Original Article
CLINICAL TRIALS AND INVESTIGATIONS

Obesity

Weight Loss Outcomes in Patients with Pain

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Objective: To determine whether the presence or severity of pain is predictive of suboptimal weight loss outcomes in behavioral weight management programs.

Methods: This is a secondary data analysis comparing weight loss among participants with overweight/obesity who participated in a 12-month randomized controlled trial. Of the 481 participants randomized, 394 (81.9%) had available pain data and were categorized by Pain Type (back pain, arthritis pain, both, or neither) and Pain Severity (no pain, moderate pain, or severe pain). Dietary and physical activity outcomes were also explored.

Results: High rates of moderate and severe (80.2%), and back and arthritis (72.6%), pain were observed. Linear mixed models showed significant differences in % weight loss among Pain Severity, but not Pain Type, groups. Patients with severe pain lost significantly less weight (−0.1 kg, 95% CI = −1.5, −1.2) compared to those with either moderate or no pain (−1.9 kg, 95% CI = −2.5, −1.3; −2.1 kg, 95% CI = −3.3, −1.0, respectively). Patients with arthritis pain lost a significant amount of weight despite only minor improvements in walking distance.

Conclusions: Pain severity, but not pain type, is predictive of suboptimal weight loss outcomes.

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Introduction

Pain and obesity are two of the most pressing health problems in the United States (US) due to their high prevalence and associated medical morbidity (1). It is relatively unknown whether pain patients obtain suboptimal weight outcomes with behavioral weight loss treatments. While there is some evidence to suggest that pain patients will do better when offered more intensive treatment compared to less intensive treatment (2-4), this is also true for patients in general (5).

Pain and obesity are of particular concern to the Veterans Health Administration (VHA) because of the high prevalence of both among veterans. The prevalence for overweight/obesity in VHA is 76.9% (6), making it 10% higher than the US general population average (7). Veterans also appear to be disproportionately affected with higher rates of specific pain-related conditions, such as low back pain (8). While there is considerable variability in rates reported due to a lack of consistency in pain assessment (9), national surveys report that between 19% (10) and 43% (11) of the general population is affected by chronic pain.

Given that higher body mass index (BMI) is a risk factor for having a chronic pain condition (12,13), it is not surprising that the obesity epidemic has been implicated as one of the major contributors to the rise in chronic pain (9), predicting both its onset and progression (14). The relationship is also bi-directional with chronic pain contributing, in part, to the rise in obesity (15). The complex and reciprocating relationship between the two, and the high prevalence of each individually and in co-occurrence, have implications for the treatment of both.

Studies clearly show that weight loss produces decreased pain and disability in chronic pain patients (16-19). However, there are clinical concerns that pain interferes with one's ability to lose weight, and some circumstantial evidence supports the notion that pain may be a barrier toward compliance with weight loss treatment as

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individuals report eating in response to pain and avoiding physical activity because of pain (20,21). Three randomized controlled trials of overweight patients with knee pain have shown that more intensive weight loss programs produce better outcomes (2-4). For example, programs that combine diet with exercise, or diet with pain coping skills, have better weight and pain outcomes than exercise alone (2), diet without pain coping skills (3), or diabetes education (4). Given that these studies were all conducted with pain patients, it is not known how outcomes might differ between pain and non-pain patients when both groups are administered the same treatment.

Given the high prevalence of pain and overweight/obesity among the US population (7,10), further investigation is warranted to understand the impact of pain on weight loss. The objective of the current study is to conduct the first longitudinal investigation of pain type and pain severity as potential predictors of weight loss in an outpatient behavioral weight management program. We aim to investigate whether weight loss outcomes differ among groups with different types and severity of pain.

Methods

Study design

This is a secondary data analysis comparing weight loss and clinical outcomes based on pain type and pain severity among treatment-seeking participants with overweight/obesity. Data was obtained from the Aspiring to Lifelong Health Program in Veterans Affairs (ASPIRE-VA) trial (22,23), a randomized controlled trial of 481 participants designed to evaluate the effectiveness of a small changes weight loss intervention (ASPIRE) compared to the standard VHA weight management program (MOVE!®). Participants were randomized to one of three treatment arms, stratified by sites: (1) the ASPIRE weight loss program delivered individually over the phone (ASPIRE-Phone), (2) the ASPIRE weight loss program delivered via in-person group sessions (ASPIRE-Group); or (3) MOVE!® delivered primarily in group format as usual care. Institutional Review Board approval was obtained at two Midwestern VA medical centers, Louis Stokes Cleveland VA Medical Center (Cleveland) and VA Ann Arbor Healthcare System (Ann Arbor), that served as recruitment and treatment sites.

