Chronic Pain: Relationship to Depression

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Abstract

The experience of chronic pain often interferes with family and social life, work performance, and overall quality of life. Depression symptoms in people with chronic pain may synergistically effect pain perception, negatively influencing the response to pain management and rehabilitation. Providers often fail to recognize and treat depression in patients presenting for treatment of chronic pain, and this failure can negatively impact rehabilitation outcomes. Importantly, limited research exists within the physical medicine setting about the relationship between chronic pain, symptoms of depression, and other variables like age and gender. Therefore**,** the relationship between chronic pain and depression in patients treated in the physical medicine is unknown. A non-experimental retrospective chart review addresses the question: In a sample of males and females ≥18 years of age with chronic pain, receiving treatment in a community physical medicine clinic, are there any differences in response to pain management between those who report depression symptoms and those who do not, controlling for gender, age, and other theoretical variables? Results of this investigation may be used to educate and support providers on the importance of attending to symptoms of depression during the treatment of chronic pain.

Keywords: chronic pain, depression, demographics, depressive symptoms, and outcomes

Chronic Pain and Depression

Chronic pain, combined with symptoms of depression, leads to excess disability, fear, anger, stress, anxiety, which in turn interferes with family relationships, work performance, and the overall quality of life (Moriarty et al., 2011). The purpose of this retrospective chart review is to determine, in a sample of adult patients presenting for treatment of chronic pain in a community-based physical medicine setting, if a relationship exists between the patient's response to treatment depending on the presence and severity of depression symptoms.

Background and Significance

Chronic pain is a source of great psychological distress, and is associated with declines in physical health, emotional status and quality of life (Kroenke, Theobald, Wu, Loza, Carpenter, & Tu, 2010). Thirty to 54% of individuals with chronic pain also experience depression (Arrora, Kuhad, Tiwari, & Chopra, 2011; Wong et al., 2011). The relationships and interactions between chronic pain and depression are complex, and may be informed by a model illustrating important biological, psychological, and social factors (see Appendix A). As noted in the model, psychological and emotional responses to the experience of chronic pain include symptoms of anxiety, anger, and fear, along with negative cognitions such as worry and catastrophizing that influence responses to pain treatment (Hall et al, 2011). The experience of chronic pain effects social factors and leads to isolation, tensioned relationships, and impaired fulfillment of family and work role functions (Mathew, Singh, Garis, & Diwan, 2013). Additional effects noted in those who experience chronic pain include decreased physical fitness and functional loss. Chronic pain and the various responses and effects may be exacerbated in those who suffer from unrecognized and untreated depression (Craig et al., 2013; Janevic et al., 2012; Kroenke et al., 2010; Sullivan et al., 2008). Depressed patients perceive themselves as more disabled; a

perception which adversely affects treatment outcomes in patients with chronic pain (Loeb et al., 2012). Providers' failure to recognize and treat depression in patients being treated for chronic pain, delays overall treatment response, and negatively impacts a host of related patient outcomes, including speed and degree of rehabilitation (Hall et al., 2011; Janevic et al., 2012; Sullivan, Adams, Tripp & Stanish, 2008).

Depression is not reported by every patient with chronic pain; however, a standard approach to screening of all patients with chronic pain is supported by the frequency of co-morbidity between the two conditions, the impact that unrecognized depression may have on treatment response for those diagnosed with chronic pain, and the availability of effective and compatible treatments for depression (Borsbo, Peolsson, & Gerdle, 2008; Janevic et al., 2012; Sullivan et al., 2008). In addition to depression, a number of psychosocial factors interact with pain pathology, to influence the level of treatment response and ongoing physical disability in patients with chronic pain (Morone et al., 2009).

Critical Review and Synthesis of the Literature

A literature search was completed using the limiters of "peer reviewed", English language, published between 2008 through 2013, inclusive. Databases included EBSCO-Academic Search Complete, CINAHL, Medline, Google Scholar, Science Direct, and Sage Journals. The search strings included: 1) chronic pain, 2) depression, 3) chronic pain and demographics, 4) depression and demographics, and 5) chronic pain, depression and demographics.

