

# The Relationship between Chronic Pain and Obesity: The Mediating Role of Anxiety

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## Abstract

Obesity is nowadays considered as one of the problems impairing functioning and quality of life. Obesity is defined by body mass index (BMI), and most studies on the association between psychiatric disorders and obesity have exclusively studied depression. But there are just a few researchers that have studied the association between obesity and anxiety, and the mechanism of this association remains unclear. This study aims to evaluate the extent to which the association between chronic pain and obesity are mediated by anxiety and moderated by coping strategies. The study population comprised 200 participants (100 male and 100 female) aged between 20 and 70 (M=45) years old. All participants completed the Pain Self-Management Checklist, Beck Anxiety Inventory-II, and Lazarus Coping Skills Scale. The statistically significant paths were anxiety-pain, pain-obesity,

and anxiety-emotional coping strategies ( $p < 0.005$ ). In summary, chronic pain predicted obesity directly, and specific coping strategies (emotional coping strategies) did not moderate the relationship between chronic pain, obesity and anxiety, but anxiety mediated this relationship.

**Key words:** Obesity, Anxiety, Chronic pain, coping strategies

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## Introduction

In the coming decades, global health will be faced with enormous challenges with several public health problems such as Obesity, major depressive disorder (MDD), and anxiety (Kelly, Yang, Chen, Reynolds, & He, 2008; Kessler et al., 2003). Obesity and Major depressive disorder and/or anxiety disorders impose a large cost on individuals, health care services and society and are associated with long-term disabilities, morbidity and mortality (Müller-Riemenschneider, Reinhold, Berghöfer, & Willich, 2008; Pi-Sunyer, 2009). Several studies have suggested bilateral relationship between obesity and MDD and/or anxiety disorders and also the possibility of their comorbidity (Afari et al., 2010; Luppino et al., 2010).

Pain is the most common physical symptom-based condition reported in both the general population and in primary care (Kroenke, 2003) and it causes several functional and work-related disabilities (Greenberg et al., 1999; Institute of Medicine, 2011). Additionally, several studies have proved additive and adverse effects of different kinds of pain such as osteoarthritis pain, chronic headaches (Bigal et al., 2007) and neuropathic pain (Miscio et al., 2005). In obese people the impact of pain on the functional status and health-related quality of life is greater than people with normal weight (Marcus, 2004; Ray, Lipton, Zimmerman, Katz, & Derby, 2011).

The underlying mechanisms of the pain and obesity relationship is still unclear (Rossi, Luu, DeVilbiss, & Recober, 2013). In some literature obesity has been defined as a pro-inflammatory state and inflammatory mechanisms are involved in the development of pain, so inflammation can be considered as a part of the causal pathway. Additionally, evidence suggested a causal relationship between acute pain and transient insulin resistance (Greisen et al., 2001; Ray et al., 2011). Eventually, there is an association between depression and both obesity and chronic pain, and obsessive patients with comorbidity of depression and anxiety have worse experience of pain (Ray et al., 2011; Tietjen et al., 2007). A potential unifying mechanism may be found in the metabolic syndrome, which is known to be associated with chronic pain (Loevinger, Muller, Alonso, & Coe, 2007; Ray et al., 2011), inflammation (Lee, Lee, Huang, & Sheu, 2007), insulin resistance (Lann & LeRoith, 2007) and mood disorders (Räikkönen, Matthews, & Kuller, 2007).

There are several ways and strategies to cope with chronic pain which has been examined by various studies (Büssing, Ostermann, Neugebauer, & Heusser, 2010). Pain-related coping may be defined as individuals' attempts to manage problems associated with their pain state (DeGood & Tait, 2011) and according to their ability to effect symptoms, coping strategies has been divided into two categories: adaptive and maladaptive. Often, adaptive and maladaptive coping responses have been known as active and passive responses, respectively. For instance, adaptive coping appears in the form of staying active and pacing problem solving, while maladaptive

copings tends to present passive strategies such as resting and avoiding (Jensen, Turner, Romano, & Nielson, 2008). It's assumed that the role of maladaptive coping strategies in chronic pain consequences is more important than adaptive coping strategies (Geisser, Robinson, & Riley, 2000). This assumption has been examined frequently in different studies. For instance, the increased use of passive coping responses after multidisciplinary pain treatment has been associated with increased disabilities and depression (Jensen, Turner, & Romano, 2007). In a study on 106 military veterans who suffered from chronic pain, there was a strong association among maladaptive responses, pain interference and depression, while the relation of adaptive coping styles and pain intensity was considerable (Tan, Teo, Anderson, & Jensen, 2011). It is hypothesized in the present study that coping strategies and anxiety would impact the relationship between chronic pain symptoms and obesity.

