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Physical symptom complaints, cognitive emotion regulation strategies, self-compassion and diabetes distress among adults with Type 2 diabetes

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Abstract

Aims—Diabetes-related distress is common among adults with Type 2 diabetes and is consistently associated with poorer self-management and treatment outcomes. However, little is known about the psychological factors that may contribute to or protect against diabetes distress. This study examined illness burden, and positive and negative ways of thinking and relating to oneself in times of stress as independent correlates of diabetes distress, cross sectionally and longitudinally.

Method—A total of 120 adults treated for Type 2 diabetes reported their physical symptom complaints, cognitive emotion regulation, self-compassion and diabetes distress at baseline; 110 completed a 3-month follow-up assessment of diabetes distress. Pearson correlations and multivariable linear regression tested baseline and longitudinal relationships.

Results—Baseline diabetes distress was associated with greater use of negative cognitive emotion regulation strategies ($r = 0.43$, $P < 0.01$), greater tendency towards self-criticism, self-judgement and over-identification ($r = 0.37$, $P < 0.01$), and greater physical symptom burden ($r = 0.50$, $P < 0.01$). Baseline physical symptoms and negative cognitive emotion regulation were independently associated with baseline diabetes distress. Baseline physical symptoms and negative aspects of self-compassion significantly predicted diabetes distress over 3 months. Positive aspects of cognitive emotion regulation and self-compassion were not independently associated with diabetes distress cross sectionally or longitudinally.

Conclusion—Greater symptom burden along with the use of negative cognitive emotion regulation and negative aspects of self-compassion were independently associated with diabetes distress. If these relations are explained by causal influence, these modifiable factors could be fruitful targets for intervention research.

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Competing interests

None declared.

Introduction

Type 2 diabetes mellitus requires adherence to prescribed medications and a variety of self-management behaviours to maintain adequate glucose control. Diabetes distress, the emotional burden associated with diabetes and its management, appears to be common and often chronic among individuals with diabetes, with 36% endorsing clinically significant diabetes distress [1,2]. Diabetes distress is associated with poorer self-management [2], including medication non-adherence [3], and worse glycaemic control [4]. Several individual-level factors have been linked to greater diabetes distress in adults with diabetes, including insulin use [2], younger age and diabetes complications [5,6].

Although burden of illness is a key contributor to diabetes distress in conceptualizations of this construct and, as indicated by presence of diabetes complications, comorbid medical conditions or more intensive treatment have been associated with increased diabetes distress [2,7], little attention has been paid to the role of physical symptoms. Prominent theories of health behaviour and coping in chronic illness highlight physical symptoms as a key driver of health behaviours and illness-related emotional distress [8] and, interacting with cognitive appraisals and emotional states, physical symptoms also figure prominently in cognitive-behavioural models that link diabetes and depression [9]. A systematic review of the literature across various chronic illness populations, including diabetes, shows that physical symptoms are consistently related to measures of depression and anxiety [10] but little is understood about the relationship between physical symptoms and diabetes distress.

Similarly, less is known about the psychological factors that contribute to diabetes distress and which could be targeted for intervention. Cognitive emotion regulation strategies may facilitate coping with the burden of a chronic illness and play a prominent role in major theoretical models of stress and coping that focus on cognitive appraisal of the stressor to explain emotional responses to stressful circumstances [11]. Cognitive appraisal has been associated with depressive symptoms, levels of optimism, self-esteem, self-acceptance and interpersonal relationships [12] and, along with related emotion-regulation strategies, has been associated with diabetes distress, better self-management and glycaemic control in Type 1 diabetes [6]. Positive strategies, such as positive reappraisal, or challenging an initial interpretation of a stressor to change its meaning in a positive manner, as well as acceptance and refocusing attention on positive stimuli, tend to engender positive emotional responses, such as gratitude, and to decrease the experience of negative emotions, such as anger or guilt [11]. Negative strategies may intensify or maintain negative emotions [13]. Examples include ruminating on negative thoughts, engaging in self-criticism, and focusing attention on negative aspects of the stressor. The relative contribution of positive and negative cognitive appraisal strategies has not been examined in relation to diabetes distress.

