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Affective symptoms and change in diabetes self-efficacy and glycaemic control

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Abstract

Aims—To examine the role of baseline depression, anxiety and stress symptoms on post-intervention diabetes self-efficacy and glycaemic control (HbA_{1c}).

Methods—The current study analysed data from patients ($n = 85$) with treated but uncontrolled Type 2 diabetes who participated in a comparative effectiveness study of two diabetes self-management interventions. Hierarchical linear regression was used to examine the relationships between baseline affective symptoms and post-intervention diabetes self-efficacy and the moderating effects of baseline affective symptoms on the relationship between changes in diabetes self-efficacy and post-intervention HbA_{1c}.

Results—Baseline depression was inversely associated with post-intervention diabetes self-efficacy ($P = 0.0001$) after adjusting for baseline characteristics including diabetes self-efficacy. In contrast, normal–mild levels of stress were associated with higher post-intervention diabetes self-efficacy ($P = 0.04$). Anxiety and stress symptoms significantly and independently moderated the relationship between changes in diabetes self-efficacy and post-intervention HbA_{1c} ($P = 0.02$ and $P = 0.03$, respectively). Further evaluation of these interactions demonstrated that changes in diabetes self-efficacy were associated with lower post-intervention HbA_{1c}, but only among those with higher baseline affective symptoms.

Conclusions—We found a moderating effect across affective symptoms on the relationship between diabetes self-efficacy changes and post-intervention HbA_{1c} in the context of a self-management intervention. Results suggest that patients with poorly controlled diabetes who have higher levels of depression, anxiety and stress symptoms may derive greater benefits from self-management interventions known to improve diabetes self-efficacy.

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Competing interests

None declared.

Introduction

Affective symptoms, including depression, anxiety and stress, are highly prevalent among individuals with diabetes and have been shown to interfere with diabetes self-management and control [1,2]. Depression is more common among those with diabetes than in the general population, especially among men [3]. Prevalence rates of anxiety disorders are also higher in patients with diabetes than in the general population, especially among women and low-income individuals [1]. Patients with diabetes are more susceptible to anxiety symptoms and stress reactivity than individuals without diabetes [4]. Depression and depressive symptoms have been associated with non-adherence to self-care, poor glycaemic control and increased risk of complications [2]. Although far less is known about the correlates and consequences of anxiety symptoms, individuals with co-morbid diabetes and anxiety often have poorer glycaemic control, making this an important area of inquiry [5]. Like anxiety, stress may affect glycaemic control through physiologic pathways and by disrupting self-care practices [6].

While affective symptoms are associated with poor outcomes among patients with diabetes, high levels of diabetes self-efficacy are associated with improved glycaemic control and increased engagement in self-management. Diabetes self-efficacy as it relates to self-management is best conceptualized as the confidence to perform diabetes-specific self-management tasks within the constraints of one's daily life. Positive associations between diabetes self-efficacy and diabetes control may be explained by self-management task performance, including medication adherence, dietary meal plans, physical activity, patient-provider communication about management and glucose monitoring [7,8,9]. Diabetes interventions designed to enhance self-efficacy by actively engaging patients to direct self-care (i.e. diabetes goal setting) have been associated with improved outcomes compared with those that provide education only [10].

Emotional responses are a major source of self-efficacy in the context of diabetes self-management [11]. Although self-efficacy theory suggests that moods, emotional states and stress can impact on perceptions of self-efficacy [12], negative affective symptoms have not been examined as moderators of the relationship between diabetes self-efficacy and glycaemic control. Thus, while the positive relationship between diabetes self-efficacy and diabetes control is well-established [13,14], studies exploring the impact of affective symptoms on diabetes self-efficacy and its relationship with diabetes control are few and limited by cross-sectional designs [15,16]. How negative affective symptoms interfere with changes in self-efficacy and their relationship with diabetes control is even less certain. This question is highly relevant when designing interventions that target changes in diabetes self-efficacy, given the high prevalence of affective symptoms among patients with diabetes.

The primary goal of this study was to investigate the role of affective symptoms on changes in diabetes self-efficacy and diabetes control among participants of a comparative effectiveness study who received one of two group-based self-management interventions. Our first aim was to examine the ability of baseline affective symptoms (i.e. anxiety, stress, depression) to collectively and uniquely predict post-intervention diabetes self-efficacy. Secondly, to determine whether there are some individuals who derive relatively greater benefits from improved diabetes self-efficacy, we investigated the separate moderating effects of baseline anxiety, stress and depressive symptoms on the relationship between change in diabetes self-efficacy and post-intervention diabetes control.

