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Chronic physical health problems moderate changes in depression and substance use among dual diagnosed individuals during and after treatment

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Abstract

Background—Physical illnesses frequently co-occur with depression and substance use disorders and may impact their improvement. Physical illness symptoms may overlap with or exacerbate somatic symptoms of depression. Individuals may use substances to cope with symptoms of physical illness.

Objectives—We examined whether chronic physical health problems moderated changes in depression and substance use among dual diagnosed individuals during and in the year following treatment.

Methods—Participants were recruited from a Veterans Affairs dual diagnosis outpatient program between March 2000 and November 2007 and were randomized to either Integrated Cognitive-Behavioral Therapy or Twelve-Step Facilitation Therapy. A total of 214 veterans with assessment data for the variables of interest were included in analyses. Participants completed quarterly depression, substance use, and health assessments over an 18 month period. We used linear mixed effects models to analyze patterns of change for depression and substance use.

Results—Individuals with severe chronic health problems and higher intake depression showed slower improvements in both non-somatic and somatic depression symptoms. Individuals with severe chronic health problems and higher midtreatment substance use showed less improvement in substance use.

Conclusions—Assessing and addressing physical health issues during depression and substance use disorder treatment may improve outcomes.

Keywords

physical health; depression; substance use disorder; treatment

Introduction

Major depressive disorder has been identified as the second leading cause of disability and substance use disorders as the second leading cause of premature mortality in the United States (Murray et al., 2013). Problematically, depression and substance use disorders frequently co-occur. In the general population, studies have reported the lifetime prevalence of depression in individuals with current substance dependence as 21% and 27% (Currie et al., 2005; Kessler et al., 2003; respectively), and the severity of each disorder is impacted by the other (Swendsen and Merikangas, 2000). Individuals with higher depression levels are 20% less likely to achieve abstinence at the end of substance treatment (Dodge, Sindelar, and Sinha, 2005) and abstinent individuals were three times more likely to relapse into dependence if they have depression (Hasin et al., 2002). Depression increased the likelihood of a suicide attempt by a factor of five for individuals in substance treatment (Aharonovich, Liu, Nunes, and Hasin, 2002).

Physical illnesses may hinder efforts to reduce depression. Somatic symptoms of depression in particular may fail to improve following psychotherapy if the somatic symptoms are caused or exacerbated by health problems. Bus et al. (2011) found that atherosclerosis caused somatic symptoms that were misinterpreted as somatic symptoms of depression. Further, both depression and baseline markers of chronic medical illness are highly associated with levels of somatic symptoms (Katon, Lin, and Kroenke, 2007). Researchers have therefore questioned whether including somatic symptoms when assessing depression in medical settings is diagnostically meaningful (Bus et al., 2011; Clark, Cavanaugh, and Gibbons, 1983).

Efforts to reduce substance use may also be negatively affected by physical illness. Among problem drinkers, 38% reported using alcohol to manage pain as compared to 15% of non-problem drinkers (Brennan, Schutte, and Moos, 2005). In methadone treatment programs, 42% of individuals with severe chronic pain reported pain as the reason for first using drugs (Rosenblum et al., 2003). More than half of individuals in alcohol treatment programs had sleep disturbances that predated alcohol dependence (Currie, Clark, Rimal, and Malhotra, 2003) and 60% of patients with insomnia relapsed to alcohol use as compared to only 30% of patients without insomnia (Brower, Aldrich, Robinson, Zucker, and Greden, 2001).

Unfortunately, individuals with comorbid depression and substance use disorders commonly have medical problems (Erfan, Hashim, Shaheen, and Sabry, 2010). Depression is associated with asthma, back problems, gastrointestinal disorders, genitourinary conditions, musculoskeletal conditions, fibromyalgia, immunodeficiency syndrome, cancer, cardiac diseases, and endocrine disorders (Gagnon and Patten, 2002; Wittchen, Lieb, Wunderlich, and Schuster, 1999). Substance dependence is associated with cardiovascular, neurological, gastrointestinal, respiratory, dermatological, and dental problems (Keaney et al., 2011). Clinical trials however, often exclude participants with severe medical illnesses

(Zimmerman, Mattia, and Posternak, 2002) or do not assess physical health problems (e.g., Bockting et al., 2005; Liu et al., 2009).

