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EXERCISE-BASED INTERVENTIONS FOR THE PREVENTION AND MANAGEMENT OF WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG DENTAL PROFESSIONALS: A NARRATIVE REVIEW

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ABSTRACT

Work-related musculoskeletal disorders (WMSDs) are highly prevalent among dentists due to prolonged static postures, repetitive fine motor tasks, and sustained biomechanical strain during clinical work. The neck, shoulders, back, and upper extremities are the most commonly affected regions, and these conditions may impair physical function, work performance, and quality of life. This narrative review aimed to summarize current evidence on exercise-based interventions for the prevention and management of WMSDs in dental professionals. A PubMed-based literature search was conducted on 21 April 2026 using terms related to dental professionals, musculoskeletal disorders, and exercise- or rehabilitation-based interventions. After limiting the search to the previous 10 years and accessible full-text articles, titles, abstracts, and selected full texts were screened for relevance. Six studies were included in the core synthesis, and additional review-level and observational evidence was used to contextualize the findings. The included evidence covered stretching, resistance training, supervised and telerehabilitation-based multimodal exercise, physiotherapy-based ergonomic and postural correction, and multifaceted ergonomic programs with an exercise component. Stretching was associated with immediate improvement in pain-related parameters, whereas resistance training reduced pain and improved trunk strength. Supervised multimodal exercise showed the strongest therapeutic support, particularly in dentists with chronic neck pain. Physiotherapy-based and multifaceted ergonomic interventions also yielded favorable results, although their multimodal design makes it difficult to isolate the independent contribution of exercise. Overall, exercise-based strategies appear promising for the management of WMSDs in dental professionals, whereas evidence for primary prevention remains limited and indirect. Larger, better-designed studies are needed to clarify the independent and comparative effects of these interventions.

KEYWORDS

Dentists, Musculoskeletal Diseases, Occupational Diseases, Exercise Therapy, Ergonomics, Rehabilitation

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Introduction

Work-related musculoskeletal disorders (WMSDs) are among the most common occupational health problems affecting dentists and other oral health care professionals. Daily dental practice requires prolonged static postures, repetitive fine motor movements, sustained neck flexion, shoulder elevation, trunk inclination, and high visual demands, all of which may contribute to excessive biomechanical load and the development of pain and functional impairment. Consequently, the neck, shoulders, upper back, lower back, and upper extremities are the body regions most frequently affected in this professional group. This distribution has also been reported in studies of dentists, dental hygienists, and dental professionals from different practice settings [1,2]. This pattern is consistent with broader evidence from healthcare and dental settings. A systematic review of healthcare professionals identified the lower back, neck, shoulders, and hand/wrist as the most commonly affected regions, with dentists and surgeons showing particularly high prevalence of lower back, shoulder, and upper-extremity complaints, while prolonged and repeated awkward postures were identified as major contributing factors [3]. Similarly, an umbrella review of ergonomic risk in dentistry reported that musculoskeletal disorders affect approximately 54–93% of dental professionals, with the spine, shoulders, and hand-wrist region being most commonly involved, and static working posture emerging as the principal ergonomic risk factor [4].

The burden of musculoskeletal complaints in dentistry is clinically relevant because these symptoms may interfere with work performance, reduce physical capacity, impair quality of life, and contribute to reduced productivity, absenteeism, or even premature withdrawal from clinical practice. Cross-sectional evidence from dental populations in different countries has consistently shown high prevalence of WMSDs, particularly in the neck, shoulders, upper back, lower back, and upper extremities, as well as functional consequences such as treatment seeking, sick leave, work avoidance, and reduced ability to perform routine clinical duties [5–8]. Importantly, musculoskeletal symptoms may develop early and accumulate over time. Studies in dental students suggest that this burden may begin already during undergraduate clinical training, supporting the need for preventive strategies from the early stages of professional development [9,10].

