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Importance of Pain Acceptance in Relation to Headache Disability and Pain Interference in Women with Migraine and Overweight/Obesity

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Abstract

BACKGROUND—Pain acceptance involves willingness to experience pain and engaging in valued activities while pain is present. Though pain acceptance could limit both headache-related disability and pain interference in individuals with migraine, few studies have addressed this issue. The current study evaluated whether higher levels of total pain acceptance and it's 2 subcomponents, pain willingness and activity engagement, were associated with lower levels of headache-related impairment in women who had both migraine and overweight/obesity.

METHODS—In this cross-sectional study, participants seeking weight loss and headache relief in the Women's Health and Migraine (WHAM) trial completed baseline measures of pain acceptance (Chronic Pain Acceptance Questionnaire [CPAQ]), headache-related disability (Headache Impact Test-6 [HIT-6]), and pain interference (Brief Pain Inventory [BPI]). Migraine headache frequency and pain intensity were assessed daily via smartphone diary. Using CPAQ total and subcomponent (pain willingness and activity engagement) scores, headache frequency, pain intensity, and BMI as predictors in linear regression, headache-related disability and pain interference were modeled as outcomes.

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RESULTS—On average, participants (n=126; age=38.5±8.2 years; BMI=35.3±6.6 kg/m^2) reported 8.4±4.7 migraine days/month and pain intensity of 6.0±1.5 on a 0–10 scale on headache days. After correcting for multiple comparisons (adjusted α=.008), pain willingness was independently associated with both lower headache related disability (p<.001; β=−.233) and pain interference (p<.001; β= −.261). Activity engagement was not associated with headache related disability (p=.128; β= −.138) and pain interference (p=.042; β= −.154). CPAQ Total Score was not associated with headache related disability (p=.439; β=.066) and pain interference (p=.305; β=.074). Pain intensity was significantly associated with outcomes in all analyses (p's <.001; β's .343−.615).

CONCLUSIONS—Higher pain willingness, independent of degree of both migraine severity and overweight, is associated with lower headache-related disability and general pain interference in treatment-seeking women with migraine and overweight/obesity. Future studies are needed to clarify direction of causality and test whether strategies designed to help women increase pain willingness, or relinquish ineffective efforts to control pain, can improve functional outcomes in women who have migraine and overweight/obesity.

Keywords

migraine; headache; obesity; pain; acceptance; disability

INTRODUCTION

Migraine accounts for the highest proportion of specific disability worldwide among the neurologic diseases[1]. It is associated with substantial personal suffering[2] as well as significant direct and indirect costs[3]. Identification of factors associated with increased migraine-related disability and pain-related interference with living is critical to understanding and reducing the burden of migraine.

Mowrer's early work suggested that individuals could develop conditioned fear responses to pairings of stimuli and events and subsequently learn to avoid certain stimuli or contextual cues in response[4]. People with migraine describe a wide range of perceived migraine precipitants, or triggers[5], and avoidance of perceived triggers and daily activities due to fear of pain can be prevelant[6]. Behavioral avoidance due to fear of pain can result in a lowering of pain threshold, failed habituation to pain, and a lack of opportunity for learning to cope with pain, ultimately leading to disability[7,8]. This fear-avoidance model has been well established in chronic musculoskeletal pain[8,9] and more recently headache-related pain[6,10]. Psychological variables, such as anxiety sensitivity- the general tendency to interpret somatic symptoms as aversive or dangerous- appear to play a larger role in exacerbating the fear-avoidance relationship than headache symptoms, such as headache severity[11]. Thus it may be possible to intervene on the fear-avoidance relationship via psychosocial intervention to improve outcomes with migraine patients.

