HHS Public Access

Author manuscript

J Behav Med. Author manuscript; available in PMC 2021 February 01.

Published in final edited form as:

J Behav Med. 2020 February ; 43(1): 57–68. doi:10.1007/s10865-019-00056-x.

Assessing the Association of Depression and Anxiety with Symptom Reporting among Individuals with Type 2 Diabetes

Arielle G. Asman, MA[1], **Claire Hoogendoorn, PhD**[1], **M. Diane McKee, MD, MS**[2,3,4], **Jeffrey S. Gonzalez, PhD**[1,2,3,4]

[1]Ferkauf Graduate School of Psychology, Yeshiva University, Bronx, NY

[2]Albert Einstein College of Medicine, Bronx, NY

[3]Montefiore Health System, Bronx, NY

[4]New York Regional Center for Diabetes Translation Research, Bronx, NY

Abstract

Depression and anxiety have been linked to increased somatic symptoms among individuals with Type 2 diabetes (T2D), but their independent effects and role in symptom attributions remain unclear. This study examined depression and anxiety in relation to total symptoms and symptom attributions in a diverse sample of 120 adults with T2D. Multiple linear regression tested associations after controlling for medical comorbidities and insulin use. Clinician-rated depression (β=.53, p<.001), self-reported depression (β=.59, p<.001) and self-reported anxiety (β=.62, p<.001) were positively associated with total somatic symptoms. Models adjusting for depression and anxiety revealed significant independent effects for each, regardless of measurement method. In attribution models, only self-reported depression (β=.27, p=.003) was significantly associated with greater attribution to diabetes, whereas clinician-rated depression (β=.19, p=.047), self-reported depression (β=.38, p<.001) and anxiety (β=.28, p=.004) were associated with increased attribution to medications. In models adjusting for depression and anxiety, self-reported depression was a significant independent predictor of diabetes (β=.29, p=.023) and medication (β=.38, p=.004) attribution; anxiety was a significant predictor of medication attribution (β=.25, p=.039). Findings suggest depression and anxiety are implicated in overall increases in somatic symptom complaints and an increased tendency to attribute these symptoms to diabetes and side-effects of diabetes medications among adults with T2D.

Correspondence to: Jeffery Gonzalez, PhD, Ferkauf Graduate School of Psychology, 1300 Morris Park Avenue, Rousso Buildng, Bronx, NY 10461, Phone: 646-592-4506, Fax: 718-430-3960, jeffrey.gonzalez@einstein.yu.edu.

Conflict of Interest: The authors declare no conflict of interest

Ethical Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards

Informed Consent: Informed consent was obtained from all individual participants included in the study.

Keywords

Diabetes Mellitus; Type 2; Depression; Anxiety; Signs and Symptoms

Introduction

Diabetes Mellitus affects millions of people all over the world. As of 2015, an estimated 30 million individuals of all ages have diabetes, of which 7.2 million individuals are unaware or did not report having diabetes (Centers for Disease Control and Prevention, 2017). Type 2 diabetes (T2D) accounts for 90-95% of all diagnosed diabetes cases (Centers for Disease Control and Prevention, 2017). Moreover, depression and anxiety are highly prevalent among individuals with diabetes (Huang et al., 2010). Studies indicate that adults diagnosed with T2D have a 1.2 to 1.6 times higher prevalence of depression compared to adults without diabetes (Gonzalez et al., 2015; Anderson et al., 2001; Ali et al., 2006). The lifetime prevalence of anxiety disorders among individuals with either T1D or T2D is estimated to be 20% higher than individuals without diabetes (Li et al., 2008). The presence of depression and anxiety has been shown to influence symptom reporting of diabetes and medication treatment (Katon et al., 2007; Paschalides et al., 2004). While these relationships are important for understanding illness symptom experiences and reporting, they have not been adequately studied.

Uncontrolled diabetes can lead to a variety of significant health issues including, heart and kidney disease, retinopathy and foot problems (Centers for Disease Control and Prevention, 2017). The monitoring of diabetes symptoms and screening for the development of complications is crucial and a priority for health care providers (Lustman et al., 1989). Somatic symptoms related to diabetes are often seen as indicators of metabolic control and can lead to increased health care utilization and lab testing by providers (Lustman et al., 1989; Cienchanowski et al., 2003). While research has emphasized a wide range of possible somatic symptoms associated with blood glucose dysregulation, there is generally a reliable relationship between subjective experience of somatic symptoms and blood glucose changes within an individual (Freund et al., 1986; Pennebaker et al., 1981). Somatic symptoms commonly associated with blood glucose dysregulation include hunger, shakiness, weakness, thirst, polyuria, and lack of energy (Lustman et al., 1989; Freund et al., 1986; Pennebaker et al., 1981). Due to this association between somatic symptoms and blood glucose dysregulation, as well as patients' underutilization of blood glucose self-monitoring (Nicolucci et al., 2013), doctors often rely on patient symptom reports to guide their medical care (Barsky, 2000). Treatment and self-management decisions are often guided by how doctors and patients decide whether a symptom is a result of diabetes control, or not, versus indicating a side-effect of the prescribed treatment regimen for achieving control of diabetes. Common side effects of metformin, the first line medication usually prescribed for individuals with T2D, include nausea, vomiting, or diarrhea (Maruthur et al., 2016). Side effects of medications may also impact diabetes health outcomes. Research has demonstrated an association between perceived medication-related side effects and nonadherence to diabetes treatment and other chronic illness regimens (Chao et al., 2007; Grant et al., 2003; Catz et al., 2000; Perkins 2002).

Symptom experiences influence patients' understanding and mental representation of their disease, which in turn impacts how they respond to and manage their illness (Petrie & Weinman, 2006). Based on Leventhal's Common Sense Model (CSM) of Self-Regulation, individuals experience situational stimuli, which impact their cognitive representations of health threats based on their understanding of the identity, cause, timeline, consequences, control, and coherence of these stimuli (Leventhal et al., 2003). These illness representations are based on one's personal experience of symptoms or knowledge of other people with similar symptom experiences (Petrie & Weinman, 2006). Individuals use those symptom experiences to understand their illness and develop specific illness representations (Leventhal et al., 1997), which influence the selection of coping strategies or management behaviors (Leventhal et al., 1997; Petrie & Weinman, 2006). Studies suggest that individuals with chronic illnesses often neglect self-management behaviors during times when their illness is asymptomatic (Halm et al., 2006; Murphy et al., 1995). Additional research has linked concerns about side effects of medications to treatment nonadherence across a variety of patient populations (Horne et al., 1999). When somatic symptoms match with an individual's illness and treatment representations, they will likely be perceived as indicators of physical illness or changes associated with medication taking. This generally leads to self-care behaviors or treatment-seeking (Suls & Howren, 2012). The consequences of erroneous symptom labeling, or attribution can have serious implications for diagnosis, treatment, illness self-management, and health care utilization.