The musculoskeletal burden observed in dental-related populations should be interpreted within a broader multifactorial framework. Although awkward posture and repetitive biomechanical strain are central contributors, observational evidence indicates that WMSDs in dentistry may also be influenced by workload organization, prolonged sitting, number of patients treated, inadequate assistance or equipment, lack of regular exercise, and psychological stress [11–15]. Neck pain appears to deserve particular attention, as it is one of the most common and clinically relevant complaints in dental practice, with survey-based evidence confirming a high burden of neck pain among dentists [16]. A recent systematic review and meta-analysis showed that older age, female sex, longer working experience, greater clinical workload, and poor cervical posture were significant risk factors for neck pain in dentists, whereas regular physical activity and stretching were associated with a lower risk [17]. These findings support the view that musculoskeletal complaints in dentistry arise from the interaction between ergonomic exposure, physical conditioning, occupational workload, and behavioral or psychosocial contributors rather than from a single mechanical factor alone.

A range of interventions has therefore been proposed to address WMSDs in dental professionals, including equipment modification, ergonomic training, workstation adjustment, physiotherapy, stretching, resistance training, rehabilitation programs, and multimodal postural correction strategies. In-office movement-based protocols, including āsana-based routines targeting the neck, shoulders, wrists, back, hips,

and lower limbs, have also been proposed as feasible preventive strategies for dental professionals, although their clinical effectiveness requires further validation [18,19]. These approaches reflect both the multifactorial origin of WMSDs and the practical need for interventions that can be implemented either preventively or therapeutically in daily clinical work. Review-level evidence suggests that stretching, physical activity, maintenance of a neutral posture, and the use of ergonomic equipment are among the most frequently recommended preventive measures in dentistry [4]. More recent clinical studies have also investigated exercise-based interventions, including stretching, resistance training, supervised exercise, telerehabilitation, and multimodal physiotherapy-based programs, as potential strategies for reducing pain, disability, and work-related musculoskeletal burden in dental professionals.

However, the literature remains fragmented. Some studies focus on prevention, whereas others address symptom management in already symptomatic individuals. In addition, many interventions combine exercise with ergonomic education, postural correction, workplace modification, or adjunctive techniques, which makes it difficult to isolate the independent effect of exercise alone. The available evidence also varies considerably in study design, population, intervention content, duration, supervision, follow-up, and outcome measures. As a result, although some ergonomic strategies such as magnification loupes and indirect-vision techniques appear beneficial, the overall evidence base for exercise-based prevention and management of WMSDs in dental professionals remains limited and methodologically heterogeneous [20,21].

Therefore, the aim of this narrative review was to summarize current evidence on exercise-based interventions for the prevention and management of work-related musculoskeletal disorders among dental professionals, with particular attention to stretching, resistance training, supervised exercise programs, telerehabilitation, and multimodal physiotherapy-based approaches.

Methodology

This narrative review was conducted to summarize the available evidence on exercise-based interventions for the prevention and management of work-related musculoskeletal disorders among dental professionals.

The review was designed as a narrative review with a structured PubMed-based search rather than as a systematic review; therefore, no protocol registration, formal risk-of-bias assessment, or meta-analysis was performed.

