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Sex Differences and Correlates of Pain in Patients with Comorbid Obesity and Binge Eating Disorder

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Abstract

Sex differences and correlates of pain were examined in a sample of patients with comorbid binge eating disorder (BED) and obesity. One hundred fifty-two treatment-seeking patients with BED completed the Brief Pain Inventory. Analysis of covariance was utilized to compare women and men on pain, and correlational analysis, overall and by sex, was performed to examine relationships among pain, eating behaviour and metabolic risk factors. Women reported significantly greater pain severity and pain interference than men. Among women, eating behaviour and metabolic markers were not associated with pain. Among men, however, binge frequency was significantly associated with pain, as was high-density lipoprotein cholesterol and fasting glucose. In sum, while women in this sample had more pain than men, the presence of pain in men was associated with increased behavioural and metabolic risk factors. Findings have clinical implications for the assessment of comorbid pain and obesity-related health risks among individuals with BED.

Keywords

binge eating disorder; eating disorders; obesity; pain; sex differences

Introduction and Aims

Obesity and chronic pain are two of the most prevalent conditions in the USA (Flegal, Carroll, Ogden, & Curtin, 2010; Johannes, Le, Zhou, Johnston, & Dworkin, 2010) and account for a substantial proportion of healthcare expenditures (Gureje, Von Korff, Simon, & Gater, 1998; Trogdon, Finkelstein, Feagan, & Cohen, 2012). Associations have been found between obesity and common chronic pain conditions such as osteoarthritis (Lementowski & Zelicof, 2008), back pain (Lake, Power, & Cole, 2000), fibromyalgia (Neumann et al., 2008) and migraines (Bigal, Liberman, & Lipton, 2006). Obesity is one of the major contributors to the rise in chronic pain (2011); however, the direction of causality appears to go in both directions with chronic pain also contributing to obesity (Arranz,

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Rafecas, & Alegre, 2014). Across chronic pain conditions, women are disproportionately affected (Fillingim, King, Ribeiro-Dasilva, Rahim-Williams, & Riley, 2009).

Binge eating disorder (BED) is also associated strongly with obesity and is the most common eating disorder in the USA (Hudson, Hiripi, Pope, & Kessler, 2007). In 2013, BED was included in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (American Psychiatric Association, 2013) as a formal diagnosis. BED is defined as recurrent episodes of eating unusually large amounts of food while experiencing a subjective sense of loss of control (binge eating), absence of extreme weight compensatory behaviours and marked distress about binge eating. New population-based evidence indicates that BED is associated with high rates of psychiatric and medical comorbidity (Hudson et al., 2007), including an increased risk for a number of musculoskeletal problems such as arthritis and chronic back/neck pain, and other chronic pain such as headaches (Kessler et al., 2013). That BED is also associated with increased musculoskeletal pain following walking (Vancampfort et al., 2014) may have implications for treatments for BED that include physical activity interventions (Grilo, Masheb, Wilson, Gueorguieva, & White, 2011) and may, for example, partly explain the extremely low physical activity levels reported by patients with BED (Hrabosky, White, Masheb, & Grilo, 2007). However, little is known about pain in clinical samples of patients with BED.

Given the dearth of data related to pain in the BED literature, we sought to investigate pain among individuals with BED seeking treatment for binge eating and obesity. More specifically, we hypothesized that similar to the broader pain literature (Institute of Medicine, 2011), women would report greater pain than men, and pain would be related to greater pathology (i.e. eating disorder and obesity risk factors), in patients with BED.

Method

Participants

Participants were 152 consecutively evaluated, treatment-seeking obese individuals who met full Diagnostic and Statistical Manual of Mental Disorders, 4th Edition research diagnostic criteria for BED, and were recruited for treatment studies at a university medical school between November 2008 and March 2010. Participants were aged 20 to 65 years (M = 44.7, SD = 10.9), 71.7% (n = 109) were women, 53.9% (n = 82) were Caucasian, 30.3% (n = 46) were Black/African-American, 11.2% (n = 17) were Hispanic, and 4.6% (n = 7) self-described as ‘other’ or were missing. Educationally, 71.7% (n = 109) reported at least some college. Mean body mass index (BMI) was 38.5 (SD =5.5). Studies received Institutional Review Board approval from Yale School of Medicine, and all participants provided written informed consent.

