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Psychometric evaluation of the Chinese version of the Diabetes Coping Measure (DCM-C) scale

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Abstract

Purpose: To evaluate the psychometric properties of a Chinese version of the Diabetes Coping Measure (DCM-C) scale.

Methods: A self-administered questionnaire was completed by 205 people with type 2 diabetes from the endocrine outpatient departments of three hospitals in Taiwan. Confirmatory factor analysis, criterion validity, and internal consistency reliability were conducted to evaluate the psychometric properties of the DCM-C.

Findings: Confirmatory factor analysis confirmed a four-factor structure (χ^2 /*df* ratio=1.351, GFI=.904, CFI=.902, RMSEA=.041). The DCM-C was significantly associated with HbA1c and diabetes self-care behaviors. Internal consistency reliability of the total DCM-C scale was .74. Cronbach's alpha coefficients for each subscale of the DCM-C ranged from .37 (tackling spirit) to .66 (diabetes integration).

Conclusions: The DCM-C demonstrated satisfactory reliability and validity to determine the use of diabetes coping strategies. The tackling spirit dimension needs further refinement when applies this scale to Chinese populations with diabetes.

Clinical Relevance: Healthcare providers who deal with Chinese people with diabetes can use the DCM-C to implement an early determination of diabetes coping strategies.

Key words

Confirmatory factor analysis, diabetes coping measure, reliability, validity

Diabetes is a complex chronic disease associated with considerable stress, coping, and illness adjustment; therefore, people with diabetes have to integrate their disease and treatment regimens into their daily life to achieve optimum wellness (Karlsen & Bru, 2002). Recently, coping strategy has occupied a prominent role in medical and psychosocial studies among people with diabetes (Coelho, Amorim, & Prata, 2003; Zhang, Chen, & Chen, 2008). A qualitative study found Chinese people with type 2 diabetes lacked the ability to appraise the effects of their coping strategies (Jayne & Rankin, 2001). Accordingly, it is important to focus on how people with diabetes develop and use coping strategies in order to understand their process of being healthy.

The development of diabetes-related coping scales made it possible to investigate correlations between the use of coping strategies and health outcomes. One promising example is the Diabetes Coping Measure (DCM) scale. The DCM is a diabetes-specific coping instrument with well established reliability and validity that is used to determine cognitive and behavioral coping (Welch, 1994). This scale has been used with various populations and in clinical practice (DeVries, Snoek, Kostense, & Heine, 2003; Keers et al., 2006; Luyckx et al., 2008). However, there is a lack of adequate diabetes-specific coping measurement to be used for Chinese populations, prompting the development of a Chinese version of the DCM (DCM-C). Thus, this study aimed to evaluate the psychometric properties of the DCM-C.

Methods

Guided by a revised version of Brislin's translation model (Brislin, 1986; Jones, Lee, Phillips, Zhang, & Jaceldo, 2001), the DCM was translated into a Chinese version, and psychometric testing of the DCM-C was then conducted. A convenience sample of 205 adults with diabetes was recruited from the endocrine outpatient departments of three hospitals in Taiwan.

Inclusion criteria were: (1) aged 40 and over, (2) diagnosed with type 2 diabetes at least 6 months, and (3) living at home.

The 21-item Diabetes Coping Measure (DCM) is a diabetes-specific instrument including four subscales: tackling spirit (5 items), avoidance (5 items), passive resignation (5 items), and diabetes integration (6 items) (Welch, 1994). Items are scored using a 5-point Likert scale from 'agree strongly' to 'disagree strongly'. All questions are reverse scored except for items 1, 4, 9, 12, and 20. Subscales are scored from 0 to 100, with higher scores indicating better use of coping strategies (Welch, Jacobson, & Polonsky, 1997). Cronbach's alpha coefficients ranged from 0.71 to 0.85 for the total score and subscales (Welch, 1994). The Summary of Diabetes Self-Care Activities (SDSCA) scale was used to evaluate the criterion validity of the DCM-C. The SDSCA measures diabetes self-care behaviors over a 7-day period using four dimensions: diet, exercise, blood sugar testing, and foot care (Toobert, Hampson, & Glasgow, 2000). The SDSCA has excellent support for reliability, validity, and sensitivity to change (e.g., Toobert et al., 2000). A recent value of HbA1c, which indicates glycaemic control over the previous 2 to 3 months, was collected from participants' medical records to examine the criterion validity of the DCM-C.