A total of 63,143 articles were retrieved from the databases and screened for duplicates. After eliminating articles mentioning different variables, the number was decreased to 64 articles

that were printed for review. After the full review and elimination of irrelevant articles, the final number of articles retained was 27 reflected in the synthesis of this work.

Chronic Pain and Correlates

Overall, the literature supports the relationship between chronic pain, depression, and a number of demographic variables. Higher levels of pain, disability, and maladaptive coping were associated with being female, of older age, with less years of education, and unemployed or part time employed (Demyttenaere, et al., 2010). Kroenke, Krebs, and Blair (2009) found a symptom overlap ranging from 30 to 60% between chronic pain and depression. Emotional and cognitive factors were also linked to both symptoms and outcomes for individuals experiencing chronic pain and depression. Patients' confidence in their ability to manage their pain was associated with better physical function and less self-perception of disability (Alschuler et al., 2008).

Screening and Treatment

Comprehensive symptom assessment is a critical element in determining the origin of the patients' symptoms, and selecting an appropriate intervention. Symptoms like disturbed sleep, disrupted appetite, fatigue, anger, depression, and anxiety may overlap with or be indicators of a) the chronic pain experience, b) the individual's ongoing status, or c) depression (Harris & D'Eon, 2008; Linton & Bergbom, 2011). Symptom assessment and evaluation is a function of patient reporting, and provider knowledge and skill in symptom recognition. Provider confusion about the chronic pain-depression link, and uncertainty about assessment and treatment options, leads to an adverse prognosis for symptom resolution (Linton & Bergbom, 2011). However, Reme and Eriksen (2010) asserted that depression symptoms could be identified in minimal time by replacing an entire questionnaire with one screening question in order to assess for depression.

Therefore, depression screening should be the gold standard of care in patients with chronic pain, as clinicians' failure to treat both conditions results in poor outcomes (Linton & Bergbom, 2011).

Methods

Sample and Setting

The sample was selected from the population of adults' aged 18 to 70 experiencing chronic pain for at least 3 months, and receiving treatment from an outpatient, private, for profit Physical Medicine clinic in Phoenix. This clinic serves about 780 patients per year.

Inclusion criteria. Participants were included if they reported a) musculoskeletal pain of the upper, middle, or lower back b) persisting 3 months or longer (Moriarty, McGuire & Finn, 2011) and c) and of at least moderate severity; defined as a score of 4 on one of the measures administered in the clinic (Anagnostis, et al., 2004;Von Korff, Deyo, Cherkin, & Barlow, 1993).

Exclusion criteria. Individuals were excluded if they a) did not speak English, b) had cognitive impairment as evidenced by inability to respond to questionnaires, or c) were pregnant.

Procedures

All data was collected after approval from the Institutional Review Board at Northern Arizona University (NAU). A valid agreement for the conduct of the study was established between NAU and the Physical Medicine clinic. A convenience sample of 103 voluntary participants was achieved and reflects the overall adult clinic demographics. All eligible participants received study information, had the opportunity to ask and receive answers to their questions, and signed the Informed Consent. Minimal risks were involved in this chart review study; no personal information was transferred into the data management and analysis package. Participants were informed that results of the study might be used for further research. During

the chart review data was obtained from two points in time; specifically, from the intake visit (time one) and the visit recorded 6-8 weeks later (time two).

Instruments and Measures

Demographic and background data was obtained from the clinic Welcome Patient Demographic Survey. Pain intensity and frequency data was obtained from the Quadruple Visual Analogue Scale (VAS), a 4-item measure with responses rated on a scale from 0 to 10, with 0 being no pain and 10 being the worst possible pain (including average pain) (see Appendix B). The VAS is a well-known and widely used measure, both in clinical and research settings, with extensive reporting of reliability and validity across settings and populations.

