Pain Catastrophizing Mediates the Effects of Psychological Distress on Pain Interference in Patients with Orofacial Pain: A Cross-Sectional Study

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Aims: To investigate whether pain catastrophizing has not only direct effects as a predictor of pain-related interference but also indirect effects as a mediator in the relationship between psychological distress and pain interference and to examine the mediating roles of subtypes of catastrophizing (magnification, rumination, and helplessness) between psychological distress and interference. **Methods:** This retrospective study included 815 patients with orofacial pain aged 18 to 81 years. All participants completed a set of self-administered questionnaires concerning pain interference (Brief Pain Inventory), psychological distress (Symptom Checklist-90-Revised), and pain catastrophizing (Pain Catastrophizing Scale) at the first consultation. The associations between these three variables were calculated using mediation path analysis. **Results:** Pain catastrophizing predicted pain interference. In addition, 34% of the variance in pain interference attributable to psychological distress was mediated by catastrophizing when controlling for pain duration and severity. The greatest portion of the mediating effect of catastrophizing was attributable to the helplessness component. **Conclusion:** Within the limitations of cross-sectional studies, this study demonstrated that pain catastrophizing mediates the effects of psychological distress on pain interference in patients with orofacial pain. Most of the mediating effects were attributable to the helplessness component of pain catastrophizing. Cognitive behavioral therapy targeting pain catastrophizing, specifically helplessness, could potentially reduce pain-related disability in orofacial pain patients. *J Oral Facial Pain Headache 2018;32:409–417. doi: 10.11607/ofph.2067*

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Orofacial pain arising from the head, face, and related structures may be defined as pain and dysfunction affecting motor and sensory transmission in the trigeminal system.[1] Melzack[2] proposed the neuromatrix theory and defined pain as a multidimensional experience that includes the affective and cognitive dimensions as well as the sensory dimension. In this respect, the orofacial sensory inputs are not the sole determinant of pain experience and behavior.

Previous studies have suggested that pain intensity and pain interference form distinct dimensions of subjective pain measurement.[3,4] Pain interference—defined as disability with daily activity related to pain—in particular has been recognized as a key component of global pain severity.[5] Due to the detrimental effects associated with pain-related interference on the quality of health, a number of studies have focused on identifying determinants of disability.[6]

Psychological distress, one of the most important predictors of orofacial pain,[7] appears to play a critical role in pain experience, according to previous research.[8–11] Although the concept of psychological distress is still vague, the most widely accepted definition refers to a state of emotional suffering characterized by symptoms of depression and anxiety.[12] A systematic review of prospective cohorts with low back pain[9] and a prospective study of temporomandibular disorders (TMD)[10] concluded that psychological distress has an impact on the disability and chronicity of a disease. Furthermore, Ross et al[8] found that psychological distress also exerted a significant effect on pain-related

disability in acute conditions of hand/wrist fractures. Consistent findings from earlier studies have suggested that elevated psychological distress may aggravate pain-related interference in patients with orofacial pain.[10,13] However, the details by which psychological distress might lead to pain interference remain unclear. A more clear and specific understanding of the relationship between psychological distress and pain interference would contribute to the development of tailored interventions.

Catastrophizing may be one of the possible explanations for this influence. Catastrophizing is defined as an exaggerated negative mental state during actual and anticipated painful stimulation and comprises three subscales: magnification, rumination, and helplessness.[14] Numerous clinical and experimental studies have shown an association between catastrophizing and a number of pain-related outcomes[15–24] and have suggested catastrophizing as one of the most important psychological predictors of both acute and chronic pain experiences.[15] Edwards et al[20] found that catastrophizing was positively correlated with pain-related disability in arthritis, fibromyalgia, and other rheumatic diseases and that its impact was still significant after controlling for depression. In addition to its role as a predictor of pain-related disability, previous research has suggested catastrophizing as a mediator in the relationship between psychological distress and pain. Pinto et al[25] reported that pain catastrophizing was a full mediator between presurgical anxiety and postsurgical pain after hysterectomy. In persistent pain conditions, the association between pain and depression was partially mediated by catastrophizing.[26] Collectively, these early studies suggest that, to a certain extent, catastrophizing mediates the association between psychological distress and pain-related disability in various pain conditions.

