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Depression and Disability in Migraine: The Role of Pain Acceptance and Values-Based Action

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Abstract
Background Migraine is a complex neurological disorder that substantially impairs a person's functioning and is often co-morbid with depression. Currently, little is known about psychological coping strategies that may underlie disability and depression in patients with migraine.
Purpose This study examines concurrent relations between depression and disability on the one hand and pain acceptance and values-based action on the other hand in patients with migraine.
Method Ninety-three patients with migraine and depressive symptoms—being evaluated for a larger project examining the impact of a behavioral intervention on depression in patients with migraine—completed measures of depression, disability, pain acceptance, and values-based action. Using multiple regression analyses, the contributions of pain acceptance and values-based action to depression and disability were assessed.
Results Low pain acceptance was strongly associated with depression and disability (r_s^2=.15–.37) in these patients. Low pain acceptance also explained unique variance in disability, beyond that of depression. Values-based action related modestly to depression and disability (r_s^2=.02–.07).
Conclusion Pain acceptance can contribute to our understanding of psychological health and functioning. An important next step would be to examine whether targeting acceptance in treatment of patients with migraine would lead to improvements in their mental health and functioning.

Keywords Migraine · Depression · Psychiatric comorbidity · Disability · Acceptance · Values-based action

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Introduction

Migraine is a complex neurological disorder, characterized by episodic severe headache attacks, which substantially impairs a person's functioning and diminishes quality of life. Aside from the headache pain and associated disability, patients with migraine are at a much higher risk for psychiatric disorders than those without migraine [1–4]. Depression, in particular, is three times more common among people with migraine than in the general population, and this rate is even higher in patients with migraine presenting to clinical settings [5–7]. This comorbidity is of major public health significance as it results in decreased quality of life, poorer response to headache treatment, and overall worse prognosis [2, 8, 9]. It is also associated with an increased risk for suicidality, medication overuse, and disability [8–12]. Importantly, the economic burden of migraine doubles when there is co-occurring depression [13].

Acceptance and values-based action are two key psychological variables related to human well-being and suffering from the Acceptance and Commitment Therapy (ACT) treatment approach [14, 15]. ACT is an evidence-based treatment that emphasizes acceptance-based coping of experiences that cannot be changed easily (e.g., migraine, pain) and encourages behavior change in areas that are personally meaningful and important (e.g., engagement with family).

Promising findings in patients with chronic pain, demonstrating the importance of pain acceptance and values-based

action on depression and disability, may provide valuable insights into coping approaches associated with disability in migraine. Identifying coping approaches associated with depression and disability in patients with migraine can, in turn, help guide future psychotherapeutic treatments for this patient population. Acceptance and values-based action have been targeted in ACT treatments with various other populations, and improvements in acceptance and values-based action have been associated with improved outcomes [16, 17]. There have also been ACT treatments implemented in patients with headache, with positive results [18, 19]. However, these studies did not specifically examine the mediating effects of acceptance and values-based action.

Pain acceptance is defined as "living with pain without reaction, disapproval, or attempts to reduce or avoid it… it involves a disengagement from struggling with pain, a realistic approach to pain and pain-related circumstances, and an engagement in positive every day activities" (p. 98 in [20]). A growing body of research demonstrates that pain acceptance plays an important role in the mental and physical well-being of patients with chronic pain—it is associated with reduced psychopathology, enhanced physical and social functioning, and greater pain tolerance in patients with chronic pain disorders [21–23]. Conversely, low pain acceptance is significantly associated with increased vulnerability to depression, reduced quality of life, and increased disability [24–27]. Importantly, targeting acceptance in treatment has been associated with improved outcomes in various populations, including chronic pain [28]. For example, Vowles et al. [25] found that changes in acceptance of pain during treatment accounted for significant variance in change on depression, anxiety, and disability measures.

Values-based action entails engaging in behavior in service of what the person holds as important and meaningful. Although values-based action has been the subject of less study, it is related to patient functioning in theorized ways. Greater success at engaging in values-based action is related to lower levels of depression and disability in patients with chronic pain [15]. Greater success at engaging in values-based action is also related to lower pain severity, pain-related distress, and pain-related anxiety and avoidance in patients with chronic pain [29]. Finally, improvements in values-based action during treatment have been related to improvements in levels of distress and disability at follow-up [28, 30].

