"The More Pain I Have, the More I Want to Eat": Obesity in the Context of Chronic Pain

E. Amy Janke[1,2] and Andrea T. Kozak[3]

Providers frequently report pain as a barrier to weight loss, and initial evidence suggests individuals with chronic pain and obesity experience reduced treatment success. However, scant evidence informs our understanding of how this comorbidity negatively influences treatment outcome. More effective programs might be designed with (i) insight into the patient's experience of comorbid chronic pain and obesity and (ii) improved understanding of the behavioral linkages between the experience of pain, engagement in health behaviors, and obesity treatment outcomes. Thirty adult primary care patients with mean BMI = 36.8 (SD 8.9) and average 0–10 pain intensity = 5.6 (SD 1.9) participated in semistructured, in-depth interviews. Transcriptions were analyzed using the constant comparative method. Five themes emerged indicating that patients with comorbid chronic pain and obesity experience: depression as magnifying the comorbid physical symptoms and complicating treatment; hedonic hunger triggered by physical pain and associated with depression and shame; emotional or "binge" eating in response to pain; altered dietary choices in response to pain; and low self-efficacy for physical activity due to pain. Individuals with chronic pain and obesity may be less responsive to traditional interventions that fail to address the symbiotic relationship between the two conditions. These individuals are at-risk for depressive symptoms and eating and activity patterns that sustain the comorbidity and make treatment problematic, and they may respond to pain with behaviors that promote weight gain, poor health and low mood. Further research is needed to examine behavioral mechanisms that promote comorbid pain and obesity, and to develop targeted treatment modules.

Obesity (2012) **20,** 2027–2034. doi:10.1038/oby.2012.39

INTRODUCTION

As prevalence rates of overweight and obesity continue to rise (1), a growing literature has identified increasing BMI as a significant precipitant of medical comorbidities, many of which involve persistent pain (2,3). In the general population, elevated BMI is correlated with pain complaints in both cross-sectional and longitudinal studies (4), and those with higher BMIs tend to report increased pain, decreased quality of life (5,6) and difficulty performing activities of daily living compared to lower weight peers (7). Evidence of a relationship between obesity and chronic pain specifically has been reported for a number of conditions including inflammatory forms of arthritis (e.g., rheumatoid), osteoarthritis, low back, headache, and neuropathic pain conditions (3,8–11). In particular, in some studies increasing BMI has been shown to be an independent risk factor for subsequent back pain (12) and knee and hand (8) osteoarthritis. For these conditions, there appears to be a dose–response relationship such that higher levels of BMI lead to a subsequent increased risk for pain (12). The potential impact on health care expenditures is substantial since both obesity (13) and chronic pain (14) are highly prevalent and expensive conditions associated with increased care utilization. Mechanisms linking obesity and pain are poorly understood, but are hypothesized to include mechanical, structural, metabolic, and behavioral changes (15).

Encouragingly, weight loss appears associated with decreased pain (7). However, a number of studies have recently emerged suggesting that individuals with obesity and chronic pain experience reduced treatment success when participating in evidence-based programming promoting behavioral self-management of pain symptoms and/or weight loss (16,17). The reasons for this blunted treatment effect among individuals with co-occurring chronic pain and obesity are poorly understood. Unfortunately, even though practitioners routinely report pain as a barrier to weight loss and, similarly, obesity as a barrier to chronic pain self-management (18,19), there is little in the way of empirical evidence to understand what specific factors reduce treatment efficacy in these individuals. And, no study to date has examined

[1]Department of Behavioral and Social Sciences, University of the Sciences, Philadelphia, Pennsylvania, USA; [2]Center for Management of Complex Chronic Care, Hines VA Medical Center, Hines, Illinois, USA; [3]Department of Psychology, Oakland University, Rochester, Michigan, USA. Correspondence: E. Amy Janke (e.janke@usciences.edu)

Received 29 July 2011; accepted 6 February 2012; advance online publication 15 March 2012. doi:10.1038/oby.2012.39

the manner in which patients perceive and understand their lived experience of comorbid chronic pain and obesity and the joint relationship of these to health, health behaviors, and treatment. Observed discrepancies in treatment outcomes between obese individuals with and without pain could be attributed to a number of differences including how pain interferes with managing one's daily activities, engagement in health behaviors, emotional functioning (e.g., presence of depression, anxiety), and the availability and understanding of appropriate activities to engage in when experiencing pain. Understanding how individuals with overweight/obesity and chronic pain understand and experience the inter-relationship between the two and the potential impact of this inter-relationship on health outcomes is important to designing more effective lifestyle interventions. Furthermore, in an area where little quantitative research exists, such insights may provide a foundation for future studies and aid in developing testable hypothesis about the mechanisms of effect.