Assessment and measures

Assessment procedures were performed by trained doctoral-level research-clinicians. BED diagnosis was based on the Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders, 4th Edition Axis I Disorders (First, Spitzer, Gibbon, & Williams, 1996) and confirmed with the Eating Disorder Examination (EDE) interview 12th

edition (Fairburn, Cooper, & O'Connor, 2008). Participants' heights and weights were measured using a wall-mounted stadiometer and a high capacity digital platform scale, respectively, to determine BMI. Waist circumference (inches) was obtained with a measuring tape placed horizontally just above the iliac crest. Blood pressure was measured three times with a digital blood pressure monitor, and the average of three measurements was used. Blood samples were drawn after overnight fasting (12 hours) and analysed for triglycerides, high-density lipoprotein (HDL) cholesterol and glucose. The following assessments were used:

Pain—Pain was assessed using the self-reported *Brief Pain Inventory* (*BPI*) (Cleeland & Ryan, 1994), which consists of the 4-item pain severity subscale (current, worst, least and average pain in past week) and the 7-item pain interference subscale (mood, physical activity, work, social activity, relations with others, sleep and enjoyment of life). BPI scale scores range from 0 to 10, with higher scores representing worse pain. Cronbach's alphas for this sample were good for the pain severity subscale (.873) and excellent for the pain interference subscale (.935).

Depression—Depression was assessed using the *Beck Depression Inventory* (*BDI*) (Beck & Steer, 1987) 21-item version, which is a well-validated measure of symptoms of depression and negative affect.

Eating and activity measures—The EDE (Fairburn et al., 2008) is a well-established and reliable investigator-based interview method for assessing binge eating frequency (in the past 28days) and eating disorder psychopathology (EDE global total score) (Grilo, Masheb, Lozano-Blanco, & Barry, 2004). Physical activity was measured with the *Godin Leisure Time Exercise Questionnaire* (Godin; (Godin & Shephard, 1985)), a 4-item, reliable self-report measure of physical activity that assesses the frequencies of strenuous, moderate and mild exercise and has been validated against accelerometers.

Statistical analyses

Analysis of covariance was used to examine potential differences in pain by sex controlling for BDI because of the strong association between pain and depression (Bair, Robinson, Katon, & Kroenke, 2003; Miller & Cano, 2009). Two-tailed partial correlations were performed to explore the associations between pain severity and pain interference, on the eating-related and metabolic measures, controlling for BDI. These were performed for the entire sample, and separately by sex.

Results

Women reported significantly higher scores than men on both the pain severity ($M = 4.12$, $SD = 1.91$ vs $M = 3.63$, $SD = 1.46$, respectively; $F(2, 149) = 8.99$, $p < .0001$) and pain interference ($M = 3.91$, $SD = 2.39$ vs $M = 3.45$, $SD = 2.09$; $F(2, 148) = 20.19$, $p < .0001$) subscales when controlling for BDI. In the overall sample, pain severity and pain interference were significantly correlated with each other ($r = .65$, $p < .0001$) and with the BDI ($r = .32$ and $r = .46$, p's $< .0001$). Among women, pain severity and pain interference were significantly correlated with each other ($r = .67$, $p < .0001$) and with the BDI ($r = .33$

and $r = .51$, p's< .0001). Among men, pain severity and pain interference were significantly correlated with each other ($r = .56$, $p < .0001$), but not with the BDI ($r = .22$, $p = .163$ and $r = .26$, $p = .100$).

Table 1 summarizes results of the correlation analysis, overall and by sex, between the BPI subscales and the eating-related and metabolic measures. Pain severity and pain interference were not related to BMI, eating disorder psychopathology (EDE global score) or physical activity in either sex. Among men, but not women, binge eating frequency was significantly related to both pain severity and pain interference (p's < .05). Overall, the only metabolic measure related to pain severity was glucose ($r = .22$, $p < .05$), and this finding held for men ($r = .57$, $p < .001$) but not women. Among men only, HDL cholesterol was negatively associated with pain severity ($r = -.45$, $p < .05$).

Discussion

The present study aimed to investigate pain among treatment-seeking patients with comorbid BED and obesity. Overall, we found sex differences in both the experience of pain and with regard to correlates of pain. Women in our sample reported both greater pain severity and greater pain interference than men, even when taking into account the potential effects of depression. Despite greater impairment in women, greater levels of pain severity and interference were associated with more frequent binge eating episodes in men only.

