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ORIGINAL RESEARCH

Association Between Coping Strategies and Pain-Related Outcomes Among Individuals with Chronic Orofacial Pain

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Background: Chronic orofacial pain is associated with substantial pain-related disability and emotional distress. Understanding the relationship between individuals' coping strategies and pain-related outcomes is important yet understudied in this population.

Purpose: To test the cross-sectional association of three coping strategies (pain catastrophizing, kinesiophobia and mindfulness) to four pain-related outcomes (depression, anxiety, pain intensity, and pain-related disability) among individuals with chronic orofacial pain, after accounting for relevant demographic and clinical variables.

Methods: Individuals (N=303) with heterogeneous chronic orofacial pain (eg, trigeminal neuralgia, other trigeminal neuropathic pain, persistent idiopathic facial pain and other types) completed self-report measures of coping (Pain Catastrophizing Scale, Tampa Scale of Kinesiophobia, and the 15-item Five Facet Mindfulness Questionnaire), pain intensity and pain-related disability (Graded Chronic Pain Scale), and PROMIS measure of anxiety and depression. We conducted 4 two-step hierarchical regressions for each of the four pain-related and emotional outcomes, with the first step including demographic and clinical covariates, and the second step including the three coping variables together.

Results: Pain catastrophizing was the only coping variable significantly associated with pain intensity (B=0.362, SE=0.115, p=0.002, 3% variance explained) and pain-related disability (B =0.813, SE=0.162, p<0.001, 7% variance explained). Pain catastrophizing (B=0.231-0.267, SE=0.046-0.051-0.050, p<0.001), kinesiophobia (B=0.201-0.316, SE=0.081-0.084, p<0.001-0.018), and mindfulness (B=0.231–0.306, SE=0.046-0.067, p<0.001) were each independently associated with symptoms of anxiety and depression, with the largest incremental variance added by catastrophizing (5–8%) and mindfulness (5%).

Conclusion: Pain catastrophizing appears to be an important intervention target to improve pain intensity, pain-related disability, anxiety and depression among individuals with chronic orofacial pain. Kinesiophobia and mindfulness may be additional treatment targets for interventions to improve anxiety and depression.

Keywords: chronic orofacial pain, coping, pain-related disability, anxiety, depression

Introduction

Chronic orofacial pain – pain in the face, mouth or jaw that is present for at least 1 day in the past month and spans at least 3 months[1,2] - is common,[3] and associated with high health care costs,[4] substantial disability[4] and emotional distress.[12–14] Consistent with the growing conceptualization of chronic orofacial pain through a biopsychosocial perspective,[5–9] psychological factors receive increasing empirical attention as key outcomes. Such psychosocial emphasis is evident across orofacial diagnostic categories,[10–12] including musculoskeletal (eg, temporomandibular disorders[13]), neuropathic (eg, trigeminal neuropathic pain[14]), neurovascular (eg, migraine[15]), and other types of orofacial pain.[16]

Prior research among people with chronic pain has shown that coping strategies have a strong association with disability and emotional distress (symptoms of depression and anxiety).[17–20] In particular, *pain catastrophizing* (a

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tendency to magnify pain, actively ruminate on it, and feel helpless about the pain experience[21]), *kinesiophobia* (excessive and debilitating fear of movement and activity due to pain or concerns about reinjury[22]), and *mindfulness* (paying attention on purpose, in the present moment, and non-judgmentally[23]). have shown strong associations with pain intensity, disability and emotional distress in patients with chronic pain.[24–34] Although prior research has shown that pain catastrophizing and kinesiophobia are important among people with pain associated with temporomandibular disorders,[35–42] these factors remain underexplored within other chronic orofacial pain conditions.[43] Further, no research has explored the association between mindfulness and pain-related outcomes in chronic orofacial pain. Given that orofacial pain conditions tend to be comorbid[44,45] and may share psychosocial processes,[43] assessing these coping variables in individuals with heterogeneous chronic orofacial pain may help develop interventions for this population that are scalable and implementable.