However, to date, concurrent relationships among these three factors (pain interference, psychological distress, and pain catastrophizing) have not been considered in patients with orofacial pain; in particular, no studies have yet examined the role of catastrophizing subtypes as mediators of orofacial pain. Therefore, the aim of the present study was to investigate whether catastrophizing not only has direct effects as a predictor of pain-related interference, but also indirect effects as a mediator in the relationship between psychological distress and pain interference. Furthermore, the mediating roles of catastrophizing subtypes between psychological distress and interference were also examined. It was hypothesized that catastrophizing would predict pain-related interference and mediate the relationship between psychological distress and pain-related interference.

Materials and Methods

Subjects

Data were retrospectively obtained from clinical records and questionnaires of patients seeking care at the Orofacial Pain Clinic of Dankook University Dental Hospital from March 2015 to December 2016. To be eligible for inclusion, patients must have reported pain in the orofacial region and must have completed the questionnaires listed in the following section. Those who did not complete the questionnaires and who were under the age of 18 were excluded. Those who did not want to complete the questionnaires were also excluded. Informed consent was obtained from all patients on the day of their first visit to the Dental Hospital. The study was approved by the Institutional Review Board committee of Dankook University Dental Hospital (IRB No. DKUDH IRB 2017-03-002).

Study Procedures

All patients were asked to complete a number of questionnaires prior to initial examination as part of the standard protocol of the Orofacial Pain Clinic of Dankook University Dental Hospital. Orofacial pain specialists (K.S.K; M.E.K; H.K.K; H.H.C) consulted the patients and diagnosed the orofacial pain based on guidelines from the American Academy of Orofacial Pain[1] and the International Classification of Headache Disorders, 3rd edition (beta version).[27]

Measures

Pain Intensity and Interference. The Brief Pain Inventory (BPI) is a simple, self-administered questionnaire first developed by Cleeland and Ryan in 1994 and designed to measure both pain severity and pain interference, mainly for cancer pain.[3] The BPI is a validated instrument for assessment of noncancer pain as well as cancer pain[3,28] and contains 11 items assessing two domains. Pain intensity, as a sensory dimension, is the mean of the four BPI pain ratings: worst, least, average, and current. Pain interference, as a reactive dimension, includes seven items to determine the functional interference caused by pain in the patient's life (general activity, walking ability, normal work, mood, relationship with others, sleep, enjoyment of life). The Korean version of the BPI[29] was used, with the question asking about interference with walking ability replaced with chewing ability, considering the location of the pain being in the orofacial region.

Psychological Distress. The Symptom Checklist-90-Revised (SCL-90R), one of the most widely used measures of multiple aspects of psychological distress, is a self-report symptom inventory developed by Derogatis in the 1970s.[30] It is a well-accepted psychometric screening tool for pa-

tients with orofacial pain in clinical practice and research[1] and contains 90 items with a 5-point rating scale [from "not at all" (0) to "extremely" (4)], yielding nine subscales (somatization, obsessive-compulsive, interpersonal sensitivity, anxiety, depression, hostility, phobic anxiety, paranoid ideation, and psychoticism) and three global indices of distress (global severity index [GSI], positive symptom distress index [PSDI], and positive symptom total [PST]). The GSI represents the number of symptoms (endorsed quantitatively) and intensity of distress (endorsed qualitatively) and assesses overall psychological distress; thus, only the GSI score was selected and analyzed as a measure of psychological distress in the current study. According to the standardized normative Korean data,[31] T scores of nine symptom dimensions and three global indices were calculated, and T scores of the GSI were used in this study.

