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Work-Related Musculoskeletal Disorders Among Dentists and Orthodontists

Natalie R. La Rochelle
Virginia Commonwealth University

WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG DENTISTS AND ORTHODONTISTS

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Dentistry at Virginia Commonwealth University.

by

Natalie Rivard La Rochelle
B.A. in Molecular & Cell Biology from University of California, Berkeley, December 2009
D.D.S. from University of California, San Francisco, June 2015

Thesis Director: Dr. Eser Tüfekçi, D.D.S., M.S., Ph.D., M.S.H.A.
Professor, Department of Orthodontics

Virginia Commonwealth University
Richmond, Virginia
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ABSTRACT

The practice of dentistry is physically demanding due to static and dynamic postures sustained daily throughout careers. Previous literature suggests that work-related musculoskeletal disorders (WMSD) are not solely the result of work habits, but also due to the individual, his or her physical makeup, genetics, and personal lifestyle. A 33-question survey was distributed to 1000 general dentists and 2300 orthodontists. The overall prevalence of work-related musculoskeletal disorders was greater among dentists and most often reported as self-limiting. Dentists were three times more likely than orthodontists to report WMSD; females were twice as likely to report WMSD than males; those who sought alternative medical remedies were two times more likely to have WMSD; and practitioners 6-10 years in practice were least likely to report WMSD. Dentists reported sitting in static positions longer than orthodontists; and those with WMSD indicated exercising, stretching, and seeking alternative health remedies more than dentists without WMSD.

INTRODUCTION

According to data compiled from the Occupational Information Network, a US Department of Labor database, dentistry was ranked as the number one most damaging career to one's health in 2015, ahead of the careers of flight attendants and anesthesiologists.[1] Dental professionals are exposed to many occupational hazards, including exposure to chemicals, radiation, biohazardous materials, and musculoskeletal conditions due to excessive time spent sitting and poor posture.[2]

Musculoskeletal disorders are one of the most important occupational health risks among healthcare workers, with approximately 81% of American dentists suffering from neck, shoulder and lower back pain, according to a 2003 article published in the Journal of the American Dental Association.[3] In recent years, increased reporting in the literature has lead to a rise in attention and awareness of work-related musculoskeletal disorders (WMSDs).[4]

Ergonomics refers to the scientific study of people at work. The goal of ergonomics is to reduce stress and eliminate injuries and disorders associated with the overuse of muscles, bad posture, and repeated tasks.[5] Limited ergonomics in the work environment of dental practitioners is associated with a high prevalence of WMSDs.[6] Numerous studies have been conducted regarding the musculoskeletal health of dentists in countries all over the world, including the United States, New Zealand, the United Kingdom, Canada, Germany, India, Thailand, Finland, Poland, Sweden, Greece, and Denmark, among others.[6-21] The reported prevalence of musculoskeletal disorders among dentists varies greatly in the literature, with general musculoskeletal pain ranging between 64% and 93%.[8]

Previous research has yielded conflicting results regarding exactly when the onset of musculoskeletal disorders takes place throughout the careers of dental professionals.[8,11] A

systematic review[8] of musculoskeletal disorders among dental professionals published in 2009 concluded that musculoskeletal pain in general dentists was negatively correlated with years of work experience, meaning a dentist or specialist is more likely to experience symptoms related to musculoskeletal disorders early in their career. Similarly, it has been hypothesized that practitioners with more experience learn to adjust their work posture to avoid such symptoms, or that practitioners with musculoskeletal problems have left the profession.[7,11,12] This theory conflicts with findings from Kierklo et al,[6] who reported that work-related musculoskeletal symptoms increase with the number of years in practice. Specifically, dentists who had practiced for 20 years were at a statistically significantly higher risk of developing pain in the hips, feet, shoulders and elbows.[6] Hence, poor postural habits and disuse of joints and muscles may result in cumulative effects. Therefore, there are varying theories in the literature regarding when WMSDs begin during dental careers.

Extensive literature exists concerning ergonomics in the workplace of general dentists, who work for extended periods in static positions with few breaks, which has lead to increased susceptibility to pain and discomfort.[6-15,17-21] Dentists often sit or stand in static asymmetric positions, maintaining their head, neck and shoulder orientation for prolonged intervals. [6] Finsen et al[19] found that general dentists with more total work time with patients per week reported a higher prevalence of neck problems than those with less work time (more than 25 hours per week versus less than 25 hours per week over a 12-month period). Additionally, Finsen et al[19] suggested that greater variation in work postures might reduce the risk of injuries to the spine, upper limbs and lower limbs.

Fewer studies have been published regarding the musculoskeletal health of orthodontists.[2,4,7,10,16,22] For a survey of Canadian orthodontists in Alberta, low back pain was the

most prevalent work-related musculoskeletal disorder reported (59%), followed by neck and shoulder pain.[16] There are occupational differences in the nature of work for practitioners of general dentistry and orthodontics: orthodontic patient adjustment appointments are generally shorter than general dentistry appointments, orthodontists often focus on the frontal surfaces of the teeth rather than the back of the patient's mouth and are therefore able to maintain a more neutral head and neck position, and many orthodontists typically stand up and walk from patient chair to patient chair more frequently than dentists.[16,23] According to median values reported in a 2015 Journal of Clinical Orthodontics bi-annual orthodontic practice survey[24], full-time solo-practicing orthodontists in the United States treat a median number of 50 patients per day and work 36 owner-hours per week. In comparison, the 2015 American Dental Association (ADA) Survey of Dental Practice[25] reported that general practitioners have an average of 71.6 total patient appointments per week and 2.6 patient visits per hour including dental hygiene visits. This equates to approximately 18 patients per day in a four-day work week, or 14 patients per day in a five-day work week. Therefore, orthodontists have a much greater number of patient visits per day than general practitioners on average.

Previous studies have examined differences in prevalence of musculoskeletal symptoms of dentists and orthodontists.[4,9,10,16,23] In a study of Finnish general dental practitioners and orthodontists, no differences were found regarding prevalence of WMSDs between the two specialties (70% vs. 72%, respectively).[9] These practitioners were found to have a "life-time prevalence" of musculoskeletal complaints, specifically 56% shoulder involvement, followed by 53% neck involvement and 28% back involvement.[9] However, many of the orthodontists in that study were in fact general dentists who reported spending greater than 50% of their clinical time practicing orthodontics. Because the study population of orthodontists included general dentists

who also practiced orthodontics, the findings may not be an accurate reflection of musculoskeletal disorders among specialized orthodontists. In addition, participants were not asked to distinguish whether their symptoms were work-related or non-work-related.

Physician-diagnosed repetitive motion disorders are much less common among dentists than self-reported musculoskeletal symptoms, at only 9% according to a survey conducted by the ADA in 1997.[26] A 2004 study by Brown et al[7] reviewed commonly discussed occupational health risks in orthodontics and dentistry, and compared reported prevalence rates in the literature with data from a cohort of orthodontists covered by the American Association of Orthodontists (AAO) Long-Term Disability Insurance Plan. The authors found a difference in prevalence of long-term disabilities between orthodontists and general dentists in the literature; however, they indicated a need for improved reporting methods, as the number of disability insurance claims for the insured orthodontist cohort (3.56%) did not correlate with rates in self-reported surveys.[7-9] The lower number of disability insurance claims and diagnosed disorders may be due to the fact that many dental professionals are self-employed in solo private practices, making them less likely to miss work or to file disability insurance claims due to mild or moderate musculoskeletal symptoms.[2] Most disability insurance plans also do not begin paying benefits for 90 days after initial filing of a claim; therefore, practitioners are disincentivized to file a claim for mild or self-limiting disorders.[7] Suggestions for improved reporting of health-related information include focusing on the individual practitioner and his or her genetic makeup, amount of physical activity, and lifestyle habits.[7] This suggestion is in agreement with a report by the ADA which states that the cumulative nature of occupational injuries is the result of all of a person's activities, not only work-related activities.[7,26]

Analysis of the individual practitioner and trends within general and orthodontic specialties can increase our understanding of the factors that lead to musculoskeletal disorders among orthodontists and dentists and aid in reducing work-related disorders. Improved understanding of the occupational health risks involved in these two areas of dentistry may influence future dental professionals in career choice and specialization. The purpose of this research was to explore ergonomic health in the practice of general dentistry and orthodontics and to improve steps taken toward preventing musculoskeletal disorders for dental health professionals working in busy modern practices. The aims of this study included correlating the following practice trends among dentists and orthodontists with prevalence of WMSDs: practice volume, procedural time spent seated and standing, participation in stretching, exercise, and alternative medicine, and reactive behavior to WMSDs including reduction in patient treatment time, the use of medication, and filing of disability insurance claims. In addition, information regarding the individual practitioners' physical lifestyle outside of work was compared with practice volume data and reporting of work-related musculoskeletal symptoms.