Participants and procedures

Eligible participants were primary care provider- or self-referred for weight management services and eligible for the MOVE! program (22). Candidates were invited to participate if they had a BMI> = 30 kg/m^2, or had a BMI between 25–30 kg/m^2 and at least one obesity-related health condition (e.g., type 2 diabetes). Other inclusion criteria were an ability to communicate in English, competency to provide informed consent, and reliable access to a telephone. Exclusion criteria were: current enrollment in another treatment or study involving weight loss or physical activity; inability to complete a 6-minute walking test (6MWT) (24); or pregnancy. Of the 481 participants randomized to ASPIRE-VA, 394 participants had available pain data, and were included in the present study (i.e. data was missing for 87 participants from the original study). Enrollment began January 2010 and 12-month follow-up assessments were completed by November 2012.

Pain categorization and measures

Pain categories were obtained with two baseline assessment instruments. Pain Type was assessed by administering the MOVE!23 Survey, a 23-item self-report instrument designed to evaluate domains related to obesity and weight management (25). Data on its psychometric properties have been reported (26), including it discriminate validity with regard to pain (27). Participants are asked: "Please indicate (with a check mark to the left) any of the following that apply to you." Response items include a list of health conditions, two of which are pain-related: *back pain or spinal disc disease* (BACK), and *arthritis or joint pain* (ARTHRITIS). Participants who checked neither pain-related condition were categorized as NEITHER, and those who checked both pain-related conditions were categorized as BOTH, following a previously validated method (27).

Pain Severity was assessed with the EuroQoL-3D (28), a standardized instrument for measurement of health outcomes. The Pain/Discomfort item from the EuroQoL was used to categorize participants based upon the following response set: *I have no pain or discomfort* (NO PAIN), *I have moderate pain or discomfort* (MODERATE PAIN), and *I have extreme pain or discomfort* (SEVERE PAIN).

At baseline, demographic and clinical data were obtained, including potentially relevant psychiatric and medical covariates chosen based upon prior research with this patient population (27). International Statistical Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes from electronic medical records were obtained for post-traumatic stress disorder (PTSD; 309.81), depression (293.83, 296.2, 296.3, 296.90, 296.99, 300.4, 301.12, 309.0, 309.1, and 311), and substance use disorder (SUD; 291, 292, 303, 304, 305.0, 305.2–305.9). ICD-9 codes were also used to obtain a composite measure of medical comorbidity using the Charlson Index, a validated measure of disease burden based upon age and presence of 19 conditions with high likelihood of mortality (29).

The primary outcome for the present study was *% weight loss* at 12 months, measured as a continuous variable. For descriptive purposes, results have been presented for change in absolute weight (kg), BMI (weight (kg)/height (m^2)) and waist circumference (cm), as well as *% weight loss*, from baseline to 12 months. The secondary outcome was the percent of participants who achieved *clinically significant weight loss* ($\geq$5% weight loss) at 12 months, measured by a categorical variable (0 = no, 1 = yes). Exploratory analyses were performed for the 6MWT (24), an objective measure of functional exercise capacity (30), and the self-reported Food Frequency Questionnaire (31) a measure of dietary fiber, fat, and fruit/vegetable intake. These measures were assessed at three time points, and participants received remuneration for completing an assessment at baseline ($20), 3 months ($20), and 12 months ($50).

Statistical analyses

Analyses were performed in Stata, version 13.1 (College Station, TX). Descriptive statistics were calculated for all variables using Pearson Chi-square test for categorical variables and analysis of variance for continuous variables.

