REABILITACIJOS MOKSLAI
Slauga, kineziterapija, ergoterapija
LSU LITHUANIAN SPORTS UNIVERSITY

Reabilitacijos mokslai: slauga, kineziterapija, ergoterapija, *1*(32) 2025, 45–56, eISSN 2538-8673; DOI: https://doi.org/10.33607/rmske.v1i32.1601

The Influence of Active Breaks on Neck Pain Relief in Office Settings: A Systematic Review

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Abstract

Background. Non-specific neck pain (NSNP) is a prevalent musculoskeletal condition among office workers, primarily associated with prolonged static postures and sedentary work. Implementation of structured active or exercise breaks within the workday schedule have been suggested as a practical approach to alleviate the effects of prolonged sitting.

Aim. This literature review aims to synthesise current evidence on the effectiveness of active or exercise-based breaks in reducing NSNP among office-based populations.

Methods. A literature review was conducted using databases including PubMed, Scopus, ScienceDirect, Google Scholar, and PEDro. Eleven peer-reviewed studies published between 2014 and 2024 were selected based on eligibility criteria focusing on adult office workers experiencing NSNP and interventions involving active or exercise breaks during working hours. Methodological quality was assessed using standardised critical appraisal tools.

Results. Many studies reported positive effects of active breaks on reducing neck pain intensity. Interventions typically included brief sessions of stretching, postural exercises, or mobility drills performed during working hours at the workplace. Despite some heterogeneity in intervention protocols and outcome measures, the collective findings indicate that active breaks are beneficial for managing NSNP in sedentary occupational settings.

Conclusions. Active breaks represent a feasible and effective strategy for alleviating non-specific neck pain among office workers. The findings support the integration of movement-based interventions into daily work routines to enhance musculoskeletal health, improve quality of life, and boost occupational productivity in a short period. Further research with standardised protocols is needed to confirm long-term efficacy and optimise intervention design.

Keywords: active breaks; non-specific neck pain; office workers; sedentary behaviour

1. INTRODUCTION

Sedentary work is widely recognised as a significant risk factor for the development of musculoskeletal disorders, particularly among office-based populations. Non-specific neck pain (NSNP), characterised by pain without a clear pathological cause, is among the most prevalent conditions associated with prolonged sitting and poor ergonomic practices in workplace environments. Globally, NSNP ranks as the fourth leading cause of disability in the 21st century (Hoy et al., 2014).

Depending on the specific occupational demands, individuals may spend between 50% and 86% of their workday engaged in sedentary activities (Toomingas et al., 2012). The prevalence of neck pain

among office workers is reported to be as high as 55%, indicating a substantial occupational health concern (Klussmann et al., 2008). This condition imposes a considerable burden not only on the individual, through reduced physical function, increased pain, and diminished quality of life, but also on society, due to treatment costs, reduced workplace productivity, and increased rates of absenteeism (Pereira et al., 2017).

Epidemiological data indicate that women are disproportionately affected, experiencing a 2.9% higher prevalence rate than men, with peak incidence observed between the ages of 45 and 74 for both genders (Kazeminasab et al., 2022; Safiri et al., 2020). A combination of physical and environmental factors contributes to NSNP, including sustained muscle contraction, inadequate muscular endurance, poor posture, and suboptimal ergonomic conditions (Andersen et al., 2012; Verhagen et al., 2013).

Effective management of neck pain necessitates addressing symptoms related to pain intensity, functional impairment, and disability (Blanpied et al., 2017). Among the interventions proposed to counteract the effects of prolonged static postures are structured movement strategies such as active breaks, postural adjustments, and ergonomic enhancements (Waongenngarm et al., 2018; Lantoine et al., 2021). The aim of this study was to evaluate the effectiveness of active breaks and exercise interventions conducted during working hours in reducing non-specific neck pain among office workers.

2. METHODS

Study selection. A systematic search was conducted across seven databases (PubMed, Web of Science, ScienceDirect, Google Scholar, Cochrane Library, PEDro, and Scopus) for English-language studies published between 2014 and 2024. Search terms included combinations of “neck pain”, “office workers”, “active breaks”, “workplace-based exercise”, “workplace ergonomics”, and “postural change”. Reference lists of relevant articles were also screened.

