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EXERCISE THERAPY IS EFFICACIOUS IN REDUCING PAIN OF MUSCULOSKELETAL DISORDERS IN CLEANING WORKERS: A SYSTEMATIC REVIEW

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ABSTRACT
Musculoskeletal disorders (MSDs) are conditions that lower productivity, cause discomfort in the form of decreased range of motion or chronic pain and impair function. These can be made worse by the workplace and its surroundings, and they impact the muscles, bones, nerves, tendons, ligaments, joints, cartilage, and intervertebral discs. Exercise therapy is one non-pharmacological intervention that might be helpful in reducing pain complaints related to MSDs. This study aimed to review the literature regarding the efficacy of exercise therapy in mitigating pain associated with musculoskeletal disorders (MSDs) in cleaning workers. A systematic review was the methodology employed. Searches for articles published between 2013 and 2023 were conducted using Google Scholar, PubMed, ProQuest, and Science Direct. Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach, the search strategy was conducted. Five of the articles were eligible for inclusion. Four studies employed a quasi-experimental design, and one study used an RCT design. Exercise therapy, which includes aerobic, motor control, functional, ergonomic, and foam roller exercises, was found to be beneficial in lowering musculoskeletal pain in cleaning workers across all studies. This evidence suggests that exercise therapy can be used as a nursing intervention to reduce musculoskeletal pain in cleaning workers.

Keywords: exercise therapy; musculoskeletal disorders (MSDs); nursing interventions; pain management

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INTRODUCTION

Cleaning workers are responsible for performing a variety of cleaning tasks, including vacuuming, polishing, mopping, washing, and sterilizing equipment. The objective is to enhance the functionality and visual appeal of the surfaces they clean by using appropriate cleaning products. Additionally, they must dispose of all hazardous and non-hazardous waste materials properly (Charles et al., 2009). Cleaning involves several activities, such as mopping, sweeping, scrubbing, dusting, and garbage removal (Rathod & Desai, 2023)

Janitors work in environments that expose them to various hazards, which can lead to the development of health problems. A review of the epidemiological literature on occupational hazards faced by cleaners revealed the prevalence of health conditions such as respiratory diseases, allergic and dermatological disorders, musculoskeletal disorders, infectious diseases, and psychological disorders (Charles et al., 2009). Physical activities performed by cleaning workers that require significant muscle strength, such as manually transporting and moving items with poor posture, can cause back pain and strain the spine. This can potentially disrupt

regular body biomechanics, ultimately leading to the development of musculoskeletal disorders (MSDs) over time (Rathod & Desai, 2023; Stanhope & Lancaster, 2016).

Musculoskeletal disorders (MSDs) are a type of discomfort characterized by continuous pain or limited movement, decreased function, and decreased productivity (WHO, 2022), involves muscles, bones, nerves, tendons, ligaments, joints, cartilage, and spinal discs, aggravated by work and work environment (Rathod & Desai, 2023). Globally, 1.7 billion people experience musculoskeletal disorders (MSDs). The highest prevalence is in the developed world, with 441 million people, followed by the Western Pacific region, with 427 million people, and South-East Asia, with 369 million people. Musculoskeletal conditions account for approximately 149 million years lived with disability (YLDs), making them the largest contributor to YLDs worldwide, representing 17% of all YLDs globally. Accurate figures on the incidence of musculoskeletal disorders (MSDs) in Indonesia are still difficult to obtain. Based on diagnosis by health workers, the incidence of musculoskeletal disorders (MSDs) in Indonesia was recorded to be 11.9% and, based on symptoms, 24.7% (Sholeha & Sunaryo, 2022).