Self-compassion is a more recently described psychological construct encompassing some aspects of cognitive emotion regulation, but includes a broader set of ways of relating to oneself in the face of challenging circumstances: (1) to be kind and understanding, rather than being self-critical; (2) to perceive one's suffering as part of a larger human experience, rather than as isolating; and (3) to hold upsetting feelings and thoughts in mindful awareness, rather than over-identifying with them [14]. Recent research suggests that self-

compassion can similarly be modelled as comprising a positive component, reflecting self-compassion and a negative component, representing self-criticism, isolation and over-identification [15]; these components may have differential relationships to outcomes and respond differently to intervention [11]. Self-compassion has been shown to buffer against the negative effects of diabetes distress on glycaemic control [16] and has been the target of successful behavioural intervention [17]. However, the effects of positive versus negative components of self-compassion have not been evaluated in relation to diabetes distress.

Given the growing interest in positive psychological interventions in diabetes and other populations as a compliment to current intervention approaches that often target negative factors [18], the current study sought to evaluate the independent relations, cross sectionally and over time, between positive and negative aspects of cognitive emotion regulation and self-compassion to diabetes distress in a diverse sample of adults treated for Type 2 diabetes. In addition to controlling for demographic and other health-related covariates, we also evaluated the independence of these effects from illness burden, as indicated by physical symptoms. We hypothesized that greater use of negative cognitive emotion regulation strategies and self-compassion, and less use of positive cognitive emotion regulation strategies and self-compassion would be independently associated with diabetes distress, independent of physical symptoms.

Methods

Participants and procedures

People with Type 2 diabetes were recruited from primary care and endocrinology clinics affiliated with an urban academic medical centre. Recruitment included opt-out mailing letters, flyers, clinic screenings and referrals as part of a longitudinal study investigating psychological factors related to treatment adherence [7,19]. Those participating in the study ($N = 120$) completed a baseline visit, provided a blood sample to assess glycaemic control, and received \$50 in compensation. A total of 110 people completed a follow-up assessment 3 months later and were compensated an additional \$50. Eligible participants were over age 18, able to read/write in English, and prescribed an oral medication for diabetes, hypertension or hypercholesterolaemia. Participants provided informed consent, and the Institutional Review Board of Albert Einstein College of Medicine approved this study.

Measures

Physical symptom burden—The Identity subscale of the Illness Perception Scale-Revised (IPQ-R) assesses the presence ('yes' or 'no') of physical symptoms experienced within the last month [20]. This subscale was modified from the original version of 14 non-illness specific symptoms to contain an additional 13 diabetes-specific symptoms (e.g. excessive urination, thirst, neuropathic pain) selected from the Diabetes Symptom Checklist [21]. Reliability for the current sample was good ($\rho_{KR20} = 0.89$).

Cognitive emotion regulation strategies—The 36-item Cognitive Emotion Regulation Questionnaire (CERQ) assesses five positive cognitive emotion-regulation domains (acceptance, positive refocusing, refocus on planning, positive reappraisal, putting

into perspective) and four negative domains (self-blame, rumination, catastrophizing, other-blame) using a 5-point Likert response scale [12]. These items are grouped into positive (CERQ-P) and negative (CERQ-N) domains, with higher scores indicating a greater likelihood of engaging in positive or negative cognitive emotion regulation [12]. Reliability was acceptable for the CERQ-P ($\alpha = 0.68$) and good for the CERQ-N ($\alpha = 0.82$) in the current sample.

Self-compassion—The 26-item Self-Compassion Scale (SCS) assesses how an individual treats themselves during difficult times and similarly focuses on cognitive emotion regulation [14]. The SCS consists of 13 positive items on a 5-point Likert scale averaged to make a composite positive domain (self-kindness, common humanity, mindfulness; SCS-P) and 13 negative items averaged to make a composite negative domain (self-judgement, isolation, over-identification; SCS-N) [22]. Higher scores indicate greater self-compassion for SCS-P and greater lack of self-compassion for SCS-N. The SCS demonstrated good reliability for both the positive ($\alpha = 0.83$) and negative ($\alpha = 0.90$) domains.

