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Alexithymia partly predicts pain, poor health and social difficulties in patients with temporomandibular disorders

A. MINGARELLI*, M. CASAGRANDE*, R. DI PIRCHIO†, S. NIZZI†, C. PARISI†, B. C. LOY†, L. SOLANO†, A. RAMPELLO‡ & C. DI PAOLO‡ *Dipartimento di Psicologia, 'Sapienza' Università di Roma, Rome, †Dipartimento di Psicologia Dinamica e Clinica, 'Sapienza' Università di Roma, Rome and ‡Servizio di Gnatologia Clinica Dipartimento di Scienze Odontostomatologiche e Maxillo Facciali, 'Sapienza' Università di Roma, Rome, Italy

SUMMARY **Temporomandibular disorders (TMD) are functional diseases of the masticatory system; their symptoms are clicking, difficulty opening the mouth wide, ear pain, facial pain and headaches. The relationships among distress, emotional factors and TMD are well known. It was shown that patients with TMD have little awareness of their inner states and emotions, and it was found that those reporting oro-facial pain presented higher alexithymia than did asymptomatic people. Other authors confirmed that alexithymia was higher in the painful TMD group than controls. This study was aimed to evaluate whether alexithymia and its components can be considered as predisposing factors for pain severity, poor health and greater social difficulties in patients with TMD. One hundred thirty-three patients received a diagnosis of TMD and completed the 20-item Toronto Alexithymia Scale. Multiple stepwise regressions showed that alexithymia and age explained 10% of the *pain* and 31% of *poor health* and also that alexithymia explained 7% of *social difficulty*. A direct comparison of patients with TMD based on alexithymia revealed a higher presence of pain in alexithymic patients with TMD than in those characterised by moderate or no alexithymia. In conclusion, alexithymia partly predicts pain, poor health and social difficulties in patients with TMD. Furthermore, alexithymic patients have more pain than those with moderate or low alexithymia.**

KEYWORDS: **temporomandibular disorders, alexithymia, pain, health, social difficulty**

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Introduction

Temporomandibular disorders (TMD) are functional diseases of the masticatory system, involving the muscles of mastication and the hard and soft tissues of the temporomandibular joint (1). Primary symptoms of TMD are clicking, difficulty opening the mouth wide, ear pain, facial pain and headaches (2). An epidemiological study points out that 50–60% of the population show signs of and/or marked functional impairment of the masticatory system, while 8–15% of women and 3–10% of men have symptoms severe enough to require treatment (3).

Chronic pain is frequently related with TMD (4), and oro-facial pain is usually associated with many conditions, such as loss of or increase in the weight, swelling, libido loss, sleep disorders, attention deficit (5). The relationships of TMD with distress and emotional factors are well known (6, 7). Stressful events appear to have a strong influence on TMD, in particular with regard to the intensification of oral parafunctions (clenching and grinding of teeth) (8). In addition, it was shown that patients with TMD have little awareness of their inner states and emotions (9). Further, patients with chronic pain (with disorders different from TMD) usually present higher alexithymia levels than controls (10, 11). A positive relationship between alexithymia and acute pain was also reported (12, 13), but this finding was not confirmed by other studies (10–14).

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A Finnish study (15), by considering 4893 people, found that those reporting oro-facial pain presented higher alexithymia than did asymptomatic people. However, participants of this study did not receive a diagnosis of TMD. More recently, Glaros and Lumley (16) evaluated the relationship between alexithymia and TMD by comparing two groups of patients with and without pain. The authors found that patients with painful TMD were not more alexithymic than pain-free controls; however, the group who experienced pain did present higher difficulty identifying feelings (DIF) than did people without pain. These findings do not confirm the relationship between TMD and alexithymia, and they only partly corroborate the relationship between alexithymia and pain severity. In fact, patients with painful TMD had greater DIF than did pain-free TMD patients, even if this difference was explained by depressed mood. Further, painful TMD patients reported lower externally oriented thinking (EOT) than did pain-free TMD patients, even after controlling for depressed mood. In our opinion, the difficulty in interpreting these results is given by the fact that the study does not consider alexithymia and its components as independent variables. Therefore, a number of issues remain unclear. First, in patients with TMD, does alexithymia (or its components) represent a predisposing factor of pain severity? Second, in patients with TMD, does alexithymia predispose to poor health and greater social difficulties?