## Materials and Methods

This study explores the mediating role of anxiety and moderating role of coping strategies in the relationship between chronic pain and obesity. As one of the inclusion criteria, participants had to meet the criteria for chronic pain and obesity (BMI >30). Additional inclusion criteria for this study were being at least 18 years of age, current self-report of chronic pain (of more than 6 months' duration) confirmed by medical record and diagnosis, obesity, and having received treatment for a painful condition within the last 5 years (recorded in their medical records). Participants were excluded if they were older than 70 years old. All participants (N=200) signed informed consent and completed study-related tasks. Participants were selected through accessible sampling from the general population.

### Data collection

Demographic characteristics, such as participants' age, gender and educational level, were gathered with relevant self-report questions.

### Measures

Symptoms of anxiety were assessed by Beck anxiety inventory (BAI-II). The 31-item self-report Chronic Pain Inventory (CPI) was used for assessment of pain severity. Coping strategies were evaluated by Coping Questionnaire, developed by Lazarus and Folkman, (1984), containing 66 items (16 distractors and 50 main items) that assess direct confrontation, distancing, self-control, seeking social support, accepting responsibility, evasion and avoidance, solving planned problems and positive re-evaluation (Sadeghi & Niknam, 2015). Lazarus reported the reliability of each subscale from 0.66 to 0.79 and the reliability of the coping skills was estimated 0.84 (Rajabi Damavandi, Poushne, & Ghobari Banab, 2009). These values reflect the desirable reliability of the test (Sadeghi & Niknam, 2015).

Asghari-moghaddam et al (2008, 2011, 2008, 2002) assessed chronic pain using Chronic Pain Inventory (CPI) (Asghari-moghaddam, Abedi Ghelich Gheshlaghi,

(Asghari-moghaddam, Abedi Ghelich Gheshlaghi, & Khalilzade Poshtgol, 2008; Asghari Moghadam, 2011; Asghari Moghadam & Golak, 2008; Asghari Moghadam & Najarian, 2002). This inventory, which contains 31 items, assesses pain severity, the start time of pain, pain intensity six months after pain start time, influence of pain on the social and family relationships, and the number of operations because of pain.

### Statistical analysis

Table 1 shows the mean and standard values of research variables: the scores mean for emotional coping and problem solving coping were 39.80 and 36.87, respectively. Furthermore, the means for anxiety, pain and obesity were 14.76, 33.01 and 32.34, respectively.

**Table 1: Descriptive statistics of variables**

Variables name		N	Mean	Std.
Coping styles	Emotional	200	39.80	11.84
	Problem solving	200	36.87	9.69
Anxiety		200	14.76	11.06
Pain		200	33.01	15.12
Obesity		200	32.34	3.22

## Results

Path analysis was used for analysis of research data. As per the obtained results, anxiety proved to be a mediating variable in the present study and, based on literature review, pain and coping styles have effects on obesity after they have been affected by anxiety; therefore, the following model was tested (Figures 1 & 2)):

Three paths from anxiety to pain, emotional coping and problem solving coping; one direct path from anxiety to obesity; and three direct paths from pain, emotional coping and problem solving coping to obesity can be observed on the path diagram. Analysis results show that standardized regression weight from anxiety to emotional coping is 0.23 and  $p < 0.001$ ; anxiety to problem solving coping is 0.12 and  $p > 0.08$ ; anxiety to pain is 0.32 and  $p < 0.001$ ; emotional coping to pain is 0.08 and  $p > 0.23$ ; problem solving coping to pain is -0.18 and  $p < 0.01$ ; pain to obesity is 0.25 and  $p < 0.001$ ; emotional coping to obesity is -0.05 and  $p > 0.50$ ; problem solving coping to obesity is -0.04 and  $p > 0.58$ ; and anxiety to obesity is 0.005 and  $p < 0.94$ . Table 2 shows the foregoing results completely. Fitness indexes did not confirm the fitness of conceptual model with observed data. Chi-square stood at 141, 983, the degree of freedom at 1, and Probability level at 0.001. Chi-square index shows the significant difference between conceptual model and observed model. As many references have suggested that chi-square is dependent upon sample size, it is thus more desirable to use other fitness indices for model fit test. Therefore, CFI, NFI and RMSEA indices were used. As shown in Table 3, these indices do not confirm the models.

