# Contribution of mechanobehavioral, psychological, and physiological domains in the progression of temporomandibular disorders

*2018 Grants*

*Dr Laura Iwasaki*

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# FollowUp Form

## *Award Information*

*In an attempt to make things a little easier for the reviewer who will read this report, please consider these two questions before this is sent for review:*

- *Is this an example of your very best work, in that it provides sufficient explanation and justification, and is something otherwise worthy of publication? (We do publish the Final Report on our website, so this does need to be complete and polished.)*
- *Does this Final Report provide the level of detail, etc. that you would expect, if you were the reviewer?*

### Title of Project*

Contribution of mechanobehavioral, psychological, and physiological domains in the progression of temporomandibular disorders

### Award Type

Center Award (CA)

### Period of AAOF Support

September 1, 2018 through June 30, 2024

### Institution

Oregon Health & Science University (OHSU)

### Names of principal advisor(s) / mentor(s), co-investigator(s) and consultant(s)

Laura Iwasaki

### Amount of Funding

$75,000.00

### Abstract

(add specific directions for each type here)

# *Respond to the following questions:*

## Detailed results and inferences:*

If the work has been published, please attach a pdf of manuscript below by clicking "Upload a file".
OR
Use the text box below to describe in detail the results of your study. The intent is to share the knowledge you have generated with the AAOF and orthodontic community specifically and other who may benefit from your study. Table, Figures, Statistical Analysis, and interpretation of results should also be attached by clicking "Upload a file".

Iwasaki Final Report 2018 CA.pdf

## Were the original, specific aims of the proposal realized?*

see attached

## Were the results published?*

Yes

## Have the results of this proposal been presented?*

Yes

## To what extent have you used, or how do you intend to use, AAOF funding to further your career?*

see attached

## Accounting: Were there any leftover funds?

$0.00

# *Published*

## Citations*

You indicated results have been published. Please list the cited reference/s for publication/s including titles, dates, author or co-authors, journal, issue and page numbers

see attached

### Was AAOF support acknowledged?
If so, please describe:

see attached

## *Presented*

### Please list titles, author or co-authors of these presentation/s, year and locations:*
see attached

### Was AAOF support acknowledged?
If so, please describe:

yes, see attached

## *Internal Review*

### Reviewer Comments

### Reviewer Status*
Approved

# File Attachment Summary

## *Applicant File Uploads*

- Iwasaki Final Report 2018 CA.pdf

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# AAO Foundation Final Report Form
**(a/o 5/30/2020)**

*In an attempt to make things a little easier for the reviewer who will read this report, please consider these two questions before this is sent for review:*

- *Is this an example of your very best work, in that it provides sufficient explanation and justification, and is something otherwise worthy of publication? (We do publish the Final Report on our website, so this does need to be complete and polished.)*
- *Does this Final Report provide the level of detail, etc. that you would expect, if you were the reviewer?*

Please prepare a report that addresses the following:

Type of Award Center Award

Name(s) of Principal Investigator(s) Laura Iwasaki

Institution Oregon Health & Science University (OHSU)

Title of Project Contribution of mechanobehavioral, psychological, and physiological domains in the progression of temporomandibular disorders

Period of AAOF Support (e.g. 07-01-2021 to 06-30-2022): 09-01-18 to 06-30-2024

Amount of Funding $75,000

Summary/Abstract (original)
Temporomandibular disorders (TMD) are a group of orofacial conditions that afflict 5-12% of the population, more females than males, and younger compared to older people.[1] These complex, common conditions are costly to individuals and society because current therapies are not evidence-based and fail to prevent or cure symptoms predictably.[2] Furthermore, polarizing suppositions about orthodontic therapy causing TMD and being useful to treat TMD continue to persist[3-6] because foundational data are lacking and the mechanisms of TMD remain unknown.