Studies were included if they met the following criteria:

1) Randomised controlled trials (RCTs) evaluating active breaks as the primary intervention.

2) Participants were office or computer-based workers.

3) Outcomes included non-specific neck pain, discomfort, or work productivity.

4) Full-text articles published in English; non-peer-reviewed material was excluded.

A total of 11 RCTs met inclusion criteria (Figure 1). These studies employed various randomisation methods (parallel-group, cluster, stratified), ensuring high internal validity and reducing selection bias.

Methodological quality assessment. The methodological quality of the included studies was assessed using the Physiotherapy Evidence Database (PEDro) Scale. A score of ≥ 6/10 indicated high quality, while a score of 4–5/10 indicated moderate quality. Studies scoring below 4 were considered low quality.

Among the 11 studies, seven (63.6%) were rated as high quality, demonstrating strong internal validity and appropriate statistical reporting. Four studies (36.4%) were rated as moderate quality, reflecting some methodological limitations. One study (Nath et al., 2024) scored in the low-quality range, indicating a high risk of bias and limited methodological rigor (Table 1).

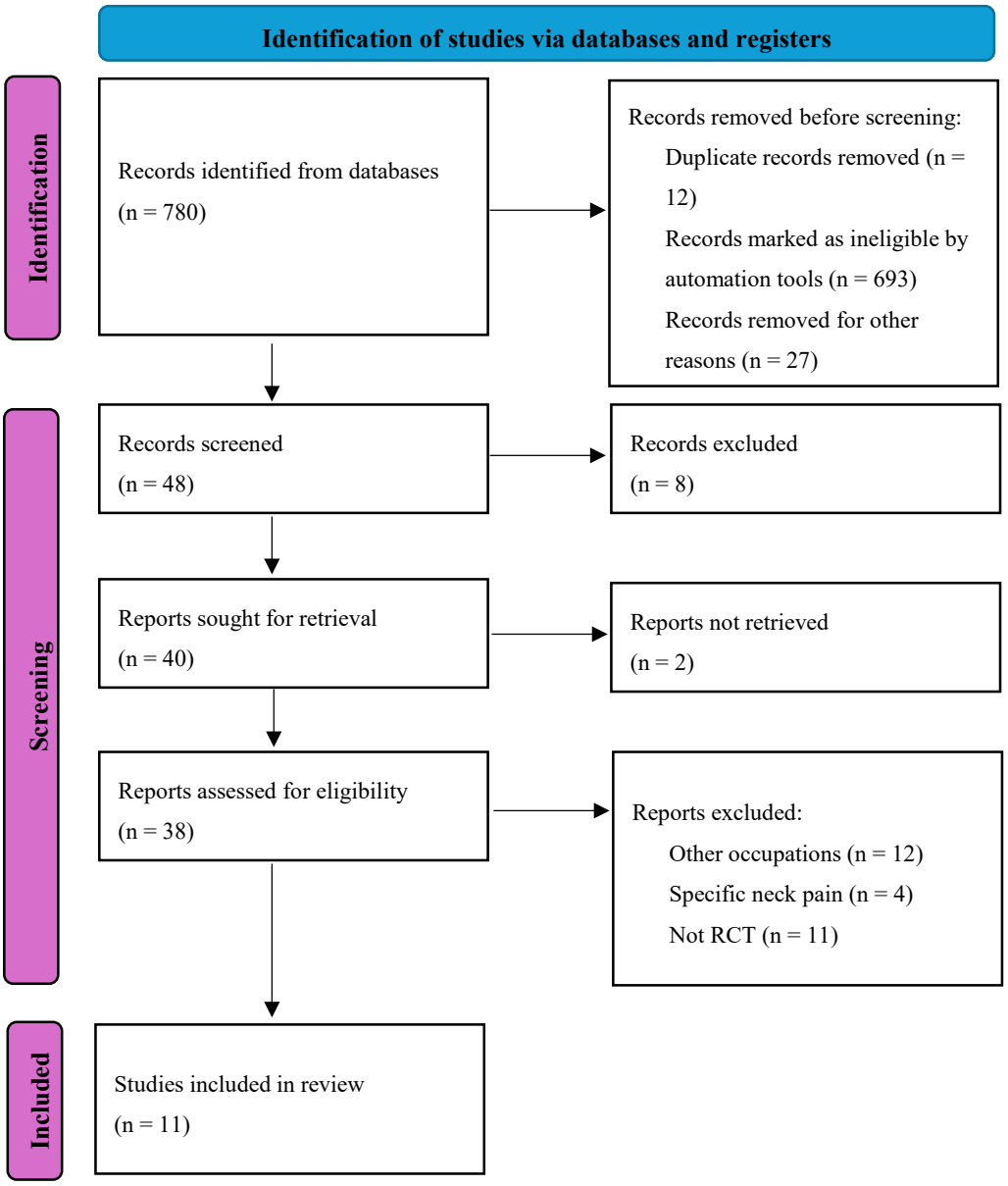

Figure 1. **PRISMA flow chart**

Data extraction. Data were systematically extracted using a pre-designed form to ensure consistency and minimise bias. Only RCTs evaluating the effects of active breaks or workplace exercise interventions on neck pain among office workers were included. Extracted data comprised bibliographic details (author, year), study design, sample size, participant characteristics, intervention details (type, duration, frequency), control conditions, outcome measures (VAS, CMDQ, SF-36), post-intervention means and standard deviations, p-values, and effect sizes (Cohen's *d*). When necessary, missing data were estimated from figures or calculated using reported statistics (confidence intervals).

Table 1. **Methodological quality score**

Scores on PEDro Scale														