The significance of pain acceptance and values-based action have yet to be explored in patients with migraine. Though pain is a hallmark of migraine, there are several important aspects of the disease that make migraine distinct from other chronic pain disorders [31]. The episodic nature and enhanced sensitivity to multiple, non-painful stimuli, such as light, sounds, and smells, are unique to migraine. Furthermore, the unpredictability of migraine attacks, in terms of frequency and duration, represents an additional stressor for patients with migraine. Finally, many acute and preventive medications used in the management of migraine are ineffective for other pain conditions [32, 33].

To date, there have been no studies examining relations between low pain acceptance and depressive symptoms or headache-specific disability in patients with migraine and there are no studies examining the relations between values-based action and the mental and physical health of patients with migraine. One study examined relations between pain acceptance and a range of other coping variables in patients with migraine; lower pain acceptance was associated with greater pain-related interference, catastrophizing, and lower perceived control and engagement in activities [34]. In a recent review on headache trigger avoidance, Martin and MacLeod [35] also challenge the conventional wisdom that avoidance of headache triggers is optimal for functioning in the long run and instead advocates "coping with triggers."

Current Study In the current study, we explored concurrent relations between pain acceptance and values-based action with depression and disability in migraine sufferers. Based on findings with patients with chronic pain, we hypothesized that higher levels of acceptance and values-based action would be associated with lower levels of depression and disability. Elucidating the psychological coping variables that are associated with distress and disability in patients with migraine can lead to improvements in psychological treatments by placing emphasis on processes that are significant and reducing or eliminating non-active ingredients. We also examined the reliability of the Chronic Pain Acceptance Questionnaire and the Chronic Pain Values Inventory, which have been extensively used in patients with chronic pain, in this group of patients with migraine.

Method

Participants The participants in this study were being recruited for a clinical trial examining the efficacy of a brief behavioral treatment for depressed patients with migraine [18]. Individuals with a history of migraine headaches (identified through hospital chart reviews, advertising in local neurology clinics and at the local university and hospital, and referrals by a neurologist) were invited to complete a screening inventory. Individuals who met screening cutoffs were invited for an in-person assessment to confirm eligibility for the intervention study.[1] Included in this manuscript are the 93 adults who completed an in-person assessment after screening positive on the following: (1) reported 4–12 migraine days in the previous month; (2) scored >2 on

[1] The majority of participants who completed the screening either did not meet the cutoffs for the PHQ or the required number of migraine days [4–12] in the previous month.

the ID Migraine, a self-administered highly sensitive three-item screen for migraine [36]; (3) endorsed at least five of the eight criteria, one of which must be "depressed mood" or "loss of interest or pleasure [37, 38] on the Patient Health Questionnaire-8, a valid screening measure for depression in clinical studies; (4) had no history of brain injury; and (5) reported having a formal diagnosis of migraine by a physician. The in-person assessment included interview measures of depression and self-report questionnaires of depressive symptoms, functioning, pain acceptance, and values-based action (see the "Measures" section).

Measures

Depression

Structured Clinical Interview for DSM-IV (SCID-IV) The SCID-IV is a semi-structured diagnostic interview to assess disorders contained in DSM-IV. It has demonstrated good clinical utility, validity, and reliability in controlled outcome studies [39]. The depression module was completed for this study.

Hamilton Rating Scale for Depression (HRSD) The 24-item HRSD [40] is a well-validated and reliable clinician-rated measure of the severity of current depressive symptoms. Higher scores represent greater depression severity.

Inventory of Depression and Anxiety Symptoms (IDAS) The IDAS [41] is a self-report measure that assesses specific symptom dimensions of major depression and related anxiety disorders. The General Depression Scale and the Dysphoria and Well-Being subscales were used in this study because they are significantly correlated with the Beck Depression Inventory [41]. These scales exhibit good internal consistency and short-term reliability in psychiatric samples [42].

