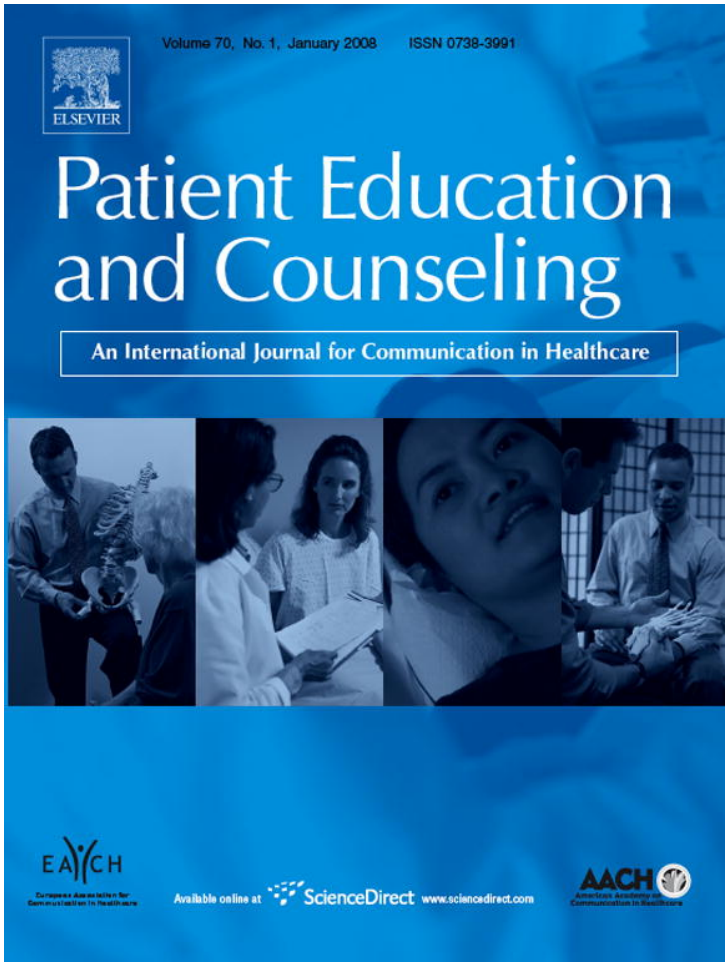

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Patient and provider perceptions of diabetes: Measuring and evaluating differences

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Abstract

Objective: This study measures diabetes care perceptions of patients and their providers, and examines perceptions differences of patient–provider pairs.
Methods: Patient and provider perceptions were assessed using the Diabetes Semantic Differential Scales (DSDS) which ask respondents to rate diabetes care concepts using contrasting adjective pairs. The DSDS was scored by two methods: using means and using factor analysis. Persons with diabetes 40-years-old or older were recruited. Using a ''snowball'' sampling strategy, potential provider participants were identified by their patients; 71 providers agreed. These providers represented 51% of the patient participants and created 138 patient–provider pairs.
Results: For the mean scores, there were significant differences between patients and providers for 5 of the 18 semantic differentials (28%). Similarly, the factor scores indicated significant differences for 14 of 54 factors (26%). The effect sizes indicated practical differences.
Conclusion: Significant differences exist between patient and provider perceptions. Generally, patients have the more positive diabetes perceptions.
Practice implications: During patient and provider discussions, participants can perceive diabetes concepts differently. The DSDS can determine perception differences. While it is best to use factor analyses to score the DSDS, mean scores are more easily calculated and indicate the broad conceptual areas where patient and provider differ.
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Keywords: Diabetes perceptions; Patient–provider interactions; Assessing perceptions

1. Introduction

Diabetes self-management relies on the patient's ability to perform a complex self-care routine including monitoring blood glucose, taking medication, making healthy dietary choices, and participating in regular physical activity [1]. In the context of diabetes care, as in virtually all non-surgical medical care, the provider functions as an educator/consultant to the patient who is managing his own illness. Given this unique health care dynamic, mutual understanding and effective communication between the patient and care provider are critical in achieving positive health outcomes [2,3].

