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Review

Strengthening the foundation: Alleviating the optimization of dental professionals' health through tailored physical activity

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Abstract: The purpose of this article is to examine the musculoskeletal difficulties that dentists encounter daily. It highlights the critical role that certain physical activities have in improving the health and functionality of the neck, upper back, and lower back muscles. This review paper looks into the occupational strain that dentists face when performing procedures, focusing in particular on the implications of bending and reclining for extended periods. The study combines data from multiple global sources without mentioning a specific place or period. The main objective is to present a thorough analysis of musculoskeletal stress in dentists by combining information from previous studies. The study emphasizes that the pressures dental professionals face during operations might result in discomfort, chronic pain, muscle weakness, postural irregularities, and decreased productivity and highlights the need of engaging in physical activity for improving posture, flexibility, and physical stamina, with a focus on building stronger core muscles. Conclusively, this article emphasizes how important it is for dental professionals to incorporate focused physical activity into their daily routines to improve overall health and lessen musculoskeletal issues.

Keywords: dental professionals, posture, ergonomics, musculoskeletal disorders, physical activity.

1. Introduction

In the realm, of healthcare professionals, dentistry is both a physically and mentally challenging profession. Dentists are essential pillars in the field of healthcare professionals because they protect their patients' oral health. The physical attributes include the capacity to hear, see, and move with good manual dexterity, maintain good posture while working for an extended amount of time, and have good psychomotor skills. Practitioners in the dental field frequently have work-related musculoskeletal disorders (WMSD), with symptoms frequently beginning early in their professional career. Although proof of their effectiveness is still lacking, ergonomic treatments in the physical, cognitive, and organizational domains have been proposed as a means of preventing them (Mulimani, et al 2018).

Disorders of the muscles, nerves, tendons, ligaments, joints, cartilage, or spinal discs are referred to as musculoskeletal disorders (MSDs). MSDs that are exacerbated or prolonged by work conditions are referred to as WMSDs. According to the World Health Organization (WHO), MSD is described as "a disorder of the muscles, tendons, joints, intervertebral discs, peripheral nerves, and vascular system, installing gradually and chronically but not directly resulting from an acute or instantaneous event". Occupational variables, medical factors (physical diseases, genetic susceptibility, age), and lifestyle factors are some of the several types of factors that contribute to MSD, and a range of components, including sociocultural, psychological, and structural factors, have an impact on (MSDs) (WHO, 2016; Anghel, et al., 2007). The most significant work-related issues at the moment are MSDs. They are important and expensive workplace issues that have an impact on working people's careers, productivity, and occupational health (Nermin. 2006; Shaik, et al., 2011).

Chronic pain and, in more severe situations, musculoskeletal problems can be brought on by this repetitive tension on the shoulder, neck, and back muscles. Therefore, addressing this problem requires a thorough understanding of the causes of such tension. The extended amount of time

spent hunching over patients and the complex nature of dental operations can put a lot of strain on the muscles in the shoulders, neck, upper, and lower back. Due to the sheer nature of their work, they must hold certain positions for long periods, which cause muscular exhaustion and discomfort. For example, if a dentist is unable to adapt to a particular work environment, there may be major repercussions that can result in damage or incapacity. But the demands of their job frequently come with a price including stress and bodily pain (Govender, 2017).

Posture is the arrangement of the various parts of the body when doing an activity. The use of unpleasant postures is arguably the biggest risk factor for individuals working in the dental field. Figure 1 shows the optimum situation of a dentist performing a clinical act while seated in a balanced position. The graphic seeks to highlight the significance of dentists keeping a neutral and balanced position, raising awareness of the possible hazards connected with continuing to maintain an inappropriate posture for lengthy periods. The dentist is depicted as being appropriately positioned around the patient, keeping their head at the right height for working, and making sure their head is turned, tilted, or extended for the best possible access. The visual aid draws attention to common ways that people deviate from a balanced posture, including excessive head and neck bending, trunk rotation and tilting, and lifting one's arms without sufficient support. On the other hand, the picture emphasizes how important it is to keep the patient's seat backrest and headrest margins free to avoid imbalanced postures that might cause the elbows and shoulders to rise and body segments to twist and tilt. The image also highlights the effects of interference in the work area, which might lead to the patient and tools needing to be moved about a lot. If the relocation is not done with special attention to postural changes, it may lead to stress, weariness, and musculoskeletal diseases. For dentists, the picture acts as a visual aid, focusing attention on the need to maintain a balanced posture for both optimal physical health and effective professional performance (Pîrvu et al., 2014).