Confirmatory factor analysis (CFA) was conducted to examine construct validity of the DCM-C. Pearson's correlations between the DCM-C and HbA1c and Spearman's correlations between the DCM-C and the SDSCA were conducted to evaluate the criterion validity. A Cronbach's alpha coefficient was calculated for each subscale and the total scale of the DCM-C to determine internal consistency. Data were analyzed using AMOS (version 16.0) and SPSS (version 15.0).

Findings

The 205 subjects comprised 126 (61.5%) males and 79 (38.5%) females, with a mean age of 60.4 years (SD=10.4). The mean duration of diabetes was 8.1 years (SD=7.6). Eighty-six percent (n=176) were currently married. Fifty-seven percent (n=117) had at least high school or college education, 95.1% (n=195) currently lived with spouse or children, and 83.4% (n=171) took an oral hypoglycemic agent to control diabetes.

Construct validity of the DCM-C was determined by the CFA. Fit estimates for a four-factor measurement model which was based on the original version of the DCM were good: $\chi^2_{(176)}$=237.811 (p=.001), χ^2/df ratio=1.351, GFI=.904, CFI=.902, RMSEA=.041 (95% CI=.027, .054). Correlations between factors were from −.04 to .81. All factor loadings were significantly loaded on their respective latent factor, ranging from .21 to .76 (Figure 1).

The DCM-C was negatively correlated with HbA1c (r=−.16, p<.05) and positively associated with diabetes-related self-care behaviors, supporting satisfactory criterion validity (Table 1). For example, diabetes integration was positively associated with specific diet (r_s=.16, p<.05) and exercise (r_s=.19, p<.01).

Internal consistency reliability for the total DCM-C scale was .744. Cronbach's alpha coefficients for each subscale of the DCM-C were .37 for tackling spirit, .59 for avoidance, .61 for passive resignation, and .66 for diabetes integration. Items 1, 4, 9, 12, and 20 had a low corrected item-total correlation, ranging from .01 to .15. All of these 5 items were loaded on the tackling spirit subscale as the original version of the DCM. If these items were deleted, the Cronbach's alpha coefficients were increased by .00 to .02 only (Table 2).

To determine whether the tackling spirit subscale affected the internal consistency of the DCM-C, items 1, 4, 9, 12, and 20 were considered for deletion. Results demonstrated acceptable internal consistency for the 16-item DCM-C (α=.780). Corrected item-total correlations were from .19 to .59 and the Cronbach's alpha coefficients if item deleted ranged from .744 to .780 (Table 2). Compared with the 21-item DCM-C, the 16-item DCM-C only increased a total Cronbach's alpha coefficient by .036, suggesting that items 1, 4, 9, 12, and 20 slightly influenced internal consistency for the total DCM-C scale. Therefore, all items were retained.

Discussion

This is the first study to evaluate the psychometric properties of a Chinese version of the DCM. The four-factor structure of the DCM-C produced by the CFA was confirmed as the original factor structure of the DCM, suggesting satisfactory construct validity. Previously, based on the exploratory factor analysis (EFA), Turan and colleagues (2002) revealed a two-factor structure of the Turkish DCM, namely positive coping and negative coping. Both the CFA and EFA can be used to test constructs of an instrument; however, philosophically the two approaches are quite different. The CFA enables researchers to determine whether a theoretical measurement model is valid while the EFA explores data to identify potential constructs (Hair, Black, Babin, Anderson, & Tatham, 2006). Furthermore, correlations between factors were from −.04 to .81 which were less than the cutoff criterion of .90 (Kline, 2005), supporting the contention that the four subscales are independent. Thus, the key contribution of this study was the use of the CFA approach to validate the construct validity of the DCM-C.

The total DCM-C scale demonstrated adequate internal consistency reliability. However, the tackling spirit subscale not only presented low internal consistency reliability (α=.37) but also had a low corrected item-total correlation for each item. A similar pattern was also found in the Turkish version of the DCM showing that the avoidance, passive resignation, and diabetes integration subscales demonstrated adequate internal consistency (α=.56, α=.75, and α=.79, respectively) but the tackling spirit subscale presented a low Cronbach's alpha coefficient (α=.37) (Turan et al., 2002).