The qualitative research project described here was designed to identify perceptions of those with both overweight/obesity and chronic pain regarding (i) their experience of the course, impact, and treatment history of pain and weight symptoms; (ii) factors that might either ease or limit their ability to engage in health-promoting behaviors; and (iii) factors that facilitate or hinder engagement in treatments designed to achieve weight and/or pain control. We aimed to obtain potential explanations from individuals experiencing both overweight/obesity and chronic pain using focus groups and individual interviews. Qualitative research techniques such as these can provide a comprehensive yet flexible approach that is particularly suitable when the focus is on examining an individual's subjective experience, detailed information is necessary to inform our understanding of the phenomenon, and there is limited prior research to otherwise suggest testable hypothesis for quantitative examination. Thus, the purpose of this study is to use a qualitative approach to gain insight into the patient's experience of comorbid chronic pain and obesity and to improve our understanding of the behavioral linkages between the experience of pain, engagement in health behaviors, and obesity treatment outcomes.

METHODS AND PROCEDURES

Participants and recruitment

Consecutive patients attending primary care clinics at a large Midwestern Veteran's Affairs (VA) hospital were recruited by flyers posted in hospital common areas (e.g., cafeteria bulletin board) and waiting rooms and by direct referral from providers. Interested patients contacted the lead investigator to obtain additional information, to be assessed for study inclusion, and to schedule interview sessions. To reduce bias, purposeful sampling was employed to include patients currently or recently enrolled in formal weight-loss programming as well as those never enrolled in such programs (20). Eligible individuals reported and electronic medical records confirmed (i) BMI ≥25; (ii) weekly pain at an intensity ≥4 (0 = none, 10 = worst imaginable) during the prior 3 months; and (iii) current diagnosis of a medical complaint associated with persistent pain (e.g., osteoarthritis). Individuals <18 years of age, inpatients, and those with difficulty communicating in English, active substance abuse or whose pain was exclusively cancer-related were excluded.

Data collection

Because discussions of weight may induce feelings of shame and stigmatization (21), participants had the option of participating either in small groups or individual interviews. All participants gave informed consent, the study was approved by the hospital institutional review board, and all procedures were in accordance with the ethical standards of this review board. Each session was facilitated by the same two PhD-level research scientists. Using a semistructured discussion guide, sessions followed a funnel structure progressing from broader, open-ended questions to more specific probes to clarify issues as needed. A semistructured approach was chosen because it allows for rich and detailed data collection as well as to allow question probes (and participant answers) to be unconstrained while permitting easy clarification and follow-up. Questions focused on the developmental course, treatment history, and perceived impact of pain and weight symptoms. Demographic information including age, gender, level of education, marital status, occupation, pain intensity, weight loss history, and height and weight was collected at the beginning of each interview encounter using a self-administered questionnaire. Height, weight, and pain variables were confirmed using anthropomorphic readings and diagnostic information reported in the electronic medical records. Summary data are presented in **Table 1**. At the conclusion of the interview, all participants were provided a $10 gift card as an incentive to thank them for their time and effort. Data saturation was reached after 30 interviews.

Data analysis

Digital audio recordings were made of each interview and transcribed verbatim. Text was verified for content accuracy by the lead investigator and two research assistants. The constant comparative method (22) was used to analyze the data. Using this iterative approach, a pair of research assistants who did not participate in data collection as well as the focus group moderators independently read the transcripts and developed an initial list of themes. Transcripts were then coded, identifying relevant text for each code. Themes were revised and refined with subheadings on a second reading, and categories reported below were distilled from these themes (23).

RESULTS

Sample description

A total of 30 patients (80% male) participated in focus groups or semistructured individual interviews. The majority of participants (86.6%) were age 50 and older, 73.3% were white, 66.6% had greater than a high school education, and 46.6% were unemployed or disabled while 43.3% were retired. Measured on a scale of 0 to 10, average pain intensity was 5.6 (SD 1.9) and average pain interference was 3.6 (SD 2.1). Mean BMI was 36.8 (SD 8.9) and, at the time of the interview

Table 1 Sample characteristics

Male	80.0% (24 of 30)
Age ≥50	86.6% (26 of 30)
White	73.3% (22 of 30)
>High school education	66.6% (20 of 30)
Unemployed or disabled, not-retired	46.6% (14 of 30)
Retired	43.3% (13 of 30)
Currently trying to lose weight	93.3% (28 of 30)
Average pain intensity	5.6 (SD 1.9)
Average pain interference	3.6 (SD 2.1)
Mean BMI	36.8 (SD 8.9)

session, an overwhelming number of participants (93.3%) indicated they were currently trying to lose weight. A follow-up query probing for number of diet attempts to date yielded a range of responses, with six participants stating they had no prior/current attempts at weight loss; nine reporting 1 to 3 prior attempts; four reporting 5 to 10 prior attempts; and three participants reporting >10 prior attempts. An additional eight participants provided more ambiguous write-in answers to this question, reporting anywhere from "many" or "some" prior attempts to "infinity" or "thousands" of prior attempts.

