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Exploring the Relationships Between Illness Perceptions, Self-Efficacy, Coping Strategies, Psychological Distress and Quality Of Life in a Cohort of Adults with Diabetes Mellitus

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Running head: Validation of the CSM in a diabetes cohort.

Exploring the Relationships Between Illness Perceptions, Self-Efficacy, Coping Strategies, Psychological Distress and Quality Of Life in a Cohort of Adults with Diabetes Mellitus

Abstract

Diabetes has a significant negative impact on mental health and quality of life (QoL). Underpinned by the Common Sense Model (CSM) the mediating role of coping patterns, self-efficacy, anxiety and depression symptoms on the relationship between illness perceptions and QoL in patients diagnosed with diabetes was evaluated. A total of 115 participants with diabetes (56, Type 1; 59, Type 2), 51% female and average age of 52.69 (SD=15.89) in Australia completed self-report measures of illness perceptions and psychological wellbeing. Baseline measures included illness perceptions, coping styles, psychological distress (anxiety and depression symptoms), self-efficacy, and quality of life. Mediating relationships were measured using structural equation modelling. A model of good fit was identified explaining 51% of variation in QoL. Illness perceptions directly influenced QoL, maladaptive coping, self-efficacy, and anxiety symptoms. The relationship between: illness perceptions and QoL was partially mediated by anxiety; illness perceptions and depression was fully mediated by maladaptive coping and self-efficacy; and self-efficacy and QoL was partially mediated by depressive symptoms. Findings provide validation of the CSM in a diabetes cohort. Psychological interventions likely to have most benefit on psychological distress and QoL are those targeting mediating psychological processes, including maladaptive coping and self-efficacy.

Keywords: diabetes mellitus, common sense model, illness perceptions, coping, self-efficacy, anxiety, depression, quality of life.

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Diabetes is one of the largest health emergencies of the 21st century (Baker IDI, 2012; International Diabetes Federation, 2015). From 1980 to 2014, the global prevalence of diabetes nearly doubled from 4.7% to 8.5% in adults (World Health Organization, 2016). In Australia, the prevalence of diabetes was estimated as 6.3% in 2015 (International Diabetes Federation, 2015) and was directly associated with a national annual health-care expenditure of AU$1.7 billion in 2008-2009 (Australian Institute of Health and Welfare, 2013). Further, as a contributing factor to a number of other health conditions (e.g., coronary heart disease), diabetes was reported as an underlying or associated cause of 10% of all Australian deaths in 2011 (Australian Institute of Health and Welfare, 2014).

In addition to the physical complications, reviews and meta-analyses show that individuals with diabetes are likely to have higher levels of depression (Ali, Stone, Peters, Davies, & Khunti, 2006; Anderson, Freedland, Clouse, & Lustman, 2001; Barnard, Skinner, & Peveler, 2006; Baumeister, Hutter, & Bengel, 2012; Renn, Feliciano, & Segal, 2011; Roy & Lloyd, 2012) and poorer quality of life (QoL) (Badescu et al., 2016; Norris et al., 2011; Petrak, Baumeister, Skinner, Brown, & Holt, 2015) than the general population. Comorbid depression has been associated with poorer glycemic control (Ali et al., 2010; van der Feltz-Cornelis et al., 2010), lower adherence to medication and poorer self-care (Ali et al., 2010; Pozzo et al., 2016; van der Feltz-Cornelis et al., 2010), as well as an elevated rate of complications such as neuropathy (Bartoli et al., 2016; van der Feltz-Cornelis et al., 2010), which add to impairment of QoL (Ali et al., 2010; Egede & Hernandez-Tejada, 2013; Goldney, Phillips, Fisher, & Wilson, 2004; Schram, Baan, & Pouwer, 2009; Smith-Palmer et al., 2016). Additionally, individuals with diabetes tend to display elevated anxiety (Fisher et al., 2008; Grigsby, Anderson, Freedland, Clouse, & Lustman, 2002; Li et al., 2008), which has also been associated with increased medical complications (Bickett & Tapp, 2016). Psychodynamic focused research has also suggested links between diabetes adaptation and

unconscious defences like denial, which may negatively influence metabolic control (Marchini et al., 2018). Individuals with diabetes may also experience blame, guilt, profound loss of body image and 'pre-diabetes' identity that influence behaviour outside their awareness (D'Alberton, Nardi, & Zucchini, 2012; Marchini et al., 2018). Consequently, Australian care guidelines for Type 1 diabetes emphasise that psychological support is essential in diabetes care (Craig et al., 2011).