MATERIALS AND METHODS

A 33-question survey was developed to examine general dentists' and orthodontists' demographics, work volume and habits, physical activity, and prevalence and severity of WMSDs. [Appendix] Study data were collected and managed using Research Electronic Data Capture (REDCap) tools hosted at Virginia Commonwealth University.[27] REDCap is a secure, web-based application designed to support data capture for research studies. Approval was obtained by the Institutional Review Board (#HM20006392) at Virginia Commonwealth University prior to the start of the study.

The definition of *musculoskeletal disorder* (as defined by the Centers for Disease Control and Prevention) and *static posture* were provided at the beginning of the survey. Questions 1-2 asked the practitioner to indicate his or her specialty and number of years in practice. Questions 3-27 asked participants to provide the following information regarding the previous 12 months: average workday length in hours, average number of workdays per week, approximate number of patients treated in a typical day, hours spent practicing continuously without taking a break, hours spent seated and standing in static positions during procedures, and practice demographics. In addition, subjects were asked questions regarding exercise habits, utilization of stretching, the number of stretching breaks taken throughout their workday, and utilization of alternative health remedies including the use of massage, acupuncture, visiting a chiropractor, and using a heating pad. Respondents also rated on a Likert scale of "strongly agree" to "strongly disagree" how likely they would be to implement a daily stretching routine if it were proven to prevent work-related musculoskeletal injuries. Subjects were then asked to state whether they have work-related or non-work-related musculoskeletal injuries, and to provide indicators of the severity of those injuries such as duration and the use of medication. Lastly, survey participants were asked

whether they have had to reduce their practice volume as a direct result of a WMSD, and if they have filed a claim with their disability insurance. At the conclusion of the survey, participants were asked to provide their gender, age, whether they have disability insurance coverage, and to provide voluntary comments or additional information.

The survey was sent electronically to 1000 randomly selected orthodontists in the United States. The AAO Partners in Research program distributed the survey. A cover letter and link to complete the survey was emailed to active AAO members. An initially low response rate of 3.8% prompted an increase in the number of orthodontists contacted by email, totaling 2300. A follow-up reminder e-mail was sent four weeks later to the same selection of orthodontists to increase participation.

The survey was also mailed to 1000 general dentists in the United States. A third party mailing service (Virginia Commonwealth University Mailing Service) sent a paper version of the survey with a cover letter and return-addressed stamped envelope. Dentists were randomly selected from the ADA member directory. The distribution of active general dentist survey recipients was based on employment data per geographic US state published by the Bureau of Labor Statistics (accessed June 7, 2016).[28] For example, 12.9% of all general dentists in the United States were employed in California in 2015, therefore, the survey was sent to 129 general dentists in California. Mailed surveys were given a unique identification number for the third party mailing service to send a second mailing to recipients who did not respond to the original mailing. Seven hundred seventy-five general dentists received the second mailing of the survey. The second mailing was sent 8 weeks following the first mailing to allow adequate time for postal delivery.

Paper survey responses were manually entered into REDCap by an independent examiner. The date and time of data entry was recorded on each survey. Every 10th survey was manually checked for accuracy of data input by a separate examiner. If errors were found, they were corrected on a case-by-case basis.

Statistical Methods

Responses were analyzed using summary statistics, including counts and percentages or means and standard deviations as appropriate. Data were compared within each practitioner group and between groups. Comparisons in demographic information, practice volume, work habits, and physical activity were made using chi-squared tests to determine if there were differences between general dentists and orthodontists. Univariate comparisons between those with reported WMSDs and those without were tested using t-tests and chi-squared tests. An overall, multivariable logistic regression model of WMSD was constructed using backwards elimination. SAS EG v. 6.1 was used for all analyses and a significance level was set at 0.05.

RESULTS

Demographics

A total of 251 general dentists and 99 orthodontists responded to the survey, amounting to response rates of 26% and 4%, respectively. Respondents with a self-reported non-work-related injury that affected their ability to practice their specialty were excluded; this resulted in 12 general dentists (5%) and 4 orthodontists (4%) who were excluded. There was no difference in prevalence of non-work-related injuries affecting practice between specialties ($p=0.7652$). Demographics for orthodontists and general dentists are given in Table 1. General dentist respondents were significantly older than orthodontist respondents on average (50.4 vs. 47.5 years, respectively) ($p=0.0282$). Sixty-eight percent of general dentists were male; similarly, 72% of orthodontist respondents were male. There were significant differences between the specialties in terms of years in practice ($p<0.0001$): the majority of general dentist respondents were in practice for over 30 years (37%), whereas orthodontists with the highest response rate (29%) were in practice 21-30 years. The majority of respondents for both specialties were solo practice owners (66% of dentists and 72% of orthodontists), followed by those who were partners in a private practice, and lastly those who were associates and those employed by a University or Public Health-related clinic (described as “other” in Table 1).

Table 1: Demographics by Specialty

	General Dentists	Orthodontists	P-value*
Sample Size (Response Rate)	251 (26%)	99 (4%)	
Age (mean ±SD)	50.4 (±11.3)	47.5 (±10.3)	0.0282
Gender (n, %)			0.4983
Male	170 (68%)	71 (72%)	
Female	80 (32%)	28 (28%)	
Years in Practice (n, %)			<0.0001
1-5years	12 (5%)	20 (20%)	
6-10years	43 (17%)	7 (7%)	
11-20years	49 (20%)	27 (27%)	
21-30years	54 (22%)	29 (29%)	
31+years	92 (37%)	16 (16%)	
Primary Role (n, %)			0.6775
Solo Practice Owner	164 (66%)	71 (72%)	
Associate	21 (8%)	9 (9%)	
Partner in Private Practice	45 (18%)	14 (14%)	
Other	20 (8%)	5 (5%)	

*P-value from Chi-Squared or t-tests for differences between specialty

Data regarding practitioner work volume according to specialty is presented in Table 2. Regardless of specialization, 85% of respondents indicated that they treat patients for 7-9 hours per day. In fact, trends in workday length were nearly identical for both general dentists and orthodontists, with 85% of each group treating patients 7-9 hours per day, 11% for 10-12 hours per day, and only 4% treating patients less than 6 hours per workday. Significant differences were found between specialties regarding the number of workdays in a typical week, however. The majority of both groups reported treating patients 4 days per week. Dentists were more likely than orthodontists to work 5 days per week, at 26% versus 14%, respectively. Orthodontists treated significantly more patients per day than general dentists, with 77% of general dentists treating 1-30 patients per day and 72% of orthodontists treating 31-80 patients per day. No significant differences were found between groups regarding the number of continuous hours per day spent working without a break or the number of hours per day spent

standing in a static position while treating patients. When comparing the number of hours spent seated in a static position while treating patients, similar proportions of general dentists and orthodontists spent 3-4 hours per day seated statically, but significantly more general dentists than orthodontists spent 5+ hours per day seated in a static position (38% versus 17%, respectively) ($p<0.0001$). Moreover, 19% of general dentists were seated statically for 0-2 hours per day versus 39% of orthodontists. Thus, general dentists reported sitting in static positions for more hours per day than orthodontists.

