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Original Article

Validation of the relationship consciousness of Japanese Patients with type 2 diabetes scale

Miki Koike ^{a,*}, Michiko Inagaki ^b, Keiko Tasaki ^b, Kiyoko Matsui ^b, Tomomi Horiguchi ^b, Azusa Oda ^a, Tantut Susanto ^c^a Department of Chronic Care, Division of Health Sciences, Graduate School of Medical, Pharmaceutical, and Health Sciences, Kanazawa University, Kodatsuno, Kanazawa, Japan^b Department of Clinical Nursing, Division of Health Sciences, Institute of Medical, Pharmaceutical, and Health Sciences, Kanazawa University, Kodatsuno, Kanazawa, Japan^c Family and Community Health Nursing Department, School of Nursing, University of Jember, Jember, Jawa Timur, Indonesia

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ABSTRACT

Objectives: The management of type 2 diabetes mellitus can be improved for individuals by developing relationships with other patients with diabetes. We created the Relationship Consciousness of Japanese Patients with Type 2 Diabetes Mellitus scale to measure the relationship consciousness of type 2 diabetes mellitus patients for other patients based on the Health Belief Model.

Methods: This was a cross-sectional study of Japanese patients with type 2 diabetes mellitus ($n = 289$). Data were analyzed via exploratory factor analyses, reliability tests, concurrent validity.

Results: The final scale obtained for the Relationship Consciousness of Japanese Patients with Type 2 Diabetes Mellitus scale comprised a six-factor structure with 36 items. All 36 items had a Cronbach's α coefficient of 0.893 and explained 59.38% of the total variance. The scale was significantly correlated with a related reciprocity consciousness scale.

Conclusions: The Relationship Consciousness of Japanese Patients with Type 2 Diabetes Mellitus scale may be an important tool for nurses to assess the relationship consciousness of patients with type 2 diabetes mellitus. In addition, by understanding patients' relationship consciousness for others who share their disease, nurses can begin to recommend ways to establish relationships between patients that suit patients' particular relationship consciousness levels and to provide better care in their clinical practice.

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1. Introduction

1.1. Background

Diabetes is a major health problem showing an increasing incidence and morbidity throughout the world. Currently, the estimated global number of patients with diabetes is over 425 million; by 2045, this is estimated to reach about 629 million [1,2]. Type 2 diabetes mellitus (T2DM) causes long-term vascular injury and various dysfunctions, such as vision loss, retinopathy,

nephropathy leading to renal failure, diabetic gangrene, and cardiovascular and cerebrovascular disease [3,4], and is considered a major societal problem because of its effect on increasing care costs and impaired quality of life due to the development of chronic complications [5,6].

Patients with T2DM who want to control their blood glucose level effectively must engage in weight management, medication management, and lifestyle changes, including the continual monitoring of metabolic parameters. All of these behaviors require considerable skill in self-management and self-control [7]. Therefore, patients with T2DM require not only self-management education, but also support with diabetes self-management in order to help them carry out and maintain glycemic control [8]. Part of the self-management support needed is peer support from people who share their disease. Peers can provide continuous self-management support and help enact healthy behavior change [5,7–10].

* Corresponding author. 5-11-80, Kodatsuno, Kanazawa, 920-0942, Japan.

E-mail addresses: k.miki@stu.kanazawa-u.ac.jp (M. Koike), tantut_s.psik@unej.ac.id (T. Susanto).

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The number of patients with T2DM is also increasing in Japan [11]. Furthermore, it is recommended that Japanese patients with diabetes make use of their relationships with others who share their disease in order to improve diabetes management, such as peer support programs [12,13]. Such relationships can have benefits for both parties [14–17]. Peer support is particularly helpful for managing diabetes because support for some diabetes-related problems can only be provided by others with diabetes. The mutually beneficial involvement of patients with diabetes is an example of a reciprocal relationship, and in this study, we define reciprocal relationships as “relationships between people who share a disease” [10,18].

However, only about 80,000 patients with diabetes in Japan have enrolled in self-help groups, where they could develop and benefit from relationships with other patients with diabetes [19]. This number is only about 0.8% of patients with T2DM in Japan and suggests that, overall, few Japanese patients with diabetes have relationships with people who share their disease. Past research has also shown that patients with T2DM, regardless of enrollment in self-help groups, have a variety of perspectives on having relationships other patients with diabetes [18]. Accordingly, it might be possible to better recommend self-care options suitable for each patient and help them connect with others who share their disease by grasping their consciousness of their relationships with other patients. Therefore, we constructed a scale to measure the relationship consciousness of Japanese T2DM patients (RCT2DM), which focused on the relationship of T2DM patients with patients who share their disease. We then evaluated the reliability and validity of the scale.