(Figure. 1 a, b: Optimum Position of Dentist; Source: Pîrvu et al., 2014)

However, Figure 2 depicts the typical problem of an imbalanced posture in dental practice, namely the orthostatic posture that is frequently seen. Due to the uneven posture, internal organ compression is caused on the right side of the body as the person bends towards the patient, mostly supporting the right foot. However, this position may be necessary for some brief clinical acts, such as bite records, impressions, some extractions, and cosmetic evaluations; there are numerous drawbacks to it (Pîrvu et al., 2014).

(Figure 2 unbalanced posture, Pîrvu, C., Pătrașcu, et al., 2014)

Many factors contribute to maintaining the orthostatic position, such as habituation, resistance changes, an intense work rhythm, and a sense of reduced mobility when working alone or with minimal assistance from a dental assistant while seated on a stool. This situation occurs when the dentist uses their instruments on their own, necessitating unrestricted mobility within the workplace to facilitate simple access. The vertical or somewhat oblique orientation results in an imbalanced posture, which is shown as a sitting position with the upper body slanted to the right. Although this

pose protects the legs and shanks, it also brings with it a host of problems related to sustained asymmetry. One-sided trunk twisting causes severe muscle and joint imbalances, which foster an environment that is favorable for low back discomfort.

The illustration essentially emphasizes how critical it is for dentists to identify and correct imbalanced postures because continuing to maintain certain positions over time might result in severe musculoskeletal problems and discomfort. The story highlights how important ergonomic treatments are for encouraging a more sustainable and balanced posture, which benefits dental professionals' general health.

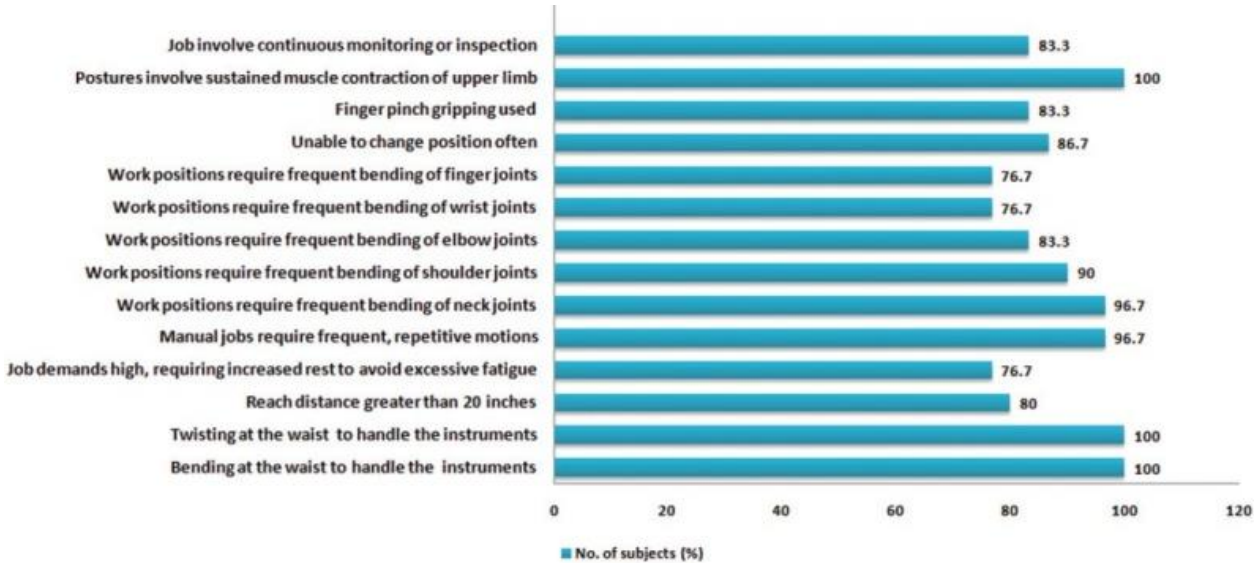
With an emphasis on the effects of long work hours, physical demands, the incidence of MSDs, and risk mitigation techniques, this review attempts to thoroughly examine musculoskeletal problems in dental professionals. Peer-reviewed publications and other pertinent materials published in the literature are carefully examined as part of this review.