This study was aimed to evaluate whether alexithymia and its components are associated to pain severity in patients with TMD (15, 16). Moreover, according to findings showing an association between alexithymia and somatisation (17) and between alexithymia and difficulty in social relationships (18), we hypothesise that alexithymia could be a predisposing factors for poor health and greater social difficulties in patients with TMD.

In line with Glaros and Lumley's study, we examined the relationship among alexithymia, pain, health and social difficulties in patients with TMD using two methods. We first assessed whether alexithymia and its components (as measured with the 20-item Toronto Alexithymia Scale; TAS-20) predict more severe pain, poor health and greater difficulties in social relationships. Second, we tested the hypothesis that pain, poor health and difficulties in social relationships are higher among alexithymic people compared with both non-alexithymic subjects and people with intermediate alexithymia.

Method

Participants

One hundred thirty-two patients (112 women and 20 men, mean age: 39·20 ± 13·56 years) were recruited from the Odontoiatric Clinic in Periodontology of Policlinico 'Umberto I' in Rome in the period from June 2010 to November 2010. All participants received a diagnosis of TMD, according to the Research Diagnostic Criteria for Temporomandibular Disorders (RDC-TMD) (1). Exclusion criteria were temporomandibular joint disorders (TMJD) due to accidents, pre-surgical treatments; or any chronic pain condition other than TMD.

All patients were unpaid volunteers who signed an informed consent before participating in the study. All aspects of the research protocol were approved by the local ethical committee, and patients were free to decline their participation. About 82% of the patients agreed to participate.

The following individual characteristics were taken into account: age, years of schooling, weight, height, body mass index (BMI), nocturnal bruxism and use of the mandibular bite plate (Table 1).

Measures

Toronto alexithymia scale. Alexithymia was measured by the TAS-20 (18, 19). The TAS-20 is the most widely used and validated self-report measure of alexithymia. TAS-20 shows a three-factor structure consisting of (1) DIF, (2) difficulty describing feelings (DDF) and (3) EOT. According to Taylor *et al.*'s recommendations (20), people are considered as non-alexithymic if their global score is below or equal to 51. A score ranging between 52 and 60 represents moderate alexithymia levels. Finally, people showing a score >61 are considered alexithymic. In the present study, 63·64% ($N = 84$) of the people were classified as non-alexithymic, 24·24% ($N = 32$) as moderate alexithymic and 12·12% ($N = 16$) as alexithymic.

Research Diagnostic Criteria for Temporomandibular Disorders Questionnaire. The RDC-TMD questionnaire (1) is aimed to assess and classify the severity of the

Table 1. Main characteristics of participants

	Global sample	High alexithymics	Moderate alexithymics	Low alexithymics
Number of participants:	132	16	32	84
Mean (±s.d.)				
Age	39·20 ± 13·56	40·00 ± 15·17	43·55 ± 15·37	37·38 ± 12·23
Years of schooling	13·69 ± 3·85	10·57 ± 2·71	12·43 ± 3·70	14·77 ± 3·64
Weight (in Kg)	64·35 ± 12·18	64·31 ± 12·37	65·83 ± 14·39	63·79 ± 11·33
Height (in cm)	165·72 ± 8·59	163·81 ± 5·41	163·83 ± 7·54	166·81 ± 9·33
BMI	23·39 ± 3·80	23·90 ± 4·09	24·47 ± 4·72	22·88 ± 3·28
Percentage				
Familiarity with TMD	20	29	41	11
Nocturnal bruxism	68	87	57	69
Use of the mandibular bite plate	57	73	52	56