Depression data was obtained from item 5 of the Back Bournemouth Questionnaire (BQ) (see Appendix B). Item five queries, “Over the past week, how depressed (down in the dumps, sad, low in spirits, pessimistic, unhappy) have you been feeling" (Bolton & Breen, 1999). Items from the BQ are rated on a scale from 0 to 10, and represent different dimensions of the pain experience, including depression symptoms. The psychometric properties of the full BQ are well-established with a test-retest reliability of 0.95; internal consistency reliability of 0.9; and internal longitudinal construct validity indicating responsiveness to clinically significant change (Bolton & Breen, 1999; Martel, Dugas, Lafond, & Descarreaux, 2009; Newell & Bolton, 2010).

Methods and Data Analysis

Present study is a non-experimental retrospective chart review, including data from two points in time. This longitudinal design is best to reveal relationships among the demographic, background and study variables (Polit & Beck, 2012, p.184).

Univariate and bivariate descriptive statistics, and appropriate graphics were examined included to describe and present the sample and study variables (Polit & Beck, 2012). The

univariate statistics include frequencies for nominal variables, and measures of central tendency to include mean, median, mode, and standard deviation (SD) for continuous variables. The bivariate descriptive statistics reveal the strength and direction of relationships between the continuous variables (correlations), or the presence and strength of associations between non-continuous study variables (cross-tabs and chi square) (Polit & Beck, 2012). Graphic representations, including histograms and scatter plots, provide efficient portrayal of the data, and are "the best methods of describing data when the data set is large" (Kim & Malory, 2014, p. 76). Scatter plots are useful in seeing outliers in the data and for supporting, or not supporting, a linear relationship between the study variables. A linear relationship between the dependent and independent variables is necessary to the assumptions for multiple linear regression (Field, 2013), the statistic chosen to answer the question for this project.

In order to answer the research question, a multiple regression was conducted with change in pain as the dependent variable, and drop in depression, age, gender, and health conditions as predictors. The multiple linear regressions included the appropriate diagnostic tests and graphics to determine whether or not the assumptions for multiple regressions were satisfied. A multiple regression is optimal when the goal is to determine the relationship between a dependent variable and multiple predictors, as in the present study.

Results

Following data collection on the standardized paper form, all data was examined for accuracy and out of range values, then entered into Excel data spreadsheet and imported into the SPSS data manager. Reflecting the general clinic population, the study sample was composed of 28 males, or 27.2 percent of the total, and 75 females, or 72.8 percent of the total. Mean age of the sample was 42.8 years (SD = 11.82), with a range of 21 to 70 years. Approximately 40

percent of the participants reported depression at the intake assessment, 72.8 percent of females and 27.2 percent of males. Chi-square analysis revealed no significant relationship between gender and intake depression, χ^2 (1, N=103) =3.52, p 0.06. Demographic and clinical characteristics are summarized in Table 1 (see Appendix C).

Results from the bivariate analysis, showed moderate (± .3) to large (± .5) (Field, 2013, p. 267) correlations between the dependent variable, drop in pain, and pain at outcome visit one and two, depression symptoms at outcome visit one, and drop in depression symptoms. A scatter plot of drop in pain by drop in depression revealed a linear relationship between the two variables. Since the variables Drop in Pain and Drop in Depression were calculated by subtracting time one and time two scores for pain and depression; the time one and two pain and depression scores are not included as predictors in the multiple regression (Glymour, Weuve, Berkman, Kawachi, & Robins, 2005). For the variables of age, gender, health, and intake depression there was no significant linear relationship with Drop in Pain. However, these variables were retained in the model due to their significance in the allopathic pain research.

A paired t-test was conducted between time one and time two means for pain and depression score. On average, participants reported higher levels of pain at time 1 (M=6.93, SD=1.13), than those reported at time 2 (M=3.92, SD=1.06). This difference, 3.01, BCa 95% CI [2.80, 3.23] was significant t (102) = 27.59, p≤ .000. Meanwhile, participants reported higher levels of depression at time1 (M=3.44, SD=1.76), than the scores of depression reported by participants at time 2 (M=1.12; SD=1.22). This difference, 2.32, BCa 95% CI [2.15, 2.51] was also significant t (102) = 21.85, p≤ .000.