Linear mixed models were used to model the primary and exploratory analyses at 3 and 12 months post-randomization using all available data. Two separate models were built for each of the *a priori* set of pain categories (Pain Type and Pain Severity) with either NEITHER or NO PAIN as the reference group. Treatment arms were pooled for the purposes of this study to investigate pain as a

TABLE 1 Baseline comparisons for Pain Type groups

	Neither		Back		Arthritis		Both		Total	
N	108		51		106		129		394	
Male, *n* (%)	92	(85.2)	41	(80.4)	95	(89.6)	107	(82.9)	335	(85.0)
Age, mean (SD)	53.5	(11.0)	54.1	(8.5)	58.5**^^	(8.5)	55.6^{+}	(9.9)	55.6	(9.8)
Race										
African American, *n* (%)	48	(44.4)	23	(45.1)	39	(36.8)	47	(36.4)	157	(39.8)
Other, *n* (%)	4	(3.7)	1	(2.0)	0	(0.0)	3	(2.3)	8	(2.0)
Caucasian, *n* (%)	56	(51.9)	27	(52.9)	67	(63.2)	79	(61.2)	229	(58.1)
Baseline weight measures										
Weight (kg), mean (SD)	109	(24.3)	111	(20.2)	115	(23.0)	114	(22.4)	113	(22.9)
BMI (kg/m^2), mean (SD)	35.2	(6.5)	35.1	(5.1)	37.4**^	(6.2)	37.1*^	(6.1)	36.4	(6.2)
Waist (cm), mean (SD)	116	(16.2)	118	(14.2)	122**	(15.0)	122**	(15.5)	120	(15.6)
Comorbidity										
Depression, *n* (%)	24	(22.2)	20*	(39.2)	26	(24.5)	56**$^{++}$	(43.4)	126	(32.0)
Post-traumatic stress disorder, *n* (%)	13	(12.0)	11	(21.6)	9^	(8.5)	32**$^{++}$	(24.8)	65	(16.5)
Substance use disorder, *n* (%)	12	(11.1)	11	(21.6)	15	(14.2)	27	(20.9)	65	(16.5)
Charlson Index, mean (SD)	1.0	(1.3)	1.2	(1.7)	1.3	(1.5)	1.2	(1.6)	1.2	(1.5)

*P-value < 0.05 compared to NEITHER.
**P-value < 0.01 compared to NEITHER.
^P-value < 0.05 compared to BACK.
^^P-value < 0.01 compare to BACK.
^{+}P-value < 0.05 compared to ARTHRITIS.
^{++}P-value < 0.01 compared to ARTHRITIS.

predictor of weight loss outcome. The following independent variables were controlled for in the models: treatment arm, site, pain category, time, and time by pain category interaction. Additional demographic and/or psychiatric variables were controlled for given baseline differences observed among pain categories. This included age, depression, and PTSD for Pain Type, and age, race, depression, PTSD and SUD for Pain Severity.

Chi-square analysis was used for the secondary outcome. Two analyses were performed to examine whether those in the reference groups (NEITHER or NO PAIN) were more likely to achieve *clinically significant weight loss* ($\geq$5% weight loss) compared to the other pain category groups. These analyses were performed for the 347 randomized participants who completed 12-month assessments (88.1% of the sample).

Results

Characteristics of the overall sample

Participants were predominately middle aged ($M = 55.6$, SD = 9.8), moderately obese (M BMI = 36.4, SD = 6.2) men ($n = 335$, 85%). The sample was ethnically diverse with 42% ($n = 165$) non-white (the majority of which were African American). Rates of depression, PTSD and substance use disorders were 32.0%, 16.5% and 16.5%, respectively, and the mean Charlson Index was 1.2 comorbid conditions (SD = 1.5, range 0 to 9).

Overall, the total sample ($N = 394$) experienced a mean *% weight loss* of 1.71% (CI = −2.20, −1.22, $P = 0.001$), and 21.9% ($n = 76$) of the 347 who completed 12-month assessment achieved *clinically significant weight loss* ($\geq$5% weight loss). Improvements were observed for the other weight outcomes as well such that BMI ($M = -0.60$, CI = −0.78, −0.43, $P < 0.001$) and waist circumference ($M = -2.51$ cm, CI = −3.16, −1.86, $P < 0.001$) significantly decreased. Walking distance (as measured by the 6MWT) significantly increased ($M = 17.4$ meters, CI = 11.56, 23.26, $P < 0.001$). Among the dietary outcomes, percent of fat intake significantly decreased ($M = -1.26$, CI = −1.78, −0.74, $P < 0.001$), fruit and vegetable servings significantly increased ($M = 0.22$, CI = 0.03, 0.42, $P = 0.026$), and no change in fiber content was observed ($M = -0.51$, CI = −1.40, 0.37, $P = 0.256$).