The Common Sense Model (CSM) provides insight into psychological processes to target when supporting individuals with diabetes. The CSM (Leventhal, Nerenz, & Steele, 1984), proposes that disease outcomes are dependent on more than disease activity and severity, with psychological factors playing a key mediating role. The model has been applied across several chronic illnesses including arthritis, multiple sclerosis, and diabetes (see Hagger & Orbell, 2003 for a meta-analysis).

The term 'illness perception' refers to a cognitive or emotional representation of a health threat and is a fundamental component of CSM. There are five dimensions of illness perception: consequence (beliefs regarding impact and effects of the illness), cause (beliefs about factors that contributed to or caused the illness), identity (beliefs about how the illness and its symptoms affect identity), timeline (beliefs about how long the illness and its symptoms will last), and control or cure (beliefs about whether the individual is able to control or recover from the illness) (Broadbent, Petrie, Main, & Weinman, 2006; Hagger & Orbell, 2003). In people with diabetes, more negative illness perceptions have been associated with increased emotional distress and depression (Paschalides et al., 2004; Skinner et al., 2014), and poorer QoL (Hampson, Glasgow, & Strycker, 2000; Paschalides et al., 2004; Scollan-Koliopoulos et al., 2013; Watkins et al., 2000). Illness perceptions have also been associated with poorer adherence to diabetes treatment programs and self-care recommendations (Ashur, Shah, Bosseri, Morisky, & Shamsuddin, 2015; Burns, Deschenes,

& Schmitz, 2016; Glasgow, Hampson, Strycker, & Ruggiero, 1997; Hampson, Glasgow, & Toobert, 1990; Hemphill, Stephens, Rook, Franks, & Salem, 2013; Scollan-Koliopoulos, Walker, & Rapp, 2011), and found to predict coping cognitions and behaviours (Lawson, Bundy, Belcher, & Harvey, 2010; Searle, Norman, Thompson, & Vedhara, 2007).

Coping refers to how individuals manage threats posed by a stressor (Carver, Scheier, & Weintraub, 1989; Lazarus & Folkman, 1984). Coping styles can be categorized differently, with a common division between adaptive (problem-focused) and maladaptive (emotion-focused) coping styles. Maladaptive coping refers to thoughts or behaviours aimed at managing emotional distress (e.g., blaming), while adaptive coping is focused on problem-solving and taking action towards the stressor (e.g., seeking advice) (Carver et al., 1989). Studies of adults with diabetes have shown adaptive coping styles to be associated with improved HbA1C (glycated haemoglobin) levels (Hill-Briggs & Gemmell, 2007; Smari & Valtysdottir, 1997), improved dietary behaviour (Hill-Briggs & Gemmell, 2007), enhanced blood glucose stability (Duangdao & Roesch, 2008), and lower levels of depression and anxiety (Burns et al., 2016; Smari & Valtysdottir, 1997; Sultan, Epel, Sachon, Vaillant, & Hartemann-Heurtier, 2008; Zhang et al., 2009). Conversely, increased maladaptive coping has been associated with poorer glycaemic control (Duangdao & Roesch, 2008), and higher levels of anxiety and depression (Burns et al., 2016; Clarke & Goosen, 2009; Smari & Valtysdottir, 1997; Zhang et al., 2009). Further, it has been indicated that coping styles have a greater influence on diabetes-related distress than clinical indicators (e.g., disease duration) (Karlsen, Oftedal, & Bru, 2012). The use of healthy coping strategies has become a target of psychological interventions for people with diabetes (see Thorpe et al., 2013 for a systematic review).