Prior research has found that individuals experiencing symptoms of mood and anxiety disorders are more likely to report higher numbers of medically unexplained somatic symptoms compared to those without depression and anxiety (Katon et al., 2007). Moreover, individuals with comorbid chronic illness and depression or anxiety disorders report increased number of chronic disease symptoms (Ludman et al., 2004; Lustman et al., 1986). The symptom-perception hypothesis is most often used to explain this association (Watson & Pennebaker, 1989). Initial research has focused on the role of negative affect (NA), specifically, on symptom reporting according to this hypothesis. NA is understood as a general dimension of subjective distress and includes a range of aversive mood states such as anger, disgust, fearfulness, and depression (Watson & Pennebaker, 1989). Individuals with elevated negative affect are internally focused and show greater recall of negative stimuli, particularly for self-referential information (Mineka et al., 1998). These experiences increase attention to minor somatic sensations and therefore could lead to a lower threshold to reporting all physical symptoms, particularly vague or ambiguous symptoms (Cienchanowski et al., 2003; Suls & Howren, 2012).

More recent findings have emphasized the differential effects of specific depression and anxiety symptoms. Suls & Howren (2012) argue that many NA scales contain items that overlap with depression and anxiety symptoms and thus propose accounting for the independent contributions of anxiety and depression on symptom reporting. Depression and anxiety generally have distinct cognitive-affective features. Depression tends to be associated with intensive self-focus and bias towards negative information (Koster et al., 2005) and rumination (Nolen-Hoeksema et al., 2008). These tendencies often lead to increased recall of negative experiences; on the other hand, anxiety is largely characterized by heightened attention to danger (Mineka et al., 1998) and hypervigilance to negatively

valenced stimuli (Bar-Haim et al., 2007). Other research has linked depression to increased reporting of past symptoms and anxiety to increased reporting of momentary symptoms (Suls & Howren, 2012).

Diabetes symptoms such as weakness and fatigue are often seen as ambiguous and therefore reported more often by individuals with depression (Lustman et al., 1989; Katon, 1998) Studies have examined the biasing impact of negative affect when illness symptoms are vague and difficult to differentiate from the psychophysical responses to emotional distress (Mora et al., 2007). Moreover, depression and anxiety share several somatic symptoms including, fatigue, changes in appetite, psychomotor slowing, and changes in sleep (Katon et al., 2007). Among individuals with diabetes, the overlapping nature of these somatic symptoms can lead to a misidentification of affective disorders when self-reported screeners for mood symptoms are used (Reddy et al., 2010; Twist et al., 2013; Katon et al., 2007).

Very few studies have examined the role of anxiety and depression in relation to patient attributions for their symptoms. Mora and collegues (2007) found that high levels of NA were associated with higher reports of both asthma and non-asthma symptoms; however, they did not find that NA was associated with misattribution of symptoms to the disease (Mora et al., 2007). Other studies have found symptom misattribution to be more closely associated with NA when perceived symptoms are ambiguous, particularly with mild or low disease severity (Chen et al., 2006). Consequently, the results may differ for illnesses with more ambiguous or vague symptoms, such as diabetes. One study conducted among individuals with T2D found that patients with high trait NA were more likely to attribute vague somatic symptoms to changes in blood glucose, even when these symptoms were unrelated to actual blood glucose levels (Weibe et al., 1994). Additional research in this area has largely focused on healthy populations (Suls & Howren, 2012) or other chronic illnesses (Mora et al., 2007; Chen et al 2006; Cameron et al., 2002).

In this study, we aim to examine the relation of depression and anxiety symptoms to both the total number of somatic symptoms reported, as well as individuals' attribution of somatic symptoms to diabetes or diabetes medications. We hypothesized that individuals who report higher levels of depressive and anxiety symptoms will report a greater number of somatic symptoms and attribute more of their symptoms to diabetes and their diabetes medications. We also investigated how these relationships may be affected by measurement method for depressive symptoms. For depression effects, we compared the strength of association based on a commonly used self-report measure of symptoms of major depressive disorder (Kroenke et al., 2001) to a clinician-administered semi-structured interview of depressive symptom severity designed to have reduced overlap with somatic symptoms of illness (Montgomery & Asberg, 1979; Svanborg & Asberg, 2001). Sensitivity analyses retested these relationships to account for the overlap between somatic symptoms of psychiatric disorders and somatic symptoms of diabetes (Twist et al., 2013; Wiltnik et al., 2014) by restricting depression and anxiety measures to cognitive and affective symptoms and excluding the somatic symptom items.

Methods

Participants and Procedures

Participants (N=120) were recruited from diabetes specialty and primary care clinics affiliated with a large, urban, academic medical center as part of a 3-month longitudinal observational study examining treatment adherence and distress. Participants were recruited through clinician referral, clinic screening, and posted fliers. Participants were evaluated for depression, completed self report questionnaires, had blood drawn, received an electronic bottle cap to track their adherence, and were given $50 compensation. 105 of the 120 participants completed the electronic medication monitoring and returned for a follow up assessment, where they were compensated an additional $50. Inclusion criteria included age 18 years or older, a diagnosis of type 2 diabetes, ability to read or write in English to complete self reports, and taking oral medication or insulin for diabetes. Participants provided informed consent, and the institutional review board at the Albert Einstein College of Medicine approved this study.

Measures

Beck Anxiety Inventory (BAI)—The BAI is a 21-item, 4-point (0-3) self report inventory for measuring the severity of anxiety symptoms over the past week. Scores between 0-9 indicate normal or minimal anxiety, scores between 10-18 indicate mild to moderate anxiety, scores between 19-22 indicate moderate to severe anxiety, and scores between 30-63 indicate severe anxiety (Beck et al., 1988). The BAI was also scored as a composite of seven cognitive-affective symptoms (unable to relax, fear of worse happening, terrified, nervous, etc) and fourteen somatic symptoms (numbness, feeling hot, wobbliness in legs, heart pounding, etc.), consistent with previous studies (Kabacoff et al., 1997). The total scale and the cognitive-affective subscale were used in these analyses. Internal consistency for this sample was excellent for the total (α=.94), as well as the cognitive-affective (α=.88) subscale.