The ***broad, long-term objectives*** of this project are to determine clinical measurements that accurately predict 1) Temporomandibular joint (TMJ) health versus degenerative changes, and 2) the development of chronic jaw-related pain. Our successful research collaboration has distinguished differences in jaw mechanics, behavior, and psychosocial status between healthy individuals and those with sub-types of TMD.[7-12] We now propose to expand our investigations longitudinally and cross-sectionally via 2 ***Specific Aims.*** These aims will determine if: 1. Mechanobehavioral Scores ($(mJ/mm^3)^2$•%) predict diagnostic changes in TMJ tissues over time in subjects with and without TMD at baseline, and 2. Psychosocial Scores from validated questionnaires, measures of autonomic nervous system (ANS) tone, and hypothalamic-pituitary-adrenal (HPA) axis regulation distinguish healthy from chronic jaw-related pain subjects.

High magnitudes and frequencies of energy input to TMJ tissues during jaw use, reflected by high Mechanobehavioral Scores, are likely to promote tissue breakdown; whereas low scores may indicate homeostasis or repair. Magnitudes of energy input (Energy Density, $mJ/mm^3$) will be measured via dynamic stereometry and validated computer modeling,[7,10] while frequencies of energy input (Jaw Muscle Duty Factor, %) will be measured via ambulatory electromyography in participants' natural environments.[11,13,14] Like other complex and debilitating conditions, chronic jaw muscle pain involves peripheral and central mechanisms[15] that are likely to be reflected in high psychosocial scores; abnormal ANS tone, measured by heart rate variability; and HPA axis regulation, measured by salivary cortisol levels.

The ***overall objective*** of the proposed research is to address a crucial next step by quantifying multiple candidate mechanisms of TMD and, thus, provide needed foundational data for the development of future evidence-based therapies. In addition, the proposed research will uniquely assess combined measurements as predictors of longitudinal changes in TMJ structures and risk indicators for jaw-related pain. These results will be fundamental preliminary data for a future research grant application to the National Institutes of Health. Our collaborative team is distinctly poised to conduct this project based on our specific expertise plus the experience of working well together, as demonstrated by our past publications and grants. Because of the prevalence and the predilection for younger compared to older individuals, orthodontic patients are likely to suffer from TMD. Hence, improved understanding of the causal and risk factors for TMD is vital to improved orthodontic patient care.

Detailed results and inferences:

1. If the work has been published please attach a pdf of manuscript OR
2. Describe in detail the results of your study. The intent is to share the knowledge you have generated with the AAOF and orthodontic community specifically and other who may benefit from your study. Table, Figures, Statistical Analysis, and interpretation of results should be included.

This collaborative study is a longitudinal follow-up of subjects who participated in previous studies to see if mechanobehavioral scores can predict whose temporomandibular disorders (TMD) will be better or worse with time and to see if psychophysiological measures can distinguish different TMD sub-groups. The previous studies involved approximately 138

subjects and were funded by 2 R01 grants from the National Institute of Dental and Craniofacial Research. Subject recruitment and data collection were conducted at the University at Buffalo (UB) School of Dental Medicine, site of the parent study. Despite a shut-down of human subjects research due to the COVID-19 pandemic from March 2020 through Aug. 2021 and the slow-recovery that followed, in the current Center Award (CA) project we recruited 32 subjects from the parent study sample. The original application proposed to recruit and collect data from 23 subjects, based on a power analysis of preliminary data and the expected costs as described in the CA application budget and Progress Reports. However, as reported in Progress Report #2, some previously unanticipated cost savings were realized due to the ability to recycle some of the custom-made devices used for subjects in the parent project and the inability to use funds approved for completion of salivary cortisol analyses because of irreversible loss of saliva samples due to a power outage at UB. This permitted increasing the sample size to allow for potential loss to follow up of subjects (e.g., who began participation before the COVID-19 pandemic but were unable or unwilling to complete the study because their circumstances changed) and to improve potential to achieve balanced sub-groups by sex and original TMD diagnoses.