General Functioning

World Health Organization Disability Assessment Schedule II (WHO-DAS) The 36-item WHO-DAS assesses behavioral functioning/impairments as a separate domain from disease symptoms and demonstrated good reliability, validity, and sensitivity to change in functional status after treatment [43]. Higher scores indicate greater disability. The Total Score on the WHO-DAS is reported.

Short Form Health Survey (SF-36) The 36-item self-report SF-36 [44] assesses the impact of medical problems on patient functioning. It includes a Physical Component Scale (PCS), Mental Component Scale (MCS), and a Total Score. The PCS and MCS have excellent internal consistency (alpha=.92 and .91, respectively). Higher scores represent better health status.

Migraine-Specific Functioning

Migraine-Specific Quality of Life (MSQL) Questionnaire The MSQL [45] measures the impact of migraine on health-related quality of life in three domains: role restriction, role prevention, and emotional functioning. All domains on the MSQL are scored from 0 to 100, with higher scores indicating better functioning. Internal consistency reliability and validity have been found to be appropriate in patients with migraine [45, 46].

Headache Disability Inventory (HDI) The HDI [47] assesses the perceived impact of headaches on daily activities and functioning. The items were designed specifically to assess the concerns of individuals with recurrent headache disorders. Higher scores represent greater impairment.

Pain Acceptance and Values-Based Action

Chronic Pain Acceptance Questionnaire (CPAQ) The CPAQ [48] measures Activity Engagement, the degree to which one engages in life activities regardless of pain, and Pain Willingness, the willingness to have pain present without trying to avoid or reduce it. The CPAQ Total Score is the sum of the two subscales and will be used in this study. The CPAQ has been used in treatments of patients with chronic pain [24, 29, 30], which is related to improvements in emotional functioning, and has demonstrated good reliability and validity [48].

Chronic Pain Values Inventory (CPVI) The CPVI [15] assesses the importance of and the success in living out the following six domains of values: family, intimate relations, friends, work, health, and growth or learning. The first six items ask patients to rate the importance of each valued domain. The second set of six items asks patients to rate how successfully they have lived according to their values in each domain. The mean success rating is used in the present study as a measure of values-based action, the extent to which patients see their behavior as guided by their values. Studies support the internal consistency and construct validity of this measure as a reflection of values-based behavioral activation [49, 50].[2]

Statistical Analyses

Pearson correlational analyses were calculated to examine relations between depression, general functioning, and headache-related disability, pain acceptance, and values-based action. The primary analyses involved multiple

[2] All analyses were run with both the CPVI-Success and CPVI-Discrepancy scales. Results were unchanged and thus, the CPVI-Success scale results are reported in this manuscript.

regression analyses. Multiple regressions were used to determine the unique and combined contribution of pain acceptance and values-based action on concurrent depression and disability. Hierarchical multiple regressions were used to assess whether pain acceptance and values-based action explained any significant variance in disability after depression was taken into account. All analyses were conducted using SAS statistical software.

Results

Participant Information The 93 participants who completed an in-person assessment were mostly female (89 %), consistent with higher rates of depression and migraine in females. They were primarily white (86 %) and had some education beyond the high school level (89 %). Age ranged from 18 to 68 (M=32, SD=13). Average age of onset for migraine was 18 (SD=9.3). In terms of headache frequency, participants experienced an average of 8 (SD=4) headaches during the month prior to enrollment and almost all participants were taking acute medications (prescribed or over-the-counter) for their migraine-related pain (89 %) and a third were taking a preventive medication for the migraine (32 %).

As noted above, all participants screened positive for migraine on the ID Migraine, a well-validated migraine screening. A study by Martin and colleagues examining the predictive value of migraine diagnostic criteria found that the three ID-Migraine items can effectively predict migraine in diverse clinical settings [51]. The average ID Migraine score for the 93 participants was 2.8: 89/93 endorsed the dysfunction item, 82/93 the nausea item, and 88/93 the light difficulties item; 75/93 participants endorsed all three items. All participants also reported being diagnosed with migraine by a physician. The diagnosis of migraine was confirmed through chart review for 57 of the 93 participants (61 %) who had medical files at the local hospital where the study was completed.