The present study investigated whether chronic physical health problems moderated changes in depression symptoms and substance use over time among individuals during and in the year after treatment for co-occurring depression and substance use disorder. Participants were Veterans participating in a clinical trial evaluating two psychotherapy interventions: Integrated Cognitive-Behavioral Therapy (ICBT) + standard pharmacotherapy and Twelve-Step Facilitation Therapy (TSF) + standard pharmacotherapy. Both interventions were successful at reducing depression and substance use *[name deleted to maintain the integrity of the review process]*. Unlike most clinical trials, our study assessed the presence and severity of a range of medical illnesses during and after treatment and did not exclude individuals with medical illness. We hypothesized that in both interventions, physical health problems would result in less improvement in depression somatic symptoms and substance use during and in the year following treatment.

Methods

Participants

The study was approved by Veterans Affairs (VA) *[name deleted to maintain the integrity of the review process]* and *[name deleted to maintain the integrity of the review process]* Institutional Review Boards. A total of 260 people from the VA dual diagnosis outpatient clinic consented to participate in the clinical trial, of which 214 participants with assessment data for the variables of interest were included in our analyses. Inclusion criteria for participation were the presence of a current Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM-IV) diagnosis of alcohol, cannabis, and/or stimulant dependence with use in the past 90 days and diagnosis of substance-independent major depressive disorder established by fulfilling criteria for having a current major depressive episode and at least one lifetime major depressive episode occurring without substance use involvement. We excluded participants if they: (a) met DSM-IV criteria for bipolar disorder, psychotic disorder, or opiate dependence through intravenous administration, (b) lived more than 50 miles away, or (c) had documented cognitive deficits that would impair recall for assessments. Participants with co-occurring Axis I and Axis II disorders, with the exception of bipolar disorder and psychotic disorder, were not excluded. The sample was primarily male (89%) and Caucasian (72%), with a mean age of 49 years ($SD = 8$) and an average of 14 years of education ($SD = 2$).

Procedure

Recruitment was conducted between March 2000 and November 2007. Eligible participants were told about the nature of the study. Participants provided written informed consent to: (a) participate in a 24 week long group treatment and randomization to either ICBT or TSF intervention, (b) participate in assessment interviews at seven time points over the course of 18 months: intake, midtreatment (12 weeks), end of treatment (24 weeks), and four quarterly follow-up assessments during the year following treatment, (c) random toxicology screenings, (d) not participate in any other formal depression or substance use intervention

during the 24 week treatment period with the exception of community 12-step meetings and pharmacotherapy. After consent, participants completed the intake research assessment and were sequentially assigned to either the ICBT or TSF intervention group based on the next available entry date. Both interventions were designed to allow for rolling admissions once every two weeks and included 36 sessions: two 60-minute group sessions per week for 12 weeks, followed by one 60-minute group session per week for 12 weeks thereafter.

All participants were provided pharmacotherapy appointments with VA clinic psychiatrists and psychotropic medications were prescribed using standard VA protocol. Given the nature of this study in a clinical context, participants, clinical staff, and research interviewers were not blind to participants' intervention assignment.

Interventions

Integrated Cognitive-Behavioral Therapy—The ICBT intervention was a combination of cognitive-behavioral strategies for alcohol use disorder from Cognitive-Behavioral Coping Skills Training (Kadden et al., 1992) and cognitive-behavioral strategies for depression from Group Therapy Manual for Cognitive-Behavioral Treatment of Depression (Muñoz, Ying, Perez-Stable, and Miranda, 1993). The intervention focused primarily on teaching participants to manage negative cognitions, increase healthy activities, and build social networks. Participants were taught and practiced: identifying maladaptive cognitions and generating alternative cognitions in the thoughts module, scheduling and assessing the effectiveness of activities for increasing positive affect and decreasing pressure to use in the behavioral module, and assertiveness and communication skills to increase positive social interactions and ability to resist social pressure in the interpersonal module.

Twelve-Step Facilitation Therapy—The TSF intervention was a therapist guided group intervention based on the Twelve-Step Facilitation Therapy Manual (Nowinski, Baker, and Carroll, 1994) which focused on teaching Alcoholics Anonymous (AA) Steps 1-5 as well as addressing topics common in AA. Sessions consisted of reviewing relevant readings (e.g., AA Big Book), learning AA steps, and discussing recovery tasks (e.g., going to 12-step meetings, obtaining a sponsor). Depression issues were not addressed and if raised by participants, were discussed in the context of TSF themes and were encouraged to be discussed at pharmacotherapy appointments.