Montgomery-Asberg Depression Rating Scale (MADRS)—The MADRS is a semi-structured clinician rated interview that evaluates depressive symptom severity though the assessment of 10 commonly occurring symptoms of depression in the previous week. Scores between 0 and 6 indicate no depression, scores between 7 and 19 are considered mild depression, scores between 20 and 34 are considered moderate depression, and score equal to or over 35 are considered severe depression (Montgomery & Asberg, 1979). The MADRS also contains less somatic symptoms of depression as compared to other self report measures (Svanborg & Asberg, 2001), and thus has less content overlap with self-reported somatic symptoms. The MADRS was also scored as a composite of seven cognitive affective symptoms (apparent sadness, inner tension, inability to feel, etc) and three somatic symptoms (reduced sleep, reduced appetite, and lassitude), consistent with previous studies (Gonzalez et al., 2016; Reijnders et al., 2010). The total scale and the cognitive-affective subscale were used in these analyses. Internal consistency for this sample was good for the total (α=.83) scale and the cognitive affective (α=.81) subscale.

Patient Health Questionnaire-9 (PHQ-9)—The PHQ-9 is a 9-item, 4-point (0-3) self report screening measure to assess the frequency of depressive symptoms over the past 2 weeks. Scores greater than or equal to 10 are considered a positive screen for Major Depressive Disorder (Kroenke et al., 2001). Since the BAI was used as the only measure of anxiety in the study, the PHQ-9 was included in the analyses to compare depression and anxiety across the same methods of measurement. The PHQ-9 was also scored as a composite of five cognitive-affective symptoms (lack of interest, depressed mood, feeling bad about self, concentration problems, suicidal ideation) and four somatic symptoms (sleep, fatigue, appetite, psychomotor changes), consistent with previous studies (Gonzalez et al., 2016). The total scale and the cognitive-affect subscale were used in these analyses. Internal consistency for this sample was good for the total (α=.87) scale and the cognitive-affective (α=.82) subscale.

Illness Perceptions Questionnaire-Revised (IPQ-R)—The IPQ-R is a self-report measure assessing patient's perceptions of their illness. The measure consists of nine scales: identity, timeline, consequences, personal control, treatment control, illness coherence, timeline cyclical, emotional representations, and causes. (Moss-Morris et al., 2002). This measure has been adapted for the diabetes population by adding diabetes specific symptoms from the Diabetes symptom checklist (Paschalides et al., 2004; Grootenhuis et al., 1994). Only the identity scale was used for these analyses. The identity scale is comprised of 27 symptoms that are both general (e.g., fatigue), and diabetes-specific (e.g., increased thirst). The list of symptoms is followed by 3 columns that ask the participants to respond whether: 1) I have experienced this symptom in the last month (yes, no), 2) This symptom is caused by my diabetes (yes, no), and 3) This symptom is caused by my medications (yes, no). If the participant attributed an experienced symptom to both T2D and medications, attributions were counted for both. Symptom attribution variables were calculated as a percentage of the total number of symptoms endorsed (e.g., 10 symptoms endorsed and 5 of those attributed to T2D = 50% attribution score), to account for high intercorrelations between total symptoms reported and number of symptoms attributed to diabetes or medication. Internal consistency for this sample was good for the total number of symptoms (ρ_{KR20} =.89) scale, the symptoms associated with diabetes (ρ_{KR20} =−91), and the symptoms associated with diabetes medication (ρ_{KR20}=.90).

Statistical Analyses

Descriptive statistics, including tests of normality, were examined for demographic and study related variables. Based on this examination, the number of reported somatic symptoms attributed to diabetes and medication from the IPQ-R was log-transformed to improve substantial kurtosis and positive skew. Tests of multicollinearity were also conducted to examine correlations among predictor variables. Proportions and rank order of IPQ-R items for each IPQ-R Identity subscale were examined. Bivariate relationships among diabetes complications, prescribed insulin, depression, anxiety, somatic symptoms, and symptom attributions were examined. Finally, hierarchical multiple linear regression models were used to test the independent contributions of clinician rated depression, self reported (SR) depression, self reported (SR) anxiety as well as the composite cognitive-affective scores of each measure on somatic symptom reporting. Covariates of insulin and diabetes

complications were included in the models, based on significant relationship to symptom reporting found in the bivariate relationships and previously reported findings in the literature (Baek et al., 2014). Three sets of analyses were performed with each subscale of the IPQ-R to examine the independent associations of depression and anxiety with one's reporting of somatic symptoms and their attribution of these symptoms to diabetes and medication, respectively. In each model, covariates were entered into step 1, the clinician rated depression assessment was entered in step 2a, the SR depression screener was entered into step 2b, SR anxiety was entered into step 2c, and both depression measures and SR anxiety were entered into step 3a and 3b, respectively. Statistical analyses were conducted using SPSS software version 24.0.

Results

Sample Characteristics

As seen in Table 1, the mean age of participants was 56.2 (SD=9.7). The majority of participants were female, with sub-optimal glycemic control. Participants had an average of 12.9 (SD=9.4) years since diagnosis and just over half of participants had at least one medical comorbidity. Almost half the participants were prescribed in insulin. The average MADRS score reflected symptoms of a "mild depression" symptom severity among participants and the average BAI score reflected symptoms of "mild anxiety." Participants reported on average 10.7 (SD=6.4) somatic symptoms experienced over the last month.

Proportion of somatic symptoms

Frequency and percentages of somatic symptoms (Table 2) revealed that the most common symptoms endorsed by participants included, pain, sleep difficulties, stiff joints, excessive urination, and feeling sleepy during the day. The most common symptoms attributed to diabetes were excessive urination, feeling very thirsty, legs/feet burn, ache, or tender, numbness or loss of feeling, and blurred vision. Individuals attributed several similar symptoms to side effects of their diabetes medication including, excessive urination, feeling very thirsty, feeling sleepy during the day, sexual difficulties, and upset stomach. The average percentage symptoms attributed to diabetes was 48% (SD= 42%), and the average percentage symptoms attributed to medication was 24% (SD= 29%), which was significantly different, $t(119)=7.0$, $p<.01$.