Patients and methods

The current study uses data from a previously conducted randomized controlled trial that evaluated the comparative effectiveness of two diabetes mellitus group clinic interventions on HbA_{1c} in primary care. In the original study, 87 participants were recruited from the diabetes primary care patient registry of a regional Veterans Affairs medical centre. Included individuals were 50–90 years old, had a primary care provider at the Veterans Affairs and a previous diagnosis of treated but uncontrolled Type 2 diabetes [baseline HbA_{1c} 53 mmol/mol (7%)]. All 87 participants were randomized to receive one of two primary care-based self-management diabetes group clinic interventions. The original study design and methodology, including the randomization process, are described elsewhere in greater detail [14]. The current sample included the 85 patients with HbA_{1c} data at both baseline and post-intervention follow-up, which occurred 3 months after baseline.

Measures

Socio-demographic and clinical characteristics—Participants self-reported their gender, age, race, education and health status. Clinical characteristics, including HbA_{1c}, systolic blood pressure, BMI, number of primary care provider visits, co-morbidities and years since diagnosis, were collected from the medical record. A Deyo co-morbidity score was derived from the Deyo modification of the Charlson co-morbidity index [17].

Glycaemic control: HbA_{1c}—HbA_{1c} was used as a measure of glycaemic control. It was measured by the Veterans Affairs laboratory using a standardized method of ion-exchange, liquid chromatography. Participants received HbA_{1c} tests at baseline and 3 months following completion of the intervention.

Diabetes-Specific Self-Efficacy Scale—The Diabetes Specific Self-Efficacy Scale [18] was used to assess participants' perceptions of diabetes-specific self-efficacy at baseline and post-intervention. The 8-item scale measures participants' confidence in performing specific diabetes self-management tasks (e.g. 'How confident are you that you can choose the appropriate foods to eat when you are hungry?'). Response options ranged from 1 (not at all confident) to 10 (totally confident). A summary score consisted of the average of the eight items, with higher scores indicating greater confidence. Cronbach's alpha for the current study was 0.83. We also created a change score for diabetes self-efficacy from baseline to post-intervention follow-up by subtracting baseline scores from post-intervention scores, such that higher scores indicated greater positive change on diabetes self-efficacy.

Depression, Anxiety and Stress Scale—The Depression, Anxiety and Stress Scale (DASS) [19] was used to measure negative emotional symptoms associated with depression, anxiety and stress. This 21-item scale contains three 7-item subscales. Participants indicated how much symptoms of depression (e.g. 'I felt sad and depressed'), stress (e.g. 'I felt I was irritable') and anxiety (e.g. 'I had a feeling of shakiness/difficulty breathing in the absence of physical exertion') applied to them over the past week on a scale from 0 (none of the time) to 3 (most of the time). Summary scores for each of the three subscales were created by summing the seven items and then multiplying that number by two. Higher scores reflect greater depression, stress and anxiety. Cronbach's alpha for the current study was 0.90, 0.73 and 0.89, for the depression, anxiety and stress subscales, respectively. Depression, Anxiety and Stress Scale scores were collected at baseline only and used in all subsequent analyses [19].

Data analysis

A series of hierarchical linear regression models were used to examine (1) collective and unique associations between the Depression, Anxiety and Stress Scale subscales and post-intervention diabetes self-efficacy (aim 1) and (2) individual and synergistic associations between each Depression, Anxiety and Stress Scale subscale and change in diabetes self-efficacy in predicting post-intervention HbA_{1c} (aim 2).

Prior to examining these questions, individual associations between four potential covariates (i.e. self-management treatment group, age, education, baseline BMI) and post-intervention HbA_{1c} were assessed with four multiple linear regression models, where post-intervention HbA_{1c} was the dependent variable and baseline HbA_{1c} and the potential covariate were independent variables. Associations between each covariate and post-intervention diabetes self-efficacy were also examined with four multiple linear regression models, where post-intervention diabetes self-efficacy was the dependent variable and both baseline diabetes self-efficacy and the potential covariate were independent predictors. Only covariates significantly associated with either post-intervention HbA_{1c} or diabetes self-efficacy were included in subsequent models.