Of the 93 patients with migraine who completed the in-person assessment, 78 (84 %) met the criteria for a major depressive episode (MDE) on the Structured Clinical Interview for DSM-IV (see below). Of note, the correlational and regression analyses reported below are based on the 93 participants who screened positive for the study. However, we also conducted the same analyses with the subset of 78 participants that met the criteria for depression on the SCID-IV interview. The results of the analyses were essentially unchanged, though slightly attenuated, likely due to restriction in range. Thus, we report below on the larger group of participants.

Descriptive Results Means and standard deviations for all the measures administered as well as Pearson correlations between these measures are presented in Table 1. As expected, the self-report and clinician-rated measures of depression were strongly related. For example, IDAS-General Depression and the HRSD were correlated (.76). Similarly, measures of general functioning/disability were significantly intercorrelated; the headache-specific measures (HDI and MSQL) were strongly intercorrelated and were moderately correlated with general measures of functioning (SF-36 and WHO-DAS). Finally, pain acceptance (CPAQ) and values-based action (CPVI) were moderately correlated (.48) with each other, suggesting that these processes are related but separate constructs.

Reliability of CPAQ and CPVI in This Sample The internal consistency reliability of the CPAQ Total Score was high at .88, and the average interitem correlation was .26. Internal consistency reliability of CPVI Success and CPVI Discrepancy scales were also high at .76 and .80, respectively. The average interitem correlations were .35 and .40 for the CPVI Success and Discrepancy scales, respectively. These average interitem correlations fall in the recommended range for scales that are reasonably homogenous without containing overly redundant items (.15–.50; [52]).

Relations Between Depression and Disability Next, we examined associations between depression and disability (Table 2). As noted above, 78/93 (84 %) participants met the criteria for a MDE on the SCID-IV. As shown in Table 2, there were significant and large differences between the depressed and non-depressed groups on all measures of functioning/disability (effect sizes (Cohen's d) ranged from 0.89 to 1.8) such that patients with migraine with a SCID diagnosis of depression exhibited more disability and poorer quality of life than non-depressed patients with migraine.

Dimensional measures of depression yielded similar results to those of the categorical measure of depression: in patients with migraine, greater dysfunction and disability was strongly associated with greater depression severity and lower well-being (Table 1). The average correlation between measures of functioning/disability with the clinician-rated HRSD was |.50| (range .32–.67) and with the self-report IDAS-General Depression Scale was |.56| (range .42–.77). As expected, measures of depression were more strongly related to the Mental Component Scale (r_s=.53–.77) of the SF-36 than to the Physical Component Scale (r_s=.30–.42). These latter correlations more closely matched the relations between the headache-specific disability measures (HDI and MSQL scales) and depression.

Acceptance and Values: Associations with Depression and Disability Next, we examined the relations between depression, pain acceptance, and values-based action. First, we compared the participants who met the SCID-MDE criteria to those who did not on these putative process variables. As

Table 1 Correlations between measures of depression, disability, pain acceptance, and values-based action

		Depression				Disability								Acceptance & Values	
	Mean (SD)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Depression															
1. Hamilton Rating Scale for Depression	23.1 (8.9)														
2. IDAS-GD	58.1(12.8)	.76													
3. IDAS Dysphoria	29.6 (7.9)	.70	.93												
4. IDAS Well Being	16.9 (5.7)	-.41	-.50	-.37											
Headache-Related Disability															
5. Headache Disability Inventory	64.4 (20.1)	.41	.48	.43	-.37										
6. MSQL Role Restriction	43.9 (17.2)	-.54	-.60	-.50	.45	-.66									
7. MSQL Role Prevention	64.4 (19.4)	-.32	-.42	-.39	.34	-.65	.74								
8. MSQL Emotion	51.5 (25.4)	-.44	-.49	-.43	.31	-.70	.66	.69							
General Functioning															
9. Short Form Health Survey- Total	47.4 (17.6)	-.60	-.68	-.62	.48	-.52	.55	.50	.48						
10. SF PCS	56.6 (19.6)	-.38	-.42	-.36	.30	-.43	.40	.40	.37	.87					
11. SF MCS	38.1 (20.6)	-.67	-.77	-.71	.53	-.48	.56	.48	.47	.88	.54				
12. World Health Organization Disability Assessment Schedule	33.2 (15.3)	.53	.63	.59	-.36	.56	-.57	-.48	-.37	-.78	-.65	-.71			
Pain Acceptance and Values-Based Action															
13. Chronic Pain Acceptance Questionnaire	59.8 (17.1)	**-.40**	**-.46**	**-.44**	**.42**	**-.63**	**.52**	**.53**	**.43**	**.55**	**.46**	**.50**	**-.57**		
14. Chronic Pain Values Inventory	2.5 (.85)	**-.36**	**-.44**	**-.45**	**.37**	**-.37**	**.40**	**.39**	**.36**	**.47**	**.40**	**.42**	**-.46**	.48	