Using the Enter option multiple regression was selected to answer the research question. Drop in pain was selected as the dependent variable, and drop in depression, intake depression,

number of health conditions, gender, and age were the independent variables. A low level of multicollinearity was present as evidence by VIFs between 1.09 and 1.26. One outlier was present, but not a priori unusual, and therefore the outlier was retained in the final model. The overall significance (alpha = 0.05) and the significance of each variable in the model does not change with or without the outlier; however, the outlier does result in a drop in R^2. The remaining assumptions for multiple regression were satisfied. Results of the regression supported a significant relationship between the dependent variable and drop in depression (R^2 =.199, F (5,97)= 4.826, p<.001); none of the other predictors were significant. Beta coefficients, t tests, and significance levels are reported in Appendix C, Table 5.

Discussion

Drop in pain from time one to time two was predicted by drop in depression over the same time period. In this sample age, gender, number of health conditions, and intake depression did not predict drop in pain. The group of participants with intake depression had significantly higher mean scores for both pain and depression at time one, as compared to the group participants rated with no intake depression. There was no significant difference in the absolute scores for drop in pain and drop in depression between the two groups. Drop in pain across both groups was clinically significant, with a VAS drop of greater than three, according to Kovacs et al. (2012), "improvements in pain and disability were defined as any reduction in the VAS [. . .] with a minimum value of 1.5 for VAS.

This project completes the first stage of a clinical practice improvement initiative, by determining the relationship between chronic pain and depression symptoms in a physical medicine setting. Within the allopathic practice setting, the effects of chronic pain and its relationship to depression are well-documented in the scholarly literature. However, studies

specific to the physical medicine setting are absent in the scholarly literature. Therefore, the results of this physical medicine study, and attempts to translate these results into clinical practice, must be considered within the context of the existing allopathic literature.

Allowing for potential differences between this sample and other populations represented in the scholarly literature, the present study triggers some short and long term recommendations. First, clinicians should review the depression item in the current intake packet administered at time one, and administered again at the fourth week visit (time two) to determine level of depression rating. For any patient reporting depression at intake or during the fourth week visit, a follow up depression scale should be administered to determine whether or not the patient meets the criteria for a diagnosis of depression; or alternatively that the patient is reporting the presence of depressive symptoms, but does not meet the criteria for a diagnosis of depression. This could be achieved by using PHQ-9, which is used for depression screening in many healthcare settings (Kocalevent, Hinz, & Brahler, 2013). Results of the follow-up depression scale will guide the clinician in determining need for treatment, either within the clinic, or from a referral to their PCP or the psychiatry. It is possible that stakeholders of the company might not be willing to screen and treat patients for depression. Providers might prefer referring to a primary care provider or a mental health specialist, rather than adding depression treatment to the menu of services.

Clearly, clinical, legal, and ethical aspects of having documented depression symptoms in the clinical record, in the absence of protocols to address these symptoms, are of concern. These aspects may be highlighted in discussions aimed at promoting practice change. Minimal clinician behaviors would include a) attending to intake depression and depression rating at the fourth week visit, b) administering a brief depression scale as indicated, and c) following up with

treatment and/or referral as indicated. This could be achieved by using PHQ-9, which is used for depression screening in many healthcare settings (Kocalevent, Hinz, & Brahler, 2013).

Results of this investigation may be used to educate and support providers on the importance of attending to symptoms of depression during the treatment of patients diagnosed with chronic pain. Symptom assessment and evaluation is a function of patient reporting, and provider knowledge and skill in symptom recognition. However, provider confusion about the chronic pain-depression link, and uncertainty about assessment and treatment options, leads to an adverse prognosis for symptom resolution (Linton & Bergbom, 2011). Moreover, Reme and Eriksen (2010) asserted that depression symptoms could be identified in minimal time by replacing an entire questionnaire with one screening question in order to conduct an assessment for depression. The PHQ-9 is a well-known scale, and is used for depression screening in many healthcare settings (Kocalevent, Hinz, & Brahler, 2013). Therefore, depression screening should be the gold standard of care in patients with chronic pain, as clinicians' failure to treat both conditions results in poor outcomes (Linton & Bergbom, 2011).