Table 2: Work Volume by Specialty

	General Dentists	Orthodontists	P-value*
Workday Length (n, %)			0.9997
<6 hours	10 (4%)	4 (4%)	
7-9 hours	213 (85%)	84 (85%)	
10-12 hours	28 (11%)	11 (11%)	
Workdays per Week (n, %)			0.0224
2	6 (2%)	0 (0%)	
3	24 (10%)	16 (16%)	
4	149 (59%)	68 (69%)	
5	65 (26%)	14 (14%)	
6	7 (3%)	1 (1%)	
Patients per Day (n, %)			<0.0001
1-15	87 (35%)	1 (1%)	
16-30	106 (42%)	11 (11%)	
31-50	52 (21%)	36 (36%)	
51-80	5 (2%)	36 (36%)	
81+	0 (0%)	15 (15%)	
Hours Without Break (n, %)			0.5967
0-1 hours	23 (9%)	11 (11%)	
1-2 hours	87 (35%)	27 (27%)	
3-4 hours	110 (44%)	48 (48%)	
5+ hours	30 (12%)	13 (13%)	
Static: Seating (n, %)			<0.0001
0-1 hours	16 (6%)	8 (8%)	
1-2 hours	33 (13%)	31 (31%)	
3-4 hours	106 (42%)	43 (43%)	
5+ hours	95 (38%)	17 (17%)	
Static: Standing (n, %)			0.4712
0-1 hours	148 (59%)	66 (67%)	
1-2 hours	68 (27%)	20 (20%)	
3-4 hours	32 (13%)	11 (11%)	
5+ hours	3 (1%)	2 (2%)	

*P-value from Chi-Squared or t-tests for differences between specialty

Physical activity, stretching habits, and the use of alternative health remedies are presented in Table 3. Most practitioners reported exercising 1-2 or 3-4 days per week. Dentists were significantly more likely than orthodontists to take stretching breaks throughout their workday for 5+ minutes at a time (48% vs. 32%, respectively) (p=0.007); however, the majority of practitioners from both groups indicated they did not break for stretching. Most dentists and

orthodontists did not stretch for 10 or more minutes on a daily basis five days per week (93% and 97%, respectively). Dentists were significantly more likely to utilize alternative health remedies than were orthodontists on a weekly basis (28% vs. 15%, respectively) (p=0.0123).

Table 3: Physical Activity by Specialty

	General Dentists	Orthodontists	P-value*
Daily Exercise (Days/Week) (n, %)			0.0873
0	45 (18%)	14 (14%)	
1-2	73 (29%)	23 (23%)	
3-4	89 (35%)	48 (48%)	
5-6	35 (14%)	14 (14%)	
7	9 (4%)	0 (0%)	
Stretch Breaks During Workday (n, %)			0.007
Yes	121 (48%)	32 (32%)	
No	130 (52%)	67 (68%)	
Daily Stretching 10+ minutes (Days/Week) (n, %)			0.1418
≤5	233 (93%)	96 (97%)	
5+	18 (7%)	3 (3%)	
Utilization of Alternative Remedies (n, %)			0.0123
Yes	70 (28%)	15 (15%)	
No	181 (72%)	84 (85%)	

*P-value from Chi-Squared or t-tests for differences between specialty

Work-Related Musculoskeletal Disorder Prevalence and Impact

The overall prevalence of work-related musculoskeletal disorders was significantly different between the two specialties (p=0.0001). For general dentists, 64% reported a WMSD compared to 41% of orthodontists. Prevalence of WMSD according to gender, specialty, and years in practice is presented in Figure 1. The regions most affected were low back, neck, wrist or hand, and shoulders (Figure 2). General dentists and orthodontists reported similar rates of

WMSD in each area except the shoulder, which was reported significantly less often for general dentists than orthodontists (38% vs. 79%, respectively) ($p<0.0001$).

