Development and Psychometric Properties of the 12-Item Diabetes Fatalism Scale

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OBJECTIVE: This study describes the development and validation of the Diabetes Fatalism Scale (DFS) in adults with type 2 diabetes.

METHODS: Thirty-five items were derived from focus groups, literature review, and expert opinion. The items were pilot tested on 20 adults with diabetes and then administered to 216 primary care patients with type 2 diabetes to assess the validity and reliability of the scale. Exploratory factor analysis (Principal Component Analysis with Varimax rotation) yielded a 12-item scale with three subscales. Pearson's correlation was used to test the DFS's association with diabetes self-care, HbA1c and quality of life. Multiple linear regression was used to assess association between the DFS and HbA1c controlling for demographics, comorbidity and insulin use.

RESULTS: Cronbach's alpha for the 12-item DFS scale was 0.804 indicating internal consistency. The DFS is scored in such a way that higher scores represent greater diabetes fatalism. The DFS scores were not significantly correlated with age, years of education, or diabetes duration. Whites, men, those with government or no insurance, and those with 3+ comorbid conditions had significantly higher DFS scores. DFS was significantly correlated with self management understanding ($r=-0.35$, $p<0.001$), control problems ($r=0.22$, $p=0.002$), self-care ability ($r=-0.30$, $p<0.001$), and self-care adherence ($r=-0.23$, $p<0.001$). The DFS was significantly correlated with HbA1c ($r=0.20$, $p=0.004$) and mental health component of SF-12 ($r=-0.24$, $p=0.001$). In multivariate models, adjusting for demographics, comorbidity and insulin use, the DFS was independently associated with increased HbA1c (beta 0.21, $p=0.005$).

CONCLUSIONS: The DFS is a valid and reliable measure of diabetes fatalism. Diabetes fatalism is associated with self-care problems, poor glycemic control, and decreased quality of life.

KEY WORDS: Diabetes Fatalism Scale; type 2 diabetes; DFS.
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BACKGROUND

Fatalism is defined as “a doctrine that events are fixed in advance so that human beings are powerless to change them”¹. In psychosocial and behavioral research, the operational definition of fatalism varies across studies ranging from definitions based on health locus of control developed by Rotter^{2–6} to the definition of cancer fatalism by Powe^{7–11}. Studies by Rotter and others equate health locus of control and its derivatives with the belief that health outcomes are dependent on external forces, powerful others, or chance, whereas, Powe and Weinrich⁷ define fatalism as “a complex psychological cycle characterized by perceptions of hopelessness, worthlessness, meaninglessness, powerlessness, and social despair”. Interestingly, recent studies suggest that the construct of health locus of control is quite different from fatalism^{12,13}.

In a prior study¹⁴, we used focus group methodology to explore the construct of fatalism in adults with type 2 diabetes. Consistent with Powe's definition⁷, perceptions of hopelessness, meaninglessness, powerlessness, and despair emerged as important themes in the focus groups. However, there was no reference to worthlessness. We found that diabetes fatalism was multidimensional, associated with self-care behavior, and appeared to differ conceptually from the health locus of control construct¹⁴. Based on these findings, we conducted additional focus groups to explore these issues and, generated items for a scale to measure diabetes fatalism, and subsequently pre-piloted the items.

In this current study, we describe the initial psychometric properties of a 12-item diabetes fatalism scale (DFS). We assessed correlations between the DFS and diabetes self-care variables, glycemic control and health-related quality of life. We hypothesized that the DFS would be internally consistent and consist of three constructs—emotional distress (despair), poor religious and spiritual coping (hopelessness), and poor perceived self-efficacy (powerlessness)—based on the conceptual underpinning of the conceptual model and the prior focus group findings. We also hypothesized that diabetes fatalism would correlate negatively with good diabetes self-care behavior, glycemic control, and health-related quality of life.

METHODS

The study was conducted in two phases. The study was reviewed and approved by our Institutional Review Board (IRB) for Human Research.