Building on prior research, we conduct the first examination of the relationship between individuals' strategies for coping with their chronic orofacial pain (pain catastrophizing, kinesiophobia, and mindfulness), and pain-related outcomes (depression, anxiety, pain intensity, and pain-related disability) across a sample of people with heterogeneous chronic orofacial pain. We hypothesized that all three coping strategies would be significantly associated with depression, anxiety, pain intensity, and pain-related disability.

Methods

Participants and Procedures

We recruited individuals with chronic orofacial pain between March and June of 2021, through an electronic newsletter sent to members of the Facial Pain Association (FPA), a non-profit organization serving individuals with orofacial pain. Inclusion criteria were ages 18+, self-reported ability to read and write in English at a sixth grade level, having nonmalignant facial pain of any kind for more than 3 months, and living in the United States. Three-hundred fifty-five individuals indicated consent for participation on an electronic consent form presented prior to the questionnaires (see Table 1 for demographic and clinical characteristics). Of these, 303 subsequently completed the questionnaires on REDCap. All study procedures were approved by the Massachusetts General Hospital Institutional Review Board and were conducted in accordance with the Declaration of Helsinki. We classified reported diagnoses in line with the International Classification of Orofacial Pain, first edition (ICOP).[46]

Table 1 Demographics of the Participants (N=303)

Variable	
Age, M (SD)	59.11 (27.57)
Gender, n (%)	
Male	42 (13.9)
Female	261 (86.1)
Education, n (%)	
Less than high school	2 (0.7)
High school	31 (10.2)
Some college	80 (26.4)
4-year college	95 (31.4)
Graduate/professional	94 (31)
Employment status, n (%)	
Full time	83 (27.1)
Part time	36 (11.6)
Homemaker	12 (4)
Student	2 (0.7)
Unemployed	118 (38)
Retired	31 (10.2)
Other	22 (7.3)

(*Continued*)

Table 1 (Continued).

Variable	
Marital status	
Single	29 (9.6)
Living w/ significant other	17 (5.6)
Separated/divorced	32 (10.6)
Widowed	12 (4)
Ethnicity, n (%)	
Hispanic/Latino	16 (5.3)
Non-Hispanic/Latino	274 (90.4)
Diagnostic category, n (%)	
Neuropathic	
Trigeminal Neuralgia	156 (51.5)
TNP	22 (7.3)
TN2	22 (7.3)
PIFP	16 (5.3)
Other	
Multiple diagnoses	60 (19.8)
Other	14 (4.6)
None stated	13 (4.3)
Pain duration, n (%)	
0–1 year	14 (4.6)
1–5 years	70 (23.1)
5–10 years	80 (26.4)
10+ years	139 (45.8)
Mental health history, n (%)	
None	166 (54.8)
Depression	96 (31.7)
Anxiety	81 (26.7)
PTSD	29 (9.6)
Other	15 (5)
Using pain medications, n (%)	216 (71.3)
Using mood medications, n (%)	103 (34)

Notes: Diagnosis codes: TNP= Other trigeminal neuropathic pain TN2= Classical trigeminal neuralgia with concomitant continuous pain *Formerly: Atypical trigeminal neuralgia; trigeminal neuralgia type 2* PIFP= Persistent Idiopathic Facial Pain *Formerly: atypical facial pain*. Unlisted diagnoses included under "multiple diagnoses" and "Other" include migraines (n=8), myofascial orofacial pain (n=2), temporomandibular disorders (n=7), glossopharyngeal neuralgia (n=10), Hemicrania continua (n=1), Burning Mouth Syndrome (N=4), occipital neuralgia (n=8) and diagnoses not specified in the ICOP (n=23).

Measures

Demographics and clinical characteristics

Participants reported demographic information (eg, age, gender, ethnicity, marital status, etc.) and clinical characteristics (eg, facial pain diagnosis, duration, existence of mental health conditions, use of prescription medication for pain or mental health). This information is displayed in Table 1.

Anxiety

The *PROMIS anxiety scale* version 108a[47] is an 8-item questionnaire assessing the frequency and intensity of anxiety symptoms on a 1–5 Likert scale. Scores are reported as T scores with a mean of 50 (SD=10).