Respond to the following questions:

1. Were the original, specific aims of the proposal realized?
   As of 05-24-2024, data to address the two specific aims have been collected and data analyses are underway in preparation for final manuscripts that will be submitted to peer-reviewed journals. Specifically, study protocols have been completed by 32 subjects, which represents the final sample size, as of Oct. 10, 2023. For Specific Aim 2, we will test Psychosocial Scores from validated questionnaires with measures of autonomic nervous system (ANS) tone to distinguish healthy from chronic jaw-related pain subjects. Due to the unexpected and irreversible loss of saliva samples (as described above), a full analysis of HPA effects will not be possible. However, preliminary data analysis has resulted in a MS in Orthodontics thesis (B Zegarowski) and has shown promising results for Specific Aim 2 without the HPA analysis.
2. Were the results published? Yes, and the AAOF was acknowledged

Publications: 4 abstracts

Iwasaki L, Gonzalez-Stucker Y, Gallo LM, Scott J, Nickel JC (2020). Mechanobehavioral Scores, Jaw Muscle Duty Factors and TMJ Longitudinal Changes. J Dent Res 99A:2768. [Presented at 2020 American Association for Dental, Oral, and Craniofacial Research (AADOCR) meeting.]

Nickel JC, Gonzalez YM, Gallo LM, Choi D, Liu H, Iwasaki LR (2023). Mechanics and behavior associated with longitudinal changes in TMJ integrity. J Dent Res 102B:0034. [Presented at 2023 International Association for Dental Research (IADR) meeting.]

Iwasaki L, Kelley M, Gonzalez-Stucker Y, Liu Y, Liu H, Choi D, Nickel JC (2023). A pilot study of night-time masticatory muscle and ANS activities. J Dent Res 102A:0167. [Presented at 2023 IADR meeting.]

Nickel JC, Zegarowski B, Gonzalez Y, Liu Y, Liu H, Iwasaki LR (2024). TMD myofascial pain and amplitude of nocturnal ANS ultradian cycling. J Dent Res 103A:2923. [Presented at 2024 International Association for Dental Research (IADR) meeting.]

Completed MS thesis: 1
Zegarowski B: Mechanobehavioral effects on temporomandibular disorder progression. Master of Science in Orthodontics, Oregon Health & Science University, School of Dentistry (2023)

3. Have the results of this proposal been presented? Yes, and the AAOF was acknowledged
Presentations: 10

[Mar 21, 2020: "Mechanobehavioral Scores, Jaw Muscle Duty Factors and TMJ Longitudinal Changes," Annual General Session of the IADR/AADR/CADR, oral presentation, Washington DC; session cancelled due to COVID-19 pandemic; planned presenter: L Iwasaki, co-authors: Y Gonzalez-Stucker, LM Gallo, J Scott, JC Nickel]

Dec 3, 2020: "Mechanobehavior and Ontogeny of the Temporomandibular Joint," Federal Working Group on Bone Diseases (FWGBD) meeting [webinar], a forum for representatives of agencies concerned with bone health, comprised of representatives from 13 NIH institutes, centers, and offices and 13 other Federal agencies (including DHHS, non-DHHS agencies and other departments) as well as liaison representatives from voluntary organizations and professional societies interested in bone diseases; presenter: L Iwasaki

Sept 17, 2021: "Mechanobehavior and Temporomandibular Joint Growth and Degeneration," Arthur A. Dugoni Orthodontic Graduation Symposium, University of the Pacific, School of Dentistry, San Francisco, CA; presenter: L Iwasaki

Feb 11, 2022: "Use of Mechanobehavior Scores to Predict Temporomandibular Joint Growth and Degeneration," E.H. Angle Society of Orthodontists Northwest Component meeting, Initial Presentation Academic Pathway, Kohala Coast, Hawaii; presenter: L Iwasaki

Apr 1, 2022: "Use of Mechanobehavior Scores to Predict Temporomandibular Joint Growth and Degeneration," E.H. Angle Society of Orthodontists Northern California Component virtual meeting; presenter: L Iwasaki