1.2. Conceptual framework

The Health Belief Model (HBM) is a psychological model explaining the formation of health behavior. According to this model, disease susceptibility, severity, the utility of a given health behavior, disability, and psychosocial variables such as personality traits all influence health behaviors [20]. In diabetes, elements of HBM can be cited as factors related to patient self-care behavior adherence [21]. Additionally, it has been suggested that education based on HBM is effective for self-care management [22]. Therefore, the usefulness of HBM has been identified as being relevant for understanding the health behavior of patients with T2DM.

This study considers the relationship that T2DM patients have with patients who share their disease as one of the health behaviors for a T2DM patient. Based on previous research that has shown that the relationships of patients with T2DM can have a positive impact on continuous self-management and help enact healthy behavioral change [5,7–10]. By including HBM elements (i.e., the severity of the disease; the benefit of health actions; the barriers to health actions; psychosocial variables) in the evaluation of the patients' consciousness for others with the same disease, researchers may be better able to evaluate the patient's relationship consciousness with others sharing the illness, which is a type of health behaviors.

In this study, the beliefs regarding the severity of the disease were defined as “diabetes susceptibility, severity.” The benefit of health action was defined as “the benefit of having the relationship with other patients with T2DM.” The barriers to health action were defined as “the barriers of having the relationship with other patients with T2DM.” Psychosocial variables were defined as “attitude toward relationship with others.” This study aimed to measure the T2DM patients' consciousness of their relationship with other patients with T2DM based on these four factors from the Health Belief Model as a hypothetical constitutional concept.

2. Material and methods

2.1. Design and participants

We sent our research plan and an example of our research questionnaire to medical facilities and requested permission to collect data at their location. We ultimately received permission to collect surveys at nine medical facilities. All participants were patients with T2DM. We excluded patients with serious complications (e.g., dialysis, blindness, paralysis, cancer) that would have a major impact on their mind and body; patients with impaired cognitive function or who have difficulty answering the questionnaire; patients with gestational diabetes; and patients with difficulty in communicating. There were no age-related inclusion criteria. Participants were recruited from February to October 2017.

2.2. Procedures for instrument development

The scale items were created using the HBM as a framework and the findings of a previous study [18]. Based on the HBM, we hypothesized that relationship consciousness could be divided into four factors: “diabetes susceptibility, severity,” “the benefit of having the relationship with other patients with T2DM,” “the barriers of having the relationship with other patients with T2DM,” and “attitude toward relationship with others.” Specific items were created based on Koike's previous research [18]. This previous qualitative research conducted with patients with T2DM in Japan who were interviewed regarding their relationships with people who share their disease. The interview contents of the patient were based on the data from the previous research, and the interview contents, based on previous research, were carefully read and items were designed to measure the consciousness of T2DM patient's relationship with people who share their disease. The created items were evaluated to determine whether the content of the item was suitable for the conceptual framework. This process was repeated, and the final items were selected. To confirm the content validity of the items, we had four teachers familiar with diabetic nursing evaluate how well the items suited the framework. We also examined the face validity in a pretest by administering the items to four nurses, including those certified for diabetes care, and seven people with T2DM who visited the study hospitals. The final draft of the RCT2DM scale contained 57 items.

2.3. Scoring of the instrument

All items in the RCT2DM scale were rated on a five-point Likert scale. Respondents were instructed to respond to each item by circling one of the following: 1 = disagree, 2 = slightly disagree, 3 = unsure, 4 = slightly agree, or 5 = agree. A total score was calculated by summing all the item scores. Higher scores indicated greater consciousness of the relationship with other people with T2DM.

2.4. Procedures

The researcher provided the medical staff with the relevant inclusion and exclusion criteria for the recruitment of participants, and the medical staff provided assistance in selecting the target patients from among the existing outpatients and hospitalized patients. Prior to patient participation, the researcher explained the purpose of the study to target patients in writing and orally and requested their research cooperation. After giving their informed consent, the patients who agreed to participate completed the instrument on the spot and then return the questionnaire. When the researcher was unable to verbally explain the study to the patient, a

doctor or nurse was asked to do so. Specifically, nurses or doctors explained that they were conducting research and that patients were free to participate or not. And even if the patient decided not to participate in the research, the patient was guaranteed that there would be no disadvantage to receiving treatment. We tried to minimize bias in the patient's answers by having the researcher or medical staff explain that the questionnaires were anonymous and that the individual could not be identified. The researchers collected all questionnaires completed by patients from the nurses or doctors. Answering the questionnaire survey was regarded as consent. This study was conducted with the approval of the Kanazawa University Medical Ethics Review Committee (approval number: 736–2). This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

2.5. Statistical analysis

The aim of this analysis was to create a scale to measure the T2DM patients' consciousness of their relationship with other patients with T2DM based on the four factors of the Health Belief Model as a hypothetical constitutional concept.

