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Developing reliable & valid Chinese measure of diabetes empowerment scale

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Executive Summary

This study translated the Diabetes Empowerment Scale (DES) in Chinese language and established the psychometric properties of the Chinese measure among Hong Kong Chinese people with diabetes. A two-stage study design incorporating qualitative and quantitative components was adopted. The first stage of the study included: back translation of the scale, 2 focus group interviews (N=5 & 7) to determine the cultural equivalency of the translated scale, and the determination of the content validity by a panel of Hong Kong Chinese diabetologists (N=3) and diabetes nurses (N=5). The second stage established the psychometric properties of the Chinese DES by applying it to a sample of patients with diabetes (N=207). Results of the study provide support for the validity and reliability of the Chinese DES with 20 items (CDES-20) and 5 subscales. Each coefficient alpha for the 5 subscales and the global CDES-20 was good (0.76-0.89). The test-retest reliability of the CDES-20 is supported by the good test-retest correlation (0.61-0.81) with a sub-sample of 20 patients over a period of 2 weeks. Although, criterion validity was only found between the global scale and metabolic control (HbA_{1c}) of respondents with Type 2 diabetes (-0.17, p=0.03), respondents with high CDES-20 scores had lower HbA_{1c} (M=0.55%, p=0.038) than those with low CDES-20 scores. The authors will conduct a follow-up study at 6 and 12 months to examine the predictive validity of the CDES-20 with metabolic control. Given the limited empirical findings in the measurement of psychosocial self-efficacy among Chinese people with diabetes, the authors argue that the CDES-20 can serve as an outcome measure for future patient education and health promotion interventions for people with diabetes. The authors also

suggest that the CDES-20 can be used as a clinical tool to identify patients who are less capable in dealing with diabetes-specific psychosocial problems for special attention.

(301 words)

Introduction

Diabetes as a chronic illness demands patients to take up to 95% of daily clinical decision-making and diabetes care [1]. It has been well documented that for diabetes treatment regimens to be effective, patients' self-management is a paramount determinant [2]. The need for patients to actively engage in self-management has given rise to the global emphasis on patient education as a central issue in diabetes care and related research in recent decades [3]. This has also augmented a recent shift from a traditional to an empowerment approach to diabetes education [4,5]. The shift in part is a result of the recognition of the limitation of the traditional approach of which the assumption is that the knowledge gained from education activities would bring about attitude changes and compliance to prescribed regimens [6,7]. Indeed, research has demonstrated that non-compliance rate to diabetes self-management ranges from 30 to 80% despite good corresponding knowledge [8].

Very often diabetic patients who are non compliant are victims of their total life situation, suffering from socio-environmental barriers to appropriate self-management [9,10]. Due to difficulties in overcoming such barriers, patients often display emotional distress such as anxiety, fears and guilt [9,11]. This has identified concerns about the role of health promotion among diabetic patients of which empowering patients with a sense of control of the disease is the central theme [7]. Indeed, World Health Organization advocates the importance of health promotion among people with diabetes of which fostering psychological wellbeing is one of the major outcomes [12]. Empowerment as a health

promotion model helps foster appropriate self-management by means of enabling patients to overcome social-environmental barriers and facilitating a sense of self-efficacy [6,7]. Research in diabetes education using empowerment as a theoretical framework has been accumulating since the early 1990s [13]. Results of a randomized controlled trial have shown improved physical outcomes such as tighter metabolic control as well as a better quality of life [6].

Anderson et al. [6] was among the first research teams investigating the application of the concept of patient empowerment with diabetic patients. They defined that the purpose of patient empowerment is to ensure patients make informed choices about their diabetes self-management. The knowledge thus required falls into two main domains. The first domain is the diabetes related knowledge and skill, which is provided in traditional education programmes. The second domain, which Anderson et al. [6] regard as equally important, is psychosocial skills to overcome social-environmental barriers arising from daily living. Anderson et al. [6] believe that for individuals to be healthy, they need to have the psychosocial skills to bring about changes in their personal behaviour and social environment that influence their lives. These skills play an important role in the development and implementation of a successful self-management plan.

