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THESIS APPROVAL PAGE FOR MASTER OF SCIENCE IN ORAL BIOLOGY

Title of Thesis: 3-year retrospective evaluation of sleep disturbance patients between an orofacial pain center and a sleep medicine clinic

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April 14, 2023

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3-YEAR RETROSPECTIVE EVALUATION OF SLEEP DISTURBANCE PATIENTS
BETWEEN AN OROFACIAL PAIN CENTER AND A SLEEP MEDICINE CLINIC

by

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A thesis submitted to the Faculty of the
Orofacial Pain Graduate Program
Naval Postgraduate Dental School
Uniformed Services University of the Health Sciences
In partial fulfillment of the requirements for the degree of
Master of Science
in Oral Biology
June 2023

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ABSTRACT

3-Year Retrospective Evaluation of Sleep Disturbance Patients Between an Orofacial Pain Center and A Sleep Medicine Clinic

Matthew Simon, DDS, 2023

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Introduction: Sleep disorders and chronic orofacial pain (OFP) in the military negatively affects individual performance, unit readiness, and national security. Previous research has revealed associations between pain and sleep disturbances but to date, no studies have evaluated the relationship between OFP diagnosis and sleep disorder categories in a military OFP clinic and sleep medicine center. **Methods:** This study retrospectively examined 3 years of data of 105 subjects concurrently evaluated at the Naval Postgraduate Dental School Orofacial Pain Center (OPC) and Walter Reed Sleep Medicine Clinic. Data examined included demographic data and the following validated indices: Generalized Anxiety Disorder-7, Patient Health Questionnaire-9, Insomnia Severity Index, and Posttraumatic Stress Disorder Checklist. Significance as well as strength and direction of associations between OFP diagnoses and sleep disorders were evaluated via odds ratios with type I error (α) set at 0.05. **Results:** The majority of subjects received a primary OFP diagnosis of a muscular disorder (77.1%, n = 81),

followed by joint (9.5%, n = 10), neuropathic (8.6%, n = 9), and other (3.8%, n = 4). The odds of being diagnosed with insomnia given a muscle disorder was 1.30 (0.23, 13.59, p=1.00), 1.41 (0.23, 15.01, p = 1.00) for a sleep-related movement disorder given a joint disorder, and 1.20 (0.43, 3.60, p = 0.81) for insomnia given a joint disorder. A higher relative prevalence of anxiety, depression, and insomnia were found in muscle disorders (74.0%, 75.3%, 86.4%) and neuropathic disorders (88.8%, 100%, 100%) compared to joint disorders (30.0%, 30.0%, 50.0%). **Conclusions:** Although there were increased odds ratios between certain OFP and sleep disorder categories, none were statistically significant. Elevated prevalence of anxiety, depression, and insomnia in neuropathic and muscle disorders are in agreement with existing literature. To refine study estimates, future research should increase the sample size and incorporate a control group.

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LIST OF ABBREVIATIONS

AHLTA	Armed Forces Health Longitudinal Technology Application
CAC	Common Access Card
CBT-I	Cognitive Behavioral Therapy for Insomnia
CDS	Corporate Dental System
CR	Continuing Review
DoD	Department of Defense
DSM-5	Diagnostic and Statistical Manual of Mental Disorders 5th Edition
ESS	Epworth Sleepiness Scale
GAD7	Generalized Anxiety Disorder 7
ISI	Insomnia Severity Index
IGF	Insulin-Like Growth Factor 1
NPDS	Naval Postgraduate Dental School
NREM	Non-Rapid Eye Movement
OFP	Orofacial Pain
OPC	Orofacial Pain Center
OSA	Obstructive Sleep Apnea
OPPERA	Orofacial Pain: Prospective Evaluation and Risk Assessment
PHQ9	Patient Health Questionnaire 9
PI	Principal Investigator
PSG	Polysomnographic Study
PTSD	Post-Traumatic Stress Disorder
PCL	Posttraumatic Stress Disorder Checklist

SAE	Serious Adverse Events
SEAL	Sea, Air, Land
TBI	Traumatic Brain Injury
UPIRTOS	Unanticipated Problems Involving Risks to Subjects or Others
WRSMC	Walter Reed Sleep Medicine Clinic

CHAPTER 1: Introduction

The role of sleep and its implications for human well-being and performance has been explored with increasing vigor over recent years. Sleep is an essential part of human life and indeed, an inability to sleep results in mortality such as with individuals diagnosed with Fatal Familial Insomnia.¹ Some of the roles of sleep are restorative for the brain by removing reactive oxygen species, tau proteins, but also for the contribution to long-term memory consolidation.^{2,3} These processes are essential for cognitive performance including focus and concentration during the course of an individual's daily functioning.⁴