Depression

The *PROMIS depression scale* version 108b[48] is an 8-item questionnaire assessing the frequency and intensity of depression symptoms on a 1–5 Likert scale. Scores are reported as T scores with a mean of 50 (SD=10).

Pain catastrophizing

The *pain catastrophizing scale* (PCS)[21] is a 13-item questionnaire assessing participants' tendency to ruminate, magnify, and feel helpless in the face of pain on a 0–4 Likert scale.

Kinesiophobia

The *Tampa Kinesiophobia Scale for Temporomandibular Disorders* (TSK-TMD[35]) is a 12-item questionnaire assessing fear of pain due to movement of the jaw on a 4-point Likert scale. References to "jaw" were modified to "jaw/face/neck" in order to be inclusive of broader orofacial pain conditions.

Mindfulness

The *Five Facet Mindfulness Questionnaire* (FFMQ-15[49]) is a 15-item questionnaire assessing different facets of mindfulness (observing, describing, acting with awareness, non-reactivity, and nonjudging) on a 5-point Likert scale.

Pain intensity and pain-related disability

The *Graded Chronic Pain Scale*[50] is a 7-item scale which assesses pain intensity and pain-related disability on separate subscales.

Analytic Strategy

We used SPSS version 24 for all analyses. We used multiple imputations for missing data. First, we conducted descriptive statistics and zero-order correlations. Second, to evaluate the incremental variance explained by pain catastrophizing, kinesiophobia, and mindfulness, we conducted four separate two-step hierarchical regressions for each of the criterion variables (pain intensity, pain-related disability, anxiety, and depression). For all analyses, step 1 included several theoretically relevant covariates that been previously deemed relevant to pain outcomes in orofacial pain population (ie, gender, education, employment, diagnostic category and pain duration[11,51,52]). Step 2 included the pain catastrophizing, kinesiophobia, and mindfulness scores. Unstandardized coefficient estimates and associated standard errors are reported. Model fit for each of the steps was evaluated with the F statistic and an increase in variance accounted for as evidenced by a change in R^2. Squared semipartial correlations (sr^2) were used as measures of effect size, interpreted as the incremental variance added by each predictor to the regression model. Power analysis was estimated assuming a small sized effect. Thus, with power set at 0.08 (alpha = 0.05) and 8 independent variables, a sample size of 301 would be required to detect a small effect size.[53]

Table 2 Outcomes and Coping Variables

Variable	M (SD)
Outcomes	
Pain intensity	59.61 (21.32)
Pain-related disability (GCPS)	50.88 (31.69)
Depression	55.30 (10.46)
Anxiety	58.25 (10)
Coping variables	
Pain Catastrophizing (PCS)	26.05 (13.32)
Kinsesiophobia (TAMPA)	28.26 (7.21)
Mindfulness (FFMQ)	52.75 (8.47)