Phase 1: Scale Development

Conceptual Model. After reviewing the literature and analyzing our focus group data, we developed a conceptual model of diabetes fatalism to guide scale development. Diabetes fatalism was operationally defined using a slight modification of Powe's definition⁷, as "a complex psychological cycle characterized by perceptions of despair, hopelessness, and powerlessness". We conceptualized diabetes fatalism as consisting of three constructs: 1) emotional distress (despair); 2) religious and spiritual coping (hopelessness); and 3) perceived self-efficacy (powerlessness). Emotional distress was conceptualized as frustration with diabetes and association of diabetes with lifestyle disruption. Consequently, higher scores on the emotional distress subscale would signify greater frustration and distress from diabetes and greater frustration and distress would be associated with increased fatalism. Religious and spiritual coping was conceptualized as the attribution of the outcomes of diabetes to a higher power as a means of acceptance and coping. Consequently, higher scores on the religious and spiritual coping subscale would signify decreased coping and acceptance and decreased coping would be associated with greater fatalism. Perceived self-efficacy was conceptualized as the individual's confidence in their ability to control diabetes or prevent complications. Consequently, higher scores on the perceived self-efficacy subscale would signify decreased self-efficacy and decreased self-efficacy would be associated with greater fatalism.

Item Generation and Selection. Items were developed from literature review and information collected during the focus groups. The initial items were reviewed by two experts familiar with the current literature on fatalism and administered to a pilot sample of 20 subjects with type 2 diabetes to determine appropriateness and relevance of the items. After expert review and pilot testing, 35 items consisting of statements related to the three postulated constructs of diabetes fatalism were selected for testing. Based on preliminary results from the initial pilot testing, we decided to eliminate a mid-point and force respondents to pick from within the range. Items were scored on a 6-point Likert scale with scores ranging from 6 (strongly agree); 5 (moderately agree); 4 (agree); 3 (disagree); 2 (moderately disagree); to 1 (strongly disagree). Scores on the religious and coping and the perceived self-efficacy items were reversed scored. A summary score consisting of the sum of individual items was created, so that higher scores would represent greater diabetes fatalism.

Phase 2: Evaluation of Instrument

We used billing records from the prior year to identify all patients with type 2 diabetes in the primary care clinics of an academic medical center in the Southeastern United States ($n \sim 3600$). We took a 10% random sample ($n \sim 360$) and patients were contacted by telephone and invited to participate in the study. Over a 12-month period, consenting subjects completed the 35-items and study assessments listed below. Questionnaires were administered by a research assistant. Response rate was 60%.

Study Variables

Demographic Variables. Age was assessed as a continuous variable but then categorized into three age categories (<50, 50–64, and 65+ years). Race/ethnicity was based on self-report. None of the participants were Hispanic, so the sample was categorized as white and black. Marital status was dichotomized as married vs. not married. Years of education was assessed as a continuous variable but then categorized into three age categories (<high school graduate, high school graduate, and > high school graduate). Insurance status was categorized as private, government (Medicare and Medicaid), and no insurance. Personal income was categorized as > \$5,000, <\$10,000, <\$15,000, and \$15,000+. Employment was dichotomized as employed vs. unemployed. Comorbidity was categorized as 0/1, 2, or 3+ conditions. Current comorbid conditions were identified through chart audit and included: hypertension, heart disease, stroke, heart failure, chronic kidney disease, chronic obstructive pulmonary disease, peripheral vascular disease, chronic liver disease, and cancer.

Metabolic Control and Quality of Life. Hemoglobin A1c (HbA1c), total cholesterol, LDL-cholesterol, and HDL-cholesterol level within the previous 3 months were abstracted from the electronic medical records. Health-related quality of life was assessed with the Medical Outcomes SF-12 (V1.0).¹⁵ We computed physical component summary (PCS) and mental component summary (MCS) scores for the sample.