Self-efficacy is an individual's belief in his/her ability to achieve certain outcomes or manage situations and has also been found to contribute to diabetes outcomes (Krichbaum,

Aarestad, & Buethe, 2003). Research indicates that there is a positive relationship between self-efficacy and self-care behaviours (e.g., adherence to meal plans, medication) in people with diabetes (Al-Amer, Ramjan, Glew, Randall, & Salamonson, 2016; Al-Khawaldeh, Al-Hassan, & Froelicher, 2012; Devarajooh & Chinna, 2017; Gherman et al., 2011; Hurley & Shea, 1992; Mohebi, Azadbakht, Feizi, Sharifirad, & Kargar, 2013; Sharoni & Wu, 2012; Walker, Smalls, Hernandez-Tejada, Campbell, & Egede, 2014; Wu et al., 2013). Additionally, higher levels of self-efficacy have been associated with lower levels of depression and anxiety (Imai et al., 2017; Indelicato et al., 2017; Wu et al., 2013), and better QoL (Bowen et al., 2015; Walker et al., 2014). Self-efficacy has also been found to mediate the relationship between depressive symptoms and self-care (Al-Amer et al., 2016; Cherrington, Wallston, & Rothman, 2010; Devarajooh & Chinna, 2017; Hernandez et al., 2016) in people with diabetes. These findings suggest that self-efficacy may mediate the relationship between diabetes activity and health outcomes.

While there is considerable evidence illness perceptions, coping styles, and self-efficacy influence psychosocial outcomes in diabetes, interrelationships between these factors are not yet clearly understood. Further, to our knowledge, this is the first study in a cohort of adults with diabetes using structural equation modelling (SEM) to explore specific pathways involving self-efficacy and the relationship with quality of life via depression and anxiety symptoms. It was hypothesized that based on the CSM: (1) poorer illness perceptions and less self-efficacy and engagement in adaptive coping would be associated with greater anxiety and depressive symptoms and poorer QoL; (2) greater engagement in maladaptive coping would be associated with greater anxiety, depression and poorer QoL; and (3) self-efficacy, coping style, and anxiety and depression symptoms would mediate the relationship between illness perceptions and QoL.

Materials and Methods

Participants:

A total of 115 participants (59 female with an average age 52.69 (SD=15.89)) participated in this study. Of these, 56 individuals (39 females) were diagnosed with Type 1 diabetes (average diagnosis being 20.18 (SD=13.67) years), while 59 individuals (20 females) were diagnosed with Type 2 diabetes (average diagnosis of 11.50 (SD=8.22) years). There were 43.4 percent of participants married or living with a partner, 36.3 percent were single, 9.8 percent were divorced or separated, 7.1 percent were widowed, and 3.4 percent identified their relationship as ‘other’.

Approximately half the participant group reported a highest education level of undergraduate or post-graduate degree (49.1%), 23.7 percent achieving a secondary school education, and 18.4 percent a technical/vocational education. The majority of participants owned their own home (48.7%) or were privately renting (31.0%). A large proportion (41.3%) of the group were in part-time or full-time employment, 14.0 percent were unable to work due to illness, and almost one-third of participants designated their status as 'other,' most commonly specifying ‘retired’. One-third of participants (37.3%) treated diabetes with daily insulin injections, 21.8 percent insulin and tablets, and 16.4 percent used insulin pump delivery. The remaining participants who reported treatment regimen noted treatment was tablets only (20.0%) or diet only (4.5%).

Materials:

Brief Illness Perceptions Questionnaire (BIPQ) (Broadbent et al., 2006).

The BIPQ measures cognitive and emotional representations of illness on an 11-point rating scale. Using nine items, the following eight dimensions were assessed: consequences, timeline, personal control, treatment control, identity, concern, understanding, and emotional representation. For example, 'How concerned are you about your illness? 0 (not at all concerned) – 10 (extremely concerned)'.

