

Comparison of Self-SNAGs and Stretching Exercises for Trapezius Myalgia in Office Workers

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ABSTRACT

Introduction: Trapezius myalgia is one of the musculoskeletal complaints frequently experienced by office workers due to prolonged static sitting and computer use. This study aimed to determine the effects of Self-Sustained Natural Apophyseal Glides (Self-SNAGs) and stretching exercises, as well as the differences in their effects on trapezius myalgia in office workers. **Methods:** The study employed an experimental method with a two-group pre-test and post-test design. A total of 38 office workers were selected using purposive sampling and allocated to two groups, each comprising 19 participants. The first group was given Self SNAGs, whilst the second group was given stretching exercises, each performed three times a week for two weeks. Changes in condition were measured using the Neck Disability Index (NDI) and analysed using a paired-sample t-test and an independent-sample t-test with $\alpha = 0.05$. **Results:** The results of the study showed that the NDI score in the Self SNAGs group decreased from 14.79 ± 5.138 (pre-test) to 4.32 ± 3.001 (post-test), $p < 0.001$, whilst the stretching exercise group's score decreased from 15.26 ± 4.954 (pre-test) to 4.05 ± 3.325 (post-test), $p < 0.001$. A comparison of the post-test scores between the two groups revealed no significant difference, with 4.32 ± 3.001 in the Self SNAGs group and 4.05 ± 3.325 in the stretching exercise group ($p = 0.799$). **Conclusion:** Both interventions showed an improvement in NDI scores among the office workers who were the subjects of the study, but there was no significant difference in effect between the two.

Keywords: trapezius myalgia, office workers, Self SNAGs, stretching exercises

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INTRODUCTION

The use of computers in work activities is on the rise, and many workers spend long periods in a static seated position. This situation contributes to an increased risk of musculoskeletal disorders, particularly in the neck, shoulder and scapular regions (Afifah & Suradi, 2025). Non-ergonomic working postures, repetitive movements, and prolonged computer use can increase static load on the musculoskeletal system and trigger pain, particularly in the trapezius muscle (Gea et al., 2025). Furthermore, a forward-head posture increases the workload on the neck and shoulder muscles, potentially leading to muscle tension and fatigue (Putri & Agustiningsih, 2024).

Trapezius myalgia is a musculoskeletal condition characterised by pain in the neck and upper back and is associated with static activities,

repetitive movements, physical strain, and psychosocial factors (Aurangzeb et al., 2025). From a biomechanical perspective, neck flexion can alter the distribution of the centre of gravity and increase the mechanical load on the cervical structures and the trapezius muscle (Alfianty et al., 2023). The prevalence of this problem is evident from the findings (Aurangzeb et al., 2025) that approximately 63 per cent of office workers have experienced musculoskeletal complaints in the past 12 months, with around 42 per cent experiencing problems with the trapezius muscle. This condition not only causes pain but can also impair function and reduce quality of life (Hashem et al., 2024).

Physiotherapy is required to reduce pain and improve function. Self-Sustained Natural Apophyseal Glides (Self SNAGs) is a self-administered mobilisation technique using a



towel or belt that combines sustained gliding with active physiological movements (Paquin et al., 2021). Theoretically, this technique can correct joint positional faults, improve cervical mobility, and modulate pain through neurophysiological mechanisms (Kaur et al., 2025). Research by Rahim et al. (2020) showed that SNAGs had a significant effect on functional neck activity. Meanwhile, Pangestu et al. (2023) found that the Mulligan technique was effective in reducing upper trapezius pain. Shamsi et al. (2021) also reported improvements in neck pain and disability following the application of SNAGs.

In addition to Self SNAGs, stretching exercises are designed to improve soft tissue elasticity, flexibility, and range of joint motion, as well as to reduce muscle tension (Harefa et al., 2026). Stretching can improve blood circulation, aid muscle relaxation, and reduce pain perception (Trisnowiyanto, 2017; Zannah et al., 2020). Previous evidence demonstrates the effectiveness of stretching exercises; for instance, Mardiyana et al. (2022) found a reduction in VAS pain scores from 5.5 to 3.7 ($p=0.000$), whilst Amoudi & Ayed (2021) reported a significant reduction in neck pain and disability ($p=0.001$). However, studies directly comparing Self SNAGs and stretching exercises in office workers with trapezius myalgia remain limited; therefore, more specific research on this population is required. A direct comparison is essential to determine an appropriate, practical and evidence-based physiotherapy intervention for office workers.