In order to examine predictors of post-intervention diabetes self-efficacy (aim 1), variables were included in two separate steps. Step 1 included significant covariates, baseline HbA_{1c} and baseline diabetes self-efficacy. Step 2 included all of the variables from Step 1, with the addition of anxiety, stress and depression. For both sets of hierarchical multiple regression models, R^2 was assessed at each step and change in R^2 was calculated for step 2 in order to determine whether the addition of the affective symptoms contributed significantly to the amount of variance explained over and above the model containing covariates only. Variance inflation factor and tolerance statistics were examined in conjunction with multiple regression analyses to examine issues of multicollinearity [20]. To examine predictors of post-intervention HbA_{1c}, variables were entered into the model in three separate steps (aim 2). Step 1 included significant covariates, intervention group assignment (i.e. treatment group) and baseline HbA_{1c}. Step 2 included all of the predictors from step 1, with the addition of the main effects of baseline anxiety, stress, depression and baseline to post-intervention change in diabetes self-efficacy. Step 3 consisted of three separate models to test classic moderation. Step 3a assessed the interaction between anxiety and change in diabetes self-efficacy, step 3b tested the interaction between stress and change in diabetes self-efficacy and step 3c assessed the interaction between depression and change in diabetes self-efficacy. Each of the step 3 models included all predictors from steps 1 and 2.

To examine the direction of any significant two-way interactions between change in diabetes self-efficacy and each of the affective symptoms, we derived equations for the simple slopes of the relationship between change in diabetes self-efficacy and post-intervention HbA_{1c} scores at high (+1 *SD*) and low (−1 *SD*) levels of each type of affect [20]. Analyses were conducted with SAS version 9.2 (SAS Institute, Cary, NC, USA).

Results

Table 1 summarizes demographic and clinical characteristics of the study population ($n = 85$). Overall, participants' mean anxiety, depression and stress scores were 12.19 (*SD* 7.88), 10.64 (*SD* 10.35) and 13.74 (*SD* 10.12), respectively. Clinical cut-offs indicated moderate levels of anxiety (range 10–14) and mild levels of depression (range 10–13) on average. Stress levels, at the uppermost limit of the normal range (0–14), did not reach clinical significance for the average patient. Zero order correlations indicated significant relationships between diabetes self-efficacy and HbA_{1c} at baseline ($r = -0.26$, $P = 0.02$) and post-intervention ($r = -0.25$, $P = 0.03$). Zero order correlations also indicated significant

relationships between depression and stress, depression and anxiety and stress and anxiety, $r_s = 0.71, 0.67$ and 0.66 , respectively (all $P < 0.00001$). Additionally, zero order associations indicated significant relationships between post-intervention diabetes self-efficacy and anxiety ($r = -0.25, P = 0.03$) as well as depression ($r = -0.54, P < 0.001$), but not stress ($r = -0.22, P = 0.06$). Multicollinearity was not an issue for change in diabetes self-efficacy or any of the Depression, Anxiety and Stress Scale scores (all variance inflation factor < 10 and all tolerance > 0.10), indicating the acceptability of including change in self-efficacy and all three affective terms in multivariate models.

Although age and baseline BMI were not individually associated with change in either HbA_{1c} or diabetes self-efficacy (all $P > 0.05$), education and treatment group were both associated with change in HbA_{1c} ($P = 0.04$ and $P = 0.02$, respectively), but not diabetes self-efficacy (both $P > 0.05$). Therefore, education and treatment group were included as covariates in all subsequent models.

Aim 1: predictors of post-intervention diabetes self-efficacy

The results of the hierarchical multiple regression analyses predicting post-intervention diabetes self-efficacy from the Depression, Anxiety and Stress Scale subscales at baseline can be found in Table 2. After adjusting for treatment group, education, baseline HbA_{1c} and baseline diabetes self-efficacy in step 1, stress and depression uniquely contributed to the prediction of post-intervention diabetes self-efficacy in step 2. Whereas depression was negatively related to diabetes self-efficacy, $F_{(1,64)} = 17.56$ ($\beta = -0.69, P < 0.0001$), stress was positively associated with diabetes self-efficacy, $F_{(1,64)} = 4.28$, ($\beta = 0.30, P = 0.04$). After accounting for covariates, the collective addition of the depression, anxiety and stress scores resulted in a significant increment in R^2 . The overall model accounted for 43% of the variance in post-intervention diabetes self-efficacy.

