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Musculoskeletal pain prevalence and prevention in active duty dental Officers

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Musculoskeletal pain prevalence and prevention in active duty dental Officers

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ABSTRACT

Background. The purpose of this study was to identify any correlations between exercise habits and self-managed, or "do it yourself (DIY)" physiotherapy and the resulting incidence and severity of musculoskeletal pain experienced among military comprehensive dentists.

Methods. An anonymous and confidential online survey was developed and distributed via the Comprehensive Dentistry alpha roster for each military branch. The survey consisted of four sections: general demographics, musculoskeletal pain prevalence, "DIY" physiotherapy, and exercise. After the survey closed, the responses were organized and analyzed using Survey Monkey Data Analysis and Microsoft Excel and descriptive statistics were drawn.

Results. A total of 550 surveys were distributed with a response rate of 44%. Over 68% of all respondents stated that they have experienced physical pain associated with clinical dentistry, with the most common locations being the neck, shoulders, lower back, and hands/wrist/ fingers. Nearly 70% of respondents reported using at least one "DIY" physiotherapy modality and 97% of respondents reported engaging in routine exercise. Among those respondents who used "DIY" physiotherapy, 72% reported it as effective at managing physical pain and 13% reported it as effective at preventing pain. Among those respondents who engage in routine exercise, 53% reported it as effective at managing physical pain and 48% reported it as effective at preventing physical pain.

Practical Implications. Musculoskeletal pain has a significant prevalence among Comprehensive Dentists in the US Armed Forces. Often, it can lead to injury which has the potential to create devastating decrements in the dental readiness of Soldiers, Sailors, and Airmen. Utilization of "DIY" physiotherapy and/or engaging in routine exercise is likely an effective management strategy for physical pain associated with clinical dentistry. Dedicated time and resources should be allocated to allow dental providers to engage in exercise and/or "DIY" physiotherapy to reduce the number of musculoskeletal- injuries in the Force.

Key Words. Musculoskeletal pain, "DIY" Physiotherapy, Comprehensive Dentist, Exercise, Management, Prevention

DUE to the strenuous nature of the dental profession, musculoskeletal pain occurs in a significant portion of dentists. According to a survey performed by Leggat et al in 2008, more than 87% experience at least one musculoskeletal disorder symptom in the previous 12 months.[1] The most frequently reported injuries among dentists involve the neck, shoulders, and lower back.[2] Often, musculoskeletal pain can lead to injuries, requiring the provider to miss time at work.

In more severe scenarios, dental providers may often find themselves being forced to retire from the profession much earlier than anticipated.[3] In a military setting, these dental-related musculoskeletal injuries can have devastating consequences on the dental readiness of Soldiers, Sailors, and Airmen. The military dental readiness classification system was developed in order to accurately and efficiently categorize and triage military service members into groups based off their clinical presentation and radiographic disease indicators.[4] The dental readiness classification system has proven itself to be accurate in its predictive nature. Studies have shown that the utilization of aggressive dental fitness programs prior to deployment/combat missions can reduce the amount of emergency dental visits by approximately 70%.[5] It can be presumed that when military dentists suffer from musculoskeletal pain there is likely a decrease in dental readiness. This, in turn, lowers the percentage of deployable military members, straining the military's lethality and adaptability.[6,10] Additionally, injured military dentists may have trouble meeting the physical demands that the military requires, resulting in lower retention rates for the military.[7] Higher turnover of dentists ends up costing the military more money to recruit and train replacement dental providers. Throughout the profession, ergonomic advances have been made to help prevent and alleviate musculoskeletal pain in providers. Dental magnification and headlights have been introduced to help providers maintain better posture and produce better quality dentistry.[8] Additionally, obtaining adequate sleep and engaging in routine exercise and periodic stretching have been recommended to help prevent the development of musculoskeletal disorders in dentists.[9] Even with these recommendations, musculoskeletal disorders and pain remain highly prevalent among the dental profession. Alarmingly, the amount of studies that focus specifically on musculoskeletal pain prevalence among dentists in the armed forces remains limited. This study aims to identify any correlations between exercise habits and self-managed, or "do it yourself (DIY)" physiotherapy and the resulting incidence and severity of musculoskeletal pain experienced among military comprehensive dentists. The null hypothesis was that there will be no difference in musculoskeletal pain experienced by comprehensive dentists regardless if they utilize "DIY" physiotherapy modalities or exercise. The alternative hypothesis was that there will be a difference in musculoskeletal pain experienced by comprehensive dentists who utilize "DIY" physiotherapy and/or exercise measures.