The novelty of this study lies in the direct comparison of two distinct physiotherapy approaches: Self-Sustained Natural Apophyseal Glides (Self SNAGs), which emphasise mobilisation of the cervical joints, and stretching exercises, which emphasise the elongation of soft tissues, in the specific population of office workers with trapezius myalgia. Previous research in theses has mostly evaluated each intervention separately or compared interventions across different populations and clinical conditions. Therefore, this study provides comparative evidence in office workers exposed to prolonged periods of static sitting and computer use, thereby clarifying whether one approach yields better results than the other under

the same research conditions. The aim of this study was to determine the effect of Self-Sustained Natural Apophyseal Glides (Self SNAGs) on trapezius myalgia in office workers, to determine the effect of stretching exercises on trapezius myalgia in office workers, and to determine the differences in the effects of these two interventions.

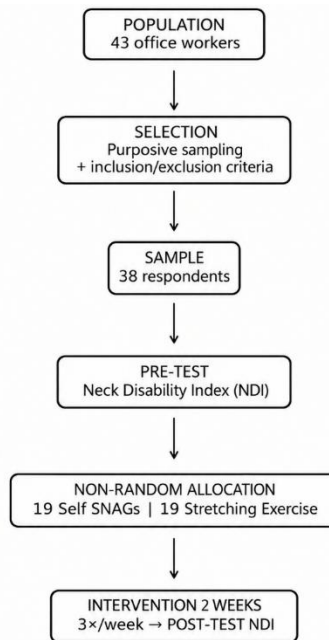
METHODS

This study employed an experimental method using a two-group pre-test and post-test design. As explained by Indrawati et al. (2025), the two-group pre-test and post-test design enables researchers to compare changes before and after the intervention in both groups. The study population consisted of 43 office workers at the Sleman Regency Department of Agriculture, Food and Fisheries who carried out administrative tasks using computers or laptops as their primary tools. As stated by Moncayo and Chapoñán (2025), the population refers to the totality of units that are the focus of the study, whilst the sample is a portion of the population selected for observation. The sample was selected using purposive sampling based on inclusion and exclusion criteria. Ahmad and Wilkins (2025) explain that purposive sampling is a deliberate sampling technique, in which the researcher selects participants based on their ability to provide information relevant to the phenomenon under study. Inclusion criteria comprised office staff at the organisation in question, suffering from trapezius myalgia, willing to participate in the study by signing an informed consent form, and working at a computer for 5–8 hours per day. Exclusion criteria were withdrawal from the study, whilst a drop-out was defined as a respondent failing to attend for three consecutive days, having a fracture or a history of severe trauma to the cervical spine, or having a skin condition that was un , preventing intervention in the trapezius myalgia area. Trapezius myalgia was operationalised as a musculoskeletal condition characterised by pain in the neck and upper back in workers meeting the occupational exposure criteria; identification was carried out via screening prior to sample selection. Once the sample had been selected, respondents were



allocated to two groups, each comprising 19 people: the Self SNAGs group and the stretching exercise group; consequently, group allocation in this article is described as non-random allocation. The sample size was determined using the Slovin formula, with a population (N) of 43 people and a 5 per cent error rate ($e = 0.05$). The formula used was $n = N/(1+Ne^2)$. Thus, $n = 43/[1+43(0.05)^2] = 43/1.1075 = 38.83 \approx 38$ respondents. The rounded

result was used as the sample size for the study, which was then divided equally into two groups, each comprising 19 respondents. This calculation was used to align the population size, margin of error, and sample size reported in the study. The research data consisted of primary data obtained directly from the respondents.



Analysis: paired sample t-test & independent sample t-test

Figure 1. Flowchart of respondent selection, allocation, intervention and measurement

Prior to the intervention, all respondents were given an explanation of the study, voluntarily provided their informed consent, and underwent a pre-test using the Neck Disability Index (NDI). According to Wen et al. (2025), the 2024 revision of the Declaration of Helsinki emphasises that participation by individuals capable of giving informed consent must be voluntary, and that every prospective participant must be adequately informed, in plain language, about the aims, methods, expected benefits, risks and burdens of the study. The researchers obtained ethical clearance from the Health Research Ethics Committee of 'Aisyiyah University, Yogyakarta, under reference number No. 5595/KEP-UNISA/VII/2026. Wen et al. (2025) explain that the research protocol must be