Qualitative findings

Several key themes emerged from focus group and individual interview discussions. Nearly all members discussed the symbiotic and negative psychosocial impact of co-occurring obesity and chronic pain. Discussions additionally focused on describing: depression as magnifying the comorbid physical symptoms and complicating treatment for comorbid obesity and pain; hedonic hunger triggered by physical pain and associated with depression and shame from eating in the absence of hunger; emotional or "binge" eating in response to pain; altered dietary choices in response to pain; and low self-efficacy for physical activity due to pain. The following sections describe these themes in greater detail.

Role of depression

Many participants discussed the role of depression as important to understanding the relationship between co-occurring chronic pain and obesity and the negative impact of the comorbidity on associated treatment efforts. Discussions about depression typically focused on how low mood complicates efforts to cope with pain and obesity via its effect on motivation and self-efficacy. Many suggested that depression magnifies the physical experience of pain for individuals who are obese and, as a result, makes weight loss and engaging in healthful behaviors even more difficult. Most underscored the importance of managing depression as part of addressing both pain and weight control.

> "*The depression just makes it all that much worse. I think the treatments for pain will work better if we could get depression under control.*"

Several participants described depression as an important contributor to obesity and pain when they co-occur, and most discussed how depression interacts with the comorbidity to negatively impact appetitive behaviors, motivation to engage in physical activity, and other efforts at self-management. Participants also suggested that weight gain eventually contributes to both depressed mood and chronic pain, resulting in a cyclical interaction among physical pain, weight, and depression.

> "*I believe that the depressed pain which I didn't recognize as pain then, disappeared [after weight-loss]. But then as soon as I was off it and started gaining it back, it started all over again. And as years went by, the physical things happened, the arthritis along with the weight made it worse.*"

Pain, shame, and hedonic hunger

Participants described responding to pain with consumption of less healthful foods in larger quantities, typically in the absence of hunger, as a way to cope with the experience of pain. Several participants identified eating as a comforting activity that aided in pain coping in the moment but that eventually led to regret and shame as it "sabotaged" their efforts at weight loss.

> "*In no way can I be hungry…I use food to soothe myself, but it really doesn't because once I've overeaten I say 'Well, there. You did it again.' I sabotage myself.*"

Many described eating as the only activity that continues to bring them regular and reliable pleasure, especially when they feel physically limited from doing most other pleasant activities by constant pain.

> "*I just eat too much. You know, there's hardly anything left other than eating.*"

Furthermore, participants described consuming food not only as a means of pleasure but also as a means of distraction from the experience of pain and the frustration of coping with pain on a regular basis. Frequently, due to the ongoing daily presence of pain in the lives of these individuals, this led to a level of food consumption beyond their daily caloric needs.

> "*I was always eating all the time. And I think that took away the pain really, just eating…I'm not thinking about it [pain], you know, I'm thinking wow this is good.*"

Emotional eating and pain

A number of participants described episodes akin to binge eating and/or eating in response to pain as a negative stressor—"emotional eating" in response to pain. While it is unclear whether such episodes would meet the clinical criteria for binge eating disorder, many participants commonly used the term "binge" to describe their eating when they experienced pain. Furthermore, many described pain-related eating as associated with the experience of strong negative effect, feeling as if their behavior was out of control, and subsequently eating large amounts of food.

> "*I lost all my discipline for my physical being, and I just acting like I didn't care no more…like haywire and I would eat, where someone would eat a normal hot dog and that would be enough for them, and they would be satisfied, it took me three or four to get satisfied. I still don't feel satisfied. I have to stop myself from continuing and eating.*"

Most participants discussed an interactional relationship between pain, depression, and what many described as a binge episode. For these individuals, the so-called binge appears to

be associated with a short-lived reduction in pain that subsequently returns in-between binges along with a decrease in mood.

