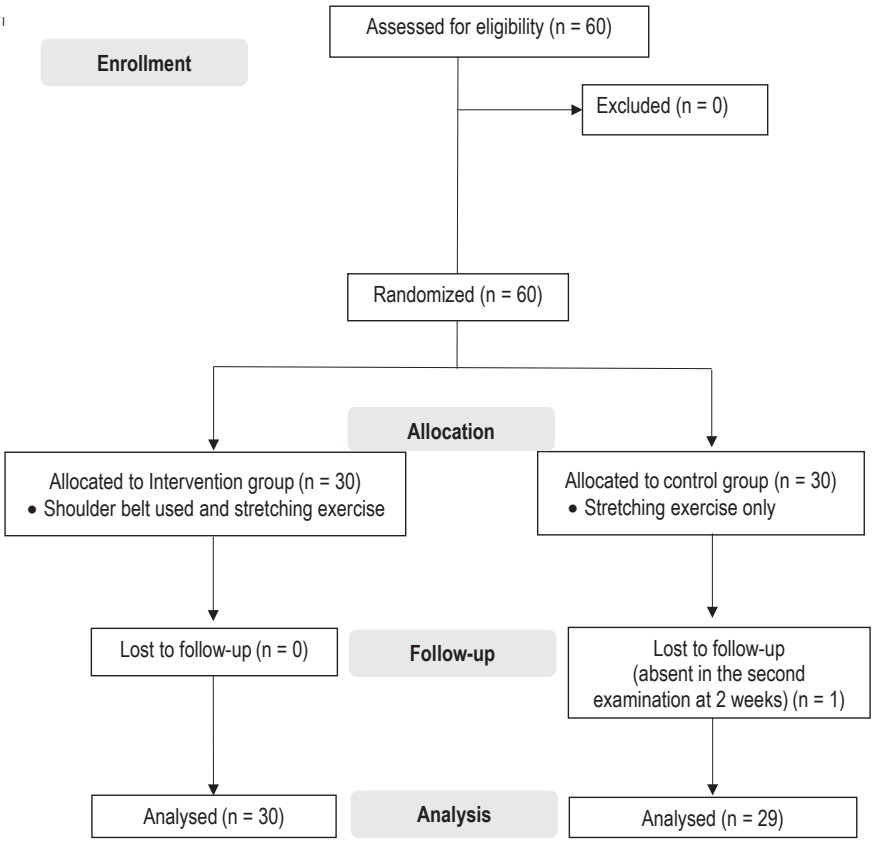

Figure 5. CONSORT flow diagram

Table 1. Baseline characteristics of the study participants

	Intervention (n = 30)	Control (n = 30)	*p*-value
Age (years)[1]	39.6 (7.9)	36.5 (6.5)	0.102[a]
Female[2]	26 (86.7)	24 (80.0)	0.488[b]
Sitting time (hours/day)[1]	7.3 (2.0)	6.9 (1.4)	0.397[a]
Sitting days per week (days)[1]	5.4 (0.7)	5.4 (0.6)	1.000[a]
Duration of neck pain (month)[3]	6.0 (3.0-10.5)	5.0 (3.0-6.0)	0.494[c]

[1]Mean (SD), [2]Number (%), [3]Median (IQR)

Statistical significance; *p*-value < 0.05

[a], independent t-test; [b], Fisher's exact test; [c], Mann-Whitney U test

Table 2. Outcome measures of clinical assessment of the study participants (intention-to-treat analysis: worst-case scenario)