Pain Catastrophizing and Its Subtypes. One of the most widely used measures of catastrophizing associated with pain—the pain catastrophizing scale (PCS) developed in 1995 by Sullivan et al[14]—was used in the current study. The inventory assesses the level of catastrophizing thoughts and feelings for past painful experiences and/or anticipatory painful events. It consists of a brief 13-item assessment on a 5-point scale ranging from 0 ("not at all") to 4 ("all the time"). Factor analyses of the PCS from previous research confirmed three second-order factors assessing rumination ("I can't stop thinking about how much it hurts"), magnification ("I worry that something serious may happen"), and helplessness ("it's awful and I feel that it overwhelms me"). The internal consistency of the PCS total score and its subtypes from previous research was adequate to excellent (coefficient alphas: total PCS = 0.87; rumination = 0.87; magnification = 0.66; and helplessness = 0.78).[14,32–35]

Data Analyses

Prior to statistical calculation, missing data were checked and handled using list-wise deletion, and independent *t* tests between the missing and obtained data were performed. All data were checked for normality using the Kolmogorov-Smirnov test to conduct regression analyses. The data were not normally distributed; thus, log transformation of data was applied to reduce statistical bias. Outliers were detected and removed using a modified *z* score > 3.5 according to Iglewicz and Hoaglin.[36]

Considering the possible influences of sex, age, and pain duration on pain experience, data representing age, sex, pain duration, pain severity, interference, PCS, and GSI scores from questionnaires were used for statistical analyses. The frequencies and percentages of subject diagnoses were calculated using descriptive statistics.
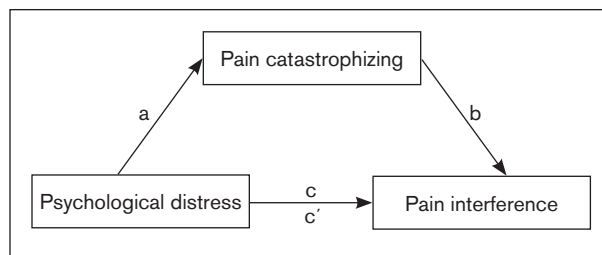

Fig 1 Conceptual model treating pain catastrophizing as a mediator in the relationship between psychological distress and pain interference, whereas c' as a direct effect shows the association between psychological distress and pain interference after controlling for the effect of pain catastrophizing.

Pearson correlations were calculated to assess the relationships between all variables. Multiple regression analysis using a stepwise selection was then performed to examine whether clinical and psychological variables contributed significantly to the variance of pain interference as a dependent variable (Fig 1). Based on the statistical results of the regression analysis, significant predictors were entered into further mediation analyses using Hayes Process macros with bootstrap sampling (5,000 samples).[37,38] Mediation analysis, a regression-based approach, was used to examine whether the relationship between GSI as an independent variable and pain interference as a dependent variable was mediated by PCS and its subtypes. The mediating effect of GSI in the association between PCS as an independent variable and pain interference as a dependent variable was also calculated. Total effect, direct effect, and indirect effect of the hypothetical path were calculated. A null hypothesis was rejected if 0 was not included in the 95% confidence interval (CI) of the bootstrap distribution of the estimates of the indirect effect.

Statistical analyses were conducted using Statistical Package for Social Sciences (SPSS for Window, version 21.0) and statistical significance was set at $P \leq .05$.

Results

Subject Characteristics

Among the 1,470 eligible subjects who completed the questionnaires, 640 were excluded due to missing data (Fig 2). Another 15 cases from the GSI were removed based on the outlier check; thus, a total of 815 subjects were included in this study. The mean ± standard deviation (SD) age of the sample was 38.8 ± 15.9 years, ranging from 18 to 81 years (Table 1); 531 (65.2%) were female. The mean pain duration at the time of first examination was 15.7 ± 39.3 months. The diagnoses of the included subjects
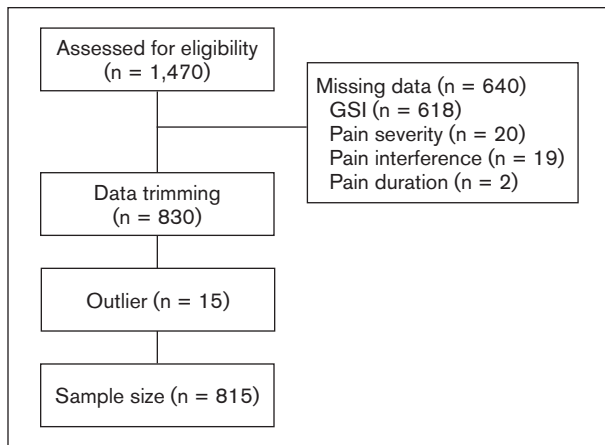
Fig 2 Study sample flowchart. GSI = Global Severity Index from Symptom Checklist-90-Revised (SCL-90-R).