A study conducted in Ethiopia found that 52.3% of cleaning workers experienced musculoskeletal disorders in the past 12 months, with 31.8% experiencing them in the past 7 days (Melese et al., 2020). A study conducted in Thailand on hospital cleaners found that musculoskeletal disorders (MSDs) were prevalent in 81.9% of cases, with the lower back (57.7%) and shoulder (52.6%) being the most affected areas (Laithaisong et al., 2022). . According to a study conducted by Hasibuan (2020), the prevalence of MSDs among cleaning workers in Indonesia was found to be high (69.8%) and low (30.2%), while Rachman et al. (2019) reported that many cases fell into the moderate (48.3%) and high (41.7%) categories. The incidence of MSDs in the low category was found to be 10.0%.

Exercise therapy is a non-pharmacological approach that can help alleviate musculoskeletal disorders (MSDs). In the nursing intervention classification (NIC), there are various types of exercise therapy that can be applied to reduce complaints of musculoskeletal disorders, namely, strength training exercise, stretching exercise, ambulation, balance exercise, joint mobility exercise, and muscle control exercise (Dochterman et al., 2018). A comparison study was conducted to evaluate the effectiveness of self-administered and therapist-facilitated stretching exercises. The results showed that both methods were clinically significant in improving hip flexion range (Zakaria et al., 2012). Another study aimed to evaluate the efficacy of exercising, modified ergonomics, and exercise combination and modified ergonomics on pain scores in office workers with neck, shoulder, and low back pain found that after 4 months, all three interventions influenced low back, shoulder, and neck discomfort. However, after 6 months, only exercise and a combination of exercise and ergonomic modifications were effective on pain scores compared to the control group, but significant improvements from months 4 to 6 were only seen in the exercise group (Shariat et al., 2018). This indicates that exercise therapy can be used as an intervention to reduce musculoskeletal disorders (MSDs). In light of these issues, this study aims to evaluate the efficacy of exercise therapy in reducing pain associated with musculoskeletal disorders (MSDs) in cleaning workers.

METHOD

This study employed a systematic review methodology. The researchers conducted article searches on several database search engines, including Google Scholar, Pub Med, Pro Quest, and Science Direct. The literature search was conducted with pre-determined inclusion and

exclusion criteria. The inclusion criteria for this study were: 1) full accessibility of the article; 2) research articles published within the last 10 years (2013–2023); 3) written in English; and 4) using interventional research designs (RCT and Quasi Experiment). The exclusion criteria were as follows: 1) Articles that cannot be accessed in full text or books; 2) systematic reviews, literature reviews, and meta-analyses.

The search for articles begins by using predetermined keywords, that are: 1) exercise therapy OR aerobic exercise OR exercise OR muscle stretching exercises OR resistance training AND (pain) AND (musculoskeletal disorders OR work-related muscular disorders) AND (cleaners OR housekeeping OR cleaning service OR office boy); 2) exercise therapy OR aerobic exercise OR motor control exercises OR stretching exercises AND (pain) AND (musculoskeletal disorders OR work-related muscular disorders) AND (cleaners OR housekeeping staff OR cleaning service OR cleaning staff OR cleaning officer), followed by filtering based on inclusion and exclusion criteria, until articles that match the research objectives are found. The article selection process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses "PRISMA" flow chart for systematic reviews and meta-analyses, which includes identification, screening, eligibility, and inclusion stages. The identified articles underwent eligibility testing using JBI Critical Appraisal to determine their appropriateness.