Outcomes	Intervention (n = 30)			Control (n = 30)			Mean difference (95% CI)[2]	*p*-value**
	Week 0	Week 2	*p*-value*	Week 0	Week 2	*p*-value*		
VAS (0-10)[1]	5.1 (1.2)	3.4 (1.9)	< 0.001[a]	5.5 (1.2)	4.1 (1.9)	< 0.001[a]	-0.54 (-1.47, 0.38)	0.244[b]
NDI-TH (pain domain) (0-5)[1]	2.1 (1.0)	0.9 (0.8)	< 0.001[a]	2.0 (0.8)	1.5 (0.9)	0.001[a]	-0.58 (-1.00, -0.15)	0.010[b]
NDI-TH (total) (0-50)[1]	12.9 (7.0)	5.4 (4.6)	< 0.001[a]	14.1 (6.0)	8.4 (8.7)	0.002[a]	-2.67 (-6.25, 0.91)	0.140[b]
CVA (degree)[1]	47.3 (6.2)	49.1 (7.8)	0.067[a]	43.9 (7.8)	43.2 (12.1)	0.636[a]	2.48 (-1.41, 6.37)	0.207[b]
CROM (degree)[1]								
Flexion	39.5 (9.4)	40.7 (10.1)	0.505[a]	34.7 (6.9)	36.1 (10.1)	0.472[a]	2.07 (-2.90, 7.03)	0.408[b]
Extension	41.9 (8.4)	46.0 (9.0)	0.013[a]	39.6 (8.3)	40.7 (12.2)	0.604[a]	3.89 (-1.03, 8.80)	0.119[b]
Right lateral flexion	39.0 (6.1)	41.8 (6.5)	0.008[a]	37.3 (6.3)	39.6 (10.5)	0.183[a]	0.97 (-2.86, 4.81)	0.614[b]
Left lateral flexion	40.1 (7.2)	41.5 (7.9)	0.331[a]	37.6 (6.8)	40.8 (10.2)	0.063[a]	-0.75 (-5.07, 3.58)	0.730[b]
Right rotation	68.5 (9.4)	74.7 (9.5)	0.002[a]	67.8 (10.4)	72.2 (16.9)	0.150[a]	2.07 (-4.50, 8.63)	0.531[b]
Left rotation	69.6 (11.2)	75.2 (9.6)	0.009[a]	69.4 (11.7)	74.4 (18.5)	0.143[a]	0.74 (-6.38, 7.87)	0.836[b]

*Statistical significance within group; *p*-value < 0.05; **Statistical significance between group; *p*-value < 0.05

[a], dependent t-test; [b], ANCOVA

[1]Mean (SD), [2]Mean difference between intervention and control at week 2 adjusted for week 0 using analysis of covariance

VAS, Visual Analogue Scale; NDI-TH, Neck Disability Index Thai version; CVA, craniovertebral angle; CROM, cervical range of motion; CI, confidence interval

than in the control group (57.9% vs. 40.7%). However, the between-group difference was not statistically significant (p = 0.140). When considering the NDI-TH pain domain, the NDI-TH (pain domain) was significantly decreased in the intervention group (56.5%) than in the control group (27.6%) (*p* = 0.010).

Regarding change in CVA, neither group showed a significant improvement in CVA at the end of treatment (*p* = 0.207). In terms of CROM difference, after two weeks, the intervention group showed significant improvements in extension (*p* = 0.013), right lateral flexion (*p* = 0.008), right rotation (*p* = 0.002), and left rotation (*p* = 0.009), as shown in Table 2. The control group, on the other hand, did not reveal any significant changes. However, there was no significant difference in CROM between groups (*p* > 0.05) as shown in Table 2.

In terms of patient satisfaction, 83.3% of participants in the intervention group and 93.1% in the control group rated their treatment at least 4 out of 5 on the satisfaction Likert scale. Nonetheless, the satisfaction was not significantly different between groups (*p* = 0.424). For the intervention group, 80.0% plan to continue using the shoulder belt after completing the 2-week intervention, while 96.7% plan to continue stretching exercises. For the control group, 93.1% plan to continue stretching exercises. Regarding compliance, most participants in both groups perform the stretching exercise for over 80.0% of the recommended duration; however, there was no statistically significant difference observed between the two groups (*p* = 1.000) as shown in Table 3. On average, the intervention group wore the belt for about 3.1 hours per day.