Table 3 Bivariate Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. Gender	1	−0.075	0.030	0.020	0.082	0.033	0.113	0.104	−0.034	0.002	0.052	−0.048	0.076	−0.056	−0.071	0.021	0.010	0.097	0.078	0.138*	0.087	0.001
2. Education		1	0.072	−0.038	−0.065	0.055	−0.102	−0.102	0.088	0.113*	0.086	0.039	−0.059	−0.011	−0.106	−0.101	−0.158*	−0.055	−0.136*	−0.096	−0.085	−0.116
3. Full time			1	−0.220**	−0.124*	−0.050	−0.170**	−0.206**	0.001	−0.056	−0.111	0.043	0.033	0.054	−0.051	−0.032	0.026	−0.089	−0.050	−0.099	0.008	−0.025
4. Part time				1	−0.073	−0.029	−0.101	−0.122*	−0.022	−0.022	0.053	0.019	0.002	−0.077	−0.243**	0.059	0.030	−0.020	0.017	0.008	0.073	0.005
5. Homemaker					1	−0.017	−0.057	−0.069	0.008	−0.057	0.103	−0.045	0.026	0.124*	0.024	0.141*	0.155**	−0.075	0.062	0.127*	0.191**	0.130*
6. Student						1	−0.023	−0.028	−0.023	−0.023	−0.019	−0.018	−0.041	−0.017	−0.056	0.041	−0.033	−0.107	0.015	0.015	−0.061	0.156*
7. Unemployed							1	−0.094	−0.029	0.069	0.048	−0.001	0.021	0.004	0.081	0.116	0.015	−0.100	0.024	0.109	0.081	0.092
8. Other								1	0.073	−0.052	−0.031	−0.022	0.106	−0.071	0.090	0.043	−0.006	0.081	0.225**	0.247**	0.047	0.125*
9. TNP									1	−0.078	−0.066	−0.062	−0.139*	−0.059	0.040	0.040	−0.036	−0.054	0.097	0.091	0.093	0.080
10. TN2										1	−0.066	−0.062	−0.139*	−0.059	−0.083	−0.069	−0.097	0.072	0.025	0.024	−0.085	−0.092
11. PIFP											1	−0.052	−0.117*	−0.050	0.060	0.011	0.019	0.026	0.033	−0.005	0.027	0.009
12. OTHER												1	−0.109	−0.047	0.001	−0.097	−0.107	−0.016	−0.072	−0.143*	0.000	−0.049
13. MULTIPLE													1	−0.105	0.060	0.057	0.069	−0.012	0.154**	0.125*	0.094	0.147*
14. NONE														1	0.038	0.034	0.027	−0.214**	−0.069	−0.043	0.035	0.075
15. Pain Duration															1	−0.016	−0.063	0.072	−0.092	−0.130*	−0.196**	−0.084
16. PCS																1	0.511**	−0.296**	0.237**	0.387**	0.515**	0.512**
17. TAMPA																	1	−0.139*	0.099	0.217**	0.385**	0.418**
18. FFMQ																		1	−0.062	−0.085	−0.380**	−0.389**
19. Pain Intensity																			1	0.673**	0.287**	0.281**
20. Pain-related disability																				1	0.370**	0.396**
21. Anxiety																					1	0.686**
22. Depression																						1

Note: *Indicates $p<0.05$; **Indicates $p<0.01$.

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Table 4 Hierarchical Regression Results