McAllister (2013) presents research from the institute of chronic pain, showing that depression and chronic pain are part of the emotional conditions and physical sensations that form a vicious cycle. This prompts the idea that pain causes depression, which accentuates the pain, so that pain can become chronic affecting thought, mood, and behavior, so that the cycle perpetuates itself. Therefore, we should break the cycle and reach better results by detecting depression and depressive symptoms using a depression scale such as the well-known PHQ-9, to assess depression and look again at the relationship between symptoms and diagnosis of depression and treatment of chronic pain.

Summary and Conclusions

More research is needed on the topic of chronic pain and depression in the physical medicine setting, particularly in the form of RCTs. Studies representing the last five years were primarily cross-sectional, correlational; although two longitudinal and two systematic reviews added strength to the overall evidence. Sampling was for the most part convenience, and sample size ranged from 54 to 5094. Measurement of demographic/background and outcome variables occurred using study-specific measures, and a number of different theoretical models, making comparisons difficult for changes in pain and depression.

Depression is a prevalent condition in the general population, and even more so in patients with chronic pain (Arora, Kuhad, Tiwari, & Chopra, 2011). Failure to recognize and treat depression impacts on the treatment response of patients with chronic pain, and their degree of rehabilitation. This suggests that a standard approach to screening for depression of all patients presenting with chronic pain should become the standard of care. Data from the proposed study can provide support for the implementation of a standard approach to screening, treatment and/or referral in patients with chronic pain who report symptoms of depression.

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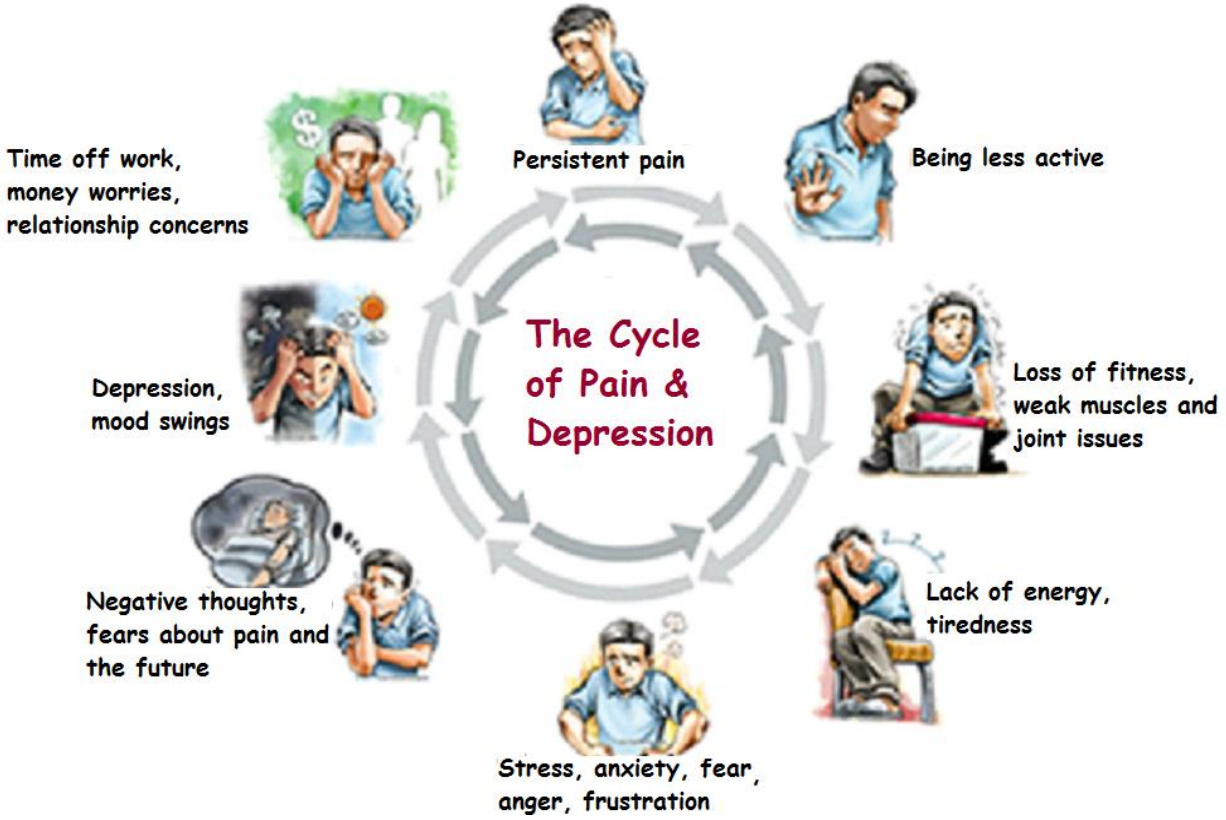
Appendix A