Pain acceptance is an adaptive alternative to avoidance-style coping. Pain acceptance is conceptualized as an active, behavioral process comprised of two components: (1) pain willingness, which is recognition that efforts to avoid or control pain are often ineffective, and, (2) activity engagement, which is the pursuit of life activities in a normal manner even

while pain is being experienced[12]. An example of being willing to experience pain is when a patient acknowledges that controlling her pain is less important than being emotionally present for a spouse. An example of activity engagement is when a patient attends an important social event despite experiencing pain. Among people with chronic musculoskeletal pain, pain acceptance has been consistently associated with improved functioning and acceptance-based treatment approaches have demonstrated efficacy to improve pain and psychosocial pain outcomes[13]. However, the role of pain acceptance in migraine may differ from its role in chronic musculoskeletal pain conditions. Although migraine is painful, it is a recurrent episodic neurologic condition characterized by attacks that are transient, often unpredictable, and include pain as well as neurologic symptoms such as nausea and vomiting, sensory and cognitive disturbances, and sensitivity to light, sound, and smell. Given the promise of acceptance from the broader chronic pain literature, acceptance in migraine deserves closer examination.

Only recently have researchers have begun to examine the role of acceptance in migraine. Dindo and colleagues found that lower pain acceptance was strongly associated with depression and disability among adult patients with migraine being evaluated for an intervention trial[14]. The same group intervened on a subset of those patients and found that a 1-day acceptance-based intervention resulted in improvements in headache severity and headache disability[15]. In addition, a cross-sectional study of treatment-seeking adults with migraine found that psychological flexibility (which was comprised of pain acceptance and other factors) accounted for a significant portion of the variance in headache severity and headache-related disability[16].

Together, these studies suggest that pain acceptance could be an important factor in understanding variations in migraine-related disability and pain-related interference in living. However, previous research examined a narrow set of functional outcomes; for example, none of the previous studies evaluated the extent to which pain interferes with functional domains outside of role-related activities. Further, although migraine frequency and pain intensity are primary drivers of migraine-related disability and interference[17,18] previous studies did not examine the role of these migraine characteristics in the relationship between pain acceptance and migraine-related disability and pain interference.

Women with obesity and migraine are a particularly important population for the examination of pain acceptance in relation to migraine-related disability and pain interference[19]. Obesity increases risk for having migraine[20], particularly in women of reproductive age[21,22], and is an exacerbating factor in individuals with existing migraine[23,24]. Acceptance-based coping appears to play an important role in obesity and related weight loss efforts. For example, acceptance has been shown to moderate the relationship between obesity and quality of life[25]; further, increasing acceptance has been show to contribute to better weight control[26].

The present study evaluated whether pain acceptance was associated with headache-related disability and general pain interference across a variety of life domains, adjusting for headache frequency, intensity, and body mass index (BMI), among women with migraine and overweight/obesity. We examined the components separately due to their distinct

theoretical and psychometric characteristics. We hypothesized that higher pain acceptance (and its two subcomponents, pain willingness and activity engagement) would be associated with lower headache-related disability and pain interference, controlling for indices of migraine severity (headache frequency, pain intensity) and degree of overweight, as measured by body mass index (BMI).

METHODS

Participants and procedures

This cross-sectional study included 126 women, aged 18–50 years, who were overweight or obese (BMI ≥ 25 kg/m^2), had a neurologist-confirmed diagnosis of migraine with or without aura according to International Classification for Headache Disorders (ICHD) third edition beta criteria[27], and were seeking behavioral treatment to lose weight and reduce headaches as part of the Women's Health and Migraine (WHAM) trial[28]. Participants were recruited between November 2012 and March 2016 from communities (via direct mailings, Internet sites, and social media outlets) and neurological medicine clinics through physician referrals. Of 943 women who contacted the research center to learn more about the study, 718 were reached by telephone and completed a screening interview to determine initial eligibility. The interview consisted of questions derived from a validated telephone-based diagnostic interview[23] to verify that participants had migraine according to International Headache Society (IHS) criteria[27] and met headache frequency-related inclusion criteria (i.e. ≥ 3 migraine headaches and 4–20 migraine headache days during past month). Additional interview questions confirmed whether participants met other inclusion criteria related to age, overweight/obesity status, stable medication use, ability to engage in exercise, absence of conditions that could interfere with adherence to the treatment protocol (e.g., substance abuse or severe psychiatric disorder) and willingness to commit to the study protocol (i.e. attendance at treatment sessions and completion of assessments). Of these 718, more than half (53.8%) were ineligible, largely due to failure to meet study criteria for migraine (n=108) or weight status (n=64), and unwillingness to commit to the research protocol (n=110). Of the remaining 318 women, 167 attended a study orientation/baseline visit during which informed consent was obtained, migraine diagnosis was confirmed by the study neurologist, height and weight status was objectively verified, and questionnaire-based measures of pain acceptance, headache-related disability and pain interference were completed. At this same visit, participants were given a smartphone equipped with a Web-based diary application to record migraine headache frequency, pain intensity, and pain interference for 28 consecutive days. Of the 167 participants who initially consented, 126 were deemed eligible who fully completed all baseline measures including the 28-day smartphone headache diary protocol and met migraine diagnosis, headache frequency, weight status, and other study criteria described above. All measures were completed at baseline prior to randomization and initiation of treatment. The study protocol was approved by the Rhode Island Hospital Institutional Review Board (Providence, RI, USA). The last author assumes full responsibility for the integrity of the data.