The implications of sleep become even more acute when considering U.S. military service members as their jobs not only affect individual performance, unit cohesiveness, and ultimately national security. Furthermore, sleep deprivation and fatigue can make service members more prone to occupational-related accidents such as damage to vehicles, errors in decision-making, and the possibility of loss of life as a result of sleep-deprived decision-making. Indeed, the lifestyle of active-duty military often requires extended working hours, nighttime operations, and sleep challenges associated with deployed environments in often austere conditions which can make adequate duration and restorative sleep challenging to achieve. To explore the effects of sleep on military performance, a number of studies have been completed in recent years which have revealed insights on its implications for individuals and ways to optimize sleep.⁵⁻³⁹

There are many dimensions exploring the role of sleep within the military and its effects on service members. The role of sleep disturbances and their effects on military performance have been given increased attention in recent years. Insomnia has been shown to affect up to 13% of military personnel in recent U.S. conflicts in Iraq and Afghanistan, and may be associated with requirements of military service such as shift work and auditory disturbances during deployment.^{8, 9, 17, 24, 25, 35, 40} The Epworth Sleepiness Scale (ESS) in one study of military service members revealed higher average scores indicating increased sleep disturbance within this population.¹⁶ The incidence of sleep disturbance specifically looking at military occupations revealed that law enforcement and healthcare personnel are more vulnerable to insomnia.²⁰ One such study examining the role of sleep deprivation and military surgical team performance demonstrated that a surgical unit will have degraded task functioning and be more prone to errors after 48 hours of continuous work.²⁷

Other studies have examined the role of sleep deprivation and the response to traumatic brain injury (TBI), depression, and post-traumatic stress disorder (PTSD) and found that the majority of military personnel diagnosed with these injuries suffer from insomnia, which may impair their ability to recover from combat related traumas.^{6, 10, 19, 21, 28, 36, 39, 41, 42} Indeed, sleep deprivation may cause an individual to ruminate over PTSD symptoms and depression which may inhibit recovery.⁴² Insomnia was the most persistent problem in service members receiving treatment for PTSD.³¹ Sleep disturbances have also been found in service members who are engaged most closely with combat, including special operators such as the U.S. Navy Sea, Air, and Land

(SEAL) teams. Members in these elite groups suffer from higher rates of obstructive sleep apnea (OSA), TBI, and insomnia than the general population.^{13, 23, 33} Nightmares contribute to challenges in achieving restorative sleep, and this has been seen at higher rates in the military.¹¹ Additionally, gender differences have also been discovered in sleep related disturbances. Active-duty women were more likely than men to have insomnia, whereas men were more prone to OSA.^{12, 18}

There have also been investigations looking into the role of sleep disturbances and chronic pain.^{43, 44} There are many factors which have an effect on the quality of sleep and also on pain. These various biochemical modulatory systems are monoaminergic, orexinergic, immune-related, melatonin-mediated, endocannabinoid, opioidergic, and the hypothalamic-pituitary-adrenal axis.⁴⁴ They act throughout the central nervous system to modulate nociceptive input as well as regulate sleep and dysregulation of these systems lead to hyperalgesia, allodynia, inhibit sleep onset, and prevent restorative sleep. Pain and sleep appear to have a bidirectional relationship; wherein worsening pain tends to decrease sleep quality in a positive feedback loop.⁴⁴ Ultimately, this cycle makes treatment more difficult and caring for patients with pain and sleep disturbances requires a deep understanding of both these factors in order to optimize treatment outcomes.⁴³

Sleep disturbances are often found as co-morbidities within chronic orofacial pain patients. This was demonstrated in the Orofacial Pain: Prospective Evaluation and Risk Assessment (OPPERA) study.⁴⁵ This study looked at 2,453 patients who did not have orofacial pain at baseline and then followed-up these patients for 5.2 years to look at

potential risk factors which would predict pain onset. Their findings indicated that subjective sleep quality deteriorated several months prior to onset of orofacial pain. This would seem to indicate a correlation between orofacial pain symptoms and sleep disturbances such as insomnia and OSA.