May 19, 2022: "Mechanobehavior Scores for Prediction of TMJ Growth & Degeneration," Keynote Speaker, TMJ Bioengineering Conference 7, University of Pittsburgh, Pittsburgh PA; presenter: L Iwasaki

May 23, 2022: "Mechanobehavior and Ontogeny of the Temporomandibular Joint," Doctors' Scientific Program, Bone Biology/Orthodontic Materials Track, American Association of Orthodontists Annual Session, Miami Beach, FL; presenter: L Iwasaki

Mar 2, 2023: "Autonomic nervous system (ANS) activity, ultradian cycling, and pain associated with temporomandibular disorders (TMD);" 2023 OHSU School of Dentistry Research Day Poster, Portland OR; presenter: B Bothwell (3rd Year Dental Student)

Nov. 3, 2023: "A pilot study of TMD pain and nocturnal ANS associated masticatory muscle activity," Pacific Coast Society of Orthodontists Posterboard competition for the 2023 Western Orthodontic Conference, Anaheim, CA; presenter: B Zegarowski (MS Orthodontics candidate); co-authors: J Nickel, L Iwasaki, Y Gonzalez, D Choi, H Liu

Mar.16, 2024: "TMD myofascial pain and amplitude of nocturnal ANS ultradian cycling," Presented at the 2024 International Association for Dental Research (IADR) meeting, New Orleans, LA; presenter: JC Nickel; co-authors: B Zegarowski, Y Gonzalez, Y Liu, H Liu.

4. To what extent have you used, or how do you intend to use, AAOF funding to further your career?

AAOF funding has been lifeblood to my career as a full-time academic orthodontist. For example, the previously completed three AAOF awards (2 BRA, 1 CA) for which I was the principal investigator (PI) have resulted in 10 peer-reviewed co-authored publications and at least 19 presentations. Specifically, the 2018-2024 CA project pertaining to this report provided some preliminary data for a successful new R03 grant (2023–2025) from the National Institute of Dental and Craniofacial Research, entitled "Predictive markers for longitudinal TMJ integrity." This new grant involves the collaborative team of: Y Gonzalez-Stucker (PI, University at Buffalo) with co-investigators: D Choi, LR Iwasaki, JC Nickel, S Sousa Melo (OHSU); M Ahmad (University of Minnesota). Furthermore, the 2018-2024 CA project provided data for a successful MS in Orthodontics thesis project (B Zegarowski) and is providing data for another (G Masuda), entitled "Temporomandibular disorder and anatomic-psychophysiologic score." Thus, this CA has not only helped to further my career but also those of others, mentored by me and co-investigators of this CA project.

Accounting for Project; (i.e.), any leftover funds, etc.

All funds for this project provided by the AAOF have been spent on the project and there are no leftover funds.

## References


1. NIDCR web-site accessed Oct. 3, 2017. https://www.nidcr.nih.gov/datastatistics/finddatabytopic/facialpain/prevalencetmjd.htm.
2. Bair E, Gaynor S, Slade GD, Ohrbach R, Fillingim RB, Greenspan JD, Dubner R, Smith SB, Diatchenko L, Maixner W. Identification of clusters of individuals relevant to temporomandibular disorders and other chronic pain conditions: the OPPERA study. *Pain.* 2016;157:1266-1278.
3. Coelho TG, Caracas HC. Perception of the relationship between TMD and orthodontic treatment among orthodontists. *Dental Press J Orthod.* 2015;20:45-51.
4. Luther F, Layton S, McDonald F. Orthodontics for treating temporomandibular joint (TMJ) disorders. *The Cochrane database of systematic reviews.* 2010:CD006541.
5. Michelotti A, Iodice G. The role of orthodontics in temporomandibular disorders. *J Oral Rehabil.* 2010;37:411-429.