A literature search was performed in the PubMed database on 21 April 2026. The search strategy was designed to capture three key concepts relevant to the review topic: the target population, musculoskeletal pain or disorders, and exercise-based or rehabilitation-related interventions. The following search query was used:

```
(dentist*[Title/Abstract]
OR "dental professional"*[Title/Abstract]
OR "oral health professional"*[Title/Abstract])
AND
(musculoskeletal pain[Title/Abstract]
OR "musculoskeletal disorder"*[Title/Abstract]
OR "work-related musculoskeletal disorder"*[Title/Abstract]
OR "neck pain"[Title/Abstract]
OR "back pain"[Title/Abstract]
OR "shoulder pain"[Title/Abstract])
AND
(exercise*[Title/Abstract]
OR stretch*[Title/Abstract]
OR physiotherap*[Title/Abstract]
OR rehabilitat*[Title/Abstract]
OR yoga[Title/Abstract]
OR "resistance training"[Title/Abstract]
OR "postural correction"[Title/Abstract])
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The initial search yielded 119 records. After applying a 10-year publication filter, 75 articles remained. Full-text availability was required for detailed methodological and outcome extraction, resulting in 51 records available for screening.

Study selection was conducted in two stages. First, titles and abstracts were screened for relevance to the review objective. Second, potentially eligible full-text articles were assessed to determine whether they addressed musculoskeletal pain, musculoskeletal disorders, or work-related musculoskeletal disorders in dentists or other dental professionals and reported exercise-based, physiotherapy-based, rehabilitative, or multimodal preventive or therapeutic interventions. Additional relevant studies were identified through manual screening of the reference lists of selected articles.

Ultimately, six primary intervention studies were included in the core narrative synthesis of exercise-based or multimodal interventions. Additional review-level and observational studies were not included in the main Results synthesis but were used to provide epidemiological, ergonomic, and contextual support for the interpretation of findings in the Discussion.

Studies were considered eligible if they focused on dentists, dental students, dental assistants, or other dental professionals and examined musculoskeletal pain, musculoskeletal disorders, or WMSDs in relation to exercise-based, physiotherapy-based, rehabilitative, or related preventive and management strategies. Particular attention was given to studies investigating stretching, resistance training, postural correction, multimodal physiotherapy programs, telerehabilitation, or broader ergonomic interventions that included an exercise component.

Articles were excluded if they were unrelated to the review topic, focused on populations outside dental practice, did not address musculoskeletal outcomes, or did not report intervention-based approaches relevant to the prevention or management of WMSDs. Review articles and observational studies were excluded from the core synthesis unless they directly informed the interpretation of intervention findings.

The included studies were synthesized descriptively, with emphasis on study design, population, intervention type, comparator, duration, target outcomes, follow-up, and overall direction of findings. Although no formal risk-of-bias assessment was performed, methodological limitations of the included studies were considered narratively, including sample size, study design, comparator type, follow-up duration, outcome measures, and whether the intervention allowed the independent effect of exercise to be isolated. The review was structured to ensure transparent reporting of the rationale, search strategy, eligibility criteria, study selection process, and interpretive limitations, in line with general quality principles for narrative reviews.

Results

A total of six primary studies were included in the core narrative synthesis of exercise-based or multimodal interventions for the prevention or management of work-related musculoskeletal disorders (WMSDs) in dental professionals. The identified evidence covered stretching-based interventions, resistance training, supervised and remotely delivered multimodal exercise programs, physiotherapy-based ergonomic and postural correction approaches, multifaceted ergonomic interventions with an exercise component, and postural correction strategies combined with kinesio taping. A concise summary of the characteristics and main findings of the included studies is presented in **Table 1**.

Stretching-based interventions

Kim et al. [22] evaluated the immediate effects of a single supervised stretching session on musculoskeletal pain sensitivity in dental professionals. Clinical work reduced pain pressure thresholds across the assessed body regions, indicating an acute increase in pain sensitivity after dental practice. A subsequent 30-minute supervised stretching session increased pain pressure thresholds across the examined regions, with the greatest changes observed in the neck, shoulders, trunk, lower back, and hand or arm regions. These findings support an immediate short-term analgesic effect of stretching rather than evidence of sustained clinical improvement or long-term prevention.

Resistance training