No serious adverse effects were reported in our study. Fifty percent of patients in the intervention group reported minor adverse effects from using the shoulder belt, which were linked to various symptoms, including axilla pain (40.0%), discomfort (16.7%), increased neck pain (13.3%), limited head movement (6.7%), scapular pain (6.7%), shoulder pain (3.3%), and arm paresthesia without weakness (3.3%). Additionally, 23.3% of the intervention group reported side effects from stretching, including increased neck pain (10.0%), limited head movement (6.7%), arm paresthesia without weakness (3.3%), and scapular pain (3.3%). The control group reported adverse effects from stretching at a rate of 27.6%, including increased neck pain (13.8%), limited head movement (13.8%), and shoulder pain (3.4%). One patient in the intervention group and two in the control group took paracetamol for rescue neck pain. Additionally, one patient in the intervention group used an analgesic spray once during the study. Compliance, satisfaction levels, and adverse effects are presented in Table 3.

Table 3. Compliance, adverse effect and satisfaction of all 59 participants

	Intervention (n = 30)	Control (n = 29)	*p*-value
Satisfaction[1]	25 (83.3)	27 (93.1)	0.424[a]
Plan to continue stretching: yes[1]	29 (96.7)	27 (93.1)	0.612[a]
Plan to continue using shoulder brace: yes[1]	24 (80.0)		
Compliance			
Stretching/day (≥ 80%)[1]	26 (86.7)	26 (89.7)	1.000[a]
Average belt using (hours/day)[2]	3.1 (1.4)		
Adverse effects			
From stretching: yes[1]	7 (23.3)	8 (27.6)	0.708[b]
- Increased neck pain	3 (10.0)	4 (13.8)	0.696[a]
- Scapular pain	1 (3.3)	1 (3.4)	1.000[a]
- Limited head movement	2 (6.7)	4 (13.8)	0.418[a]
- Arm paresthesia without weakness	1 (3.3)		
From shoulder belt: yes[1]	15 (50.0)		
- Axilla pain	12 (40.0)		
- Discomfort	5 (16.7)		
- Increased neck pain	4 (13.3)		
- Scapular pain	2 (6.7)		
- Limited head movement	2 (6.7)		
- Shoulder pain	1 (3.3)		
- Arm paresthesia without weakness	1 (3.3)		

[1]Number (%), [2]Mean (SD)

Statistical significance between group; *p*-value < 0.05

[a]; Fisher's exact test, [b]; Chi-square test

Satisfaction is at least 4 points from the 5-point satisfaction Likert scale

Discussion

In our study, we found that treating the neck pain with either stretching exercise alone or stretching exercise combined with the shoulder belt can reduce VAS and NDI-TH total scores after 2 weeks of treatment and the changes exceeded the minimum clinically important difference in VAS and NDI-TH (total) in both groups (MCID = 0.8 points for the VAS in chronic NS-NP, MCID = 3.5 points for the NDI in NS-NP).[20-22] However, no statistically significant difference between groups was observed for the VAS or total NDI-TH scores, except in the NDI-TH pain domain, where the intervention group showed significantly greater improvement (p = 0.010). This discrepancy may be explained by the nature of these two assessment tools. While VAS primarily measures pain intensity at a single point in time, the NDI pain domain evaluates the impact of pain on daily functions such as lifting, concentration, and reading. Therefore, the posture-corrector belt, which provides proprioceptive feedback and encourages upright posture during work, may not have been sufficient to lower pain intensity significantly, but it may have helped reduce the functional burden of pain during work-related tasks. Another possible explanation is that the NDI-TH pain domain may be more sensitive to short-term functional changes than the VAS, especially in chronic conditions where baseline pain levels are moderate. In our study, participants in the intervention group wore the belt for an average of 3.1 hours per day during work, and had an average total sitting duration of 7.3 hours. This duration may not have been sufficient to reduce pain intensity overall, but may have offered functional improvements during periods of belt use. Most similar studies to date, such as those by Tunwattanapong et al.[7] and Shariat et al.[10], have evaluated only the total NDI score and pain intensity (e.g., VAS), without exploring domain-specific outcomes. These differences make it difficult to compare with our findings, where only the pain domain of the NDI-TH showed significant between-group improvement. Nevertheless, our results suggest that combining a posture-corrector belt with stretching may offer functional pain relief even if global pain intensity (VAS) remains unchanged.

