



## **Bob Anderson Stretching Intervention for Alleviating Carpal Tunnel Syndrome Among Garment Workers at CV. X Medan**

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### **Abstract**

Carpal tunnel syndrome (CTS) is an occupational disease that causes pain and dysfunction of the hands. Carpal tunnel syndrome often occurs among workers who perform repetitive hand movements and work in non-ergonomic positions, such as garment workers. Various stretching techniques are recommended to reduce the severity of CTS, including Bob Anderson stretching. This study aims to evaluate the effect of the Bob Anderson stretching intervention on alleviating CTS

among garment workers. We used an experimental with a one-group pretest-posttest design, and the study was conducted at a garment manufacturing company (CV. X) in Medan. The sample consisted of 32 garment workers selected by purposive sampling. The severity of CTS was measured using the Boston Carpal Tunnel Questionnaire (BCTQ). Data analysis was performed using a dependent t-test. The results of this study showed that the mean total symptom severity scores before intervention (mean  $\pm$  SD= 28.06  $\pm$  5.68) decreased after the Bob Anderson stretching intervention (mean  $\pm$  SD= 20.56  $\pm$  3.83). This significant mean difference (mean difference  $\pm$  SD= 7.50  $\pm$  3.61;  $p$ -value<0.001) indicates that the Bob Anderson stretching intervention is effective for alleviating CTS among garment workers at CV. X Medan. Garment factory owners should implement the Bob Anderson stretching program into the daily workplace schedule at least twice a day and provide training on proper stretching techniques to ensure that garment workers can independently and consistently practice Bob Anderson stretching every day at work to alleviate their CTS severity.

**Keywords:** Bob Anderson stretching, Carpal tunnel syndrome, Garment workers

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## Introduction

Carpal tunnel syndrome (CTS) is an occupational disease affecting the upper extremity musculoskeletal system, causing pain and dysfunction of the hands. Carpal tunnel syndrome occurs due to prolonged pressure or compression on the median nerve in the wrist, caused by inflammation or swelling of tendons or tissues, improper hand posture, or excessive activity. Consequently, blood supply to the nerves is reduced, leading to symptoms such as tingling or numbness, muscle weakness, and hand dysfunction (Madani et al., 2023). According to data from the National Health Interview Study (NIHS), the prevalence of work-related CTS in 2015 was 1.68% (CDC, 2024). In the United States, cumulative trauma disorders affecting the musculoskeletal and nervous systems due to prolonged exposure to specific forces, movements, or positions are reported as occupational diseases with a prevalence exceeding 50%, including CTS, which is estimated to account for 267 cases per 100,000 populations annually. Meanwhile, in the United Kingdom, the prevalence of CTS is reported to be 6–17% (Asfian et al., 2021). Based on a study in Indonesia on jobs requiring intensive wrist use, the prevalence of CTS among such workers was found to reach 5.6–15% (Sujadi, 2022). Other findings suggest that CTS affects approximately 3–6% of workers whose jobs primarily require hand use and excessive physical effort (Alhusain et al., 2019).

Garment workers are particularly susceptible to CTS due to repetitive hand movements while sewing and non-ergonomic working positions. A study showed that approximately 79.2% of garment workers in Denpasar who had been working for more than two years and worked eight hours a day suffered from CTS (Paramita et al., 2021). Yudistira et al. (2022) also found in their research that 66% of sewing machine operators in the production department of a garment company had CTS, which was significantly associated with repetitive movements and the work posture. The severity of CTS among garment workers is affected not only by the level of vibration and duration of exposure to sewing machines (Putri et al., 2022), but also by poor ergonomic body positions and repetitive movements while sewing (Lalchanzani & Rosita, 2022). Additionally, the lack of awareness about the importance of stretching has been identified as a contributing factor



to increased CTS risk among workers (Sinha et al., 2023). Various techniques such as wrist stretching, tendon, and nerve gliding exercises (Anggraini & Astari, 2021; Asmoro & Pristianto, 2022) or myofascial stretching of the carpal ligaments (Shem et al., 2020) have been proven to significantly alleviate pain due to CTS and restore hand function in CTS patients.

A guide that explains practical, simple, and applicable stretching techniques that workers can do on their own is the one introduced by Bob Anderson in his book titled “Stretching”. He explains stretching techniques for the hands, wrists, and forearms designed to help alleviate muscle tension caused by repetitive movements, improve blood circulation, enhance joint flexibility, and prevent injuries such as carpal tunnel syndrome (Anderson, 2020). Thus, this approach has the potential to help alleviate pain due to carpal tunnel syndrome, which can disrupt daily activities of garment workers, and improve their productivity.