Effective patient–provider communication has been found to be positively associated with a number of patient outcome variables including satisfaction and self-care behaviors [4–11]. Sherman et al. [6] found that physicians with better communication skills have more satisfied patients, better patient outcomes, and greater satisfaction with their clinical practice. According to a study of provider–patient dialogues conducted by Carter et al. [7], better communication and patient knowledge was positively associated with higher adherence to medical recommendations. Similarly, Rost [8] found that increased patient participation in medical interactions was related to an increase in patient satisfaction and adherence to care recommendations.

Effective patient–provider communication is founded on the shared meaning of the terms and concepts used an encounter or, if meanings are not shared, an understanding of how terms and concepts are perceived by each person. According to Kleinman [12], an individual's explanatory model of illness influences

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how illness concepts are understood and perceived (by the patient or provider), and in turn influences patient compliance and satisfaction.

To date, little research has investigated similarities or differences between patients' and providers' perceptions of diabetes concepts. Diabetes perceptions are how an individual identifies and understands diabetes and are distinguished from diabetes attitudes, which are an individual's beliefs and feeling about diabetes. A patient's perception is connotative, i.e., personal and encompassing. Patients' experience of an illness is expansive; illness is the patients' subjective perception of disease and is shaped by many factors [13,14]. Conversely, a provider's focus is to determine the patient's problem and to provide a solution. The provider's framework organizes the information and provides context for subsequent decisions. A provider's perception of diabetes is denotative, i.e., explicit and limited.

Diabetes concepts are assigned attributes that are relevant to each individual. For the provider, diabetes concepts and terms may have a more direct and precise medical meaning. A lack of awareness or understanding of each other's perception of diabetes increases the potential for misinterpretation between patient and provider. Loewe and Freeman [15] found that diabetes patients were more concerned with the visible signs of complications (e.g., wounds that do not heal) than were providers; providers, on the other hand, focused more on the internal (unseen) processes of the disease. A study by Aufseesser et al. [16] regarding eight retinopathy terms found that diabetes patients' understanding of these terms was varied and inaccurate, and the physicians were unaware of these misunderstandings. Even the concept of ''diabetes control'' can have different meaning for patients and physicians as demonstrated in a study by Hunt, Arar and Larme [17].

The purpose of the present study is to measure and identify differences in the perceptions of diabetes between patients and their providers using the Diabetes Semantic Differential Scales (DSDS). The study also examines two scoring methods to determine whether their results are comparable and appropriate. The research questions explored in this paper are:

1. Do patients matched with their providers have measurable differences in their perceptions of diabetes care concepts?
2. Do two scoring methods, means scores and factor analysis scores, yield similar results?

2. Methods

Patient and provider surveys were used to assess diabetes care perceptions. The instruments used are summarized in Table 1 and described below.

2.1. Measures

2.1.1. The Diabetes Semantic Differential Scales (DSDS)

Semantic differential scales were used to assess patients' and providers' perceptions of diabetes concepts. This technique, developed by Osgood et al. [18], asks respondents to rate a specified object or concept using contrasting adjective pairs. The method evaluates the semantic meaning of an object or concept to the individual. Semantic differentials have three components: (1) the concept to be measured, (2) the contrasting adjective pairs to rate the concept, and (3) the undefined rating positions between the adjective pairs. It is suggested that the number of rating positions should be between five and nine with seven positions being the optimal number [19] (see Table 1). The rating positions for each scale are converted to numeric values for analyses. As learned during the pilot testing of the DSDS [20], the relevance of the adjective pairs can only be determined empirically. Adjective pairs appearing to be unrelated to the concept under investigation may prove to be valuable, while pairs appearing to be appropriate may prove to be unremarkable.