The Model of Chronic Pain: Relationship to Depression



Note: Adapted from: Craig et al., 2013; Janevic, Rosland, Wiitala, Connell, & Piette, 2012; Kroenke, Theobald, Wu, Loza, Carpenter, & Tu, 2010

Appendix B

BACK BOURNEMOUTH QUESTIONNAIRE

Patient Name _____ Date _____

Instructions: The following scales have been designed to find out about your back pain and how it is affecting you. Please answer ALL the scales, and mark the ONE number on EACH scale that best describes how you feel.

1. Over the past week, on average, how would you rate your back pain?

No pain — Worst pain possible

0 1 2 3 4 5 6 7 8 9 10

2. Over the past week, how much has your back pain interfered with your daily activities (housework, washing, dressing, walking, climbing stairs, getting in/out of bed/chair)?

No interference — Unable to carry out activity

0 1 2 3 4 5 6 7 8 9 10

3. Over the past week, how much has your back pain interfered with your ability to take part in recreational, social, and family activities?

No interference — Unable to carry out activity

0 1 2 3 4 5 6 7 8 9 10

4. Over the past week, how anxious (tense, uptight, irritable, difficulty in concentrating/relaxing) have you been feeling?

Not at all anxious — Extremely anxious

0 1 2 3 4 5 6 7 8 9 10

5. Over the past week, how depressed (down-in-the-dumps, sad, in low spirits, pessimistic, unhappy) have you been feeling?

Not at all depressed — Extremely depressed

0 1 2 3 4 5 6 7 8 9 10

6. Over the past week, how have you felt your work (both inside and outside the home) has affected (or would affect) your back pain?

Have made it no worse — Have made it much worse

0 1 2 3 4 5 6 7 8 9 10

7. Over the past week, how much have you been able to control (reduce/help) your back pain on your own?

Completely control it — No control whatsoever

0 1 2 3 4 5 6 7 8 9 10

_____
Examiner

OTHER COMMENTS: _____

With Permission from: Bolton JE, Breen AC: The Bournemouth Questionnaire: A Short-form Comprehensive Outcome Measure. I. Psychometric Properties in Back Pain Patients. *JMPT* 1999; 22 (9): 503-510.

QUADRUPLE VISUAL ANALOGUE SCALE

Patient Name _____ Date _____

Please read carefully:

Instructions: Please circle the number that best describes the question being asked.

Note: If you have more than one complaint, please answer each question for each individual complaint and indicate the score for each complaint. Please indicate your pain level right now, average pain, and pain at its best and worst.

Example:

	Headache				Neck			Low Back			
No pain	0	1	(2)	3	4	(5)	6	7	(8)	9	10	**worst possible pain**

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1 – What is your pain RIGHT NOW?

No pain	0	1	2	3	4	5	6	7	8	9	10	**worst possible pain**

2 – What is your TYPICAL or AVERAGE pain?