Authors		1^0	1	2	3	4	5	6	7	8	9	10	Total score	Quality of study
1	Beneka et al. (2024)	+	+	–	+	–	–	–	+	–	+	+	5/10	Moderate
2	Nath et al. (2024)	+	+	–	–	–	–	–	–	–	+	–	2/10	Low
3	Alshehre et al. (2023)	+	+	+	+	–	–	+	+	+	+	+	8/10	High
4	Yaghoubitajani et al. (2022)	–	+	+	–	–	–	–	+	+	+	+	6/10	High
5	Johnston et al. (2021)	+	+	–	+	–	–	–	–	+	+	+	5/10	Moderate
6	Shariat et al. (2017)	+	+	+	+	–	–	–	+	+	+	+	7/10	High
7	Tunwattanapon et al. (2016)	+	+	+	+	–	–	+	+	+	+	+	8/10	High
8	Jakobsen et al. (2015)	+	+	–	+	–	–	+	+	+	+	+	7/10	High
9	Nakphet et al. (2015)	+	+	–	+	–	–	+	+	–	+	+	6/10	High
10	Osama et al. (2015)	+	+	–	+	–	–	–	+	–	+	+	5/10	Moderate
11	Gram et al. (2014)	+	+	–	+	–	–	–	–	+	+	+	5/10	Moderate

1^0 = eligibility criteria; 1 = random allocation; 2 = concealed allocation; 3 = baseline comparability; 4 = blind subjects; 5 = blind therapists; 6 = blind assessors; 7 = adequate follow-up; 8 = intention-to-treat analysis; 9 = between-group comparisons; 10 = point estimates and variability. + = YES, – = NO.

Data analysis. Data were extracted from the included studies based on predefined criteria. Key information, including mean values (M), standard deviations (SD), and sample sizes (N) for both the active break and control groups, was systematically recorded. When numerical data were not directly reported, the following strategies were applied: (1) data were retrieved from tables when available; (2) SDs were calculated from standard errors (SE) or confidence intervals (CI) using established formulas; (3) if only medians and ranges were reported, SDs were estimated using validated conversion methods in Microsoft Excel. To ensure comparability across studies, all outcome measures were converted into standardised mean differences (SMD, Cohen's *d*). Additional data included participant demographics (age, sex), intervention duration, active break frequency and type, and implementation details (duration of each break, exercise modality). These were organised into summary evidence tables detailing study design, outcome measures, intervention characteristics, main findings, and methodological quality.