Additionally, there were no differences in CVA and CROM between the groups. Furthermore, the intervention group reported a relatively high rate of mild discomfort from using the belt (50.0%), while both groups reported adverse events from stretching exercises at the same rate.

While the intervention group showed a slightly greater improvement in pain (VAS) and NDI-TH total score than did the control group, there was no statistically significant improvement between groups. Possible reasons for this include, firstly, the treatment duration may be too short. We have chosen a two-week intervention period to assess the short-term effects. While exercise may require several weeks to show results, the use of an additional belt can immediately improve workers' posture while sitting, resulting in more rapid improvements. However, we realized that after implementing ergonomic changes, it may take time to see effects on pain reduction. A randomized controlled trial by Mahmud et al. showed that office ergonomics training resulted in better work habits and significant decreases in neck, upper back, and lower back pain among employees. This research fol-

lowed up at six and twelve months after the initial assessment.[9] Therefore, extending the study to a longer term may reveal significant outcomes for the shoulder belt.

Without information regarding the safety of the belt, we must be aware of potential adverse effects and limit our study to only two weeks. As a result, the duration of usage may have been insufficient. We advised the participants to use the belts while sitting during their daily work for at least two hours each business day over two weeks. Since no recommendation regarding duration for daily use of the device was provided by the manufacturer, we have no reference for determining the proper usage time. Additionally, no research similar to ours has combined this type of belt with stretching exercises to establish the optimal duration of belt use. More extended belt usage may lead to discomfort and increase the risk of participant dropout. Our study found that participants in the intervention group used the belt for an average of only 3.1 hours per day, despite spending an average of 7.3 hours sitting at work. A study by Bankhele et al. reported that the combination of an upper back belt and scapular exercises could improve posture from CVA and could reduce pain.[23] The participants in their study wore the belt for six hours a day without any discomfort. In contrast, the participants in our study wore the belt only three hours a day, and 50.0% reported minor adverse effects. For the design of the belt, Bankhele's research uses a belt with a figure-eight design made of cloth, adjustable straps, padding, and pressure sensors (two Flexiforce sensors of 100 lbs and four flex sensors of 4.5 lbs)[23], which is different from our belt. Although our belt allows for adjusting the tightness of the strap, it is a one-size (free size) design, and the weight of our participants ranges from 41.0 to 102.5 kg. Therefore, it may not fit every patient, although we allow patients to try it on and evaluate it before they begin the intervention. As a result, the type of device we selected for the study may not be well-designed, and the way to fit the device may be different. This difference in usage duration might explain why the Bankhele study found more significant results. From another perspective, it is also important to note that Bankhele et al. used a pre-post design without a control group, which can show significant within-group improvements. In contrast, our study included both intervention and control groups. Due to these differences in study design, the lack of a large difference between groups in our study may be explained by a follow-up period that was too short to observe substantial benefits.

In addition, discomfort from wearing the belt could affect the compliance and the dosage of use. So far, we do not know precisely how long the belt should be worn. Our research indicated that wearing this brand resulted in mild side effects. This outcome aligns with findings from a previous study by Furukawa14, which also noted minor discomfort in the neck and shoulder (23.1%) as well as cosmetic concerns (11.5%). Notably, 50.0% of our participants in the intervention group reported minor adverse effects which is relatively high. These adverse events caused the satisfaction of participants in the intervention group to be lower than that of the control group (83.3% in the intervention group and 93.1% in the control group rated at least 4 points on the 5-point satisfaction Likert scale). Even though there were considerable adverse effects (50.0% from the belt and 23.3% from the stretching exercises), participants still reported high overall satisfaction.