A diabetes-related psychosocial self-efficacy measure, Diabetes Empowerment Scale (DES), is available; Anderson et al. developed and psychometrically tested this instrument among Caucasians in the West [6,14,15]. To date, two versions of the DES exist [14,15]. The long version consisting of 37 items (DES-37) and eight sub-scales

measure subjects' ability to, for example, self-assess readiness to change and set and reach diabetes goals. Subjects indicate on a 5-point likert scale from '1' (strongly agree) to '5' (strongly disagree). A sample item of the scale is, "In general, I believe that I am able to turn my diabetes goals into a workable plan". This scale has demonstrated high internal consistency of 0.94 and test-retest reliability of 0.79 over a period of 6 weeks [14]. Sub-scale reliabilities ranged between 0.57 and 0.85 [14]. Anderson et al. [15] develop a brief version of DES with 28 items (DES-28, alpha=0.96) and 3 subscales: managing the psychosocial aspects of diabetes (9 items, alpha=0.93), assessing dissatisfaction and readiness to change (9 items, alpha=0.81), and setting and achieving diabetes goals (10 items, alpha=0.91).

The prevalence of diabetes in Hong Kong has been rising steadily in the past decade [16,17]. Health statistics demonstrate that both hospitalization and mortality rates from diabetes and related complications have risen gradually in the last decade [18]. Diabetologists in Hong Kong have advocated the use of empowerment as a model guiding diabetes care and education [19]. To develop education interventions using this model, one of the pre-requisites is to have the necessary construct to provide the baseline assessment of patients' perceived psychosocial self-efficacy levels. This information is essential for the design of interventions to overcome psychosocial constraints to diabetes self-management. In addition, the instrument will provide an outcome measure to establish the effectiveness of such interventions. The instrument will again serve as a clinical assessment tool for identifying patients with low level of psychosocial self-efficacy for specific attention. It is suggested that the lack of a reliable and valid Chinese

measure of diabetes-related psychosocial self-efficacy is one of the major drawbacks in the development of diabetes education and related research in Hong Kong.

Aim

This aim of this study was twofold, to translate the DES-37 in Chinese language and to establish the psychometric properties of the Chinese measure among Hong Kong Chinese people with diabetes. Two specific objectives have been identified to fulfil the aim.

1. To examine the cultural equivalency of the Chinese DES
2. To test the reliability and validity of the Chinese DES

Method

Design

A study design incorporating qualitative and quantitative components, undertaken at two stages, enabled the psychometric properties of the Chinese measure to be established. This design was informed by the literature on validating translated instruments for use in different languages and cultures [20,21]. The first stage involved the examination of cultural equivalency and content validity of the Chinese DES while the second stage established construct validity, criterion validity and internal consistency reliability and test-retest reliability.

The first stage of the study included several procedures: back translation of the scale, focus group interviews to determine the appropriateness of terminology used in the

translated scale for the Hong Kong Chinese people with diabetes, and the determination of the content validity by a panel of Hong Kong Chinese diabetes workers. The second stage established the psychometric properties of the Chinese scale by applying it to a sample of Hong Kong Chinese patients with diabetes.

Procedures and sampling methods

First stage

Back translation

The DES-37 was translated to Chinese by a bilingual translator, and back translated to English by an independent bilingual translator. The two investigators, the two translators and one research nurse formed a translation committee. The committee held meetings to check and agree on a version of the Chinese DES-37. This procedure was to ensure for conceptual and linguistic relevance of the translated version [20,21].

Focus groups

Two focus groups with council members of a diabetes patient support group and a diabetes mutual-aid group were conducted. The council members organized self-help activities for their fellow patient members. They were invited as experts giving opinions on the cultural equivalency of the Chinese DES-37 and appropriateness of language usage of its individual items. The literature suggests that the ideal group size of each focus group is 6 to 8 members and at least more than one group is required to give reliable findings [22].

Two research nurses conducted the focus group interviews at the usual venues where council members had their activities. One research nurse acted as a moderator while the other acted as an observer taking field notes of the interactions. The moderator went through each item of the Chinese DES-37. Participants were asked to consider and comment on the ease of understanding, clarity, and style of individual items and whether culturally appropriate terms had been used. In addition, participants were asked to identify whether modification/deletion of terms/phrases/items was required. If modification was regarded as necessary, the group was asked to suggest and discuss what the modified items were like. The focus group interviews were audio-taped and transcribed verbatim. The scale was modified after the two focus group interviews were analyzed. A focus-group modified version was developed.