"*…after I come off the binges or in between the binges it's like it [pain] flairs up, and I don't know why. My moods… when I'm down the pain starts but when I'm up, when I'm feeling good, I'm okay.*"

Others described the physical and emotional comfort for their pain they find in eating large quantities of food and subsequently engaging in sedentary activities, behaviors directly at odds with typical behavioral interventions targeting weight reduction. Participants described feeling more vulnerable to these binge-like and sedentary episodes because much of their day is spent alone at home without other activities to fill the time. Some described particular times of the day, mostly evening or times when they are predominantly alone and inactive, as especially problematic for triggering such behaviors.

"*I eat more at night…But it's always like binges, you know, like everything, it's like I'm trying to break through them.*"

Altered dietary choices

Though a number of participants described their eating explicitly as a "binge," almost all participants described eating more frequently, in larger amounts, and choosing less healthful foods higher in sugar, fat, and calories in response to pain or a combination of pain and low mood.

"*I think the more pain I have the more I want to eat. It's like everything is out of control.*"

Participants explicitly described a noticeable shift in eating behavior after the onset of pain, suggesting that the presence of pain led to a decrease in healthful eating and an increase in consumption of high-sugar, high-fat snack foods. Even individuals who described eating a relatively balanced, health-promoting diet before their chronic pain described a change in eating behavior towards calorically dense food items in response to the presence of pain. Participants also tended to describe the consumption of these high-calorie foods as a "necessity" to aid in coping with pain.

"*It used to be that I could do yogurt and I could do vegetables and that would all satisfy me and I wasn't thinking about anything else. But now the pain's there, I can't stand it. I really want my ice cream and I think I'll die if you take away my ice cream! [laughing]*"

Others described craving certain types of foods in response to pain, and typically these foods were viewed as "forbidden" with high levels of sugar, sodium, and fat that contribute readily to weight gain and other chronic health conditions. Individuals who experienced such cravings typically expressed low-self efficacy to resist them when they occurred, describing how pain often reduced their motivation to do anything to manage their weight and their view of food as the sole option to aid them in "getting through the day."

"*It [pain] took away the desire to lose weight…I was just like, 'Oh, forget it. I don't want to worry about that right now.' You're just so worn out, the only thing you can think to do is give yourself a sugar kick and try to get something done.*"

Finally, many hypothesized that because they are regularly inactive and at home much of the day due to their pain, they eat more frequently and make poorer food choices than if they were active and spending time outside the home.

"*…not doing anything gives me time to think about food… whereas, if I was outside, really working hard, not worrying about food, I would definitely go longer periods without eating.*"

Reduced engagement in and low self-efficacy for physical activity

All participants described difficulty engaging in regular physical activity due to pain. Participants frankly described their daily activities as very sedentary involving a good deal of "screen time" in front of the television, and that even movement in their home to accomplish the most basic activities of daily living can be challenging.

"*I sit. A normal day is sitting, watching TV, and that's about it, you know…it's really an inconvenience for me to get up from here and go there.*"

Many who used to be regularly active and enjoy such activity, now find themselves struggling even to complete simple, everyday tasks. Several described encountering not only pain in response to even the lowest levels of physical activity, but also low self-efficacy and low mood. Indeed, most of these participants directly tied their low motivation for physical activity to their experience of pain.

"*It [pain] makes it [weight-loss] more difficult in the sense that it feeds right into my procrastination and I don't do walking because that's one of the exercises that I used to be very good about, was walking….And now, I think walking two blocks, it's all changed…I've gotten heavier and I've gotten lazier.*"

Participants described this limited level of activity as very discouraging and interfering with their sense of self and mood. Many described feelings of shame and poor self-image associated with limited activity, isolation, and their negative perception of their bodies and discussed the direct negative impact of this experience on any attempts to engage in pleasant activities, make healthier dietary choices, or even to be physically active.

"*I don't want to go anywhere….I think the combination of the pain and my weight is like, I don't want to get dressed up because I don't have anything to wear. I get discouraged when I can't do very much….I gotta plan things that aren't going to be real intense*."

Some indicated that rehabilitation treatment approaches typically used to manage chronic pain (e.g., physical therapy) caused so much pain that they became disinterested in engaging in any exercise beyond their regular therapeutic regime, even when directly told by a health provider that they should be exercising to achieve weight reduction in addition to their therapy practice.

"*Exercise is the best [to lose weight], and I get all this physical therapy exercise and all of that just increases my pain, which reduces my desire to have any exercise*."

Others felt they could not exercise appropriately given their medical and pain issues, or did now know how to adapt exercises to meet their limitations. In particular, limited mobility and use of wheelchairs seemed especially problematic. Some participants described how assistive devices prescribed to help the individual cope with their pain subsequently limit their comfort engaging in physical activity in a public setting. However, even for those who did not require assistive devices, pain alone was enough of a barrier limiting their engagement in regular activity. Many expressed the belief that exercise would not even be possible until their pain was reduced.