No pain	0	1	2	3	4	5	6	7	8	9	10	**worst possible pain**

3 – What is your pain level AT ITS BEST (How close to "0" does your pain get at its best)?

No pain	0	1	2	3	4	5	6	7	8	9	10	**worst possible pain**

4 – What is your pain level AT ITS WORST (How close to "10" does your pain get at its worst)?

No pain	0	1	2	3	4	5	6	7	8	9	10	**worst possible pain**

OTHER COMMENTS:

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_____

_____
Examiner

Reprinted from *Spine*, 18, Von Korff M, Deyo RA, Cherkin D, Barlow SF, Back pain in primary care: Outcomes at 1 year, 855-862, 1993, with permission from Elsevier Science.

Appendix C

Table 1

Descriptive Socioeconomic Demographics and Clinical Characteristics of the Sample (N = 103)

Characteristic Measures	*Values*
Gender, n (%) female	75(72.8)
Age, mean (SD)	42.86(11.82)
Health conditions mean (SD)	6.64(3.48)
Intake Depression, n (%)	41(39.8)
Pain1, mean (SD)	6.93(1.13)
Pain2, mean (SD)	3.92(1.06)
Drop in Pain, mean (SD)	3.01(1.11)
Depression1, mean (SD)	3.44(1.76)
Depression2, mean (SD)	1.11(1.22)
Drop in Depression, mean (SD)	2.32(1.08)

Note. SD = standard deviation; N = number of study participants.

Table 2

Pearson Correlations

	Age	*Pain*	*Pain2*	*Depress*	*Depres2*	*Health*	*DropP*	*DropD*
Age	-----	.156	.217*	.100	.056	.324**	-.049	.099
Pain		-----	.493**	.459**	.325**	.205*	.549**	.380*
Pain2			-----	.197*	.301**	.212*	-.457**	-.021
Depress				-----	.797**	.376**	.280**	.727**
Depres2					-----	.348**	.043	.165
Health						-----	.006	.219*
Drop Pain							-----	.408*
DropD								-----

Note. N=103.
*. Correlation is significant at the 0.05 level (2-tailed)
**. Correlation is significant at the 0.01 level (2-tailed)
Pain = Pain rating at first outcome visit; Pain 2 = Pain rating at second outcome visit; Depress = Depression symptom rating at first outcome visit; Depres2 = Depression symptom rating at second outcome visit; Health = Number of health conditions checked on intake paperwork; Drop P = Change in pain rating from outcome visit one to outcome visit two; Drop D = Change in depression rating from outcome visit one to outcome visit two.

Table 3

Paired Samples t-Test for Pain

		Paired Differences					*t*	*df*	*Sig. (2-tailed)*
		Mean	*Std. Deviation*	*Std. Error Mean*	*95% Confidence Interval of the Difference*				
					Lower	*Upper*			
Pair 1	Pain-Pain2	3.00971	1.10698	.10907	2.79336	3.22606	27.593	102	.000

Table 4

Paired Samples t-Test for Depression

	Paired Differences					*t*	*df*	*Sig. (2-tailed)*
	Mean	*Std. Deviation*	*Std. Error Mean*	*95% Confidence Interval of the Difference*				
				Lower	*Upper*			
Pair 1 Depr1-Depr2	2.32039	1.07752	.10617	2.10980	2.53098	21.855	102	.000

Table 5

Multiple Regression

Variables	*B*	*Beta*	*t*	*95% CI*
Constant	2.523***		5.879	[1.672, 3.375]
Drop Depression	.468***	.455	4.800	[.274, .661]
Intake D	.029	.013	.126	[-.428, .486]
Health	-.016	-.050	-.459	[-.085, .053]
Gender	-.372	-.150	-1.580	[-.840, .095]
Age	-.005	-.058	-.600	[-.023, .013]
R	.446			
R2	.199			
Adjusted R2	.158			
F	4.826			
ΔR2	.199			
Δ F	4.826 ***			
Standard Error	1.01581			

Note: N=103. CI=confidence interval.*p<.05;**p<.01;***p<.001(two-tailed).