The DSDS contains 18 diabetes care concepts. Patients and providers evaluated each of these concepts using nine scales anchored by adjective pairs developed by Wikblad et al. [21]. In order to present an unambiguous orientation, there is a patient version and a provider version of the DSDS. The versions differ in only 2 of the 18 diabetes care concepts. In the patient version there is the concept ''caring for diabetes'', while in the provider version it is presented as ''patient's self-care for diabetes.''

Table 1
Survey instruments and measures

Quantitative measures	Number of items	Sample item
Diabetes Semantic Differential Scales (DSDS)	18	Please rate "diabetes"
		Constrained __ : __ : __ : __ : __ : __ : __ Free
		Weak __ : __ : __ : __ : __ : __ : __ Strong
		Dominant __ : __ : __ : __ : __ : __ : __ Submissive
		Worthless __ : __ : __ : __ : __ : __ : __ Valuable
		Difficult __ : __ : __ : __ : __ : __ : __ Easy
		Unsafe __ : __ : __ : __ : __ : __ : __ Safe
		Tense __ : __ : __ : __ : __ : __ : __ Relaxed
		Routine __ : __ : __ : __ : __ : __ : __ Varied
		Independent __ : __ : __ : __ : __ : __ : __ Dependent
Diabetes Care Profile (DCP)		Sample item
Positive attitude	5	"I feel satisfied with my life."
Negative attitude	6	"I am afraid of my diabetes."

Table 2
Decision matrix for factor labeling

Low High	Challenge[1]	Power[2]	Lifestyle Autonomy[3]	Certainty[4]	Adaptability[5]
Constrained ——— Free	+				
Weak ——— Strong		+			+
Dominant —— Submissive		-	+	+	
Worthless ——— Valuable		+			
Difficult ——— Easy	+				
Unsafe ——— Safe	+				
Tense ——— Relaxed	+				
Routine ——— Varied			+	+	+
Independent —— Dependent			+		

Similarly, the patient version concept of ''your emotions about diabetes'' was revised to ''patient emotions about diabetes'' for the provider version.

For each of the nine adjective pairs, the undefined rating positions were converted to numbers (leftmost space = 1, rightmost space = 7) and treated as continuous. Scoring of the DSDS was performed using two methods. The first method was simple and straightforward. Using the 9 adjective pairs of each diabetes care concept, a mean response score was calculated for each of the 18 concepts. Low scores were considered to represent more negative perceptions and high scores more positive. The scoring was reversed for two of the adjective pairs (the dominant-submissive and the independent–dependent pairs) to make their negative-positive endpoints and scoring consistent with the other adjective pairs. This method provided summary measures that were labeled DSDS ''mean scores.''

The second method was the more traditional method of scoring semantic differentials using principal components analysis with varimax rotation of the first three factors. Each construct was expected to contain three orthogonal meaningful dimensions, similar to those found by Osgood et al. [18], i.e., the dimensions of evaluation, potency and activity [19,22]. There were no *a priori* assumptions about the meaning or strength of the dimensions (how each adjective pair would correlate with any of them), nor was it assumed that the factor structure would be the same for all constructs. Three factor scores were computed for each construct for each patient on the construct's rotated factors, and then three factor scores were similarly computed for each construct for each provider using the factor structures from the patients' data. The decision matrix for labeling factors is provided in Table 2. Patient data were used in these analyses with listwise deletion for missing data. Unlike the mean scores, no adjective pair score were reversed for the factor analyses.

The three factors derived from these analyses were labeled by the investigators with terms descriptive and appropriate for diabetes: challenge, power, lifestyle autonomy, certainty and adaptability. These sub-measures are considered DSDS ''factor scores.''

2.1.2. Positive attitudes and negative attitudes towards diabetes

The Diabetes Care Profile (DCP) [23] is a diabetes specific instrument that measures social and psychological factors related to diabetes and its treatment. Patients completed two of the fourteen DCP subscales: positive attitude towards diabetes and negative attitude towards diabetes. The scores of these subscales range from 1 to 5. Higher scores for the positive attitude subscale and lower scores for the negative attitude subscale are preferred.