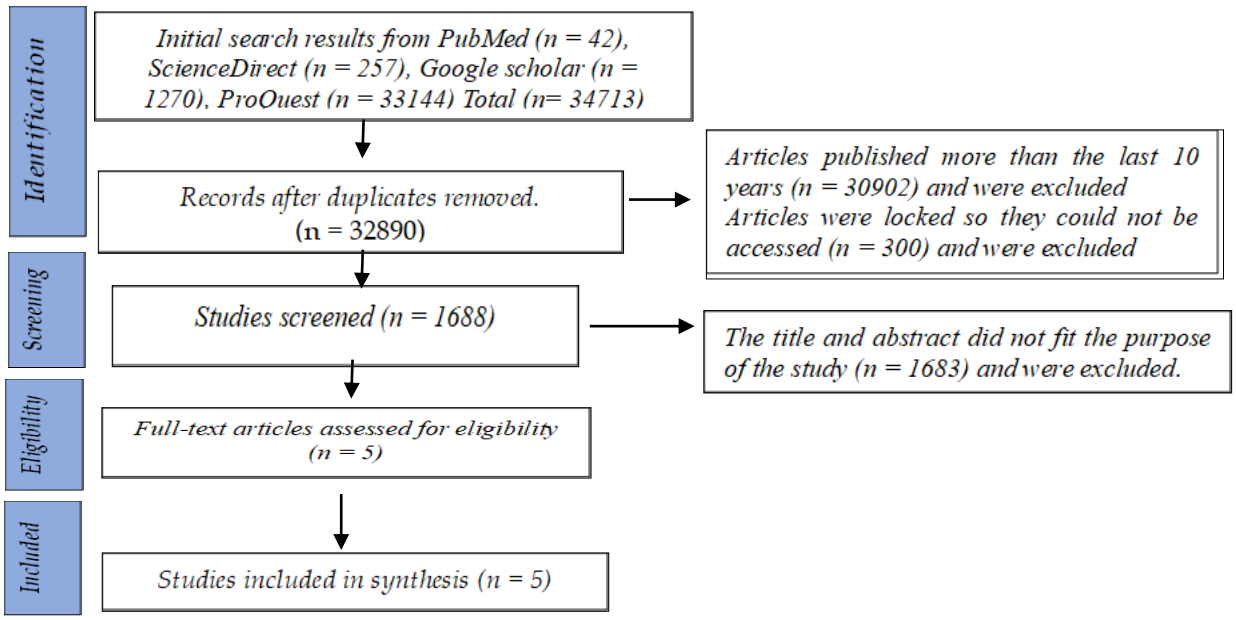

Figure 1. PRISMA "flowchart"

RESULTS

The articles that were included in the review were systematically analyzed, as presented in the table below:

Table 1.
Results of Article Analysis

No	Title, Author & year	Aim	Design	Results (can be expanded)
1	Korshøj et al. (2018) *Decrease in musculoskeletal pain after 4 and 12 months of an aerobic exercise intervention: a worksite RCT among cleaners*	The purpose of this study is to compare the level of musculoskeletal pain at 4 and 12 months to the beginning of the study in order to determine the effectiveness of aerobic exercise.	This study employed a randomized controlled trial (RCT) design, which involved 116 cleaners who were cluster-randomized to receive aerobic exercise or not to receive exercise.	The study found that the aerobic exercise group had a considerable reduction (>30%) in the intensity of pain in the neck, shoulder, and arm/wrist at 12 months compared with the reference group. However, there was a trend towards increased pain intensity in the knee. After 4 months, just hip pain had increased significantly.
2	Mrunalini et al. (2021) *Effect of motor control exercises in the management of mechanical low back pain among hospital housekeeping staff*	The aim of this research is to evaluate the efficacy of exercise for motor control in the management of mechanically induced low back pain in hospital housekeepers.	This research employed a quasi-experimental design with a sample of 30 participants that matched the included and excluded criteria.	Research has demonstrated substantial improvements in mechanical back pain and disabilities in domestic workers through motor control exercises.
3	(Lestari et al., 2021) *The Effects of Ergonomic Exercise on Musculoskeletal Disorders among Cleaning Service Officers*	The objective of the research is to investigate the efficacy of an ergonomic workout to prevent or reduce musculoskeletal disorders (MSDs) among cleaning workers.	The research employed a pre-experimental technique using a one-group pre-test and post-test design. Nineteen cleaning workers that matched the included criteria completed the study.	The research demonstrated that the average musculoskeletal disorder score was 45.11 prior to the implementation of ergonomic exercises. Additionally, after having intervened, the NBM score decreased to 39.16. Statistical analysis revealed a p-value of 0.000 ($p<0.05$). These findings confirm the beneficial impact of ergonomic exercises on the incidence of musculoskeletal disorders in cleaning workers.
4	(Artiga et al., 2022) *Functional training improves. the effectiveness of stretching programs for university cleaning staff*	The objective of the research is to investigate whether a combination of structural stretching, functionally based body movement, and posture training could provide additional benefits in terms of mobility, ergonomic performance, and perceived discomfort for workers at higher risk of developing occupational musculoskeletal disorders (MSDs).	The study employed a two-group pre- and post-experimental design with a sample size of 25 cleaning workers.	Overall, the task's ergonomic design and ease of movement resulted in significant improvements of 25.75 ± 3.33% and 26.3 ± 10.5%. These improvements were also associated with lower pain levels, with r values of 0.541 and 0.317, respectively. The study found that the experimental group showed more improvement than the control group in shoulder or hip range of motion. Additionally, the experimental group exhibited better ergonomic shape during vertical tasks and horizontal wiping tasks. Both groups experienced an increase in intrinsic motivation.
5	Hsieh & Wang (2022) *Workplace Foam*	To investigate the immediate efficacy of using foam roller	This study employed a quasi-experimental	This study discovered significant enhancements in the total freedom of movement for the shoulder, hips, and