Furthermore, 80.0% of those in the intervention group intended to continue using the belt, and more than 90% in both groups planned to keep doing the stretching exercises. This finding indicates that participants felt the benefits outweighed the drawbacks. Additional research is needed to investigate the potential long-term risks and benefits of using these kinds of shoulder braces in the management of neck pain associated with poor posture.

Limitations

Further studies should include a more extended follow-up period, as our research did not cover intermediate or long-term effects. The research should recommend wearing the shoulder belt for an extended period each day. In our study, we did not follow participants after the treatment to evaluate their continued use of the belt and adherence over the subsequent weeks and months. Moreover, we did not know the carry-over effect of the belt in any patients who decided to discontinue wearing it. Additionally, our study did not assess posture change during wear of the belt to determine if it could improve poor posture. Other designs of the posture-corrector belt, especially the custom-made one, could potentially increase comfort and improve compliance more than a prefabricated device. Finally, future studies could be improved by adding a placebo group (such as a sham or low-tension belt) to account for the psychological impact of simply wearing a device.

Conclusions

The use of shoulder-posture-corrector belts combined with stretching exercises demonstrated a significant improvement only in the pain domain of the Thai version of the Neck Disability Index (NDI-TH) compared with stretching exercises alone; however, this combined intervention did not offer additional benefits over stretching exercises alone in terms of pain measured by Visual Analogue Scale (VAS), overall neck disability, posture, or range of motion in the management of chronic neck pain in office workers after two weeks of treatment.

While shoulder-posture-corrector belts may provide subjective benefit or act as biofeedback tools in the short term, stretching exercises alone are as effective as combining them with shoulder-posture-corrector belts in managing neck pain in office workers. From a cost-effectiveness and clinical practicality standpoint, routine prescription of posture belts may not be warranted unless further benefits are demonstrated in long-term studies.

Conflict of interest declaration

The authors declare no conflicts of interest.

Generative AI declaration

The authors confirm that no large language models (LLMs) or artificial intelligence (AI) tools were used in the creation of this manuscript, including the writing, editing, or preparation of figures and tables, with the exception of Grammarly and QuillBot, which was used solely for basic spell-checking and grammar correction.

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Data availability

The data that support the findings of this research article are available from the corresponding author upon reasonable request.

Author contributions

Jakrapat Sawatruang: investigation, methodology, writing - original draft,

Santi Assawapalangchai: conceptualization, supervision, writing- review and editing.