**Table 2: Regression Weights (Default Model)**

			Regression Weights		S.E.	C.R.	P
			Unstandardized	Standardized			
Emotional coping strategies	<---	anxiety	.246	.230	.074	3.330	***
Problem solving coping strategies	<---	anxiety	.107	.122	.062	1.734	.083
Pain	<---	anxiety	.451	.327	.094	4.805	***
Pain	<---	Emotional defence	.103	.080	.087	1.178	.239
Pain	<---	Problem solving defence	-.275	-.175	.104	-2.639	.008
Obesity	<---	pain	.052	.248	.016	3.339	***
Obesity	<---	Emotional defence	-.013	-.047	.019	-.669	.503
Obesity	<---	Problem solving defence	.013	.039	.023	.551	.582
Obesity	<---	anxiety	-.001	-.005	.022	-.065	.948

Figure1: Unstandardized estimated

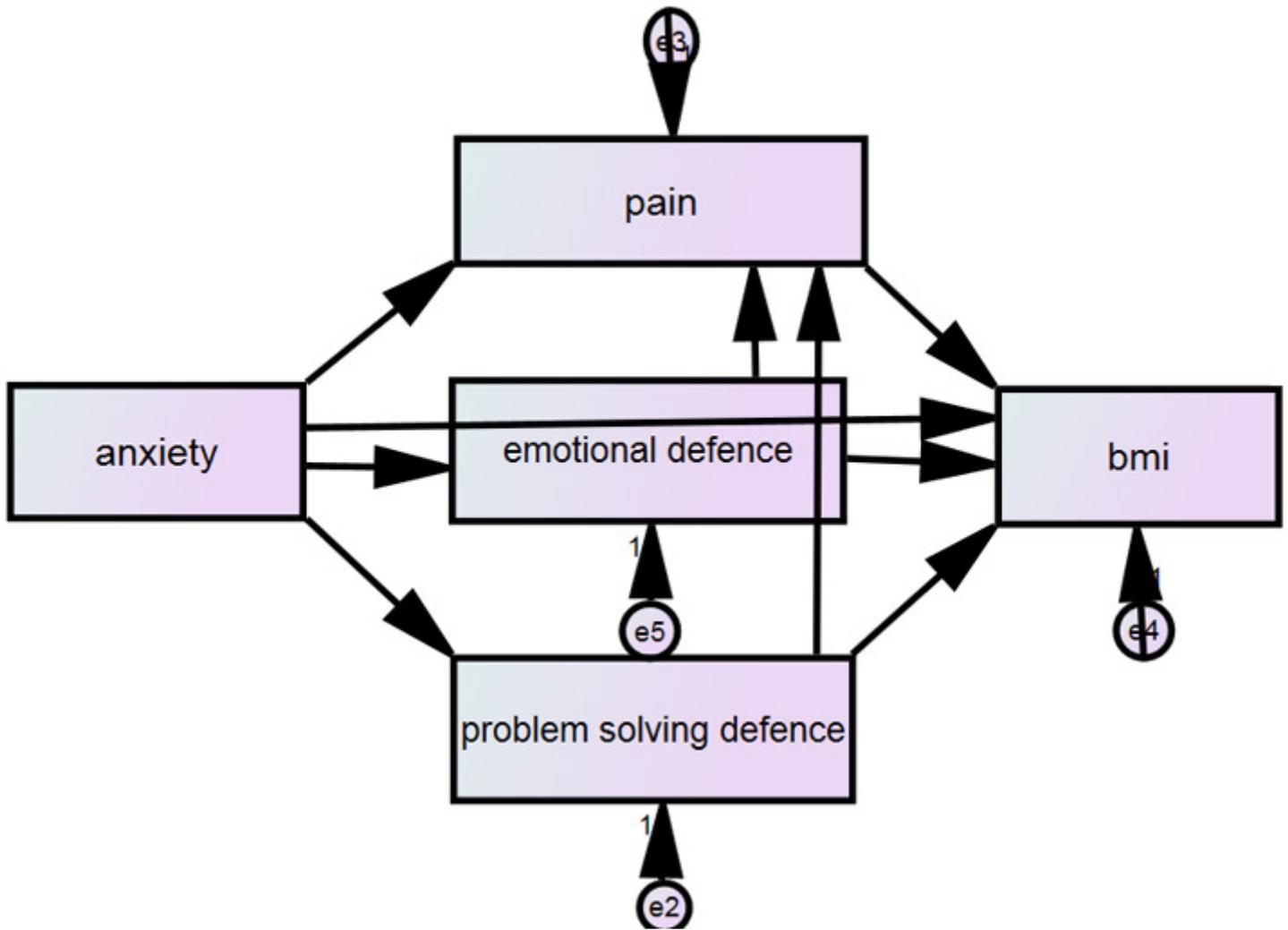
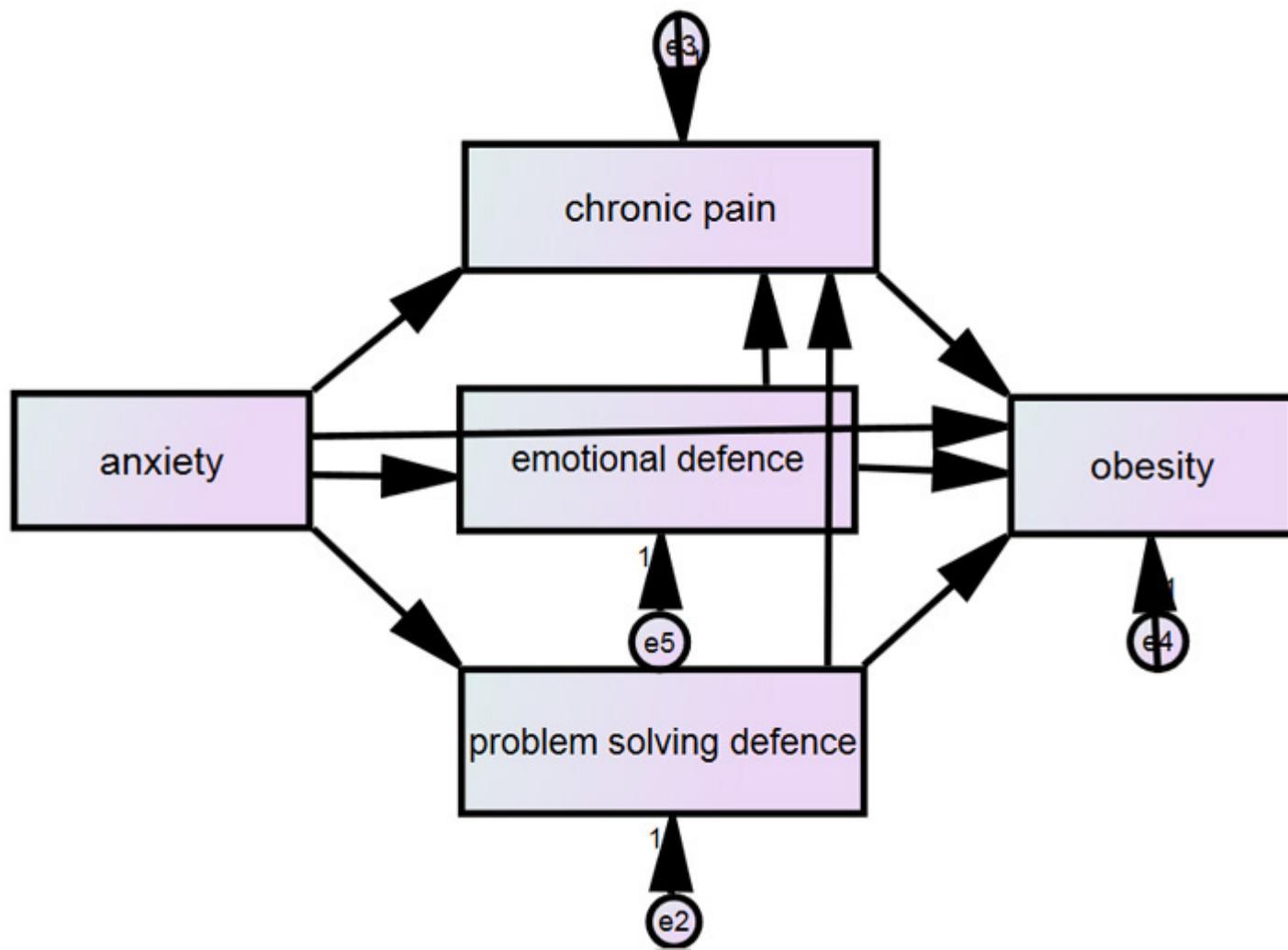