Additional details on both interventions are available in prior study publications (*[name deleted to maintain the integrity of the review process]; [name deleted to maintain the integrity of the review process]; [name deleted to maintain the integrity of the review process]*).

Measures

Clinical Diagnosis—DSM–IV diagnoses of lifetime and current depression and substance use disorders (alcohol and 10 categories of drugs) were assessed at intake using the Composite International Diagnostic Interview, a structured interview developed by the World Health Organization to assess psychiatric symptoms independent of symptoms related to medical conditions or substance use/withdrawal (Robins et al., 1988). It has been

used to assess depression and substance use in national and international epidemiological studies (e.g., Darves-Bornoz et al., 2008; Kessler, Chiu, Demler, and Walters, 2005).

Depression Symptoms—Depression symptoms were assessed with the Hamilton Depression Rating Scale (HDRS) and the Beck Depression Inventory (BDI) at intake and quarterly thereafter.

The HDRS is a structured clinical interview assessing depression symptoms over the past week (Hamilton, 1960) with good sensitivity and specificity among addictions samples (Willenbring, 1986). The HDRS has four established subscales: Dysphoric Mood subscale, Dysfunctional Cognitions subscale, Vegetative Symptoms subscale, and Anxiety/Agitation subscale (Cleary and Guy, 1977; Hamilton, 1967; Mowbray, 1972).

The BDI is a self-report measure of depression symptoms over the past two weeks (Beck, Ward, Mendelson, Mock, and Erbaugh, 1961) with good reliability and validity among addictions samples (Moffett and Radenhausen, 1990). The BDI has two established subscales: Cognitive-Affective subscale and Somatic-Performance subscale (Beck and Steer, 1993).

For the present study, we used the depression symptom item means for the combination of the HDRS Dysphoric Mood and Dysfunctional Cognitions subscales and the BDI Cognitive-Affective subscale as the variables measuring non-somatic symptoms. We used the item means for the HDRS Vegetative Symptoms and the BDI Somatic-Performance subscales as the variables measuring somatic symptoms. The use of item means allowed for the standardization and comparison between the non-somatic symptom and the somatic symptom subscales in the HDRS and BDI.

Substance Use—The Timeline Follow-Back (Sobell and Sobell, 1992) was used to assess daily quantity and frequency of alcohol use and frequency of other substance use at intake and quarterly thereafter. Its validity and reliability have been demonstrated for individuals with psychiatric disorders and comorbid alcohol and/or substance use disorders (e.g., Carey, Carey, Maisto, and Henson, 2004). Random toxicology screens were conducted to maximize the reliability of the participants' self-reported use. We used Percentage of Days Abstinent (PDA) as the variable for evaluating substance use.

Physical Health—Physical health was assessed as part of a life stress assessment at intake and quarterly thereafter. The Psychiatric Epidemiology Research Interview, modified by the National Institute of Mental Health, Clinical Research branch (Hirschfield et al., 1977), is a self-report list of 133 stressors across 12 domains (work, financial, interpersonal, health, etc.). Trained research staff interviewed participants regarding details of each stressor endorsed on the checklist including duration, prognosis, and impact on life functioning. Two trained raters would rate each stressor according to the standardized rules and criteria of the Bedford College Life Events and Difficulties Schedule (Brown and Harris, 1978). Chronic health difficulties (CHD) comprised of health stressors continuing for longer than two weeks (e.g., chronic back pain, arthritis, diabetes) and CHD severity was rated based on the combined influence of all chronic health stressors on life functioning. We used CHD as an

indicator of physical health status. CHD status was coded 0 for no impact on life functioning, 1 for non-severe impact, and 2 for severe impact, and was updated every quarter.