6. Mohlin B, Axelsson S, Paulin G, Pietilä T, Bondemark L, Brattström V, Hansen K, Holm AK. TMD in relation to malocclusion and orthodontic treatment. *Angle Orthod.* 2007;77:542-548.
7. Gallo LM, Iwasaki LR, Gonzalez YM, Liu H, Marx DB, Nickel JC. Diagnostic group differences in temporomandibular joint energy densities. *Orthod Craniofac Res.* 2015;18 Suppl 1:164-169.
8. Iwasaki LR, Crosby MJ, Gonzalez Y, McCall WD, Marx DB, Ohrbach R, Nickel JC. Temporomandibular joint loads in subjects with and without disc displacement. *Orthop Rev (Pavia).* 2009;1:90-93.
9. Iwasaki LR, Gonzalez YM, Liu Y, Liu H, Markova M, Gallo LM, Nickel JC. Mechanobehavioral scores in women with and without TMJ disc displacement. *J Dent Res.* 2017;96:895-901.
10. Iwasaki LR, Gonzalez YM, Liu Y, Liu H, Markova M, Gallo LM, Nickel JC. TMJ energy densities in healthy men and women. *Osteoarthritis Cartilage.* 2017;25:846-849.
11. Khawaja SN, Nickel JC, Iwasaki LR, Crow HC, Gonzalez Y. Association between waking-state oral parafunctional behaviours and bio-psychosocial characteristics. *J Oral Rehabil.* 2015;42:651-656.
12. Nickel JC, Gonzalez YM, McCall WD, Ohrbach R, Marx DB, Liu H, Iwasaki LR. Muscle organization in individuals with and without pain and joint dysfunction. *J Dent Res.* 2012;91:568-573.
13. Iwasaki LR, Gonzalez YM, Liu H, Marx DB, Gallo LM, Nickel JC. A pilot study of ambulatory masticatory muscle activities in temporomandibular joint disorders diagnostic groups. *Orthod Craniofac Res.* 2015;18 Suppl 1:146-155.
14. Wei F, Van Horn MH, Coombs MC, She X, Gonzales TS, Gonzalez YM, Scott JM, Iwasaki LR, Nickel JC, Yao H. A pilot study of nocturnal temporalis muscle activity in TMD diagnostic groups of women. *J Oral Rehabil.* 2017;44:517-525.

# IADR Abstract Archives

## TMD Myofascial Pain and Amplitude of Nocturnal ANS Ultradian Cycling

**Objectives**: To test if sympathetic and parasympathetic nocturnal ultradian cycle amplitudes correlated with pain scores in subjects with and without chronic TMD myofascial pain.
**Methods**: According to IRB oversight, subjects 18 years or older were recruited. Subjects' 6 month characteristic pain intensity (CPI) scores were assessed using validated instruments (DC/TMD). Subjects were trained to use a portable EMG/ECG recorder, recording data for 3 nights, with each recording ≥ 6 hours. Commercial software (MindWare™) was used to quantify heart rate variability. Nocturnal ultradian cycling of sympathetic/parasympathetic activity was quantified as the ratio of low (0.04 – 0.15 Hz) and high (0.15 – 0.4 Hz) frequency spectral powers. Time domain parasympathetic nervous system activity was quantified according to the statistic of the number of times successive heartbeat intervals exceed 50 ms (pNN50). Five minute bins of night-time ultradian cycling of ANS activity were plotted and fitted with a $10^{th}$ order polynomial. Peaks and valleys of ANS tone were identified based on the polynomial, and amplitudes of ultradian cycling were calculated as the ratio of peak/valley for LF/HF and pNN50 data. Student T Tests were used to determine group differences in the variables. 3D regression analysis tested for a correlation between normalized ANS ultradian amplitudes and CPI scores.
**Results**: Sixteen females and 11 males completed protocols (15 +Pain, 12 -Pain; av. age 46.3±12.5 yrs.). +Pain group CPI scores ranged from 7 to 70. +Pain subjects had significantly higher normalized LF/HF and lower normalized pNN50 amplitudes compared to control (-Pain) subjects (all $p<0.001$). There was a correlation (Adjusted $R^2 = 0.67$) between normalized amplitudes of ANS ultradian cycling and CPI scores, where higher pNN50 cycling amplitudes were associated with lower CPI scores.
**Conclusions**: Amplitudes of ANS nocturnal activity were associated the intensity of pain experienced by individuals with TMD chronic myofascial pain.