Table 1 Sample Characteristics (n = 815)

Characteristic	
Age (y), mean (SD)	38.8 (15.9)
Female, n (%)	531 (65.2)
Duration (mo), mean (SD)	15.7 (39.3)
Diagnosis, n (%)	
TMD	691 (84.8)
Headaches	18 (2.2)
Burning mouth syndrome	14 (1.7)
Trigeminal neuralgia	13 (1.6)
Painful posttraumatic trigeminal neuropathy	13 (1.6)
Toothache	9 (1.1)
Atypical odontalgia	7 (0.9)
Other[a]	50 (6.1)

TMD = temporomandibular disorders.
[a]Other includes periodontal abscess; pericoronitis; sialadenitis; oral mucosal pain; sinusitis; osteomyelitis; cancer pain; persistent idiopathic facial pain.

Table 2 Bivariate Correlations Between Study Variables (n = 815)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Age	1	0.02	−0.038	0.157**	0.145**	0.021	0.126**	0.087*	0.082*	0.144**
(2) Sex		1	−0.103**	0.03	−0.014	−0.153**	−0.079*	−0.089*	−0.116**	0.055
(3) Pain duration			1	−0.101**	−0.11**	0.128**	0.041	0.1**	0.113**	0.046
(4) Pain intensity				1	0.753**	0.272**	0.322**	0.348**	0.362**	0.198**
(5) Pain interference					1	0.315**	0.365**	0.419**	0.425**	0.28**
(6) PCS: Magnification						1	0.721**	0.682**	0.854**	0.343**
(7) PCS: Rumination							1	0.703**	0.87**	0.337**
(8) PCS: Helplessness								1	0.915**	0.344**
(9) PCS: Total									1	0.376**
(10) GSI										1

PCS = Pain Catastrophizing Scale; GSI = Global Severity Index from Symptom Checklist-90-Revised. *P < .05. **P < .01.

with orofacial pain are presented in Table 1. Most of the diagnoses were TMD (84.8%), followed by headaches (2.2%), burning mouth syndrome (1.7%), trigeminal neuralgia (1.6%), painful posttraumatic trigeminal neuropathy (1.6%), toothache (1.1%), atypical odontalgia (0.9%), and others (6.1%). Results of the t test between the included and excluded subjects revealed that the two groups did not show significant differences in sex distribution, age, pain duration, pain severity, PCS, or GSI (all P values > .05). However, the excluded subjects showed higher pain interference than those who were included (P = .031).

Correlations Between Variables
Multicollinearity among all variables was checked via Pearson correlations for the identification of highly correlated variables (r > .90).[39] Table 2 shows the results of bivariate correlations among all variables. Only the total score of pain catastrophizing and the subscale of helplessness showed multicollinearity (r = 0.915). There were moderate correlations between GSI total scores and PCS subtypes. The GSI also showed weak correlations with pain severity,

pain interference, and age. PCS total scores showed a moderate correlation with pain interference and a weak correlation with pain intensity.

Factors Predicting Pain Interference
As expected, pain severity most strongly predicted pain interference (β = 0.672, P < .001) (Table 3). Multiple regression analysis demonstrated that pain catastrophizing (β = 0.154, P < .001) and the GSI (β = 0.092, P < .001) also significantly predicted pain interference. Pain duration was the smallest predictor of pain interference (β = −0.064, P = .005). Sex (P = .194) and age (P = .613) were excluded from the model using stepwise selection.