BMI, body mass index; computed by dividing weight (kg) by height (m^2).

pain condition and pain-related disability. Information on health is also included. This information concerns the following dimensions: a) general health, b) oral health, c) general health care and d) oral health care. Pain-related social difficulties are also investigated, with question concerning to a) interference in daily activities, b) changes in employment, c) difficulty in employment, d) changes in recreational area, e) difficulty in social activities, f) difficulty in speaking, g) difficulty in laughing and h) difficulty in kissing. The presence of pain was assessed by participants on a 0 (no pain)- to 10 (severe pain)-point scale.

Procedure

All patients diagnosed as TMD were required to evaluate the presence of pain and to fill in the RDC-TMD questionnaire. An interview with the patients evaluated the presence of nocturnal bruxism according to the report that they frequently presented with tooth grinding sounds during sleep, confirmed by a roommate or family member. Then they were recruited by a psychologist in the waiting room of the Odontoiatric Clinic in Periodontology. After each participant provided informed consent, he/she was required to fill in the TAS-20. Then, he/she was administered a questionnaire by a psychologist. Approximately 1 week later, each participant had another interview with the psychologist and received his/her psychological profile.

Data analysis

To evaluate the relationships among variables, the Pearson's correlation was used. Multiple stepwise regression (forward method) analyses were used to assess the best model in predicting the levels of TMD symptoms. The following variables were alternatively entered into the stepwise linear regression model as independent variables: (i) total alexithymia score and age and (ii) DIF, DDF, EOT and age. Stepwise multiple regressions examined the influence of alexithymia (TAS-20 scores) on 1) pain; 2) poor health: average of z scores of the following dimensions: a) general health, b) oral health, c) general health care and d) oral health care (high scores define poor health); 3) social difficulties: average of *z* scores of the following dimensions: a) interference in daily activities, b) changes in employment, c) difficulty in employment, d) changes in recreational area, e) difficulty in social activities, f) difficulty in speaking, g) difficulty in laughing and h) difficulty in kissing. Finally, facets of the TAS-20 were entered in stepwise analyses to predict 1) pain, 2) poor health and 3) social difficulties.

To directly compare the presence of TMD symptoms as a function of alexithymia, separate multivariate analyses of covariance (MANCOVAS) were performed with alexithymia (high alexithymia, moderate alexithymia, low alexithymia) as the between-group variable and age as a covariate. One MANCOVA considered *poor health* (general health, oral health, general health care, oral health care) and another MANCOVA considered *social difficulty* (interference in daily activities, changes in employment, difficulties in employment, changes in recreational area, difficulty in social activities, difficulty in speaking, difficulty in laughing, difficulty in kissing) as dependent variables. One ANCOVA considered pain as a dependent variable. An alpha value of 0·05 was used to establish statistical significance for all analyses.

Table 2. Means, standard deviations and correlations among variables

	TAS-20	DIF	DDF	EOT	Pain	Worst health	Social difficulty
DIF	0·77***						
DDF	0·74***	0·59***					
EOT	0·56***	0·14	0·35***				
Pain	0·24**	0·26**	0·23**	0·12			
Poor health	0·30***	0·45***	0·33***	0·12	0·30***		
Social difficulty	0·24**	0·35***	0·15	0·06	0·60***	0·29***	
Age	0·12	0·19*	0·19*	0·12	0·22*	0·49***	0·10
Mean	45·44	16·17	12·20	16·78	4·48	−0·03	0·00
SD	12·93	7·46	4·88	4·90	3·00	0·79	0·74

DIF, difficulty identifying feelings; DDF, difficulty describing feelings; EOT, externally oriented thinking; TAS-20: Global scores of alexithymia.
*$P < 0·05$: **$P < 0·01$; ***$P < 0·001$.