submitted to the research ethics committee for consideration, comment, guidance and approval before the research begins; the ethics committee must be independent, transparent, have adequate resources, and be authorised to monitor, recommend changes, or withdraw research approval. Following the pre-test, participants received the intervention appropriate to their group for two weeks, three times a week. The Self SNAGs group performed exercises in a seated position using a towel or strap positioned to apply and maintain pressure on the posterior arch of C1; respondents then actively performed cervical rotation at the C1–C2 segment up to the maximum range of motion that did not cause pain, held the end position for 10 seconds, and slowly returned to a neutral position; the exercise was



performed 10 times per session, three times a week for two weeks, with the researcher providing instructions at the initial visit and ensuring correct technique at subsequent visits. The stretching exercise group performed exercises in an upright seated position, targeting the sternocleidomastoid (SCM) and upper trapezius muscles through three movements, namely (1) neck flexion, (2) neck flexion accompanied by rotation to the opposite side, and (3) lateral flexion towards the contralateral side; each movement was performed passively by a physiotherapist for 30 seconds, repeated three times on each side with a 10-second rest interval, carried out to the point of mild discomfort without causing pain, with a session duration of approximately 10–12 minutes and a frequency of three times per week for two weeks. Once the entire intervention was complete, a post-test measurement was carried out using the NDI, which is used to assess functional limitations resulting from neck complaints and consists of 10 items with a total score of 0–50, where a higher score indicates greater functional limitation of the neck. John et al. (2025) explain that the NDI comprises 10 items, each scored from 0 to 5, which are totalled and expressed as a percentage; a higher score reflects greater pain-related disability, whilst Saltychev et al. (2024) add that the NDI has good internal consistency and test-retest reliability and has been shown to be responsive in monitoring changes in patients with neck pain. Data were analysed using IBM SPSS version 20, with the Shapiro–Wilk test to assess normality and Levene’s test for homogeneity, whilst pre-test–post-test changes were analysed using a paired-sample t-test and comparisons of results between groups using an independent-sample t-test with $\alpha = 0.05$.

RESULTS

Respondent characteristics

Respondent characteristics provide a general overview of the demographic and occupational characteristics of the respondents involved in the study. The presentation of these characteristics is necessary to provide information on the profile of the study subjects prior to further analysis of the research data. In

this study, respondent characteristics included age, gender, working hours and length of service. All these characteristics are presented in the form of frequency distributions and percentages based on the 38 respondents who met the study criteria. The results of the overall distribution of respondent characteristics are presented in the following table.

Table 1. Respondent Characteristics

Characteristic	Category	Frequency	Percentage
Age	27–40 years	22	57.9%
	41–55 years	16	42.1 %
Gender	Male	15	39.5%
	Female	23	60.5 %
Working hours	7.5 hours	3	7.9%
	8 hours	24	63.2 %
	9 hours	9	23.7%
	10 hours	2	5.3%
Length of service	≤5 years	7	18.4%
	6–10 years	12	31.6 per cent
	11–15 years	8	21.1%
	16–20 years	7	18.4%
	>20 years	4	10.5 %
Total		38	100.0%

Based on the above, the majority of respondents were in the 27–40 age group, totalling 22 respondents (57.9 per cent), whilst the 41–55 age group comprised 16 respondents (42.1 per cent). By gender, female respondents constituted the largest group with 23 respondents (60.5 per cent), whilst male respondents numbered 15 (39.5 per cent). In terms of working hours, the majority of respondents worked 8 hours a day (24 respondents, 63.2 per cent), followed by 9 hours (9 respondents, 23.7 per cent), 7.5 hours (3 respondents, 7.9 per cent) and 10 hours (2 respondents, 5.3 per cent). Based on length of service, the largest group had been working for 6–10 years, comprising 12 respondents (31.6 per cent), followed by 8 respondents (21.1%) with 11–15 years’ service, 7 respondents (18.4%) each with ≤5 years’ and 16–20 years’ service, and 4



respondents (10.5%) with >20 years' service. Overall, these characteristics indicate that the respondents were predominantly workers aged 27–40 years, female, working an 8-hour day, and with 6–10 years' service.

Research Findings

The study involved 38 office workers who met the study criteria and were divided into two groups, each comprising 19 respondents. Group I received the Self-Sustained Natural Apophyseal Glides (Self SNAGs) technique, whilst Group II received stretching exercises. Both interventions were administered three times a week for two weeks. Changes in the participants' condition were assessed using the Neck Disability Index (NDI); a lower NDI score indicates less functional limitation of the neck associated with trapezius myalgia.