These established scales were used to provide a measure of validation to the two DSDS scoring methods. Diabetes perceptions and diabetes attitudes are not independent from each other. It is expected that an association will exist between the DSDS and the DCP subscales. If the DSDS mean scores are valid measures of perceptions, positive correlations with the positive attitude subscale and negative correlations with the negative attitude subscale can be expected. The DSDS factor scores should also correlate with these two subscales, but the direction of these correlations will vary, i.e., for the factor scores it is the existence and magnitude of the correlation that is important not whether it is positive or negative.

2.2. Study participants

2.2.1. Selection and data collection

Patient and provider recruitment were interconnected. Patients were recruited from southeastern Michigan, an area that includes the metropolitan Detroit area and the cities of Ann Arbor, Ypsilanti and Jackson. Patient recruitment was limited to individuals 40-years-old or older, not cognitively impaired, under the care of a health care professional, and who had been diagnosed with diabetes mellitus for at least 1 year. Patients were recruited from Human Subjects Core of the U of M Older

Table 3
Internal reliability of the DSDS mean scores

DSDS mean score	*n*	Cronbach's coefficient alpha
Diabetes	239	0.73
Heart disease and diabetes	253	0.75
Caring for diabetes	253	0.73
Low blood sugar	245	0.77
Having diabetes	260	0.76
Blood sugar testing	260	0.73
Your emotions about diabetes	257	0.77
Controlling your blood sugar	258	0.73
High blood sugar	254	0.76
Diabetes complications	257	0.74
Diabetes diet	257	0.73
Exercise and diabetes	262	0.74
Using insulin	206	0.75
Taking diabetes pills	244	0.70
Lifelong disease	255	0.78
Help with diabetes from family	260	0.77
Help with diabetes from friends	249	0.80
Paying for diabetes	254	0.75

Americans Independence Center, and through newspaper ads and flyers. Potential participants were instructed to call a toll-free telephone number in which the project personnel evaluated eligibility. If found eligible, participants were scheduled for an interview (the appointment was conducted in the subject's home or at a place suggested by either the subject or a research assistant). Before the scheduled interview, a confirmation letter, a consent form (approved by the Institutional Review Board of the University of Michigan Medical School), and the patient survey were mailed to the participant. Patients were paid $35 for their participation. Recruitment continued until the target sample size was attained. Two hundred and seventy-three people agreed to participate and completed the survey and the interview.

A targeted ''snowball'' sampling strategy was used to recruit health care providers. Snowball sampling is a technique that uses enrolled individuals to recommend or suggest potential participants. In this study, providers were identified by their patients and asked to participate. During their interviews, patients' were asked to identify and provide the name and location of the single individual that the patient indicates as the primary provider of their diabetes care (whether a physician or a nurse) and permission to contact him/her. These providers were mailed an approved health care provider consent form and survey, a copy of the consent form signed by their patient, and $15 for their participation. One hundred and eighty-three unique providers were asked to participate; seventy-one providers (39%) agreed and returned their provider survey. These providers represented 138 patients (51%).

2.2.2. Demographics

Demographics for entire patient sample ($n = 273$) were calculated. Patients' average age was 62 ($\pm$12) years old and 61% were women. The majority of the patient participants were Caucasian (63%), although the proportion of African Americans was substantial (33%). Most had type 2 diabetes (99.6%). The average time since diagnosis was 10 ($\pm$9) years.

The demographics of patients whose providers participated in the survey ($n = 138$) were compared to patients whose providers did not participate (because names were not obtained or the provider declined/did not respond) ($n = 135$). There were no statistically significant differences between the two patient groups for age, gender, ethnicity, marital status, education, type of diabetes, or time since diagnosis. There were differences for age at onset of diabetes (50 ± 13 years old for patients with provider participation vs. 53 ± 12 years old for patients without provider participation, $p = 0.03$) and whether the patient previously had diabetes education (78% for patients with

Table 4
Diabetes semantic differential scales mean scores of patient and provider matches