Bivariate relationships among depression, anxiety, and somatic symptoms

The relationships among clinician-rated depression, SR depression symptoms, SR anxiety symptoms, and total, diabetes-attributed and diabetes medication-attributed somatic symptoms were examined using Pearson product-moment correlations (Table 3). Among potential covariates, there was a significant positive relationship between both diabetes complications and insulin with somatic symptoms and diabetes attribution. Clinician-rated depression, SR depression, and SR anxiety were all significantly associated with somatic symptoms. Clinician-rated depression, SR depression and SR anxiety were all significantly correlated with a greater proportion of somatic symptoms attributed to diabetes and with a greater proportion attributed to diabetes medications.

Independent contributions of depression and anxiety on somatic symptoms

Hierarchical models showed that clinician-rated depression, SR depression and SR anxiety were each positively associated with the number of somatic symptoms reported when controlling for covariates (*p*s<.001) (Table 4). The covariates, diabetes complications and insulin (step 1), explained 22% of the variance (p<.001), and clinician-rated depression, SR depression and SR anxiety accounted for significant additional variance ranging between 26% and 33% (Table 4, steps 2a, 2b, 2c), in somatic symptom reports (*ps*<.001).

Models including depression and anxiety together continued to reveal significant independent effects for each, regardless of whether depression was clinician-rated or SR (Table 4, steps 3a, 3b). The addition of clinician-rated depression and SR depression with SR anxiety into steps 3a and 3b, respectively, explained an additional 37% of variance for each. In the full model, the presence of complications, higher scores on clinician-rated depression, SR depression, and SR anxiety were independently associated with greater numbers of somatic symptoms (p<.001). Sensitivity analyses (Table 5) which re-tested these relationships after restricting depression and anxiety measures to cognitive affective symptoms (i.e., somatic symptom items), produced similar results and did not attenuate these relationships.

Independent contributions of depression and anxiety on attribution of somatic symptoms

Attribution models showed that only SR depression (p=.003) was significantly associated with greater attribution of symptoms to diabetes whereas, SR depression (p< .001), SR anxiety (p= .004) and clinician-rated depression (p=.047) were associated with attribution to medications (Table 4). Covariates (step 1), explained 12% of the variance in attribution of somatic symptoms to diabetes (p=.001), and only 3% of the variance in attribution to medications (p=.15). In step 2, only SR depression accounted for significant additional variance of 6.4% in attribution to diabetes (p= .003). SR depression, SR anxiety, and clinician-rated depression all accounted for significant additional variance of 13% (p<.001), 7% (p=.004) and 3% (p=.047), respectively, to medication.

Models including both depression and anxiety showed that SR depression had a significant independent relationship with attribution to diabetes and medications, while SR anxiety only had a significant independent relationship with attribution to medication (Table 4, steps 3a &3b). The addition of clinician-rated depression with SR anxiety into step 3a, did not explain significant additional variance in attribution to diabetes (p=.45) or to medication (p=.74), accounting for 3% and 7% additional variances, respectively. The addition of SR depression with SR anxiety in step 3b explained significant additional variance in attribution to both diabetes (p=.023), and attribution to medication (p=.004). In the full model of diabetes attribution, insulin use (p=.013) and SR depression (p=.023) were independently associated with a greater percentage of reported somatic symptoms attributed to diabetes. In the full model of medication attribution, only SR depression was independently associated with a greater percentage of reported somatic symptoms attributed to medication (p=.004).

Sensitivity analyses limiting these affective measures to only the cognitive-affective symptoms among the items that comprise their total scores (i.e., excluding the somatic

items) produced remarkably similar results (Compare Table 4 and Table 5). The only changes in significance levels were for a marginal independent effect of clinician-rated depression with medication attribution (p = .047) which was then no longer significant at p=.062 when limiting the measure to cognitive-affective symptoms only (Table 5, step 2a). The significant independent effect of SR anxiety with medication attribution (p=.039) was changed to a borderline significant effect (p=.050) when limiting to cognitive-affective symptoms. (Table 5, step 3a).

Discussion

The findings of the study show that in adjusted analyses, there was strong support for the relationship between depression and anxiety with symptom reporting. The various measures of depression and anxiety were bivariately associated with greater symptom reports. Moreover, all three measures were associated with both symptoms attributed to diabetes and to diabetes medication.

Examining the symptom profiles of study participants revealed the symptoms most frequently endorsed were generalized or vague somatic symptoms including, pain, sleep difficulties, and stiff joints. Symptoms most likely to be attributed to diabetes and diabetes medications included, excessive urination, feeling thirsty, feeling sleepy, numbness, and upset stomach. These symptoms are comparable with previous studies reporting common symptoms of diabetes and side effects of diabetes medications (Freund et al., 1986; Maruthur et al., 2016). While accuracy was not measured systematically, from an observational perspective the symptom patterns of attributions do appear to match known symptoms of glucose dysregulation and side effects of common diabetes medications. Commonly experienced side effects such as stomach upset and sexual difficulties were also among the most likely symptoms to be attributed to diabetes medications. The frequency of symptom endorsement overall, and the proportions attributed to diabetes and diabetes-related medications challenges the conceptualization of type 2 diabetes as a largely asymptomatic illness.

Multivariable adjustment revealed that both depression measures and SR anxiety were independently associated with the number of somatic symptoms reported, after controlling for covariates. This is consistent with previous literature showing that depression and anxiety symptoms are associated with higher reports of somatic symptoms across various chronic illnesses (Katon et al., 2007; Ludman et al., 2004). Including anxiety in the model alongside each depression measure did not attenuate these findings, and each measure remained independently associated with greater symptoms reported. These findings are consistent with previous studies on the association between indicators of emotional distress and increased somatic symptom reports (Suls & Howren, 2012). However, previous studies have not examined the independent associations of depression and anxiety with symptom reporting. While the constructs of depression and anxiety overlap, their associations were independent in this study. The inclusion of both clinician-rated and SR measures of depression in this study is a unique contribution to this literature, demonstrating the consistency of this relationship across different types of depression measures.