The frequencies for Pain Type were 27.4% ($n = 108$) for NEITHER, 12.9% ($n = 51$) for BACK, 26.9% ($n = 106$) for ARTHRITIS and 32.7% ($n = 129$) for BOTH. The frequencies for Pain Severity were 19.8% ($n = 78$) for NO PAIN, 67.8% ($n = 267$) for MODERATE, and 12.4% ($n = 49$) for SEVERE. Overall, 72.6% ($n = 286$) of participants reported back, arthritis or both types of pain, and 80.2% ($n = 316$) reported moderate or severe pain.

Demographic and clinical characteristics by pain categories

Tables 1 and 2 show comparisons of baseline demographic and clinical characteristics by Pain Type and Pain Severity. Across the Pain Type groups, there were significant differences for age, BMI, waist circumference, and presence of ICD-9 depression and PTSD. The ARTHRITIS group was significantly older than the BACK and NEITHER groups, and the two groups with arthritis (ARTHRITIS and

TABLE 2 Baseline comparisons for Pain Severity groups

	No Pain		Moderate		Severe		Total	
N	78		267		49		394	
Male, *n* (%)	64	(82.1)	227	(85.0)	44	(89.8)	335	(85.0)
Age, mean (SD)	53.4	(12.8)	56.3*	(8.9)	55.2	(8.9)	55.6	(9.8)
Race								
African American, *n* (%)	26	(33.3)	105	(39.3)	26*	(53.1)	157	(39.8)
Other, *n* (%)	4	(5.1)	4	(1.5)	0	(0.0)	8	(2.0)
Caucasian, *n* (%)	48	(61.5)	158	(59.2)	23	(46.9)	229	(58.1)
Baseline weight measures								
Weight (kg), mean (SD)	107	(21.4)	114*	(22.8)	113	(24.5)	113	(22.9)
BMI (kg/m^2), mean (SD)	35.6	(6.0)	36.7	(6.1)	36.0	(6.6)	36.4	(6.2)
Waist (cm), mean (SD)	117	(15.7)	121	(15.3)	120	(17.1)	120	(15.6)
Comorbidity								
Depression, *n* (%)	11	(14.1)	92**	(34.5)	23**	(46.9)	126	(32.0)
Post-traumatic stress disorder, *n* (%)	2	(2.6)	50**	(18.7)	13**	(26.5)	65	(16.5)
Substance use disorder, *n* (%)	4	(5.1)	52**	(19.5)	9*	(18.4)	65	(16.5)
Charlson Index, mean (SD)	0.9	(1.2)	1.2	(1.6)	1.3	(1.6)	1.2	(1.5)

* *P*-value < 0.05 compared to NO PAIN.
** *P*-value < 0.01 compared to NO PAIN.

BOTH) had significantly higher BMI and larger waist circumference than those groups as well. The BOTH group had significantly higher percentages of participants with ICD-9-CM diagnoses of depression and PTSD compared to the NEITHER and ARTHRITIS groups.

Among the Pain Severity groups, depression, PTSD and SUD were observed in significantly greater percentages for the MODERATE and SEVERE groups compared to the NO PAIN group.

With regard to treatment completion rates, there were no significant differences among Pain Type ($P = 0.40$) or Pain Severity ($P = 0.37$) groups.

Comparisons by pain type

Table 3 shows results of the linear mixed models for the primary outcome, descriptive weight outcomes, and the exploratory outcomes. For the primary outcome of *% weight loss,* there was no significant difference (adjusted model, $P = 0.46$) among Pain Type groups. There were also no significant differences for the descriptive weight outcomes of weight (kg), BMI and waist circumference (all P's > 0.05). For the secondary outcome of *clinically significant weight loss*, there was no significant difference in adjusted or unadjusted rates [unadjusted χ^2 $(3) = 1.07$, $P = 0.78$]. Figure 1 depicts the weight changes (kg) from baseline to 12 months for the four Pain Type groups.