Diabetes Self-Management. The 23-item Diabetes Knowledge Test was used to measure diabetes knowledge¹⁶. Diabetes self-management was measured with the Diabetes Care Profile¹⁷.

Psychosocial Variables. Depression was measured with the 20-item Center for Epidemiological Studies Depression scale (CES-D)¹⁸. Perceived control of diabetes was measured with the 15-item revised Perceived Control Questionnaire¹⁹.

Statistical Analyses

Analyses were performed with SPSS V16.0 and STATA V10.0. Data reduction techniques were employed to construct a parsimonious diabetes fatalism scale that incorporated the three constructs defined in our conceptual model. An exploratory factor analysis (Principal Component Analysis with Varimax Rotation) was used to derive a set of factors and maximize the variance of the factor loadings. We used the Kaiser-Guttman criterion (eigenvalues >1.0) to decide the number of factors and associated items that would be retained²⁰. Items were retained if they loaded on only one factor with a factor loading of at least 0.5. In addition, items were selected if they correlated at ≥ 0.7 with at least one factor, and did not correlate at ≥ 0.4 with the other factors²⁰. Item means and standard deviations, item-item correlations, corrected item-total correlations, and Cronbach's alpha without the item were calculated to assess the internal consistency of the scale.

T-tests, ANOVA, and Pearson's correlation were used to examine the relationship between DFS scores and demographic, diabetes self-care, metabolic control, quality of life, and psychosocial variables. Linear regression was used to assess the unique contribution of DFS to the variance in HbA1c. Multiple linear regression was used to assess the independent effect of DFS scores on HbA1c controlling for demographics, comorbidity, and insulin use.

RESULTS

Table 1 shows the demographic characteristics of the sample.

Exploratory Factor Analysis. The principal component analysis yielded three factors that accounted for 63.9% of the variance (Table 2). Rotated factor loadings were consistent with three factors with loadings that ranged from 0.713 to 0.828. The three factors were consistent with our conceptual model. Factor 1 consisted of five items that measured emotional distress, Factor 2 consisted of four items that measured religious and spiritual coping, and Factor 3 consisted of three items that measured perceived self-efficacy.

Internal Consistency and Reliability. An item analysis of the 12 DFS items revealed a Cronbach's alpha of 0.804 (Table 3). Item analysis for each of the three subscales revealed Cronbach's

Table 1. Sample Characteristics (n=216)

	% or Mean (SD)
Age (Years)	57.0 (11.3)
Duration of diabetes (Years)	13.1 (10.4)
Years of education	11.6 (3.2)
Age	
<50 years	21.8
50–64 years	52.3
65+ years	25.9
Sex: Women	71.8
Race/Ethnicity	
White	38.9
Black	61.1
Marital status: married	37.7
Educational level	
<High school grad.	40.3
High school grad.	27.0
>High school grad.	32.7
Insurance status	
Private	19.4
Government (Medicare/Medicaid)	57.9
Uninsured	22.7
Income	
<\$5,000	26.5
<\$10,000	27.5
<\$15,000	22.0
\$15,000+	24.0
Employed: Yes	25.2
Comorbidity	
0/1	48.1
2	29.2
3+	22.7
Insulin user: Yes	39.8
Hemoglobin A1c	8.0 (1.9)

Table 2. Component Loadings of the Principal Component Analysis after Varimax Rotation^{a,b}