Inter-items correlational analyses were undertaken with items 3, 4 and 7 reversed, to be consistent with the other items in the scale. Confirmatory factor analyses (CFA) using the AMOS statistical package (version 24) was undertaken to check the construct as illness perceptions are likely to be conceptualised depending on the specific cohort, and this method is established in previous research (Knowles, Swan, Salzberg, Castle & Langham, 2014; Knowles, Wilson ,Connell, & Kamm, 2011). Illness perception was found to have a good model fit (χ^2 p>.05; χ^2/N =1-3, CFI >.95, TLI>.95, SRMR <.05) and strong internal consistency (.82) using 5 items including 'Illnesses effect on life' and 'How much will treatment help'. Items were summed and averaged to attain a total illness perception score (range 0-10), with higher scores reflecting a more threatening perception of the illness.

Carver Brief coping questionnaire (Brief-COPE) (Carver, 1997).

The Brief-COPE assesses an individual's coping reactions in response to a stressor. The questionnaire consists of 28 items measured on a 4-point rating scale where 0 = 'I haven't been doing this at all' and 3 = 'I've been doing this a lot'. Consistent with the approach of Carver et al. who recommend using cohort specific data to explore higher-order factors, and previous research (Knowles, Swan, Salzberg, Castle & Langham, 2014), an

exploratory factor analysis using principle factor axis with an Oblimin rotation was performed using all scale items. For parsimony, the first two components were chosen as they represented the most variance and had strong component weights. The two components were then assessed using CFA and Cronbach alpha with item-if-deleted analyses.

The first component was identified as 'maladaptive coping' and had good fit and internal consistency (.78) using 8 items including 'I've been using alcohol or other drugs to make myself feel better', and 'I've been giving up trying to deal with it'. The second component was identified as 'adaptive coping' and had good fit and internal consistency (.81) using 8 items including 'I've been concentrating my efforts on doing something about the situation I'm in' and 'I've been taking action to try to make the situation better'.

General Self-efficacy Scale (GES) (Schwarzer & Jerusalem, 1995)

The GES is a 10-item scale assessing self-efficacy, which is defined by the authors as optimistic self-beliefs to cope with a variety of difficult demands in life. Each item is assessed on a 4-point scale where 1 = 'not at all true' and 4 = 'exactly true'. For example, 'I can solve most problems if I invest the necessary effort'. Items are summed giving a score range of 10 to 40, with higher scores reflecting greater self-efficacy. The GES data indicated excellent internal consistency (0.91).

Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983)

The HADS is a 14-item scale assessing anxiety and depression symptoms. Each item is scored on a 4-point scale. Seven items assess anxiety (e.g., 'Worrying thoughts go through my mind [0 = only occasionally – 3 = a great deal of the time]'), and seven items assess depression (e.g., 'I still enjoy the things I used to enjoy [0 = definitely as much – 3 = hardly at all]'). Summed subscale values are interpreted as 0-7 (normal), 8-10 (mild), 11-15

(moderate), and 16-21 (severe) (Snaith, 2003). The HADS displayed good internal consistency (overall HADS 0.86; HADS Anxiety 0.86; HADS Depression 0.77).

Diabetes Quality of Life Brief Clinical Inventory (DQoL-Brief) (Burroughs, Desikan, Waterman, Gilin, & McGill, 2004)

The DQoL-Brief measures diabetes-specific QoL across 15 items and displayed good internal consistency (0.84). Each item is assessed on a 5-point scale. For example, 'How satisfied are you with your current diabetes treatment? (1 = very satisfied – 5 = very dissatisfied)'. Items are summed and averaged to attain an overall QoL score, with higher scores reflecting poorer QoL.

Procedures:

Patients attending the diabetes clinics at two metropolitan hospitals in Australia were invited to participate. Potential participants with diabetes were identified by the diabetes clinical staff (e.g. endocrinologist, diabetes educator) and provided with a study flyer and/or invited to meet with a research assistant in the clinic to discuss further. Clinical staff also obtained patient permission to provide researchers with patient contact details for follow-up. If agreeable, people with diabetes were approached, informed and formally consented by a research assistant. Study flyers were also posted online through community organisations such as Diabetes Australia so people from the wider community could self-refer to the study.