Our findings that women with BED and obesity experience greater pain severity and interference than men is consistent with reviews showing that women report more severe and more frequent pain (Unruh, 1996). Epidemiologic studies clearly demonstrate that women are at greater risk for many pain conditions and when they do have these often report a longer duration of the pain condition (Fillingim et al., 2009). However, some pain research on sex differences is mixed, including findings using functional brain imaging and studies of response to pharmacologic and non-pharmacologic pain treatments (Fillingim et al., 2009). The biopsychosocial mechanisms that underlie sex differences in pain are in need of further exploration.

We did not observe an association between weight and pain in this sample, in contrast to population studies for specific chronic pain conditions such as migraine (Bigal et al., 2006). Norwas there a relationship between pain and physical activity despite well-established impairments in physical function among individuals with chronic pain (2011). One potential reason for a lack of associations with weight and physical activity may be the restricted range of BMI and physical activity in the present sample. Associations did emerge between pain and biomarkers for disease risk, but these were observed in men only. Men with greater pain severity had lower levels of HDL cholesterol, placing them at greater risk for heart disease, as well as higher blood glucose levels, placing them at greater risk for diabetes. Like previous studies showing that extra care should be taken to screen obese patients with BED for obesity-related diseases (Hudson et al., 2007), our study highlights that additional screening is necessary for male patients with BED who are experiencing pain.

There are a number of limitations to consider. Although the study sample was similar to a population-based cohort (Kessler et al., 2013), findings may not generalize to individuals with comorbid BED and obesity who do not seek care. Findings in the present study may also have been attenuated given the homogeneity of participants with regard to obesity status and binge eating frequency. Of note is that the assessment of pain was limited to the self-reported BPI that does not discriminate between patients with acute and chronic pain and does not assess for type of pain (Cleeland & Ryan, 1994). Finally, our analyses were correlational in nature, and we cannot infer, for example, whether men engaged in greater binge eating because of more severe pain.

In summary, we found that women reported greater pain severity and interference than men among a sample of patients with comorbid BED and obesity. The presence of pain in men, however, was associated with increased behavioural and metabolic risk factors, including frequency of binge eating. These findings have clinical implications for the assessment of comorbid pain and obesity-related health risks among individuals with BED.

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Table 1

Partial correlation analysis, overall and by sex, between the BPI subscales (pain severity and pain interference), and eating-related and metabolic measures

			BPI (*r*)[†]					
	Overall *n* = 152		Overall *n* = 152		Women *n* =109		Men *n* = 43	
Eating-related and metabolic measures	**Mean**	**(*SD*)**	**Severity**	**Interference**	**Severity**	**Interference**	**Severity**	**Interference**
BMI (kg/m^2)	38.5	(5.5)	.08	.03	.11	.07	.00	−.09
Eating and activity measures								
Binge eating frequency (past 28 days)	18.5	(15.2)	.14	.16	.05	−.03	.37*	.42**
Eating disorder psychopathology (total EDE)	2.7	(0.9)	.15	.13	.15	.14	.09	.06
Physical activity (Godin)	14.6	(17.0)	−.15	−.12	−.15	−.15	−.07	−.01
Metabolic measures								
# of metabolic syndrome markers	2.2	(1.1)	.06	.04	.09	.12	.10	−.07
Waist circumference (inches)	46.5	(5.5)	.07	.03	.11	−.03	.14	.25
Triglycerides (mg/dl)	133.9	(93.7)	.05	.05	.08	.10	.08	.01
HDL cholesterol (mg/dl)	52.1	(14.7)	−.09	.07	−.08	.11	−.45*	−.20
Systolic blood pressure (mm Hg)	127.1	(15.2)	−.04	−.03	.03	.03	−.24	−.20
Diastolic blood pressure (mm Hg)	79.6	(10.6)	−.05	−.01	−.01	.01	−.16	−.04
Glucose (mg/dl)	110.5	(41.9)	.22*	.15	.13	.19	.57***	.11

BPI, Brief Pain Inventory; BMI, body mass index; total EDE, overall score for the Eating Disorder Examination interview; Godin, Godin Leisure Time Exercise Questionnaire; HDL, high-density lipoprotein.

[†]Conrolling for Beck Depression Inventory.

* < .05;

** < .01;

*** < .001.