The descriptive results showed that both groups had relatively comparable NDI scores prior to the intervention. In Group I, the mean NDI score decreased from 14.79 ± 5.138 at the pre-test to 4.32 ± 3.001 at the post-test, whilst in Group II it decreased from 15.26 ± 4.954 to 4.05 ± 3.325 . Thus, the average score reduction was 10.47 points in the Self SNAGs group and 11.21 points in the stretching exercise group.

Table 2. Descriptive statistics for Neck Disability Index scores before and after the intervention

Group	N	Pre-test Mean $\pm$ SD	Post-test Mean $\pm$ SD	Average decrease
Self SNAGs	19	14.79 $\pm$ 5.138	4.32 $\pm$ 3.001	10.47 (70.8 per cent)
Stretching exercise	19	15.26 $\pm$ 4.954	4.05 $\pm$ 3.325	11.21 (73.5%)

Based on Table 2, both interventions resulted in a significant reduction in NDI scores after two weeks of treatment. The mean reduction in the stretching exercise group was numerically greater than that in the Self SNAGs group, namely 11.21 compared with 10.47 points. However, these descriptive differences cannot yet be used to conclude that stretching exercises are

more effective, as the effectiveness of both interventions is determined based on the results of statistical tests between the groups.

Table 3. Results of the normality and homogeneity tests

Test	Group	P-value	Notes
Shapiro-Wilk	Self SNAGs	0.485	Normal
Shapiro-Wilk	Stretching exercise	0.125	Normal
Levene's Test	Both groups	0.516	Homogeneous

Prerequisite tests indicated that the data from both groups met the assumptions for parametric analysis. The Shapiro-Wilk test yielded a p-value of 0.485 for Group I and 0.125 for Group II. Both values were greater than 0.05; therefore, the data were deemed to be normally distributed. The test for homogeneity using Levene's Test yielded a p-value of 0.516, which is also greater than 0.05; therefore, the variances of both groups are deemed homogeneous.

Hypothesis testing was carried out using a paired-sample t-test to determine changes in NDI scores before and after the intervention in each group, and an independent-sample t-test to determine differences in the final results between the two groups. The significance level used was $\alpha = 0.05$.

Table 4. Results of hypothesis testing, 95% confidence intervals, and effect sizes

H-	Intervention	Pre-test	Post-test	p-value	95% CI of change/difference	Effect size
H1	Self-SNAGs	14.79 $\pm$ 5.138	4.32 $\pm$ 3.001	<0.001	8.51–12.43	dz=2.58
H2	Stretching exercise	15.26 $\pm$ 4.954	4.05 $\pm$ 3.325	<0.001	9.79–12.63	dz=3.79
H3	Post-test between groups	—	4.32 vs 4.05	0.799	–1.81–2.35	d=0.09

Note: CI = 95% confidence interval; dz = Cohen's d for paired changes; d = Cohen's d for post-test differences between groups.



In Group I, the paired-sample t-test revealed a significant difference between pre-test and post-test scores, with $t = 11.244$ and $p = 0.000$ ($p < 0.05$). Consequently, the first hypothesis was accepted, namely that Self SNAGs have an effect on the reduction of trapezius myalgia based on changes in NDI scores. In Group II, the paired-sample t-test yielded $t = 16.538$ with $p = 0.000$ ($p < 0.05$), thus the second hypothesis was accepted. Meanwhile, the independent samples t-test yielded a post-test mean of 4.32 ± 3.001 in the Self SNAGs group and 4.05 ± 3.325 in the stretching exercise group, with $p = 0.799$ ($p > 0.05$). Consequently, the third hypothesis was rejected as there was no significant difference in effect between the two interventions.

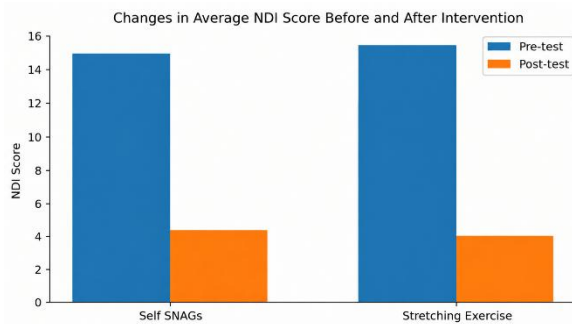


Figure 1. Mean change in NDI scores in the Self SNAGs and Stretching exercise groups

Estimates of the magnitude of change indicate that the reduction in NDI scores in both groups was not only statistically significant but also large by standard measures: the paired effect size (d_z) was 2.58 for the Self SNAGs group and 3.79 for the stretching exercise group. The 95% confidence intervals for the mean changes were 8.51–12.43 and 9.79–12.63 points, respectively. For the comparison between the groups, the post-test mean difference was only 0.27 points with a 95% CI of –1.81 to 2.35 and Cohen’s $d = 0.09$, indicating that the difference between the interventions was very small and not statistically significant.