	b	SE	*t*	*p* value	95% CI for *b*	sr^2
Pain intensity						
Step 1						
Gender	0.445	3.675	0.121	0.904	(−6.765, 7.656)	0.00
Education	−2.978	1.239	−2.403	0.016	(−5.407, −0.549)	0.02
Employment						
Full time	1.563	3.040	0.514	0.607	(−4.395, 7.521)	0.00
Part time	1.500	4.187	0.358	0.720	(−6.708, 9.708)	0.00
Home maker	7.910	6.471	1.223	0.222	(−4.772, 20.593)	0.00
Student	9.893	14.842	0.667	0.505	(−19.197, 38.983)	0.00
Unemployed	3.674	4.931	0.745	0.456	(−5.990, 13.339)	0.00
Other	15.608	4.315	3.618	0.000	(7.152, 24.065)	0.04
Diagnosis category						
TN2	11.015	4.804	2.293	0.022	(1.598, 20.432)	0.02
TNP	6.677	4.817	1.386	0.166	(−2.765, 16.119)	0.01
PIFP	8.088	5.591	1.447	0.148	(−2.871, 19.047)	0.01
OTHER	−2.603	5.937	−0.438	0.661	(−14.248, 9.042)	0.00
MULTIPLE	8.769	3.201	2.739	0.006	(2.494, 15.043)	0.02
NONE	−2.655	6.082	−0.437	0.662	(−5.812, −0.437)	0.00
Pain duration	−2.459	−3.124	1.371	0.023		0.01
Step 2						
PCS	0.362	0.115	3.146	0.002	(0.136, 0.588)	0.03
TAMPA	−0.151	0.208	−0.725	0.469	(−0.561, 0.259)	0.00
FFMQ	−0.052	0.173	−0.301	0.764	(−0.395, 0.291)	0.00
Pain disability						
Step 1						
Gender	4.934	5.278	0.935	0.350	(−5.421, 15.288)	0.00
Education	−2.062	1.802	−1.144	0.253	(−5.594, 1.470)	0.00
Employment						
Full time	0.229	4.369	0.052	0.958	(−8.334, 8.792)	0.00
Part time	2.415	5.968	0.405	0.686	(−9.283, 14.113)	0.00
Homemaker	23.849	9.257	2.576	0.010	(5.705, 41.993)	0.02
Student	10.379	21.350	0.486	0.627	(−31.465, 52.223)	0.00
Unemployed	17.563	7.068	2.485	0.013	(3.710, 31.417)	0.02
Other	27.109	6.747	4.018	0.000	(13.785, 40.432)	0.06
Diagnosis category						
TN2	12.478	6.869	1.817	0.069	(−0.985, 25.941)	0.01
TNP	5.598	7.044	0.795	0.427	(−8.215, 19.412)	0.00
PIFP	1.342	8.011	0.168	0.867	(−14.356, 17.040)	0.00
OTHER	−15.941	9.084	−1.755	0.081	(−33.885, 2.003)	0.01
MULTIPLE	8.200	4.616	1.776	0.076	(−0.848, 17.247)	0.01
NONE	−2.702	8.722	−0.310	0.757	(−19.797, 14.393)	0.00
Pain duration	−5.823	1.950	−2.986	0.003	(−9.646, −2.000)	0.03
Step 2						
PCS	0.813	0.162	5.023	0.000	(0.495, 1.131)	0.07
TAMPA	0.060	0.315	0.191	0.849	(−0.572, 0.692)	0.00
FFMQ	0.034	0.224	0.152	0.879	(−0.406, 0.474)	0.00
Anxiety						
Step 1						
Gender	0.602	1.736	0.347	0.729	(−2.809, 4.013)	0.00
Education	−0.757	0.627	−1.206	0.229	(−1.996, 0.482)	0.01
Employment						

(*Continued*)

Table 4 (Continued).

	b	SE	*t*	*p* value	95% CI for *b*	sr^2
Full time	1.714	1.536	1.115	0.266	(−1.320, 4.748)	0.00
Part time	2.218	2.003	1.107	0.269	(−1.715, 6.151)	0.00
Homemaker	10.495	3.011	3.486	0.000	(4.594, 16.397)	0.04
Student	−6.026	7.612	−0.792	0.430	(−21.088, 9.037)	0.00
Unemployed	5.158	2.540	2.031	0.045	(0.125, 10.191)	0.02
Other	2.997	2.038	1.471	0.142	(−0.999, 6.992)	0.01
Diagnosis category						
TN2	4.815	2.269	2.122	0.034	0.01	0.01
TNP	−2.072	2.837	−0.731	0.471	0.00	0.00
PIFP	2.072	2.752	0.753	0.452	0.00	0.00
OTHER	1.439	2.707	0.532	0.595	0.00	0.00
MULTIPLE	2.609	1.532	1.703	0.089	0.01	0.01
NONE	2.236	3.862	0.579	0.570	0.00	0.00
Pain duration	−2.488	0.671	−3.709	0.000	(−3.809, −1.168)	0.05
Step 2						
PCS	0.267	0.051	5.274	0.000	(0.166, 0.368)	0.08
TAMPA	0.201	0.084	2.392	0.018	(0.035, 0.367)	0.01
FFMQ	−0.306	0.067	−4.598	0.000	(−0.438, −0.174)	0.05
Depression						
Step 1						
Gender	−2.257	1.809	−1.248	0.213	(−5.822, 1.307)	0.01
Education	−1.116	0.616	−1.812	0.071	(−2.327, 0.095)	0.01
Employment						
Full time	1.518	1.513	1.004	0.316	(−1.455, 4.491)	0.00
Part time	1.331	2.047	0.650	0.516	(−2.689, 5.352)	0.00
Homemaker	7.454	3.109	2.397	0.017	(1.357, 13.551)	0.02
Student	23.318	8.369	2.786	0.008	(6.473, 40.162)	0.03
Unemployed	5.691	3.019	1.885	0.071	(−0.535, 11.917)	0.02
Other	5.507	2.047	2.690	0.007	(1.494, 9.520)	0.02
Diagnosis category						
TN2	4.641	2.450	1.894	0.060	0.01	0.01
TNP	−1.382	2.749	−0.503	0.618	0.00	0.00
PIFP	2.385	2.675	0.891	0.373	0.00	0.00
OTHER	−0.410	2.837	−0.144	0.885	0.00	0.00
MULTIPLE	4.200	1.572	2.672	0.008	0.02	0.02
NONE	4.881	3.702	1.319	0.199	0.01	0.01
Pain duration	−1.457	0.655	−2.223	0.026	(−2.742, −0.172)	0.02
Step 2						
PCS	0.231	0.046	5.077	0.000	(0.142, 0.321)	0.05
TAMPA	0.316	0.081	3.918	0.000	(0.158, 0.475)	0.03
FFMQ	−0.298	0.065	−4.567	0.000	(−0.426, −0.169)	0.05