Conclusions on the effectiveness of active breaks for pain and discomfort were drawn using the GRADE (Grades of Recommendation, Assessment, Development, and Evaluation) system to evaluate the overall quality of evidence and strength of recommendations (Furlan et al., 2015). Each outcome was initially ranked as "high" or "low", depending on whether most studies were randomised or non-randomised controlled trials (Swinton et al., 2017). Five domains were assessed: study limitations, inconsistency, indirectness, imprecision, and publication bias (Guyatt et al., 2011). Evidence quality was rated as high, moderate, low, or very low, based on how many of these domains were unmet.

3. RESULTS

Table 2 presents data from RCTs and cluster RCTs (CRCTs), assessing the effectiveness of various exercise-based or active break interventions in reducing non-specific neck pain (NSNP) among office workers. Each row provides information on the author, study design, intervention type and duration, outcome measures, and results for both control and intervention groups. Effect sizes (Cohen's *d*) and p-values are included to indicate clinical relevance and statistical significance.

Interventions studied included stretching exercises (SE), strength training (ST), yoga, ergonomic modifications (EM), and corrective exercises (CE), delivered over periods ranging from 4 to 24 weeks.

Most studies demonstrated statistically significant reductions in neck pain in the intervention groups. Largest effects (Cohen's $d > 2.0$) were observed in studies with combined interventions (exercise + ergonomic modification). Several interventions, such as office yoga, dynamic exercise, and supervised training, showed moderate-to-large effect sizes. Supervised programmes were generally more effective than unsupervised ones.

Most interventions yielded p values < 0.05, indicating statistically significant differences between intervention and control groups.

Result analysis shows that structured active breaks and exercise-based interventions can significantly reduce neck pain intensity in office settings, especially when supervision or ergonomic components are included.

Figure 2 presents a horizontal bar chart summarising the number of studies evaluating different exercise interventions for the management of non-specific neck pain (NSNP) among office workers, alongside their corresponding effect sizes (Cohen's *d*). The chart includes eight intervention categories: strength training, stretching exercise, stretching combined with strengthening, stretching with postural correction training, strength training combined with ergonomic modification, walking, and body-mind approaches (e.g., yoga).

Strength training was the most frequently investigated intervention, appearing in five studies and demonstrating the largest effect size (Cohen's *d = 3.19*), indicating a very strong effect on reducing NSNP. Stretching exercises were examined in three studies and showed a large effect (*d = 1.65*). Combined interventions, such as stretching plus strengthening (*d = 0.74*), and stretching plus postural correction training (*d = 0.61*), also exhibited moderate to large effects. Strength training combined with ergonomic modification (*d = 0.40*) and walking programmes (*d = 0.36*) yielded small to moderate effects. In contrast, body-mind interventions, despite being included in one study, showed a minimal effect (*d = 0.09*).

Table 2. **Summary of study designs, interventions, and outcomes evaluating the effectiveness of interventions for non-specific neck pain in office workers**

Authors	Study design	Description of intervention	Outcome measures	Control group		Intervention group		Cohen's *d*	P between groups
				Mean ± SD	Size (n)	Mean ± SD	Size (n)		
Beneka et al. (2024)	RCT	6-w. Structured EP	VAS	6.15 ± 1.87	42	2.50 ± 0.30	56	2.72	0.001
Nath et al. (2024)	RCT	13-w. Office yoga	MSC	1.58 ± 0.53	98	1.53 ± 0.53	93	0.09	0.015
		13-w. Walking programme				1.39 ± 0.53	108	0.36	0.011