Given the relationship between sleep disturbances and chronic pain, improving sleep quality and quantity may also improve pain symptoms. Solutions to sleep related issues have been evaluated with different modalities. Exploration of sleep in the military have elucidated that military unit leaders who received a classroom training reviewing information about sleep led to units who were more likely to averaged sleep durations of at least 7 hours in a 24 hour period versus controls, which suggested a potential method of improving sleep within the ranks.⁵ Another study suggested that the attendance of religious service could potentially buffer the effects of combat casualty exposure and sleep disturbances.³⁸ Implementing optimal sleep policies for service members along with unit level sleep training have been proposed as a likely method of improving tactical advantage and ultimately improving the readiness of the U.S. military.²⁶ Furthermore, improving sleep following a deployment has been found to reduce inflammatory biomarkers such as c-reactive protein, decreased symptoms of depression, increased production of insulin-like growth factor (IGF-1), and led to a higher quality of life.^{15, 34} Cognitive behavior therapy for insomnia (CBT-I) has been shown to be effective as a treatment for insomnia and nightmares in veterans.^{29, 46-48} Alternative therapies such as acupuncture have also been shown to improve symptoms of disturbed sleep.^{49, 50} All of

these treatment modalities may be implemented to improve sleep, and may have a concomitant effect on chronic pain.

MILITARY RELEVANCE: To the author's knowledge, no current study has evaluated the correlation of sleep disturbances and orofacial pain diagnoses in a tertiary orofacial pain clinic and a sleep medicine clinic within a military population. The aims of this retrospective study were to compare sleep disturbance diagnoses and orofacial pain diagnoses to determine if there are any correlations.

CHAPTER 2: Materials and Methods

This study was reviewed and approved by the Walter Reed National Military Medical Center Institutional Review Board (IRB# WRNMMC-2022-0394). This retrospective study was conducted in the Orofacial Pain Center (OPC) located at the Naval Postgraduate Dental School in Bethesda, MD. This clinic serves Department of Defense (DoD) eligible beneficiaries to include active-duty service members and retirees of the uniform services as well as their family members. This clinic treats patients with chronic pain involving the trigeminal system to include temporomandibular disorders, headaches, and neuropathic pain. As part of the standard initial evaluation protocol, psychometric and sleep disorder data is obtained for all patients, to include PTSD symptom data using the Post-Traumatic Disorder Checklist (PCL), anxiety using the Generalized Anxiety Disorder-7 questionnaire (GAD7), depression using the Patient Health Questionnaire 9 (PHQ9), and insomnia using the Insomnia Severity Index (ISI). Orofacial pain diagnoses and the scores from the aforementioned measures are recorded in the patient's medical record on the Armed Forces Health Longitudinal Technology Application (AHLTA) system. The Walter Reed Sleep Medicine Clinic (WRS MC) evaluates and treats this same population of patients for broad sleep issues including insomnia variants, hypersomnias, parasomnias, sleep-related breathing disorders, sleep-related movement disorders, and other sleep disturbances as determined through clinical examination and data from polysomnographic studies (PSG).

This study was conducted by the Principal Investigator (PI) and involved the OPC and the WRS MC. Eligibility criteria for this study were patients 18 years or older who

are either Active Duty, their eligible dependents, or family members who were evaluated by the OPC and obtained a PSG by the WRSMC between 1 August 2018 and 31 July 2021. Exclusion criteria were patients who were referred to other sleep centers in the local area or received a home sleep study.

The primary aim of this study was to understand the percentage of patients evaluated by the OPC that also have a sleep medicine diagnosis, and to determine if correlation exists between the orofacial pain diagnostic categories (muscle, joint, neuropathic, and neurovascular disorders), sleep medicine diagnostic categories (insomnia, hypersomnias, parasomnias, sleep-related movement disorders, sleep-related breathing disorders), and other sleep disorders, and GAD7, PHQ9, ISI, and PCL scores. OPC initial patient encounters from 1 August 2018 to 31 July 2021 using the Corporate Dental System software (CDS) were compared to the WRSMC PSG database to determine which patients were evaluated by both clinics. From these patients, orofacial pain diagnoses, sleep medicine diagnoses, as well as GAD7, PHQ9, ISI, and PCL scores were collected from AHLTA. Orofacial pain diagnoses were placed into diagnostic categories of muscle, joint, neuropathic, and neurovascular disorders using the guidelines from the American Academy of Orofacial Pain 6th Edition. Sleep medicine diagnoses and PSG data were collected from the WRSMC PSG database. Sleep disturbance diagnoses were categorized as insomnia, hypersomnias, parasomnias, sleep-related breathing disorders, sleep-related movement disorders as determined by guidelines from the International Classification of Sleep Disorders 3rd Edition. The above data was kept on a password protected digital Excel spreadsheet that is kept on a restricted Walter Reed

OPC shared drive. Individual orofacial pain and sleep disorder diagnoses were categorized into associated disorder groups, categorical and continuous data were represented as counts with percentages and means with standard deviations, respectively. Anxiety (GAD), Depression (PHQ-9), Insomnia (ISI), and PTSD (PCL) scores were derived from calibrated scaled forms. Associations between orofacial pain and sleep disorders were assessed through calculated odds ratios by conditional maximum likelihood estimation using the Fisher method with Type I error allowance (alpha) set to 0.05. Data management and statistical analysis were conducted utilizing R v4.2.3.