All correlations are significant at ≥.01 level

In bold are the correlations between pain acceptance and values based on one hand and depression and disability on the other hand

SD standard deviation, *IDAS-GD* Inventory of Depression and Anxiety Symptoms-General Depression, *MSQL* Migraine-Specific Quality of Life, *SF-PCS* Short Form Health Survey Physical Component Scale, *SF-MCS* Mental Component Scale

shown in Table 2, the depressed group exhibited significantly lower levels of pain acceptance (CPAQ) and values-based actions (CPVI) than the non-depressed group. Effect sizes were large.

Severity of depression, both clinician-rated and self-reported, also exhibited significant associations with pain acceptance and values-based action (Table 1). The HRSD and IDAS-General Depression were moderately associated with lower pain acceptance (Spearman's r=−.40 and −.46, respectively) and decreased values-based action (r_s=−.36 and −.44, respectively). Moderately strong correlations between the IDAS Well-Being and Dysphoria subscales of depression were also observed with these measures (Table 1).

Next, we examined relations between disability/functioning, pain acceptance, and values-based action in patients with migraine. Headache-related disability (HDI), migraine-specific role limitations (MSQL), and general disability levels (WHO-DAS, SF-36 Total) were strongly related

Table 2 Major depressive episode: associations with disability, pain acceptance, and values-based action

	MDE on SCID	No MDE on SCID		
	Mean (SD)	Mean (SD)	*t* test	Effect size
CPAQ	57.05 (16.3)	73.8 (14.2)	t=4.1 (p<.01)	d=1.05
CPVI	2.40 (.81)	3.25 (.76)	t=3.8 (p<.01)	d=1.05
HDI	67.43 (18.8)	48.4 (19.7)	t=3.6 (p<.01)	d=1.0
MSQL Emotion	10.2 (3.7)	13.5 (3.0)	t=3.2 (p<.01)	d=0.91
MSQL Role Prevention	16.2 (3.8)	20.3 (2.4)	t=4.1 (p<.01)	d=1.1
MSQL Role Restriction	21.2 (5.5)	28.4 (5.0)	t=4.7 (p<.01)	d=1.3
WHO-DAS	35.7 (14.2)	20 (14.5)	t=3.9 (p<.01)	d=1.1
SF-Total	43.5 (14.8)	67.4 (17.9)	t=5.5 (p<.01)	d=1.6
SF-PCS	54.0 (18.7)	70.6 (18.3)	t=3.2 (p<.01)	d=0.89
SF-MCS	33.1 (16.6)	64.3 (20.4)	t=6.4 (p<.01)	d=1.8

N=78 in the MDE on SCID group. N=15 in the no MDE on SCID group

MDE on SCID major depressive episode on Structured Clinical Interview for DSM-IV, *No MDE* no major depressive episode on Structured Clinical Interview for DSM-IV, *CPAQ* Chronic Pain Acceptance Questionnaire, *CPVI* Chronic Pain Values Inventory, *HDI* Headache Disability Inventory, *MSQL* Migraine-Specific Quality of Life, *WHO-DAS* World Health Organization Disability Assessment Schedule, *SF-Total* Short Form Health Survey Total Score, *SF-PCS* Physical Component Scale, *SF-MCS* Mental Component Scale

to lower pain acceptance (r_s=|.43|–|.63|) and moderately related with decreased values-based action (r_s=|.37|–|.47|).