Attribution models showed that only SR depression was significantly associated with greater attribution of symptoms to diabetes and diabetes medication. While SR anxiety revealed a significant independent relationship with attribution to medication, this relationship was attenuated to nonsignificance when entered into the model together with SR depression. Clinician-rated depression was significantly associated with greater attribution of symptoms to diabetes medication only. However, this relationship was also attenuated to non-significance when entered into the model together with SR anxiety, which maintained a significant independent association in this model. These results demonstrate that while depression does appear to be associated with an increased tendency to attribute symptoms to diabetes and to the effects of medications used to treat diabetes, this relationship was largely observed for a self-report measure of depression and was not as robust for the clinician rated depression measure. Results suggest that distinct features of depression and anxiety are associated with symptom reports and symptom attribution. Research has distinguished between cognitive-affective features of depression and anxiety, with depression associated with increased recall of negative experience and anxiety more strongly associated with hypervigilance (Mineka et al., 1998). Due to these distinct features, studies have hypothesized that heightened anxiety may lead to increased accuracy in reporting symptom attribution, compared to those with lower anxiety (Mora et al., 2007). While these studies have found mixed results (Mora et al., 2007; Weibe et al., 1994; Finitsis, 2013), this area of research points to the distinct features of depression and anxiety in their relationship to symptom reporting. The current study further highlights these differences. Moreover, a SR depression measure appears to be more robustly associated with attribution given that the inclusion of anxiety in the models attenuated the relationships only for the clinician-rated depression measure. This relationship could reflect similarity in the method of assessment. It is important to consider the types of measures used to capture each construct when interpreting these findings and relationships.

Analyses restricted to cognitive affective symptoms of depression and anxiety marginally attenuated these relationships. This demonstrates that these relationships are likely not driven by increased reporting of overlapping somatic symptoms. Cognitive-affective aspects of depression and anxiety seem to be involved in increased symptom reporting (Suls & Howren, 2012). Our study suggests that the relationships between depression and anxiety with symptom reporting may be more related to the specific cognitive-affective features of these emotional distress indicators rather than the overlap of somatic symptoms.

While this study reveals significant findings on the relationships between depression and anxiety with symptom reporting and symptom attribution, further replication of these analyses in larger samples is required due to our novel approach. To our knowledge, this study is the first to examine the independent associations of both a clinician-rated and SR depression measure as well as anxiety with attribution of symptoms to diabetes and medication. These findings expand previous research and contribute to the current body of literature on the role of depression and anxiety symptoms on symptom reporting.

These findings are limited in describing causality due to the cross-sectional nature of the study. While various interpretations can be drawn about the relationships between psychiatric symptoms and symptoms reporting, we cannot make definitive conclusions about

the mechanisms influencing these relationships. For example, somatic symptoms may be indicators of the burden of blood glucose dysregulation and diabetes management, consequently contributing to emotional distress symptoms of depression and anxiety (Lustman et al., 1989; Katon, 2003). Future studies would benefit from developing a longitudinal study design to examine the mechanisms of anxiety and depression that predict diabetes symptom reporting. Our results are consistent with expected associations between symptom experiences and emotional experiences; as predicted by the CSM (Leventhal et al., 2003). Future studies should examine CSM predicted associations between these somatic symptom experiences and diabetes treatment adherence and self-management. Studies that examine the impact of these relationships on other diabetes and health care outcomes such as, health care costs and misdiagnosis rates would provide a broader understanding of the detrimental impact of depression and anxiety on illness symptom misattribution. By understanding these mechanisms, providers will be able to develop more targeted and appropriate treatment for individuals with diabetes and depression. Our study is also limited by the type of measurement used for indicators of emotional distress and symptom reporting. While we did capture comparison in method of measurement for depression symptoms, the current study only included SR measures of anxiety and symptom reporting. No clinician-rated or objective measure of anxiety and symptom reports were included. This presents a possible limitation in comparing these relationships. Moreover, symptom attribution was based on a pre-determined list of 27 symptom items and did not allow for free response answers. This may have limited the number of symptoms a participant may endorse and consequently attribute to their T2D or medications. Our relatively small sample size may limit the generalizability of the findings as well as the power for the analyses.

Despite these limitations, this study is one of the first to focus on the independent contributions of depression and anxiety in relation to symptom attributions in diabetes. These findings highlight how individuals experiencing symptoms of anxiety and depression not only report more symptoms, but are also more likely to believe these symptoms are caused specifically by diabetes or their prescribed medications. Diabetes care providers should be aware of the close associations between somatic symptoms and the experience of anxiety and depression. Although challenging, clinicians who understand the relationship between anxiety and depression and increased symptom reporting, and increased attribution of symptoms to diabetes or its treatment, may be able to assist patients in gaining insight. Interventions specific to such populations to improve self-care and medication adherence need to be developed and evaluated.

Acknowledgments

Funding: This study was partially supported by the Einstein-Mount Sinai Diabetes Research Center (P30 DK020541) and the New York Regional Center for Diabetes Translation Research (P30 DK111022). Dr. Gonzalez is also supported by grants R01 DK104845 and R18 DK098742 from the National Institutes of Health. Dr. Hoogendoorn was also supported by the Drs. David and Jane Willner Bloomgarden Family Fellowship Fund.

Citations

Ali S, Stone M, Peters J, Davies M, & Khunti K (2006). The prevalence of co-morbid depression in adults with Type 2 diabetes: a systematic review and meta-analysis. Diabetic Medicine, 23(11), 1165–1173. [PubMed: 17054590]

Anderson RJ, Freedland KE, Clouse RE, & Lustman PJ (2001). The prevalence of comorbid depression in adults with diabetes: a meta-analysis. Diabetes Care, 24(6), 1069–1078. [PubMed: 11375373]

Baek RN, Tanenbaum ML, & Gonzalez JS (2014). Diabetes burden and diabetes distress: The buffering effect of social support. Annals of Behavioral Medicine, 48(2), 145–155. [PubMed: 24550072]

Bar-Haim Y, Lamy D, Pergamin L, Bakermans-Kranenburg MJ, & Van Ijzendoorn MH (2007). Threat-related attentional bias in anxious and nonanxious individuals: a meta analytic study. Psychological bulletin, 133(1), 1. [PubMed: 17201568]

Barsky AJ (2000). The validity of bodily symptoms in medical outpatients. The science of self report: Implications for research and practice, 339–362

Beck AT, Epstein N, Brown G, & Steer RA (1988). An inventory for measuring clinical anxiety: psychometric properties. Journal of consulting and clinical psychology, 56(6), 893. [PubMed: 3204199]

Cameron LD, Leventhal H, Love RR, & Patrick-Miller LJ (2002). Trait anxiety and tamoxifen effects on bone mineral density and sex hormone-binding globulin. Psychosomatic Medicine, 64(4), 612–620. [PubMed: 12140351]

Catz SL, Kelly JA, Bogart LM, Benotsch EG, & McAuliffe TL (2000). Patterns, correlates, and barriers to medication adherence among persons prescribed new treatments for HIV disease. Health Psychology, 19(2), 124. [PubMed: 10762096]

Centers for Disease Control and Prevention. National Diabetes Statistics Report. (2017). Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services.