CHAPTER 3: Results

The cohort of this study was 105 patients comprised of 61 men (58.1%) and 44 women (41.9%) (Table 1). The mean age of the group was 40.7 years and the demographic composition was 51.4% White, and 29.5% Black. Additionally, the majority were active-duty (67.6%) with the Army (44.8%) and Navy (25.7%) being the most represented of the cohort. With respect to diagnostic orofacial pain categories, muscle disorders had the highest prevalence with 91.43% followed by joint diagnoses with 68.57% (Table 2). By examining sleep disorder categories, sleep-related breathing disorders had the highest prevalence in this cohort at 84.76%, other sleep disorders at 80.00%, and insomnia having a 26.67% prevalence.

This study also examined GAD7, PHQ9, ISI, and PCL scores and compared this in relation to diagnostic orofacial pain categories (Table 3). Joint diagnoses had a mean GAD7 score of 3.80 (mild anxiety), mean PHQ9 score of 5.00 (minimal symptoms), and ISI score of 10.90 (subthreshold insomnia). Muscle diagnoses had a mean GAD7 score of 10.19 (moderate anxiety), mean PHQ9 score of 11.21 (minor depression), and ISI score of 16.33 (moderate insomnia). Neuropathic diagnoses had a mean GAD7 score of 11.33 (moderate anxiety), mean PHQ9 score of 11.33 (minor depression), and ISI score of 21.22 (moderate insomnia).

When examining the total prevalence of anxiety, depression, insomnia, and PTSD by the diagnostic orofacial pain category (Table 4), 74.0% of muscle diagnoses had anxiety, 75.3% had depression, 86.4% had insomnia, and 22.2% met criteria for PTSD. Among joint orofacial pain diagnoses 30.0% had anxiety, 30.0% had depression, 50.0% had insomnia, and 10.0% met criteria for PTSD. When looking at neuropathic

orofacial pain diagnoses, 88.8% met criteria for anxiety, 100% had depression, 100% had insomnia, and 11.1% met PTSD criteria.

Evaluating data for correlations between orofacial pain and sleep disorder diagnoses (Table 5), there were several identified. First, muscle orofacial pain diagnoses and insomnia had a 1.297 odds ratio (OR) (P=1.000). Joint orofacial pain disorders and sleep movement related disorders had a 1.405 OR (P=1.000). Neurovascular orofacial pain disorders and insomnia had a 2.384 OR (P=0.077), and joint orofacial pain disorders and insomnia had a 1.200 OR (P=0.814). When comparing the number of total orofacial pain and the total number of sleep disorder diagnoses to scores for anxiety, depression, insomnia, and PTSD (Table 6) showed that the more sleep disorders that were diagnosed the higher the PTSD score. Figure 1 compares the severity of anxiety, depression, insomnia, and PTSD to the absolute number of orofacial pain diagnoses and no significant correlations were shown. Figure 2 examines the number of sleep disorder diagnoses to the scores for anxiety, depression, insomnia, and PTSD and no significant correlations were identified.

CHAPTER 4: Discussion

The present study aimed to elucidate correlations between orofacial pain and sleep disorder diagnoses between a tertiary orofacial pain clinic and a sleep medicine clinic within a military setting. To the author's knowledge, this study is the first of its kind to examine relationships between diagnostic categories for orofacial pain and sleep disorders. Previous studies examining relationships between chronic pain and sleep disturbances have found that 70% of sleep disorder patients also had a pain complaint.⁵¹ There were increased odds ratios between several diagnostic categories (Table 5) including muscle disorders vs. insomnia (1.297 OR, P=1.000), joint disorders vs. sleep movement related disorders (1.405 OR, P=1.000), neurovascular disorders vs. insomnia (2.384 OR, P=0.077), and joint disorders vs. insomnia (1.200 OR, P=0.814). Notably, none of these increased odds ratios were statistically significant. These findings are not in agreement with previous studies which explored relationships between individual temporomandibular disorders and sleep disturbances. One study conducted in the United Kingdom found orofacial pain patients had a 3.7 relative risk of having some sort of sleep disturbance.⁵² With respect to TMD and sleep, one study that used the Pittsburgh Sleep Quality Index found worsened sleep quality in patients with TMD relative to control subjects.⁵³ There was greater excessive daytime sleepiness in myofascial pain patients relative to controls using the Epworth Sleepiness Scale.⁵⁴ Neurovascular disorders are also commonly treated in the tertiary orofacial pain center, but as these are usually managed initially by primary care physicians or neurologists, these are typically not the chief complaint being evaluated by the orofacial pain specialist. Previous studies have demonstrated positive associations between migraines as well as tension-type headaches

with worsened insomnia.^{55, 56} No correlations between neurovascular disorders and sleep disturbances were seen in this study, and the small sample of neurovascular disorder patients (N=1) being seen at the OPC primarily for that pain complaint may be due to the fact that other providers were already managing their neurovascular disorders.