Regression Analyses Using multiple regression analyses, we explored the unique and combined contributions of pain acceptance and values-based action on depression and disability. Table 3 displays the results of these regression analyses. Jointly, 18–25 % of the variance in depression was accounted for by these process measures. On both clinician and self-reported depression severity scales (HRSD and IDAS-General Depression (IDAS-GD)), low pain acceptance (CPAQ) explained a significant variance in depression (r_s^2=.15 on the HRSD; r_s^2=.20 on the IDAS-GD). Values-based action (CPVI) also explained a significant, though modest, variance in depressive severity on the IDAS (r_s^2=.05).

With headache-specific measures of functioning as the criteria, 19–40 % of the variance was explained by the CPAQ and CPVI jointly. Nearly all of this variance was due to pain acceptance (Table 3). The CPAQ explained 37 % of the variance to headache disability (HDI) and between 17 and 26 % to MSQL. For general measures of functioning, pain acceptance, and values-based action explained 35 % of the variance in SF-36 and 36 % in the WHO-DAS. Again, the CPAQ explained the majority of that variance (r_s^2=.28–.31); however, the CPVI also explained a modest but significant variance in disability (r_s^2=.05–.07).

Given the strength of the CPAQ findings in explaining variance in disability, we next decided to assess whether pain acceptance would explain a significant variance in functioning after controlling for depression. Hierarchical regression analyses were done whereby depression measures were entered in step 1 and pain acceptance in step 2. As shown in Table 4, self-rated depressive symptoms (IDAS-GD) contributed 22 % of the variance in headache disability (HDI). After controlling for depression, pain acceptance contributed an incremental 20 % (p<.01) of the variance. Together therefore, depression and pain acceptance accounted for 42 % of the variance in the HDI. Similar results were observed when clinician-rated depressive symptoms (HRSD) were entered in step 1. Pain acceptance provided an incremental 25 % of the variance in disability after controlling for depression. When the WHO-DAS and the SF-36 were the dependent variables, a similar

Table 3 Simultaneous regression analyses: role of pain acceptance and values-based action in depression and disability

Variables entered	β (final)	r_s^2	R^2
Clinician-Rated Depression Severity (HRSD)			
CPAQ	−.29	.15*	.18**
CPVI	−.20	.03	
Self-Reported Depression (IDAS-GD)			
CPAQ	−.33	.20**	.25**
CPVI	−.24	.05*	
SF-36 Total Score			
CPAQ	.38	.28**	.35**
CPVI	.31	.07**	
WHO-DAS			
CPAQ	−.43	.31**	.36**
CPVI	−.26	.05*	
HDI			
CPAQ	−.53	.37**	.40**
CPVI	−.17	.03	
MSQL Role Restriction			
CPAQ	.43	.26**	.28**
CPVI	.17	.02	
MSQL Role Prevention			
CPAQ	.43	.25**	.27**
CPVI	.14	.02	
MSQL Emotional Functioning			
CPAQ	.33	.17**	.19**
CPVI	.17	.02	

HRSD Hamilton Rating Scale for Depression, *IDAS-GD* Inventory of Depression and Anxiety Symptoms-General Depression, *WHO-DAS* World Health Organization Disability Assessment Schedule, *HDI* Headache Disability Inventory, *MSQL* Migraine-Specific Quality of Life, *CPAQ* Chronic Pain Acceptance Questionnaire, *CPVI* Chronic Pain Values Inventory

*p<.05; **p<.01

Table 4 Hierarchical multiple regression analyses: role of pain acceptance in patient functioning after controlling for depression

Variables entered	β	Δr^2	R^2
HDI			
1. IDAS-GD	.38	.22**	.42**
2. CPAQ	−.59	.20**	
1. HRSD	.42	.15*	.40**
2. CPAQ	−.64	.25**	
WHO-DAS			
1. IDAS-GD	.54	.38**	.48**
2. CPAQ	−.31	.10**	
1. HRSD	.56	.24**	.40**
2. CPAQ	−.39	.16**	
SF-36 Total Score			
1. IDAS-GD	−.73	.46**	.52**
2. CPAQ	.29	.06**	
1. HRSD	−.86	.32**	.44**
2. CPAQ	.37	.12**	

β values are from the final equation

HRSD Hamilton Rating Scale for Depression, *IDAS-GD* Inventory of Depression and Anxiety Symptoms-General Depression, *WHO-DAS* World Health Organization Disability Assessment Schedule, *HDI* Headache Disability Inventory, *MSQL* Migraine-Specific Quality of Life, *CPAQ* Chronic Pain Acceptance Questionnaire

*p<.05; **p<.01

picture emerged. Even after controlling for depression in step 1 (IDAS-GD or HRSD), pain acceptance explained a significant incremental variance in general functioning (6–16 %).