In the item analysis, we examined the distribution of responses, ceiling effects ($Mean \pm 1SD > 5$), and floor effects ($Mean \pm 1SD < 1$). Additionally, we conducted a good-poor analysis where we extracted the top 25% and the bottom 25% of the scale scores. Patients were classified according to the *t*-test for the average score of the upper group and the lower group, and items with no significant differences were excluded from analysis. In the item-total correlations, an item-total correlation indicating the presence of no correlation between the item score and its total score ($|r| < 0.2$) were excluded.

In the construct validity assessment, due to the expected correlations between the facets of the HBM, exploratory factor analysis using the maximum likelihood method and a promax rotation was performed. We interpreted and named the subordinate factors which were ultimately identified.

The content validity index was calculated, and the internal validity was examined.

To determine the internal consistency and reliability of the RCT2DM scale, we evaluated the Cronbach's α coefficient for the entire scale and all of the subscales. Further, a second good-poor analysis was carried out after factor analysis.

Data were analyzed using the IBM SPSS Statistics 24, SPSS AMOS 24, and R version 3.4.2 (2017). Statistical significance was set at $P = 0.05$.

2.6. Approaches to concurrent validity

Reciprocity consciousness was considered to be similar to the concepts measured in the RCT2DM scale; therefore, higher scores on the RCT2DM scale were considered to indicate higher reciprocity consciousness. To measure the concurrent validity of the RCT2DM scale, we assessed the relationship between both the total score and subscale scores of the RCT2DM scale and a 10-item reciprocity consciousness scale, which is a subscale of the 30-item Interpersonal Relationship Awareness Scale by Tanaka [23,24]. This interpersonal relationship consciousness scale was evaluated using a seven-point Likert scale ranging from 1 (do not agree at all) to 7 (agree very much). Its validity has been confirmed based on exploratory and confirmatory factor analysis, as well as covariance structural analysis. The reliability was also good (Cronbach's $\alpha = 0.864$). We used this scale after obtaining the permission of its developer.

3. Results

We distributed the questionnaire to 378 participants, of which 377 were collected (response rate 99.7%). We excluded participants with missing answers on the RCT2DM scale items, which reduced the number for analysis to 289 (effective response rate 76.7%).

3.1. Sample characteristics

There were 191 men (66.8%) and 95 women (33.2%) in the final sample. Their ages ranged from 21 to 92 years, and the average age was 61.19 years. The mean HbA1c level was 7.31%. The detailed results are shown in Table 1.

3.2. Item analysis results

Of the 57 items in the RCT2DM scale, four items showed a ceiling effect and thus were excluded. As a result of the good-poor analysis, no significant difference was found in seven items. In the I - T correlation, in addition to the results of the good-poor analysis, two items were cited as excluded candidates. Therefore, a total of 44 items were selected for the RCT2DM scale.

3.3. Construct validity

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was calculated, based on which the sample size was judged as valid (KMO = 0.841). Bartlett's test of sphericity was significant ($P < 0.001$), which indicated that the sample could be assessed via factor analysis. In determining the number of factors, we observed flexion in the eigenvalue transition at six factors, according to the scree plot (Fig. 1). Examining the minimum average partial correlation indicated the presence of six factors while parallel analysis recommended eight factors. We judged that six factors were a reasonable number of factors.

Eight items had factor loadings of less than 0.40, so they were excluded, and the analysis was run again. As a result, a six-factor structure comprising 36 items was obtained, explaining 68.27% of the variance (Table 2). The first factor had eleven items, most of which related to the positive aspects of the relationship between the T2DM patients; therefore, it was named "perceived benefit of the relationship." The second factor had nine items, all of which were negatively worded (and hence reverse-scored) and concerned negative aspects of the relationship between the T2DM patients; these were deemed obstacles to the relationship, and thus the factor was named "perceived barriers to the relationship." The third factor contained seven items, mainly relating to the burden of diabetes management and fear of the progression of diabetes, so it was named "perceived severity of diabetes." The fourth factor contained three items relating to positive attitudes toward the relationship with others, and thus the factor was named "a positive attitude toward the relationship with others." The fifth factor had four items, all of which were negatively worded (and hence reverse-scored); this factor included items related to negative attitudes toward relationships with others due to low self-esteem, so it was named "negative attitude toward relationships with others." Finally, the sixth factor had two items, both reverse-scored. Both items related to self-assessment of participants' ability to perform diabetes management practices, it was named "perceived self-management ability."

3.4. Concurrent validity

The correlations between the RCT2DM subscales, the total score, and the reciprocity scale score was examined (Table 3). There was a significant correlation between the reciprocity consciousness scale

Table 1
Participant Characteristics (n = 289).