For the exploratory outcomes, walking distance increased for participants in all groups, but the magnitude of the change was significantly less for the ARTHRITIS and BOTH groups compared to the NEITHER and BACK groups (all P's < 0.01). No significant differences in dietary outcomes were observed among the four groups (all P's > 0.05). Given the significant difference in age across the Pain Type groups, all analyses were rerun with age as an additional covariate with comparable results.

Comparisons by pain severity

Table 4 shows results of the linear mixed models for the primary outcome, descriptive weight outcomes, and the exploratory outcomes. For the primary outcome, the NO PAIN and MODERATE PAIN groups had significantly greater reductions in *% weight loss* compared to the SEVERE PAIN group (P's < 0.05).The SEVERE PAIN group did not lose or gain weight. There were also significant differences for the descriptive weight outcomes of Weight, BMI and waist circumference such that the NO PAIN and MODERATE PAIN groups had significantly greater reductions in these measures compared to the SEVERE PAIN group. For the secondary outcome of *clinically significant weight loss*, there was no significant difference in adjusted or unadjusted rates [unadjusted χ^2 $(2) = 0.66$, $p = 0.720$]. Figure 2 depicts the weight changes (kg) from baseline to 12 months for the three Pain Severity groups.

In the exploratory analysis, the MODERATE PAIN group exhibited significantly less change in 6MWT distance compared to the NO PAIN group ($P < 0.01$). No significant differences in dietary outcomes were observed among the three groups (all P's > 0.05).

Discussion

This is the first study to prospectively investigate the presence and impact of pain type and severity on weight loss. High rates of pain were observed in this sample of participants with overweight/obesity who were seeking weight management treatment in the VHA. Moderate or severe pain was reported in over 80% of sample participants, and nearly three-quarters reported back and/or arthritis pain. Consistent with our findings, other studies have reported very high rates of pain among participants with overweight/obesity [10,12],

TABLE 3 Adjusted comparisons of outcomes for Pain Type groups[a]

	Neither	Back	Arthritis	Both
Primary outcome				
% Weight loss	−2.0 (−2.9 to −1.0)	−1.5 (−2.9 to −0.1)	−2.1 (−3.0 to −1.2)	−1.3 (−2.1 to −0.4)
Descriptive weight outcomes				
Weight (kg)	−2.1 (−3.1 to −1.0)	−1.6 (−3.1 to −0.0)	−2.3 (−3.3 to −1.3)	−1.5 (−2.4 to −0.5)
BMI (kg/m^2)	−0.6 (−1.0 to −0.3)	−0.5 (−1.0 to 0.0)	−0.8 (−1.1 to −0.4)	−0.5 (−0.8 to −0.2)
Waist (cm)	−3.2 (−4.4 to −1.9)	−2.6 (−4.5 to −0.7)	−2.3 (−3.5 to −1.0)	−2.1 (−3.3 to −0.9)
Exploratory outcomes				
6-min walk (m)	33.3 (22.2 to 44.3)	35.2 (18.4 to 52.1)	6.4**^^ (−4.6 to 17.5)	3.6**^^ (−7.1 to 14.2)
Fiber (gm)	0.3 (−1.4 to 2.1)	−0.9 (−3.3 to 1.6)	−1.3 (−3.0 to 0.4)	−0.9 (−2.5 to 0.6)
% Fat (gm)	−1.5 (−2.5 to −0.5)	−1.2 (−2.6 to 0.3)	−1.4 (−2.4 to −0.4)	−1.3 (−2.2 to −0.4)
Fruit/veg (svgs)	0.5 (0.1 to 0.9)	−0.1 (−0.7 to 0.4)	0.1 (−0.3 to 0.4)	0.2 (−0.1 to 0.6)

Values given as mean (95% CI).
[a]Predicted 12-month changes for each outcome variable based on linear mixed models. Independent variables included time (as 12-months indicator), treatment arm indicators, site, baseline value of the outcome variable, age, depression, post-traumatic stress disorder, Pain Type (with NEITHER as reference group), time, and time by Pain Type interaction.
***P*-value <0.01 compared to NEITHER.
^^*P*-value <0.01 compared to BACK.

including a national VHA sample that found similar rates of back and arthritis pain (27).

Most notably, our study showed that for the 12% of the sample who reported severe pain, % weight loss was significantly less than for those with moderate or no pain. Specifically, individuals reporting severe pain, on average, did not gain or lose weight during the 12-month treatment. However, pain severity did not predict the percent who achieved clinically significant weight loss, and pain type did not predict either % weight loss or the percent who achieved clinically significant weight loss.