No	Title, Author & year	Aim	Design	Results (can be expanded)
	Roller Exercise for Hotel Housekeepers: An Exploratory Study	exercises as intervention to promote total freedom of movement for hotel cleaners.	design with a total sample of 20 participants, divided into two groups of 10 individuals each.	wrists among participants in the treatment group after completing the six-week daily foam roller exercise program. In contrast, the comparison group did not exhibit that significant a change in total freedom of movement. From qualitative datasets generated by interviewing the participants, several advantages to group exercises with foam rollers were identified, including relaxing muscles, reducing physical aches and pains, an overall sense of wellbeing, increased levels of personal strength, as well as improving team relationships.

DISCUSSION

The review identified five studies reporting on the efficacy of exercise therapy in reducing pain in musculoskeletal disorders (MSDs). The results showed that various exercises, including aerobic exercise, motor control exercise, functional training, ergonomic exercise, and foam roller exercise, were effective in reducing musculoskeletal disorders (MSDs) pain. Research by Korshøj et al. (2018) proved that aerobic exercises performed for 30 minutes with a frequency of 2-3 times per week clinically (>30%) significantly reduced pain in the neck, shoulders, and arms and wrists of the exercise group compared to the reference group at the 12-month follow-up. This suggests that aerobic workouts can reduce musculoskeletal discomfort in the upper extremities. Aerobic exercise can enhance cardiorespiratory fitness, resulting in a reduction of aerobic workload, as demonstrated by the relative heart rate, during cleaning. The study revealed that the AE group had a lower aerobic workload during cleaning compared to the REF group (Korshøj et al., 2015). This will increase muscle strength and reduce relative muscle load during work, which in turn will reduce musculoskeletal pain (Armstrong et al., 1993). Musculoskeletal disorders can be caused by a decrease in the flow of nutrients and oxygen to muscles. Aerobic exercises focus on improving oxygen transport by increasing blood flow to the tissues, which can increase their efficiency (Kumar et al., 2014). Aerobic exercise has a positive impact on endogenous opioid (EO) analgesic function in the form of improved EO function, leading to an increase in pain inhibitory capacity (Bruehl et al., 2020). This statement reinforces previous findings by Smith et al. (2019) that aerobic exercise can trigger β-endorphin release from the hypothalamus and pituitary, which then activates μ-opioid receptors both peripherally and centrally. This results in an endogenous analgesic effect that can reduce pain. The release of β-endorphins during aerobic exercise can also trigger activation of the endogenous opioid system via the periaqueductal gray (PAG) pathway in the brain. The PAG sends signals to the spinal cord to inhibit the transmission of pain signals.