Aim 2: predictors of post-intervention HbA_{1c}

The results of the hierarchical multiple regression analyses for aim 2 are presented in Table 3. After controlling for the covariates in step 1, neither the Depression, Anxiety and Stress Scale subscales nor change in diabetes self-efficacy were uniquely associated with post-intervention HbA_{1c} in step 2 (all $P > 0.05$). However, step 3 revealed interactions between change in diabetes self-efficacy and each of the affective symptoms (anxiety: $F_{(1,63)} = 5.43, P = 0.02$; stress, $F_{(1,63)} = 5.20, P = 0.03$; depression, $F_{(1,63)} = 3.64, P = 0.06$) on post-intervention HbA_{1c}. The addition of the interaction terms between change in diabetes self-efficacy and anxiety and stress was associated with significant increases in R^2 above the main effects model. The overall amount of variance in post-intervention HbA_{1c} accounted for by the complete models that included the interaction terms between change in diabetes self-efficacy and affective symptoms was between 28 and 30%.

Simple slopes of the relationship between change in diabetes self-efficacy and post-intervention HbA_{1c} were calculated at both higher and lower levels of change in diabetes self-efficacy and each affective category (see Fig. 1a–c). The pattern of simple slopes reveals that greater changes in diabetes self-efficacy were associated with lower post-intervention HbA_{1c} scores, but only among those with higher baseline levels of affective symptoms.

Discussion

This study provides evidence for the role of affective symptoms in predicting post-intervention diabetes self-efficacy and the moderating effect of affective symptoms on the relationship between change in diabetes self-efficacy and HbA_{1c} within the context of a self-

management intervention. The affective symptoms of depression and stress had independent associations with post-intervention diabetes self-efficacy after adjusting for treatment group, education, baseline HbA_{1c} and baseline diabetes self-efficacy. While depressive symptoms were negatively related to post-intervention diabetes self-efficacy, stress in the normal to mild range was associated with higher post-intervention diabetes self-efficacy. It is interesting to note that the zero-order association between stress and post-intervention diabetes self-efficacy was negative. Additionally, the zero-order associations among the Depression, Anxiety and Stress Scale measures were positive. Therefore, the positive association between stress and post-intervention diabetes self-efficacy seen in the multivariate model likely reflects a 'suppression relationship' [20], such that stress encountered in everyday life may enhance diabetes self-efficacy only after factoring out the variance associated with anxiety and depression. Furthermore, anxiety, depression and stress each demonstrated significant moderating effects on the relationship between change in diabetes self-efficacy and HbA_{1c} following completion of a self-management intervention. Further analysis of these interactions showed that change in diabetes self-efficacy was associated with lower post-intervention HbA_{1c} when patients had higher baseline affective symptoms, but not for those with lower (normal) affect scores at baseline.

This study makes a contribution to the literature by investigating interrelationships among three different types of affective symptoms and change in diabetes self-efficacy and HbA_{1c} in the context of a self-management intervention. The current study evaluated for whom changes in diabetes self-efficacy would be more likely to impact on HbA_{1c}. Using a moderation analysis, we demonstrated that affective symptoms have an effect on the relationship between diabetes self-efficacy changes and post-intervention HbA_{1c}. The moderating effects on change in diabetes self-efficacy emerged for anxiety and stress, even after controlling for intervention group, education and baseline HbA_{1c}. Although we did not find a significant moderating effect of depression, depression did reveal a similar trend and a post-hoc power analysis revealed 76% power to detect an increase in R^2 of 0.06. There was only 57% power to detect a change in R^2 as small as the one that emerged when the self-efficacy by depression interaction term was added to the model (i.e. change in R^2 of 0.04). Therefore, the failure of depression to be a significant moderator of the relationship between self-efficacy and HbA_{1c} may reflect the inability to detect small effects.

Our finding that higher baseline affective symptoms moderate the relationship of change in diabetes self-efficacy on HbA_{1c} extends literature exploring the moderating role of affective symptoms on treatment effects in the context of healthcare interventions. A meta-analysis showed that pre-intervention distress moderated the effects of psychosocial treatments for cancer survivors [21]. Likewise, depression vulnerability moderated the effects of cognitive behavioral therapy in a randomized trial for smoking cessation [22]. Both authors found that patients with higher levels of distress or depression vulnerability experienced greater benefits from treatment. Our findings demonstrate that the expected relationship between change in diabetes self-efficacy and HbA_{1c} following a self-management intervention is more likely among patients with higher baseline anxiety, stress and depressive symptoms compared with those with lower levels. Our findings suggest that self-management interventions that seek to achieve diabetes control through changes in diabetes self-efficacy should assess baseline affective symptoms generally, and target patients with poorly controlled diabetes in particular.