This study utilised baseline data that was collected for a randomised controlled trial (RCT) of a diabetes-focused intervention program. Inclusion criteria were: (1) have a diabetes diagnosis, confirmed by medical records; (2) be aged 18 years or above; and (3) able

to converse in English without interpreter. Exclusion criteria were: (1) presence of developmental disability or amnestic syndrome impairing ability to learn from the intervention; and (2) comorbid serious acute medical illness defined by treating physician.

Participants completed questionnaires at a time and place convenient to them, and returned questionnaires to staff at the diabetes unit or by pre-paid envelope. The study protocol was approved by the local research ethics committee. An executive steering committee (all authors) oversaw project planning, procedures and ongoing data collation.

Statistical analyses:

Exploratory analysis and visual inspection of the data indicated all study variables met necessary assumptions required for structural equation modelling (SEM) (e.g., normality, linearity). Correlational analyses were undertaken to compare the relationship between study variables. Consistent with the CSM, a SEM was specified using the AMOS statistical package. As recommended by Hu and Bentler (Hu & Bentler, 1999), criteria used to specify paths or variables to be removed were based on inspection of standardized residuals, modification indices, and a significant improvement in fit (i.e., significant change in χ^2/N and an increase in standard goodness of fit measures [$\chi^2P > 0.05$; $\chi^2/N = 1–3$, Root Mean Square Error of Approximation (RMSEA) < 0.07, Comparative Fit Index (CFI) > 0.95, Goodness of Fit Index (GFI) > 0.95]).

Results

Initial screening across Type 1 diabetes versus Type 2 diabetes indicated non-significant differences across marital status ($\chi^2(4) = 8.24$, $p < .083$), but significant differences between gender and diabetic types (61% of female were affected by Type 1 diabetes, whereas only 28.3% of males had Type 1 diabetes; $\chi^2(1) = 15.98$, $p < .001$). In relation to age, people with Type 1 diabetes were significantly younger than those with Type 2 (*M*=43.21, SD=14.06 vs *M=60.69, SD=12.10*), t(110)=7.07, p<.001. Participants with Type 1 diabetes had significantly higher scores on illness perceptions (*M*=5.57, SD=1.82 vs *M=4.51, SD=2.22*), t(110)=2.27, p<.007 QoL (*M*=2.64, SD=.58 vs *M=2.21, SD=.55*), t(110)=3.98, p<.001 and anxiety (*M*=7.49, SD=3.85 vs *M=5.86, SD=4.13*), t(110)=2.13, p<.035 than those with Type 2. Non-significant differences were found between patients with Type 1 diabetes versus patients with Type 2 diabetes for self-efficacy (*M*=30.27, SD=3.37 vs *M=29.93, SD=6.18*), t(110)=0.35, p=.724, maladaptive coping (*M*=0.78, SD=.52 vs *M=.66, SD=.55*), t(110)=1.12, p=0.265 and adaptive coping (*M=1.07*, SD=0.56 vs *M=1.12, SD=.60*), t(110)=.43, p=.667.

As shown in Table 1, illness perceptions were found to have a significant positive correlation with maladaptive coping, psychological distress and QoL and a significant negative correlation with self-efficacy. Results suggest that poorer perceptions relating to illness are associated with greater engagement in maladaptive coping, increased psychological symptoms, and reduced self-efficacy. Adaptive coping was not found to correlate significantly with any study variables. Quality of life was found to have a significant negative correlation with maladaptive coping and psychological distress. These results suggest that poorer QoL is associated with higher psychological distress.