Measures

Pain Acceptance—Pain Acceptance was measured using the well validated and widely utilized 20-item revised version of the Chronic Pain Acceptance Questionnaire (CPAQ)[12,29,30]. The CPAQ is comprised of 2 subscales: (1) Activity Engagement (performing valued activities despite the presence of pain), and, (2) Pain Willingness (relinquishing efforts to avoid or control pain). Although the CPAQ is commonly used as single process measure of pain acceptance, the two subfactors have different patterns of association with important chronic pain characteristics and outcomes, suggesting that subfactor analyses can be warranted[12]. Each item is rated on a 7-point scale ranging from 0 (never true) to 6 (always true). The components are calculated by summing the responses in each domain. Higher scores indicate higher levels of acceptance. The CPAQ demonstrates good internal consistency across a variety of pain syndromes including migraine, and predictive validity as evidenced by moderate to high correlations between both components (Activity Engagement and Pain Willingness) and pain intensity and pain interference[12].

Headache disability—The Headache Impact Test-6 (HIT-6) was used to assess severity of headache disability[31]. The HIT-6 is a global measure of adverse headache impact containing 6 items that measure impact on “usual daily activities” including work, school, or social activities; pain severity; fatigue, and desire to lie down; frustration; and difficulty with concentration. Higher HIT-6 scores indicate greater impact on normal everyday life and ability to function with scores ≤49, 50–55, 56–59, and ≥60 indicating little to no impact, some impact, substantial impact, and very severe impact. The HIT-6 has good internal consistency and demonstrates ability to discriminate between different levels of migraine frequency and severity[32,33].

Migraine headache characteristics and pain interference—Using a smartphone equipped with a Web-based diary application, participants recorded headache occurrence (yes/no), maximum pain intensity on a 0 (*no pain*) to 10 (*pain as bad as you can imagine*) scale, and related level of pain interference in multiple areas of functioning. Questions to determine level of pain interference were taken from the pain interference subscale of The Brief Pain Inventory[34]. Participants rated the extent to which pain interfered with seven domains (i.e. general activity, mood, walking ability, normal work both outside and inside the home, relations with other people, sleep, and enjoyment of life) during the past 24 hours on a 0 (*no interference*) to 10 (*complete interference*) scale. For each domain, the sum of all ratings was divided by the total number of ratings to calculate average level of interference. The Brief Pain Inventory has demonstrated reliability and validity in patients with different chronic pain conditions[35] and was recently shown to be consistently associated with headache intensity and pain sensitization in women with migraine and obesity[18].

Anthropometric characteristics—Height was measured in millimeters using a wall-mounted Harpenden stadiometer. Weight was measured in light street clothing, without shoes, and to the nearest 0.1 kg using a calibrated digital scale. These measures were used to calculate BMI using the following formula: BMI (kg/m^2) = weight (kg) / (height [m])^2.