Nevertheless, the prevalence of neurovascular disorders in this cohort were 52.38% (Table 2). Temporomandibular disorders of the joints have not been explored as much as other categories of diagnosis and most data examining their relationship to sleep are found in rats.⁵⁷

Another aim of this study was to assess prevalence between orofacial pain diagnostic categories, sleep disturbance categories, and questionnaire scores examining anxiety, depression, insomnia, and PTSD. This study showed a higher relative prevalence of anxiety, depression, and insomnia in muscle disorders (74.0%, 75.3%, 86.4%) and neuropathic disorders (88.8%, 100%, 100%) compared to joint disorders (30.0%, 30.0%, 50.0%) (Table 4). Additionally, the relative intensity scores for anxiety, depression, and insomnia were lower for joint disorders (3.80, 5.00, 10.90) compared to muscle (10.19, 11.21, 16.33) and neuropathic disorders (11.33, 11.33, 21.22), respectively (Table 3). This would indicate more severe anxiety, depression, and insomnia in muscle and neuropathic disorders compared to joint disorders in this cohort. Anxiety, depression, and PTSD have been previously established as risk factors for orofacial pain along with sleep disturbances.^{58, 59}

In addition to examining correlations using only the primary chief complaint diagnosis for orofacial pain and sleep, this study also evaluated if there were differences in anxiety, depression, insomnia, and PTSD relative to the absolute number of diagnoses

a patient had in these categories (Table 6). The number of orofacial pain diagnoses a patient had in this cohort did not show any correlation with their scores for anxiety, depression, insomnia, or PTSD (Figure 1). The same lack of correlation was found for anxiety, depression, insomnia, and PTSD when looking at the absolute number of sleep disorders a patient presented with in this cohort (Figure 2). To the author's knowledge, no other studies have examined whether having increased absolute numbers of orofacial pain or sleep disturbance diagnoses has any relation to increased metrics for these risk factors for chronic pain.

The present study had a cohort of 105 patients consisting of 96 muscle disorders, 72 joint disorders, 55 neurovascular, 10 neuropathic disorders, and 39 other disorders. With respect to sleep disturbances, there were 89 sleep-related breathing disorder patients, 84 other sleep disorders, 28 insomnia disorders, 18 hypersomnolence diagnoses, and 8 sleep-related movement disorders. Sleep-related breathing disorders such as obstructive sleep apnea are compensated by the Department of Veteran's Affairs upon retirement which may explain its high prevalence in the present cohort. This may also explain the higher age of patients in this cohort of 40.7 (Table 1) relative to the average active-duty patient of 21, as this age is commonly approximate to when service members retire. Prior to retirement, service members will receive medical examinations to assess their health, and this may also contribute to higher PSGs occurring at this age. 58% of the present cohort were men and 42% were women. 44.8% of the cohort were Army, 25.7% were Navy, 15.2% were Air Force, and 67.6% of the study were active-duty compared to 32% being eligible family-member dependents, reservists, or retirees. The relative

differences in gender, active-duty status, and branch of service are likely related to the types of military facilities being in the area of responsibility of the OPC and WRMSC.

The limitations of the present study are the small sample size of 105 participants, the lack of a control group, and the use of a single night PSG. The relatively small number of patients in the current study may be due to the fact that only 3 years of data were examined as well as the inclusion requirement to have a PSG from the WRSMC. As many patients are referred to civilian facilities to have a PSG completed, this may bias the results of the study and may under sample some diagnostic categories depending on the qualities of patients who are referred to those other facilities. The inclusion of a control group of patients without orofacial pain or sleep disturbances may have revealed more significant comparisons to the current cohort as this may have revealed differences in anxiety, depression, PTSD, and sleep diagnoses. This might provide more meaningful comparisons which may direct future research inquiry. Finally, single night PSG has been shown to be prone to the “First night effect” with reduced latency, total sleep duration, and architecture changes being noted.^{60, 61} The first night effect is described as a patient’s difficulty in sleeping in a different environment than they are accustomed, along with the necessity of the equipment utilized for the PSG which can make sleep more difficult to achieve in a lab setting. PSG data taken from the second of a 2-night PSG may have improved the accuracy of sleep disturbance diagnoses in the current study. Consideration to a future study may be given to examining orofacial pain joint disorders and insomnia as there is little research looking specifically into this domain of inquiry at the time of this writing.