DISCUSSION

These qualitative data examine the experiential context of comorbid obesity and chronic pain, present multiple behavioral phenomena associated with the comorbid relationship that may play some role in its initiation and maintenance, and suggest particularly problematic barriers for successful prevention, treatment engagement and healthful outcome. Associated with the co-occurrence of chronic pain and obesity, participants discussed patterns of reactive eating in response to pain, preference for high-calorie/low-nutrient foods to sooth their pain, limited pleasant activities (outside of eating), limited engagement in physical activity, low self-efficacy for physical activity and for making healthy food choices, and low mood. The role of depression in intensifying the additive negative impact of chronic pain and obesity on health and health behaviors seemed particularly relevant to these participants.

While pain is often observed as a barrier to weight loss and, similarly, obesity as a barrier to pain self-management (18,19), there is little evidence informing our understanding of the process by which this comorbidity negatively influences outcome. To our knowledge, the only two studies to date to examine this question found (i) in an obese residential treatment-seeking population, increasing levels of pain and depression were associated with decreased ability to achieve activities of daily functioning and reduced weight loss (16) and (ii) an outpatient cognitive behavioral therapy program for chronic pain resulted in more favorable outcomes for nonobese compared to obese participants—pointing to the potential moderating role of BMI in chronic pain self-management—and, compared to nonobese counterparts enrolled in the program, obese participants had higher levels of disability, reduced physical quality of life, and increased symptoms of depression (17). The present qualitative results place such findings into a larger experiential context. Obese individuals with chronic pain may struggle to engage in traditional, empirically based approaches because these programs neglect to assess and accommodate for the unique challenges brought on by this comorbidity. For such assessment and accommodation to have the most meaningful impact on treatment outcomes, it is necessary to understand the specific obstacles those with pain and obesity face when they engage in treatment. Participants in the present study underscored the significant role of depression in complicating treatment efforts, and also discussed the substantial impact of pain on their ability to engage in any physical activity, even in some cases to complete the most basic activities of daily living. Furthermore, they also discussed at great length the impact of pain on eating behavior, noting that the presence of pain was associated with eating less healthful foods in larger amounts to achieve pleasure, relief from pain, or simply as a distraction. Given these data, it seems likely that many evidence-based programs may not be optimally designed to achieve weight loss (or, pain self-management) in those with comorbid chronic pain and obesity. For example, pain is not regularly assessed in traditional weight management programs, yet such programs that target healthier eating and increased physical activity may be less effective for individuals who regularly use eating to cope with their pain, who see eating as their only pleasant activity in the face of pain, and who feel they cannot engage in physical activity or even complete activities of daily living due to pain. While at this time there is little empirical evidence to guide treatment efforts for those with chronic pain and obesity, these and other similar findings underscore the importance of assessing for the presence of pain at the onset of weight loss treatment and suggest several areas where individuals with pain and obesity may particularly struggle in traditional treatment approaches and where additional research is warranted.

Participants in the present study reported that comorbid chronic pain and obesity had a synergistic negative effect on engagement in health behaviors, with the presence of pain regularly associated with an increase in behaviors known to be associated with poorer health outcomes (e.g., increased consumption of high-calorie foods, decreased physical activity). While the specific mechanism by which an association between pain and obesity occurs and influences treatment cannot be directly examined via these qualitative findings, the results do suggest likely areas for further investigation. In particular, the role of low mood appears central. There is a significant body of literature suggesting separately that both obesity (24) and pain (25) are associated with symptoms of depression, and pain has been shown worse among obese individuals with depression (26). Depression is associated with higher

caloric intake (27,28) and depressive symptoms are related to an increased likelihood of eating during negative episodes (so-called "emotional eating") and lower engagement in and self-efficacy for physical activity (27–29). One could hypothesize that the presence of chronic pain and its associated low mood may increase one's susceptibility to behaviors such as emotional eating, and thus may interact with BMI to result in increased caloric intake. Unfortunately, evidence examining the relationship between eating behavior and pain is seriously lacking. What research does exist suggests ingesting high-fat, high-sugar meals increases pain tolerance in animal models (30) and human studies (31). However, much of the research conducted with humans examines the impact of oral sucrose on pain response in infants. Indeed, the analgesic properties of sucrose in the human infant are so well supported that sucrose is becoming part of the accepted standard of practice for managing acute procedural pain in NICUs (32). To date little is known about pain-related eating behavior in adult humans.