Chao J, Nau DP, & Aikens JE (2007). Patient-reported perceptions of side effects of antihyperglycemic medication and adherence to medication regimens in persons with diabetes mellitus. Clinical therapeutics, 29(1), 177–180 [PubMed: 17379058]

Chen E, Hermann C, Rodgers D, Oliver-Welker T, & Strunk RC (2006). Symptom perception in childhood asthma: the role of anxiety and asthma severity. Health Psychology, 25(3), 389 [PubMed: 16719611]

Ciechanowski PS, Katon WJ, Russo JE, & Hirsch IB (2003). The relationship of depressive symptoms to symptom reporting, self-care and glucose control in diabetes. General hospital psychiatry, 25(4), 246–252. [PubMed: 12850656]

Finitsis DJ (2013). Stress, Anxiety, and Somatic Symptoms: A Comparison of Biomarkers in a Clinical Sample.

Freund A, Johnson SB, Rosenbloom A, Alexander B, & Hansen CA (1986). Subjective symptoms, blood glucose estimation, and blood glucose concentrations in adolescents with diabetes. Diabetes Care, 9(3), 236–243 [PubMed: 3731991]

Gonzalez JS, Hood KK, Esbitt SA, Mukherji S, Kane NS, & Jacobson A (2015). Psychiatric and psychosocial issues among individuals living with diabetes Diabetes in America. 2nd ed NIDDK.

Gonzalez JS, Kane NS, Binko DH, Shapira A, & Hoogendoorn CJ (2016). Tangled up in blue: unraveling the links between emotional distress and treatment adherence in type 2 diabetes. Diabetes Care, dc161657

Grant RW, Devita NG, Singer DE, & Meigs JB (2003). Polypharmacy and medication adherence in patients with type 2 diabetes. Diabetes Care, 26(5), 1408–1412. [PubMed: 12716797]

Grootenhuis PA, Snoek FJ, Heine RJ, Bouter LM. (1994). Development of a Type 2 diabetes symptom checklist: a measure of symptom severity. Diabetic Medicine, 11, 253–261. [PubMed: 8033523]

Halm EA, Mora P, & Leventhal H (2006). No symptoms, no asthma: the acute episodic disease belief is associated with poor self-management among inner-city adults with persistent asthma. CHEST Journal, 129(3), 573–580.

Horne R, Weinman J, & Hankins M (1999). The beliefs about medicines questionnaire: The development and evaluation of a new method for assessing the cognitive representation of medication. Psychology & Health, 14(1), 1–24.

Huang C-Q, Dong B-R, Lu Z-C, Yue J-R, & Liu Q-X (2010). Chronic diseases and risk for depression in old age: a meta-analysis of published literature. Ageing research reviews, 9(2), 131–141. [PubMed: 19524072]

Kabacoff RI, Segal DL, Hersen M, & Van Hasselt VB (1997). Psychometric properties and diagnostic utility of the Beck Anxiety Inventory and the State-Trait Anxiety Inventory with older adult psychiatric outpatients. Journal of anxiety disorders, 11(1), 33–47. [PubMed: 9131880]

Katon W (1998). The effect of major depression on chronic medical illness. Paper presented at the Seminars in clinical neuropsychiatry.

Katon WJ (2003). Clinical and health services relationships between major depression, depressive symptoms, and general medical illness. Biological psychiatry, 54(3), 216–226 [PubMed: 12893098]

Katon W, Lin EH, & Kroenke K (2007). The association of depression and anxiety with medical symptom burden in patients with chronic medical illness. General hospital psychiatry, 29(2), 147–155. [PubMed: 17336664]

Koster EH, De Raedt R, Goeleven E, Franck E, & Crombez G (2005). Mood-congruent attentional bias in dysphoria: maintained attention to and impaired disengagement from negative information. Emotion, 5(4), 446. [PubMed: 16366748]

Krein SL, Heisler M, Piette JD, Makki F, & Kerr EA (2005). The effect of chronic pain on diabetes patients' self-management. Diabetes Care, 28(1), 65–70. [PubMed: 15616235]

Kroenke K, Spitzer RL, & Williams JB (2001). The PHQ-9: validity of a brief depression severity measure. Journal of general internal medicine, 16(9), 606–613 [PubMed: 11556941]

Leventhal H, Benyamani Y, Brownlee S, Diedenbach M, Leventhal E, Patrick-Miller L, & RobitaiIle C (1997). Illness Representation: Theoretical Foundations *In* Weinman J & Petrie (Eds). Perceptions of Health and Illness. London: Harwood Publishers, p. 19–45.

Leventhal H, Brissette I, & Leventhal EA (2003). The common-sense model of self-regulation of health and illness. The self-regulation of health and illness behaviour, 1, 42–65.

Li C, Barker L, Ford ES, Zhang X, Strine TW and Mokdad AH (2008), Diabetes and anxiety in US adults: findings from the 2006 Behavioral Risk Factor Surveillance System. Diabetic Medicine, 25: 878–881 [PubMed: 18644077]

Ludman EJ, Katon W, Russo J, Von Korff M, Simon G, Ciechanowski P, … Young B (2004). Depression and diabetes symptom burden. General hospital psychiatry, 26(6), 430–436 [PubMed: 15567208]

Lustman PJ, Griffith LS, Clouse RE, & Cryer PE (1986). Psychiatric illness in diabetes mellitus: Relationship to symptoms and glucose control. Journal of Nervous and Mental Disease.

Lustman PJ, Clouse RE, & Carney RM (1989). Depression and the reporting of diabetes symptoms. The International Journal of Psychiatry in Medicine, 18(4), 295–303.

Maruthur NM, Tseng E, Hutfless S, Wilson LM, Suarez-Cuervo C, Berger Z, … Bolen S (2016). Diabetes medications as monotherapy or metformin-based combination therapy for type 2 diabetes: a systematic review and meta-analysis. Annals of internal medicine, 164(11), 740–751. [PubMed: 27088241]

Mineka S, Watson D, & Clark LA (1998). Comorbidity of anxiety and unipolar mood disorders. Annual review of psychology, 49(1), 377–412.