There are several explanations for our low internal consistency. First, the tackling spirit subscale is a multidimensional construct. A low alpha coefficient indicates a low degree of intercorrelation among the five measured items. That is, each item may independently act to reflect different aspects of tackling spirit coping, rather than to measure a single feature. Another possible reason is the lack of the applicability. An inspection of this subscale found these items primarily focus on the coping strategies related to the interaction with others and the perception of diabetes research. The perception regarding diabetes research may be not suitable to reflect active and positive efforts among Chinese people with type 2 diabetes compared with those in the West. Based on the proposed theoretical concept of tackling spirit, further refinement is necessary when applies this scale to Chinese populations with diabetes.

Conclusions

This study provides important evidence for the psychometric properties of the DCM-C in a sample of the Chinese population with type 2 diabetes. Psychometrically sound instruments in Chinese versions are crucial as the proportion of Chinese populations with diabetes is dramatically increasing. Refinement of the tackling spirit subscale is necessary in the future study. Further psychometric evaluation in other samples, e.g., type 1 diabetes, is also needed.

Clinical Resources

- American Diabetes Association: http://www.diabetes.org/about-diabetes.jsp
- World Health Organization: http://www.who.int/diabetes/facts/en

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Table 1. Correlations of the DCM-C, HbA1c, and the SDSCA for the criterion validity

Variables	The DCM-C				
	Total score	Tackling spirit	Avoidance	Passive resignation	Diabetes integration
HbA1c	−.16*	.04	−.05	−.26**	−.11
The SDSCA					
General diet	.21**	.13	.10	.19**	.11
Specific diet	.21**	.13	.12	.14*	.16*
Exercise	.26**	.12	.13	.22**	.19**
Blood glucose testing	.11	.16*	.13	.05	−.02
Foot care	.11	.22**	.10	.01	.03

*P<.05; **P<.01

Table 2. Internal consistency for the item analysis of the DCM-C

Items	Mean (SD)	21 items		16 items	
		Corrected item-total correlation	Cronbach's alpha if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
Tackling spirit					
1. Most people would be a lot healthier if they followed a diabetic diet.	4.73 (.69)	.05	.746	NA	NA
4. Because of my own experience, I can help educate other people about diabetes.	3.98 (1.50)	.15	.746	NA	NA
9. I believe that research will discover a cure for diabetes before long.	3.40 (1.67)	.01	.759	NA	NA
12. Clinical research is continually improving the treatments available for diabetes.	4.40 (1.08)	.14	.744	NA	NA
20. My diabetes has caused me to think about life in a more positive way.	4.39 (1.16)	.09	.747	NA	NA
Avoidance					
2. I am reluctant to visit my doctor for my regular diabetes check up when I know I am in poor blood glucose control.	4.70 (.92)	.24	.739	.20	.779
3. I dislike reading about diabetes because it only makes me worry more.	4.49 (1.21)	.41	.727	.37	.769
5. When my blood sugars are high I don't bother monitoring them as much.	4.65 (.98)	.31	.735	.30	.744
6. It's difficult to undertake regular blood sugar monitoring into my busy lifestyle.	4.55 (1.11)	.30	.735	.26	.776
8. I am uncomfortable talking to people about my diabetes.	3.34 (1.75)	.36	.730	.40	.767
Passive resignation					
7. Whatever I do, diabetes complications will continue to ruin my health.	4.33 (1.38)	.38	.727	.43	.764
10. I feel like just giving in to my diabetes.	4.64 (1.05)	.18	.741	.19	.780
11. I can't do much to control my blood	3.41	.39	.726	.40	.767

sugar well.	(1.73)				
13. Because of my illness, I cannot plan realistically for the future.	3.83 (1.60)	.47	.719	.49	.759
14. I always seem to have poor blood sugars no matter what I do.	3.57 (1.74)	.40	.725	.44	.763
Diabetes integration					
15. Diabetes makes me feel different from everyone else.	3.85 (1.60)	.39	.727	.37	.770
16. I dislike being referred to as a "diabetic".	4.09 (1.56)	.34	.731	.37	.769
17. Diabetes is the worst thing that has ever happened to me.	3.00 (1.86)	.38	.727	.40	.767
18. Most people would find it difficult to adjust to diabetes.	3.52 (1.78)	.40	.725	.45	.762
19. Having diabetes over a long time changes your outlook on life for the worse.	3.94 (1.61)	.53	.714	.59	.750
21. I think it is unfair that I should have diabetes when other people are so healthy.	4.35 (1.38)	.26	.737	.26	.777

NA = Items were deleted and no results for this item.