Division:
Meeting: 2024 IADR/AADOCR/CADR General Session (New Orleans, Louisiana)
Location: New Orleans, Louisiana
Year: 2024
Final Presentation ID: 2923
Abstract Category|Abstract Category(s): Neuroscience

Authors

- Nickel, Jeffrey ( Oregon Health & Science University , Portland , Oregon , United States ; University at Buffalo School of Dental Medicine , Buffalo , New York , United States )
- Gonzalez-stucker, Yoly ( University at Buffalo , Buffalo , New York , United States ; University at Buffalo School of Dental Medicine , Buffalo , New York , United States )
- Liu, Ying ( East Tennessee State University , Johnson City , Tennessee , United States )
- Liu, Hongzeng ( Oregon Health & Science University , Portland , Oregon , United States )
- Iwasaki, Laura ( Oregon Health & Science University , Portland , Oregon , United States ; University at Buffalo School of Dental Medicine , Buffalo , New York , United States )


Support Funding Agency/Grant Number: American Association of Orthodontists Foundation Biomedical Research Award
Financial Interest Disclosure: NONE

SESSION INFORMATION
Poster Session
Pain, Function, Dysfunction, and Treatment
Saturday, 03/16/2024 , 03:45PM - 05:00PM

# IADR Abstract Archives

## Mechanobehavior Scores in Individuals With Versus Without TMJ Disc Displacement

**Objectives**: Temporomandibular joint (TMJ) cartilages are susceptible to mechanical fatigue. This observational study tested for differences in mechanobehavior scores (MBS) in subjects with and without TMJ disc displacement (±D).
**Methods**: In accordance with Institutional Review Board oversight, Diagnostic Criteria for Temporomandibular Disorders examination and imaging protocols identified eligible consenting adult subjects. Specifically, magnetic resonance imaging was used to assign subjects' TMJs to ±D groups. Subjects were trained to record in-field jaw muscle activities for calculation of duty factors (DFs, % muscle activity time/recording time). Modeled TMJ loads and in vivo dynamic stereometry were used to determine energy density (ED, $mJ/mm^3$), a measure of the concentration of mechanical work done to TMJ tissues. MBS was defined by $ED^2xDF$. Analysis of Variance (ANOVA) and regression and cluster analyses tested for group differences, where significance was defined by $p<0.05$.
**Results**: Of 242 individuals screened, 56 females (TMJs: 67 +D, 45 -D) and 52 males (TMJs: 43 +D, 61 -D) participated. Subjects produced 346 day- and 357 night-time jaw-muscle recordings of average duration 6.9±2.3 and 7.6±1.9 hours, respectively, and 199 (104 right, 95 left) intact dynamic stereometry recordings. Average EDs were 2-times and significantly higher in +D than –D TMJs (adjusted $p<0.05$). Day-time DF were approximately twice night-time DF. Significant differences in MBS occurred in females. Peak day-time masseter MBS for jaw-loading magnitudes of >1 to ≤5 N were up to 17-times and significantly higher in +D than –D TMJs (all adjusted $p<0.05$). Three MBS clusters were identified ($R^2=0.51$, $p=0.012$). All –D TMJs were in the cluster with the lowest MBS.
**Conclusions**: Higher mechanobehavior scores due to higher TMJ energy densities and day-time masseter muscle duty factors at low jaw-loading magnitudes occurred in TMJs with disc displacement compared to those without disc displacement.

