

## Study

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### Background and Purpose

Individuals with temporomandibular disorder (TMD) are prone to develop persistent pain and can show sleep problems. One component of the dysfunction associated with persistent pain is disordered breathing (DB), defined as divergent breathing with a pattern that is not associated with a specific medical diagnosis (e.g., asthma) that can be seen when awake or sleeping. Little is known about quantifying DB in TMD. The purpose of this study was to assess DB in individuals with TMD compared to age matched control subjects to determine which tests and measures best captured DB associated with TMD.

### Methods and Materials

This was a descriptive case control study. Three individuals with myalgic TMD and 3 age-matched controls were recruited to participate in this IRB approved study. During 1 study visit, multiple assessment methods were used to assess three breathing domains: **Biomechanical** (chest and neck circumference, the Modified Mallampati Scale, cervical and jaw range of motion, and pressure point threshold, postural assessment), **Respiratory** (resting respiratory rate, resting blood pressure, blood oxygen levels, capnography, Breath-Hold Time, Manual Assessment of Respiratory Motion, Hi-Lo Breathing assessment, Control-Pause Time, and overnight pulse oximetry), and **Psychophysiological** (Nijmegen Questionnaire, Neck Disability Index, Pittsburgh Sleep Quality Index, Jaw Functional Limitation Scale-8, and Self-Evaluation of Breathing Questionnaire (SEBQ)).

Table 1: Sleep Study Data (TMD subjects in shaded boxes; red text represents abnormal value)

Overnight basal SPO <sub>2</sub> %	93.3	95.7	94	95.9	96.5	96.1	96
Total events	61	18	31	1	5	7	
Time in Events (min)	41.9	15.5	23.3	0.3	2.9	2.1	

### Participants

Three subjects with myalgic TMD diagnosis according to the Diagnostic Criteria for TMD<sup>1</sup> were recruited to participate in this study along with three control subjects without TMD. Subjects attended 1 visit lasting no longer than 70 minutes at the Physical Therapy Institute at the MWU Multispecialty Clinic. Data collected included demographics, questionnaires, non-invasive assessment of breathing at rest, non-invasive assessment of jaw and neck mobility, diagnostic assessment of neck pain and TMD using range of motion and palpation, postural assessment and quantification, and mouth structure assessment.

### Results

Individuals with TMD exhibited different combinations of DB across the 3 domains of breathing compared to control subjects. Comparative analysis of all measurements revealed that a simple screening method encompassing Breath-Hold Time, two questions from the SEBQ, and two questions from the Nijmegen Questionnaire were effective for identifying DB (Table 3). Along with this, overnight pulse oximetry was a useful measure to identify sleep disordered breathing in 1 individual with TMD.

Table 2: Respiratory Measures (TMD subjects in shaded boxes; red text represents abnormal value)

Resting Pulse Oximetry (%)	96	99	99	96	98	97	>95
Breath Hold Time (s)	18.7	22.8	23.08	28.83	14.8	28.34	<25s = DB >40s = rarely associated with breathing problems
MARM %	63	95	45.8	56	74.35		~50
Control Pause Time (s) (Second Trial)	15.5	8.63	2.88	17.14	7.7	21.01	<10s sub-optimal
Hi-LO	Upper Chest	Normal	Normal	Normal	Upper Chest	Normal	"Normal" Diaphragmatic

Table 3: Results of Screening Suggested by Kiesel et. Al.<sup>2</sup>

Measure	S1	C1	S2	C2	S3	C3
Breath Hold Time (s)	18.7	22.8	23.08	28.83	14.8	28.34
SEBQ Q5	2	0	2	2	2	0
SEBQ Q25	3	0	3	2	2	0
Nijmegen Q2	1	0	4	0	3	3
Nijmegen Q14	1	3	0	0	3	2

### Discussion

Results from this study provide information to allow more efficient screening of DB in individuals with TMD and informs future studies targeting interventions in individuals with TMD who have DB. SEBQ was abnormal in all three subjects but normal for all control which supports that individuals with myalgic TMD identified themselves as having breathing issues. DB was supported by the abnormal Breath Hold time in the 3 patients versus controls (abnormal in only 1 control) and abnormally low control pause times in two of the three subjects vs one of the controls. Overnight basal SPO<sub>2</sub> % was abnormal in two subjects but normal for all controls. It is important to note that for these two subjects, the total hypoxic events and the average time spent in these events was significantly higher than all controls. Sleep was rated as disturbed by all subjects on at least one questionnaire but by none for the control subjects. Neck dysfunction (NDI) was present for all three subjects but not for controls. This is consistent with the strong association seen between neck dysfunction and jaw dysfunction in TMD.<sup>3</sup> Lastly, all three subjects and only one control tested positive with the suggested screening method in Table 3.

### Conclusions

Considering breathing and sleep assessment for individuals with persistent orofacial pain can be done easily and effectively and may add another dimension to physical therapy care. The simple screening method suggested by Kiesel et al.<sup>2</sup> and shown in table 3 seems to be the most effective method of identifying individuals with DB. Future studies which examine interventions for DB in individuals with chronic TMD are needed.

### References:

- Schiffman E, Ohrbach R, Truelove E, et al. Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) for Clinical and Research Applications: recommendations of the International RDC/TMD Consortium Network and Orofacial Pain Special Interest Group. *J Oral Facial Pain Headache*. Winter 2014;28(1):6-27.
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