CHAPTER 5: Conclusions

Within the limits of the current study, although there were increased odds ratios between certain OFP and sleep disorder categories, none were statistically significant. Elevated prevalence and intensity of anxiety, depression, and insomnia in neuropathic and muscle disorders are in agreement with existing literature. Future considerations may examine the relationship between temporomandibular joint disorders and sleep disturbances such as insomnia, as there is a paucity of literature related to these entities and how they interact in patients.

Table 1. Study Subject Demographics

	Overall (N=105)
Age	
Mean (SD)	40.7 (11.1)
Median [Min, Max]	40.0 [18.0, 80.0]
Sex	
Male	61 (58.1%)
Female	44 (41.9%)
Race	
White	54 (51.4%)
Black	31 (29.5%)
Hispanic	2 (1.9%)
Asian	3 (2.9%)
Other race	7 (6.7%)
Unknown	8 (7.6%)
Branch of Service	
Army	47 (44.8%)
Navy	27 (25.7%)
Air Force	16 (15.2%)
Marine Corps	7 (6.7%)
Coast Guard	2 (1.9%)
Public Health Service	3 (2.9%)
Foreign Service	1 (1.0%)
Unknown	2 (1.9%)
Status	
AD	71 (67.6%)
Dependent	10 (9.5%)
Reserve	4 (3.8%)
Retired	20 (19.0%)

Table 2. Prevalence of Orofacial Pain and Sleep Disorder Diagnoses

Group	Category	Total	Percent
OFP	Muscle	96	91.43
OFP	Joint	72	68.57
OFP	Neurovascular	55	52.38
OFP	Other	39	37.14
OFP	Neuropathic	10	9.52
Sleep	Breathing	89	84.76
Sleep	Sleep_Other	84	80.00
Sleep	Insomnia	28	26.67
Sleep	Hypersomnolence	18	17.14
Sleep	Movement	8	7.62

Table 3. The mean and standard deviations for each scaled assessment based on the primary OFP diagnosis category.

N =	Category	GAD7 Anxiety Mean (SD)	PHQ9 Depression Mean (SD)	ISI Insomnia Mean (SD)	PCL PTSD Mean (SD)
10	Joint	3.80 (5.33)	5.00 (5.79)	10.90 (7.09)	19.00 (20.07)
81	Muscle	10.19 (6.42)	11.21 (7.74)	16.33 (6.98)	38.22 (25.16)
9	Neuropathic	11.33 (5.02)	11.33 (5.59)	21.22 (4.63)	20.50 (17.68)
1	Neurovascular	3.00	5.00	12.00	
4	Other	3.75 (3.86)	5.25 (5.12)	9.00 (5.35)	11.00

Table 4. Continuation of *Table 3* that displays the frequency and percentage of individuals categorized by their primary OFP diagnosis and Anxiety, Depression, Insomnia, and PTSD classifications.

	Joint (N=10)	Muscle (N=81)	Neuropathic (N=9)	Neurovascular (N=1)	Other (N=4)	Overall (N=105)
GAD						
Minimal	7 (70.0%)	21 (25.9%)	1 (11.1%)	1 (100%)	3 (75.0%)	33 (31.4%)
Mild	2 (20.0%)	13 (16.0%)	2 (22.2%)	0 (0%)	1 (25.0%)	18 (17.1%)
Moderate	0 (0%)	26 (32.1%)	4 (44.4%)	0 (0%)	0 (0%)	30 (28.6%)
Severe	1 (10.0%)	21 (25.9%)	2 (22.2%)	0 (0%)	0 (0%)	24 (22.9%)
PHQ9						
No Symptoms	7 (70.0%)	20 (24.7%)	0 (0%)	0 (0%)	2 (50.0%)	29 (27.6%)
Minimal Symptoms	1 (10.0%)	16 (19.8%)	3 (33.3%)	1 (100%)	1 (25.0%)	22 (21.0%)
Minor Depression	1 (10.0%)	19 (23.5%)	4 (44.4%)	0 (0%)	1 (25.0%)	25 (23.8%)
Major Depression, Moderate	1 (10.0%)	13 (16.0%)	1 (11.1%)	0 (0%)	0 (0%)	15 (14.3%)
Major Depression, Severe	0 (0%)	13 (16.0%)	1 (11.1%)	0 (0%)	0 (0%)	14 (13.3%)
ISI						
No Clinical Insomnia	5 (50.0%)	11 (13.6%)	0 (0%)	0 (0%)	2 (50.0%)	18 (17.1%)
Subthreshold Insomnia	1 (10.0%)	21 (25.9%)	1 (11.1%)	1 (100%)	1 (25.0%)	25 (23.8%)
Clinical (Moderate Severity)	4 (40.0%)	29 (35.8%)	3 (33.3%)	0 (0%)	1 (25.0%)	37 (35.2%)
Clinical (Severe)	0 (0%)	20 (24.7%)	5 (55.6%)	0 (0%)	0 (0%)	25 (23.8%)
PTSD						
No.PTSD	2 (20.0%)	14 (17.3%)	1 (11.1%)	0 (0%)	1 (25.0%)	18 (17.1%)
PTSD.1	1 (10.0%)	18 (22.2%)	1 (11.1%)	0 (0%)	0 (0%)	20 (19.0%)
Missing	7 (70.0%)	49 (60.5%)	7 (77.8%)	1 (100%)	3 (75.0%)	67 (63.8%)