Statistical analysis

Descriptive statistics were calculated to report frequencies, means and standard deviations for demographic and study variables. Bivariate relationships were assessed with Pearson's correlation coefficient r . T-tests and chi-squared tests detected differences along demographic and baseline variables between those who were lost to follow-up and those who completed the follow-up visit. Hierarchical linear regression tested whether individual-level demographic factors (age, gender), illness-burden variables (complications, insulin use, physical symptoms) and cognitive emotion regulation strategies reported at baseline (CERQ-N, CERQ-P, SCS-N, SCS-P) were independently associated with diabetes distress at baseline and follow-up. Regression models did not show significant multicollinearity (all VIF < 2, tolerance > 0.5). Statistical analyses were run using SPSS 22.0 for Mac.

Results

Sample characteristics

Table 1 presents demographic characteristics. Participants were predominantly female (64%) and African American (62%). The mean illness duration was 12.9 years (SD = 9.5, range 1–42). The majority of participants were not prescribed insulin, and endorsed at least one diabetes health complication, the most common being neuropathy (26.7%). Participants reported experiencing an average of 10.7 (SD = 6.4) physical symptoms over the prior month with pain, sleep difficulties and stiff joints most commonly endorsed. Participants tended to report greater use of positive emotion regulation strategies and more self-compassion than negative emotion regulation strategies and negative self-compassion.

The overall level of diabetes distress at baseline indicated moderate distress, whereas at follow-up, the average Diabetes Distress Scale (DDS) score was significantly lower ($t(109) = 3.5$, $P = 0.001$). The correlation between DDS scores at baseline and follow-up was large, indicating 47.6% shared variance between time-points. Of the 30 participants with high distress (DDS ≥ 3.0) at baseline, 16 (53.3%) continued to report high distress at follow-up.

Participants who did not return for the follow-up visit ($n = 10$) were significantly younger ($M = 49.7$ years, $SD = 12.5$) than those who did return ($M = 56.8$ years, $SD = 9.2$; $t(118) = -2.3$, $P = 0.026$), but did not differ in other demographic or baseline measures.

Table 2 reports results of bivariate correlation analyses. These showed that younger age, higher physical symptom burden, higher SCS-N scores, and higher CERQ-N scores, were each significantly associated with greater baseline diabetes distress. Insulin use was also associated with greater baseline distress ($M = 2.7$, $SD = 1.4$) than those not prescribed insulin ($M = 2.1$, $SD = 1.0$; $t(81.3) = -2.7$, $P = 0.008$). Physical symptoms were significantly related to SCS-N and CERQ-N. Analyses for follow-up distress showed that physical symptoms, SCS-N, SCS-P and CERQ-N were significant predictors. Insulin use was also associated with greater follow-up distress ($M = 2.3$, $SD = 1.2$) compared with those not prescribed insulin ($M = 1.9$, $SD = 0.9$; $t(75.9) = -2.0$, $P = 0.050$).

Baseline hierarchical regression analyses

Table 3 shows standardized regression coefficients and P -values for each predictor of diabetes distress at baseline. In the first step, age, gender, presence of complications, insulin use and total number of physical symptoms accounted for 28.8% of the variance in distress at baseline ($F(5,114) = 9.23$, $P < 0.001$), with physical symptoms being the only unique predictor ($\beta = 0.48$; $P < 0.001$). The addition of positive and negative domains of the CERQ and SCS in step 2 accounted for an additional 9.7% of the variance ($P = 0.003$). In the full model, greater numbers of physical symptoms and higher scores on CERQ-N were independently associated with more baseline diabetes distress. The full model accounted for 38.5% of the variance in baseline diabetes distress.

Predicting follow-up diabetes distress

We examined the prospective relationship between baseline physical symptoms and cognitive emotion regulation and follow-up diabetes distress (Table 3). In the first step, age, gender, complications, insulin use and physical symptoms accounted for 18.1% of the variance in follow-up distress ($F(5,104) = 4.61$, $P = 0.001$), with physical symptoms being the only unique predictor. The addition of positive and negative domains of the CERQ and SCS in step 2 accounted for an additional 10.3% of the variance ($P = 0.009$). In the full model, greater number of physical symptoms and use of negative ways of relating to the self with self-judgement, isolation and over-identification (SCS-N) independently predicted distress. The full model accounted for 28.4% of the variance in follow-up distress.