Mediation Analyses
Pain severity and pain duration were included as covariates in all mediation analyses using multiple regression analysis. Table 4 shows the results of the mediation analyses, treating catastrophizing as a mediator in the association between psychological distress and pain interference. The hypothesis of the study's mediation model was supported by a

Table 3 Multiple Regression Results for Prediction of Pain Interference from Clinical and Psychological Variables

Predictors	B	SE	β	t	P value
Constant	−2.088	0.452		−4.623	< .001
Pain duration	−0.03	0.011	−0.064	−2.844	.005
Pain intensity	0.883	0.032	0.672	27.958	< .001
PCS: Total	0.134	0.022	0.154	6.06	< .001
GSI	0.482	0.125	0.092	3.843	< .001

Final model: F = 309.414 (P < .001). SE = standard error; PCS: Total = Pain Catastrophizing Scale total score; GSI = Global Severity Index from Symptom Checklist-90-Revised (SCL-90-R). Sex (P = .194) and age (P = .613) were excluded from the model using a stepwise selection.

Table 4 Effect of Pain Catastrophizing (PCS: Total) on the Association Between Psychological Distress (GSI) as a Predictor and Pain Interference as an Outcome

Path	Effect	Estimate (SE)	t	P	95% CI
c	Total effect	0.729 (0.121)	6.032	< .0001	0.492, 0.967
c'	Direct effect	0.481 (0.125)	3.842	.0001	0.235, 0.727
a×b	Indirect effect	0.248 (0.055)			0.153, 0.375*

The ratio of the total effect mediated was 0.34. PCS: Total = total score of Pain Catastrophizing Scale; GSI = Global Severity Index from the Symptom Checklist-90-Revised; SE = standard error; CI = confidence interval. *Significant partial mediation.

Table 5 Effect of Pain Catastrophizing (PCS Subgroups) on the Association Between Psychological Distress (GSI) as a Predictor and Pain Interference as an Outcome

PCS subgroups	Path	Effect	Estimate (SE)	t	P	95% CI
Magnification	c'	Direct effect	0.588 (0.125)	4.673	< .0001	0.341, 0.835
	a×b	Indirect effect	0.141 (0.046)			0.060, 0.242*
Rumination	c'	Direct effect	0.570 (0.125)	4.561	< .0001	0.325, 0.816
	a×b	Indirect effect	0.159 (0.044)			0.081, 0.259*
Helplessness	c'	Direct effect	0.498 (0.123)	4.03	.0001	0.256, 0.741
	a×b	Indirect effect	0.231 (0.049)			0.146, 0.342*

The total effect of all subtypes was 0.729. The ratios of the total effects mediated by magnification, rumination, and helplessness were 0.19, 0.21, and 0.31, respectively. PCS = Pain Catastrophizing Scale; GSI = Global Severity Index from Symptom Checklist-90-Revised; SE = standard error; CI = confidence interval. *Significant partial mediation.

Table 6 Effect of Psychological Distress (GSI) on the Association Between Pain Catastrophizing (PCS) as a Predictor and Pain Interference as an Outcome

Path	Effect	Estimate (SE)	t	P	95% CI
c	Total	0.162 (0.021)	7.678	< .0001	0.120, 0.203
c'	Direct	0.134 (0.022)	6.06	< .0001	0.090, 0.178
a×b	Indirect	0.027 (0.008)			0.012, 0.045*

The proportion of the total effect mediated was 0.16. PCS = Pain Catastrophizing Scale; GSI = global severity index from Symptom Checklist-90-Revised; SE = standard error; CI = confidence interval. *Significant partial mediation.

significant indirect effect of catastrophizing (estimate = 0.248; 95% confidence interval [CI] = 0.153 to 0.375). When controlling for catastrophizing (path c'), the effect of psychological distress on pain interference was still significant, but less so than path c (path c' estimate = 0.481, P = .0001). The proportion of the total mediated effect was 34%, indicating a partial mediation of catastrophizing. Table 5 shows the subtypes of catastrophizing that also partially mediate this relationship. Helplessness was the strongest mediator, explaining 31% of the vari-ance. Catastrophizing also mediated the relationship between pain severity as a predictor and pain interference as an outcome, even when controlling for psychological distress (estimate = 0.0635; 95% CI = 0.0400 to 0.0932). Meanwhile, psychological distress also partially mediated the association between catastrophizing as a predictor and interference as an outcome, but the indirect effect of this relationship (estimate = 0.027; 95% CI = 0.012 to 0.045) and the proportion of the total mediated effect (16%) were relatively small (Table 6).