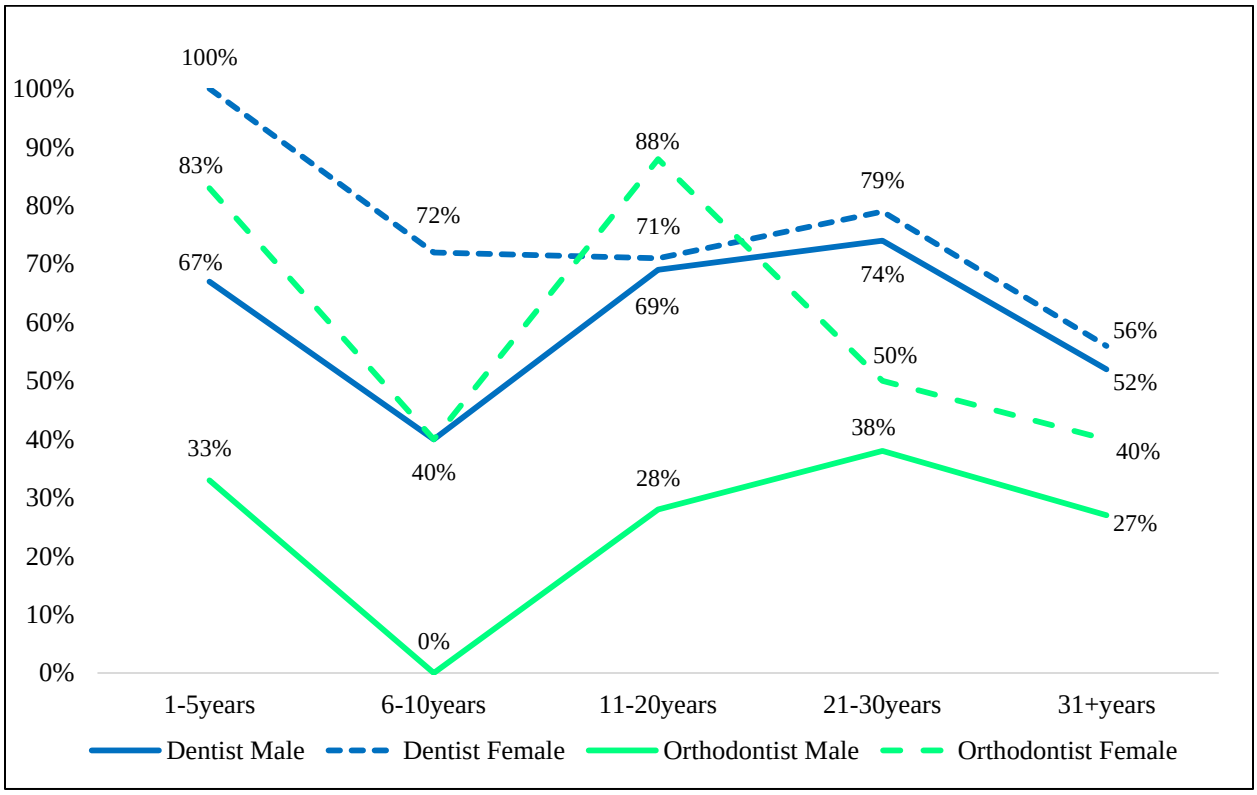

Figure 1: WMSD Prevalence by Gender, Specialty, and Years in Practice

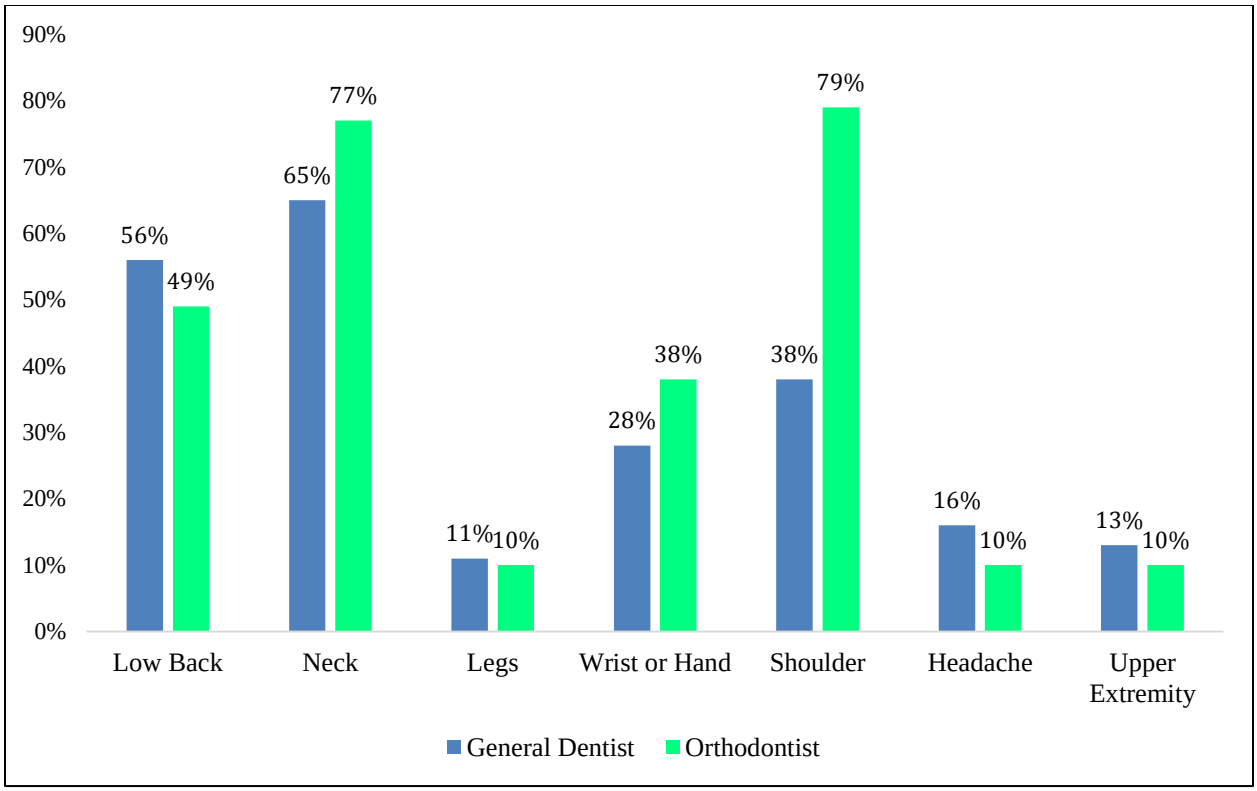

Figure 2: Regions Affected by Work-Related Musculoskeletal Disorders

The impact of WMSDs was most often reported as self-limiting (72% for general dentists and 69% for orthodontists). The reported outcomes from the presence of a work-related musculoskeletal disorder are displayed by specialty in Figure 3. Twenty-nine percent of general dentists and 18% of orthodontists reported taking non-prescription medication due to the presence of a WMSD. Similar proportions of general dentists and orthodontists reported taking prescription medication (3% for both specialties) and filing an income disability insurance claim (2% and 3%, respectively) due to the presence of a WMSD. Dentists were more likely than orthodontists to stop practicing (10% vs. 3%, respectively) or to reduce the volume of their practice (11% vs. 5%, respectively). None of the reported outcomes were significantly different between specialties (Figure 3).

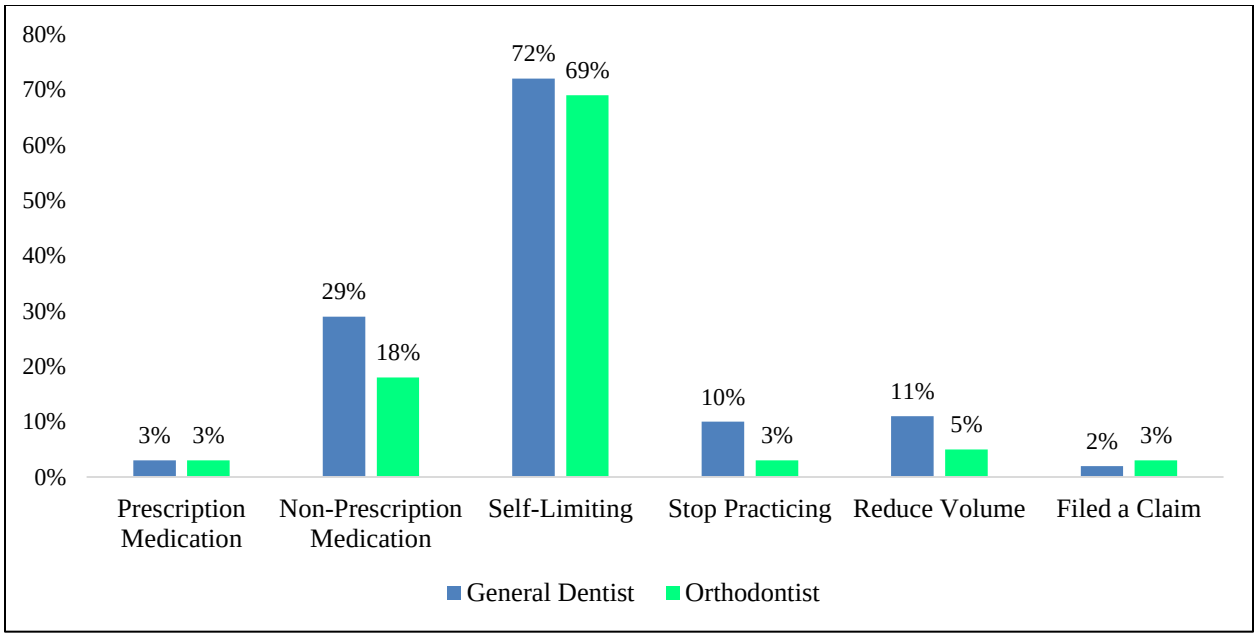

Figure 3: Impact of Work-Related Musculoskeletal Disorders by Specialty

Income Disability Insurance

Eighty-five percent of general dentists and 91% of orthodontists reported that they currently own an income disability insurance policy. There was no significant difference in the reported disability coverage between specialties (p=0.2030). No significant trend was identified for owning a disability insurance policy based on number of years in practice (p=0.3542) (Table 4). However, there was a statistically significant decrease in income disability insurance policy ownership after more than 10 years in practice (85%) versus 10 years or less (94%) (p=0.0324).

Table 4: Reported Income Disability Insurance Coverage: All Practitioners

Years in Practice	Number of Respondents with Disability Insurance Coverage (n, % of Subcategory)
1-5 years	28 (93%)[a]
6-10 years	44 (94%)[a] } P=0.0324*
11-20 years	62 (85%)[b]
21-30 years	70 (86%)[b]
31+ years	84 (83%)[b]

*P-value from t-tests for differences between 1-10 and 11-31+ years in practice
a vs. b: Statistically significant relationship, P=0.0324

Although nearly 70% of survey respondents reported having a work-related musculoskeletal disorder, only 3% reported actually filing a disability insurance claim for their disorder. Respondents were also asked whether they agreed with the statement, "There is no financial benefit in filing a claim with my disability insurance for a work-related musculoskeletal injury or discomfort". Forty-four percent of general dentists and 36% of orthodontists agreed with this statement, whereas 39% and 54% were neutral, respectively. A complete summary of survey responses is given in Figure 4.