CV. X is one of the garment companies in Medan specializing in textiles for the production and sale of manufactured clothing, providing screen printing and embroidery services, and more. The production process uses electric sewing machines operated by 40 garment workers. Based on a preliminary survey to identify the severity of symptoms among 30 garment workers, it was found that 43% of them experienced pain in their hands or wrists, which was felt both during the day and at night. Additionally, 43% of the garment workers reported feeling slight weakness in their hands or wrists. Among the 30 garment workers, 40% respectively experienced 2–3 episodes of hand or wrist pain that disrupted sleep at night over the past two weeks, felt 1–2 episodes of hand or wrist pain during the day, experienced episodes of pain during the day lasting less than 10 minutes per day, felt slight numbness or tingling at night, and experienced numbness or tingling in the hands that disrupted sleep 2–3 times at night over the past two weeks. Meanwhile, 37% of garment workers reported mild numbness or tingling, and 33% of garment workers experienced moderate difficulty in holding and using small objects such as keys or pens. This indicates that the majority of garment workers suffer from carpal tunnel syndrome that is sufficiently disruptive. Therefore, we are interested in evaluating the effect of the Bob Anderson stretching intervention on alleviating carpal tunnel syndrome among garment workers at CV. X Medan.



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## Methods

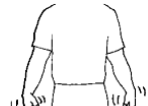
This is an experimental study with a one-group pretest–posttest design. The study was conducted at CV. X Medan from February to April 2025. Sample selection was done using purposive sampling, based on inclusion and exclusion criteria determined by the researcher to fulfill the study objectives. The inclusion criteria for the sample were garment workers aged 20–45 years, with a minimum of two years of work experience and a minimum of five days/week or six hours/day of work, using electric sewing machines, and willing to participate in the study. The exclusion criteria included garment workers with a history of hand/wrist/finger injuries, as well as a history of diseases such as obesity, rheumatoid arthritis, diabetes mellitus, hypothyroidism, and hypertension, or currently taking medications that may affect the nervous system. According to these inclusion and exclusion criteria, the number of eligible participants from the total population is 32 garment workers.

The severity of carpal tunnel syndrome was measured using the Indonesian version of the Boston Carpal Tunnel Questionnaire (BCTQ), which has been validated and proven reliable (Octaviana et al., 2022). A severity scale consisting of 11 questions was used to assess the severity of symptoms such as pain, numbness, weakness, tingling, and difficulty performing fine motor movements over the past two weeks, with five possible answers: normal (1), mild (2), moderate (3), severe (4), and very severe (5). The total score is then categorized into five levels: asymptomatic (total score 11), mild (12–22), moderate (23–33), severe (34–44), and very severe (45–55). The study began with the first stage: a pretest, which is the measurement of CTS severity using the BCTQ before intervention. This was followed by the second stage: the intervention of hand, wrist, and forearm stretches by Bob Anderson, which we had taught (Table 1). The movements were performed in a standing position, following proper posture and stretching technique guidelines, and were conducted once daily in the morning before work, with a frequency of three times per week (every Monday, Wednesday, and Friday) over four weeks. We observed each stretching activity to ensure the accuracy of the stretching movements based on duration,



repetition frequency, and technical precision. In the final stage, after four weeks, a posttest was conducted, measuring CTS severity using the BCTQ after the intervention.

**Table 1. Bob Anderson Stretching Intervention Protocol (Anderson, 2020)**

| Illustration                                                                           | Description                                                                                                                                                                                      | Illustration                                                                             | Description                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.    | First, interlace your fingers in front of you and rotate your hands and wrists clockwise 10 times.                                                                                               | 8.     | Next gently pull each finger and thumb straight out and hold for 2–3 seconds.                                                                                                                                  |
| 2.    | Repeat counterclockwise 10 times.                                                                                                                                                                | 9.     | Now, shake your arms and hands at your sides for 10–12 seconds.                                                                                                                                                |
| 3.    | Then separate and straighten your fingers until the tension of a stretch is felt. Hold for 10 seconds, then relax.                                                                               | 10.    | Start with your arms straight out in front of you. Slowly turn your hands to the outside (as you keep your arms straight) until a stretch is felt along the inside forearms and wrists. Hold for 5–10 seconds. |
| 4.  | Next, bend your fingers at the knuckles and hold for 10 seconds. Then relax.                                                                                                                     | 11.  | Place your hands palm-to-palm in front of you. Then, move your hands downward, keeping your palms together, until you feel a mild stretch. Keep your elbows up and even. Hold for 5–8 seconds.                 |
| 5.  | Now, with your arms straight out in front of you, bend your wrists with fingers pointing upwards. Hold for 10–12 seconds. Do twice.                                                              | 12.  | From the above stretch, rotate your palms around until they face more or less downward. Go until you feel a mild stretch. Keep your elbows up and even. Hold for 5–8 seconds.                                  |
| 6.  | Then bend your wrist with your fingers pointing downwards to stretch the top of your forearms. Hold for 10–12 seconds. Do twice.                                                                 | 13.  | Place your hands palm-to-palm in front of you. Push one hand gently to the side until you feel a mild stretch. Keep your elbows up and even. Hold for 5–8 seconds.                                             |
| 7.  | With your index finger and thumb gently hold a finger or the thumb of the opposite hand. Use your index finger and thumb to rotate each finger and thumb 5 times clockwise and counterclockwise. |                                                                                          |                                                                                                                                                                                                                |