References

1. Binder A. The diagnosis and treatment of nonspecific neck pain and whiplash. Eura Medicophys [Internet]. 2007 Mar [cited 2024 Oct 4];43(1):79-89. Available from: https://pubmed.ncbi.nlm.nih.gov/17369782/
2. Kim R, Wiest C, Clark K, Cook C, Horn M. Identifying risk factors for first-episode neck pain: A systematic review. Musculoskelet Sci Pract [Internet]. 2018 Feb [cited 2024 Oct 4];33:77-83. Available from: https://pubmed.ncbi.nlm.nih.gov/29197234/. doi: 10.1016/j.msksp.2017.11.007
3. Nejati P, Lotfian S, Moezy A, Moezy A, Nejati M. The relationship of forward head posture and rounded shoulders with neck pain in Iranian office workers. Med J Islam Repub Iran [Internet]. 2014 May 3 [cited 2024 Oct 4];28:26. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC4154278/ doi: 10.1016/j.msksp.2017.11.007
4. Hush JM, Michaleff Z, Maher CG, Refshauge K. Individual, physical and psychological risk factors for neck pain in Australian office workers: a 1-year longitudinal study. Eur Spine J [Internet]. 2009 Oct [cited 2024 Oct 4];18(10):1532-40. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC2899383. doi: 10.1007/s00586-009-1011-z
5. Hoe VC, Urquhart DM, Kelsall HL, Sim MR. Ergonomic design and training for preventing work-related musculoskeletal disorders of the upper limb and neck in adults. Cochrane Database Syst Rev [Internet]. 2018 Oct 23 [cited 2024 Oct 4];10:CD008570. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC6486299. doi: 10.1002/14651858.CD008570.pub2.
6. Corp N, Mansell G, Stynes S, Wynne-Jones G, Morsø L, Hill JC, et al. Evidence-based treatment recommendations for neck and low back pain across Europe: A systematic review of guidelines. Eur J Pain [Internet]. 2021 Feb [cited 2024 Oct 4];25(2):275-95. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC7839780/. doi: 10.1002/ejp.1679
7. Tunwattanapong P, Kongkasuwan R, Kuptniratsaikul V. The effectiveness of a neck and shoulder stretching exercise program among office workers with neck pain: a randomized controlled trial. Clin Rehabil [Internet]. 2016 Jan [cited 2024 Oct 4];30(1):64-72. Available from: https://pubmed.ncbi.nlm.nih.gov/25780258/. doi: 10.1177/0269215515575747
8. Aas RW, Tuntland H, Holte KA, Røe C, Lund T, Marklund S, et al. Workplace interventions for neck pain in workers. Cochrane Database Syst Rev [Internet]. 2011 Apr 13 [cited 2024 Oct 4];2011(4):CD008160. Available from: https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD008160.pub2/full. doi: 10.1002/14651858.CD008160.pub2
9. Mahmud N, Kenny DT, Md Zein R, Hassan SN. The effects of office ergonomic training on musculoskeletal complaints, sickness absence, and psychological well-being: a cluster randomized control trial. Asia Pac J Public Health [Internet]. 2015 [cited 2024 Oct 4];27. Available from: https://pubmed.ncbi.nlm.nih.gov/21878465/. doi: 10.1177/1010539511419199
10. Shariat A, Cleland JA, Danaee M, Kargarfard M, Sangelaji B, Tamrin SBM. Effects of stretching exercise training and ergonomic modifications on musculoskeletal discomforts of office workers: a randomized controlled trial. Braz J Phys Ther [Internet]. 2018 Mar-Apr [cited 2024 Oct 4];22(2):144-53. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC5883995/. doi: 10.1016/j.bjpt.2017.09.003
11. Horton SJ, Johnson GM, Skinner MA. Changes in head and neck posture using an office chair with and without lumbar roll support. Spine [Internet]. 2010 May 1 [cited 2024 Oct 4];35(10):1081-7. Available from: https://pubmed.ncbi.nlm.nih.gov/20445477/. doi: 10.1097/BRS.0b013e3181cb8f82
12. Dandale C, Telang PA, Kasatwar P. The effectiveness of ergonomic training and therapeutic exercise in chronic neck pain in accountants in the healthcare system: a review. Cureus [Internet]. 2023 Mar 4 [cited 2024 Oct 4];15(3). Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC10072180/. doi: 10.7759/cureus.35762
13. Yoon TL, Min JH, Kim HN. Effect of using an 8-figure shoulder brace on posture and muscle activities during the performance of dental hygiene procedures. Int J Environ Res Public Health [Internet]. 2020 Nov 16 [cited 2024 Oct 4];17(22):8494. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC7696399/. doi: 10.3390/ijerph17228494
14. Furukawa Y. Tasuki for neck pain: An individually randomized, open-label, waiting-list-controlled trial. J Occup Health [Internet]. 2020 Jan [cited 2024 Oct 4];62(1). Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC6970410/. doi: 10.1002/1348-9585.12097
15. Salaffi F, Ciapetti A, Carotti M. Pain assessment strategies in patients with musculoskeletal conditions. Reumatismo [Internet]. 2012 Sep 28 [cited 2024 Oct 4];64(4):216-29. Available from: https://www.reumatismo.org/index.php/reuma/article/view/reumatismo.2012.216. doi: 10.4081/reumatismo.2012.216
16. Luksanapruksa P, Wathana-apisit T, Wanasinthop S, Sanpakit