Our findings also extend literature exploring the role of diabetes-related distress on diabetes control. Diabetes-related distress, which has been used as a proxy for negative affective symptoms associated with diabetes and self-management task performance, is strongly associated with HbA_{1c} levels [23]. However, two recent observational studies by Fisher and colleagues [24,25] found no association between depression or depressive symptoms (in

contrast to diabetes-related distress) and glycaemic control. Far less is known about the effects of anxiety and stress on diabetes self-efficacy and glycaemic control, including how these symptoms map on to diabetes-related distress. Previous studies have focused on the prevalence of anxiety among patients with diabetes [1] and anxiety or stress as a predisposing factor in the development of diabetes [26]. The Problem Areas in Diabetes (PAID) [23] scale contains items that reflect anxiety and stress-related aspects of self-management (e.g. worrying about complications, feeling scared or overwhelmed), although research has yet to examine relationships among these constructs. Our finding that high-normal levels of stress improve diabetes self-efficacy is supported by challenge models of risk and resilience, which suggest that manageable doses of stress enhance competence [27].

While our study reveals interesting findings in an understudied area, it is not without limitations. First, a complex interplay of factors (e.g. complications, coping styles) besides diabetes self-efficacy and affective symptoms affects diabetes control. Second, although we were able to examine the interplay between affective symptoms and change in self-efficacy in predicting post-intervention glycaemic control, the current study only assessed these symptoms at baseline and was therefore unable to examine the dynamic interplay between changes in self-efficacy, affective symptoms and HbA_{1c}. Third, Depression, Anxiety and Stress Scale and diabetes self-efficacy measures were all collected by participant self-report; however, these measures were validated in this manner. Finally, the Depression, Anxiety and Stress Scale measures were collected only at baseline and there is potential for symptom change as a consequence of the self-management intervention, which could affect changes in diabetes self-efficacy and HbA_{1c} values that are not captured in our analyses.

Clinical implications

Importantly, future research and clinical practice should focus on assessing patients with diabetes for affective symptoms as these disorders may be vastly undetected. Patients with diabetes who frequently visit the clinic with somatic complaints should be screened for affective symptoms and referred for mental health treatment when indicated. Treatments that simultaneously address affective symptoms and self-management are needed. Furthermore, patients with baseline affective symptoms may experience the greatest benefit from interventions that raise diabetes self-efficacy to improve diabetes control.

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Figure 1. Plots of the interactions between (a) baseline anxiety, (b) baseline depression and (c) baseline stress and change in diabetes self-efficacy predicting post-intervention HbA_{1c}
 (a) The simple slope of the relationship between change in diabetes self-efficacy and post-intervention HbA_{1c} was significant for those with higher anxiety ($\beta = -0.40$, $P = 0.02$), but not for those with lower anxiety ($\beta = 0.10$, $P = 0.44$). (b) The simple slope of the relationship between change in diabetes self-efficacy and post-intervention HbA_{1c} was marginally significant for those with higher depression ($\beta = -0.33$, $P = 0.06$), but not for those with lower depression ($\beta = 0.10$, $P = 0.49$). (c) The simple slope of the relationship between change in diabetes self-efficacy and post-intervention HbA_{1c} was marginally significant for those with higher stress ($\beta = -0.25$, $P = 0.06$), but not for those with lower stress ($\beta = 0.12$, $P = 0.37$).