Notes: For employment, all dummy coded variables represent comparisons against "retired status" as the most common category of employment. For diagnosis, all dummy coded variables represent comparisons against "trigeminal neuralgia" as the most common diagnostic category.

Results

Descriptive Statistics

Means and standard deviations for all measures are detailed in Table 2 and zero-order correlations are detailed in Table 3. Pain catastrophizing was positively correlated with all four outcome variables (pain intensity, pain-related disability, anxiety and depression; rs = 0.237-0.515, ps<0.001). Kinesophobia was positively correlated with pain-related disability, anxiety and

depression (rs = 0.217-0.418, p<0.001), but not with pain intensity. Mindfulness was negatively correlated with anxiety and depression (rs=−0.380 to −0.389, p<0.001) but not with pain intensity or pain-related disability. The four outcome variables (pain intensity, pain-related disability, anxiety and depression) were also positively correlated with each other (rs=0.281-0.686, ps<0.001). Overall, participants exhibited high rates of depression and anxiety, with 67% reporting clinically meaningful symptoms of depression and 56% reporting clinically meaningful symptoms of anxiety, defined as ≥0.5 SD above the general population mean.[47,48]

Multiple Regressions

For pain intensity, step 1 of the model was statistically significant ($F(14, 289) = 2.90$, $p < 0.0001$, $R^2 = 0.13$). Examining the individual independent variables indicated that education (B = −2.978, SE = 1.239, p = 0.016, sr^2 =−0.02), an "other" employment category (B = 15.608, SE = 4.310, $p < 0.001$, $sr^2 = 0.04$), having classical trigeminal neuralgia with concomitant continuous pain (TN2; B = 11.015, SE = 4.804, p = 0.022, $sr^2 = 0.02$), having multiple orofacial pain diagnoses (B = 8.769, SE = 3.201, p = 0.006, $sr^2 = 0.02$), and pain duration (B = −3.124, SE = 1.371, p = 0.023, sr^2 = 0.01) had a significant association with pain intensity. In step 2, the model was significant ($F(17, 286) = 3.65$, p = 0.013, $\Delta R^2 = 0.032$). Pain catastrophizing was the only independent variable significantly associated with pain intensity, adding 3% incremental variance to the mode (B = 0.362, SE = 0.115, p = 0.002, $sr^2 = 0.03$; see Table 4).

For the pain-related disability outcome, step 1 was significant ($F(14, 289) = 4.22$, $p < 0.001$, $R^2 = 0.182$). Significant independent variables included the "homemaker", "unemployed" and "other" employment categories (B = 23.849, SE = 9.257, p = 0.010, $sr^2 = 0.02$, B = 17.563, SE = 7.068, p = 0.013, $sr^2 = 0.02$ and B = 27.109, SE = 6.747, p < 0.001, $sr^2 = 0.06$), and pain duration (B = −5.823, SE = 1.950, p = 0.003, $sr^2 = 0.03$). For step 2 ($F(17, 286) = 13.56$, p < 0.001, $\Delta R^2 = 0.10$), only pain catastrophizing was significantly associated with pain-related disability, adding 7% incremental variance to the model (B = 0.813, SE = 0.162, $p < 0.001$, $sr^2 = 0.07$; see Table 4).