MATERIALS AND METHODS

Participants:

The dental providers that were sent invitations to complete this survey were current active duty Comprehensive Dentists, to include current residents that are serving in the U.S. Army, U.S. Navy, or U.S. Air Force. Comprehensive Dentists are specialists in the military that have completed at minimum a two year postgraduate residency in Advanced Education in General Dentistry and are utilized in more versatile positions due to their extensive training. Invitations were sent to registered military email addresses via the respective Comprehensive Dentistry Specialty Leader for each service branch. A total of 550 invitations were sent in a 'BCC' fashion in order to protect respondent privacy during recruitment. Participants were informed that the questionnaire was anonymous, has no identifying information,

and that no compensation was to be provided for participation.

Questionnaire:

The questionnaire's format was developed in collaboration with the advising statistician in order to qualify and quantify experienced musculoskeletal pain as it relates to clinical dentistry performed in a military setting.

A pilot questionnaire was distributed to the seven junior residents at Billy Johnson Dental Clinic (Fort Hood, TX, AEGD-II Program) and adjustments were made to the final questionnaire based on feedback regarding questions or statements that proved to be potentially erroneous or confusing. The finalized survey was distributed via a third- party survey counseling service (SurveyMonkey) to the Comprehensive Dentistry distribution list for each branch with the help of each Comprehensive Dentistry Specialty Leader. The survey was made available for submission for three months: August 1, 2021 – October 31, 2021. Monthly periodic reminder emails were disseminated on the first of each month to maximize participation. Individual responses were securely maintained by the third party online survey service and only members of the investigative team listed in this protocol were given access to the results.

The questionnaire contained 19 questions and consisted of four sections: demographics, musculoskeletal pain prevalence, "DIY" physiotherapy, and exercise.

The demographics section gathered data on military branch, biological sex, age, years practicing dentistry as a comprehensive dentist, average number of days per week spent in patient care, and average number of hours per day spent in patient care.

The musculoskeletal pain section asked participants if they have ever experienced musculoskeletal pain related to clinical dentistry, and if they had, to further describe the location and severity of the pain. It also asked if it had caused them to miss work or reduce their time chairside, and if they had noticed any change in frequency or intensity of the pain while deployed. This section allowed participants to rate their pain intensity on a 1-10 scale (with 1 being next to no pain and 10 being burnt alive) and to describe their frequency of pain as either "throughout the day, once a day, few times a week, few times a month, or few times a year."

The "DIY" physiotherapy section asked participants if they utilize any of the nine pre-selected types of "DIY" physiotherapy. For those utilizing these tools, they were asked to identify their frequency of use and if they found their use of "DIY" physiotherapy to be effective at managing and/or preventing musculoskeletal pain associated with clinical dentistry.

The exercise section asked participants to identify the types of exercise that they routinely engage in, to describe their frequency (in hours per week), and were asked if they found their exercise regime to be effective at managing and/or preventing musculoskeletal pain associated with clinical dentistry.

Statistical analysis:

Following the conclusion of the survey collection window, data organization and statistical analysis was conducted. The survey was designed to utilize Likert scales in order to standardize and quantify the