Authors	Study design	Description of intervention	Outcome measures	Control group		Intervention group		Cohen's *d*	P between groups
				Mean ± SD	Size (n)	Mean ± SD	Size (n)		
Alshehre et al. (2023)	RCT	8-w. EP + EM	NPRS	6.15 ± 1.87	42	2.50 ± 0.30	56	10.71	0.001
Yaghoubi-tajani et al. (2022)	RCT	8-w. Online supervised CE	VAS	4.27 ± 1.34	12	3.25 ± 1.95	12	0.61	0.151
		8-w. Non-supervised CE				4.12 ± 2.29	12	0.08	0.847
Johnston et al. (2021)	C-RCT	12-w. ST + EM	VAS	2.96 ± 2.59	55	2.02 ± 2.01	41	0.40	0.048
		12-m. ST + EM				2.78 ± 2.57	41	0.07	0.736
Shariat et al. (2018)	RCT	24-w. EP (Stretching)	CMDQ	12.55 ± 2.80	28	1.88 ± 2.57	43	3.97	0.001
		24-w. Combined EP + EM				2.62 ± 2.77	34	3.56	0.001
Tunwattan-apong et al. (2016)	RCT	4-w. SE	VAS	5.60 ± 1.80	46	4.50 ± 1.80	41	0.61	0.0056
Jakobsen et al. (2015)	C-RCT	10-w. SE	VAS	3.50 ± 1.60	45	2.40 ± 1.60	52	0.63	0.001
Osama et al. (2015)	RCT	5-w. ST + SE	VNRS	4.50 ± 1.15	16	3.70 ± 1.02	16	0.74	0.045
Nakphet et al. (2015)	RCT	12-w. Passive breaks-SE	Borg's-10S	6.20 ± 1.80	10	4.70 ± 2.00	10	0.79	0.046
		12-w. Dynamic exercise				4.60 ± 1.50	10	0.96	0.045
Gram et al. (2014)	C-RCT	20-w. Supervised ST	VAS	3.60 ± 2.20	81	1.90 ± 1.57	69	0.89	0.001
		20-w. Unsupervised ST				2.50 ± 1.41	70	0.60	0.0003

RCT – Randomised Controlled Trial; C-RCT – cluster RCT; w. – week; CMDQ – Cornell Musculoskeletal Discomfort Questionnaire; MSC – musculoskeletal complain; VAS – Visual Analogue Scale; NPRS – Numeric Pain Rating Scale; EP – exercise programme; CE – corrective exercise; EM – ergonomic modification; ST – strength training; SE – stretching exercise; Borg's-10S – Borg Category-Ratio Scale 10.
Nath et al. (2024) indicated effect size (Cohen's *d*) directly; Jakobsen et al. (2015) indicated effect size (Cohen's *d*) directly – but for overall pain reduction (neck/shoulder and back pain). Rest of effect size magnitudes (Cohen's *d*) are calculated by authors.