2. Musculoskeletal Discomfort among Dental Professionals

Dental practitioners often assume unnatural postures that cause musculoskeletal discomfort. Poor work methods, inadequate patient positioning, and inappropriate seating can cause these postures. Incorrect operating positions provide a significant occupational health risk to dental surgeons in particular, underscoring the importance of maintaining a calm, neutral, and balanced bodily alignment. Alarming figures are uncovered by surveys: a considerable portion of dental workers report having back pain (23.3%), shoulder discomfort (13.3%), neck pain (33.3%), and moderate back pain (66.7%). Due to joint bending, muscle contraction, pinch grabbing, and continuous monitoring that come with dental procedures, ankle pain (46.7%) and wrist, hand, or back pain (40%) are also common (Shaik et al., 2011).

Figure 3 highlights the relationship between musculoskeletal pain and uncomfortable postures by emphasizing the effects of improper seating positions, patient placement, and poor work practices. Notably, 96.7% of dental surgeons often bend their necks, 90% flex their shoulder joints, 83.3% bend their elbow joints, and 100% must twist and bend at the waist. A large percentage (86.7%) cannot change postures while working, and 80% must extend their reach beyond 20 inches, which impacts dentists' musculoskeletal health as a whole (Shaik, et al., 2011).

Figure 3: The current working environment (Source: Shaik, et al., 2011).



This comprehension of physical demands informs safety and ergonomic issues, offering vital information to aspiring dental professionals so they can grasp the difficulties before they join the field. When working, dental professionals frequently adopt awkward postures that can cause a variety of musculoskeletal issues. Extreme forward head and neck flexion, trunk inclination and rotation elevating one or both shoulders, increased curvature of the thoracic spinal column, and incorrect positioning of the lower limbs are among the recognized postures (De Sio et al., 2018). Ergonomic interventions are urgently needed to address consequences like limited cervical spine motion, muscular imbalances, impaired proprioception, and unexplained discomfort and weariness (Kawtharani et al., 2023). The need for intervention is further highlighted by challenging postures that involve thumb hyperextension, elbow flexion, and wrist flexion, which have been shown to strain ligaments and neurovascular systems (Novak, 2004). Dental surgeons frequently can't resist

holding still for extended periods. More than half of the body's muscles are clenched statically even in the best seated positions, and the vertebral joints barely move.

This may lead to detrimental physiological alterations that might cause shoulder, neck, or back pain as well as MSDs. In the dentistry business, several factors, including poor work habits, repetitive procedures, uncomfortable physical postures, scaling, and root planning, are the primary causes of multiple sclerosis (MS), stress, and lost productivity. Ignoring chronic pain or suffering can lead to physiological deterioration that can eventually cause an injury (macro change) or handicap that will ruin one's career (Shaik, 2015). Persistent use of these postures can lead to muscular necrosis, pain, discomfort, or incapacity, all of which can accelerate the onset of musculoskeletal problems (Abduljabbar, 2008). Despite maintaining proper posture and ergonomics, it is known that muscular tension develops, leading to joint hypomobility and ischemia. Long work hours have an impact on this. In general, people lead more sedentary lives as they age, which may cause their bone health to decline. Weight-bearing workouts like walking can cause bone remodeling by activating osteocyte signaling, a process known as "mechanotransduction (Chang et al., 2022; Huang, 2010).

Core strengthening has become a highly favored trend in the field of rehabilitation. Several regimens, such as lumbar stabilization and motor control training, have been mentioned while using this word. Essentially, maintaining functional stability around the lumbar spine requires muscle control, which is what is meant to be addressed by core strengthening.

Dentists also tend to be uninformed about proper posture, extended static postures, inadequate operational instruments, and little exercise (Joseph, 2020). A primary cause of musculoskeletal problems is a reduction in the supply of oxygen and nutrients to the muscles. As the name implies, aerobic exercise focuses more on enhancing oxygen transport by raising blood flow to the tissues and boosting their effectiveness (Valachi, 2003). Blood triglycerides are also eliminated by the increased blood flow velocity. Therefore, there should be a warm-up, an exercise session, and a cool-down in the workout regimen for dental professionals.

Warm-up:

This should take ten minutes and involve stretching and full-body motions.

Exercise Time:

- Intensity: Heart rate should be at 70% of maximum heart rate (HRmax–220-age). Exercise should be done until the heart rate reaches 70% of HRmax. The person will find this challenging in some ways.
- Time: 30 to 60 minutes.
- Regularity: thrice a week
- Exercise mode: Dentists are free to select their favorite exercises, such as weight training, stair climbing, swimming, biking, running, or walking.

Cool-down:

Initiating with five to ten minutes of full body stretches and motions (Kisner, 2017) To counterbalance the impacts of static labor and postural demands, numerous experts propose a dynamic manner of working.

- This includes employing the active balanced posture and the passive balanced posture alternatively using the short breaks between the patients to leave the stool and walk a working program with long demanding treatment sessions alternating to short and easier ones performing simple exercises between patients at the end of the program They must include seven daily stretches in their regimen (Kehmeier, 2020).