Content validity

Hong Kong Chinese diabetes workers were invited to form a panel of content experts to judge the content validity of the Chinese DES-37. Four diabetologists who conducted research in diabetes care and five diabetes nurses with clinical expertise in patient education were invited to give their expert opinions. They were also potential end users of the Chinese DES. One diabetologist declined the invitation to participate due to other commitment at the time of the study leaving eight members in the panel.

The DES-37 and the focus-group-modified Chinese version were sent to each member of the panel. Content validity was assessed by asking each member to rate the agreement of each item as a valid measure of the construct using a 5-point likert scale from '1'

(strongly disagree) to '5' (strongly agree). A Content Validity Ratio (CVR) was calculated for each item and the overall Chinese DES-37 respectively. In addition, the panel was asked to make comments on individual items in relation to the accuracy, clarity, style and meaning of the translation. A panel-modified version was developed incorporating the panel's comments.

Second stage

The pilot test

The panel-modified version of the Chinese DES-37, together with an additional section on demographic and clinical data, was pilot-tested with 19 patients to check feasibility of the data collection procedure and the ease of administration of the scale in terms of clarity and patients' willingness to complete the scale. The administration of the pilot study was undertaken using a structured interview to minimize potential threats to the understanding of the meaning of the Chinese DES-37 arising from the differences in patients' education levels if the scale is self-completed. Research nurses read the scale in a consistent manner and recorded the responses for patients. The 19 patients were selected using the same criteria and procedure (to be reported in the next paragraph) identified for the main study. A pilot-test-modified version of the scale was developed after incorporating patients' comments.

Main study

A diabetes specialist clinic provided the setting for the main study. Entire population of adult outpatients (aged 18 and above, Type 1 or Type 2) who attended the clinic for

diabetes care during a three-month data collection period (11 clinic days) provided the sampling frame. Systematic random sampling was adopted to select every fourth patient from the follow-up appointment list. This sampling method was adopted as it was a convenient way to draw a sample from a large identified population when a printed list of this population was available. Non-Cantonese speakers and those with language problems, such as stroke patients who exhibited speech difficulty were excluded from the study. A sample size of at least 185 is required to provide for a minimum of 5 respondents per item on the Chinese DES-37 for factor analysis and minimized the probability of misleading results based on chance [23,24,25].

The pilot-test-modified version was used in the main study. In addition, results of the routine blood taking for metabolic control (HbA_{1c}) of each patient taken on the day of the follow up were retrieved from patient record. A research nurse contacted patients via telephone one week ahead of their follow-up day to explain the nature and purpose of the study, confidentiality of personal data as well as patients' right to withdraw from the study at anytime without jeopardizing their care received from the hospital. After obtaining verbal consent, the research nurse set up an appointment with each patient for a structured interview in an interview room on the follow-up day.

Test-retest reliability was evaluated at an interval of 2 weeks with a sub-sample of 20 patients. This sample size is generally accepted as reasonable; a bigger sample will not generate a larger coefficient if the instrument is in fact not reliable. This time period was selected with the expectation that diabetes-related psychosocial self-efficacy would be

unlikely to change in that period, but minimize the risk of eliciting responses that were recalled from prior testing.

Home visits for the retest was arranged to minimize inconvenience imposed on patients in making an extra trip to the clinic. Patients were explained fully while they were interviewed on the clinic day about the possibility of a retest and consent was sought again when contacting them for the retest.

Data analysis including psychometric tests

Two researchers and one research nurse analysed the data obtained from the two focus group interviews to determine the cultural equivalency of individual items and whether they needed refinement. Those items that were culturally unfair would be modified. Content validity was determined by content validity ratio (CVR) derived from the judgements of the panel of content experts. Acceptable CVR is that above 3.