Data Analytic Plan

We used linear mixed effects models to analyze changes in depression and substance use because of its ability to accommodate missing data resulting from variability in participant retention over time (Frees, 2004). We analyzed depression trajectories across seven time points (intake, midtreatment, end of treatment, and the four quarterly follow-up assessments) and substance use trajectories across six time points (midtreatment, end of treatment and the four quarterly follow-up assessments). Predictor variables used in each model were time (linear and quadratic) and covariates for intake depression symptom item mean scores and midtreatment PDA levels. CHD were factored into each model as a two-way and three-way interaction with time and intake depression or midtreatment PDA. Two control variables were factored into each model as time-invariant variables: age, centered at the mean age of the sample, and treatment condition (coded ICBT = 1, TSF = 0, ICBT as the reference group). These were random intercept models, where participants were included as the random factor and slopes were constant. The errors were modeled with an autoregressive structure on the first and second lags. Likelihood ratio tests (Casella and Berger 2002) were used to test the significance of sets of nested models, such that models with all CHD parameters were compared to models without any CHD parameters. This provides an omnibus test for all CHD parameters, and thus is a global test of the association of CHD with the patterns of depression and substance use.

Intake HDRS and BDI reflected depression severity at treatment entry, but intake PDA reflected substance use severity in the 90 days prior to study participation. As participants were in a variety of settings prior to treatment entry (e.g. medical or mental inpatient, detoxification, outpatient, etc.), patterns of use varied in ways not associated with severity and thus we used midtreatment PDA as an indicator of early substance use.

Models were estimated using Stata version 13.1 (Stata Corporation, 2013).

Results

Descriptive Results

Participants experienced a wide range of chronic physical health problems with musculoskeletal (arthritis and chronic back pain) being the most common. CHD severity was stable for the majority of participants, with changes over time being observed for 45 participants (17 improved, 28 worsened). The types of CHD that participants experienced prior to treatment entry are shown in Table 1.

Participants with CHD had higher starting depression levels but did not differ on midtreatment PDA. Intake depression scores, depression symptom item mean scores, and midtreatment PDA levels by CHD group are shown in Table 2.

Depression Outcomes

HDRS Models—The mixed effects models for the non-somatic subscale and the somatic subscale with nested CHD parameters were significant as compared to no CHD parameters (Likelihood Ratio $\chi^2_{(12)} = 22.07$, $p = 0.04$; Likelihood Ratio $\chi^2_{(12)} = 23.01$, $p = 0.03$, respectively). In both models, time, intake depression, intake depression by time interaction, and intake depression by time by CHD interaction predicted depression symptom item mean scores (Table 3). Among participants with higher intake depression levels, those with severe CHD showed slower improvements in non-somatic and somatic symptoms during the intervening time points compared to those with no CHD (intake HDRS $\times$ time $\times$ CHD, $p < 0.04$, Table 3; Figure 1). These differences were not observed for non-severe CHD compared to no CHD (intake HDRS $\times$ time $\times$ CHD, $p > 0.22$, Table 3; Figure 1).

BDI Models—The mixed effects models for the non-somatic and somatic subscales with nested CHD parameters were significant as compared to no CHD parameters (Likelihood Ratio $\chi^2_{(12)} = 25.42$, $p = 0.01$; Likelihood Ratio $\chi^2_{(12)} = 43.24$, $p < 0.01$, respectively). In both models, intake depression, intake depression by time interaction, and intake depression by time by CHD interaction predicted depression symptom item mean scores (Table 3). Trajectory patterns for the BDI were similar to the HDRS.

Intervention—Treatment condition (TSF vs. ICBT) as a time-invariant variable was significant for depression models ($p < 0.05$). Our prior clinical outcomes publication reported these differences [*name deleted to maintain the integrity of the review process*], and therefore we created extended depression models with treatment condition included as a predictor variable. Interactions between treatment and CHD were non-significant for all extended models ($p > 0.05$).

Substance Use Outcomes

The mixed effects model for PDA with nested CHD parameters was significant as compared to no CHD parameters (Likelihood Ratio $\chi^2_{(12)} = 190.58$, $p < 0.01$). Time, midtreatment PDA, time by CHD, midtreatment PDA by time interaction, and midtreatment PDA by time by CHD interaction predicted PDA levels (Table 3). Although PDA levels for the three CHD groups did not differ significantly at midtreatment (Table 2), participants with severe CHD engaged in greater substance use during the following time points as compared to participants with no CHD (time $\times$ CHD, $p = 0.03$, Table 3) and this pattern was observed only for participants with lower midtreatment PDA levels (midtreatment PDA $\times$ time $\times$ CHD, $p < 0.04$, Table 3; Figure 2). These differences were not observed for non-severe CHD compared to no CHD (time $\times$ CHD, $p > 0.62$, midtreatment PDA $\times$ time $\times$ CHD, $p > 0.62$, Table 3; Figure 2).