Table 5. Odds of a sleep disorder based on their OFP disorder.

Associations	OR	Lower	Upper	P.Value
Joint to Insomnia	1.200	0.431	3.602	0.814
Muscle to Insomnia	1.297	0.227	13.586	1.000
Neurovascular to Insomnia	2.384	0.893	6.788	0.077
Neuropathic to Insomnia	1.198	0.186	5.768	0.724
Muscle to Breathing	0.000	0.000	2.841	0.349
Joint to Breathing	1.373	0.371	4.686	0.570
Joint to Movement	1.405	0.234	15.006	1.000
Neurovascular to Movement	0.903	0.158	5.143	1.000

Table 6. Association of number of OFP diagnoses with Anxiety, Depression, Insomnia, and PTSD.

Orofacial Pain Score	Anxiety Mean (SD)	Depression Mean (SD)	Insomnia Mean (SD)	PTSD Mean (SD)
1	4.33 (4.24)	6.00 (6.36)	12.89 (6.72)	4.00 (5.66)
2	9.87 (6.65)	11.47 (8.63)	16.33 (8.06)	48.20 (23.36)
3	9.60 (7.31)	10.92 (8.85)	15.60 (8.18)	36.67 (27.63)
4	11.35 (6.61)	12.16 (6.65)	17.94 (6.52)	40.47 (22.89)
5	7.95 (5.16)	8.32 (6.68)	14.47 (5.87)	24.33 (19.99)
6	8.83 (5.19)	8.67 (5.39)	14.83 (7.76)	0.00

Sleep Score	Anxiety Mean (SD)	Depression Mean (SD)	Insomnia Mean (SD)	PTSD Mean (SD)
1	9.67 (7.92)	9.00 (9.96)	15.33 (8.55)	23.33 (40.41)
2	9.41 (6.76)	10.79 (8.17)	16.07 (7.89)	34.00 (30.87)
3	9.31 (6.34)	10.27 (7.15)	15.90 (6.83)	36.88 (20.90)