Motor control exercise is a technique that aims to enhance muscle control for body movements. The technique uses the principles of motor learning to rehabilitate muscle control for the trunk, posture, and movement patterns. This can eventually lead to a decrease in the level of discomfort and inability to function. According to (Mrunalini et al., 2021), administering motor control exercises for 6 weeks, divided into 3 phases, was found to be effective in reducing mechanical low back pain and disabilities in hospital domestic workers. A study comparing motor control exercises with core stabilization exercises for the purpose of alleviating pain and disability in subjects with mechanical low back pain revealed that motor control exercises demonstrated a statistically significant reduction in back pain and disability when compared to core stabilization exercises (Vikranth et al ., 2015). Akbari et al. (2008),

demonstrated that motor control and general exercises can reduce pain, increase the thickness of the transversus abdominis (TA) and lumbar multifidus (LM) muscles, and improve lumbar mobility in patients with chronic low back pain (LBP) without spinal instability. The study also found that motor control exercises were more effective than general exercises in reducing pain. Some of these studies indicate that motor control exercises are an effective treatment option for mechanical low back pain. The concept behind motor control exercises for low back pain is based on the biological foundation that these individuals experience changes in spinal stability and control (Hodges & Richardson, 1996). Physiology research has revealed that individuals with lower limbs might suffer from lagged conditions of deeper torso muscular groups (such as the transverse muscle of the abdomen and the multifidus muscle) when the stability of the spine is challenged during active work (Hodges & Richardson, 1998, 1999). In patients with low back pain, a lower cross-sectional area is found morphologically (Hides et al., 1994), and a higher proportion of intramuscular fat was found in the multifidus muscle (Alaranta et al., 1993), as well as a tendency for increased spine stiffening to balance the poor steadiness of deeper muscular layers by enhancing activities of the surface musculature (van Dieën et al., 2003). This increases relapse and chronicity risk in patients recovering from recent episodes of low-back pain, which can be prevented by motor control training (Hides et al., 2001).

Research from Lestari et al. (2021), found ergonomics exercise effectively reduces musculoskeletal disorder complaints in cleaning workers. Ergonomic exercise involves a combination of muscle movement and controlled breathing. The ideal posture for this exercise is standing, as it activates all the nerves in the brain. This heightened sense of awareness improves physical fitness and overall health. Bending the body during exercise can increase blood flow to the upper body and supply oxygen to the brain, which can help relieve physical and mental tension (Suwanti et al., 2019). Performing ergonomic exercises regularly can trigger the release of endorphins and inhibit trigger cell activity, thus providing a relaxation response to the body. This can help reduce musculoskeletal disorders by channelling reduced impulses to the brain through closed gelatin gates, resulting in a calm state (Kurnia, 2019). Doing ergonomic exercises before and after work can activate the function of organs and segmental nerve fibres throughout the body by generating bioelectricity, which results in increased blood and oxygen circulation, providing additional energy for active work. Ergonomic exercises can be used to relax the muscles, especially in the lower back, thighs, and calves, while maintaining the flexibility of the body, including the spine, joints between the vertebrae, sacrum, and coccyx. This can help maintain the anatomical and functional structural strength of the muscles, ligaments, and spine after a long day at work (Sagiran, 2012; Wratsongko, 2006). The above explanation demonstrates that ergonomic exercises can be used as physical exercises to alleviate MSD pain. Gymnastics, as a form of physical exercise, can positively impact muscle strength and function, and reduce pain sensations in the joints (Bennell et al., 2012; Flachenecker, 2012).