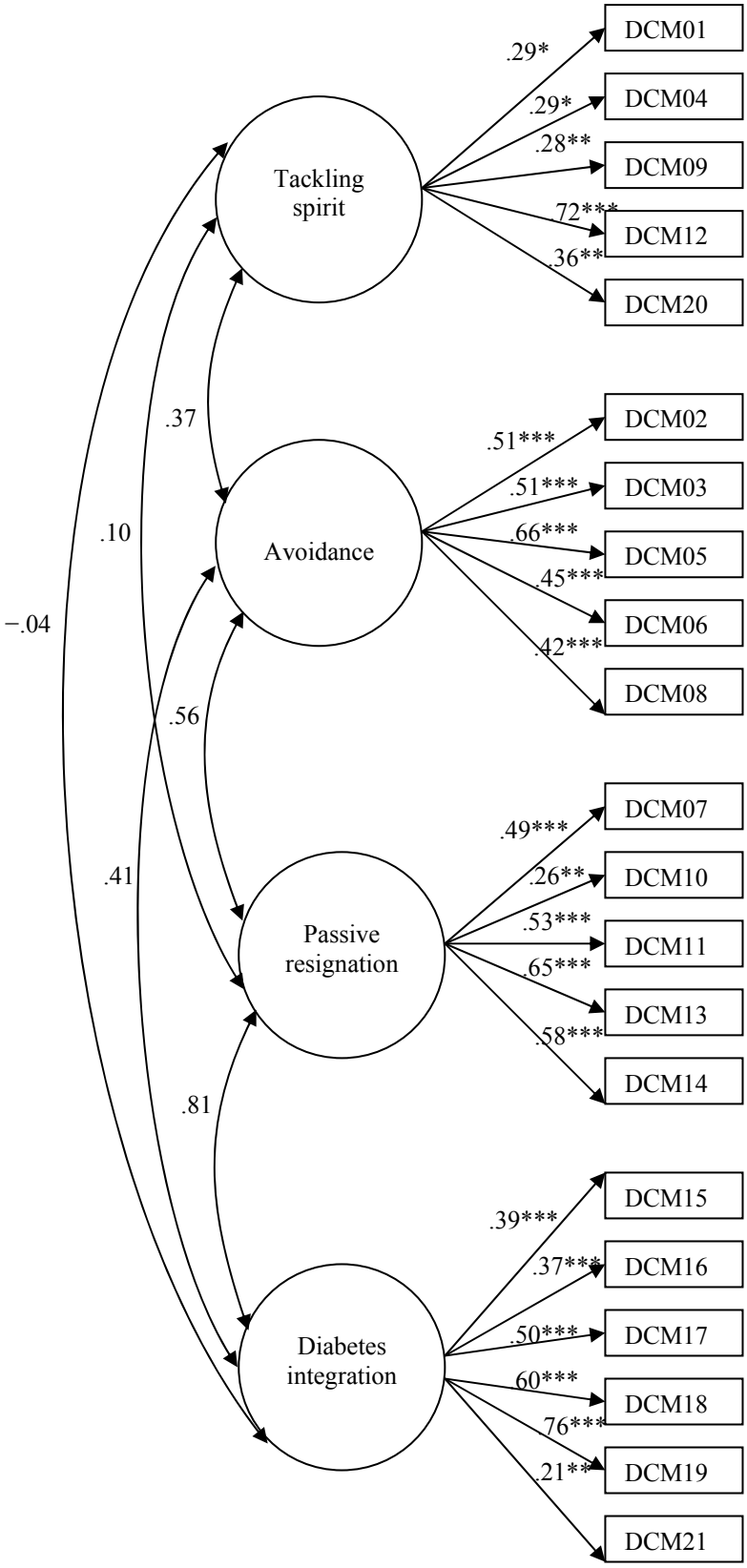

Figure 1. The four-factor measurement model of the DCM-C

* = p<.05; ** = p<.01; *** = p<.001