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A triad multisystem phenotype assessment for Temporomandibular disorder symptoms in young adults

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01. Introduction

A multisystem phenotype, characterized by a triad of somatic symptoms, psychological distress, and sleep disturbance, was recently found to be associated with an elevated risk of developing "first-onset TMD pain" in the Orofacial Pain. Considering the high prevalence of TMD signs/symptoms in the general population, it is essential to broaden the triad multisystem assessment to the wider community and implement necessary preventive measures. This is crucial for maintaining the overall health and well-being of individuals at high risk of developing TMDs.

Objective

To apply the multisystem assessment approach for examining the inter-relationships between somatic symptoms, psychological distress, and sleep quality in young adults with TMDs.

Additionally, the biopsychosocial risk factors for pain-related (PT), intra-articular (IT), and combined (CT) TMD symptoms were also identified.

Hypotheses

(a) the presence of TMD symptoms, particularly TMD pain, is associated with significantly greater somatic symptom burden, higher levels of psychological distress, and poorer sleep

(b) TMD, somatic, psychological, and sleep quality are moderate to strongly correlated

(c) the multisystem phenotype increased the risk of TMD pain, but not dysfunction.

02. Methodology

Individuals aged 18 to 24 years old; proficient in the English language;
NO history of orofacial trauma/orthognathic surgery, NOT undergoing treatment for debilitating physical and/or mental health conditions

- **Questionnaire**
  - **Demographic data**
  - **5T TMD Symptoms of SQ**
  - **PHQ-15**
  - **DASS-21**
  - **PSQI**

Kruskal Wallis/post-hoc Mann-Whitney U tests and Spearman's rank-order correlation.
Weak, moderate, or strong using cut-off points of 0.1, 0.4, and 0.7.
Univariate and multivariate logistic regression -> identify the biopsychosocial factors contributing to PT, IT, and CT.

03. Results/Findings

Final sample comprised 365 participants, age 22.5 ± 1.3 years

Variables	No TMD symptoms (NT)	Pain-related TMD symptoms (PT)	Intra-articular TMD symptoms (IT)	Combined TMD symptoms (CT)	P-value *Post-hoc*
n (%)	152 (41.6)	63 (17.3)	71 (19.5)	79 (21.6)	-
Somatic symptoms					
Total PHQ-15					
Mean (SD)	5.15 (4.88)	10.05 (5.63)	5.49 (4.00)	9.92 (6.12)	**<0.001**
Median (IQR)	4.00 (5.00)	10.00 (9.00)	4.76 (5.00)	9.00 (8.00)	CT,PT > IT,NT
Psychological Distress					
Depression					
Mean (SD)	3.10 (3.50)	3.37 (3.41)	3.17 (3.28)	3.24 (3.32)	0.703
Median (IQR)	2.00 (5.00)	2.00 (5.00)	2.00 (4.00)	2.00 (3.00)	
Anxiety					
Mean (SD)	4.09 (3.29)	4.90 (3.20)	4.24 (3.73)	5.84 (3.17)	**<0.001**
Median (IQR)	4.00 (5.00)	4.00 (4.00)	4.00 (5.00)	6.00 (4.00)	CT>NT,IT
Stress					
Mean (SD)	5.97 (4.45)	6.68 (3.67)	6.18 (4.45)	7.20 (3.66)	0.051
Median (IQR)	6.00 (5.00)	7.00 (5.00)	6.00 (8.00)	7.00 (4.00)	

SD = standard deviation; IQR = Interquartile range; PHQ-15 = Patient Health Questionnaire-15; PSQI = Pittsburgh Sleep Quality Index. Results of Kruskal-Wallis and Mann-Whitney U tests with Bonferroni correction. Bold indicates p <0.05 and > denotes statistically significant differences between groups.

Table 4. Correlations between the different biopsychosocial variables.

Variable	TT	TQ	P1	P2	P3	S1	S2	S3	S4	S5	S6	S7
TT												
TQ	0.36**											
P1	0.06	0.39**										
P2	0.20**	**0.47****	**0.60****									
P3	0.13*	**0.45****	**0.69****	**0.80****								
S1	0.16**	**0.52****	0.28**	**0.46****	**0.46****							
S2	0.12*	0.39**	0.31**	0.33**	0.35**	**0.63****						
S3	0.09	0.24**	0.11*	**0.60****	0.16**	**0.61****	0.26**					
S4	-0.02	0.22**	0.14**	0.21**	0.21**	**0.63****	**0.41****	**0.41****				
S5	0.01	-0.03	0.01	0.04	0.06	0.20**	0.06	0.06	0.23**			
S6	0.17**	0.39**	0.24**	0.29**	0.28**	**0.48****	0.16**	0.16**	0.11*	-0.05		
S7	0.09	0.14**	0.09	0.14**	0.12*	0.17**	-0.01	-0.01	0.11*	-0.03	0.07	
S8	0.18**	**0.44****	**0.45****	**0.45****	**0.48****	**0.58***	**0.44****	**0.44****	0.21**	-0.09	0.15**	0.13*