Discussion

The hypothesis of this study was that in cases of orofacial pain, pain catastrophizing would predict pain-related interference and mediate the relationship between psychological distress and pain-related interference. Within the context of cross-sectional studies, the results support the study hypothesis and suggest that pain catastrophizing predicts pain-related interference. Additionally, a significant variance of pain-related interference attributable to psychological distress was mediated by catastrophizing, even when controlling for the confounding effects of pain severity and duration. It is not surprising that pain severity was the most important predictor of pain-related interference, since pain is generally considered to be the impairment that contributes to disability.[6] Of particular interest, pain catastrophizing rather than psychological distress was more positively associated with pain interference in the current study. This finding is consistent with a cross-sectional study by Severeijns et al,[24] demonstrating that catastrophizing is a potent predictor of pain disability in the chronic pain condition. A prospective study by Velly et al[10] also found that baseline catastrophizing was a more potent predictor for future disability than depression in a cohort with temporomandibular disorders. Much of the literature has shown that catastrophizing accounts for 7% to 31% of the variance in pain ratings of diverse patient groups, including low back pain, rheumatoid arthritis, dental procedures, whiplash injuries, and experimental pain procedures.[6] Martin et al[40] found that catastrophizing was associated with heightened disability after controlling for psychological distress. The results also indicate that catastrophizing mediated the relationship between pain severity as a predictor and pain interference as an outcome, even when controlling for psychological distress (estimate = 0.0635; 95% CI = 0.0400 to 0.0932). These findings are not surprising considering the theoretical background that an exaggerated negative cognition for pain would influence the psychological component of pain experience and contribute to more intense pain and disability. In the fear-avoidance model (a well-known theoretical model of pain), pain-related fear is a key element for increased disability and includes pain catastrophizing as a cognitive component for the interpretation of threat.[41,42]

The results of the present study showed a moderate positive correlation between psychological distress and catastrophizing. This relationship additively and negatively contributed to pain-related disability. Within the limitations of this cross-sectional study, catastrophizing appears to contribute unique variance to predicting pain-related disability, independent of its relationship with psychological distress.

This study also found that the contribution of catastrophizing as a mediator of the relationship between psychological distress and pain interference was significant while controlling for pain severity and duration. Catastrophizing primarily has been viewed within the context of cognitive theories of emotional disorders.[6] It has been discussed as a distorted cognitive component of anxiety and depression and might contribute to the precipitation and maintenance of psychological distress.[43,44] Within the theoretical background, the present findings suggest that catastrophizing might be a vehicle through which psychological distress may influence pain-related interference. On the other hand, the indirect effect of psychological distress on the association between catastrophizing as an independent variable and pain interference as a dependent variable was also significant in the reverse condition, but the proportion of the total mediated effect was relatively small. It is possible that catastrophizing may contribute to the heightened disability through the indirect effect of psychological distress when considering the positive moderate correlations between two psychological factors. However, it seems that pain interference is better explained by psychological distress indirectly through catastrophizing rather than vice versa.