The effect of Bob Anderson's hands, wrists, and forearms stretching intervention on carpal tunnel syndrome was further analyzed by comparing the total symptom severity scores before (pretest) and after (posttest) the intervention using a dependent (paired) t-test on normally distributed data. If the pretest and posttest total scores differ significantly, with a p-value < 0.05, it indicates that Bob Anderson stretching intervention has an effect on CTS severity.

## Results

Based on data collected from 32 garment workers at CV. X Medan, the results of the study are presented as follows.

Table 2. Characteristics of Garment Workers at CV. X Medan

| Characteristics           | n(=32) | % (=100) |
|---------------------------|--------|----------|
| Age                       |        |          |
| ≤35 years                 | 17     | 53.1     |
| >35 years                 | 15     | 46.9     |
| Gender                    |        |          |
| Female                    | 10     | 31.2     |
| Male                      | 22     | 68.8     |
| Length of work experience |        |          |
| ≤5 years                  | 21     | 65.6     |
| >5 years                  | 11     | 34.4     |

Table 2 above shows that the majority of garment workers at CV. X Medan are aged 35 years or younger (53.1%) compared to those aged over 35 years (46.9%), and are predominantly male (68.8%). Meanwhile, based on length of work experience, most garment workers at CV. X Medan have been working for 5 years or more (65.6%).

Table 3. Carpal Tunnel Syndrome Severity Before and After Bob Anderson Stretching Intervention

| Category     | Pretest |          | Posttest |          |
|--------------|---------|----------|----------|----------|
|              | n(=32)  | % (=100) | n(=32)   | % (=100) |
| Asymptomatic | 0       | 0        | 0        | 0        |
| Mild         | 6       | 18.8     | 20       | 62.5     |
| Moderate     | 21      | 65.6     | 12       | 37.5     |
| Severe       | 5       | 15.6     | 0        | 0        |
| Very severe  | 0       | 0        | 0        | 0        |



As seen in Table 3 above, initial findings revealed that the majority of garment workers at CV. X Medan suffered from CTS with moderate severity (65.5%), while the remainder reported mild symptoms (18.8%) and a smaller proportion even endured severe symptoms (15.6%). After regularly performing the Bob Anderson stretching intervention for four weeks, it was observed that the severity of CTS among the garment workers reduced, with most now reporting mild symptoms (62.5%). Meanwhile, although approximately 37.5% still had moderate symptoms, it was clear that the number had decreased, and nobody reported severe symptoms anymore.

Table 4. The Effect of Bob Anderson Stretching Intervention on the Severity of Carpal Tunnel Syndrome Among Garment Workers at CV. X Medan

| Intervention                  | Mean $\pm$ SD*   | Min | Max | Mean difference $\pm$ SD | p      |
|-------------------------------|------------------|-----|-----|--------------------------|--------|
| Before (pretest total scores) | 28.06 $\pm$ 5.68 | 20  | 41  | 7.50 $\pm$ 3.61          | <0.001 |
| After (posttest total scores) | 20.56 $\pm$ 3.83 | 13  | 28  |                          |        |

\*SD=Standard Deviation

Based on the results of the dependent t-test analysis in Table 4 above, it was found that there was a significant mean difference (mean difference  $\pm$  SD = 7.50  $\pm$  3.61) in the total symptom severity scores before and after the Bob Anderson stretching intervention, with a p-value <0.001. Before the intervention, the mean total symptom severity scores among garment workers at CV. X Medan was 28.06, with the minimum total score being 20 and the maximum 41. However, after the Bob Anderson stretching intervention was performed regularly for four weeks, the mean total symptom severity scores decreased to 20.56, with the minimum total score being 13 and the maximum 28. This finding indicates that the Bob Anderson stretching intervention is effective in significantly alleviating the severity of carpal tunnel syndrome among garment workers at CV. X Medan.

## Discussion

In his book, Anderson explains various stretching techniques, ranging from static and dynamic stretching to proprioceptive neuromuscular facilitation, and provides clear and understandable instructions for practicing stretching movements safely and effectively,



particularly for the hands, wrists, and forearms. The most common hand stretching techniques include finger stretches, thumb stretches to address tension due to repetitive use of the abductor and flexor pollicis muscles, and palm stretches, which help improve blood circulation and reduce pressure on the median nerve structures. For wrist stretching, recommended techniques include flexor stretches involving passive extension of the wrist with the assistance of the other hand, extensor stretches by passively bending the wrist downward, and circular wrist movements through wrist rotation to enhance joint mobility and reduce stiffness. Meanwhile, recommended stretching techniques for the forearm include pronator stretches to reduce tension affecting the neutral position of the wrist, supinator stretches to help maintain flexibility for rotational movements, along with forearm extensor and flexor stretches to improve muscle balance (Anderson, 2020).