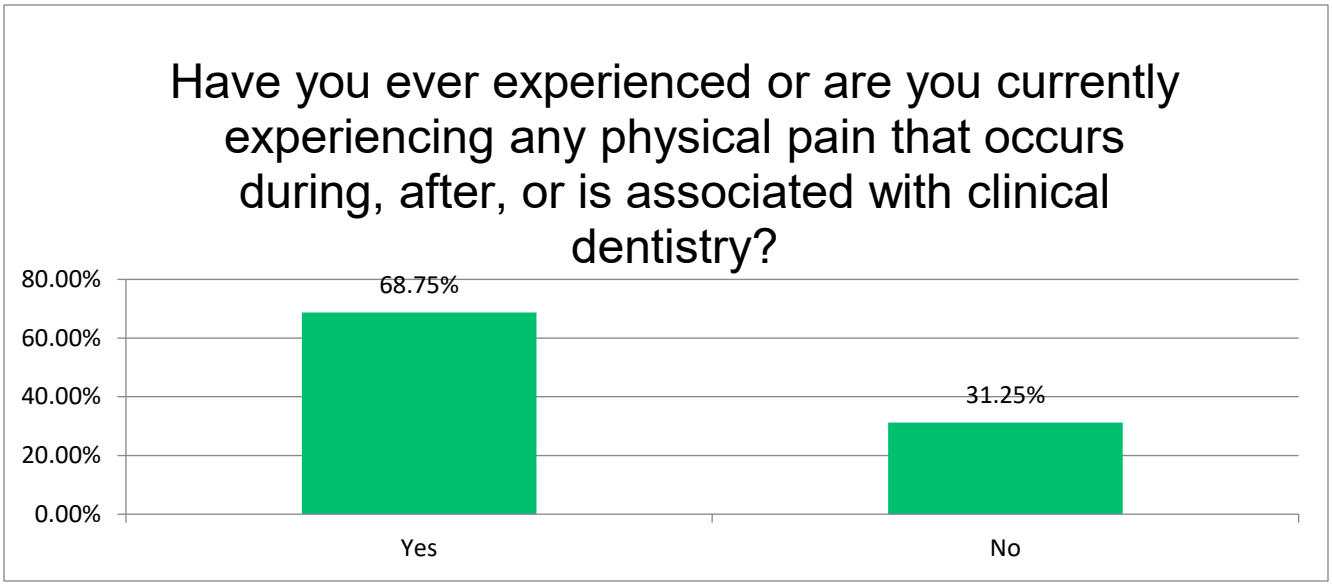

***Figure 1**: Results from Question 7 of the questionnaire*

subjective nature of pain. Descriptive statistics were extrapolated from the data and logical inferences and conclusions were drawn.

RESULTS

Demographics: A total of 240 surveys were collected for an overall response rate of 43.6%. The breakdown according to branch was: 42.5% of respondents were members of the U.S. Army, 29.5% were members of the U.S. Air Force, and 28% were members of the U.S. Navy. In relation to biological sex, 71% were male and 29% were female. Nearly three-quarters of all respondents were between 31 and 50 years of age, and