Statistical Analysis

Analyses were conducted using IBM SPSS Statistics for Windows, Version 20.0 (IBM Corp., 2011, Armonk, NY: http://www.spss.com). Demographic/anthropometric, headache frequency, pain intensity, headache-related disability, pain interference, and pain acceptance values were summarized using means and standard deviations (SD) or counts with percentages, as appropriate. Separate linear regression models were used to evaluate the CPAQ Total Score and each of the Pain Willingness and Activity Engagement component scores as predictors of headache-related disability (HIT-6) and total pain interference (BPI) scores. Headache frequency, pain intensity, and BMI were evaluated as covariates. In the absence of statistically significant interactions, models including main effects only are reported. Given that six separate statistical models were used to evaluate CPAQ total score, pain willingness and activity engagement as predictors of headache-related disability and pain interference, test of significance associated with the regression analysis were conducted with alpha = .008 (i.e., .05 ÷ 6) to adjust for multiple comparisons. All tests were two-tailed. This study involved a secondary analysis of baseline data collected as part of an ongoing randomized controlled trial. For the randomized controlled trial, a sample of 140 participants was estimated to adequately power comparison of changes in monthly headache frequency between the behavioral weight loss intervention and migraine education control arms.

RESULTS

Participant Characteristics

Demographic, anthropometric, headache, and psychological pain-related characteristics of the 126 participants are reported in Table 1. On average, participants were 38 years of age and had severe obesity (BMI ≥ 35 kg/m^2). Nearly one-quarter (22.2%) identified as being a member of a racial minority group and 18% reported having Hispanic ethnicity. More than half (57.1%) of participants had at least a 4-year college/university degree. Participants on average experienced migraine attacks that produced moderate pain intensity on 8 days during the 28-day monitoring period. Sixteen participants (12.7%) met criteria for chronic migraine (15–20 migraine days). Overall, participants reported experiencing a very severe level of headache disability (i.e. HIT-6 score ≥60) and the highest levels of pain interference in the domains of general activity, mood, and enjoyment of life. Finally, participants reported low mean levels of pain willingness (score of 26 out of a maximum score of 54), activity engagement (score of 39 out of a maximum score of 66), and total CPAQ score (score of 66 out of 120).

Associations of pain acceptance with headache disability and pain interference

Results of linear regression models for pain acceptance are reported in Table 2.

Headache disability—Mean levels of headache disability were lower for participants who reported higher levels of pain willingness (β= −0.23; SE=0.04). By contrast, mean levels of headache disability were higher for individuals who reported higher pain intensity levels. Headache disability was not associated with total pain acceptance (β=0.07; SE=0.04) or activity engagement (β= −0.06; SE=0.04). Similarly, there were no interactions between

pain acceptance, migraine headache features, and BMI variables in relation to headache disability.

Pain interference—Mean levels of total pain interference were lower for individuals who reported higher levels of pain willingness (β= −0.26; *SE*=0.12). Conversely, mean levels of total pain interference were higher for participants who reported higher levels of maximum pain intensity. There were no associations between mean levels of total pain interference and total pain acceptance (β=0.07; *SE*=0.10) and activity engagement (β= −0.15; *SE*=0.11). Interactions between pain acceptance, migraine headache features, and BMI were not observed.

DISCUSSION

The current study is the first to evaluate pain acceptance in the context of headache disability and general pain interference among a sample of treatment-seeking women with migraine and obesity. The major finding is that higher levels of pain willingness, one of the sub-components of pain acceptance, was associated with lower levels of headache-related disability and pain interference with living. Importantly, this relationship occurred independently of headache frequency, pain intensity, and BMI, suggesting that higher levels of pain willingness may be beneficial for reducing headache-related disability and general pain interference regardless of degree of migraine severity and overweight.

Conversely, total pain acceptance and activity engagement, the other sub-component of pain acceptance, were not associated with headache-related disability and pain interference. The reasons for these results are not entirely clear. It could be that once individuals stop focusing so much on pain control efforts they are naturally more functional. Another possibility is that individuals with migraine and obesity have also been shown to have very low levels of movement in general[36], which might limit the impact of activity engagement due to a restricted range of overall activity. Finally, CPAQ items refer to pain generally, but not headache specifically. It could be that the CPAQ does not adequately capture activity engagement despite the presence of the full range of headache symptoms, some of which are not best characterized solely as pain. Further research is needed to clarify these issues.