Sensitivity analyses

Two supplementary two-step regression models were run where only positive domains (SCS-P, CERQ-P) were entered in one model, and only negative domains (SCS-N, CERQ-N) were entered into another to examine contributions to baseline and follow-up diabetes distress. These models, including the same covariates in step 1 of Table 3, showed that the positive domains (SCS-P, CERQ-P) did not account for additional variance in either baseline or follow-up distress after accounting for age, gender and illness-burden factors. In comparison, negative domains (SCS-N, CERQ-N) entered in step 2 accounted for 8.3% of the variance in baseline distress ($P = 0.001$) with higher CERQ-N independently associated

with higher baseline distress ($\beta = 0.23$; $P = 0.011$). Negative domains accounted for 6.5% of the variance in follow-up distress ($P < 0.001$) with higher SCS-N independently predicting higher follow-up distress ($\beta = 0.29$; $P = 0.006$).

Discussion

This study examined physical symptom burden, positive and negative aspects of cognitive emotion regulation, and self-compassion in relation to diabetes distress, cross sectionally and over 3 months in a diverse sample of adults with Type 2 diabetes. Evidence was generally stronger for the role of negative aspects of cognitive emotion regulation and self-compassion than for positive aspects. Although both sets of factors were related at the bivariate level, in our full baseline model, physical symptoms and negative cognitive emotion regulation were independently associated with diabetes distress. At follow-up, physical symptoms and negative self-compassion, not negative cognitive emotion regulation, were independent predictors of diabetes distress. This indicates that these strategies may have different implications for distress over time. Diabetes distress is common [1] and can have a significant impact on illness self-management and glycaemic control [2,4]. Understanding the symptoms that individuals experience, the way they think about stressors and how they relate to themselves in times of stress, might improve our understanding of risk for diabetes distress and, if the relationships reported here prove to be causal, may be useful in guiding interventions to address diabetes distress. Results emphasize the importance of attending to both burdensome somatic aspects of living with diabetes alongside psychological aspects related to coping with stress.

When positive and negative aspects of cognitive emotion regulation strategies and self-compassion were included in the baseline regression model, physical symptom burden and negative cognitive emotion regulation strategies were significant independent correlates. This model accounted for nearly 40% of the variance in diabetes distress. At follow-up, physical symptoms and negative self-compassion were significant predictors. Positive cognitive emotion regulation strategies were not significant at baseline or follow-up. We found no evidence for independent contributions of positive cognitive emotion regulation strategies in our multivariable models. Further, results point to increased physical symptom burden and use of negative cognitive emotion regulation strategies, as clinically relevant risk factors for diabetes distress.

Physical symptoms of illness appear to play a significant role in predicting diabetes distress. Those reporting more physical symptom burden and higher self-criticism at baseline showed higher distress at follow-up. Physical symptoms were also associated with increased use of negative cognitive emotion regulation and a greater tendency to relate to oneself with self-criticism, isolation and over-identification, and negative aspects of self-compassion. However, physical symptom complaints were not associated with positive aspects of either of these constructs. Individuals with greater negative affect appear more likely to engage in negative cognitive emotion relation strategies and it is possible that negative affect is a third variable underlying these relations. It is also conceivable that a greater burden of physical symptoms may influence maladaptive coping strategies including pessimistic, maladaptive and irrational cognitive styles [8]. Negative cognitive emotion regulation strategies and

negative aspects of self-compassion could also influence the experience and reporting of physical symptoms, through increased attention on the self and negative experiences [23].