Montgomery SA, & Asberg MARIE (1979). A new depression scale designed to be sensitive to change. The British journal of psychiatry, 134(A), 382–389 [PubMed: 444788]

Mora PA, Halm E, Leventhal H, & Ceric F (2007). Elucidating the relationship between negative affectivity and symptoms: the role of illness-specific affective responses. Annals of Behavioral Medicine, 34(1), 77–86. [PubMed: 17688399]

Moss-Morris R, Weinman J, Petrie K, Horne R, Cameron L, & Buick D (2002). The revised illness perception questionnaire (IPQ-R). Psychology and health, 17(1), 1–16.

Murphy E, & Kinmount AL (1995). No symptoms, no problem? Patients' understandings of non-insulin dependent diabetes. Family Practice, 12(2), 184–192 [PubMed: 7589943]

Nolen-Hoeksema S, Wisco BE, & Lyubomirsky S (2008). Rethinking rumination. Perspectives on psychological science, 3(5), 400–424 [PubMed: 26158958]

Nicolucci A, Kovacs Burns K, Holt RI, Comaschi M, Hermanns N, Ishii H, … Stuckey H (2013). Diabetes Attitudes, Wishes and Needs second study (DAWN2™): Cross-national benchmarking of diabetes-related psychosocial outcomes for people with diabetes. Diabetic Medicine, 30(7), 767–777. [PubMed: 23711019]

Paschalides C, Wearden A, Dunkerley R, Bundy C, Davies R, & Dickens C (2004). The associations of anxiety, depression and personal illness representations with glycaemic control and health-related quality of life in patients with type 2 diabetes mellitus. Journal of psychosomatic research, 57(6), 557–564. [PubMed: 15596162]

Pennebaker JW, Cox DJ, Gonder-Frederick L, Wunsch M, Evans W, & Pohl S (1981). Physical symptoms related to blood glucose in insulin-dependent diabetics. Psychosomatic Medicine.

Perkins DO (2002). Predictors of noncompliance in patients with schizophrenia. The Journal of clinical psychiatry.

Petrie K, & Weinman J (2006). Why illness perceptions matter. Clinical Medicine, 6(6), 536–539. [PubMed: 17228551]

Reddy P, Philpot B, Ford D, & Dunbar JA (2010). Identification of depression in diabetes: the efficacy of PHQ-9 and HADS-D. Br J Gen Pract, 60(575), e239–e245. [PubMed: 20529487]

Reijnders JS, Lousberg R, & Leentjens AF (2010). Assessment of depression in Parkinson's disease: The contribution of somatic symptoms to the clinimetric performance of the Flamilton and Montgomery–Åsberg rating scales. Journal of psychosomatic research, 68(6), 561–565. [PubMed: 20488273]

Suls J, & Flowren MB (2012). Understanding the physical-symptom experience: The distinctive contributions of anxiety and depression. Current Directions in Psychological Science, 21(2), 129–134.

Svanborg P, & Åsberg M (2001). A comparison between the Beck Depression Inventory (BDI) and the self-rating version of the Montgomery Åsberg Depression Rating Scale (MADRS). Journal of affective disorders, 64(2-3), 203–216. [PubMed: 11313087]

Twist K, Stahl D, Amiel SA, Thomas S, Winkley K, & Ismail K (2013). Comparison of depressive symptoms in type 2 diabetes using a two-stage survey design. Psychosomatic medicine, 75(8), 791–797. [PubMed: 23922402]

Watson D, & Pennebaker JW (1989). Health complaints, stress, and distress: exploring the central role of negative affectivity. Psychological review, 96(2), 234 [PubMed: 2710874]

Wiebe DJ, Alderfer MA, Palmer SC, Lindsay R, & Jarrett L (1994). Behavioral self-regulation in adolescents with Type I diabetes: Negative affectivity and blood glucose symptom perception. Journal of Consulting and Clinical Psychology, 62(6), 1204. [PubMed: 7860818]

Wiltink J, Michal M, Wild PS, Schneider A, König J, Blettner M, … Fottner C (2014). Associations between depression and diabetes in the community: do symptom dimensions matter? Results from the Gutenberg Health Study. PloS one, 9(8), e105499. [PubMed: 25127227]

Table 1

Participant Baseline Descriptive Statistics (N=120)

Variable	M(SD) or N (%)
Age, M	56.2 (9.7)
Sex	
Female	77 (64%)
Male	43 (36%)
Ethnicity (n=109)	
Hispanic or Latino	31 (26%)
Non-Hispanic	78 (65%)
Education Level	
Less than/Some high school	*21 (18%)*
High school diploma	*18 (15%)*
Some college	*39 (33%)*
College Degree	*25 (21%)*
Some graduate school or degree	*16 (13%)*
Years since diagnosis (n=116)	12.9 (9.5)
HbA1C (glycemic control)	8.0 (1.8)
Prescribed insulin	49 (41%)
Diabetes complications	
No complications	58 (48%)
At least 1 complication	62 (52%)
BAI	10.3 (11.3)
MADRS	10.1 (8.7)
PHQ-9	6.1 (5.5)
Screened positive	26 (21.7%)
Total Symptoms	10.7 (6.4)
Diabetes Attribution	48.4% (42%)
Medication Attribution	24.6% (28.8%)

MADRS= Montgomery-Asberg Depression Rating Scale; BAI=Beck Anxiety Inventory; PHQ-9=Patient Health Questionnaire

Table 2

Rank order and percentages of IPQ-R Identity items by symptom subscale

	Total Somatic Sxs		Diabetes Attribution		Meds Attribution	
Symptoms	**Rank**	**%**	**Rank**	**%**	**Rank**	**%**
Pain	**1**	**67.5**	13	21.7	20	8.3
Sleep Difficulties	**2**	**61.7**	19	14.2	12	11.7
Stiff Joints	**3**	**60.8**	17	15	17	10
Excessive Urination	**4**	**58.3**	**1**	**49.2**	**1**	**25**
Feeling very sleepy during the day	**5**	**55.8**	7	31.7	**3**	**23.3**
Fatigue	6	55%	8	28.3	11	11.7
Feeling Very Thirsty	7	50	**2**	**43.3**	**2**	**24.2**
Legs/Feet Burn, Ache, Tender	8	50%	**3**	**39.2**	8	15
Blurred Vision	9	48.3	**5**	**34.2**	22	7.5
Headaches	10	48.3	20	14.2	10	12.5
Numbness or Loss of feeling	11	44.2	**4**	**35**	16	10.8
Feeling of Pins and Needles	12	41.7	6	33.3	18	9.2
Loss of Strength	13	40	15	16.7	13	11.7
Loss of Balance/Unsteadiness	14	40	12	22.5	14	11.7
Upset Stomach	15	37.5	23	10	**5**	**18.3**
Hot/Cold Hands or Feet	16	35.8	14	20	23	6.7
Feeling Unusually Hungry	17	34.2	9	26.7	9	13.3
Sexual Difficulties	18	32.5	10	24.2	**4**	**20**
Feeling “shaky”	19	30.8	11	22.5	7	15
Dizziness	20	30	16	15.8	15	10.8
Nausea	21	25.8	21	10.8	6	15
Breathlessness	22	25.8	25	5	24	5
Weight Loss	23	25.8	24	10	21	8.3
Sore Eyes	24	22.5	18	14.2	26	3.3
Wheezing	25	20	26	1.7	25	4.2
Sore Throat	26	15.8	27	0.8	27	2.5
Feeling Faint or Fainted	27	13.3	22	10.8	19	8.3