While emotional eating may provide one pathway linking pain and obesity to poorer weight loss outcomes as it can lead to food intake beyond an individual's daily needs and subsequent weight gain (33), vulnerability to emotional eating is not directly a function of weight (34). Rather, individual differences in trait vulnerabilities and coping likely play an important role. For example, emotional eating may depend on the individual's ability to apply appropriate response strategies when stressed (35), with those most vulnerable to emotional eating lacking more effective strategies to manage distress. Given this, it is possible that obesity in tandem with pain increases one's vulnerability to employ less effective coping strategies, and this serves as one mechanism promoting the emotional eating described in the current sample. If this hypothesis is correct, prevention and treatment programs that target these specific coping deficits may more effectively address pain and obesity when they co-occur.

The salience of low mood and impaired coping in these respondents may also point to cognitive vulnerabilities shared by those with both obesity and chronic pain. In particular, catastrophizing has been identified as an important cognitive vulnerability associated with poorer coping in individuals with pain, and many of the participants' responses were consistent with a catastrophic tone. Pain catastrophizing is associated with disability and higher pain intensity both in pain patients (36,37) and in the general population (38,39). Interestingly, initial evidence also suggests a relationship between pain catastrophizing, obesity, and chronic pain. In one study by Somers and colleagues (40) catastrophizing was significantly higher in borderline morbidly obese and morbidly obese osteoarthritis patients compared to overweight and obese patients, and those who had higher catastrophizing were much more likely to engage in binge eating and to have lower self-efficacy for controlling their eating behavior. Additional research suggests that self-efficacy may mediate the effect of pain catastrophizing on reported pain intensity and disability in overweight/obese individuals with osteoarthritis (41) and the contribution of self-efficacy may be domain specific for specific eating behaviors, physical and psychological disability, and physical activity behaviors (42). Additional research is needed to examine the role of catastrophizing and self-efficacy in disordered eating and in health behaviors and coping generally for individuals with chronic pain and obesity. In particular, whether and how pain catastrophizing and domain-specific self-efficacy may be specific vulnerabilities associated with obesity and potentially disordered eating in the context of pain may be a fruitful area of investigation. Should further research support a relationship between pain catastrophizing, self-efficacy, and eating behavior in those with chronic pain and overweight/obesity, this may suggest vulnerabilities that could be targeted for treatment and potentially even prevention.

Several limitations of the study must be noted. First, participant BMIs were predominantly within the obese range, though the study sampled BMI ≥25. Important differences may exist among overweight, obese, and morbidly obese individuals with pain that cannot be easily captured here. Similar differences may occur for individuals with varying pain histories. Factors such as pain intensity, duration, and location may influence the relationship between pain and obesity in a way that cannot be assessed with the present data. Second, the sample was predominantly male. Caution must be taken in generalizing findings. However, since many studies skew towards predominantly or entirely female samples, the focus on males here may present a unique strength. Finally, one limitation that requires special consideration is the potential difficulty inherent in discussing pain using such a qualitative approach. Clearly, pain is subjective and an experience that combines both sensory and emotional dimensions (43). In the interview discussions, participants frequently described an interaction between depression, pain, and the experience of obesity and the resulting impact of this interaction on associated behaviors such as diet and physical activity. However, because the experience of chronic pain and depression is not easily parsed into "physical-pain" and "emotional-pain" during discourse it was not always clear during interviews when participants were discussing one specific manifestation of suffering (e.g., pain or depression) versus the interplay of both that can occur with the experience of pain. At times, participants were able to discuss a clear progression from physical pain/obesity to symptoms of depression, others described a converse process, and others spoke of suffering and pain more generally. While this may be seen as a limitation and possible confound, it can also be viewed as an advantage of qualitative approaches in that such techniques can capture the richness and complexity of subjective experience expressed directly by participants.

Despite limitations, this study is among the first to provide a contextual understanding of co-occurring chronic pain and obesity to guide research and intervention. These findings highlight the varied challenges to treatment engagement facing adults living with chronic pain and obesity. While research increasingly demonstrates a correlational relationship between obesity and pain that is associated with poorer health and

quality of life outcomes, the present findings also provide an experiential context to aid in interpreting these quantitative data. Specifically, those who experience comorbid chronic pain and obesity report unique barriers to self-management that may not be entirely addressed in current interventional approaches, and they may respond to the presence of pain with unhealthful eating and physical activity behaviors that promote poor health, low mood, and low self-efficacy. Interventional approaches for obesity that ignore the presence and impact of pain and its associated depression may be less efficacious. Development of self-management intervention modules that can address issues specific to comorbid pain and obesity is warranted, as is increasing our understanding of behavioral mechanisms that support and sustain this relationship.