Table 1. Pearson's correlation and descriptive statistics of the scales

Consistent with the CSM, illness perceptions, maladaptive- and adaptive coping, self-efficacy, psychological distress (anxiety and depression symptoms) and QoL were specified in a structural equation model. The initial model was informed by the CFA and was saturated with the validated measurement models of each variable, represented as latent variables. To reduce measurement error in the model, single indicator latent variables were specified with subscale internal consistency and variance.

The final model was derived by removing non-significant pathways or variables that did not add significantly to the model's fit. This process of removal continued until the final model was parsimonious, theoretically valid, and provided best fit. Based on this iterative process, several paths and variables were identified as non-significant contributors to the model. Thus, pathways between illness perceptions and adaptive coping, illness perceptions and self-efficacy, adaptive coping and depressive symptoms and adaptive coping and anxiety symptoms were removed.

Figure 1. Final SEM model (p = ** <.001, * <.01)

The final model (Figure 1) had a good fit (χ^2 (4) = 9.4, p = 0.052, RMSEA < 0.07, CFI > 0.97, GFI > 0.97, SMSR<0.05). This model was run with age and gender as control variables and the analysis indicated age and gender did not confound the relationships specified in the model. Fifty-one percent of variation in QoL was explained by this model. Illness perceptions had a significant direct influence on QoL (β = 0.48, p < 0.001). Illness perceptions had a significant direct influence on maladaptive coping, self-efficacy, and anxiety symptoms (β = 0.36, p < 0.001, β = -0.44, p < 0.001, β = 0.21, p < 0.01, respectively). The relationship between illness perceptions and QoL was partially mediated by anxiety symptoms. The

relationship between illness perceptions and depressive symptoms was fully mediated by maladaptive coping and self-efficacy. The relationship between self-efficacy and QoL was partially mediated by depressive symptoms, whilst the relationship between maladaptive coping and QoL was fully mediated by depression and anxiety symptoms. There was a significant positive correlation between depression and anxiety symptoms ($p< 0.05$).

Discussion

There is a paucity of systematic evaluation of the psychological consequences and associations with diabetes outcomes. In this context, the study reported here aimed to explore mediating relationships between illness perceptions, coping styles, self-efficacy, and psychological distress in individuals with diabetes.

Support for our first hypothesis was found in that poorer illness perceptions and less self-efficacy would be associated with greater anxiety, depressive symptoms and poorer QoL. These findings are consistent with past research demonstrating that poorer illness perceptions are associated with anxiety and depression (Paschalides et al., 2004; Skinner et al., 2014) and poorer QoL (Hampson et al., 2000; Paschalides et al., 2004; Scollan-Koliopoulos et al., 2013; Watkins et al., 2000); and that less self-efficacy is associated with anxiety and depression (Imai et al., 2017; Indelicato et al., 2017; Wu et al., 2013) and poorer QoL (Bowen et al., 2015; Walker et al., 2014). While in line with the hypothesized direction, adaptive coping did not have a significant association with anxiety, depressive symptoms, or QoL. This finding is inconsistent with past research which has demonstrated adaptive coping to have beneficial impact on depression and anxiety (Burns et al., 2016; Smari & Valtysdottir, 1997; Sultan et al., 2008; Zhang et al., 2009). Support for our second hypothesis was found, in that greater engagement in maladaptive coping was associated with anxiety and depressive symptoms and

poorer QoL, again compatible with previous studies (Burns et al., 2016; Clarke & Goosen, 2009; Smari & Valtysdottir, 1997; Zhang et al., 2009)..