Results

Multiple stepwise regression analyses

Global alexithymia. Means, standard deviations and correlations (*Pearson's r*) of measures used in the modelling analyses are presented in Table 2. In Table 3, results of multiple stepwise regression are reported. When *pain* was the dependent variable, alexithymia and age were both significant and they explained 10% of the total covariance. In the analysis considering *poor health*, alexithymia and age were both significant and they explained 31% of the total covariance. When *social difficulty* was considered as dependent variable, alexithymia and age were both significant and they explained 7% of the total covariance.

DIF, DDF and EOT. Means and standard deviations of measures used in the modelling analyses are presented in Table 2. In Table 3, results of multiple stepwise regression are reported. When *pain* was the dependent variable, DIF, DDF and age explained 10% of the total covariance, but none of them was significant. In the analysis considering *poor health*, DIF and age variables were both significant and they explained 38% of the total covariance. Concerning *social difficulty*, only DIF was significant and it explained 13% of the total covariance.

Table 3. Stepwise regression analyses predicting pain, poor health and social difficulty from (a) TAS-20 scores and age and (b) DIF, DDF, EOT and age

	R^2	F	P	β	t	P
a) Independent variables: alexithymia and age						
Pain	0·10	6·18	0·003			
TAS				0·22	2·50	0·01
Age				0·19	2·16	0·03
Poor health	0·31	27·17	0·000001			
Age				0·46	6·07	0·000001
TAS				0·25	3·29	0·001
Social difficulty	0·07	9·69	0·002			
TAS				0·27	3·11	0·002
b) Independent variables: DIF, DDF, EOT and age						
Pain	0·10	4·40	0·006			
DIF				0·16	1·45	0·15
Age				0·17	1·85	0·07
DDF				0·11	1·01	0·32
Poor health	0·38	36·52	0·000001			
Age				0·42	5·71	0·000001
DIF				0·37	4·98	0·000002
Social difficulty	0·13	17·46	0·00006			
DIF				0·36	4·18	0·00006

DIF, difficulty identifying feelings; DDF, difficulty describing feelings; EOT, externally oriented thinking.

MANCOVA and ANCOVA results

Alexithymia and pain. The ANCOVA considering *alexithymia* (high alexithymia, moderate alexithymia, low alexithymia) as between-group variable, age as covariate and pain as dependent variable showed a significant effect ($F_{2,128} = 3·51$; $P = 0·03$; *Partial* $\eta^2 = 0·063$; see Table 4), which revealed a greater *pain* in high-alexithymic patients than in the other patients (see Fig. 1).

Alexithymia and poor health. The MANCOVA considering *alexithymia* (high alexithymia, moderate alexithymia,

Table 4. Means and standard deviations of all variables and ANOVA results

				ANCOVA results		
	Low alexithymia	Moderate alexithymia	High alexithymia	$F_{2,128}$	P	*Partial* η^2
Pain	4·23 ± 2·95	4·06 ± 3·20	6·67 ± 3·00	3·51	0·03	0·063
General health	3·24 ± 0·98	3·51 ± 0·98	3·72 ± 0·64	<1	–	0·016
Oral health	3·60 ± 0·95	3·75 ± 1·05	3·81 ± 0·75	<1	–	0·005
General health care	2·88 ± 0·89	3·10 ± 1·26	3·63 ± 0·92	2·56	0·08	0·047
Oral health care	2·80 ± 0·93	3·00 ± 1·20	3·72 ± 0·90	3·9	0·02	0·069
Interference in daily activities	3·04 ± 2·93	3·11 ± 3·15	4·25 ± 3·98	<1	–	0·009
Changes in employment	2·32 ± 2·68	2·74 ± 2·98	4·92 ± 3·93	1·57	0·2	0·030
Difficulties in employment	1·59 ± 0·98	1·85 ± 1·29	2·33 ± 1·43	1·37	0·3	0·026
Changes in recreational area	3·18 ± 3·10	2·41 ± 3·03	4·75 ± 3·71	1·24	0·3	0·024
Difficulty in social activities	1·39 ± 0·75	1·62 ± 1·15	2·61 ± 1·27	2·54	0·08	0·048
Difficulty in speaking	1·63 ± 0·86	1·63 ± 1·04	2·58 ± 1·00	4·65	0·01	0·084
Difficulty in laughing	1·73 ± 1·06	2·11 ± 1·39	2·75 ± 1·48	2·61	0·08	0·049
Difficulty in kissing	1·74 ± 0·97	1·70 ± 1·07	2·00 ± 1·20	<1	–	0·004