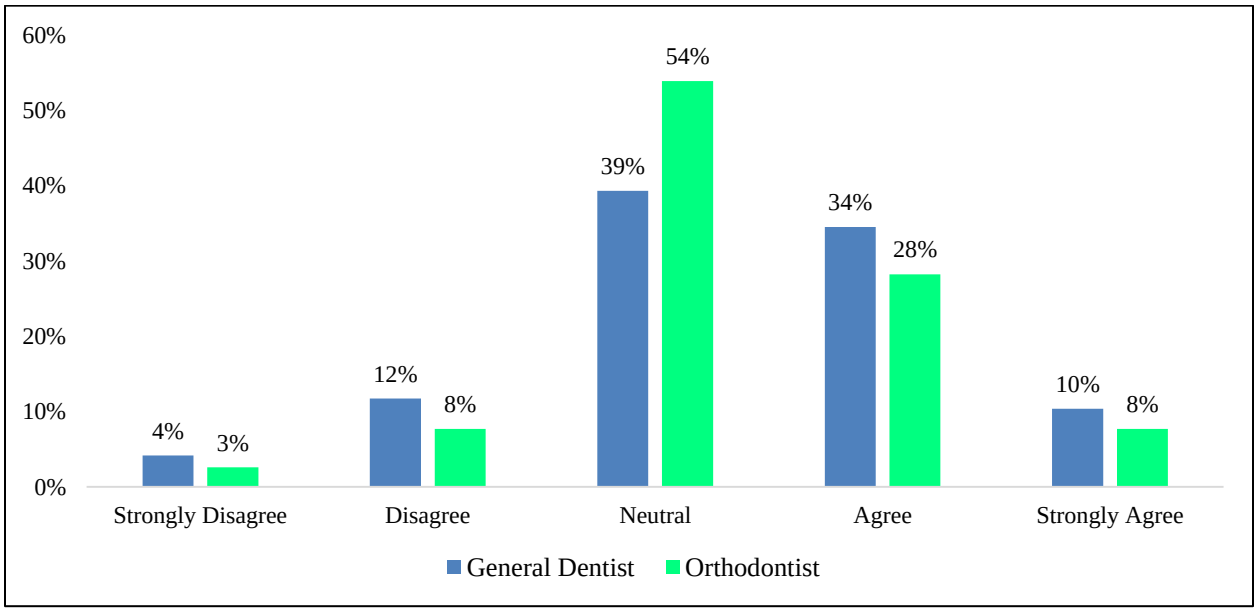

Figure 4: Response to "There is No Financial Benefit in Filing a Disability Insurance Claim"

Factors Associated with Work-Related Musculoskeletal Disorders

For general dentists and orthodontists, demographics, work schedule and work habits, and physical activity measures were each analyzed for associations with WMSD.

Demographic data for general dentists and its association with WMSD are presented in Table 5. For general dentists, females were significantly more likely to report WMSD than males (74% vs. 60%, p=0.0352). Dentists in practice 1-5 years reported the highest rate of WMSD (83%), and those in practice 31+ years reported the lowest rate of WMSD (52%) (p=0.0236). Dentists who reported WMSD were not significantly different in age than those who did not (49.3 years vs. 52 years, p=0.0796). Whether a general dentist was a solo practice owner, associate or partner in a private practice did not factor significantly into whether they reported WMSDs, although associates reported the highest rate of WMSD (80%).

Table 5: Analysis of General Dentists: Demographics and Reported WMSD

Reported WMSD:	**Yes**	**No**	**P-value***
Age (mean ±SD)	49.3 (±10.9)	52.0 (±11.7)	0.0796
Gender (n, %)			0.0352
Male	96 (60%)	65 (41%)	
Female	56 (74%)	20 (26%)	
Years in Practice (n, %)			0.0236
1-5years	10 (83%)	1 (17%)	
6-10years	24 (60%)	16 (40%)	
11-20years	33 (70%)	14 (30%)	
21-30years	41 (76%)	13 (24%)	
31+years	44 (52%)	40 (48%)	
Primary Role (n, %)			0.3533
Solo Practice Owner	94 (61%)	59 (39%)	
Associate	16 (80%)	4 (20%)	
Partner in Private Practice	27 (61%)	17 (39%)	
Other	15 (75%)	5 (25%)	

*P-value from Chi-Squared or t-test for differences between those with WMSD and those without
†Percentages total to 100% by row

The effect of practice volume (workday length, workdays per week, and patients per day) and work habits (hours without break, hours in a static seated position, and hours in a static standing position) on the development of WMSD for general dentists is given in Table 6. Specifically, those dentists who worked longer days had the highest rate of WMSD (23 of 28 or 82%), and those who spent 0-1 hours sitting had the lowest rate of WMSD (5 of 14 or 36%). Time spent in a static standing position was marginally significant due to the 5+ hours subcategory (0% with and without WMSD, respectively); after removing the 5+ hours subcategory, this category was no longer significant (p=0.2528). Dentists with and without reported WMSD had similar distributions of the number of workdays per week, patients per day, and hours worked without break; therefore, it is not likely that these variables factored heavily into whether a dentist reported WMSD or not.

Table 6: Analysis of General Dentists: Work Volume / Work Habits and Reported WMSD

Reported WMSD:	Yes	No	P-value*
Workday Length (n, %)			0.095
≤6 hours	7 (5%)	3 (4%)	
7-9 hours	123 (80%)	77 (91%)	
10-12 hours	23 (15%)	5 (6%)	
Workdays per Week (n, %)			0.1909
2	3 (2%)	2 (2%)	
3	11 (7%)	12 (14%)	
4	99 (65%)	42 (49%)	
5	36 (24%)	26 (31%)	
6	4 (3%)	3 (4%)	
Patients per Day (n, %)			0.5558
1-15	52 (34%)	32 (38%)	
16-30	68 (45%)	32 (38%)	
31-50	28 (18%)	20 (24%)	
51-80	4 (3%)	1 (1%)	
81-120	0 (0%)	0 (0%)	
120+	0 (0%)	0 (0%)	
Hours Without Break (n, %)			0.3093
0-1 hours	9 (6%)	11 (13%)	
1-2 hours	54 (36%)	28 (33%)	
3-4 hours	70 (46%)	35 (41%)	
5+ hours	19 (13%)	11 (13%)	
Static: Seating (n, %)			0.0679
0-1 hours	5 (3%)	9 (11%)	
1-2 hours	23 (15%)	7 (8%)	
3-4 hours	63 (41%)	36 (43%)	
5+ hours	62 (41%)	32 (38%)	
Static: Standing (n, %)			0.0871
0-1 hours	93 (61%)	48 (56%)	
1-2 hours	43 (28%)	21 (25%)	
3-4 hours	17 (11%)	16 (19%)	
5+ hours	0 (0%)	0 (0%)	

*P-value from Chi-Squared test for differences between those with WMSD and those without
†Percentages total to 100% by column

The physical activity measures utilized by general dentists and their association with WMSD are summarized in Table 7. For those dentists with reported musculoskeletal disorders, daily exercise, daily stretching, and stretching break utilization were not significantly associated

with reported WMSD. Of the total number of dentists who utilized alternative medical remedies, 77% reported having a WMSD and 23% did not (p=0.0121).

Table 7: Analysis of General Dentists: Physical Activity and Reported WMSD

Presence of WMSD:	**Yes**	**No**	**P-value***
Daily Exercise (Days/Week) (n, %)			0.3935
0	26 (62%)	16 (38%)	
1-2	42 (59%)	29 (41%)	
3-4	58 (69%)	26 (31%)	
5-6	23 (72%)	9 (28%)	
7	4 (44%)	5 (56%)	
Stretch Breaks During Workday (n, %)			0.5878
Yes	74 (66%)	38 (34%)	
No	79 (63%)	47 (37%)	
Daily Stretching 10+ minutes (Days/Week) (n, %)			0.8773
≤5	143 (64%)	79 (36%)	
5+	10 (63%)	6 (38%)	
Utilization of Alternative Remedies (n, %)			0.0121
Yes	48 (77%)	14 (23%)	
No	105 (60%)	71 (40%)	

*P-value from Chi-Squared test for differences between those with WMSD and those without
†Percentages total to 100% by row

Demographic data for orthodontists and its association with WMSD are presented in Table 8. Among orthodontists, the only demographic factor statistically significantly associated with WMSD was gender (p=0.0031); females were significantly more likely to report WMSD than males (65% vs. 32%, respectively). Similar to general dentists, the orthodontists who were earliest in their careers reported the highest rate of WMSD (1-5 years, 50%). Orthodontists in practice 6-10 years reported the lowest rate of WMSD (29%). Also similar to general dentists, the orthodontist's role in their practice did not factor significantly into whether they reported a WMSD, and orthodontic associates also reported the highest rate of WMSD (56%).