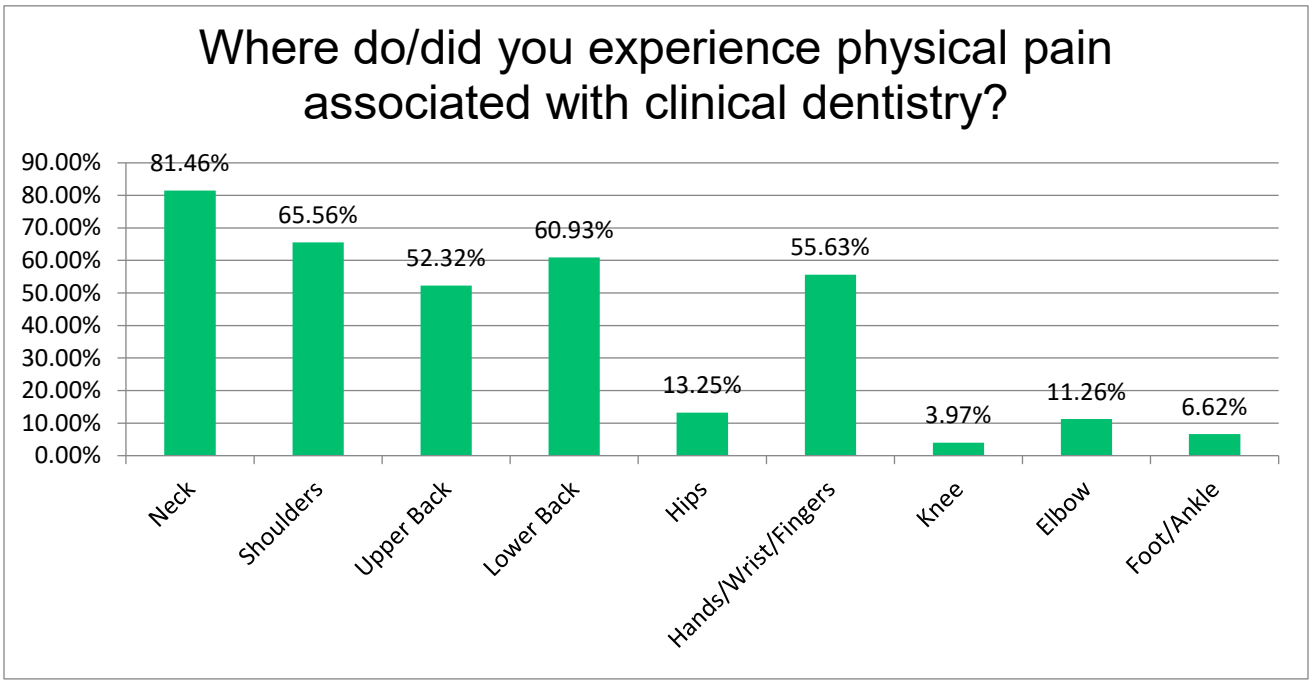

Figure 2: Results from Question 8 of the questionnaire

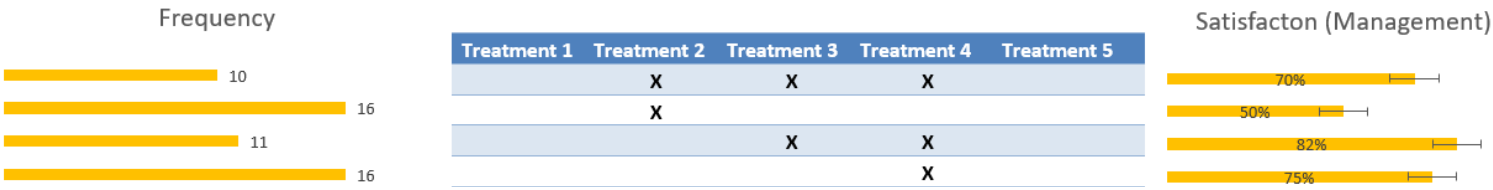

Figure 3: *Most frequent "DIY" Physiotherapy combinations and their corresponding self-reported satisfaction in managing musculoskeletal pain. Treatment 1: Trigger Point Massage; Treatment 2: Massage Gun; Treatment 3: Lacrosse Ball/Peanut; Treatment 4: Foam Roller; Treatment 5: Heating Blanket*

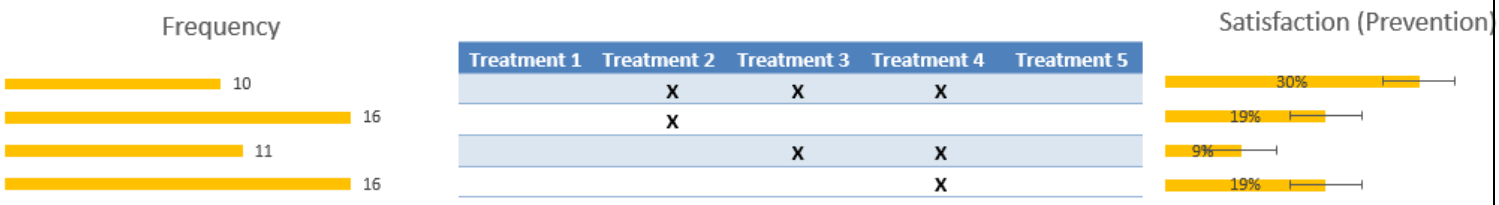

Figure 4: *Most frequent "DIY" Physiotherapy combinations and their corresponding self-reported satisfaction in preventing musculoskeletal pain. Treatment 1: Trigger Point Massage; Treatment 2: Massage Gun; Treatment 3: Lacrosse Ball/Peanut; Treatment 4: Foam Roller; Treatment 5: Heating Blanket*

two-thirds of respondents had graduated Comprehensive Dentistry residency training within the last 12 years. Three-quarters of participants report spending at least three days a week in direct patient care, with 43% spending five days a week in direct patient care. The vast majority of participants (86%) reported spending between three and eight hours a day in direct patient care, with the majority stating that they spent five to six hours a day in direct patient care.