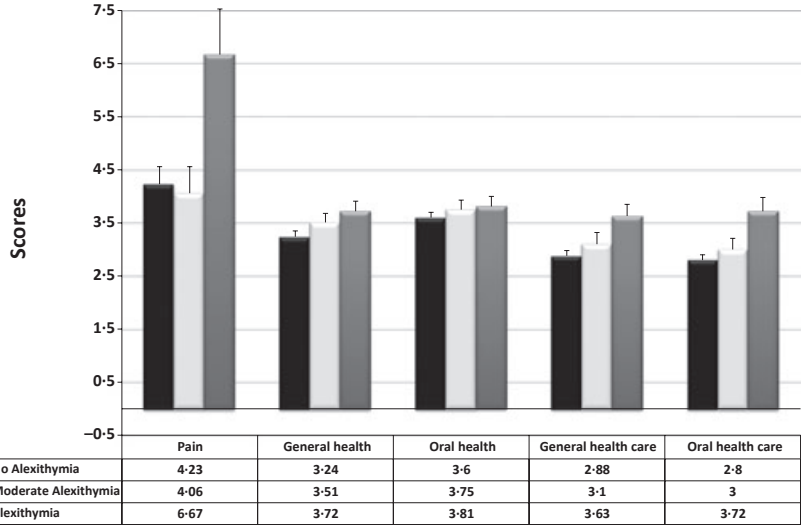


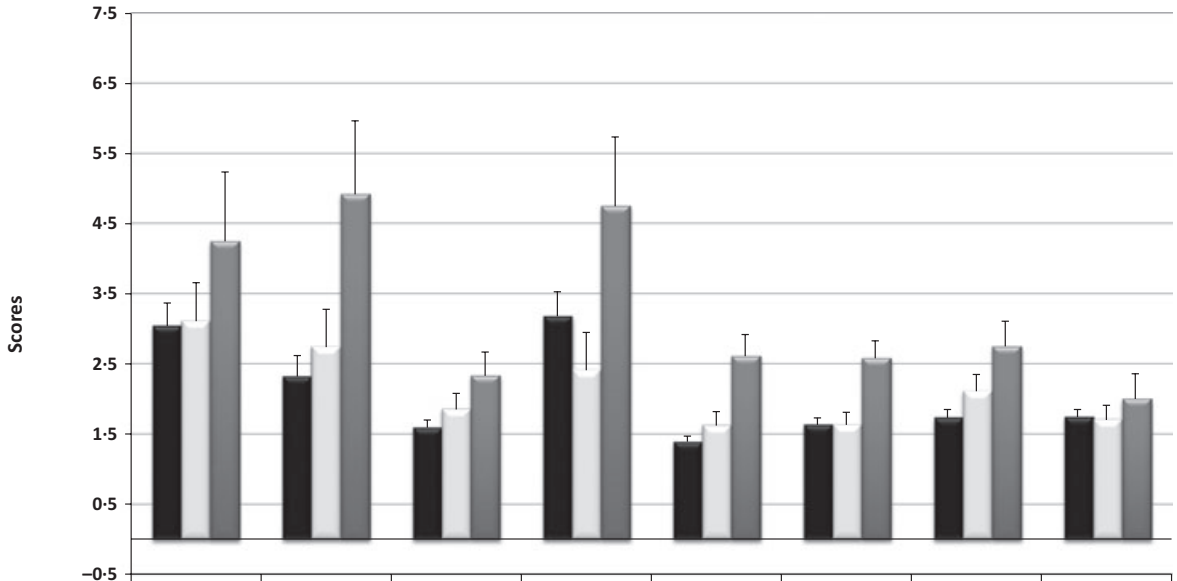
Fig. 1. Pain and poor health (general health, oral health, general health care, oral health care) scores in patients with TMD, characterised by low alexithymia (black bars), moderate alexithymia (white bars) and high alexithymia (grey bars). It should be highlighted that higher health scores indicate poor health.