For anxiety, the overall model was significant ($F(14, 289) = 3.04$, $p < 0.0001$, $R^2 = 0.13$). Significant effects emerged for "homemaker" and "unemployed" employment categories (B = 10.495, SE = 3.011, $p < 0.001$, $sr^2 = 0.04$ and B = 5.158, SE = 2.540, p = 0.045, $sr^2 = 0.02$, respectively), having classical trigeminal neuralgia with concomitant continuous pain (TN2; B = 4.815, SE = 2.269, p = 0.034, $sr^2 = 0.01$) and pain duration (B = −2.488, SE = 0.671, $p < 0.001$, sr^2 = 0.05). In step 2 ($F(17, 286) = 43.27$, $p < 0.001$, $\Delta R^2 = 0.27$), pain catastrophizing, kinesiophobia, and mindfulness were all significantly and independently associated with anxiety (B = 0.267, SE = 0.051, $p < 0.001$, $sr^2 = 0.08$; B = 0.201, SE = 0.084, p = 0.018, $sr^2 = 0.01$ and B = −0.306, SE = 0.067, $p < 0.001$, $sr^2 = 0.05$, respectively, adding 1–8% incremental variance to the model; see Table 4).

For depression, step 1 of the model was statistically significant ($F(14, 289) = 3.73$, $p < 0.001$, $R^2 = 0.16$). Examining the individual independent variables indicated that the "home maker", "student", and "other" employment categories (B = 7.454, SE = 3.109, p = 0.017, $sr^2 = 0.02$; B = 23.318, SE = 8.369, p = 0.008, $sr^2 = 0.03$ and B = 5.507, SE = 2.047, p = 0.007, $sr^2 = 0.02$ respectively), having multiple orofacial pain diagnoses (B = 4.200, SE = 1.572, p = 0.008, $sr^2 = 0.02$) and pain duration (B = −1.457, SE = 0.655, p = 0.026, $sr^2 = 0.02$) were significantly associated with depression. In step 2, the model was significant ($F(17, 286) = 41.82$, $p < 0.001$, $\Delta R^2 = 0.25$). Pain catastrophizing, kinesiophobia, and mindfulness were significantly associated with depression (B = 0.231, SE = 0.046, $p < 0.001$, $sr^2 = 0.05$; B = 0.316, SE = 0.081, $p < 0.001$, $sr^2 = 0.03$ and B = −0.298, SE = 0.05, $p < 0.001$, $sr^2 = 0.05$, respectively, adding 5–8% incremental variance to the model; see Table 4).

Discussion

Chronic orofacial pain is characterized by substantial pain-related disability and emotional distress. This study tested the association between three coping strategies (pain catastrophizing, kinesiophobia and mindfulness) and four pain-related outcomes (depression, anxiety, pain intensity, and pain-related disability), while accounting for relevant demographic and clinical variables.

Pain catastrophizing was the only coping variable that was independently associated with pain intensity and pain-related disability. This finding emphasizes the importance of addressing pain catastrophizing among individuals with orofacial pain, and its potential to aid in reducing pain intensity and pain-related disability among this population.

While pain catastrophizing has been linked with negative pain outcomes among individuals with chronic pain[30,54,55] as well as temporomandibular disorders,[37–41] our finding supports the same association for other types of orofacial pain. Pain outcomes may thus benefit from interventions targeting pain catastrophizing.[56,57]

All three coping strategies (pain catastrophizing, kinesiophobia and mindfulness) were significantly associated with depression and anxiety. While the link between mindfulness and reduced depression and anxiety has been demonstrated in several clinical populations,[58–61] including those with chronic pain,[19,62,63] ours is the first study to show evidence for this association among individuals with chronic orofacial pain. The finding that all three coping strategies were independently associated with levels of depression and anxiety suggests that emotional distress among this population may be most efficiently addressed using a multifaceted intervention, incorporating skills to reduce catastrophizing, minimizing fear of pain due to movement, and cultivating a mindful approach to managing orofacial pain symptoms. Given the high rates of participants with clinically meaningful symptoms of anxiety (56%) and depression (67%) in our sample, addressing emotional distress is an urgent priority for this patient population.