	Patient and provider matches (*n*)	Patients with diabetes (mean $\pm$ S.D.)	Primary diabetes care providers (mean $\pm$ S.D.)	Effect size
Diabetes	131	4.00 ± 1.03	4.14 ± 0.84	0.14
Heart disease and diabetes	130	3.90 ± 1.01	3.85 ± 0.98	0.05
Caring for diabetes	135	4.23 ± 1.03	4.08 ± 0.83	0.16
Low blood sugar	127	3.99 ± 1.08	3.56 ± 0.77	0.44*
Having diabetes	134	3.67 ± 1.09	3.56 ± 0.76	0.12
Blood sugar testing	134	4.54 ± 1.02	4.43 ± 1.06	0.10
Your emotions about diabetes	136	4.10 ± 1.13	3.52 ± 0.92	0.54*
Controlling your blood sugar	134	4.18 ± 1.05	4.29 ± 0.78	0.12
High blood sugar	132	3.65 ± 1.11	3.43 ± 0.73	0.23
Diabetes complications	132	3.67 ± 1.12	3.24 ± 0.85	0.42*
Diabetes diet	135	4.09 ± 1.02	4.23 ± 1.00	0.14
Exercise and diabetes	132	4.35 ± 0.97	4.60 ± 0.98	0.25
Using insulin	107	3.94 ± 1.10	4.29 ± 0.91	0.35
Taking diabetes pills	131	4.70 ± 1.00	4.74 ± 1.01	0.04
Lifelong disease	132	3.60 ± 1.15	3.72 ± 1.02	0.11
Help with diabetes from family	134	4.51 ± 1.16	3.86 ± 0.89	0.60*
Help with diabetes from friends	128	4.28 ± 1.11	3.91 ± 0.80	0.37
Paying for diabetes	130	4.09 ± 1.06	3.46 ± 0.72	0.66*

* Paired *t*-test significant difference at the p level of ≤ 0.003.

provider participation vs. 66% for patients without provider participation, $p = 0.03$).

Providers' average age was 47 (±10) years old, 44% were women, and 89% were Caucasian. The majority of the provider participants were physicians (96%) and had been in practice for an average of 18 (±11) years. Over half the providers (57%) had less than 25% of their practice devoted to diabetes care.

2.3. Statistical analyses

The internal reliability of the 18 DSDS mean scores was estimated using Cronbach's coefficient alpha. All 273 patients were used to calculate these measures, however, the numbers vary due to missing responses.

The 138 paired patient–provider DSDS mean score differences and DSDS factor score differences were determined using paired *t*-tests. Bonferroni adjustments for multiple statistical tests were used to determine significance levels for both scoring methods. For the DSDS mean scores, a $p \leq 0.003$ was used to indicate a significant difference between patient and provider scores. For the DSDS factor scores, a $p \leq 0.001$ was used to indicate a significant difference between patient and provider scores.

Effect sizes were used to determine significant practical differences between the scores of patients and providers. Effect sizes of 0.2, 0.5 and 0.8 correspond to small, medium and large effect differences [24].

Pearson correlation coefficients were used to determine relationships between each of the two types of DSDS scoring (mean and factor), and the DCP positive attitude towards diabetes subscale and the DCP negative attitude towards diabetes subscale. All 273 patients were used to calculate these correlations. Separate Bonferroni adjustments were used to determine the appropriate significance levels for the DSDS mean score correlations and for DSDS factor score correlations. For the DSDS mean score correlations, a Bonferroni adjustment determined the appropriate significance level to be $p \leq 0.003$. For the DSDS factor score correlations, the appropriate significance level was $p \leq 0.001$. Furthermore, only correlations of absolute value equal to or greater than 0.25 were considered to be of sufficient strength to be of practical significance.

3. Results

3.1. DSDS mean scores

Internal reliability measures of the DSDS mean scores are provided in Table 3. The alphas had a mean and standard deviation of 0.75 ± 0.02 and ranged from 0.70 to 0.80.