Discussion

This study examined whether chronic physical health problems moderate changes in depression and substance use over time among dual diagnosed individuals during and in the year following treatment. More than two-thirds of our sample had chronic health problems and a quarter of our sample had chronic health issues designated as severe, indicative of

significant negative impact on life functioning. We hypothesized that somatic symptoms of depression would improve less due to overlap with symptoms of medical illness. Contrary to our expectations, non-somatic symptom change was similar to somatic symptom change. Both somatic and non-somatic symptoms improved slower among individuals with severe physical health problems and higher initial depression. Similar course for both somatic and non-somatic symptoms suggests that somatic symptoms are diagnostically meaningful indicators of depression and show changes during and after treatment even among people with physical health issues. Similar non-somatic and somatic improvements over time for both the clinician interview Hamilton Depression Rating Scale and self-report Beck Depression Inventory heightens confidence in our findings.

We also hypothesized that physical health problems would hinder substance use improvement because individuals may use substances to cope with physical health symptoms such as pain and sleep problems. This hypothesis was supported for individuals with severe physical health problems and substance use in early treatment. Researchers have observed similarities in the chronic nature of substance use disorders and medical disorders, advocating for long-term continuing care for both (McLellan, Lewis, O'Brien, and Kleber, 2000). Co-occurring medical disorders may contribute to the chronicity of substance use observed.

It is possible that medical illnesses could hinder therapy session attendance thus leading to worse outcomes, but our past research found this not to be the case in our sample [*name deleted to maintain the integrity of the review process*]. Nonetheless, medical illnesses may compromise improvement through other means such as limiting a person's ability to practice behavioral coping techniques. Stress resulting from medical illness could decrease concentration and attention during therapy sessions as well as when practicing coping techniques. Lastly, chronic medical illnesses are associated with a greater vulnerability for developing learned helplessness (Chaney et al., 1999; Hermann, 1979) which may interfere with receptivity to interventions, retention of treatment gains, and self-efficacy.

Future studies could investigate whether an adjunct component focusing on managing physical health concerns would improve treatment outcomes for depression and substance use disorders. A chronic disease self-management program improved self-reported health distress and disability (Lorig et al., 1999) and both acceptance and commitment therapy and cognitive-behavioral therapy for chronic pain reduced pain interference (Wetherell et al., 2011).

Individuals may use substances as a means of coping with depression (Coelho et al., 2000; Weiss, Griffin, and Mirin, 1992; [*name deleted to maintain the integrity of the review process*]). If symptoms were only measured during treatment as is often the case in clinical settings, physical health problems would appear to have less influence on substance use and more adverse effects on depression. During our follow-up timeframe however, depression symptoms continued to improve while substance use worsened among individuals with severe chronic physical health problems. This warrants further study.

Our findings should be interpreted in the context of several limitations. Due to a predominately male veteran sample, our results require replication in other samples to support generalizability. The comorbid nature of the sample also limits generalizability to individuals meeting criteria for only depression or substance use disorder. Further, we could not examine differences in treatment response relative to physical health status due to the lack of a no treatment control group. Lastly, the life stress assessment used in this study does not directly assess the severity of medical illness or pain which has been associated with treatment outcomes for both depression and substance use (Bair et al., 2004; Trafton, Oliva, Horst, Minkel, and Humphreys, 2004). Medical illness severity, including pain, were taken into account in our life stress assessment indirectly based on their influence on a person's life functioning (e.g., sleep disruption, limitations on activities such as work and hobbies/sports) thus allowing for the inclusion and evaluation of a broad range of medical illnesses typically seen in clinical samples. Replication with other methods for assessing physical health status would be of value.

This research expands on the limited literature regarding the impact of physical health on depression and substance use disorder treatment. Our findings of slower improvements in depression symptoms and increased substance use during and in the year following treatment for individuals with severe physical health problems lend support for assessing physical health status in mental health settings. Individuals with severe health issues may benefit from increased monitoring, booster sessions, or adjunctive interventions addressing health concerns.