To explore these relationships simultaneously, and assess potential mediating pathways as proposed by the CSM, a SEM approach was undertaken. Consistent with the CSM, and in support of our third hypothesis was the finding that self-efficacy, coping style (specifically maladaptive coping), and anxiety and depression symptoms were mediators between illness perceptions and QoL. Also consistent with the CSM and past research was the finding that illness perceptions directly influenced on QoL as well as acting via multiple mediators (Hagger, Koch, Chatzisarantis, & Orbell, 2017; Hagger & Orbell, 2003; Knowles, Wilson, Connell, & Kamm, 2011). While it is known that self-efficacy can act as a mediator - for example between depressive symptoms and self-care (Al-Amer et al., 2016; Cherrington et al., 2010; Devarajooh & Chinna, 2017; Hernandez et al., 2016), the current findings provide further evidence for the important role of self-efficacy and its impact on psychological well-being; directly on depression and indirectly on anxiety symptoms, via maladaptive coping. Consistent with past research, maladaptive coping was found to be a strong and significant mediator between illness perceptions and anxiety and depressive symptoms (Hagger et al., 2017; Knowles et al., 2017; Knowles et al., 2011). Also consistent with past research reporting that poorer psychological well-being is associated with reduced QoL (Ali et al., 2010; Egede & Hernandez-Tejada, 2013; Goldney et al., 2004; Schram et al., 2009; Smith-Palmer et al., 2016), was the current finding that anxiety and depressive symptoms acted as mediators influencing QoL. This study's results provide further evidence for the significant associations between diabetes, psychological well-being and QoL for a cohort of adults with diabetes which supports guidelines recommending the integration of psychological care to optimise diabetes management and better outcomes (Craig et al., 2011).

The findings from the current study suggest that the way in which individuals perceive their diabetes, their self-efficacy relating to managing life challenges, and the coping strategies they engage in (especially maladaptive coping) are associated with psychological well-being and QoL. It follows that interventions like mindfulness, designed to increase awareness and attention, may assist people to become more aware of their perceptions and how they wish to approach their illness differently; emerging evidence suggests mindfulness based interventions may positively impact wellbeing and quality of life in people with diabetes (e.g. Schroevers et al., 2015; van Son et al., 2013). The identified mediating pathways provide further support for past research that has identified both self-efficacy (Al-Amer et al., 2016; Cherrington et al., 2010; Devarajooh & Chinna, 2017; Hernandez et al., 2016) and individual coping patterns (American Association of Diabetes Educators, 2017; Thorpe et al., 2013) as a potential focus of psychological intervention to promote optimal health and QoL despite living with a chronic illness.

All variables were measured subjectively with self-report questionnaires in this study, therefore reporting bias may exist such as the impact of socially desirable responding (Caputo, 2017). Further, lack of homogenous administration may have impacted validity as participants completed questionnaires at any time or place they deemed convenient. The lack of disease activity data (e.g., HbA1c) limits the generalizability of the results. As the study was cross-sectional, true causal (mediational) relationships could not be tested. Due to the limited sample size, individuals with Type 1 and Type 2 diabetes were analysed together in the final model. Given that individuals with Type 1 were typically younger, had poorer illness perceptions, and more severe anxiety symptoms than individuals with Type 2, future research could compare the final model across diabetes type.

Future CSM research should seek to explore other potential mediators impacting the psychosocial aspects of diabetes, including social and/or carer support (Bouldin et al., 2017;

Gu et al., 2017; Song, Nam, Park, Shin, & Ku, 2017), medication adherence (Gu et al., 2017), trust in health care providers (Reach et al., 2018), unconscious defence mechanisms (Marchini et al., 2018), and sense of coherence (Nuccitelli et al., 2018).

Conclusion

To the authors' knowledge, this is the first study demonstrating utility of the CSM in a cohort of adults with diabetes using SEM to explore specific associations between QoL, self-efficacy, and psychological distress. The use of SEM in the current study to explore the interrelationships between psychosocial mediators and the relationship to QoL is a methodological advance from previous studies using non-simultaneous statistical methods. The findings demonstrated poorer illness perceptions have a significant direct and indirect relationship to QoL and that self-efficacy and maladaptive coping mediate the relationship between illness perceptions and psychological well-being. Anxiety and depressive symptoms acted as key mediators between self-efficacy and maladaptive coping and QoL. The findings provide a strong basis for future psychological interventions to target modifiable mediators (e.g., self-efficacy, coping patterns) as identified through the application of a CSM approach to promote optimal self-care and enhanced QoL in individuals living with diabetes.