Holzgrevé et al. [23] evaluated a 10-week trunk-oriented resistance training program performed twice weekly by dentists and dental assistants with musculoskeletal complaints. Outcomes included pain intensity assessed with a visual analogue scale combined with a modified Nordic Questionnaire, maximum voluntary isometric contraction of the trunk musculature, and ergonomic risk assessed using rapid upper limb assessment based on inertial motion data. The intervention was associated with reductions in pain intensity in the neck, upper back, lower back, and both shoulders, as well as improvements in trunk strength. However, the study used an uncontrolled pre–post design with a small sample, so the findings may support physical conditioning as a preventive strategy, although firm conclusions about prevention cannot be drawn. Holzgrevé et al. specifically assessed pain intensity, MVIC, and RULA-based ergonomic risk, and reported reduced pain and improved trunk strength after the 10-week program.

Supervised and multimodal exercise

Alkan et al. [24] assessed a 12-week combined exercise program consisting of resistance, stretching, and postural alignment exercises in dentists with chronic neck pain. The randomized trial compared supervised exercise, telerehabilitation, and a control program based on non-resistance postural exercises. Outcomes included pain intensity, pain pressure threshold, grip strength, muscular endurance, neck disability, and upper-extremity disability. Assessments were performed at baseline and after 12 weeks. The supervised group showed the broadest improvement across outcomes, whereas telerehabilitation produced more limited but favorable changes, particularly in pain-related parameters and neck disability. The control group also improved in pain intensity and neck disability, but between-group comparisons favored supervised exercise. These findings provide the strongest direct therapeutic support among the included studies, particularly for dentists with chronic neck pain. The Alkan trial included 55 dentists with chronic neck pain and compared supervised exercise, telerehabilitation, and home/postural exercise over 12 weeks, with outcomes including VAS, pain pressure threshold, grip strength, muscular endurance, and disability measures.

Physiotherapy-based postural correction and multimodal ergonomic interventions

Ndahiriwe et al. [25] evaluated a physiotherapy-based ergonomic and postural correction program in dental practitioners and students with WMSDs. The intervention was compared with routine self-selected exercise and focused on disability and functional performance outcomes. Both groups improved, but the physiotherapy-based ergonomic and postural correction program produced greater improvement in neck disability, upper-extremity function, and low-back-related disability. These findings suggest that structured physiotherapy-based interventions may be more effective than non-standardized exercise alone, although the small sample and short follow-up limit generalizability.

Dehghan et al. [26] assessed an 8-week multifaceted ergonomic intervention program in dentists, with follow-up at 3 and 6 months. The intervention combined ergonomic modification, identification of occupational risk factors, regular exercise, and discussion sessions. Musculoskeletal complaints were assessed across multiple body regions, including the neck, shoulders, arms, wrists, back, thighs, knees, and feet. The intervention group showed reduced prevalence of complaints across several regions during follow-up, whereas the control group remained stable or worsened in some regions. Because exercise was delivered as one component of a broader ergonomic program, the independent effect of exercise could not be isolated. Dehghan et al. used the Nordic Musculoskeletal Questionnaire at baseline, 3 months, and 6 months, and the intervention included workplace modification, risk-factor identification, regular exercise, and discussion sessions.

Fadaei Forghan and Sedaghati [27] evaluated an 8-week postural correction program combining comprehensive corrective exercises with kinesio taping in dentists with forward head posture. The study focused primarily on postural outcomes rather than pain or disability. Compared with the control group, the intervention improved forward head posture, rounded shoulders, thoracic kyphosis, and scapular alignment. These findings suggest favorable effects on postural parameters, but they do not establish whether exercise alone, kinesio taping, or their combination was responsible for the observed changes.

Table 1. Characteristics and main findings of included intervention studies.

Author/ year	Study design	Population	Intervention / comparator / duration	Key findings	Main limitations	Clinical interpretation
Kim et al., 2023	RCT	52 dental professionals	Supervised stretching vs rest (single 30-min session)	Pain pressure threshold decreased after clinical work and increased after stretching across all assessed regions, with the greatest changes in the low back, trunk, hand/arm, neck, and shoulder	Single-session study; small sample; no long-term follow-up	immediate short-term relief only
Dehghan et al., 2016	RCT	102 male dentists	Multifaceted ergonomic program vs no intervention (8 weeks, 3- and 6-month follow up)	Self-reported musculoskeletal complaints decreased across several body regions after intervention, while the control group remained stable or worsened	Male-only sample; self- reported outcomes; potential analytical limitations; exercise effect not isolable	workplace intervention, preventive evidence uncertain