Table 8: Analysis of Orthodontists: Demographics and Reported WMSD

Presence of WMSD:	**Yes**	**No**	**P-value***
Age (mean ±SD)	47.2 (±10.3)	48.1 (±10.5)	0.6497
Gender (n, %)			0.0031
Male	22 (32%)	47 (68%)	
Female	17 (65%)	9 (35%)	
Years in Practice (n, %)			0.7363
1-5years	9 (50%)	9 (50%)	
6-10years	2 (29%)	5 (71%)	
11-20years	12 (46%)	14 (54%)	
21-30years	11 (39%)	17 (61%)	
31+years	5 (31%)	11 (69%)	
Primary Role (n, %)			0.7635
Solo Practice Owner	26 (38%)	42 (62%)	
Associate	5 (56%)	4 (44%)	
Partner in Private Practice	6 (43%)	8 (57%)	
Other	2 (50%)	2 (50%)	

*P-value from Chi-Squared test for differences between those with WMSD and those without
†Percentages total to 100% by row

The effect of work volume/habits and physical activity on the development of WMSD for orthodontists is presented in Table 9 and Table 10. There were no significant differences found among orthodontists with and without reported WMSD regarding work volume/habits and physical activity. Proportions of orthodontists with and without reported WMSD were similar for all work volume/habits categories; therefore, no trends were identified in association with WMSD for orthodontic practice measures (Table 9).

Table 9: Analysis of Orthodontists: Work Volume / Work Habits and Reported WMSD

Presence of WMSD:	Yes	No	P-value*
Workday Length (n, %)			0.7426
≤6 hours	1 (3%)	3 (5%)	
7-9 hours	34 (87%)	46 (82%)	
10-12 hours	4 (10%)	7 (13%)	
Workdays per Week (n, %)			0.8961
2	0 (0%)	0 (0%)	
3	7 (18%)	9 (16%)	
4	27 (69%)	38 (68%)	
5	5 (13%)	9 (16%)	
6	0 (0%)	0 (0%)	
Patients per Day (n, %)			0.6894
1-15	1 (3%)	0 (0%)	
16-30	4 (10%)	7 (13%)	
31-50	14 (36%)	20 (36%)	
51-80	14 (36%)	20 (36%)	
81-120	6 (15%)	7 (13%)	
120+	0 (0%)	2 (4%)	
Hours Without Break (n, %)			0.7115
0-1 hours	4 (10%)	7 (13%)	
1-2 hours	12 (31%)	15 (27%)	
3-4 hours	17 (44%)	29 (52%)	
5+ hours	6 (15%)	5 (9%)	
Static: Seating (n, %)			0.8207
0-1 hours	3 (8%)	5 (9%)	
1-2 hours	11 (28%)	20 (36%)	
3-4 hours	19 (49%)	22 (39%)	
5+ hours	6 (15%)	9 (16%)	
Static: Standing (n, %)			0.492
0-1 hours	23 (59%)	41 (73%)	
1-2 hours	11 (28%)	9 (16%)	
3-4 hours	4 (10%)	5 (9%)	
5+ hours	1 (3%)	1 (2%)	

*P-value from Chi-Squared test for differences between those with WMSD and those without
†Percentages total to 100% by column

Orthodontists who reported exercising 3-4 and 5-6 days per week were less likely to report WMSD (33% with WMSD vs. 67% without for 3-4 days of exercise per week, and 38% with WMSD vs. 62% without for 5-6 days per week); however, these differences were not

statistically significant (p=0.3195) (Table 10). Daily stretching for thirty minutes per day five days per week was marginally significant (p=0.0868) due to the fact that very few orthodontists reported stretching for more than five days per week (n=2). Of the 13% of orthodontists who utilized alternative remedies (excluding orthodontists with a previous non-work-related musculoskeletal injury), 54% reported WMSD and 46% did not, however, the subcategory sample size was relatively small (n=7 and n=6, respectively). Moreover, this difference was not statistically significant (p=0.3128) (Table 10).

Table 10: Analysis of Orthodontists: Physical Activity and Reported WMSD

Presence of WMSD:	**Yes**	**No**	**P-value***
Daily Exercise (Days/Week) (n, %)			0.3195
0	7 (50%)	7 (50%)	
1-2	12 (55%)	10 (45%)	
3-4	15 (33%)	31 (67%)	
5-6	5 (38%)	8 (62%)	
7	0 (0%)	0 (0%)	
Stretch Breaks During Workday (n, %)			0.3428
Yes	12 (48%)	15 (52%)	
No	25 (38%)	41 (62%)	
Daily Stretching 10+ minutes (Days/Week) (n, %)			0.0868
≤5	37 (40%)	56 (60%)	
5+	0 (0%)	2 (100%)	
Utilization of Alternative Remedies (n, %)			0.3128
Yes	7 (54%)	6 (46%)	
No	32 (39%)	50 (61%)	

*P-value from Chi-Squared test for differences between those with WMSD and those without
†Percentages total to 100% by row

The overall model of work-related musculoskeletal disorders considered all factors to evaluate their association with the presence or absence of WMSD [specialty, demographics (age, gender, years in practice, professional role), work volume and work habits, and physical activity] (Table 11). The only factors that were significantly associated with WMSD were specialty

(p<0.0001), gender (p=0.0036), years in practice (p=0.0232), and the use of alternative remedies (p=0.0267). General dentists were three times more likely than orthodontists to report WMSD (95% CI: 1.8-5.6). Females were twice as likely to report WMSD as compared to males (95% CI: 1.3-4.2). Those who reported seeking alternative remedies were also two times more likely to have WMSD (95% CI: 1.09, 3.57). Regarding years in practice, those with 6-10 years in practice were less likely to report WMSD than those with 1-5 years (OR: 3.2), 11-20 (OR: 2.4), and 21-30 years in practice (OR: 2.9). The difference between those practicing 6-10 years and ≥31 years was not statistically significant.

Table 11: Overall Model of Work-Related Musculoskeletal Disorders

	Odds Ratio	95% CI	P-value†
Specialty			<0.0001
General Dentist vs. Orthodontist*	3.197	(1.84, 5.55)	
Gender			0.0036
Female vs. Male*	2.367	(1.32, 4.23)	
Years in Practice			0.0232
1-5 years vs. 6-10 years*	3.196	(1.09, 9.37)	
11-20 years vs. 6-10 years*	2.361	(1.03, 5.39)	
21-30 years vs. 6-10 years*	2.874	(1.24, 6.65)	
31+ vs. 6-10 years	1.26	(0.58, 2.76)	
Alternative Remedies			0.0267
Yes vs. No Alternative Remedies*	1.98	(1.09, 3.57)	

*Indicates statistically significant pairwise comparison
†P-value from overall logistic model

DISCUSSION

Sample Demographics

According to the ADA Health Policy Institute and the AAO, approximately 155,100 general dentists and 10,500 orthodontists were employed in the United States in 2016. Approximately 70% of dentists and 73% of orthodontists were male.[25,29] Our study sample was comprised of 68% male general dentists and 73% male orthodontists; therefore our sample was representative of the US population of dentists and orthodontists according to gender.

This study's sample of general dentists was older than the orthodontist sample (50.4 vs. 47.5 years old, respectively, p=0.0282). Thus, our samples were not fully comparable according to age. However, our survey focused on each practitioner's number of years in practice as a basis for comparison between specialties rather than individual age, and statistical models were adjusted according to years in practice. Moreover, it is debatable whether a 2.9-year age difference is clinically significant.

The sample sizes and response rates were very different between specialties in this study, with a total of 251 general dentist and 99 orthodontist respondents amounting to response rates of 26% and 4%, respectively. This difference in response rate could be accounted for by different delivery methods of the survey, such that fewer orthodontists responded due to the high volume of daily emails sent and received in this digital age. Older general dentists may have been more likely to respond to a paper survey than younger dentists, which may account for the largest response rate among dentists 31 or more years in practice. Similarly, younger orthodontists may have been more likely than older orthodontists to respond to a digital survey. A larger number of orthodontists were contacted in this survey due to a very low initial response rate of 38 out of 1000 AAO members (3.8%). However, increasing the number of survey recipients did not

significantly affect the overall response rate (4%). Despite the low response rate from orthodontists, the sample seemed representative of the United States population of orthodontists with the exception of orthodontists 6-10 years in practice.[29] According to the number of years in practice, trends for WMSD prevalence for orthodontists were similar to dentists despite different sample sizes. Additionally, a limitation of this study was that investigators were not able to verify whether orthodontists provided survey data more than once because no personal health identifiers were collected for this research. Thus, it is possible that duplicate responses were recorded for orthodontic subject data.