Rank score for top five symptoms in each subscale are indicated in bold type

IPQ-R items ranked in ascending order of prevalence among total somatic symptoms reported

Table 3

Bivariate Zero Order Relationships

	1	2	3	4	5	6	7
1. Diabetes complications	---	---	---	---	---	---	---
2. Insulin	.33**	---	---	---	---	---	---
3. Clinician-rated depression	.26**	.12	---	---	---	---	---
4. Self-reported depression	.27**	.25*	.78**	---	---	---	---
5. Self-reported anxiety	.36*	.18*	.64**	.74**	---	---	---
6. Total somatic symptoms	.45**	.27**	.61**	.67**	.71**	---	---
7. Diabetes attribution	.24**	.31**	.22**	.35**	.25**	.40**	---
8. Medication attribution	.17	.12	.22**	.39**	.30**	.43**	.51**

Clinician-rated Depression=MADRS; Self-reported Depression=PHQ-9; Self-reported Anxiety=BAI; Total somatic symptoms=IPQR Identity; Diabetes attribution=IPQR identity diabetes percentage variable; Medication Attribution=IPQR identity medication percentage variable

* p<.05 (2-tailed)

** p<.01 (2-tailed)

Table 4

Multiple linear regression analysis for variable predicting somatic symptoms

	Total Somatic Sxs			Diabetes Attribution			Med Attribution		
	β	p	R^2	β	p	R^2	β	p	R^2
Block 1			.22			.12			.03
Complications (y/n)	**.41**	**.000**		.15	.106		.15	.112	
Insulin (y/n)	.13	.130		**.26**	**.005**		.03	.741	
Block 2a			.48			.14			.07
Complications (y/n)	**.28**	**.000**		.11	.237		.11	.268	
Insulin (y/n)	.11	.116		**.26**	**.006**		.05	.622	
CR Depression	**.53**	**.000**		.16	.079		**.19**	**.047**	
Block 2b			.53			.18			.16
Complications (y/n)	**.29**	**.000**		.10	.294		.08	.401	
Insulin (y/n)	.02	.751		.21	.022		−.02	.852	
SR Depression	**.59**	**.000**		**.27**	**.003**		**.38**	**.000**	
Block 2c			.55			.14			.10
Complications (y/n)	**.20**	**.004**		.09	.347		.06	.531	
Insulin (y/n)	.09	.185		.25	**.008**		.03	.714	
SR Anxiety	**.62**	**.000**		.18	.057		**.28**	**.004**	
Block 3a			.59			.15			.10
Complications (y/n)	**.20**	**.004**		.09	.363		.06	.541	
Insulin (y/n)	.09	.157		**.25**	**.008**		.04	.712	
CR Depression	**.26**	**.001**		.09	.450		.02	.738	
SR Anxiety	**.46**	**.000**		.12	.295		**.25**	**.039**	
Block 3b			.59			.18			.16
Complications (y/n)	**.22**	**.002**		.10	.278		.08	.419	
Insulin (y/n)	.05	.473		**.21**	**.025**		−.02	.853	
SR Depression	**.31**	**.001**		**.29**	**.023**		**.38**	**.004**	
SR Anxiety	**.40**	**.000**		−.04	.771		−.00	.992	

CR Depression=MADRS; SR Depression=PHQ-9; SR Anxiety=BAI; Total Somatic Symptoms=IPQR Identity; Diabetes Symptom=IPQR Identity Total, Diabetes Subscale; Med Symptoms=IPQR Identity Medication Subscale

Table 5

Cognitive-affective depression and anxiety symptom dimensions as independent predictors of somatic symptom reporting

	Total Somatic Sxs			Diabetes Attribution			Med Attribution		
	β	p	R^2	β	p	R^2	β	p	R^2
Block 1			.22			.11			.03
Complications (y/n)	.41	.000		.15	.115		.15	.118	
Insulin (y/n)	.13	.155		.26	.007		.05	.599	
Block 2a			.47			.14			.06
Complications (y/n)	.31	.000		.11	.228		.12	.231	
Insulin (y/n)	.14	.053		.26	.005		.06	.548	
CR Depression C/A	.49	.000		.17	.059		.17	**.062**	
Block 2b			.46			.20			.15
Complications (y/n)	.36	.000		.12	.172		.12	.191	
Insulin (y/n)	.05	.465		.21	.018		−.01	.987	
SR Depression C/A	.50	.000		.29	.001		.35	.000	
Block 2c			.45			.14			.10
Complications (y/n)	.30	.000		.11	.236		.11	.257	
Insulin (y/n)	.12	.095		.26	.006		.06	.519	
SR Anxiety C/A	.49	.000		.15	.103		.26	.006	
Block 3a			.50			.14			.10
Complications (y/n)	.28	.000		.10	.278		.11	.274	
Insulin (y/n)	.14	.057		.26	.006		.06	.520	
CR Depression C/A	.31	.001		.12	.283		.03	.774	
SR Anxiety C/A	.30	.001		.07	.554		.23	**.050**	
Block 3b			.50			.20			.16
Complications (y/n)	.32	.000		.14	.134		.13	.154	
Insulin (y/n)	.08	.265		.21	.025		.01	.903	
SR Depression C/A	.31	.002		.37	.003		.36	.006	
SR Anxiety C/A	.27	.007		−.12	.344		.00	.997	

CR Depression=MADRS; SR Depression=PHQ-9; SR Anxiety=BAI; Total Somatic Symptoms=IPQR Identity; Diabetes Symptom=IPQR Identity Total, Diabetes Subscale; Med Symptoms=IPQR Identity Medication Subscale