Past research has highlighted the role of negative affect in perpetuating general health complaints [23]. Past interventions have also shown promise to alter and improve perceived distress in diverse people with Type 2 diabetes [24] and Type 1 diabetes [25]. In chronic illness samples, negative cognitive emotion strategies have contributed to increases in distress and depressive symptoms [26], with rumination specifically associated with increases in emotional distress and depression, as well as dysregulation of the HPA axis, which may represent a biological mechanism underlying relationships to poor health outcomes [9,24]. Our study further underscores the importance of negative cognitive emotion regulation and negative self-compassion as potential intervention targets to ameliorate diabetes distress.

Contrary to our hypotheses, positive cognitive emotion regulation, measured as a composite of strategies involving acceptance, positive reappraisal, refocusing attention on planning how to deal with the stressor, turning attention to positive distractions and putting things into perspective by comparing with worse problems, was not associated with diabetes distress at either time point. Our findings on the limited contribution of positive aspects of self-compassion are somewhat surprising given previous research suggesting that self-compassion can buffer against diabetes distress, although positive and negative aspects were not distinguished in prior work [16]. Our findings on the relatively more significant role of negative versus positive aspects of self-compassion are in line with previous research that found negative self-compassion domains were more strongly related to psychological distress [27] and more responsive to cognitive-behavioural intervention [28]. Still, more research is needed on the relative contributions of positive versus negative cognitive emotion regulation strategies and ways of relating to oneself when facing challenging situations.

These results should be considered within the context of our study design. Cross-sectional relationships between measures of cognitive emotion regulation and distress limit the ability to make causal inferences. Two time points over 3 months did not give us sufficient ability to examine change over time. Future research could examine these constructs at additional points across a longer period to examine covariation in these variables over time. Further, there is a degree of construct and measurement overlap between cognitive emotion regulation and self-compassion, which may have limited our ability to identify independent roles for these factors in relation to diabetes distress. However, the highest correlation among these variables, between negative cognitive emotion regulation strategies and negative aspects of self-compassion, indicated a maximum of 23% shared variance and we found no evidence of problematic multicollinearity in our models. We also did not differentiate among types of physical symptoms or between those attributed to diabetes versus those attributed to other causes when measuring overall symptom burden. It is possible that individuals with more physical symptoms were also experiencing greater pain, which is known to contribute to higher distress [29]. Because the DDS includes only negatively worded items, indicating problems and the experience of emotional distress relating to diabetes, and does not assess positive aspects of well-being, it is also possible that the more consistent association with negative aspects of cognitive emotion regulation and

self-compassion relative to positive aspects is a measurement artefact. Finally, another limitation of our study is the somewhat small sample size, which limited power in our analyses. Future studies of cognitive emotion regulation and diabetes distress in larger samples of adults with Type 2 diabetes are needed to replicate these findings.

Future research on contributors to diabetes distress should include these modifiable factors and attempt to replicate these novel findings. Furthermore, more research is needed to distinguish between diabetes-related and other physical symptoms (e.g. comorbid chronic illnesses and chronic pain) in relation to diabetes distress. Finally, our results suggest that negative cognitive emotion regulation strategies may have a more potent role than positive strategies in relation to diabetes distress, which suggests that positive psychology interventions, often involving a focus on increasing positive coping strategies [18] may be less effective than those that focus on reducing use of negative/maladaptive strategies. However, because so few prior studies have distinguished between positive and negative aspects of coping with stress, this remains an important area for future research.

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What's new?

- Our study evaluated the independent roles of physical symptom complaints, and negative and positive cognitive emotion regulation strategies in relation to the experience of diabetes distress over time in adults with Type 2 diabetes.
- We identified independent effects for physical symptom complaints and negative aspects of cognitive emotion regulation and self-compassion in relation to diabetes distress.
- Previous studies have paid limited attention to individual-level factors that may explain risk for diabetes distress, and our results suggest an independent role for physical symptom complaints and negative aspects of cognitive emotion regulation and self-compassion, both cross sectionally and over time. If these relations reflect causal influences, these modifiable factors could be fruitful targets for interventions to improve diabetes distress.