Ndahiriwe et al., 2025	RCT	30 dental practitioners and students with WMSDs	Physiotherapy- based ergonomic/post ural program vs self-selected exercise (6 weeks)	Both groups improved, but the intervention group improved more, particularly in upper extremity function and low back-related disability	Very small sample; single- center academic cohort; short follow-up	multimodal physiotherapy, not isolated exercise
Alkan et al., 2025	Single- blind RCT	55 dentists with chronic neck pain	Combined exercise program (supervised or telerehabilitatio n) vs postural correction only (12 weeks)	Supervised exercise produced the greatest overall improvement; telerehabilitation also improved pain and disability, but to a lesser extent	Small sample; short follow-up; no long-term data	strongest therapeutic evidence
Holzgreve et al., 2022	Pre-post interventio n study	17 dental professionals with musculoskelet al pain	Trunk-oriented resistance training; no control (10 weeks)	Pain decreased in the neck, upper back, lower back, and shoulders, and trunk strength improved; postural changes were limited	No control group; small sample; possible confounding	strengthening/co nditioning, no causal inference
Fadaei Forghan & Sedaghati, 2025	Quasi- experimen tal controlled study	30 dentists with forward head posture	Corrective exercises plus kinesio taping vs no intervention (8 weeks)	Postural alignment improved, particularly forward head posture and kyphosis, whereas some postural parameters deteriorated in the control group	Small sample; no blinding; no sham taping; posture outcomes only; exercise effect not isolable	postural outcomes, pain/disability unclear

Discussion

Main findings

The present narrative review suggests that exercise-based and multimodal interventions may be useful in the management of work-related musculoskeletal disorders (WMSDs) among dental professionals. The strongest direct therapeutic evidence was provided by supervised multimodal exercise in dentists with chronic neck pain, whereas stretching mainly supported immediate short-term symptom relief and resistance training suggested potential benefits for pain reduction and physical conditioning. However, the available evidence remains limited, heterogeneous, and often based on small samples or multimodal intervention designs.

Therapeutic evidence: supervised exercise, stretching, resistance training

Among the reviewed studies, Alkan et al. [24] provide the strongest direct therapeutic evidence, showing that a 12-week combined exercise program reduced pain and disability in dentists with chronic neck pain. Supervised exercise produced the greatest benefit, telerehabilitation yielded moderate improvement, and the postural-correction control program showed the smallest changes. These findings suggest that structured and supervised exercise may be particularly relevant in symptomatic dental professionals, especially those with chronic neck pain.

In contrast, Kim et al. [22] mainly support short-term symptom relief. A single 30-minute supervised stretching session improved pain pressure thresholds immediately after clinical work, indicating an acute reduction in pain sensitivity rather than evidence of sustained clinical improvement or long-term prevention. Holzgreve et al. [23] suggest that trunk-oriented resistance training may reduce pain and improve trunk muscle strength in dental professionals. However, because the study used a small uncontrolled pre–post design, its findings may support resistance training as a physical conditioning strategy, but they do not allow firm causal conclusions about prevention.

Prevention vs management distinction

A key issue in interpreting the available literature is the distinction between prevention and management. Several included studies assessed symptomatic individuals or measured short-term improvement in pain, disability, strength, or posture. These outcomes are more directly relevant to symptom management than to primary prevention of new WMSDs.

At the same time, the present findings should be interpreted within a broader multifactorial framework. Observational evidence indicates that WMSDs in dentistry are shaped not only by posture and repetitive strain, but also by workload organization, prolonged sitting, inadequate assistant support, insufficient equipment, psychological stress, and modifiable behavioral factors such as physical inactivity [12–15,28]. This is consistent with umbrella-level evidence identifying static posture as the principal ergonomic risk factor in dentistry, while stretching, physical activity, maintenance of a neutral posture, and ergonomic equipment are among the most frequently recommended preventive measures [4]. These observations reinforce the view that prevention and management of WMSDs in dental settings should not be reduced to a single ergonomic correction, but should instead address the interaction between biomechanical load, work organization, and physical conditioning.