Study findings suggest that enhancing pain willingness or relinquishing ineffective efforts to control headache-related pain may be a viable coping strategy to reduce headache-related disability and pain interference across functional domains in individuals with migraine and obesity, regardless of the degree of severity of both conditions. Overall these results are consistent with the larger body of literature on acceptance-based therapies, which suggest that reducing avoidance-style coping produces improvements in functioning among musculoskeletal pain patients[37,38] as well as more broadly in other behavioral medicine populations[39]. Given that there are already robust technologies, for example Acceptance and Commitment Therapy[39], that appear helpful for increasing pain willingness and improving pain outcomes in part through this mechanism, future research seems warranted to test acceptance-based interventions in individuals with migraine, including those with overweight/obesity.

Study findings suggesting that pain willingness may serve to limit headache disability and pain interference in women with migraine and overweight/obesity could have important clinical implications, although future prospective studies are needed to confirm hypothesized direction of the relationship. Acceptance-based interventions encompass a variety of strategies, and it could be that emphasizing the relinquishment of excessive pain control strategies could be warranted when adding pain acceptance strategies to existing cognitive behavioral therapy (CBT) interventions for migraine. Acceptance-based interventions include strategies that focus on altering the unhelpful functions of thoughts (as opposed to trying to reduce them in frequency) and mindfully acknowledging and embracing unwanted emotions, which might prove to be more helpful than strategies that focus largely on making behavioral commitments. For example, thoughts about activities or situations that should be avoided due to the potential for headache symptoms (e.g. “I can’t go to work), would be mindfully observed, labeled, and dispassionately watched in order to decouple the relationship between thoughts and avoidance behavior; with the goal of allowing more flexible and values-consistent behavior. In addition, the results also suggest that it may be useful to re-evaluate strategies focused on distraction and avoidance, which run counter to pain willingness. However we again caution that these findings are preliminary.

It is also important to note that, consistent with previous research and current intervention guidelines, the results of the current study showing that pain intensity is a strong correlate of migraine-related disability and pain interference in living suggest that efforts to manage pain intensity should be central to any migraine intervention. It may be important, however, for interventionists to help patients distinguish the degree to which pain management can contribute to improved outcomes while noting the limitations and possible detrimental effects of excessive efforts to control pain.

The current study has notable strengths, including a large sample size, examination of both migraine severity and the degree of overweight, and prospective and near real time assessment of headache activity. An additional strength was examining the two components of pain acceptance separately. The CPAQ is typically reported as a single total score in studies of musculoskeletal pain. However the most recent CPAQ component analysis showed that the two factors were distinct and had different correlation patterns in relation to criterion variables[12], suggesting that the subscales should be examined separately in analyses. The results of the current study support employment of this approach in future studies. Finally, the study had two measures of headache impact on functioning, increasing the confidence in validity of the finding that pain willingness might play a role in pain-related impairment among individuals with migraine.

This study also has important limitations. As previously stated, the study is cross sectional and thus causal interpretation is not possible. Future prospective research is needed to clarify directionality of relationship among pain acceptance and outcome variables. In addition, the sample was entirely female, majority Caucasian, and treatment seeking making generalizability to male, more diverse, and non-treatment seeking populations limited. The study did not use migraine-specific measures when assessing acceptance or interference, limiting our ability to make inferences about acceptance of migraine pain, or its impact on migraine-related interference. We did not assess for potential intervening variables that

could impact the relationship between pain acceptance and functional outcomes, such as anxiety sensitivity. Finally, although not necessarily a limitation, it should be noted that the sample had a relatively high burden for participation and thus could be considered highly motivated for the context of interpretation.

Summary

In this cross-sectional study of women with migraine and obesity, pain willingness, a component of pain acceptance characterized as the recognition that efforts to avoid or control pain are often ineffective, was associated with migraine frequency and headache-related disability, regardless of migraine severity and degree of overweight. These findings warrant additional research to examine the potential efficacy of acceptance-based strategies, particularly those focused on increasing pain willingness, for reducing pain-related outcomes in individuals with migraine and overweight/obesity.

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Abbreviations

BMI	body mass index
WHAM	Women's Health and Migraine Trial
SD	standard deviation

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Table 1

Participant characteristics.