Risk Factors for Work-Related Musculoskeletal Disorders

General dentists were three times more likely than orthodontists to report WMSD in this study. Although the practice of orthodontics may seem less physically demanding of practitioners than general dentistry, more than one-third of orthodontists reported work-related musculoskeletal problems (41% of orthodontists compared with 64% of general dentists). Thus, despite the low sample size and response rate of orthodontists, this study proved that a significant portion of orthodontists and nearly two-thirds of dentists experience musculoskeletal pain as a result of their work. A study on comparisons of instantaneous and cumulative loads on the low back and neck in orthodontists found that although spinal load during prolonged sitting is low and static postures sustained for 10-15 seconds (on average for orthodontists) seem harmless, such prolonged postures are rendered hazardous by virtue of their frequency and duration on a daily and yearly basis.[4]

Associates of both specialties reported the highest rate of WMSD in this study compared to solo practitioners, partners in private practice, and other employed practitioners (Table 5,

Table 8). This may be because associates spend a greater proportion of their workday treating patients than performing administrative work in comparison to practice owners. When both genders were considered, practitioners 1-5 years in practice also reported the highest rate of WMSD. Increased prevalence of WMSD among young dentists is a finding also reported in previous studies.[11,19,30] The results of the present study indicate that dentists and orthodontists earliest in their careers were more susceptible to WMSD. However, a decrease in WMSD among all practitioners with 6-10 years of experience may indicate that practitioners at this point have learned to adjust their posture to improve ergonomics and to modify their work habits to decrease symptoms and discomfort. During years 6-10 in practice, doctors may also begin to increase delegation of manual work tasks to assistants, perhaps due to an increase in administrative work load due to practice growth or an increase in patient volume. It is likely that all practitioners 6-10 years in practice are very busy, and although the response rate for general dentists was much higher than orthodontists for this category, the two groups reported similar trends of WMSD (Table 1, Figure 1).

When male and female practitioners were analyzed separately, the highest prevalence of WMSD throughout careers differed. For male practitioners of both specialties, the highest prevalence of WMSD was during years 21-30 (74% for male dentists and 38% for male orthodontists, Figure 1). The highest reported WMSD for female dentists was during years 1-5 (100%). For female orthodontists, reported WMSD peaked among practitioners with 11-20 years of experience (88% vs. 83% prevalence at years 1-5). After 10 years in practice for both male and female dentists and male orthodontists, WMSD prevalence increased approaching 30 years of experience. This may be a result of increasing age of the individual practitioner. Female orthodontists were the least represented group in our overall sample (28 respondents, Table 1),

therefore, it is possible that the different trend of WMSD prevalence for this group was due to the small sample size.

Reported WMSD finally tapered off among practitioners with more than 30 years of experience for all groups. A possible explanation for this decreasing trend may be that those with musculoskeletal disorders have by this point left the profession, which has also been suggested in previous investigations.[12,19] When practitioners of both genders were analyzed together, musculoskeletal discomfort appeared to correlate inversely with years of experience, which has been suggested in previous literature.[8,11,19,30] However, when male and female practitioners of each specialty were analyzed separately in the present study, this trend was disproven.

Female practitioners of both specialties were more likely to report WMSD than males in the present study. Previous studies have reported mixed results regarding gender and prevalence of WMSD.[9,16,18,26,30-32] Kerosuo et al[9], Marshall et al[31], Chowandadisai et al[30], and a survey by the ADA[26] reported greater prevalence of WSMD among female dentists, whereas Decharat et al[18] found males to have significantly higher WMSD prevalence than female dental health care workers. Rankin et al[32] found female dentists more likely to report headaches than male counterparts, but otherwise found both genders equally susceptible to general health problems. Kerusuo et al[9] found that female dentists and orthodontists were significantly more likely to report musculoskeletal complaints than males, and men estimated their health problems to be severe significantly less often than females.

Areas impacted by WMSD were generally the same between specialties with the exception of shoulder pain, which was more heavily reported by orthodontists (79% vs. 38% for dentists, $p<0.0001$, Figure 2). This finding was unexpected considering orthodontists are less likely than dentists to sustain static postures, and may indicate that orthodontists are more

susceptible to shoulder disuse while treating patients. Previous studies of all dental professionals have found that the type of dentistry practiced is correlated with pain in different body areas.[22,33] A study by Lalumandier et al[33] of musculoskeletal disorders among all dental specialties found dentists and orthodontists to be equally affected in terms of areas impacted by WMSD, in the descending order of back, neck, shoulders, legs, and lastly arms. The present study found that among dentists, neck pain was reported most frequently (65%), followed by low back (56%), shoulder (38%), and wrist or hand pain (28%) (Figure 2). Leg pain was reported least for general dentists (11%). Orthodontists reported shoulder pain most frequently (79%), followed by a 77% prevalence of neck pain, low back pain (49%), and wrist or hand pain (38%). Leg pain was also among the least reported areas impacted by WMSD for orthodontists (10%), along with headache (10%) and upper extremity pain (10%).

Previous research has positively correlated longer appointment length with musculoskeletal pain among dentists.[19,30] This study did not ask practitioners to report average appointment length due the large heterogeneity of appointment types among dentists and orthodontists; rather, practitioners reported other practice volume data such as daily patient volume, workday length and workdays per week. Thus, this study assumed that a smaller daily patient load was correlated with longer appointment length for practitioners when the same workday length was considered. No significant correlations were found in this study relating patient volume, workday length, or workdays per week to WMSD prevalence in dentists or orthodontists.

Awareness of the harmful effects of sitting for extended periods has increased among the United States workforce in recent years.[34-38] This study identified trends among practitioners regarding time spent seated and standing while practicing dentistry, however these results were

not significant: general dentists with reported WMSD tended to spend more time seated and less time standing in static positions while treating patients, and the highest proportion of orthodontists with reported WMSD also spent the least time standing in our study. Estimated time spent seated and standing was self-reported by practitioners, and it is possible that estimates were not completely accurate. Ratzon et al[39] found a significant correlation between length of time spent sitting and severity of low back pain among dentists, and Shugars et al[40] found that general dentists who spent 80-100% of the time practicing while seated reported more frequent low back pain than dentists who stand more while practicing. Interestingly, Lalumandier et al[33] also found that oral and maxillofacial surgeons who spent the most hours standing of all dental professionals reported twice as much leg pain than general dentists, and ultimately recommended incorporating as much variety as possible into daily postural habits.

Dentists who reported exercising 3-4 and 5-6 days per week also indicated the presence of WMSD. It is not clear whether an increase in WMSD is correlated with more exercise or that dentists are likely to exercise to alleviate symptoms of WMSD. The opposite was true for orthodontists who exercised 3-4 and 5-6 days per week, where exercise was correlated with absence of WMSD (33% with vs. 67% without WMSD for 3-4 days of exercise per week, and 38% with vs. 62% without WMSD for 5-6 days of exercise per week). Interestingly, if a practitioner reported a WMSD, they were statistically significantly more likely to utilize alternative remedies than if they did not report a WMSD. Thus, it is also likely that practitioners utilize alternative remedies as a means to alleviate musculoskeletal discomfort, as opposed to employing these measures preventively.

Income Disability Insurance

The reported 3% rate of income disability insurance claims among all practitioners in this study (2% for dentists and 3% for orthodontists, Figure 3) is similar to that reported for long-term disabilities (3.56%) in a cohort study of insured orthodontists.[7] It is possible that a majority of practitioners are not filing disability insurance claims due to a WMSD because nearly 70% of WMSDs reported in this study are self-limiting. Additionally, many income disability insurance policies impose a 90-day waiting period before benefits are dispersed. This study did not demonstrate that orthodontists file fewer income disability insurance claims than general dentists due to WMSD, despite the lower prevalence of WMSD found among this specialty.