low alexithymia) as between-group variable, age as covariate and general health, oral health, general health care, oral health care (poor health) as dependent variables was not significant (*Rao's*$_{8\cdot250}$ = 1·06; P = 0·40; *Partial* η^2=0·040); ANCOVAS, however, showed a significant effect for oral *health care*. ANCOVAS results are reported in the Table 4. *Poor health* variables as a function of alexithymia are reported in Fig. 1.

Alexithymia and social difficulty. The MANCOVA, considering interference in daily activities, changes in employment, difficulties in employment, changes in recreational area, difficulty in social activities, difficulty in speaking, difficulty in laughing and difficulty in kissing (*social difficulty*), showed a significant effect of *alexithymia* (*Rao's*$_{16,238}$ = 2·26; P = 0·005; *Partial* η^2=0·161), and ANCOVAS revealed a significantly greater difficulty in speaking in alexithymic patients than in the other patients (see Table 4 and Fig. 2). All other differences in social difficulties are in the expected direction.

Discussion

We examined the relationship of global alexithymia and its facets with pain, poor health and social difficulties in patients with TMD. Similarly to Glaros and Lumley's study (16), we used two methods: comparison between groups and correlations within group. In this study, the findings highlight significant correlations of alexithymia and two of its facets (DIF and



	Interference DA	Changes E	Difficulty E	Changes RA	Difficulty SA	Difficulty S	Difficulty L	Difficulty K
N0-Alexithymia	3·04	2·32	1·59	3·18	1·39	1·63	1·73	1·74
Moderate Alexithymia	3·11	2·74	1·85	2·41	1·62	1·63	2·11	1·7
Alexithymia	4·25	4·92	2·33	4·75	2·61	2·58	2·75	2

Fig. 2. Social difficulties (interference in daily activities, changes in employment, difficulty in employment, changes in recreational area, difficulty in social activities, difficulty in speaking, difficulty in laughing and difficulty in kissing) scores in patients with TMD, characterised by low alexithymia (black bars), moderate alexithymia (white bars) and high alexithymia (grey bars). It should be highlighted that higher health scores indicate poor social difficulties. DA, daily activities; E, employment; RA, recreational area; SA, social activities; S, speaking; L, laughing; K, kissing. *P = 0.01.

DDF) to pain, poor health and social difficulties in patients with TMD. Specifically, global alexithymia and age predicted 10% of pain and 31% of poor health in patients with TMD, while global alexithymia only predicted 7% of variance in social difficulty. When facets of alexithymia were considered, 10% of pain was predicted by DIF, DDF and age; 38% of poor health was predicted by DIF and age; finally, 13% of social difficulty was predicted by DIF. These results are line with recent findings highlighting facial emotion recognition deficits in patients with TMD (21).

Concerning pain, results of this study replicate previous findings (15, 16) because they indicate clearly that the presence of pain intensify significantly as a function of alexithymia and specifically of Difficulty in Identifying and of Describing Feelings. Equally, findings of the present study confirm preceding results showing an association between alexithymia and both poor health (22) and social difficulty (23). However, for the first time, the latter two associations were found in patients suffering TMD.