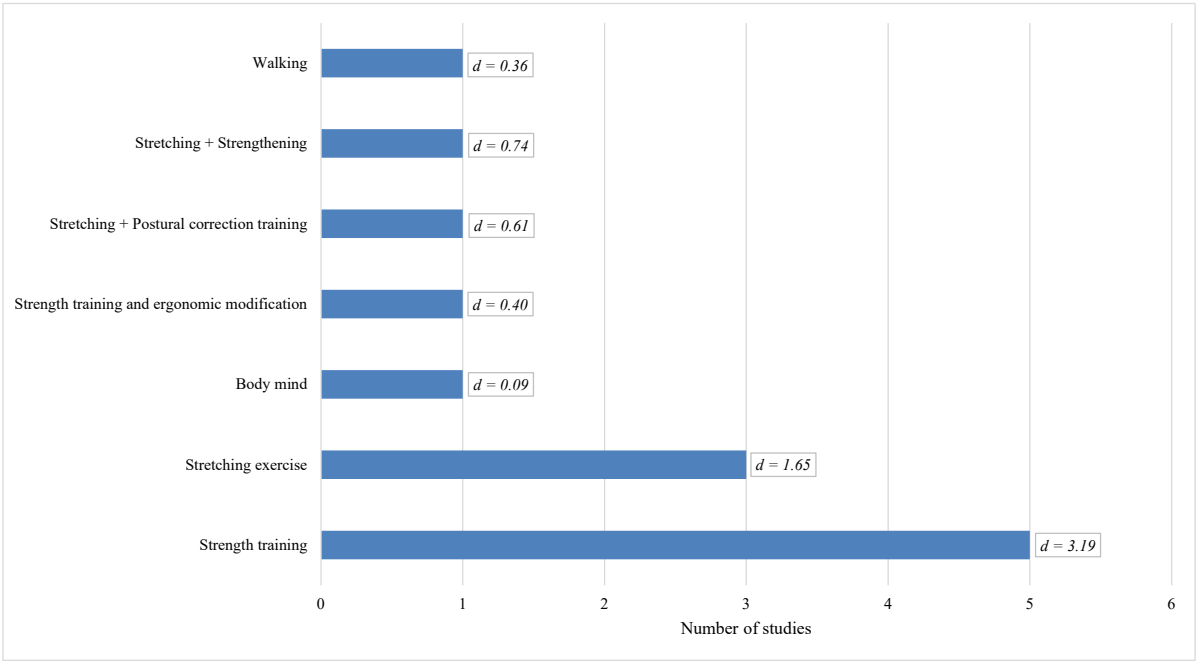

Figure 2. **Frequency of intervention types and their average effect sizes**

4. DISCUSSION

This review analysed 11 RCTs to evaluate the effectiveness of active break interventions, such as stretching, strengthening, ergonomic modifications, and mind-body strategies on preventing or reducing non-specific neck pain in office workers. The findings strongly support prior research, showing that structured, active approaches are more effective than passive strategies in reducing musculoskeletal discomfort and improving function in sedentary populations. Long sitting hours, poor posture, and low physical activity have been linked to neck pain (Andersen et al., 2011; Szeto et al., 2005). This review confirms that targeted exercises, posture correction, and ergonomic changes lead to clinically meaningful improvements in pain and function. Unlike earlier reviews that included mixed populations (Blangsted et al., 2008; Coury et al., 2009), this study focused solely on RCTs with office workers, enhancing specificity and methodological quality. Effect sizes across studies ranged from moderate to very large, clearly showing the benefit of these interventions.

Recent studies reflect changing work environments, such as remote work. For instance, Yaghoubitajani et al. (2022) demonstrated the efficacy of online-supervised corrective exercises, highlighting adaptability in virtual settings. Strengthening exercises showed particularly strong effects. Alshehre et al. (2023) reported a very large effect (d = 10.71) from combining exercise with ergonomic changes. Yaghoubitajani et al. (2022) and Gram et al. (2014) also found large benefits from resistance training (d = 0.61 and 0.89). Johnston et al. (2021) supported the effectiveness of combined exercise and ergonomic strategies (d = 0.40). Stretching was also effective. Shariat et al. (2017) found a large effect (d = 4.17) from stretching with ergonomic adjustments. Nakphet et al. (2014) observed strong outcomes from dynamic and stretching exercises (d = 0.96–0.79), confirming that low-intensity flexibility routines can be impactful. Microbreaks with light physical activity also proved effective. Osama et al. (2015) and Tunwattanapong et al. (2016) reported moderate to large improvements (d = 0.74 and 0.61), showing the value of short, structured movement breaks during the workday. Mind-body approaches showed smaller effects. Nath et al. (2024) reported minimal improvement from yoga (d = 0.09), while walking

had slightly more benefit ($d = 0.36$), suggesting these strategies alone may not be sufficient for neck pain relief. Ergonomic modifications were most effective when combined with exercise. Studies like Shariat et al. (2017) and Alshehre et al. (2023) showed that ergonomics alone produced less lasting benefit, reinforcing the importance of active components. Despite positive findings, the literature lacks long-term follow-up, and variation in intervention delivery, intensity, and adherence limits generalisability. Further research is needed to determine optimal implementation for different workplaces.

In summary, this review shows that active breaks during working hours are effective, practical, and adaptable tools for reducing neck pain in office workers. It provides updated, high-quality evidence, especially relevant for modern work contexts like remote settings, and emphasises the value of movement-based health strategies.