Table 4 provides the mean scores for the patient and provider semantic differentials using the mean response of the nine adjective pairs method of scoring. For 5 of the 18 semantic differentials (28%), a difference in patient and provider perceptions was indicated (low blood sugar, your emotions about diabetes, diabetes complications, help with diabetes from family, and paying for diabetes). The effect sizes for these concepts were moderate indicating that the differences have practical significance. The patients had the more positive (higher) score for each concept.

3.2. DSDS factor analysis scores

Table 5 provides the three factor scores for the patient and provider semantic differentials. The three factors are characterized as ''challenge'' (always the first component for each semantic differential), and variously as ''power'', ''lifestyle autonomy'', ''certainty'' or ''adaptability''.

Nine of the 18 semantic differentials had at least one factor where a significant difference between the patient and provider scores was indicated (14 of all 54 factors or 26%). Again, the effect sizes for these concepts were moderate indicating that the differences have practical significance.

3.3. DSDS scores and patient attitudes

3.3.1. DSDS mean score correlations

The DSDS mean score were highly correlated with both DCP attitude scales. Sixteen of 18 correlations (89%) with positive attitude were significant (ranging from 0.29 to 0.46), while 18 of 18 correlations (100%) with Negative Attitude were significant (ranging from −0.26 to −0.57).

3.3.2. DSDS factor score correlations

Seventeen of the 54 factor score (31%) had correlations of absolute value equal to or greater than 0.25 with positive attitude ranging from an absolute *r* of |0.25| to |0.50|. Eighteen factors score (33%) had a significant correlation with negative attitude ranging from an absolute *r* of |0.27| to |0.57|.

4. Discussion and conclusion

4.1. Discussion

The purpose of this study was to measure diabetes care perceptions of patient and providers, to identify differences between a patient and their providers, and to examine the two scoring methods. Given that the patients and providers in this study were self-selected, results should be interpreted with caution, as they may not be generalizable to other populations.

The first research question sought to identify measurable differences between patients and providers in their perceptions of diabetes care concepts. The results of the paired *t*-tests indicate that perception differences do exist. Significant differences between the patient and provider perceptions were found for approximately 25% of the diabetes concepts. These differences were consistent across both scoring methods. The mean score differences suggest the patients are more positive than their providers for the concepts of low blood sugar, your emotions about diabetes, diabetes complications, help with diabetes from family, and paying for diabetes.

Factor score differences generally support the mean score differences; low blood sugar's challenge factor, your emotions about diabetes' challenge and lifestyle autonomy factors, help

Table 5
Diabetes semantic differential scales factor scores of patient and provider matches