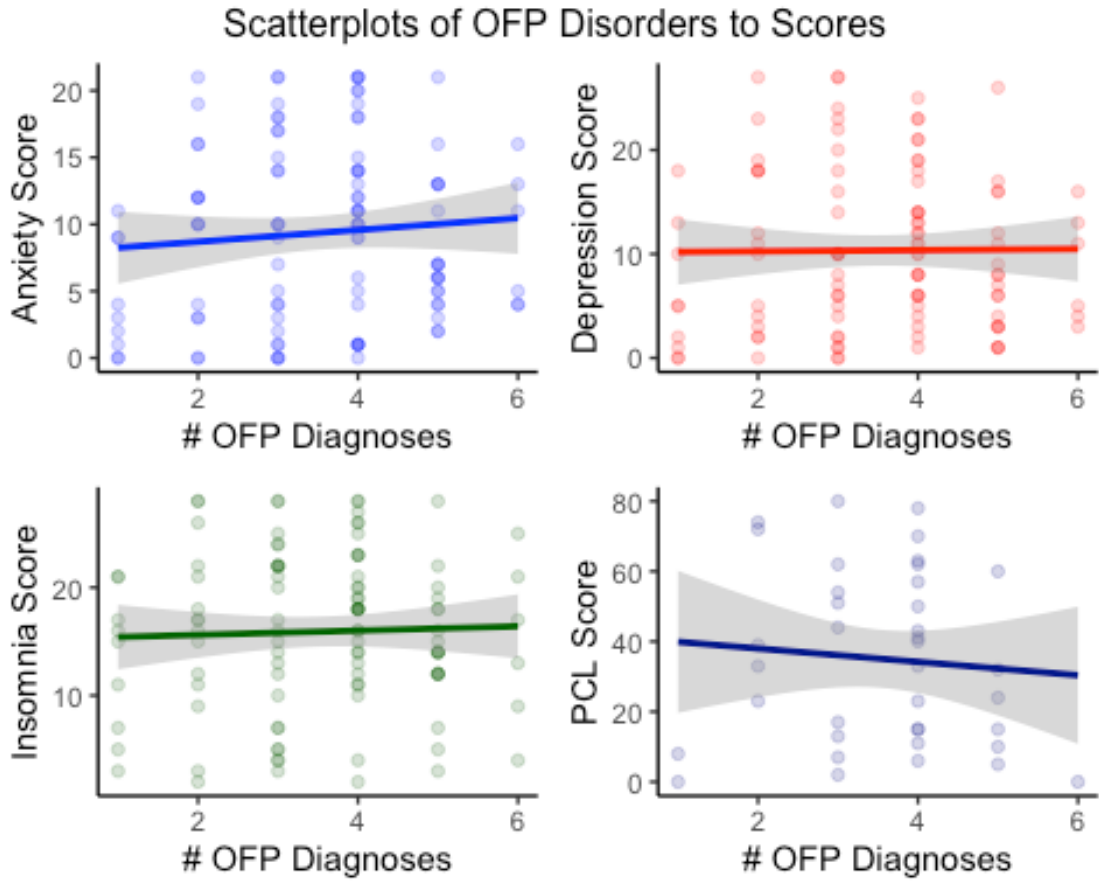


Figure 1. This is an array of scatterplots that plot the number of OFP Diagnoses to anxiety, depression, insomnia, and PTSD scores.

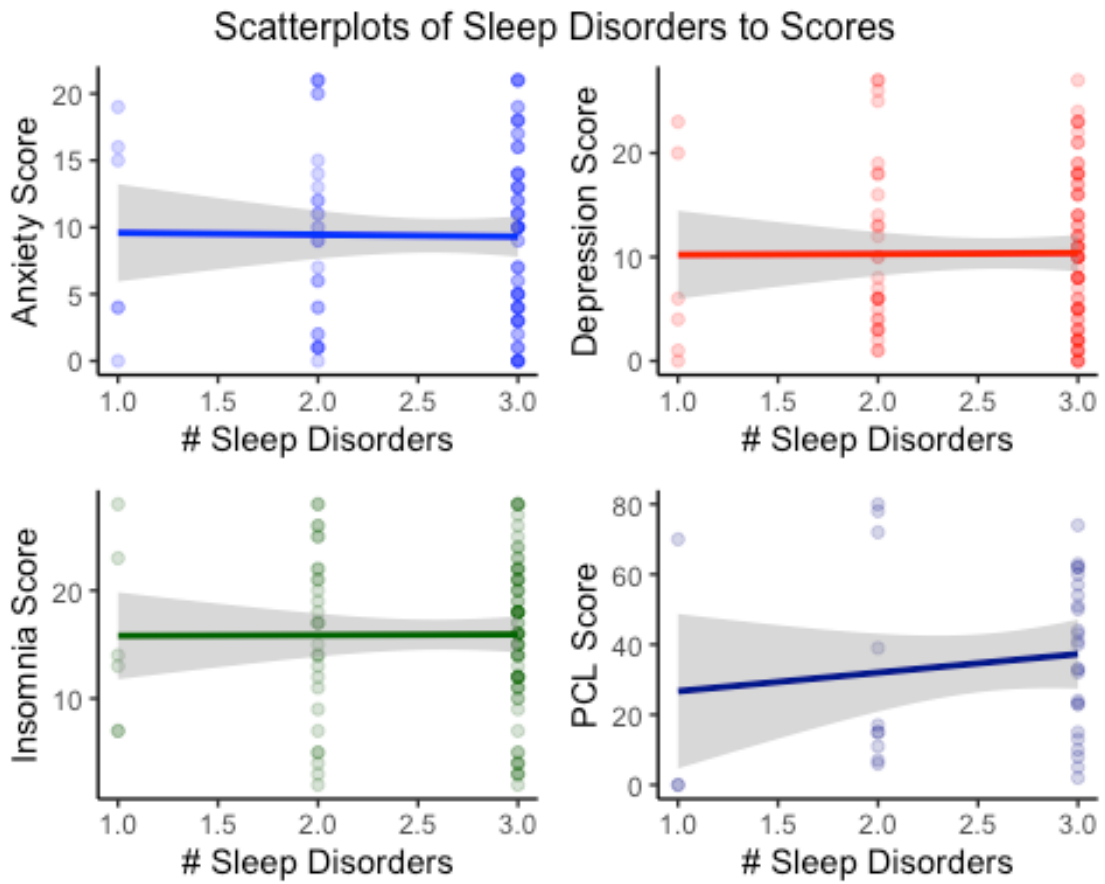


Figure 2. This is an array of scatterplots that plot the number of Sleep Diagnoses to anxiety, depression, insomnia, and PTSD scores.

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