Categorising interventions by type supports practical workplace applications. However, limitations include variability across studies in protocols, sample sizes, and follow-up, and occasional lack of reporting on blinding or adherence. The absence of a formal meta-analysis and potential publication bias may also affect findings.

5. CONCLUSIONS AND PERSPECTIVES

This review found that active, strength-based, and ergonomically supported interventions can effectively reduce non-specific neck pain in office workers. When included in the workday, these strategies help improve comfort and musculoskeletal health. The studies reviewed used a variety of methods, including stretching, strengthening, posture training, ergonomic adjustments, walking, and mind–body practices like yoga. While results varied, strengthening and combined interventions tended to be more effective than low-intensity or passive approaches. Overall, physical activity-based strategies are adaptable and practical for workplace settings.

Author Contributions: Conceptualisation, M.S.; methodology, M.S.; software, A.P.; validation, M.S., A.P., and V.D.; formal analysis, M.S.; investigation, M.S.; resources, M.S. and A.P.; data curation, A.P.; writing—original draft preparation, M.S.; writing—review and editing, A.P.; visualisation, A.P.; supervision, V.D.; project administration, M.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Informed Consent Statement: Not applicable.

Acknowledgements: No.

Conflicts of Interest: The authors declare no conflict of interest.

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Aktyvių pertraukų įtaka kaklo skausmo mažinimui biuro aplinkoje: sisteminė apžvalga

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Santrauka

Įvadas. Nespecifinis kaklo skausmas (NKS) yra dažna raumenų ir kaulų sistemą paveikianti būklė tarp biuro darbuotojų, dažniausiai susijusi su ilgalaikiu statišku sėdėjimu ir sėdimu darbu. Siūloma įtraukti struktūrizuotas aktyvias ar fizinės veiklos pertraukas į darbo dienos grafiką kaip praktišką būdą sumažinti ilgo sėdėjimo poveikį.

Tikslas. Šios literatūros apžvalgos tikslas – apibendrinti šiuo metu turimus įrodymus apie aktyvių arba fizinės veiklos pertraukų veiksmingumą mažinant NKS tarp biuruose dirbančių suaugusiųjų.

Metodai. Literatūros apžvalga atlikta naudojant duomenų bazes, tokias kaip „PubMed“, „Scopus“, „ScienceDirect“, „Google Scholar“ ir „PEDro“. Pagal atrankos kriterijus buvo pasirinkta 11 mokslinių straipsnių, publikuotų 2014–2024 metais, kuriuose buvo aprašomi suaugusių biuro darbuotojų, patiriančių NKS, tyrimai ir intervencijos, apimančios aktyvias ar fizinės veiklos pertraukas darbo metu. Metodologinė kokybė įvertinta naudojant standartizuotus vertinimo įrankius.

Rezultatai. Daugumoje tyrimų nustatyta teigiama aktyvių pertraukų įtaka kaklo skausmo intensyvumo mažinimui. Intervencijos dažniausiai apėmė trumpus tempimo, laikysenos korekcijos ar judumo pratimus darbo vietoje. Nepaisant intervencijų protokolų ir vertinimo metodų skirtumų, bendri rezultatai rodo, kad aktyvios pertraukos yra naudingos siekiant valdyti NKS sėdimo darbo aplinkoje.

Išvados. Aktyvios pertraukos yra įgyvendinamas ir veiksmingas būdas mažinti nespecifinį kaklo skausmą tarp biuro darbuotojų. Tyrimo rezultatai patvirtina judėjimu grįstų intervencijų integravimo į kasdienę darbo rutiną naudą – tai gali pagerinti raumenų ir kaulų sistemos sveikatą, gyvenimo kokybę bei darbo našumą. Siekiant patvirtinti ilgalaikį veiksmingumą ir optimizuoti intervencijų dizainą, būtini tolesni tyrimai su standartizuotais protokolais.

Reikšminiai žodžiai: aktyvios pertraukos; nespecifinis kaklo skausmas; biuro darbuotojai; sėdima veikla

Received 2025 04 12
Accepted 2025 05 16