Musculoskeletal Pain:

A total of 69% of all respondents reported that they were experiencing or had experienced physical pain that occurs during, after, or is associated with clinical dentistry (Figure 1). The most common sites that pain was experienced were (Figure 2): neck (81%), shoulders (65%), lower back (60%), hands/wrists/fingers (55%), and upper back (52%). The least common sites were: knee (4%), foot/ankle (7%), elbow (11%), and hips (13%). The average pain severity, on a 1-10 scale, for each site was as follows: lower back (4.7), neck (4.2), shoulders (4.1), upper back (4.0), hands/wrists/fingers (3.7), hips (2.7), elbow (2.1), foot/ankle (2.0), knee (1.7). Nearly one-third reported experiencing pain multiple times a day. Most respondents stated that they never missed work due to musculoskeletal pain (80%). However, 5% of respondents reported missing one day of work and 11% stated missing more than a day but less than a week. Less than 10% of participants reported decreasing the amount of time spent in patient care due to musculoskeletal pain associated with clinical dentistry. With regards to changes in frequency and intensity during times of deployment, 40% of participants stated that they did not experience any change, 13% reported an increase in frequency, 10% reported an increase in intensity, 8% reported a decrease in frequency, 7% a decrease in intensity, and 35% reported no history of deployment.

"DIY" Physiotherapy:

A total of 70% of respondents reported using at least one type of "DIY"

physiotherapy modality. The most commonly used "DIY" physiotherapy modalities were: foam roller (43%), lacrosse ball/peanut (30%), massage gun (29%), heating pad/blanket (26%), and trigger point massage (25%).

Due to the multi-select design of the questionnaire and having ten unique “DIY” physiotherapy types to select from, there were a possible 1,023 unique combinations of “DIY” physiotherapy use that could have been selected. The most common combinations were: massage gun and lacrosse ball and foam roller, massage gun alone, lacrosse ball and foam roller, and foam roller alone. From these four combinations, the lacrosse ball and foam roller combination had the highest percentage of reported satisfaction in managing musculoskeletal pain at 82%. The next highest was only foam roller at 75% satisfaction, followed by massage gun and lacrosse ball and foam roller at 70%, and massage gun alone at 50%. For every "DIY" physiotherapy modality, the most commonly reported frequency of use was less than once a week. Of those respondents who had reported using "DIY" physiotherapy, 72% believed that it was effective at managing physical pain and 13% believed it to be effective at preventing musculoskeletal pain. Figure 3 shows the most common combinations and their resulting satisfaction in managing musculoskeletal pain. Figure 4 shows the most common combinations and their resulting satisfaction in preventing musculoskeletal pain.

Exercise

A total of 96% of respondents reported engaging in at least one form of routine exercise. The most common types of exercise modalities were: cardiovascular (90%), weight lifting (58%), stretching (57%), HIIT/Crossfit (27%), and yoga/pilates (20%). The majority of respondents self-reported engaging in one to three hours per week for each type of selected exercise modality. Of those respondents who reported engaging in at least one form of exercise, 53% believed that it was effective at managing physical pain and 48% believed it was effective at preventing physical pain.

Due to the multi-select design of the questionnaire and having five different forms of exercise to select from, there were 31 possible unique combinations of exercise that could have been selected by respondents. The most common combinations were: cardiovascular and weight lifting and stretching, cardiovascular only, cardiovascular and stretching, cardiovascular and weight lifting, and cardiovascular and weight lifting and yoga and stretching. From these five combinations, cardiovascular and stretching had the highest percentage of reported satisfaction in preventing musculoskeletal pain at 63%. The next highest was cardiovascular and weight lifting and yoga and stretching at 47%, followed by cardiovascular and weight lifting at 41%, cardiovascular and weight lifting and stretching at 40%, and cardiovascular only at 37%. When looking at these five groups and their satisfaction in managing pain, the group with the highest percentage was cardiovascular and weight lifting at 59%, followed by cardiovascular and weight lifting and stretching at 55%, then cardiovascular and weight lifting and yoga and stretching at 53%, cardiovascular and stretching at 44%, and lastly cardiovascular alone at 41%. Figure 5 shows the most common combinations and their resulting