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Glossary

<i>Chronic health difficulties</i>	Physical medical conditions that are on-going, continuing for more than two weeks (e.g., chronic back pain, arthritis, diabetes) that objectively impact life functioning (impair ability to work, decrease participation in pleasurable activities, negatively impact finances, etc.)
<i>Non-somatic depression symptoms</i>	Cognitive and affective symptoms of depressive episodes such as pessimism, indecisiveness, sadness, and crying
<i>Somatic depression symptoms</i>	Physical symptoms associated with depressive episodes such as fatigue and changes in sleep and appetite
<i>Trajectory</i>	Patterns of change in some variable (e.g. depression, substance use) over time for individuals

Biographies

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Sandra A. Brown, Ph.D., is Vice Chancellor for Research and a Distinguished Professor of Psychology and Psychiatry at the University of California, San Diego. Dr. Brown is internationally recognized for her developmentally focused alcohol and drug intervention research. Her primary foci include models of clinical course for substance abuse, psychiatric comorbidity, as well as neurocognitive and psychosocial factors influencing transitions out of alcohol and drug problems. Dr. Brown's research yielded pioneering information on adolescent addiction and the relapse process for youth, as well as long term outcomes for clinical samples of youth who have experienced alcohol and drug problems.

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Figure 1.

Modeled non-somatic and somatic trajectories for the Hamilton Depression Rating Scale based on intake depression symptom item mean scores and chronic health severity. The three panels depict estimated linear mixed effects model trajectories for participants with intake item mean scores at 1.00 (25% of max score), 2.00 (50% of max score), and 3.00 (75% of max score). Shaded regions are 95% confidence bands.

Figure 2.

Modeled substance use trajectories based on midtreatment Percentage of Days Abstinent and chronic health severity. The three panels depict estimated linear mixed effects model trajectories for participants with midtreatment Percentage of Days Abstinent levels at the 10th, 50th, and 90th percentile of the sample. Shaded regions are 95% confidence bands.

Table 1
Frequency and percentage of individuals with non-severe and severe Chronic Health Difficulties in the 90 days prior to treatment entry by health category

Health Category	Non-Severe CHD (<i>n</i> = 85)	Severe CHD (<i>n</i> = 60)
Cardiovascular	23 (27%)	26 (43%)
Pulmonary	13 (15%)	15 (25%)
Gastrointestinal	21 (25%)	14 (23%)
Genitourinary/Gynecology	7 (8%)	9 (15%)
Musculoskeletal	58 (68%)	43 (72%)
Eye, Ear, Nose & Throat	7 (8%)	6 (10%)
Trauma	2 (2%)	1 (2%)
Dermatology	2 (2%)	4 (7%)
Neurology	9 (11%)	8 (13%)
Diabetes	9 (11%)	17 (28%)
Dental	4 (5%)	1 (2%)
Cancer	0 (0%)	2 (3%)
HIV	2 (2%)	3 (5%)
Other	2 (2%)	0 (0%)
Total	159 ^a	149 ^b

Note.

^a 159 health problems reported by 85 participants with non-severe chronic health difficulties ($M = 1.9$ health problems per person, $SD = 0.9$).

^b 149 health problems reported by 60 participants with severe chronic health difficulties ($M = 2.5$ health problems per person, $SD = 1.2$).

Table 2

Intake Depression and midtreatment Percentage of Days Abstinent by Chronic Health Difficulty severity.

	No CHD (<i>n</i> = 69)	Non-Severe CHD (<i>n</i> = 85)	Severe CHD (<i>n</i> = 60)
Intake Sample Characteristics	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)
Intake HDRS Mean	25.54(10.19)	29.52(10.95)*	31.35(10.83)*
Intake HDRS Non-Somatic Item Mean	1.11(0.53)	1.33(0.52)*	1.30(0.52)*
Intake HDRS Somatic Item Mean	1.22(0.57)	1.45(0.70)*	1.65(0.74)*
Intake BDI Mean	22.89(9.22)	24.76(11.02)	26.73(11.14)
Intake BDI Non-Somatic Item Mean	1.14(0.49)	1.19(0.56)	1.24(0.55)
Intake BDI Somatic Item Mean	1.00(0.49)	1.17(0.56)	1.31(0.59)*
Midtreatment PDA	0.91(0.17)	0.92(0.17)	0.90(0.20)

*Note.** $p < 0.05$ compared to no chronic health difficulties.

Table 3

Mixed effects models for Beck Depression Inventory and Hamilton Depression Rating Scale non-somatic and somatic symptom subscales and Percentage of Days Abstinent.