All of the analyses described above were done with a subset of the sample that had confirmed diagnoses of migraine in the charts (57/93). This was done to make certain that the results presented for the total sample that included patients whose diagnosis of migraine was based on self-report alone did not differ greatly from those with a confirmed chart diagnosis. The results of these analyses were even stronger for this subset of participants, but the take-home points were unchanged (results available upon request).

Discussion

The goal of this study was to elucidate the role of pain acceptance and values-based action on depression and disability in 93 patients with migraine who endorsed depressive symptoms and were being evaluated for a treatment study. The CPAQ and the CPVI exhibited strong psychometric properties in this population, providing preliminary support for the use of these measures in patients with migraine. Overall, it appears that patients with migraine who have lower levels of pain acceptance and who exhibit decreased engagement in valued activities may suffer greater overall distress and greater disability. Pain acceptance, in particular, accounted for 15 to 37 % of the variance on measures of depression and disability. Decreased engagement in values-based action explained a smaller, though significant, variance (3 to 7 %) in self-reported depression and general functioning but not headache-specific disability or quality of life.

From an ACT theoretical perspective, low pain acceptance is associated with decreased engagement in meaningful activities that are associated with pain. In turn, avoidance of meaningful activities is related to greater feelings of isolation, depression, and reduced functioning. The findings of this study are consistent with this perspective and with the findings of other studies demonstrating that pain acceptance and values-based actions are positively associated with better mental health and better physical and social functioning, and negatively associated with depression and disability in patients with chronic pain disorders [21–23]. Furthermore, in patients with chronic pain, changes in acceptance during treatment have been found to be related to improvements in functioning and quality of life [17, 25, 26, 53–56]. This is the first study, however, to examine relations between these constructs and negative outcomes in patients with migraine. An important next step would be to examine whether targeting acceptance in treatment of patients with migraine would lead to improvements in their functioning.

Of note, pain acceptance explained a significant and strong unique variance in functioning status even after controlling for depressive symptom severity. This is important because variables such as pain acceptance are generally neglected, at least in comparison to the measurement and targeting of symptoms. These findings also suggest that pain acceptance may be a clinically useful target in treatment, in addition to addressing specific symptoms of depression. Consistent with this, McCracken and colleagues found similar results in patients with chronic pain, whereby pain acceptance led to enhanced physical functioning above and beyond the influence of depression [57]. Overall, treatments targeting acceptance, as well as other coping strategies related to depression [58–60], could alleviate the suffering and disability of patients with migraine.

Limitations and Future Directions The current study has limitations. First, the methods are cross-sectional. Longitudinal data are needed to determine the direction of causal relations between pain acceptance, values-based action, and depression and disability. Second, migraine diagnosis in this study was not based on a clinical assessment; it was based on the ID-Migraine, patient-reported diagnosis of migraine by a physician, and verification of diagnosis of migraine in medical charts for nearly two thirds of the patients. Although misdiagnosis is possible, the ID-Migraine has been demonstrated to have high sensitivity and specificity. In addition, a study by Martin and colleagues examining the predictive value of migraine diagnostic criteria found that the three ID-Migraine items can effectively predict migraine in diverse clinical settings [51]. Furthermore, the analyses were run with only the participants whose diagnosis of migraine by a physician was confirmed through chart review. Results remained unchanged, though strengthened somewhat. Nonetheless, future studies should obtain formal migraine diagnoses of participants. Third, the generalizability of these findings to all patients with migraine should be considered. Only patients with migraine who endorsed depressive symptoms at screening were included. However, given the high prevalence of depression in patients with migraine, these results provide information about a substantial portion of the overall population of people with migraine. Finally, future studies should assess the impact of other coping approaches that may be related with depression and disability in patients with migraine.

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