The goal of physical activity for dentists should be to improve their general fitness. The ability to undertake physical labor is referred to as fitness in general. Effective physical labor demands strong cardiopulmonary function, or aerobic fitness, as well as musculoskeletal strength, endurance, and flexibility. Integrating physical therapy into the regimen of dentists has proven to be a transformative factor in their professional lives. Notably, this holistic approach not only addresses physical discomfort but also yields a substantial boost in work productivity. Dentists who embrace physical therapy experience enhanced agility, reduced fatigue, and improved posture, all of which directly contribute to a more efficient and effective practice. This strategic investment in their well-being ensures their long-term physical health and translates into heightened performance, ultimately benefiting both the practitioner and their patients (Martin et al., 2004).

3. Dentistry: Managing Health Care Needs with the Effects of Prolonged Work Hours

Dentists, who are frequently praised as the cornerstones of oral health, must strike a careful balance between endurance and precision. As protectors of their patients' oral health, dentists are at the forefront of healthcare, taking on a wide range of issues that go beyond simple dental operations. The dual nature of the demands on one's body and mind stand out among these difficulties, resulting in a distinct and challenging work environment. It needs a varied skill set to navigate the complex world of dentistry, not simply clinical expertise. To precisely detect and treat tooth disorders, dentists need to have keen senses of hearing and vision. To ensure that precise and effective care is delivered, their movements must be both agile and exact. Sustaining an ideal posture for extended periods of work is not only advised but also essential, highlighting the significance of robust psychomotor abilities in this diverse field (Shaik, et al., 2011).

Beyond their clinical skill and mental acuity, dentists also have to deal with the problem of working long hours, which may exacerbate hand-arm vibration syndrome (HAVS). This syndrome may develop over time as a result of prolonged exposure to the vibrational forces produced by dental tools and instruments during complex operations. The blood vessels, nerves, and muscles in the hand and arm may be impacted by the continuous pressure and vibration, which may result in symptoms like tingling and numbness or, in extreme situations, decreased hand function. Due to the demanding nature of dentistry, working long hours is frequently required, which increases the risk of HAVS. Dentists must retain focus and precision due to the complicated and comprehensive nature of dental operations, which can occasionally result in lengthy sessions. This increased exposure to vibration of the hands and arms emphasizes how critical it is to recognize the possible hazards linked to long work hours in dentistry. The risk of HAVS lurks in the background as dentists skillfully perform intricate dental operations. By definition, the work requires a careful balancing act between giving patients complete treatment and protecting the health of those who provide it. As a result, dental professionals must be aware of how their work hours affect their physical health in addition to demonstrating clinical proficiency (Dahlin, 2001). Dentists need to be aware of the possible repercussions of extended work hours to maintain their dedication to patient care and their quest for excellence. It becomes imperative to put preventive measures, ergonomic tool use, and regular breaks into practice to reduce the risk of HAVS. In addition to meeting patients' urgent needs, the focus should be on creating a long-term, healthy work environment for dental practitioners (Andréu, et al., 2011).

Dental professionals can reap the benefits of adding physical workouts to their routines as they recognize the necessity for a well-rounded fitness plan. To improve aerobic performance, aerobic workouts are essential. These include weight training, stair climbing, swimming, biking, running, and walking. These workouts provide an intense yet advantageous cardiovascular workout by raising the heart rate to 70% of the maximal heart rate (HRmax–220-age). For dental professionals who must meet the demands of their line of work, this degree of intensity aids in the promotion of cardiovascular health and endurance (Kisner et al., 2017).

The importance of a thorough warm-up in maintaining physical health, especially for dental professionals, cannot be emphasized enough. It is recommended that dental practitioners warm up with a vigorous combination of full-body exercises and stretches that last around 10 minutes. This two-pronged strategy accomplishes two goals: it increases heart rate gradually and promotes better blood circulation throughout the entire body. Dynamic stretches help to increase joint flexibility while also lowering the chance of injury during the next workout. This is especially true for dentists, who must maintain static postures and repetitive motions as part of their job, therefore flexibility is essential to their general physical well-being. Within their hectic schedules, this exact timetable is meticulously calibrated to find a balance between sufficient preparation and effective time management.