Table 1

Baseline and post-intervention characteristics of the study population

Characteristics	Total sample (<i>n</i> = 85)*	
Age, mean (SD)	63.81 (7.80)	
Males, <i>n</i> (%)	83 (97.65)	
Race, <i>n</i> (%)		
White	40 (47.62)	
African American	27 (32.14)	
Hispanic or Latino	14 (16.67)	
Other/unknown	2 (1.19)	
Education level, <i>n</i> (%)		
High school	25 (29.41)	
Some further education/technical college	60 (70.59)	
Deyo co-morbidity index, mean (SD)	3.69 (2.67)	
HbA _{1c} , mmol/mol (% mean) (SD)		<i>P</i> -value †
Baseline	72 mmol/mol (8.77%) (1.17)	} 0.01
Post-intervention	68 mmol/mol (8.36%) (1.40)	
Systolic blood pressure, mean (SD)	133.62 (16.35)	
BMI, mean (SD)	33.60 (6.64)	
Primary care provider visits, mean (SD)	52.80 (26.10)	
Years diagnosed with diabetes, mean (SD)	6.20 (3.10)	
Perceived health status, mean (SD)‡	2.52 (0.91)	
Diabetes self-efficacy, mean (SD)§		<i>P</i> -value †
Baseline, <i>n</i> = 74	6.88 (2.05)	} 0.11
Post-intervention, <i>n</i> = 75	7.43 (1.62)	
Change from baseline to post-intervention, <i>n</i> = 74	0.35 (1.89)	
Diabetes, Anxiety Stress Scale, mean (SD)¶		
Anxiety	12.19 (7.88)	
Depression	10.64 (10.35)	
Stress	13.74 (10.11)	

* *n* = 85 unless otherwise noted.† Dependent samples *t*-test (d.f. = 84 for HbA_{1c} and 74 for diabetes self-efficacy).

‡ Perceived Health Status: range 1–5, lower scores denote greater perceived health status.

§ Diabetes-Specific Self-Efficacy: range 1–10, higher scores denote greater self-efficacy.

^aScores for each affective component scored independently, higher scores denote more symptoms.

Table 2

Multiple regression model of Depression, Anxiety and Stress Scale (DASS) subscales predicting post-intervention diabetes self-efficacy

	Step 1: model with covariates only (<i>n</i> = 74)		Step 2: main effects model (<i>n</i> = 74)	
	β	<i>P</i>	β	<i>P</i>
Step 1: covariates				
Treatment group	0.18	0.10	0.02	0.87
Education level	0.05	0.64	−0.03	0.77
Baseline HbA _{1c}	−0.16	0.15	−0.03	0.73
Baseline diabetes self-efficacy	0.38	0.001	0.28	0.006
Step 2 *: main effects				
Baseline DASS—anxiety	—	—	0.07	0.62
Baseline DASS—stress	—	—	0.30	0.04
Baseline DASS—depression	—	—	−0.69	< 0.0001
<i>R</i> ²	0.32	—	0.43	—
Change in <i>R</i> ²	—	—	0.11	0.001

* Step 2 included all variables from step 1.

Table 3
Change in Diabetes Self-Efficacy and Depression, Anxiety, Stress Scale as Predictors of Post-intervention HbA1c

	Step 1: model with covariates only (n = 85)		Step 2: main effects model (n = 74)		Step 3a: interaction model—anxiety (n = 74)		Step 3b: interaction model—stress (n = 74)		Step 3c: interaction model—depression (n = 74)	
	β	P	β	P	β	P	β	P	β	P
Step 1: covariates										
Treatment group	-0.23	0.02	-0.18	0.13	-0.17	0.14	-0.19	0.11	-0.18	0.12
Education level	0.20	0.04	0.20	0.07	0.17	0.12	0.20	0.07	0.19	0.09
Baseline HbA _{1c}	0.35	0.001	0.36	0.002	0.38	0.001	0.36	0.002	0.38	0.001
Step 2 [*] : main effects										
Baseline DASS—Anxiety	—	—	0.03	0.83	0.06	0.69	0.01	0.93	0.05	0.76
Baseline DASS—Stress	—	—	0.13	0.46	0.16	0.33	0.21	0.21	0.16	0.32
Baseline DASS—Depression	—	—	0.01	0.96	0.02	0.92	0.02	0.94	0.03	0.89
Change in diabetes self-efficacy	—	—	-0.08	0.47	0.24	0.17	0.19	0.24	0.11	0.47
Step 3 [†] : interaction										
Change in diabetes self-efficacy $\times$ anxiety	—	—	—	—	-0.41	0.02	—	—	—	—
Change in diabetes self-efficacy $\times$ stress	—	—	—	—	—	—	-0.37	0.03	—	—
Change in diabetes self-efficacy $\times$ depression	—	—	—	—	—	—	—	—	-0.28	0.06
R^2	0.22	—	0.24	—	0.30	—	0.30	—	0.28	—
Change in R^2	—	—	0.02	0.64	0.06	0.02	0.06	0.03	0.04	0.06

^{*} Step 2 included all variables from step 1.

[†] Step 3 included all variables from step 2.

DASS, Depression, Anxiety and Stress Scale.