No significant correlation was found between EOT and each of the variables measured in patients with TMD. This may be explained by assuming a specific role of emotional dysregulation in the exacerbation of pain, poor health and social difficulties in patients with TMD. These results are in line with the inconsistency of relationship found between EOT and TMD pain in the literature (16).

When we directly compared high-alexithymic, moderate-alexithymic and low-alexithymic patients with TMD in measures of pain, poor health and social difficulties, we found that these were higher in high-alexithymic patients than in the other two groups, but these differences were significant only for pain, oral health care and difficulty in speaking.

The higher presence of pain in high-alexithymic patients confirms previous results (15, 16). However, it should be underlined that the present study has confirmed the association between alexithymia and pain, considering alexithymia as an independent variable, differently from previous studies.

This difference seems important because it clearly highlights that the presence of alexithymic traits may contribute to the presence of pain or pain severity in patients with TMD. Although a connection between chronic pain and alexithymia was noted in several studies (11), it is not clear the nature of this connection. One explanation could be that affect regulation failure, characterising alexithymia, is linked with chronic pain (20). These results confirm that psychological factors – that is, emotional dysregulation – play an important role in the presence of pain in patients with TMD. Considering that the distribution of alexithymia in our sample is similar to that observed in healthy people (24), it would be useful to repeat the study by considering a larger sample of patients with TMD.

The study has some limitations that should be considered. In fact, the results only partly support the hypothesis, that is, alexithymia exhibited low correlations with pain, poor health and social difficulties even though they were statistically significant. To clarify the relationship between alexithymia and the conditions associated with TMD will be important to repeat the study while including more participants well as assessing other psychological traits that may contribute, together with alexithymia, to explain the difficulties experienced by patients with TMD.

Conclusions

These results, although preliminary, points out the usefulness of developing a protocol of diagnosis and care in a biopsychosocial perspective, providing the synergistic collaboration of a psychologist with other professional people who are interested in TMD. The dentist is the first specialist able to diagnose TMD and to establish the treatment plan, which provides for the immediate control of pain through drug administration and occlusal therapy. The psychologist may provide an important aid to classify the disorder in the context of emotional disregulation and could contribute to reduce pain and social difficulties and to improve general and oral health through psychological programmes aimed to promote emotional regulation (25).

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Disclosure

This research was carried out without funding.

Conflicts of interest

No conflicts of interest declared. We declare that the study described in the manuscript was performed in full accordance with ethical principles, including the World Medical Association Declaration of Helsinki (version, 2002). The study has been independently reviewed and approved by the local ethical board. The study experiments were undertaken with the understanding and written consent of each participant and according to the above-mentioned principles.

References

1. Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord. 1992;6:301–355.
2. Okeson JP. Orofacial pain, guidelines for assessment, diagnosis, and management. Carol Stream, Illinois (IL): Quintessence Publishing; 1996.
3. LeResche L. Epidemiology of temporomandibular disorders: implications for the investigation of etiologic factors. Crit Rev Oral Biol Med. 1997;8:291–305.
4. John MT, Migloretti DL, LeResche L, Von Korff M, Critchlow CW. Widespread pain as a risk factor for dysfunctional temporomandibular disorder pain. Pain. 2003;102: 257–263.
5. Stohler CS. Chronic orofacial pain: is the puzzle unraveling? J Dent Educ. 2001;65:1383–1392.
6. Suvinen TI, Reade PC, Kemppainen P, Könönen M, Dworkin SF. Review of aetiological concepts of temporomandibular pain disorders: towards a biopsychosocial model for integration of physical disorder factors with psychological and psychosocial illness impact factors. Eur J Pain. 2005;9:613–633.
7. Van Selms MKA, Lobbezoo F, Visscher CM, Naeije M. Myofascial temporomandibular disorder pain, parafunctions and psychological stress. J Oral Rehabil. 2008;35:45–52.
8. Schwartz SM, Gramling SE, Grayson R. Stress induced oral behaviors and facial pain. Int J Stress Manag. 2001;8:35.
9. Meldolesi GN, Picardi A, Accivile E, Toraldo di Francia R, Biondi M. Personality and psychopathology in patients with temporomandibular joint pain-Dysfunction syndrome. Psychother Psychosom. 2000;69:322–328.
10. Bushnell MC, Villemure C, Strigo I, Duncan GH. Imaging pain in the brain: the role of the cerebral cortex in pain perception and modulation. J Musculoskelet Pain. 2002;10: 59–72.