Descriptive statistics were used to establish the frequency, range, mean and standard deviation of demographic and clinical characteristics of the respondents. Factor analysis was used to determine the underlying construct of the scale to test the construct validity of the scale. The analysis was informed by the work of Anderson et al. [15] as well as experts in psychometric properties [23,24,25]. A principal components factor analysis using Varimax Rotation was used to identify an empirically derived set of subscales. Factor loadings over or equal to 0.50 were considered significant and were used to define factors. An iterative process of factor analyses and item analyses was used to compare

various forced factor solutions. The purpose of this iterative process was to determine the smallest number of factors that were psychologically coherent and meaningful. In addition, the identified factors should have the smallest number of items with a coefficient over or equal to 0.70 [23,24,25].

A Pearson correlation matrix was used to determine the relationships among the Chinese DES subscales. Pearson correlation coefficients between the Chinese DES, the DES-37 and the DES-28 were examined to establish the relationship. Cronbach's alpha coefficient was calculated for each sub-scale and the overall Chinese DES to determine the internal consistency reliability. Test-retest reliability using Spearman correlation coefficients between the 20 patients' test and retest scores were calculated. In addition, Wilcoxon Signed Ranks test was to be conducted to make sure that the Chinese DES is reliable.

Pearson correlation coefficients between metabolic control (HbA_{1c}) and the Chinese DES were calculated to establish the criterion validity of the scale. The metabolic control was selected as a criterion based on the assumption that people with high diabetes-specific psychosocial self-efficacy would exhibit better self-management resulting in better HbA_{1c} . This was supported by the findings of a randomised control trial [6]. In addition, the lack of valid and reliable Chinese scales measuring similar concept precluded the use of concurrent validity.

Results

First stage

Back translation

The authors, two bilingual translators and two research nurses formed a translation committee to decide on the language of the items of the scale that best reflected the linguistic and conceptual equivalence of the Chinese DES-37.

Focus group

Table 1 (all tables are put in Appendix 1) shows the characteristics of the participants of two focus groups (N= 5 & 7 respectively). The two interviews lasted for approximately 90 and 120 minutes respectively. Analysis of the focus group data showed the two groups were congruent in their opinions. They suggested modification on some wordings of some items to the colloquial language used by diabetes patients in Hong Kong, for example, “positive and negative methods”. However, no replacement or elimination of items was indicated. A focus-group-modified Chinese DES-37 was developed accordingly.

Content validity ratio

The Chinese and the original version of the DES were sent to 3 diabetologists and 5 diabetes nurses in Hong Kong to determine the content validity. A CVR was derived from the ratings obtained from this panel. The overall CVR of the Chinese DES-37 was high attaining a ratio of 4.3. The ratio of all the items on the Scale ranged from 4.8 to 3.9.

Two members made suggestions on refining the sentence structure of 2 items to make them read fluently. A panel-modified version was developed.

Second stage

Pilot study

The 19 patients participated in the pilot study initially commented on the difficulty in understanding the translated title of the scale “Diabetes empowerment scale”. After explaining the diabetes-related psychosocial self-efficacy as the focus of measure, patients demonstrated understanding. In addition, patients also commented on the non-specificity of the wordings in some items involved “diabetes goals”. Some patients expected to have a specific goal defined for them within the items. It was clarified to the patients that the scale aimed at measuring the ability to reach their goals rather than achieving a goal defined by others. After this explanation, they found those items easy to respond to.

To avoid bias in the data collected in the main study, a standardized statement was read to each subject before administering the scale. It explained the nature of the scale as measuring ability in managing psychosocial problems arising from diabetes self-management. Research nurses should not define diabetes goals for the subjects, but asked them to tell their agreement on the ability to identify and reach such goals for themselves. The sequence of the items was altered. Items that patients regarded as comparatively difficult to make a response were moved to the latter half of the scale while those regarded as easy went to the former part. This purpose of the re-sequencing was to put

“easy” items first to warm up respondents and avoid discouragement. No other modification apart from re-sequencing was made to the scale and the data collection procedure. A final version of the Chinese DES-37 was developed.

Main study

a) Demographic and clinical data

A total of 298 patients were identified from the appointment list using systematic random sampling. Twenty-five patients could not be contacted because they moved to another place without a contact number or address. A total of 52 patients refused to participate in the study on the telephone contacts and another 14 patients did not turn up for the appointment after giving verbal consent in the telephone contact. A total of 207 patients were successfully recruited, giving a response rate of 70%. A Goodness-of-Fit Chi-square test revealed no statistically significant differences between the responders and non-responders in terms of age and gender.