*TT = Total number of TMD symptoms; TQ = Total PHQ-15 score; P1 = Depression; P2 = Anxiety; P3 = Stress; S1 = Total PSQI; S2 = Subjective sleep quality; S3 = Sleep latency; S4 = Sleep duration.; S5 = Sleep efficiency; S6 = Sleep disturbance ; S7 = Use of sleep medications; S8 = Daytime dysfunction. Results of Spearman's correlation. *indicates p <0.05, ** indicates p <0.01, and bold specifies correlation coefficient >0.4.*

Variables	No TMD symptoms (NT)	Pain-related TMD symptoms (PT)	Intra-articular TMD symptoms (IT)	Combined TMD symptoms (CT)	P-value *Post-hoc*
Overall sleep quality					
Total PSQI					
Mean (SD)	5.99 (3.09)	6.68 (2.99)	6.13 (2.80)	7.27 (3.47)	**0.017**
Median (IQR)	5.00 (4.00)	6.00 (3.00)	6.00 (4.00)	7.00 (4.00)	CT>IT,NT
Subjective sleep quality					
Mean (SD)	1.09 (0.54)	1.29 (0.55)	1.08 (0.65)	1.33 (0.80)	**0.014**
Median (IQR)	1.00 (0.00)	1.00 (1.00)	1.00 (0.00)	1.00 (1.00)	CT,PT>IT,NT
Sleep latency					
Mean (SD)	1.39 (1.08)	1.51 (1.08)	1.55 (0.95)	1.61 (1.08)	0.536
Median (IQR)	1.00 (2.00)	1.00 (1.00)	1.00 (1.00)	2.00 (1.00)	
Sleep duration					
Mean (SD)	1.04 (0.82)	0.94 (0.80)	0.93 (0.80)	1.01 (0.84)	0.738
Median (IQR)	1.00 (0.00)	1.00 (1.00)	1.00 (1.00)	1.00 (1.00)	
Sleep efficiency					
Mean (SD)	0.29 (0.65)	0.11 (0.32)	0.38 (0.66)	0.34 (0.73)	0.082
Median (IQR)	0.00 (0.00)	0.00 (0.00)	0.00 (1.00)	0.00 (0.00)	
Sleep disturbance					
Mean (SD)	1.20 (1.46)	1.48 (1.27)	1.08 (0.91)	1.46 (1.43)	**<0.001**
Median (IQR)	1.00 (0.00)	1.00 (1.00)	1.00 (0.00)	1.00 (0.00)	CT,PT>IT,NT
Use of sleep medication					
Mean (SD)	0.03 (0.18)	0.02 (0.13)	0.03 (0.24)	0.11 (0.39)	0.056
Median (IQR)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	
Daytime dysfunction (S8)					**0.003**
Mean (SD)	0.95 (0.99)	1.35 (1.02)	1.07 (1.00)	1.41 (1.12)	CT>IT,NT
Median (IQR)	1.00 (2.00)	1.00 (1.00)	1.00 (2.00)	1.00 (1.00)	PT>NT

SD: standard deviation; IQR: Interquartile range. Results of Kruskal-Wallis and Mann-Whitney U tests. Bold indicates p <0.05 and > denotes statistically significant differences between groups.

Variables	Univariate Odds ratio (95% CI)	Univariate P-value*	Multivariate Odds ratio (95% CI)	Multivariate P-value^
Pain-related TMD symptoms				
Gender				
Male	Reference			
Female	1.57 (0.64-3.86)	0.320		
Somatic symptoms	**1.18 (1.11-1.25)**	**< 0.001**	**1.18 (1.11-1.25)**	**< 0.001**
Psychological distress				
Depression	1.02 (0.94-1.11)	0.608		
Anxiety	1.08 (0.98-1.18)	0.100		
Stress	1.04 (0.97-1.11)	0.265		
Overall sleep quality	1.07 (0.98-1.18)	0.140		
Intra-articular TMD symptoms				
Gender				
Male	Reference			
Female	1.36 (0.60-3.08)	0.467		
Somatic symptoms	1.02 (0.96-1.08)	0.623		
Psychological distress				
Depression	1.01 (0.93-1.10)	0.886		
Anxiety	1.01 (0.93-1.10)	0.764		
Stress	1.01 (0.95-1.08)	0.743		
Overall sleep quality	1.02 (0.92-1.04)	0.756		
Combined TMD symptoms				
Gender				
Male	Reference			
Female	1.22 (0.57-2.62)	0.616		
Somatic symptoms	**1.17 (1.10-1.23)**	**<0.001**	**1.15 (1.08-1.22)**	**<0.001**
Psychological distress				
Depression	1.01 (0.94-1.10)	0.765		
Anxiety	**1.17 (1.08-1.28)**	**< 0.001**		
Stress	**1.07 (1.01-1.14)**	**0.038**		
Overall sleep quality	**1.13 (1.03-1.23)**	**0.007**		

Results of univariate and multivariate logistic regression analyses. Bold indicates p <0.05.

04. Conclusion

Individuals with combined TMD pain and dysfunction demonstrated notably greater **somatic symptom burden**, higher anxiety levels, and poorer sleep compared to those with only intra-articular and no TMD symptoms.

Somatic symptoms may mediate the link between TMDs and psychological as well as sleep disturbances

Future efforts should be directed toward improving the multisystem system assessment and phenotype classification to advance the prevention and care of patients with TMDs