Demographic characteristics	
Age, mean (± SD), years	38.4 (8.1)
Race, *n* (%)	
White	98 (77.8%)
African American	13 (10.3%)
Other	12 (8.7%)
Mixed Race	4 (3.2%)
Ethnicity, *n* (%)	
Non-Hispanic	103 (81.7%)
Hispanic	23 (18.3%)
Education, *n* (%)	
< 4 year college/university degree	54 (42.9%)
≥ 4 year college/university degree	62 (57.1%)
Anthropometric characteristics	
Weight, mean (±SD), kg	93.8 (19.9)
Body mass index, mean (±SD), kg	35.3 (6.5)
Migraine headache characteristics	
Migraine headaches/month, mean (±SD), number	5.4 (2.8)
Migraine headache days/month, mean (±SD), number	8.4 (4.6)
Maximum pain intensity, mean (±SD), 0–10 scale	6.0 (1.5)
Headache disability, HIT-6 score, mean (±SD)	65.3 (4.3)
Pain interference domains, BPI subscale domain and total scores, mean (±SD)	
General activity	4.1 (2.2)
Mood	4.5 (2.4)
Walking ability	1.8 (2.0)
Normal work both outside and inside the home	3.6 (2.3)
Relationships with other people	3.3 (2.3)
Sleep	3.1 (2.7)
Enjoyment of life	4.3 (2.5)
Total	24.7 (14.5)
Pain acceptance components, CPAQ component and total scores, mean (±SD)	
Pain willingness	26.3 (8.5)
Activity engagement	39.1 (10.3)
Total	66.7 (10.1)

Note. N = 126; HIT-6 = Headache Impact Test-6; BPI = Brief Pain Inventory; CPAQ = Chronic Pain Acceptance Questionnaire

Table 2

Results of linear regression models used to predict headache-related disability and pain interference domains from pain acceptance

	Headache Disability (HIT-6)					Pain Interference (BPI)				
	Coeff	*β*	*SE*	*p*	R^2	*Coeff*	*β*	*SE*	*p*	R^2
CPAQ Total Score					0.154					0.403
Intercept	55.595 (41.18–63.01)		3.745	<.001		−31.132 (−52.06– −10.21)		10.570	0.004	
CPAQ Total Score	0.028 (−0.04–0.10)	0.066	0.036	0.439		0.106 (−0.10–0.31)	0.074	0.103	0.305	
Pain Intensity	1.121 (0.63–1.61)	0.393	0.248	<.001		5.892 (4.51–7.28)	0.615	0.701	<.001	
Migraine Days	0.010 (−0.15–0.17)	0.011	0.080	0.898		−0.047 (−0.60–0.30)	−0.047	0.033	0.166	
BMI	0.027 (−0.08–0.14)	0.040	0.066	0.632		0.417 (0.11–0.73)	0.187	0.157	0.009	
Pain Willingness					0.201					0.443
Intercept	62.533 (57.79–68.28)		2.901	<.001		−5.119 (−20.96–10.72)		8.002	0.524	
Pain Willingness	−0.119 (−0.20– −0.03)	−0.233	0.043	0.006		−0.447 (−0.68– −0.21)	−0.261	0.118	<.001	
Pain Intensity	0.993 (0.52–1.47)	0.348	0.241	<.001		5.413 (4.10–6.73)	0.565	0.664	<.001	
Migraine Days	0.021 (−0.13–0.18)	0.022	0.078	0.793		−0.110 (−0.54–0.32)	−0.035	0.216	0.611	
BMI	−0.008 (−0.12–0.10)	−0.013	0.055	0.880		0.285 (−0.12–0.59)	0.128	0.152	0.524	
Activity Engagement					0.139					0.418
Intercept	61.533 (54.77–68.30)		3.415	<.001		−8.842 (−27.82–10.13)		9.585	0.358	
Activity Engagement	−0.058 (−0.13–0.02)	−0.138	0.038	0.128		−0.218 (−0.43–0.01)	−0.154	0.106	0.042	
Pain Intensity	0.979 (0.48–1.48)	0.343	0.254	<.001		5.358 (3.95–6.77)	0.559	0.712	<.001	
Migraine Days	0.013 (−0.15–0.17)	0.014	0.080	0.871		−0.138 (−0.58–0.31)	−0.044	0.224	0.538	
BMI	<.001 (−0.11–0.11)	<.001	0.038	0.128		0.316 (−0.01–0.63)	0.142	0.160	0.051	