Table 2 shows the demographic information of respondents. The majority of respondents aged between 46 and 65 with a mean age of 53 years (SD 12.4). Over half of the sample was female respondents (52.2%). Table 3 shows the clinical information of respondents. The majority of respondents were with Type 2 diabetes. One third of respondents (29.5%) had diabetes diagnosed within the past five years. One third of respondents (29%) had poor metabolic control as reflected by HbA_{1c} according to the standard set by the World Health Organization [26].

b) Psychometric tests and scale statistics

A principal components factor analysis yielded 11 factors with Eigen values ≥ 1.0 . After an iterative process of factor analyses and item analyses to examine the various factor solutions, the authors judged the 5-factor solution to be the best. It yielded a 20-item Chinese DES (CDES-20, $\alpha=0.86$) with 5 subscales, which accounts for 63.3% of the total variance. Factor 1, entitled “Overcoming barriers” ($\alpha=0.89$), assesses patients’ ability to identify, think of, try out and decide on ways to overcome barriers to achieving diabetes goals. Factor 2, entitled “Determining suitable methods for self-management” ($\alpha=0.79$), describes patients’ perceived knowledge about diabetes and self, and perceived ability in figuring out if it is worthwhile to make changes in how one takes care of diabetes. Factor 3, entitled “Achieving diabetes goals” ($\alpha=0.78$), assesses patients’ perceived ability to identify realistic diabetes goals, change the goals into a workable plan and reach the goal after making up one’s mind. Factor 4, entitled “Obtaining support to self-management” ($\alpha=0.78$), describes patients’ perceived ability to identify sources of support and ask for the support when in need of them. Factor 5, entitled “Coping with diabetes-related stress” ($\alpha=0.76$), describes patients’ perceived ability to identify sources of diabetes-related stress and perceived effective coping. (See appendix 2 for the CDES-20 as well as its English version.)

Descriptive statistics for the 5 subscales are presented in Table 4. The CDES-20 subscales correlation matrix is presented in Table 5. The correlations among the subscales range from 0.34 to 0.63. The correlation between the CDES-20, Chinese DES-37 and Chinese DES-28 is 0.95 and 0.93 respectively.

The CDES-20 subscales test and retest reliability coefficients of a sub-sample of patients (N=20) are presented in Table 6. The correlations among the subscales range from 0.61 to 0.81. In addition, Wilcoxon Signed Ranks tests demonstrate non-significant results with all the subscales indicating that the CDES-20 is reliable.

No significant correlation was found between the five subscales, the global scale and HbA_{1c} of the total sample. When the total sample is categorized into respondents with Type 1 (n=36) and Type 2 (n=171), a weak correlation was found between the global scale and HbA_{1c} of Type 2 respondents (-0.17, p=0.03), indicating the higher the CDES scores the lower the HbA_{1c} values. Other correlations were all non-significant. After controlling for the effects of age, education level, and length of time since diabetes was diagnosed, non-significant correlations remain, indicating that these variables might not be the confounding factors. In addition, the authors divided Type 2 patients into two groups, low (n=74) and high psychosocial self-efficacy group (n=81), using the mean CDES-20 score. An independent groups *t* test indicated that the high self-efficacy group had lower HbA_{1c}, $t(153) = 2.10$, $p < 0.038$, than that of the low efficacy group. The mean difference in HbA_{1c} was 0.55%.

Discussion

The cultural equivalency of the CDES-20 is supported by the fact that it was examined by two focus groups whose participants were council members of two diabetes self-help

groups. These participants had personal experience with diabetes self-management and were familiar with the colloquial language used in describing issues related to self-management. A panel of Hong Kong diabetes workers who were content experts again determined the high cultural equivalency and content validity of the translated scale. The panel included diabetologists and diabetes nurses who had good clinical experience with diabetes patients and understanding of the concept of empowerment in patient education.