	Factor	Patient and provider matches (n)	Patients with diabetes (mean ± S.D.)	Primary diabetes care providers (mean ± S.D.)	Effect size
Diabetes	Challenge	116	0.135 ± 1.047	0.109 ± 0.747	0.03
	Power	116	0.062 ± 0.950	0.359 ± 0.914	0.31
	Lifestyle autonomy	116	−0.036 ± 1.057	−0.025 ± 0.779	0.01
Heart disease and diabetes	Challenge	121	0.059 ± 1.052	−0.168 ± 0.910	0.23
	Power	121	0.041 ± 1.040	0.055 ± 0.899	0.01
	Lifestyle autonomy	121	0.009 ± 1.046	0.420 ± 1.095	0.38
Caring for diabetes	Challenge	123	0.066 ± 1.022	−0.276 + 0.843	0.36
	Lifestyle autonomy	123	−0.019 ± 1.064	−0.209 ± 0.865	0.20
	Power	123	−0.017 ± 0.981	0.214 ± 1.022	0.23
Low blood sugar	Challenge	121	0.047 ± 1.040	−0.327 ± 0.712	0.41*
	Lifestyle autonomy	121	−0.067 ± 1.049	−0.119 ± 0.888	0.05
	Power	121	0.013 ± 0.951	0.094 ± 0.928	0.09
Having diabetes	Challenge	127	0.115 ± 1.046	−0.066 ± 0.728	0.20
	Power	127	0.003 ± 1.039	−0.002 ± 0.773	0.01
	Lifestyle autonomy	127	−0.027 ± 1.012	0.201 ± 0.778	0.25
Blood sugar testing	Challenge	130	0.042 ± 0.963	−0.133 ± 0.849	0.20
	Lifestyle autonomy	130	0.039 ± 1.029	−0.324 ± 0.949	0.36
	Certainty	130	0.124 ± 1.048	−0.399 ± 0.923	0.51*
Your emotions about diabetes	Challenge	126	0.053 ± 1.015	−0.369 ± 0.549	0.52*
	Lifestyle autonomy	126	0.019 ± 1.048	−0.615 ± 0.710	0.67*
	Adaptability	126	0.043 ± 1.026	0.144 ± 0.846	0.11
Controlling your blood sugar	Challenge	127	0.070 ± 1.017	−0.329 ± 0.891	0.41*
	Lifestyle autonomy	127	−0.041 ± 1.008	0.128 ± 0.835	0.18
	Power	127	−0.057 ± 0.944	0.383 ± 0.967	0.45*
High blood sugar	Challenge	122	0.037 ± 1.008	−0.137 ± 0.641	0.20
	Power	122	0.007 ± 0.945	−0.077 ± 0.696	0.10
	Lifestyle autonomy	122	−0.027 ± 0.976	−0.035 ± 0.830	0.01
Diabetes complications	Challenge	126	−0.085 ± 1.028	0.325 ± 0.690	0.46*
	Lifestyle autonomy	126	−0.068 ± 1.072	0.363 ± 0.964	0.41*
	Power	126	0.057 ± 1.007	0.070 ± 0.989	0.01
Diabetes diet	Challenge	126	0.015 ± 1.059	0.104 ± 0.857	0.09
	Lifestyle autonomy	126	−0.104 ± 1.048	0.137 ± 0.992	0.24
	Power	126	0.010 ± 0.971	−0.233 ± 0.836	0.27
Exercise and diabetes	Challenge	110	0.183 ± 0.939	−0.119 ± 0.976	0.31
	Lifestyle autonomy	110	−0.008 ± 0.881	0.484 ± 0.961	0.52*
	Power	110	0.003 ± 0.968	−0.182 ± 0.767	0.21
Using insulin	Challenge	98	−0.067 ± 1.002	−0.243 ± 0.904	0.18
	Lifestyle autonomy	98	−0.010 ± 0.934	0.009 ± 0.861	0.02
	Power	98	−0.191 ± 0.908	−0.087 ± 0.739	0.13
Taking diabetes pills	Challenge	119	0.000 ± 1.033	0.167 ± 0.781	0.18
	Lifestyle autonomy	119	−0.119 ± 0.991	−0.295 ± 0.843	0.19
	Certainty	119	0.016 ± 1.041	−0.381 ± 0.860	0.41
Lifelong disease	Challenge	123	0.021 ± 1.033	0.181 ± 0.850	0.17
	Power	123	−0.048 ± 1.025	0.250 ± 1.003	0.29
	Lifestyle autonomy	123	0.025 ± 1.034	−0.298 ± 0.862	0.34
Help with diabetes from family	Challenge	130	0.020 ± 1.046	0.447 ± 0.605	0.49*
	Lifestyle autonomy	130	0.013 ± 1.087	−0.486 ± 0.775	0.51*
	Certainty	130	0.120 ± 1.014	0.067 ± 0.730	0.06
Help with diabetes from friends	Challenge	122	−0.005 ± 1.056	0.273 ± 0.579	0.32
	Certainty	122	−0.021 ± 1.075	−0.073 ± 0.618	0.06
	Lifestyle autonomy	122	−0.006 ± 1.011	0.518 ± 0.921	0.52*
Paying for diabetes	Challenge	122	0.093 ± 0.992	0.589 ± 0.559	0.59*
	Lifestyle autonomy	122	0.031 ± 1.074	0.096 ± 1.259	0.06
	Power	122	0.002 ± 0.945	0.768 ± 1.116	0.70*