The reviewed intervention studies also need to be considered in the context of objective ergonomic and biomechanical evidence. Not all workplace modifications appear to influence musculoskeletal load in the same way. In a repeated-measures surface electromyography study, magnification lenses were associated with lower activity of the middle trapezius and lumbar erector spinae during restorative work, whereas the ergonomic stool increased muscle activity to a greater extent, suggesting that ergonomic supports should not automatically be assumed to reduce strain [29]. Likewise, motion-capture and RULA-based assessment has shown that biomechanical risk differs across dental specialties, with lower ergonomic risk in endodontology and orthodontics than in general dentistry and oral and maxillofacial surgery [30]. Specialty-specific studies among oral and maxillofacial surgeons and orthodontists further support the view that ergonomic exposure may differ between dental disciplines [31,32]. This indicates that preventive strategies, including exercise-based approaches, may need to be adapted to the specific demands of different areas of dental practice. Postural parameters may also be relevant to spinal complaints, as thoracic kyphosis angle has been investigated in relation to low back pain among dentists [33].

Multimodal interventions and difficulty isolating exercise

Several of the included studies assessed multimodal rather than isolated exercise interventions. Ndahiriwe et al. [25] reported that a physiotherapy-based ergonomic and postural correction program was more effective than routine self-selected exercise in improving neck disability, upper extremity function, and low back-related disability. Dehghan et al. [26] likewise found beneficial effects of a multifaceted ergonomic intervention program that combined workstation-related and exercise-related components. Similarly, an 8-week program combining corrective exercises with kinesio taping improved forward head posture, thoracic kyphosis, rounded shoulders, and scapular alignment in dentists [27].

These studies are clinically relevant because they reflect realistic workplace interventions. However, they also highlight a central limitation of the current literature: when exercise is delivered together with ergonomic education, postural correction, workplace modification, or adjunctive techniques, it becomes difficult to determine which component is actually responsible for the observed improvement. Therefore, although multimodal interventions may be useful in practice, they provide limited evidence for the independent effect of exercise alone. Similar caution applies to other combined approaches, such as myofascial rollers and post-isometric relaxation techniques assessed in dental undergraduate students with upper cross syndrome, where improvements in pain intensity and posture may reflect the combined intervention rather than a single therapeutic component [34].

Consistency with review-level evidence

Mulimani et al. place these multimodal findings in a more cautious preventive context. In their Cochrane review of ergonomic interventions in dental care practitioners, only two randomized studies met the inclusion criteria, including the trial by Dehghan et al. discussed in the present review [20,26]. Importantly, the review applied a strict prevention framework, requiring that most participants be free of symptoms at baseline in the body region analyzed. As a result, although Dehghan et al. reported broader reductions in musculoskeletal complaints across several body regions, the review considered only the thigh and foot outcomes and concluded that there was no clear preventive effect of the multifaceted intervention on incident WMSD risk [20]. This apparent discrepancy does not necessarily indicate contradiction, but rather reflects different analytic perspectives: symptom improvement in a multimodal workplace intervention versus stricter evidence for prevention of new disorder onset.

This cautious interpretation is also supported by broader review-level evidence. Roll et al., in a systematic review of preventive and rehabilitative strategies for musculoskeletal disorders in oral health care professionals, reported that the most frequently investigated approaches included equipment modification, ergonomic training, and physical exercise. However, the most consistent benefits were observed for magnification loupes and indirect-vision techniques, whereas evidence for other strategies remained mixed or limited by low-quality study designs [21]. Together, these review-level findings suggest that although multimodal and exercise-related interventions appear promising, the current preventive evidence base in dentistry remains methodologically weak and insufficient to support strong causal conclusions [20,21].

Practical implications

From a practical perspective, the current evidence supports a cautious multimodal approach to WMSD prevention and management in dental settings. Short supervised stretching routines may be useful for immediate post-work discomfort, whereas resistance training may improve physical capacity and resilience to occupational load. For symptomatic dentists, particularly those with chronic neck pain, which remains one of the most relevant complaints in dental practice, supervised multimodal exercise appears to be more strongly supported than unsupervised or minimally guided strategies [16].