4. Discussion

Improved mental and physical health work together to boost one's professional health. Dentists who put their health first are better able to handle the pressures of their line of work with fortitude and effectiveness. This all-encompassing strategy guarantees a long-lasting and rewarding career characterized by ongoing satisfaction and professional advancement. Putting dynamic dentistry well-being strategies into practice practically means incorporating easy workouts into everyday life. Incorporating brief stretches or gentle exercises can help dental workers decompress physically and mentally in between patient appointments. This keeps the body moving and flexible, and it also gives dentists more energy and attention for the tasks that come after. The risk of musculoskeletal problems is decreased and longevity in the dental field is encouraged by targeted stretches for musculoskeletal health, which include seven daily stretches that target the shoulders, neck, back, and wrists—important muscle groups that are frequently strained during dental treatments.

Furthermore, dental professionals must use substances with awareness. They should abstain from smoking, adrenaline stimulants, and additive-filled beverages as these might impair concentration, increase tension, and have negative effects on general health. With its integration of targeted

stretches, physical exercises, and mindfulness techniques, this holistic approach to thriving in dentistry not only protects physical health but also promotes better performances and overall professional well-being. Dental professionals can ensure a rewarding and long-lasting career in oral healthcare by adopting these dynamic methods, which enable them to handle the complexities of their field with resilience.

Our comprehensive analysis examines the effects of customized physical activity programs on dental professionals' well-being and job performance. Long hours at work have been linked to higher levels of stress, exhaustion, and musculoskeletal problems in dentistry, according to research. Proficiency was found to be maintained by further education, with technical skill mastery and accuracy in psychomotor abilities being recognized as key components. In terms of shoulder, neck, and back conditions, the frequency of MSDs showed both similarities and differences, and these patterns were influenced by role dynamics and gender. Resolving incorrect postures and creating chairs with functionality tailored to a certain posture are two examples of ergonomic considerations that were essential in addressing age-related patterns and musculoskeletal issues. Dental practitioners emphasized the inclusion of physical activity, warm-up procedures, structured exercise programs, and dynamic work methods in their risk mitigation efforts. Swimming has become known as a comprehensive exercise with benefits. Positive results were shown by adaptive approaches, which enhanced total professional well-being while preventing dangers, lowering working stress, combatting weariness, and boosting health. These results offer a thorough grasp of how customized physical activity might improve dental professionals' performance and overall health.

Improving the professional health of dentists demonstrates how better mental and physical health are interwoven. Putting health first is crucial to overcoming the challenges that come with working as a dentist and remaining strong and productive. The implementation of this all-encompassing approach guarantees a long-lasting and fulfilling career characterized by consistent fulfillment and regular career progression. The practical use of dynamic dentistry well-being techniques is introducing easy exercises into everyday schedules. Incorporating quick stretches or light workouts in between patient sessions can help dentists who value their health to decompress both physically and mentally. This helps maintain the body's flexibility and motion while also boosting stamina and focus for upcoming tasks. Targeted stretches that concentrate on important muscle groups: shoulders, neck, back, and wrists; that are typically stressed during dental treatments help reduce the risk of musculoskeletal issues. Dental professionals need to be cognizant of substance usage in addition to physical activities. It is recommended to refrain from smoking, using stimulants high in adrenaline, and drinking beverages with a lot of additives because these chemicals might cause headaches, tension, and poor health outcomes. Targeted stretches, physical activities, and mindfulness practices are all incorporated into this holistic approach, which not only protects physical health but also improves overall professional well-being and performance in the physically demanding field of dentistry.

By using these innovative techniques, dental professionals can guarantee a fulfilling and long-lasting career in oral healthcare by navigating the challenges of their industry with fortitude and succeeding in their jobs.

5. Conclusions

Conclusively, MSDs are a significant occupational health risk for dental professionals, and this is within the stated constraints of this study. The obstacles that come with practicing dentistry are reflected in this. Ignored work-related musculoskeletal diseases, which are mostly caused by unpleasant and protracted postures during dental treatments, might result in persistent discomfort and even endangerment of one's career. Educating the public and putting good ergonomics and postural techniques into practice among dentists is key to reducing the incidence of these conditions. A significant improvement may be achieved by implementing dynamic work habits, regularizing breaks, and including easy workouts into everyday routines. Moreover, the prioritization of core strengthening and aerobic activities is essential for improving overall fitness and mitigating the negative effects of static labor. The understanding that dentists' health has a direct impact on their ability to provide high-quality treatment highlights the significance of initiatives to support physical health, such as making physical therapy more accessible. Putting dentists' physical and mental health first goes beyond maintaining their careers; it represents a dedication to making sure the public continues to get high-quality dental treatment. We can strengthen the basis of this essential profession and promote a workforce of dentists who are healthier and more productive by tackling these issues and taking proactive steps to implement solutions.

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