Table 3: Indices of fitness

Index Name	Observed Value	Excepted Value
$\frac{\chi^2}{df}$	141.983	Below 3
RMSEA	0.84	Below 0.1
CFI	0.23	More than 0.9
NFI	0.27	More than 0.9
IFI	0.27	More than 0.9

Figure 2: Standardized estimated



## Discussion

The present study explored the relationship between chronic pain and obesity with the mediating role of anxiety and moderating role of coping strategies. Personal resources play an important role in reduction and prevention of anxiety. The results obtained by the present study show that anxiety predicts emotional coping strategies. In other words, greater anxiety correlates with greater emotional coping strategies. The result is consistent with the findings of similar studies. For example, the importance of dysfunctional coping strategies in predicting anxiety and its helpful role in managing anxiety were indicated by researchers (Cooper, Katona, Orrell, & Livingston, 2006). There is a relationship between psychological distress and different coping strategies. There are negative relations between the problem-focused coping and anxiety, stress and depressive symptoms, while this relation in case of the avoidant coping is positive (van Berkel, Boot, Proper, Bongers, & van der Beek, 2014). Problem-focused coping helps to manage the stress causing the problem, and emotional-focused coping diminishes the negative emotions associated with the stressor (Folkman, Lazarus, Dunkel-Schetter, DeLongis,

& Gruen, 1986). However, avoidance coping, as a type of passive coping, is highly related to psychological outcomes due to minimizing, denying or ignoring to deal with a stressful situation (Holahan, Moos, Holahan, Brennan, & Schutte, 2005; Snow, Swan, Raghavan, Connell, & Klein, 2003).

Based on the results obtained in this study, there is a significant prediction between anxiety and chronic pain. In other words, anxiety increases the severity of pain. Additionally, pain, depression and anxiety frequently co-occur and have additive and adverse effects on health-related quality of life (HRQL), functional impairment and treatment response (Bair, Robinson, Katon, & Kroenke, 2003; Bair, Wu, Damush, Sutherland, & Kroenke, 2008). A study on 500 primary care patients with chronic pain discovered negative association between anxiety severity and pain severity (Bair et al., 2008). There are some findings that claim chronic pain substantially increases the likelihood of anxiety disorder (McWilliams, Cox, & Enns, 2003). In other research, it was concluded that the presence of any of the five common pain complaints increased the likelihood of having an anxiety disorder significantly (Kroenke & Price, 1993).

The other finding of the current study is related to the prediction of obesity by chronic pain. The findings demonstrate that obesity is strongly associated with chronic regional pain (CRP) as well as reporting of musculoskeletal pain at specific members such as the knees. Furthermore, obesity is associated with more severe pain (Deere et al., 2012). Obesity is also associated with an increased risk of pain at any members, as well as a range of musculoskeletal pain phenotypes. The strongest associations, as observed in analyses on boys and girls combined, were between obesity, risk of CRP, and knee pain. Whereas CRP also comprised pain at shoulders, lower back, and hips, all of which showed weak evidence of an association with obesity, the relationship between obesity and CRP may have been driven by that with knee pain. Obesity was also associated with pain severity, as reflected by higher average pain scores in obese participants reporting CRP and knee pain (Deere et al., 2012). However, the findings of the present study are in contrast with those of other researchers that claim obesity influences the pain. It was found that pain predicts obesity. In general, the path analysis (as shown above) shows that anxiety is a predictor of chronic pain and chronic pain can predict obesity. On the other hand, anxiety can predict the emotional coping strategies, but the emotional coping strategies are not able to predict obesity.

### Limitations

The present research was faced with some limitations, such as a small study population. The population of the present research being 200 individuals can be one of the reasons for indices of fitness not confirming any fitness between conceptual model and observed data. Another limitation was the cross-sectional design, and the authors of the present study recommend that this research be repeated in a longitudinal prospective design.

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