		Rotated component loading		
		Factor 1	Factor 2	Factor 3
Subscale 1: Emotional distress				
1	I get upset when I think about my diabetes	0.755	0.051	0.336
2	I feel down when I think about my diabetes	0.801	-0.004	0.300
3	I get frustrated with having to live with diabetes	0.803	0.026	0.149
4	Diabetes is a disease that makes life more difficult	0.733	0.104	-0.076
5	Diabetes causes a lot of suffering for me	0.750	-0.070	0.121
Subscale 2: Religious and spirituality coping				
6	Trusting in God has helped me better deal with my diabetes	0.136	0.731	0.203
7	I believe God does not give me more than I can bear	-0.017	0.713	0.210
8	I believe God can completely cure my diabetes	0.012	0.828	0.007
9	I have prayed about my diabetes so I am not going to worry about it anymore	-0.034	0.768	0.012
Subscale 3: Perceived self-efficacy				
10	I believe I am able to control my diabetes the way my doctor expects	0.295	0.104	0.760
11	If I do everything my doctor tells me, I can prevent the complications of diabetes like blindness, amputations, kidney failure, impotence, etc.	0.116	0.201	0.795
12	I believe that diabetes is controllable	0.124	0.086	0.798

^a Items 6 through 12 are reverse scored [(1=6), (2=5), (3=4), (4=3), (5=2), (6=1)]

^b All items scored so that high score equals high diabetes fatalism

alphas of 0.856 for emotional distress, 0.774 for religious and spiritual coping, and 0.769 for perceived self efficacy. Item, scale, and subscale means and standard deviations are presented in Table 3. Corrected item-total correlation of the 12-item DFS ranged from 0.288 to 0.583 and the item analysis showed that alpha would not be meaningfully improved by dropping any one item from the scale.

Relationship of DFS with Demographic Characteristics. DFS scores were uncorrelated with age ($r=0.052$, $p=0.457$), years of education ($r=-0.120$, $p=0.090$), or diabetes duration ($r=0.107$, $p=0.129$). Whites ($M=38.1$) scored higher than Blacks ($M=35.9$, $p=0.009$); men ($M=38.6$) scored higher than women ($M=35.9$, $p=0.003$); those with government ($M=37.2$) or no insurance ($M=37.4$) scored higher than those with private insurance ($M=35.5$, $P=0.029$); and those with 3+ comorbid conditions ($M=38.7$) scored higher than those with 0/1 ($M=35.8$) or two conditions ($M=35.8$, $P=0.029$). Scores did not differ significantly by other demographic variables or insulin use.

Relationship of DFS with Diabetes Self-care, Metabolic Control, and Quality of Life. The DFS scores were significantly

Table 3. Items Wording and Descriptive Statistics of the Diabetes Fatalism Scale^{a,b}

		Item Mean (sd)	Corrected item-total correlation	Cronbach's α without item
	Subscale 1: Emotional distress ($\alpha=0.856$)	17.0 (3.5)		
1	I get upset when I think about my diabetes	3.2 (0.8)	0.583	0.771
2	I feel down when I think about my diabetes	3.3 (0.8)	0.563	0.773
3	I get frustrated with having to live with diabetes	3.3 (0.9)	0.503	0.778
4	Diabetes is a disease that makes life more difficult	3.7 (0.9)	0.392	0.789
5	Diabetes causes a lot of suffering for me	3.4 (0.9)	0.411	0.787
	Subscale 2: Religious and spirituality coping ($\alpha=0.774$)	11.1 (3.0)		
6	Trusting in God has helped me better deal with my diabetes	2.5 (1.1)	0.464	0.782
7	I believe God does not give me more than I can bear	2.8 (0.9)	0.367	0.791
8	I believe God can completely cure my diabetes	2.8 (1.0)	0.336	0.795
9	I have prayed about my diabetes so I am not going to worry about it anymore	3.1 (0.9)	0.288	0.799
	Subscale 3: Perceived self-efficacy ($\alpha=0.769$)	8.6 (1.9)		
10	I believe I am able to control my diabetes the way my doctor expects	3.0 (0.8)	0.538	0.776
11	If I do everything my doctor tells me, I can prevent the complications of diabetes like blindness, amputations, kidney failure, impotence, etc.	2.9 (0.8)	0.489	0.780
12	I believe that diabetes is controllable	2.8 (0.7)	0.442	0.784
	12-Item Diabetes Fatalism Scale ($\alpha=0.804$)	36.7 (5.9)		