Approximately 20% of our sample reported more than one orofacial pain diagnosis, and those that did tended to exhibit worse outcomes. This suggests that individuals with orofacial pain comorbidity may have an increased need and potential to benefit from interventions. Importantly, all three coping variables were associated with more positive outcomes, above and beyond diagnosis type in the multiple regression models. This provides preliminary support for transdiagnostic clinical interventions that address coping skills, which cut across orofacial pain conditions. Targeting pain catastrophizing, kinesiophobia, and mindfulness may therefore help improve outcomes regardless of specific pain diagnoses. Given challenges with in person treatment for individuals with orofacial pain,[64] interventions delivered via web-based platforms may be a novel solution to promote adherence, engagement and improve treatment accessibility.[65] Such an inclusive approach is supported by previous research indicating heterogeneous orofacial pain conditions share common experiences.[66,67]

Of the other demographic and clinical characteristics controlled for in the current study, employment stood out in its association with four outcome variables (depression, anxiety, pain intensity, and pain-related disability), with less favorable outcomes associated primarily with being unemployed or a homemaker in the multiple regression models. This supports previous work linking socioeconomic factors[51] and specifically employment status[11] with unfavorable orofacial pain outcomes, and suggests that routinely collecting employment-related information may help improve and optimize care for this patient population,[11] particularly for underserved communities or those who with low socio-economic status.[68]

This study has several strengths. First, the concurrent examination of the three tested coping strategies (pain catastrophizing, kinesiophobia and mindfulness) in individuals with orofacial pain is novel. This enabled us to test the relative and independent association of each strategy to several key pain-related outcomes. Further, while the concept of mindfulness has been studied in the context of chronic pain,[24–27,62,69,70] to our knowledge, this is the first examination of mindfulness specifically in individuals with orofacial pain. The sample size of >300 participants is an additional strength, which enabled us to have sufficient statistical power to examine the association of the coping strategies above and beyond that of numerous potentially confounding demographic and clinical factors previously associated with pain-related outcomes.

Limitations of the study should also be considered. The main limitation of the study is its cross-sectional design, which precludes us from drawing causal inferences. Indeed, the association between the coping strategies and pain outcomes may be bi-directional, and factors such as anxiety and depression may have developed prior orofacial pain onset. Additionally, over two-thirds of the sample reported trigeminal neuralgia as their primary orofacial pain diagnosis, with only few cases of common diagnoses such as temporomandibular disorders (included under the "multiple diagnoses" or "other" categories). This may have impacted associations with the kinesiophobia scale (TSK-TMD), which is primarily used for musculoskeletal orofacial pain, and may limit generalizability of the findings to other orofacial pain populations to some degree. However, controlling for diagnoses in our statistical analyses may have partially reduced this risk.

Finally, all assessments, including orofacial pain diagnoses, were self-reported, which inherently carries a risk of bias.[71] Longitudinal studies capturing other chronic pain and health issues and testing the effects of interventions

targeting these coping strategies are needed to help identify the specific and potentially causal role played by such factors in pain outcomes among individuals with heterogeneous chronic orofacial pain.

Conclusion

Across people with chronic orofacial pain recruited from a national facial pain association, we found alarming rates of depression and anxiety. Higher pain catastrophizing and kinesiophobia and lower mindfulness were associated with higher depression and anxiety. Higher pain catastrophizing was associated with higher pain and disability. Results support interventions that address these three coping factors and include heterogeneous samples of people with orofacial pain.

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Disclosure

The authors declare that they have no conflicts of interest.

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