The results of this study showed that the Bob Anderson stretching intervention, which was performed regularly over a four-week period, significantly alleviated the severity of carpal tunnel syndrome among garment workers at CV. X Medan ( $p < 0.001$ ). This finding indicates that consistent static stretching exercises can contribute to the improvement of CTS symptoms and functional hand capacity among garment workers. Constant use of this technique can have a positive cumulative effect on the soft tissue around the wrist, especially the flexor muscles and tendons that go through the carpal tunnel. Previous research by Cheurlin et al. (2025) also showed that static stretching of the wrist can improve joint flexibility and grip strength. Such interventions not only affect hand function but can also improve functional mobility relevant to daily activities, given that sewing activities require stability and endurance of the hand muscles over long periods of time. Nakamura et al. (2025) in their study also found that static stretching has a positive impact on muscle function without significantly impairing muscle performance, making it safe and suitable for hand muscle rehabilitation.

In a double-blind randomized controlled trial by Shem et al. (2020), it was also reported that the group engaging in independent stretching (carpal ligament stretching) had significant improvements in various clinical parameters, such as numbness or tingling, grip strength, and BCTQ scores (CTS severity), compared to the control group, which only showed limited



improvements in distal sensory latency. That study also highlighted that carpal ligament stretching is a cost-effective, practical approach that can be performed by CTS patients, making it an efficient and affordable additional option for managing mild to moderate symptoms, and potentially improving patient adherence to long-term therapy regimens. On the other hand, the study by Łach & Cygańska (2024), which evaluated the effectiveness of a preventive exercise protocol for carpal tunnel syndrome in office workers, showed that while it did not significantly reduce pain symptoms, the intervention—a series of exercises focused on mobilizing the median nerve, stretching of the lower arm muscles, and isometric muscle strengthening—performed over eight weeks, were able to improve grip and hand pinch strength, thereby restoring hand functional status. This indicates that regular physical exercise significantly contributes to enhancing neuromuscular function and hand muscle capacity, particularly in individuals with early-stage CTS.

Dynamic exercise interventions such as a combination of tendon and gliding exercises involving finger and wrist movements to reduce adhesion of the tissues surrounding the median nerve and tendons, reduce edema, and improve circulation and intra-canal mobilization, along with the use of a wrist splint for six weeks, have also been reported to improve grip and pinch strength, as well as alleviate symptoms and improve hand function, although the differences between the treatment and control groups were not statistically significant. That randomized controlled trial also explained that while wrist splints can help alleviate symptoms, their effects on hand functional status are limited if not combined with active exercises. Therefore, consistent exercises such as Bob Anderson stretching have great potential to provide additional benefits in alleviating the severity of carpal tunnel syndrome, through reduction of intra-carpal tunnel pressure and improvement of the biomechanics of the wrist flexor muscles, especially when integrated with other conservative therapeutic modalities (Abdolrazaghi et al., 2023).

However, this study has several limitations. Firstly, this is an experimental study with a one-group pretest-posttest design. Without a control group (comparison group), it is difficult to conclude that the reduction in symptoms is directly caused by the intervention, as it is challenging to eliminate external factors or confounders that may influence the intervention outcomes. The



second limitation is that the intervention was conducted over a four-week period, which clearly limits the evaluation of the long-term impact of the Bob Anderson stretching intervention on the severity of carpal tunnel syndrome. Lastly, the accuracy of executing the stretching movements may vary due to differences in understanding and adherence among participants regarding the intervention protocol, despite the researchers' efforts to ensure observation, which could affect the quality of the intervention and the perceived results.

### **Conclusion and Recommendation**

The results of this study indicate that the Bob Anderson stretching intervention is effective for alleviating carpal tunnel syndrome among garment workers at CV. X Medan. Garment factory owners should prioritize the implementation of the Bob Anderson stretching program into the daily workplace schedule, at least twice a day, to prevent the worsening of carpal tunnel syndrome among workers, which could lead to increased absenteeism and reduced production efficiency. Garment factory owners are also expected to provide training on proper stretching techniques for garment workers, enabling them to independently and consistently practice these techniques daily at the workplace, before and after work, or during breaks. Further research is recommended to evaluate the long-term impact of the Bob Anderson stretching intervention on carpal tunnel syndrome severity and to explore the effectiveness of this intervention in alleviating carpal tunnel syndrome across various worker populations.



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