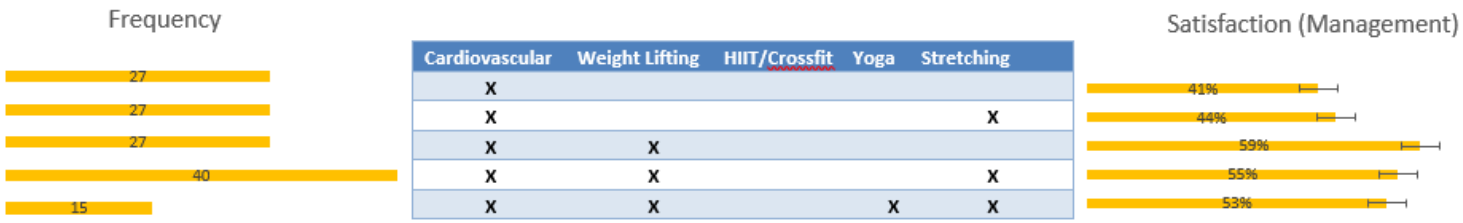

Figure 5: *Most frequent exercise combinations and their corresponding self-reported satisfaction in managing musculoskeletal pain.*

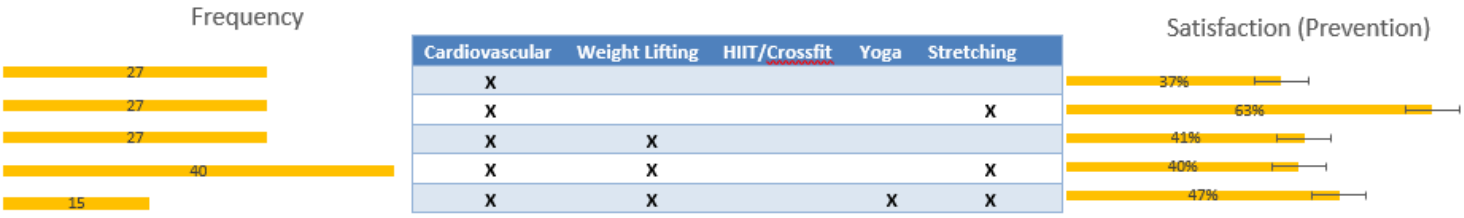

Figure 6*: Most frequent exercise combinations and their corresponding self-reported satisfaction in preventing musculoskeletal pain.*

satisfaction in managing musculoskeletal pain. Figure 6 the most common combinations and their resulting satisfaction in preventing musculoskeletal pain.

DISCUSSION

Musculoskeletal pain prevalence has consistently been cited as one of the top reasons that dental providers retire from the profession, which is unsurprising given the physically taxing nature of the job. This relationship was also found to be present in the military population of this study, with 69% of respondents reporting that they had experienced musculoskeletal pain related to clinical dentistry. However, it is important to point out some of the unique differences between military dentists and their civilian counterparts. Military dentistry is dynamic in nature and often requires serving in a multitude of different operational environments, including naval ships, field hospitals, remote bases, and other extreme settings. Additionally, military dentists are administered mandatory physical fitness tests in order to remain in the armed forces, and it is expected that service members exercise routinely to remain in war-fighting physical condition. On the flip side, there is no financial pressure to maximize production as a military dentist, which translates to the average military dentist seeing fewer patients per day compared to the average civilian dentist.[11] Given these differences, it is alarming that over two-thirds of military dentists are experiencing musculoskeletal pain.

Exercise has been shown to be a proven strategy in the prevention and management of musculoskeletal pain among dentists.[12] Given the military population of this study, it is unsurprising that 96% of respondents engage in at least one form of exercise and it is actually surprising that 4% of respondents reported not engaging in any type of exercise. From those individuals that do exercise, 53% believe it to be effective at managing physical pain and 48% believe it to be effective at preventing physical pain. Past studies have demonstrated that physical exercises that particularly focus on strengthening the core and ‘postural awareness’ have resulted in the greatest self-reported reduction in musculoskeletal pain.[12]

In particular, exercises that are performed in the opposite direction of the awkward, hunched static postures required in dentistry have been shown to have the highest association with a pain-free career.[13] This may explain the relatively low perceived satisfaction of exercise in regards to managing musculoskeletal pain in this study; perhaps the respondents are not focusing their exercise regimens on core-strengthening and counter-acting the static postures held during the workday. Furthermore, this correlates with the finding that cardiovascular activity alone had the lowest perceived satisfaction in both management and prevention of pain, since cardiovascular activity alone does not target the core nor counteract these static, awkward postures.