The study provides support for the construct validity and test-retest reliability of the CDES-20 using usual evaluative criteria informed by the literature [15,23,24,25]. Each coefficient alpha for the 5 subscales and the global CDES-20 was good (see Table 4). The strength of the intercorrelations among the CDES-20 subscales (see Table 5) suggests that the instrument is measuring related but separate domains of psychosocial self-efficacy [27]. The test-retest reliability of the CDES-20 is provided by the good test-retest correlation (see Table 6) between the scores of a sub-sample of 20 patients over a period of 2 weeks.

However, criterion validity was not supported by most correlations between the CDES-20 subscales, global scale and HbA_{1c}. Only a weak correlation was found between the global scale and HbA_{1c} of respondents with Type 2. The lack of significant correlation between CDES-20 and HbA_{1c} of Type 1 respondents might be explained by the small sample size of Type 1 respondents in the current sample. However the overall lack of correlations between subscales and HbA_{1c} of Type 2 respondents could not be explained by the same logic. A search of the literature identified a possible answer.

The United Kingdom Prospective Diabetes Study (UKPDS) [28] demonstrates that no matter which treatment regime people with Type 2 diabetes receive, subjects' metabolic control deteriorates overtime. This finding provides strong support to the fact that diabetes is a progression disease. In the current study, although the effect of the length of time since diagnosis confirmed was statistically controlled in the data analysis, this could not circumvent the fact that many Type 2 patients might have a long period of time with diabetes undiagnosed. A cross-sectional study [29] with American veterans (N=90) also demonstrates no correlation between metabolic control and DES-37. The researchers explain that metabolic control is influenced by multiple factors and suggest longitudinal studies to identify the predictive value of the instrument [29]. It is, however, important to note the findings and research design of the randomized control trial conducted by Anderson et al. [6]. This study showed that patients undergoing an education programme to develop psychosocial self-efficacy achieved better metabolic control over a period of 3 months as compared to their baseline measurement as well as to that of the control group. The authors of the current study argue that although metabolic control as a physical marker has been conventionally used as an important objective outcome indicator of diabetes control, it's function in discriminating whether subjects engage in good self-management as a result of high psychosocial self-efficacy in studies using cross sectional research design may be questionable.

Moreover, it is important to note the mean difference of 0.55 percentage point of HbA_{1c} between the low and high psychosocial self-efficacy group in the current study.

According to the findings of the UKPDS [30], for every percentage point decrease in HbA_{1c} there is a 35% reduction in late complications, 25% reduction in diabetes-related deaths, a 7% reduction in all-cause mortality, and an 18% reduction in combined fatal and nonfatal myocardial infarction. From this perspective, a 0.55 percentage point of difference in HbA_{1c}, although small, is a significant finding that has much bearing in patients' long-term physiological end points. The authors suggest conducting a follow-up study to identify the HbA_{1c} values of this cohort of subjects 6 and 12 months after the main study to determine the predictive validity of the CDES-20.

In summary, findings of the study provide support that the CDES-20 has good reliability and satisfactory validity. The criterion validity is limited by the fact that adopting HbA_{1c} as the selected criterion for testing in a cross-sectional study may have questionable function. A follow-up study with the same cohort of subjects at a 6- and 12-month period will be required to test the predictive validity of the scale.

Conclusions and principle benefit for health promotion in Hong Kong

Given the limited empirical findings in the measurement of psychosocial self-efficacy among Chinese people with diabetes, the authors argue that the CDES-20 has good potential to add to our understanding of a relatively understudied area. The instrument can serve as an outcome measure for future patient education and health promotion interventions for people with diabetes. The authors also suggest that the CDES-20 can be

used as a clinical tool to identify patients who are less capable in dealing with diabetes-specific psychosocial problems for special attention.

Plans of dissemination

This is the first study of this kind in Hong Kong. The findings in the form of a report will be sent to the Hospital Authority as well as the hospital and the specialist clinic where the study was based. In addition, a copy of the report will be sent to Anderson who granted the approval to use the DES-37.

The findings of this study will be presented in local (Hospital Authority Convention, 2002, Second Pan Pacific Nursing Conference, to be held in Hong Kong in Nov 2002) and international conferences (5th International Diabetes Federation Western Pacific Region Congress, to be held in Beijing in May 2002). Research articles will be sent to international refereed journals including Patient Education and Counseling, Diabetes Care, and Diabetes Research and Clinical Practice. A poster has been accepted for presentation (See appendix 4 for the abstract) in International Council of Nurses 22nd quadrennial Congress, Jun 2001. This conference is to be held in Copenhagen.