*Paired t-test significant difference at the p level of ≤ 0.001.

with diabetes from family's challenge and lifestyle autonomy factors, and paying for diabetes' challenge and power factors all indicate that patients have the more positive perceptions. The exception to this agreement was diabetes complications; for this concept patients had the more negative perceptions for diabetes complications' challenge and lifestyle autonomy factors. The factor scores also indicated significant differences for several additional concepts (blood sugar testing, controlling your blood sugar, exercise and diabetes, and help with diabetes from friends).

Previous studies have largely used qualitative methods to examine patient–provider differences in diabetes experiences and perspectives (e.g., [15,17]). While qualitative approaches such as in-depth interviews with patients and providers offer rich descriptions of diabetes perceptions, these approaches do not provide a standardized method for interpreting the magnitude of similarity or difference. A study by Aufseesser et al. [16] examined patient understanding of diabetes terms, but limited the topic area to retinopathy rather than the wide range of concepts addressed by the DSDS. Wikblad, Wibell and Montin's work [21] and our previous study [20] surveyed independent groups of patients and health professionals for their diabetes perception. In contrast, this study used a quantitative survey method to examined patient–provider pairs and measures actual perceptions differences in patient–provider relationships.

The results support the DSDS as an instrument that provides a valid method to reliably assess perceptions of key diabetes concepts of both patients and providers. Further, the DSDS not only allows the researcher and the clinician to determine the perception differences between patient and provider, but also to estimate the magnitude of these differences.

The second research question concerned the comparability of two scoring methods. In other words, what method should be used to measure diabetes perceptions? The technical aspect of this question is being addressed in another study [25], however, it is clear that the factor scores have a greater sensitivity, i.e., appear to be more precise, to the nuances of patient–provider perceptions differences. Mean scores indicate differences, but provide only broad areas were differences exist. Another difference between the scoring systems is ease of use. Computing the mean of a specific DSDS is a relatively simple computation even with nine adjective pairs. Factor analysis, on the other hand, requires a certain degree of statistical sophistication in both execution and interpretation.

4.2. Conclusion

This study suggests that the patient's perception of diabetes differs from the provider's perception. For the patient, diabetes is experienced and given meaning within a personal socio-cultural world. Diabetes concepts and terms are assigned attributes that are relevant to each individual. For the provider, diabetes concepts and terms most likely have a more direct and precise medical meaning. While the emergence of perception differences is not surprising, the number of differences was greater than anticipated, particularly since the differences are between actual patient–provider pairs. As in the pilot study [20], patients and providers differed on concepts that were not anticipated and did not differ on concepts where differences were expected (e.g., exercise and diabetes).

When possible the preferred method of scoring the DSDS is the factor method. This is also the method that should be used in research studies where statistical expertise is more likely to be available. However, in a clinical environment this refinement may not be necessary or possible. The administration of the DSDS and the mean scoring may be of use for assessment of patient and provider perceptions in clinical practices. The mean scores would be able to indicate general areas where perception difference exist and should be considered in interactions with the patient.

The consistent results found by both the mean and factor scoring methods underscore the strength of these findings (as well as how robust the DSDS is). Further, the DCP attitude subscales correlated with both the mean and the factor scores providing support for the validity (construct) of the instrument. Future research in the area of patient–provider perception differences should explore the relationships among perception differences, patient satisfaction, and self-care behavior. It would also be beneficial if these factors were examined for their impact on patient complication expectations and blood sugar levels.

4.3. Practice implications

The findings also have practice applications for providers and diabetes educators. During patient and provider discussions, participants perceive diabetes concepts differently. The relationships among patient–provider perception differences are complex and do not appear to be intuitive. Providers and educators should avoid making assumptions about a patient's understanding of diabetes or that they correctly understand instructions and advice. The DSDS can assist in determining the areas where differences exist.

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