However, exercise should not be presented as a standalone solution. It should be integrated with ergonomic education, appropriate visual aids, workstation adjustment, workload organization, and regular monitoring of symptoms, particularly because observational studies continue to identify multiple ergonomic and individual risk factors for WMSDs in dental professionals [35]. Simple in-office movement protocols, including region-specific āsana-based routines for the neck, shoulders, wrists, back, hips, and legs, have also been proposed as feasible preventive strategies for dental professionals, although such protocols require further clinical validation [18,19]. Additional evidence also supports the practical relevance of brief and region-specific movement strategies. Hand-wrist disorders and low back complaints remain clinically relevant in dentistry, especially in the context of repetitive fine motor work and cumulative occupational exposure [36,37]. A small biomechanical study suggested that pre-procedural chair-side finger stretches may attenuate the decline in pinch strength after scaling and root planing, indicating that very brief targeted routines may help reduce procedure-related muscle fatigue [38]. Although such findings do not provide symptom-level evidence comparable to randomized clinical trials, they support the practical plausibility of targeted movement-based strategies in dental settings.

Limitations of included studies

Several limitations of the included studies should be considered when interpreting the present findings. First, the number of eligible interventional studies was small, and most were based on limited samples, reducing statistical power and generalizability. Second, the included populations were heterogeneous, ranging from dentists and dental assistants to students and mixed academic or clinical groups, which complicates direct comparison across studies.

Third, the interventions differed substantially in content, duration, supervision, and purpose, with some studies evaluating isolated exercise protocols and others assessing multimodal programs that combined exercise with ergonomic education, postural correction, workplace modification, or adjunctive techniques such as kinesio taping. As a result, the specific contribution of exercise alone often could not be determined. Fourth, the outcome measures were inconsistent and included pain, disability, pain pressure threshold, strength, posture, and biomechanical indicators, which limited comparability between studies. Finally, several studies had important methodological weaknesses, including short follow-up, lack of blinding, absence of control groups, reliance on self-reported outcomes, and in some cases substantial risk of bias. These factors mean that the available interventional evidence should be interpreted as suggestive rather than definitive.

Limitations of this review

The present review also has methodological limitations. First, this was a narrative review rather than a formal systematic review or meta-analysis, and no protocol was registered in advance. Second, the literature search was limited to a single database, PubMed, which may have led to omission of relevant studies indexed elsewhere. Third, the search was restricted to articles published within the previous 10 years and to accessible full-text papers, which may have further narrowed the evidence base and introduced selection bias. Fourth, no formal risk-of-bias assessment or standardized evidence-grading framework was applied, limiting the methodological appraisal of the included studies. Finally, because the synthesis was descriptive and selective by design, the conclusions of this review should be understood as an interpretive summary of the available literature rather than a comprehensive quantitative assessment of intervention effectiveness.

Future research

Future studies should more clearly distinguish between primary prevention and management of existing symptoms. Trials designed to assess prevention should include participants without baseline symptoms in the analyzed body region and should evaluate incident WMSDs over longer follow-up periods. In contrast, therapeutic trials should focus on symptomatic dental professionals and use standardized measures of pain, disability, function, strength, and work-related outcomes.

Further research should also attempt to separate the effects of isolated exercise from those of multimodal interventions. Well-designed randomized controlled trials comparing supervised exercise, home-based exercise, telerehabilitation, ergonomic education, and combined programs would help clarify the independent and comparative effectiveness of these strategies. Standardized intervention protocols, larger samples, longer follow-up, and subgroup analyses by dental specialty, symptom location, and baseline activity level are needed to determine which interventions are most appropriate for specific groups of dental professionals.

Conclusions

The available evidence suggests that exercise-based interventions may be useful for the management of work-related musculoskeletal disorders among dental professionals, particularly in symptomatic individuals. Stretching may provide short-term relief of work-related discomfort, resistance training may support physical conditioning, and supervised multimodal exercise currently has the strongest therapeutic support, especially in dentists with chronic neck pain.

However, evidence for primary prevention remains limited, indirect, and inconsistent. In addition, many available interventions are small, heterogeneous, and multimodal, which makes it difficult to determine whether the observed effects result from exercise itself, ergonomic education, postural correction, workplace modification, or their combined influence. Larger controlled studies with standardized protocols, longer follow-up, and clearly separated preventive and therapeutic outcomes are needed.

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