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Appendix 1:**Table 1**

Demographic characteristics of the participants of the two focus groups

	Patient support group N=5	Mutual-aid group N=7
Age (years)	52.8 ¹	49.6 ²
Gender		
Female	5	5
Male	/	2
Marital status		
Single	1	2
Married	3	4
Widow	1	1
Education level		
Primary	2	1
Secondary	2	2
Post secondary	1	4
Employment status		
Housewife	1	/
Retired	3	2
Full-time employment	1	4
Student	/	1
Length of time since diagnosed (years)	8.6 ³	13.5 ⁴
Length of time since being a council member (years)	1.5 ⁵	4 ⁶

¹ range 41-73, ² range 20-63, ³ range 4-13, ⁴ range 8-21, ⁵ range 0.5-4, ⁶ range 1-10

Table 2
 Respondents' demographic data (N=207)

	Frequency (%)
Age (years)*	
16-25	3 (1.4%)
26-35	15 (7.3%)
36-45	40(19.3%)
46-55	60 (29%)
56-65	55 (26.6%)
≥66	34 (16.4%)
Gender	
Male	99 (47.8%)
Female	108 (52.2%)
Level of education	
No formal education	32 (15.5%)
Primary	66 (31.9%)
Form 1-5	84 (40.6%)
Form 6-7	10 (4.8%)
Tertiary	13 (6.3%)
Postgraduate	2 (1%)

*Mean=52.98, SD=12.44

Table 3

Clinical data of respondents (N=207)

	Frequency (%)
Type of diabetes	
Type I	36 (17.4%)
Type II	171 (82.6%)
Length of time since diagnosed (years) ¹	
<1	6 (2.9 %)
1-2	20 (9.7 %)
3-5	35 (16.9 %)
6-10	56 (27 %)
11-20	70 (33.8%)
>20	20 (9.7 %)
Metabolic control (HbA _{1c}) ²	
Optimal control (< 7%)	64 (30.9%)
Borderline control (7- 8.5%)	83 (40.1%)
Poor control (> 8.5%)	60 (29%)

¹Mean=10.53, SD=7.55; ²Mean HbA_{1c} =7.88%, SD=1.61

Table 4
Descriptive statistics for CDES-20 subscales (N=207)

Scale name	n	Means \pm SD (range)	Standardized item α	Variance (%)	Eigen value
1 Overcoming barriers	4	3.33 \pm 0.86 (1-5)	0.89	27.2	5.4
2 Determining suitable methods for self-management	5	3.81 \pm 0.49 (2-5)	0.79	12.5	2.5
3 Achieving diabetes goals	4	3.75 \pm 0.59 (2-5)	0.78	9.4	1.9
4 Obtaining support to self-management	3	3.77 \pm 0.60 (1-5)	0.78	7.5	1.5
5 Coping with diabetes-related stress	4	3.58 \pm 0.67 (1.75-5)	0.76	6.7	1.3

Global scale: α =0.86, mean=3.65, SD=0.4, range, 2.3-5

Table 5

Pearson correlations between CDES-20 subscales (N=207)

Scale name	1	2	3	4	5
1 Overcoming barriers	/	0.52	0.63	0.47	0.48
2 Determining suitable methods for self-management	0.52	/	0.50	0.47	0.34
3 Achieving diabetes goals	0.63	0.50	/	0.44	0.40
4 Obtaining support to self-management	0.47	0.47	0.44	/	0.37
5 Coping with diabetes-related stress	0.48	0.34	0.40	0.37	/

All correlations are significant at $P < 0.01$.

Table 6
Test and retest reliability (N=20)

Scale name	Spearman's rho	P value of Spearman's rho	P value of Wilcoxon Signed Ranks Test
1 Overcoming barriers	0.77	0.001	0.51
2 Determining suitable methods for self-management	0.81	0.0001	0.23
3 Achieving diabetes goals	0.76	0.001	0.13
4 Obtaining support to self-management	0.72	0.002	0.14
5 Coping with diabetes-related stress	0.61	0.13	0.21
Global scale	0.78	0.0001	0.18