DISCUSSION

Respondent Characteristics

Respondent characteristics showed that the majority of participants were aged 27–40 years

(57.9%), female (60.5%), worked 8 hours per day (63.2%), and had 6–10 years’ service (31.6%). These characteristics suggest that complaints of trapezius myalgia in this study were found among workers of working age who were engaged in relatively sedentary office work. In terms of age, advancing age is associated with changes in the musculoskeletal system, including a reduction in muscle mass and functional capacity, making the musculoskeletal system more susceptible to fatigue and disorders (Naruse et al., 2023).

The predominance of female respondents also needs to be taken into account when interpreting the results. The studies cited in this thesis indicate that work-related muscle activity may contribute to differences in neck pain complaints based on gender, meaning that women may have a different susceptibility to neck complaints (Koch et al., 2025). Furthermore, the majority of respondents worked 8 hours per day, and the largest group in terms of length of service had been employed for 6–10 years. Prolonged exposure to static sitting and computer-based activities can place sustained strain on the neck and shoulder muscles. Prolonged slumped sitting has also been reported to increase activity in the axioscapular muscles and is associated with the onset of neck pain (Christensen et al., 2023). Thus, the characteristics of the respondents in this study align with a work context that facilitates the occurrence of complaints in the neck and trapezius regions.

The Effect of Self-SNAGs on Trapezius Myalgia

The results of the study showed that Self SNAGs produced a statistically significant change in NDI scores, from 14.79 ± 5.138 to 4.32 ± 3.001 ($p < 0.001$), with an average reduction of 10.47 points and a 95% CI of 8.51–12.43. A large within-group effect size ($d_z = 2.58$) indicates that the change is more than merely a statistical difference. From a clinical-descriptive perspective, based on the NDI categories used in this thesis, the mean score shifted from the moderate category (5–14) to the mild category (0–4), although the mean post-test score of 4.32 was very close to the threshold for the mild category. The study results support the presence of relevant functional improvement in the study



subjects; however, the clinical interpretation should not be equated with a claim of achieving the minimum clinically important difference (MCID), as the MCID parameter was not assessed in this study.

Theoretically, Self SNAGs constitute a form of self-mobilisation that combines sustained glide of the cervical joints with active movement. Mulligan's concept describes the existence of a 'joint positional fault', namely a misalignment of the relative positions of the joint surfaces, which may be associated with pain and functional limitations. Correction of joint position and optimisation of cervical movement form the basis of the Self SNAGs mechanism, whilst stimulation during mobilisation may contribute to pain modulation via neurophysiological mechanisms (Paquin et al., 2021; Kaur et al., 2025). This mechanism is relevant to the study's findings, as the reduction in NDI scores indicates a decrease in functional limitations of the neck following the intervention.

These findings are consistent with a study (Rahim et al., 2020) which showed that the Mulligan SNAGs technique had a significant effect on functional neck activity. The results of a study (Pangestu et al., 2023) also indicated that the Mulligan technique was effective in reducing upper trapezius muscle pain in elderly farmers. The similarity of these findings reinforces the notion that SNAGs-based interventions can provide benefits for complaints in the neck and trapezius areas, despite differences in the characteristics of the participants and the instruments used.

The Effect of Stretching Exercises on Trapezius Myalgia

Stretching exercises also produced statistically significant changes, with the mean NDI decreasing from 15.26 ± 4.954 to 4.05 ± 3.325 ($p < 0.001$). The mean reduction of 11.21 points had a 95% CI of 9.79–12.63 and a very large within-group effect size ($d_z = 3.79$). In terms of the interpretation of NDI categories in this thesis, the baseline mean fell within the 'severe' category (15–24) and the final mean within the 'mild' category (0–4). This change in category provides a clinical-descriptive

indication that neck function improved following the intervention. However, as with the Self SNAGs, clinical significance was not stated based on the MCID, as the study did not specifically measure the minimum clinically important difference.