Division:
Meeting: 2023 IADR/LAR General Session with WCPD
Location:
Year: 2023
Final Presentation ID: 0033
Abstract Category|Abstract Category(s): Craniofacial Biology

Authors

- **Iwasaki, Laura** ( Oregon Health & Science University , Portland , Oregon , United States )
- Gonzalez, Yoly ( University at Buffalo , Buffalo , New York , United States )
- Gallo, Luigi ( LMG Engineering GmbH , Danikon , Switzerland )
- Liu, Ying ( East Tennessee State University , Johnson City , Tennessee , United States )
- Liu, Hongzeng ( Oregon Health & Science University , Portland , Oregon , United States )
- Nickel, Jeffrey ( Oregon Health & Science University , Portland , Oregon , United States )


Support Funding Agency/Grant Number: National Institute for Dental and Craniofacial Research R01 DE 016417-05A1
Financial Interest Disclosure: NONE

SESSION INFORMATION
Interactive Talk Session
Craniofacial Biology: TMJ and Bone Biology
Wednesday, 06/21/2023 , 08:00AM - 09:30AM

# IADR Abstract Archives

## A Pilot Study of Night-Time Masticatory Muscle and ANS Activities

**Objectives**: To test relations between night-time masticatory muscle and autonomic nervous system (ANS) activities.
**Methods**: Adult subjects in good oral and general health gave informed consent to participate. Subjects were categorized into 2 groups based on scores from the validated Patient Health Questionnaire-15 (PHQ-15) of >5 (Group A) and ≤5 (Group B), representing medium-high and low dysregulated sensory processing, respectively. Subjects performed biting tasks while bilateral masseter and temporalis muscle activities (electromyography, mV) and bite-forces (N) were measured in the laboratory. Outputs (mV/N) were plotted for each subject and muscle to calibrate electromyography recorded by subjects using portable devices at home. Subjects were trained to use the devices to record electromyography and electrocardiography (heartbeat) during 3 nights for ≥6 hours per night. For each electrocardiography recording, low (sympathetic) and high (parasympathetic) frequency spectral powers were measured over 5-minute intervals and plotted versus time to demonstrate ANS ultradian cycling and identify 20-minute epochs, ±10 minutes about each peak and valley. For 2 peak and 2 valley epochs per recording for each subject, duty factors (DF, % time of muscle activity/epoch) and time domain standard deviations of inter-heartbeat intervals (SDNN) were calculated. Linear regression slopes of normalized DF versus SDNN (DF/SDNN) for each subject and muscle were calculated and evaluated for group differences using Fisher Exact tests and cluster analysis.
**Results**: Data from eight Group A and six Group B subjects showed normalized DF/SDNN were correlated ($R^2$=0.22-0.80). Group B compared to Group A had significantly higher DF/SDNN regression slopes for both masseter and temporalis muscles (p=0.01). Masseter DF/SDNN data showed 4 clusters, where Group B subjects had significantly lower masseter DF during valley epochs.
**Conclusions**: Night-time masticatory muscle and ANS activities were correlated. Subjects with higher versus lower dysregulated sensory processing (PHQ-15) scores had periodically higher night-time masseter muscle activities.

Division:
Meeting: 2023 AADOCR/CADR Annual Meeting (Portland, Oregon)
Location: Portland, Oregon
Year: 2023
Final Presentation ID: 0167
Abstract Category|Abstract Category(s): Craniofacial Biology

Authors

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- Kelley, Madeline ( Private Practice , Bend , Oregon , United States )
- Gonzalez-stucker, Yoly ( University at Buffalo , Buffalo , New York , United States )
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- Liu, Hongzeng ( Oregon Health & Science University , Portland , Oregon , United States )
- Choi, Dongseok ( Oregon Health & Science University , Portland , Oregon , United States )
- Nickel, Jeffrey ( Oregon Health & Science University , Portland , Oregon , United States )

Support Funding Agency/Grant Number: American Association of Orthodontists Foundation

Financial Interest Disclosure: NONE

SESSION INFORMATION

Interactive Talk Session

Craniofacial Biology II

Wednesday, 03/15/2023 , 09:45AM - 11:15AM