ACKNOWLEDGMENTS

This study was funded by a VA Health Services Research & Development Project Grant (TPP 42-004). We thank all the patients who participated in this study for their time and effort. We also thank Kimberly Bonk, Gerta Dume, Cody Kearse, and Christine Nguyen for their help in transcribing interviews and Raymond May and Elyssa Perkins for reviewing interviews and preparing the manuscript for publication, as well as Dr Michelle L. Ramirez for her feedback on drafts.

DISCLOSURE

The authors declared no conflict of interest.
See the online ICMJE Conflict of Interest Forms for this article.

REFERENCES

1. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999-2008. *JAMA* 2010;303:235–241.
2. Guh DP, Zhang W, Bansback N *et al*. The incidence of co-morbidities related to obesity and overweight: a systematic review and meta-analysis. *BMC Public Health* 2009;9:88.
3. Pi-Sunyer X. The medical risks of obesity. *Postgrad Med* 2009;121:21–33.
4. Peltonen M, Lindroos AK, Torgerson JS. Musculoskeletal pain in the obese: a comparison with a general population and long-term changes after conventional and surgical obesity treatment. *Pain* 2003;104:549–557.
5. Neumann L, Lerner E, Glazer Y *et al*. A cross-sectional study of the relationship between body mass index and clinical characteristics, tenderness measures, quality of life, and physical functioning in fibromyalgia patients. *Clin Rheumatol* 2008;27:1543–1547.
6. Hainsworth KR, Davies WH, Khan KA, Weisman SJ. Co-occurring chronic pain and obesity in children and adolescents: the impact on health-related quality of life. *Clin J Pain* 2009;25:715–721.
7. Larsson UE. Influence of weight loss on pain, perceived disability and observed functional limitations in obese women. *Int J Obes Relat Metab Disord* 2004;28:269–277.
8. Grotle M, Hagen KB, Natvig B, Dahl FA, Kvien TK. Obesity and osteoarthritis in knee, hip and/or hand: an epidemiological study in the general population with 10 years follow-up. *BMC Musculoskelet Disord* 2008;9:132.
9. Stavropoulos-Kalinoglou A, Metsios GS, Panoulas VF *et al*. Underweight and obese states both associate with worse disease activity and physical function in patients with established rheumatoid arthritis. *Clin Rheumatol* 2009;28:439–444.
10. Bigal ME, Liberman JN, Lipton RB. Obesity and migraine: a population study. *Neurology* 2006;66:545–550.
11. Miscio G, Guastamacchia G, Brunani A *et al*. Obesity and peripheral neuropathy risk: a dangerous liaison. *J Peripher Nerv Syst* 2005;10:354–358.
12. Mirtz TA, Greene L. Is obesity a risk factor for low back pain? An example of using the evidence to answer a clinical question. *Chiropr Osteopat* 2005;13:2.
13. Tucker LA, Clegg AG. Differences in health care costs and utilization among adults with selected lifestyle-related risk factors. *Am J Health Promot* 2002;16:225–233.
14. Luo X, Pietrobon R, Sun SX, Liu GG, Hey L. Estimates and patterns of direct health care expenditures among individuals with back pain in the United States. *Spine* 2004;29:79–86.
15. Janke EA, Collins A, Kozak AT. Overview of the relationship between pain and obesity: What do we know? Where do we go next? *J Rehabil Res Dev* 2007;44:245–262.
16. Wachholtz A, Binks M, Eisenson H, Kolotkin R, Suzuki A. Does pain predict interference with daily functioning and weight loss in an obese residential treatment-seeking population? *Int J Behav Med* 2010;17:118–124.
17. Sellinger JJ, Clark EA, Shulman M *et al*. The moderating effect of obesity on cognitive-behavioral pain treatment outcomes. *Pain Med* 2010;11:1381–1390.
18. Mauro M, Taylor V, Wharton S, Sharma AM. Barriers to obesity treatment. *Eur J Intern Med* 2008;19:173–180.
19. Howarth D, Inman D, Lingard E, McCaskie A, Gerrand C. Barriers to weight loss in obese patients with knee osteoarthritis. *Ann R Coll Surg Engl* 2010;92:338–340.
20. Giacomini MK, Cook DJ. Users' guides to the medical literature: XXIII. Qualitative research in health care A. Are the results of the study valid? Evidence-Based Medicine Working Group. *JAMA* 2000;284:357–362.