"DIY" physiotherapy has increased in popularity due to its ease of accessibility, portability, and claims of therapeutic effectiveness. This makes it a particularly suitable option for military dentists with regards to managing dental-related musculoskeletal pain. The most commonly utilized "DIY" physiotherapy modalities selected from this study are all different forms of manual manipulation therapy. Manual manipulation therapy has been demonstrated to be effective in the treatment of musculoskeletal pain.[14] In this study, there was no clear pattern that emerged from the different types of "DIY" physiotherapy utilized in terms of resulting satisfaction (i.e. no increase in satisfaction with increasing number of modalities utilized). A possible explanation may be the different subjective preferences for the different types of manual manipulation therapy.

Some of the weaknesses of this study include the limitations found with all survey and questionnaire type studies: the inability to assign respondents to certain groups and instead having data be dependent upon survey responses. Response bias is always something to consider, as respondents tend to report what they think the investigator wants to hear and may be untruthful in their responses. Non-response bias may have been at play, as evidenced by the survey response rate of 43.6%, despite attempts made to minimize this issue via monthly email reminders to the survey population. Extreme responding bias is possible due to the scale-type Likert scale questions on the survey.

Additionally, despite attempting to make the survey as clear and concise as possible, there were quite a few individuals that submitted responses with unanswered questions and/or incomplete questionnaires. This weakened the overall data as it skewed the averages of some of the questions. Moreover, the original intent of the research design was to analyze four different groups and perform an ANOVA: those that do not engage in exercise or "DIY" physiotherapy, those that use "DIY" physiotherapy solely, those that use exercise solely, and those that use both "DIY" physiotherapy and exercise. However, an oversight was made in that due to the population being limited to active duty military personnel, the sample size of groups that did not utilize exercise were too small to be able to have enough statistical power to perform the ANOVA. As a result, the statistics were limited to descriptive statistics and were unable to be used to objectively accept or reject the null hypothesis.

For the ease of analyzing the data, only the most commonly selected combinations of "DIY" physiotherapy and exercise were selected to be analyzed. This may have introduced partial reference bias, as the conclusions may have been altered had all possible combinations been examined. But based off the reported trends, the null

hypothesis can be tentatively rejected as respondents that did engage in exercise and/or "DIY" physiotherapy reported lower frequency and severity of their musculoskeletal pain.

Future studies can be designed utilizing a civilian population, which when compared with the results of this study, may help in determining the impact of exercise on pain prevalence.

CONCLUSION

Musculoskeletal pain is an ever-present concern among dental providers. This study investigated the amount of musculoskeletal pain related to clinical dentistry experienced by active duty dental providers and their perceived management and/or prevention of that pain through exercise and the utilization of "DIY" physiotherapy. This study revealed that over two-thirds of comprehensive dentists report experiencing musculoskeletal pain related to clinical dentistry, and that those individuals that engaged in exercise and "DIY" physiotherapy reported having less frequent and less severe musculoskeletal pain. Of the individuals that engaged in at least one type of "DIY" physiotherapy, 72% of them perceived "DIY" physiotherapy to be effective at managing musculoskeletal pain, while only 13% perceived it to be effective at preventing musculoskeletal pain. Of the individuals that engaged in at least one form of routine exercise, 53% perceived exercise to be effective at managing musculoskeletal pain and 48% perceived exercise to be effective at preventing musculoskeletal pain.

It is the hope of the authors that Dental Corps leaders across all branches can utilize the findings of this study to justify setting aside dedicated time during the work-day for dental providers and staff to engage in routine exercise and physiotherapy.

Additionally, leaders should dedicate funding to supply dental clinics with "DIY" physiotherapy modalities for dental staff to utilize with the intentions of helping manage and prevent future musculoskeletal injuries related to clinical dentistry and thereby maximizing dental readiness.

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