11. Lumley MA, Asselin LA, Norman S. Alexithymia in chronic pain patients. J Comp Psychol. 1997;38:160–165.
12. Nyklicek I, Vingerhoets AJ. Alexithymia is associated with low tolerance to experimental painful stimulation. Pain. 2000;85:471–475.
13. Putterman E, Byrne N, Ditto B. Alexithymia and symptom reporting following blood donation. Psychosom Med. 2001;63:138–139.
14. Lumley MA, Smith JA, Longo DJ. The relationship of alexithymia to pain severity and impairment among patients with chronic myofascial pain: comparisons with self-efficacy, catastrophizing, and depression. J Psychosom Res. 2002;53:823–830.
15. Sipilä K, Veijola J, Jokelainen J, Järvelin MR, Oikarinen KS, Raustia AM *et al.* Association of symptoms of TMD and orofacial pain with alexithymia: an epidemiological study of the Northern Finland 1966 Birth Cohort. Cranio. 2001;19: 246–251.
16. Glaros AG, Lumley MA. Alexithymia and pain in temporomandibular disorder. J Psychosom Res. 2005;59:85–88.
17. De Gucht V. Stability of Neuroticism and Alexithymia in Somatization. Compr Psychiatry. 2003;44:466–471.
18. Bagby RM, Parker JDA, Taylor GJ. The twenty-item toronto alexithymia scale – I. Item selection and cross-validation of the factor structure. J Psychosom Res. 1994;38:23–32.
19. Bressi C, Taylor G, Parker J, Bressi S, Brambilla V, Aguglia E *et al.* Cross validation of the factor structure of the Toronto Alexithymia scale: an italian multicenter study. J Psychosom Res. 1996;41:551–559.
20. Taylor GJ. Somatoform disorders. In: Taylor GJ, Babgy RM, Parker JDA, eds. Disorders of affect regulation: alexithymia in medical and psychiatric illness. Cambridge: Cambridge University Press; 1997:114–137.
21. Haas J, Eichhammer P, Traue HC, Hoffmann H, Behr M, Cronlein T *et al.* Alexithymic and somatisation scores in patients with temporomandibular pain disorder correlate with deficits in facial emotion recognition. J Oral Rehabil. 2013;40:81–90.
22. Razali SM, Yunus NNAM, Kumaraswamy N. Relationship between alexithymia, personality and somatic symptoms. Int Med J. 2002;9:117–120.
23. Hesse C, Floyd K. Affection mediates the impact of alexithymia on relationships. Pers Indiv Differ. 2011;50:451–456.
24. Salminen JK, Saarijärvi S, Äärelä E, Toikka T, Kauhanen J. Prevalence of alexithymia and its association with sociodemographic variables in the general population of Finland. J Psychosom Res. 1999;46:75–82.
25. Mingarelli A, Germanò G, Casagrande M, Benevento M, Muggianu A, Stella E *et al.* Regolazione delle emozioni e ipertensione arteriosa. Ipertens Prevenz Cardiov. 2011; 18:75–82.

Correspondence: Maria Casagrande, Department of Psychology, 'Sapienza' Università di Roma, Via dei Marsi, 78, Rome 00185, Italy. E-mail: maria.casagrande@uniroma1.it