21. Puhl RM, Heuer CA. The stigma of obesity: a review and update. *Obesity (Silver Spring)* 2009;17:941–964.
22. Glaser B. Lessons in human biology from a monogenic pancreatic ß cell disease. *J Clin Invest* 2011;121:3821–3825.
23. Miles M, Huberman AM. *Qualitative Data Analysis: An Expanded Sourcebook*. Sage Publications: Thousand Oaks, CA, 1994.
24. de Wit L, Luppino F, van Straten A *et al*. Depression and obesity: a meta-analysis of community-based studies. *Psychiatry Res* 2010;178:230–235.
25. Janke EA, Holroyd KA, Romanek K. Depression increases onset of tension-type headache following laboratory stress. *Pain* 2004;111:230–238.
26. Tietjen GE, Peterlin BL, Brandes JL *et al*. Depression and anxiety: effect on the migraine-obesity relationship. *Headache* 2007;47:866–875.
27. Konttinen H, Silventoinen K, Sarlio-Lähteenkorva S, Männistö S, Haukkala A. Emotional eating and physical activity self-efficacy as pathways in the association between depressive symptoms and adiposity indicators. *Am J Clin Nutr* 2010;92:1031–1039.
28. de Wit LM, Fokkema M, van Straten A *et al*. Depressive and anxiety disorders and the association with obesity, physical, and social activities. *Depress Anxiety* 2010;27:1057–1065.
29. Ball K, Burton NW, Brown WJ. A prospective study of overweight, physical activity, and depressive symptoms in young women. *Obesity (Silver Spring)* 2009;17:66–71.
30. Mukherjee K, Mathur R, Nayar U. Ventromedial hypothalamic mediation of sucrose feeding induced pain modulation. *Pharmacol Biochem Behav* 2001;68:43–48.
31. Harrison D, Johnston L, Loughnan P. Oral sucrose for procedural pain in sick hospitalized infants: a randomized-controlled trial. *J Paediatr Child Health* 2003;39:591–597.
32. Holsti L, Grunau RE. Considerations for using sucrose to reduce procedural pain in preterm infants. *Pediatrics* 2010;125:1042–1047.
33. Hays NP, Roberts SB. Aspects of eating behaviors "disinhibition" and "restraint" are related to weight gain and BMI in women. *Obesity (Silver Spring)* 2008;16:52–58.
34. Greeno CG, Wing RR. Stress-induced eating. *Psychol Bull* 1994;115:444–464.
35. Evers C, Marijn Stok F, de Ridder DT. Feeding your feelings: emotion regulation strategies and emotional eating. *Pers Soc Psychol Bull* 2010;36:792–804.
36. Sullivan MJ, Lynch ME, Clark AJ. Dimensions of catastrophic thinking associated with pain experience and disability in patients with neuropathic pain conditions. *Pain* 2005;113:310–315.
37. Turner JA, Jensen MP, Warms CA, Cardenas DD. Catastrophizing is associated with pain intensity, psychological distress, and pain-related disability among individuals with chronic pain after spinal cord injury. *Pain* 2002;98:127–134.
38. Severeijns R, Vlaeyen JW, van den Hout MA, Picavet HS. Pain catastrophizing is associated with health indices in musculoskeletal pain: a cross-sectional study in the Dutch community. *Health Psychol* 2004;23:49–57.
39. Edwards RR, Smith MT, Stonerock G, Haythornthwaite JA. Pain-related catastrophizing in healthy women is associated with greater temporal

summation of and reduced habituation to thermal pain. *Clin J Pain* 2006;22:730–737.
40. Somers TJ, Keefe FJ, Carson JW, Pells JJ, Lacaille L. Pain catastrophizing in borderline morbidly obese and morbidly obese individuals with osteoarthritic knee pain. *Pain Res Manag* 2008;13:401–406.
41. Shelby RA, Somers TJ, Keefe FJ *et al*. Domain specific self-efficacy mediates the impact of pain catastrophizing on pain and disability in overweight and obese osteoarthritis patients. *J Pain* 2008;9:912–919.
42. Pells JJ, Shelby RA, Keefe FJ *et al*. Arthritis self-efficacy and self-efficacy for resisting eating: relationships to pain, disability, and eating behavior in overweight and obese individuals with osteoarthritic knee pain. *Pain* 2008;136:340–347.
43. IASP Task Force on Taxonomy. *Part III: Pain Terms, a Current List with Definitions and Notes on Usage*. In: Merskey H, Bogduk, N (eds). *Classification of Chronic Pain*. *2nd edn*., IASP Task Force on Taxonomy: IASP Press, Seattle, 1994, pp. 209–214.