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Table 1. Pearson's correlation and descriptive statistics of the scales

	Illness Perceptions	Maladaptive coping	Adaptive coping	Self-efficacy	Anxiety	Depression	Mean (SD)
Illness Perceptions	-	-	-	-	-	-	4.95 (2.13)
Maladaptive coping	0.50**	-	-	-	-	-	0.71 (0.53)
Adaptive coping	-0.07	0.03	-	-	-	-	1.10 (0.57)
Self-efficacy	-0.44**	-0.48**	0.30**	-	--	-	30.16(5.03)
Anxiety	0.49**	0.55**	-0.08	-0.42**	-		6.54 (4.06)
Depression	0.44**	0.57**	--0.16	-0.51**	0.50**	-	5.50 (3.49)
Quality of Life	0.66**	0.39**	-0.01	-0.32**	0.52**	0.51**	2.40 (0.61)

***. Correlation is significant at the 0.01 level (2-tailed).*

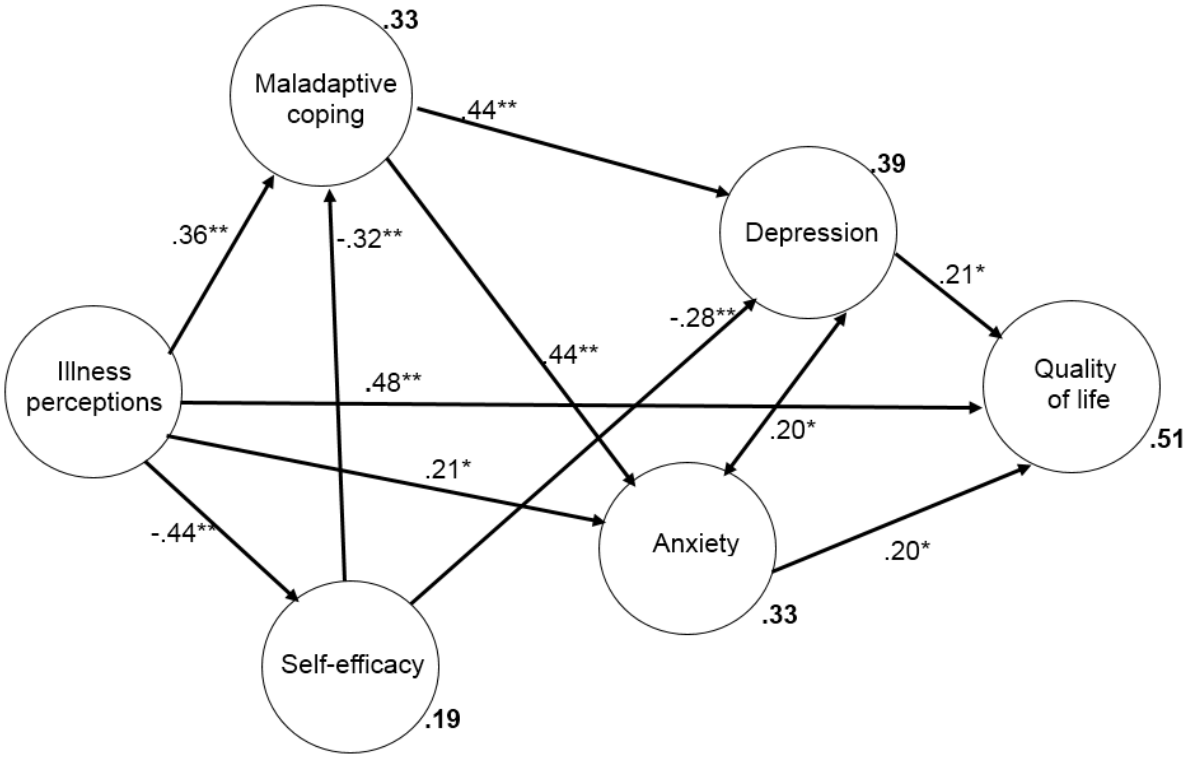

Figure 1. Final SEM model (p = ** <.001, * <.01)