^a Items 6 through 12 are reverse scored [(1=6), (2=5), (3=4), (4=3), (5=2), (6=1)]

^b All items scored so that high score equals high diabetes fatalism

correlated with HbA1c ($r=0.20$, $p=0.004$), the mental health component of SF-12 ($r=-0.24$, $p=0.001$), self management understanding ($r=-0.35$, $p<0.001$), control problems ($r=0.22$, $p=0.002$), self-care ability ($r=-0.30$, $p<0.001$), and self-care adherence ($r=-0.23$, $p<0.001$). DFS scores were also significantly correlated with perceived control of diabetes ($r=-0.29$, $p<0.001$) and depression ($r=-0.26$, $p<0.001$) (See Table 4).

Relationship of DFS with HbA1c. In a univariate linear regression model, DFS score was significantly associated with

mean HbA1c ($\beta=0.20$, $p=0.004$) and explained 4% of the variance in HbA1c. As shown in Table 5, DFS score was independently associated with HbA1c after controlling for demographics, comorbidity, and insulin use ($\beta=0.21$, $p=0.005$). The combination of DFS scores, demographics, comorbidity, and insulin use explained 30% of the variance in HbA1c in this sample.

DISCUSSION

To our knowledge, this is the first scale designed to specifically measure diabetes fatalism. The 12-item DFS is consistent with

Table 4. Correlations between Diabetes Fatalism Scale and Diabetes Outcome Measures

Measure	Correlation (r)	p-value
Metabolic control and quality of life		
Hemoglobin A1c	0.20*	0.004
Total cholesterol	0.10	0.145
LDL-cholesterol	-0.06	0.397
HDL-cholesterol	-0.08	0.240
SF-12 physical health component	-0.11	0.120
SF-12 mental health component	-0.24*	0.001
Diabetes self-care variables		
Diabetes knowledge	-0.08	0.224
Diabetes self-management - understanding	-0.35*	<0.001
Diabetes self-management - control problems	0.22*	0.002
Diabetes self-management - diet adherence	-0.12	0.093
Positive attitudes toward diabetes	-0.39*	<0.001
Negative attitudes toward diabetes	0.58*	<0.001
Perceived diabetes self-care ability	-0.30*	<0.001
Perceived importance of diabetes care	-0.19*	0.006
Diabetes self-care adherence	-0.23*	0.001
Social/personal factors influencing diabetes care	0.46*	<0.001
Psychosocial variables		
Perceived control of diabetes	-0.29*	<0.001
Depression (CES-D)	0.26*	<0.001

*Statistically significant correlations at $p<0.05$

Table 5. Effect of DFS-12 and Demographic Variables on Hemoglobin A1c^a

Predictor	Coefficient	Beta	P-value
DFS-12	0.07	0.21*	0.005
Age (Years)	-0.04	-0.21*	0.011
Years of education	0.09	0.15	0.081
Diabetes duration	0.01	0.07	0.379
Black vs. White	0.69	0.17*	0.047
Women vs. Men	-0.28	-0.06	0.376
Unemployed vs. Employed	0.55	0.13	0.143
Income <\$10,000 ^b	-0.20	-0.05	0.595
Income <\$15,000 ^b	0.02	0.00	0.961
Income \$15,000+ ^b	-0.06	-0.01	0.902
Government insurance ^c	-0.59	-0.15	0.184
No insurance ^c	0.24	0.05	0.627
Not married vs. Married	0.38	0.09	0.208
2 Comorbid conditions ^d	0.12	0.03	0.714
3+ Comorbid conditions ^d	0.40	0.08	0.293
Insulin users vs. non users	1.00	0.25*	0.002

^a Adjusted r -squared = 0.30 (i.e. 30% of variance in hemoglobin A1c accounted for by these variables)

^b Reference group is income <\$5,000

^c Reference group is private insurance

^d Reference group is 0/1 comorbid conditions

* Significant at $p<0.05$

our conceptual model, has good reliability, validity, and acceptable psychometric properties, and is significantly correlated with diabetes self-care, glycemic control, and quality of life.