One question raised by these findings is whether weight management interventions need to be bolstered for patients with severe

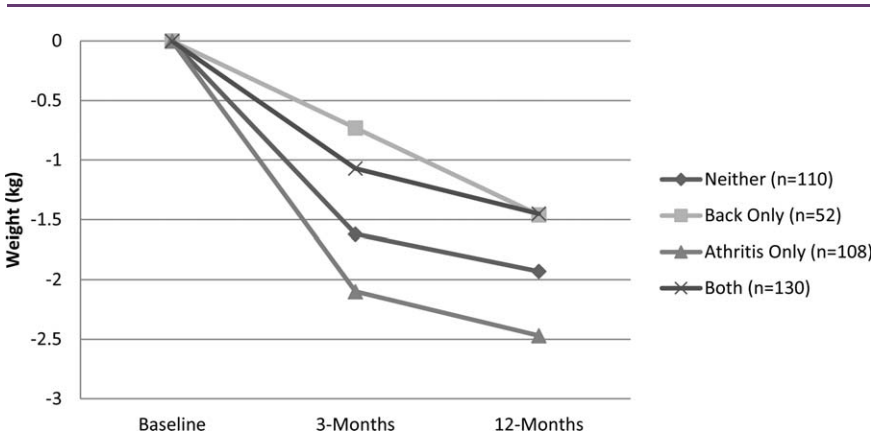

Figure 1 Adjusted weight change at 3 and 12 months based on linear mixed effects models controlling for treatment arm, baseline BMI, pain type, visit, and visit by pain type interaction.

TABLE 4 Adjusted comparisons of outcomes for Pain Severity groups[a]

	No Pain	Moderate	Severe
Primary outcome			
% Weight loss	−2.1	−1.9	−0.1*^
	(−3.3 to −1.0)	(−2.5 to −1.3)	(−1.5 to 1.2)
Descriptive weight outcomes			
Weight (kg)	−2.2	−2.1	−0.3^
	(−3.5 to −0.9)	(−2.7 to −1.4)	(−1.8 to 1.2)
BMI (kg/m^2)	−0.7	−0.7	−0.1*^
	(−1.1 to −0.3)	(−0.9 to −0.5)	(−0.5 to 0.4)
Waist (cm)	−3.3	−2.6	−0.4*^
	(−4.8 to −1.8)	(−3.4 to −1.9)	(−2.2 to 1.4)
Exploratory outcomes			
6-min walk (m)	33.0	12.0**	16.0
	(19.4 to 46.7)	(4.9 to 19.2)	(−1.4 to 33.5)
Fiber (gm)	−1.2	−0.8	0.9
	(−3.2 to 0.8)	(−1.9 to 0.2)	(−1.6 to 3.3)
% Fat (gm)	−1.8	−1.3	−1.1
	(−3.0 to −0.7)	(−1.9 to −0.6)	(−2.5 to 0.3)
Fruit/veg (svgs)	0.1	0.2	0.5

Values given as mean (95% CI).
[a]Predicted 12-month changes for each outcome variable based on linear mixed models. Independent variables included time (as 12-months indicator), treatment arm indicators, site, baseline value of the outcome variable, age, race, depression, post-traumatic stress disorder, substance use disorder, Pain Severity (with NO PAIN as reference group), time, and time by Pain Severity interaction.
*P-value < 0.05 compared to NO PAIN.
**P-value < 0.01 compared NO PAIN.
^P-value < 0.05 compared to MODERATE.

pain. Of note is that participants in our study had gained 3.16 kg (95% CI = 1.99, 4.34; N = 394), or 6.97 lbs (95% CI = 4.38m 9.57), in the 12 months prior to study initiation, a similar finding to previous research reporting steep weight gain trajectories prior to VHA weight management treatment (32,33). Thus, weight management treatment likely slowed the rate of weight gain for those with severe pain even though they did not experience the same level of benefit as individuals with moderate or no pain. Weight stabilization, rather than weight loss, may be an important initial goal for those with severe pain. Despite the disparate mean weight loss outcomes for participants with and without severe pain, a similar proportion of participants achieved clinically significant weight loss.