In the theoretical review of this thesis, stretching exercises are intended to improve soft tissue elasticity, muscle flexibility and range of joint motion, as well as to reduce muscle tension (Harefa et al., 2026). Stretching provides elongation of tissues experiencing restrictions, thereby supporting functional improvement in the neck region. This mechanism may explain the reduction in the NDI, as reduced tissue tension and improved mobility can help participants carry out daily activities with fewer limitations.

The results of this study are consistent with those of Amoudi and Ayed (2021), who demonstrated that a stretching programme can significantly reduce neck pain and disability. The findings of Mardiyana et al. (2022) also showed a reduction in pain following stretching exercises, with $p = 0.000$. The similarity of these results reinforces the findings of this study that stretching can be applied to groups with musculoskeletal complaints in the neck region. Although the reduction in scores in the stretching exercise group was, descriptively, slightly greater than that in the Self-SNAGs group, this difference still needs to be considered alongside the results of the between-group tests.

Differences in the Effects of the Self SNAGs and Stretching Exercises

The between-group analysis showed no significant difference in effect between the Self SNAGs and stretching exercises. The mean post-test NDI score was 4.32 ± 3.001 in the Self SNAGs group and 4.05 ± 3.325 in the stretching exercise group, with a difference of 0.27 points, 95% CI -1.81 to 2.35 , $p = 0.799$, and Cohen's $d = 0.09$. These findings are significant as they indicate that the difference between the two interventions is very small compared to the variation in respondents' scores. Consequently, statistical significance in each group should not be interpreted as evidence that one intervention is superior to the other. Both interventions



demonstrated substantial changes from baseline, but the comparative evidence in this study suggests comparable final outcomes.

This equivalence in outcomes can be understood through the mechanisms of each intervention. Self-SNAGs emphasise sustained glide at the cervical joints accompanied by active movement, thereby helping to improve mobility and provide pain modulation via neurophysiological mechanisms. Stretching exercises provide elongation of muscle and soft tissue, improve flexibility, reduce muscle tension, and aid local circulation. Although their mechanisms of action differ, both share the same functional objectives: to reduce musculoskeletal tension, alleviate pain, improve neck mobility, and enhance function. These factors may explain why both groups experienced significant changes, whilst the differences between the groups were very small.

These findings differ from those of Naz et al. (2023), whose thesis reported better outcomes in the Mulligan group compared with the McKenzie self-stretching group. These differences may be related to the characteristics of the subjects, the type of comparator intervention, the duration, the frequency, and the severity of the condition under investigation. The study by Naz et al. employed a randomised controlled trial lasting eight weeks, whilst this study utilised non-random allocation and a two-week intervention in office workers with trapezius myalgia. These differences in design and population constitute important reasons for limiting the interpretation of this study's results to the specific conditions and subjects under investigation.

Limitations of the Study

This study has several limitations that need to be considered when interpreting the results. Firstly, the intervention period lasted only two weeks and therefore does not reflect the long-term effectiveness of the two methods. Secondly, the evaluation of outcomes primarily used the Neck Disability Index as the main indicator; consequently, changes in musculoskeletal condition were not fully captured through other parameters such as the range of motion of the

cervical joints, muscle strength, and pain intensity.

Thirdly, the study subjects were limited to office workers who met the study criteria; therefore, generalising the results to other populations should be done with caution. Fourthly, the study did not fully control for confounding factors that may have influenced the outcomes of the interventions. These limitations suggest that future studies should consider a longer duration of intervention and follow-up, a larger sample size, control for confounding factors, and the inclusion of additional objective parameters to provide a more comprehensive picture of the effectiveness of both interventions.

CONCLUSION

Among office workers at the Sleman Regency Department of Agriculture, Food and Fisheries who were the subjects of this study, the administration of Self SNAGs and stretching exercises both demonstrated an improvement in trapezius myalgia based on changes in NDI scores, whilst both interventions yielded comparable results, thus showing no clear superiority of one method over the other. These findings apply to the characteristics and conditions of the study subjects and are not intended to be generalised to the entire population of office workers.

The recommendations are as follows. Firstly, physiotherapists may consider both Self SNAGs and stretching exercises as intervention options for office workers with trapezius myalgia, as both demonstrated a significant effect and were statistically non-distinct in terms of efficacy. Secondly, office workers are advised to exercise regularly, maintain an ergonomic working posture, and take breaks between computer-based activities to help reduce the risk of musculoskeletal complaints. Thirdly, future research is advised to utilise a larger sample size, a longer intervention duration and follow-up period, and to include parameters such as cervical range of motion, muscle strength, pain intensity, working posture, and ergonomic factors.



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