The reliability of the DFS is supported by the high internal consistency of the scale ($\alpha=0.804$) and subscales ($\alpha=0.856$, 0.774 , and 0.769 respectively) and the fact that the scale's Cronbach alpha could not be improved by eliminating any of the items. The 12-item DFS has good face and content validity. We started with a conceptual model of fatalism previously tested in cancer research^{7,8,11}. We then used focus group methodology to explore the construct in diabetes and identified themes relevant to diabetes and generated items for the scale¹⁴. The items were reviewed and modified by a team of experts and piloted in a small sample of patients with type 2 diabetes to assess appropriateness of the items and determine the optimal response format.

The construct validity of the 12-item DFS is supported by three findings. First, the DFS is correlated with validated measures of diabetes self-care (See Table 4). Patients that scored high on the DFS were more likely to report self-care control problems, negative attitudes toward diabetes, and having social and personal factors that impaired good diabetes care. Those who scored high on the DFS were also less likely to report good self-care understanding, adherence to diet, positive attitudes toward diabetes, good self-care ability, adherence to self-care recommendations, and see diabetes care as important. Those who scored high on the DFS were also more likely to have depression and less likely to report having good control of their diabetes.

Second, the DFS is correlated with glycemic control and quality of life. Individuals that scored high on the DFS had significantly higher HbA1c ($r=0.20$, $P=0.004$) and lower mental health component scores on the SF-12 ($r=-0.24$, $P=0.001$). Third, the DFS was independently associated with HbA1c and explained a portion of the variance in HbA1c. In a univariate linear regression model, DFS scores alone explained 4% of the variance in HbA1c in the sample ($\beta=0.20$, $p=0.004$). In a multivariate model that included demographics, comorbidity, and insulin use (Table 5), the DFS score was still independently associated with HbA1c ($\beta=0.20$, $p=0.005$) and the variables in the multivariate model explained 30% of the variance in HbA1c.

The three constructs that are part of the DFS (emotional distress, coping, and self-efficacy) are theoretically sound and have been shown to correlate with diabetes self-care and glycemic control. Delahanty and colleagues²¹ completed a study of 815 primary care patients with type 2 diabetes to characterize the determinants of diabetes-related emotional distress. The patients were administered the Problem Areas in Diabetes (PAID) scale²². Higher level of distress was associated with disease severity and self-care burdens. Peyrot and colleagues²³ completed a study of 57 adults with type-1 diabetes and 61 adults with type-2 diabetes to examine stress, coping, and regimen adherence as determinants of chronic and transient metabolic control. They found that individuals with type 2 diabetes who exhibited self-controlling behaviors had better glycemic control while "emotional" or "stressed" adults had worse glycemic control. Quinn and colleagues²⁴ completed a brief review of the role of religion and spirituality in African Americans with diabetes. The authors noted that religion and spirituality play a significant role in coping with diabetes and other chronic illnesses. These finding further support the validity of the DFS.

There are a number of limitations to this study. First, longitudinal data are not yet available, so there is no data on the test-retest reliability of the DFS or its ability to detect change over time in intervention studies. Second, the sample was comprised of predominantly lower income patients with type 2 diabetes from the southeast, so it is will be important to further validate the scale in a more diverse population and among patients with type 1 diabetes. Third, our data did not include a measure of health locus of control, so we are unable to assess the correlation between the DFS and locus of control. However, recent studies suggest that the construct of health locus of control is quite different from fatalism^{12,13}.

In conclusion, the 12-item DFS is a brief, easy to administer, valid and reliable measure of diabetes fatalism. It may serve as a valuable tool to identify patients experiencing high levels of emotional despair, hopelessness, and powerlessness linked to their diabetes that may benefit from targeted interventions.

Conflict of Interest: None disclosed.

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