Another important finding was that participants with arthritis, either alone or in combination with back pain, had less improvement in walking distance during a timed test, compared to participants with back pain only or neither type of pain. Even though inferior improvements in walking were observed among participants with arthritis, they exhibited comparable outcomes with regard to weight. While patients may state they avoid physical activity because of pain (20), our findings suggest that longitudinal improvement in walking distance may not be necessary for successful weight outcome, however the impact on weight loss maintenance is unknown.

Our results are consistent with findings from the only other study to examine the relationship between pain and weight loss (34). In that retrospective chart review of men and women with obesity who had enrolled in a four-week residential weight loss program, pain type and frequency of pain types, did not predict weight change after controlling for the effects of depression (34). Our findings show that pain type is not predictive of weight loss in even longer (12 months), outpatient treatment. In addition, our study extends findings to include pain severity. In contrast to reports that patients eat in response to pain (20) we did not find that dietary outcomes differed by presence or absence of pain type or severity in this longitudinal trial.

This study has a number of limitations. Pain type, while determined by the MOVE!23 survey using previously validated methodology (27), was limited to back and arthritis pain. Although these two are the most common types of pain (9), they do not account for other types of chronic pain (e.g., fibromyalgia) that were likely present even in the NEITHER condition. Thus, the current study probably observed weaker associations between outcomes, and back and arthritis pain, than what would have been found with a comparison

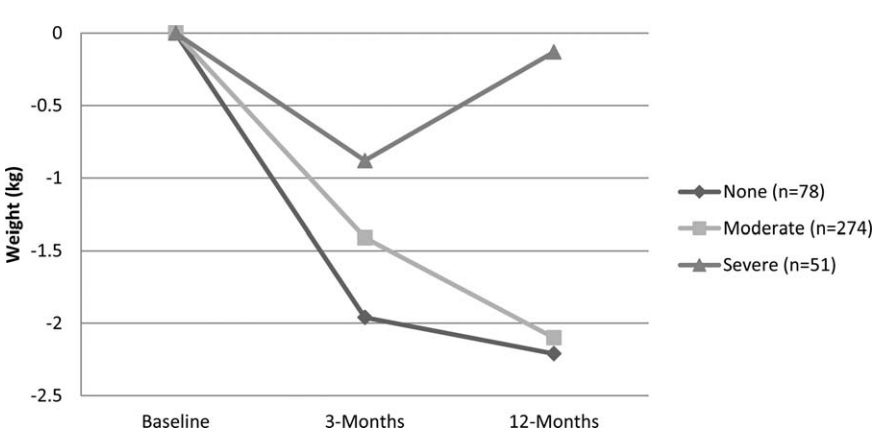

Figure 2 Adjusted weight change at 3 and 12 months based on linear mixed effects models controlling for treatment arm, baseline BMI, pain severity, visit, and visit by pain severity interaction.

group truly without pain. Another limiting factor was the small overall weight loss obtained in the ASPIRE-VA trial (−1.71% or −1.87 kg) that may have made it less likely to find significant effect sizes. Finally, our findings may not generalize to other populations as study subjects were older male participants with overweight/obesity who participated in a weight loss clinical trial through the VHA at two Midwestern states.

This is the first study to prospectively demonstrate that severe pain predicts poor 12-month outpatient weight loss outcomes. However, findings from this study also suggest that moderate pain is not a barrier to weight loss and that weight management interventions should be encouraged in patients regardless of their type of pain. Implications from the present findings are that individuals with severe pain may need modified, or more targeted interventions to achieve significant weight loss. Alternatively, first focusing on stopping weight gain among those with severe pain may be another treatment approach for interventionists. Results from the present study also suggest that clinicians should encourage weight management for participants with arthritis pain as these patients have been shown to lose comparable amounts of weight even with minor improvements in walking distance.

In sum, pain severity, but not pain type, is predictive of suboptimal weight loss outcomes. Our findings have important implications for the clinical care of patients with the combined problems of pain and overweight/obesity. Providers should not be reluctant to refer these patients to weight loss treatment. Even patients with the most severe pain are likely to achieve weight stabilization, and those with arthritis pain may expect good weight loss outcomes. Primary care providers and medical home teams may benefit from understanding the role of pain in weight management treatment. O

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