S, Chavasiri C. Reliability and validity study of a Thai version of the Neck Disability Index in patients with neck pain. J Med Assoc Thai [Internet]. 2012 May [cited 2024 Oct 4];95(5):681-8. Available from: https://pubmed.ncbi.nlm.nih.gov/22994028/. doi: 10.2519/jospt.2009.2930

17. Bush KW, Collins N, Portman L, Tillett N. Validity and intertester reliability of cervical range of motion using inclinometer measurements. J Man Manip Ther [Internet]. 2000 Apr [cited 2025 July 22];8(2):52–61. Available from: https://www.researchgate.net/publication/233567761_Validity_and_Intertester_Reliability_of_Cervical_Range_of_Motion_Using_Inclinometer_Measurements doi:10.1179/106698100790819546
18. Shaghayegh Fard B, Ahmadi A, Maroufi N, Sarrafzadeh J. Evaluation of forward head posture in sitting and standing positions. Eur Spine J [Internet]. 2016 Nov [cited 2024 Oct 4];25(11):3577-82. Available from: https://pubmed.ncbi.nlm.nih.gov/26476717/. doi: 10.1007/s00586-015-4254-x
19. Dimitriadis Z, Podogyros G, Polyviou D, Tasopoulos I, Passa K. The reliability of lateral photography for the assessment of forward head posture through four different angle-based analysis methods in healthy individuals. Musculoskelet Care [Internet]. 2015 Sep [cited 2024 Oct 4];13(3):179-86. Available from: https://onlinelibrary.wiley.com/doi/10.1002/msc.1095. doi: 10.1002/msc.1095
20. Lauche R, Langhorst J, Dobos GJ, Cramer H. Clinically meaningful differences in pain, disability, and quality of life for chronic nonspecific neck pain: a reanalysis of four randomized controlled trials of cupping therapy. Complement Ther Med [Internet]. 2013 Aug [cited 2024 Oct 4];21(4):342-7. Available from: https://pubmed.ncbi.nlm.nih.gov/23876565/. doi: 10.1016/j.ctim.2013.04.005
21. Leung M, Kan MMP, Cheng HMH, De Carvalho DE, Anwer S, Li H, et al. Effects of using a shoulder/scapular brace on the posture and muscle activity of healthy university students during prolonged typing: a randomized controlled crossover trial. Healthcare (Basel) [Internet]. 2023 May 25 [cited 2024 Oct 4];11(11):1555. Available from: https://www.mdpi.com/2227-9032/11/11/1555. doi: 10.3390/healthcare11111555
22. Pool JJM, Ostelo RWJG, Hoving JL, Bouter LM, de Vet HCW. Minimal clinically important change of the Neck Disability Index and the numerical rating scale for patients with neck pain. Spine [Internet]. 2007 Dec 15 [cited 2024 Oct 4];32(26):3047-51. Available from: https://pubmed.ncbi.nlm.nih.gov/18091500/. doi: 10.1097/BRS.0b013e31815cf75b
23. Bankhele JR, Yeradkar RS, Mulye MM. Effect of upper back brace with auditory feedback for forward head rounded shoulder posture among office workers with chronic neck pain: a pre-post single group study. Indian J Occup Ther [Internet]. 2020 Jul-Sep [cited 2024 Oct 4];52(3):85-9. Available from: https://www.researchgate.net/publication/346591897_Effect_of_upper_back_brace_with_auditory_feedback_for_forward_head_rounded_shoulder_posture_among_office_workers_with_chronic_neck_pain_-_A_pre-post_single_group_study. doi: 10.4103/ijoth.ijoth_26_20