Variables	HDRS				BDI		PDA	
	Non-Somatic		Somatic		Non-Somatic		Somatic	
	<i>B</i> (<i>SE</i>)	<i>B</i> (<i>SE</i>)	<i>B</i> (<i>SE</i>)	<i>B</i> (<i>SE</i>)	<i>B</i> (<i>SE</i>)	<i>B</i> (<i>SE</i>)	<i>B</i> (<i>SE</i>)	<i>B</i> (<i>SE</i>)
CHD								
non-severe	-0.09(0.20)	-0.01(0.20)	0.22(0.19)	0.16(0.17)	0.05(0.36)			
severe	0.07(0.22)	0.12(0.23)	0.07(0.22)	-0.04(0.19)	0.45(0.36)			
Time (linear)	0.30(0.10)[†]	0.29(0.12)[*]	0.06(0.11)	0.16(0.09)	0.44(0.18)[*]			
Time (quadratic)	-0.03(0.02)	-0.04(0.02)[*]	0.00(0.02)	-0.02(0.02)	-0.05(0.03)			
Time (l) × CHD								
non-severe	0.01(0.15)	-0.10(0.16)	0.04(0.14)	0.10(0.12)	-0.12(0.24)			
severe	-0.25(0.16)	-0.21(0.17)	-0.18(0.16)	-0.09(0.14)	-0.52(0.24)[*]			
Time (q) × CHD								
non-severe	-0.00(0.02)	0.03(0.03)	-0.01(0.02)	-0.02(0.02)	0.02(0.03)			
severe	0.04(0.03)	0.05(0.03)	0.03(0.03)	0.03(0.02)	0.06(0.03)			
Intake	0.94(0.11)[†]	0.96(0.12)[†]	1.03(0.12)[†]	1.01(0.11)[†]	1.39(0.30)[†]			
Intake × Time (l)	-0.44(0.08)[†]	-0.37(0.09)[†]	-0.23(0.09)[*]	-0.29(0.09)[†]	-0.51(0.20)[*]			
Intake × Time (q)	0.05(0.01)[†]	0.05(0.02)[†]	0.02(0.02)	0.04(0.02)[*]	0.06(0.03)[*]			
Intake × CHD								
non-severe	0.01(0.14)	0.00(0.14)	-0.17(0.15)	-0.14(0.14)	-0.05(0.39)			
severe	-0.04(0.16)	-0.06(0.15)	-0.09(0.17)	-0.02(0.15)	-0.53(0.40)			
Intake × Time (l) × CHD								
non-severe	0.08(0.11)	0.11(0.11)	-0.01(0.11)	-0.05(0.11)	0.12(0.26)			
severe	0.31(0.12)[*]	0.22(0.12)	0.24(0.12)[*]	0.22(0.12)	0.60(0.26)[*]			
Intake × Time (q) × CHD								
non-severe	-0.01(0.02)	-0.02(0.02)	0.00(0.02)	0.01(0.02)	-0.02(0.04)			
severe	-0.05(0.02)[*]	-0.04(0.02)[*]	-0.04(0.02)	-0.04(0.02)[*]	-0.08(0.04)[*]			

Variables	HDRS		BDI		PDA
	Non-Somatic		Somatic		
	B(SE)	B(SE)	B(SE)	B(SE)	B(SE)
Treatment	0.10(0.05)*	0.13(0.05)*	0.10(0.05)	0.10(0.05)*	0.01(0.02)
Age	-0.01(0.00)*	-0.00(0.00)	-0.01(0.00)	-0.01(0.00)	0.00(0.00)
Random					
Participant	0.19(0.05)	0.24(0.04)	0.22(0.04)	0.24(0.04)	0.08(0.02)
Phi Lag 1	0.25(0.05)	0.20(0.05)	0.25(0.05)	0.23(0.06)	0.41(0.05)
Phi Lag 2	0.10(0.06)	0.05(0.05)	0.11(0.06)	0.13(0.07)	-0.14(0.06)
Error	0.48(0.02)	0.52(0.02)	0.45(0.02)	0.42(0.02)	0.20(0.01)

Note.

* $p < 0.05$;

† $p < 0.01$.

CHD = chronic health difficulties with no difficulties as the reference group, Intake = intake depression symptom item mean scores or midtreatment Percentage of Days Abstinent levels, Time (t) = linear change over time, Time (q) = quadratic change over time, Treatment = Integrated Cognitive-Behavioral Therapy as the reference group coded 1 and Twelve Step Facilitation Therapy coded 0.