All components of catastrophizing also partially mediated this relationship; interestingly, the effect sizes of rumination, magnification, and helplessness were not equal. The proportion of the total effect mediated by helplessness was the highest (31%), nearly approaching the variance seen in the relationship between psychological distress and pain-related interference explained via the total score of pain catastrophizing (34%). As a predictor for disability, the role of specific components of catastrophizing seems to vary depending on the duration and the disease condition.[6] Magnification was reported to be the best predictor of disability in patients with whiplash injury lasting 1 year in duration,[45] whereas helplessness was the best predictor of disability in patients with chronic low back pain.[46] It appears that the helplessness subscale of the PCS is the best mediator among the three components in the association between psychological distress and pain-related interference in the cohort with orofacial pain when controlling for duration. To the best of the authors' knowledge, this study is the first to explore the complex relationship among catastrophizing, psychological distress, and pain-related interference and identify the helplessness component of catastrophizing as the best mediator influencing the relationship between psychological distress and interference in orofacial pain patients regardless of pain severity and duration.

The present results support the role of catastrophizing as a predictor and mediator in the pain

experience and suggest that catastrophizing deserves attention as an important target for treatment in patients with orofacial pain. Although there have been inconsistent results for whether catastrophizing is a stable condition or readily modifiable with situational specificity, it appears to be relatively stable over time, at least without intervention.[6] The aim of cognitive-behavioral therapy (CBT), an effective treatment for various chronic pain conditions, is to decrease maladaptive cognition and behaviors.[47,48] Previous research has found that CBT as an intervention targeting pain catastrophizing was effective in reducing pain disability in various conditions. Smeets et al[47] conducted a randomized controlled trial (RCT) that showed reduction in catastrophizing via CBT intervention mediated the reduction of disability in chronic low back pain. In an RCT by Turner et al,[48] the impact of CBT intervention in improving disability was beyond improvement via education in patients with TMD pain. This effect was mediated by changes in coping, pain belief, and catastrophizing.[49] Given that the helplessness component of PCS best explained the variance of the total effect between psychological distress and interference, helplessness might be an essential and specific target for successful intervention. For instance, concrete instructions in self-management skills would be a logical intervention to reduce helplessness in the clinical setting. On the other hand, unlike CBT, third-generation behavioral therapy, termed acceptance and commitment therapy (ACT), places an emphasis on the concepts of acceptance of pain, experiential avoidance, and mindfulness.[50,51] A meta-analysis concluded that ACT is as effective as CBT and may be as effective in treating somatic health problems, as well as psychological disorders.[52] Thus, a focus on the usefulness of ACT in the treatment of pain catastrophizing is warranted.

The partial mediation of catastrophizing in this relationship between psychological distress as a predictor and pain interference as an outcome that was found in the present study indicates that there could be other factors that mediate the effect of psychological distress on pain-related interference. Boggero et al[53] found that fatigue partially mediated the relationship between psychological distress and pain-related interference in patients with persistent orofacial pain. Passive coping also fully mediated the association between anxiety and disability in adolescents with chronic pain.[54] In the future, other factors deserve further exploration to elucidate the complex link between psychological distress and disability and to develop a possible intervention target.

The findings of this study should be interpreted in the context of several limitations. First, a 55.4% response rate for enrollment in the study may limit the generalizability of the results. In addition, the subjects who were excluded due to missing data and outliers showed higher interference than those who were included. This may lead to some bias for the estimation of data. However, other demographic and clinical data did not differ between the two groups. Second, as is common in all cross-sectional studies, causality cannot be inferred from the relationship among psychological distress, catastrophizing, and pain interference. Third, although the majority of the subjects were diagnosed with painful TMD, the current study was composed of diverse cases of orofacial pain. Therefore, further research is needed to identify whether the reported relationship in the heterogenous orofacial pain conditions is reproducible in each homogenous diagnostic group. Finally, pain-related interference as an outcome may be influenced by factors other than psychological distress and catastrophizing. Although the current study did not investigate all possible contributors to pain disability, pain severity and duration (one of the most influential factors) were controlled for in the mediation analysis.

Conclusions

Within the context of this cross-sectional study, pain catastrophizing predicted pain interference and partially mediated the effects of psychological distress on pain interference. In particular, the greatest portion of the mediating effect of catastrophizing was attributable to the helplessness component rather than to magnification and rumination. These findings support the role of CBT as an intervention and suggest that targeting pain catastrophizing, specifically helplessness, might lead to the reduction of pain-related disability in patients with orofacial pain.

Acknowledgments

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