Table 1Demographic and descriptive statistics ($N = 120$)

Variable	<i>n</i> (%)
Gender	
Male	43 (35.8)
Female	77 (64.2)
Race ($N = 119$)	
Black	74 (61.7)
White	32 (26.7)
Other	13 (10.9)
Ethnicity ($N = 109$)	
Hispanic or Latino	31 (25.8)
Not Hispanic or Latino	78 (65)
Education level ($N = 119$)	
Less than high school diploma	21 (17.5)
High school diploma	18 (15)
Some college	39 (32.5)
College degree	25 (20.8)
Some graduate school or degree	16 (13.4)
Yearly family income ($N = 114$)	
Less than \$10 000	21 (17.5)
\$10 000–14 999	18 (15)
\$15 000–24 999	21 (17.5)
\$25 000–49 999	33 (21.5)
\$50 000–99 999	19 (15.8)
\$100 000–149 999	2 (1.7)
Years since diagnosis, M (SD) ($n=116$)	12.9 (9.5)
HbA _{1c} , M (SD)	64 (21) mmol/mol; 8.0 (1.9)%
Prescribed insulin	49 (40.8)
Diabetes complications	
None	58 (48.3)
One or more	62 (51.7)
Physical symptoms	
Pain	81 (67.5)
Sleep difficulties	74 (61.7)
Stiff joints	73 (60.8)

Table 2

Summary of bivariate correlation analyses with total diabetes distress at baseline ($N = 120$) and at 3-months follow-up ($N = 110$)

	DDS								
	<i>M</i> (SD)	Baseline	Follow-up	Age	Physical Symptoms	SCS-N	SCS-P	CERQ-N	CERQ-P
Baseline DDS	2.3 (1.2)	1							
Follow-up DDS	2.0 (1.0)	0.69**	1						
Age	56.2 (9.7)	-0.18*	-0.12	1					
Physical symptoms	10.7 (6.4)	0.50**	0.40**	-0.02	1				
SCS-N	2.5 (0.9)	0.37**	0.38**	-0.06	0.33**	1			
SCS-P	3.5 (0.7)	-0.12	-0.22*	0.18	-0.10	-0.08	1		
CERQ-N	33.3 (10.0)	0.43**	0.23*	-0.03**	0.36**	0.48**	-0.10	1	
CERQ-P	64.2 (17.7)	-0.01	-0.11	0.06	0.04	0.03	0.28**	0.32**	1

* $P < 0.05$,

** $P < 0.01$.

DDS, Diabetes Distress Scale; SCS-P, Self-Compassion Scale – Positive Domain; SCS-N, Self-Compassion Scale – Negative Domain; CERQ-P, Cognitive Emotion Regulation Questionnaire – Positive Domain; CERQ-N, Cognitive Emotion Regulation Questionnaire – Negative Domain.

Table 3

Summary of hierarchical regression analyses cognitive emotion regulation strategies with total diabetes distress at baseline ($N = 120$) and at 3-months follow-up ($N = 110$)

Predictor	Baseline DDS			Follow-up DDS		
	β	P -value	R^2	β	P -value	R^2
Step 1			0.29			0.18
Age	-0.14	0.11		-0.05	0.64	
Gender	-0.03	0.72		-0.05	0.55	
Complications	-0.05	0.62		-0.10	0.38	
Insulin	0.12	0.18		0.11	0.28	
Physical symptoms	0.48	<0.01		0.41	<0.01	
Step 2			0.39			0.28
Age	-0.10	0.22		0.01	0.88	
Gender	-0.02	0.83		-0.04	0.61	
Complications	-0.10	0.31		-0.09	0.42	
Insulin	0.14	0.10		0.14	0.15	
Physical symptoms	0.37	<0.01		0.31	0.01	
SCS-P	<0.01	0.96		-0.13	0.17	
SCS-N	0.10	0.26		0.27	0.01	
CERQ-P	-0.13	0.14		-0.12	0.23	
CERQ-N	0.29	<0.01		<0.01	0.99	

Significant P -values (< 0.05) are in given in bold.

DDS, Diabetes Distress Scale; SCS-P, Self-Compassion Scale – Positive Domain; SCS-N, Self-Compassion Scale – Negative Domain; CERQ-P, Cognitive Emotion Regulation Questionnaire- Positive Domain; CERQ-N, Cognitive Emotion Regulation Questionnaire – Negative Domain.