Occupational Sitting

As prolonged static posture has been linked to health risks, standing work stations have recently received significant attention in hopes of reducing sitting time at work.[41,42] Office-based ergonomic interventions, such as "Take a Stand!" and "JustStand.org" are among efforts recently established to provide a healthier work environment.[42,43]

A study by Danquah et al[44] reported that the office-based intervention "Take a Stand!" reduced neck and shoulder pain after three months, suggesting that alternating work postures may be helpful in reducing adverse health outcomes. However, a recent systematic review[34] concluded that at present there is little evidence that sit-stand desks can reduce sitting time at work. Furthermore, it is noted that the health benefits of standing are not well-known and future studies with longer duration and larger sample size are needed to determine the healthiest way to work.

The current study was timely as it focused on WMSDs in dental professionals, a topic discussed in a recent issue of The Practice Management Bulletin.[45] According to the February 2017 issue of this publication, overexertion and bodily reaction are common occupational hazards in the dental profession; in 2016, 520 individuals in the dental field were affected by this type of work-related injury.[45] The recommendations such as using ergonomic furniture, periodic breaks and stretching were included as tips to prevent WMSD.

Limitations

The subject of ergonomics and work-related musculoskeletal disorders in dentistry may be more relevant to general dentists than orthodontists, as evidenced by the results of this study, which could lead to an increase in response bias of dentists and nonresponse bias of orthodontists. Regardless of specialty, individuals who are affected by WMSD may have been more likely to respond to this survey because they take personal interest in the subject matter. This could have inflated the reported prevalence of WMSD in this study.

In the present study, the sample size and response rate of orthodontists was considerably lower than that of general dentists, relatively weakening the data regarding orthodontists. Moreover, orthodontists may have responded more than once to the survey due to the fact that no personal health identifiers or unique survey identifiers were used for electronic survey delivery and response.

This study did not allow for identification of direct cause and effect relationships between demographics, work volume and physical activity variables analyzed. However, practitioners with reported WMSD did indicate the direct impact of their discomfort or disorder on their

practice habits and lifestyle, and those results are presented by specialty in Figure 3. Clear trends among practitioners who are symptom-, injury-, and disorder-free were not identified.

Future studies that specifically ask individual practitioners what measures they employ to prevent musculoskeletal discomfort would provide additional information. Additional studies that differentiate between doctor-workload and assistant-workload would also be helpful.

CONCLUSIONS

The etiology of work-related musculoskeletal disorders among dentists and orthodontists is complex. General dentists were 3.1 times more likely than orthodontists to report WMSD, females were 2.4 times more likely than males to report WMSD, practitioners 1-5, 11-20, and 21-30 years in practice were 2-3 times more likely than those 6-10 years in practice to report WMSD, and those who utilized alternative medical remedies were 1.9 times more likely to report WMSD than those practitioners who did not.

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APPENDIX

Work-Related Musculoskeletal Disorders Survey:

Definition of terms:

Musculoskeletal Disorder: Injury or pain in the body's joints, ligaments, muscles, nerves, tendons, and structures that support the limbs, neck and back. [Centers for Disease Control and Prevention]

Static Posture: Posture that requires contraction of over 50% of the body's muscles to keep it still whilst resisting the forces of gravity [Valachi 2003].

In the context of this survey, static posture refers to an un-ergonomic position that the practitioner may experience while treating a patient, either seated or standing.

This survey will take approximately 5 minutes of your time. We thank you!

1. Which best defines your specialty:
☐General Dentistry
☐Orthodontics

2. Years in Practice:
☐1-5 ☐6-10 ☐11-20 ☐21-30 ☐30+

Please answer the remaining questions in regard to the past 12 months.

3. I have routinely practiced my dental specialty in the last 12 months.
☐Yes
☐No

4. Average workday length:
☐1-3 hours ☐4-6 hours ☐7-9 hours ☐10-12 hours

5. Number of workdays in a typical week:
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7

6. Approximate number of patients in a typical day:
☐1-15 ☐16-30 ☐31-50 ☐51-80 ☐81-120 ☐120+

7. Total number of hours per day I spend SEATED in a static position during procedures:
[In the context of this survey, static posture refers to an un-ergonomic position that the practitioner may experience while treating a patient, either seated or standing.]
☐0-1 hours ☐1-2 hours ☐3-4 hours ☐5+ hours

8. Total number of hours per day I spend STANDING in a static position during procedures:
[In the context of this survey, static posture refers to an un-ergonomic position that the practitioner may experience while treating a patient, either seated or standing.]
☐0-1 hours ☐1-2 hours ☐3-4 hours ☐5+ hours

9. Please select the answer that describes your primary role in your practice:
☐Solo Practice Owner
☐Associate
☐Partner in Private Practice
☐Employed by a Corporate-Owned Company or a University
☐Employed in Public Health Related Clinic
☐Other: _____ (Please specify)

10. In order to prevent or alleviate work-related musculoskeletal discomfort, I routinely (check all that apply):
☐Stretch during my workday
☐Take breaks during my workday
☐Exercise
☐None of the above

11. Number of days/week that I exercise (30+ minutes of aerobic exercise, strengthening exercise such as weight-lifting, or yoga, etc):
☐0 ☐1-2 ☐3-4 ☐5-6 ☐7

12. Number of days/week that I perform 10+ minutes of full-body stretching (may include yoga):
☐0 ☐1-2 ☐3-4 ☐5-6 ☐7

13. Number of days/week I seek alternative health remedies including massage, acupuncture, chiropractics, heating pad, or physical therapy (to prevent/alleviate musculoskeletal discomfort?):
☐0 ☐1-2 ☐3-4 ☐5-6 ☐7

14. Number of stretching breaks/workday (for at least 5 minutes):
☐0 ☐1-2 ☐3-4 ☐5-6 ☐7

15. Average number of hours/workday I practice continuously without taking a break:
☐0-1 hours ☐1-2 hours ☐3-4 hours ☐5+ hours

16. I would implement a daily stretching routine if it were proven to prevent work-related musculoskeletal injuries.
☐Strongly Disagree ☐Disagree ☐Neutral ☐Agree ☐Strongly Agree

17. I regularly have **NON-work-related** musculoskeletal discomfort or a previous musculoskeletal injury not caused by my work.
☐Yes ☐No

18. Does your NON-work-related musculoskeletal discomfort affect your ability to practice normally?
☐Yes ☐No ☐N/A

19. I regularly have **work-related** musculoskeletal discomfort.
☐Yes ☐No
If yes, please select all of the affected regions:
☐Low back
☐Neck
☐Lower extremities (legs)
☐Wrist or hand
☐Shoulder
☐Headache
☐Upper extremities
☐None
☐Other: _____

If you answered yes to question 19, please answer questions 20-27:

20. On average, my work-related musculoskeletal discomfort level is:
☐Mild ☐Moderate ☐Severe

21. I regularly take NON-prescription medication for my discomfort.
☐True ☐False

22. I regularly take prescription medication for my discomfort.
☐True ☐False

23. My work-related musculoskeletal discomfort is self-limiting (short duration, goes away without medical intervention).
☐True ☐False

24. I have had to stop practicing for a period of time due to work-related musculoskeletal discomfort.
☐True ☐False

25. I have had to reduce my practice volume (daily hours, daily patient volume or #workdays/week) due to work-related musculoskeletal discomfort.
☐True ☐False

26. I have filed a claim with my disability insurance for a work-related musculoskeletal injury or discomfort.
☐True ☐False ☐I do not have disability insurance

27. There is no financial benefit in filing a claim with my disability insurance for a work-related musculoskeletal injury or discomfort.
☐Strongly Disagree ☐Disagree ☐Neutral ☐Agree ☐Strongly Agree

Demographics

Gender: ☐Male ☐Female

Age: _____ (Must be between 20 years old and 85 years old)

I currently have disability insurance coverage: ☐Yes ☐No

Please feel free to provide any additional information or comments.