Functional training is an effective exercise therapy for reducing musculoskeletal pain. Functional training is a type of exercise that aims to improve an individual's performance in daily activities by focusing on movements that are essential for daily functioning. Research conducted by Artiga et al. (2022), investigated the efficacy of a stretching programme for university cleaners. The study found that complementing a workstation stretching session with functional exercises and posture exercises could improve range of motion and reduce pain. This suggests that functional exercises, with their emphasis on coordination of multiple muscles and complex movements, may provide additional benefits compared to traditional stretching exercises. These findings are in accordance with the results of previous research

conducted by (Cortell-Tormo et al., 2018), which states that periodic functional resistance training reduces pain and disability and improves quality of life, balance, and physical fitness in women with chronic low back pain (CLBP). Furthermore, previous studies have employed randomised controlled trials to assess the efficacy of intensive scapular functional training in reducing pain in adults with chronic non-specific pain in the neck/shoulder region. The results demonstrated a statistically significant reduction in pain from 5.7 to 2.0 (95% CI 0.35 to 3.64) in the Scapular Function Training (SFT) group compared to the control group ($p < 0.05$). The pressure pain threshold (PPT) increased by 129 kPa in the lower trapezius in the SFT group compared to the control group ($p < 0.01$). Additionally, shoulder elevation strength increased by 7.7 kg in the SFT group compared to the control group ($p < 0.01$). These results indicate that SFT reduces pain intensity and increases shoulder elevation strength in adults with chronic nonspecific pain in the neck/shoulder region. The magnitude of improvement in pain intensity is of a clinical relevance (Andersen et al., 2014).

An exercise using a device called foam roller exercise has been scientifically proven to increase muscle flexibility, which can be associated with decreased musculoskeletal pain. According to (Hsieh & Wang, 2022) research, group foam roller exercise provides several benefits, including muscle relaxation, pain reduction, an overall sense of well-being, increased energy, and improved team relationships. The research proves that foam roller exercises are effectively used to improve range of motion and reduce pain caused by cleaning tasks for hotel cleaners (de Souza et al., 2019; Yoshimura et al., 2020). A randomised controlled trial conducted by Yoshimura et al. (2021) investigated potential acute muscle morphological changes after foam roller (FR) intervention and aimed to clarify the mechanism of ROM improvement by FR intervention. The results of the trial indicated that FR intervention could effectively improve ankle ROM without causing excessive discomfort or pain, as evidenced by the results of the questionnaire and VAS evaluation. Another study by (Kelly & Beardsley, 2016), investigated the potential cross-over effects of self-myofascial release (SMFR) by examining the effects of foam roller treatment on the ipsilateral leg for three 30-second sessions on changes in dorsiflexion (DF) range of motion (ROM) of the ipsilateral and contralateral ankle and assessing the time course of these effects up to 20 minutes after treatment. The results demonstrated that the foam roller (FR) increased the dorsiflexion range of motion (DF ROM) of the ankle for at least 20 minutes in the ipsilateral limb and up to 10 minutes in the contralateral limb. This indicates that the FR produced a cross-over effect on the contralateral limb. Furthermore, research has demonstrated that foam roller exercise can alleviate anterior knee pain, enhance thoracolumbar fascial mobility (Griefahn et al., 2017), and augment hamstring flexibility (DeBruyne et al., 2017).

CONCLUSION

The results of a systematic review conducted on the efficacy of exercise therapy in reducing musculoskeletal disorders (MSDs) pain found a variety of exercise therapy that can be applied in reducing MSDs pain in cleaning workers. Various exercise therapies such as aerobic exercise, motor control exercise, ergonomic exercise, functional exercise, and foam roller exercise in its implementation need to pay attention to clinical conditions, pain location, and frequency of the administration to obtain effective and safe results.

More research is needed to determine the efficacy of exercises in decreasing pain associated with musculoskeletal disorders, particularly in the cleaning worker population. This systematic review only identified five relevant studies on the efficacy of exercise therapy in decreasing MSD pain in cleaning workers. Furthermore, it is essential to employ more rigorous designs, such as Randomized Controlled Trials (RCTs), and larger sample sizes to

obtain stronger evidence. This is because most of the studies found in this systematic review use quasi-experimental designs and minimal sample sizes.

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