Characteristics		n	Mean±SD (Range) or %
Age		288	61.19±11.12 (21–92)
HbA1c		238	7.31±1.14 (5.0–15.0)
Body mass index		282	25.55±4.35 (17.3–41.4)
Sex	Male	191	66.8
	Female	95	33.2
Profession	Yes	187	66.5
	Nos	119	32.5
Complications	Yes	84	30.3
	No	193	69.7
Treatment contents ^a	Oral medicine	216	76.1
	Insulin therapy	85	29.9

Note: SD = standard deviation.

^a Multiple treatments can be selected.

score and the first ($r = 0.439$), second ($r = 0.204$), and third ($r = 0.296$) factors, as well as the RCT2DM scale total score ($r = 0.419$). However, factors four to six did not correlate with the reciprocity consciousness scale.

3.5. Content validity

The content validity index (CVI) was employed to determine item validity. Six experts, consisting of three diabetes nurses, and three chronic disease nurses were asked to rate each of the RCT2DM scale items based on relevance, clarity, and simplicity. The questions rated on a four-point Likert scale with a score of 1 (not relevant), 2 (somewhat relevant), 3 (quite relevant), and 4 (highly relevant). Then, the CVI was computed; the number of experts giving a rating of either 3 or 4 was divided by the total number of experts. The CVI of the items on the RCT2DM scale ranged from 0.83 to 1.0, and the total CVI of the final version of RCT2DM scale was 0.97.

3.6. Reliability

The Cronbach's α coefficient for the entire 36-item RCT2DM scale was 0.893. The Cronbach's α coefficients of the individual factors ranged from 0.719 to 0.911. In the good-poor analysis, significant differences were observed for all the items.

4. Discussion

4.1. Construct validity

In contrast to the HBM framework, we extracted six factors, not four, from the exploratory factor analysis. Three of the subscales directly corresponded to those in the HBM framework: "diabetes susceptibility, severity," "the benefit of having the relationship with other patients with T2DM," and "the barriers of having the relationship with other patients with T2DM." The fourth and fifth

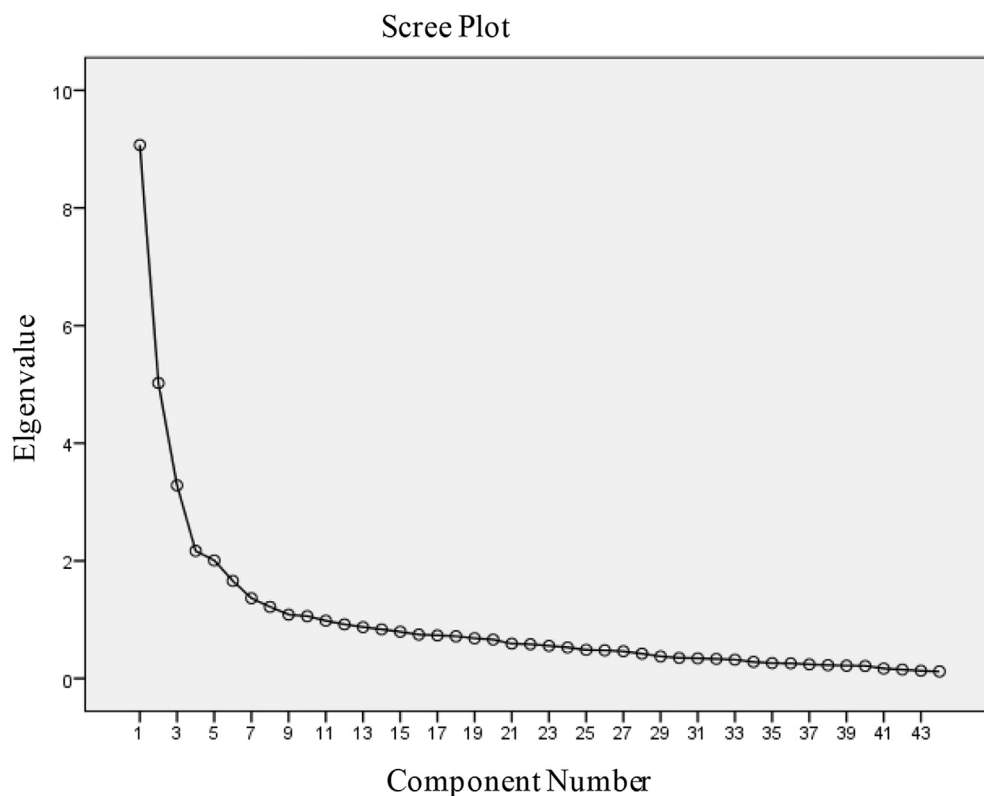


Fig. 1. Loading factors of the RCT2DM scale.

Table 2
Factor Analysis Results of RCT2DM scale.

Item number	Item content	Factor					
		1	2	3	4	5	6
Factor 1: Perceived benefits of the relationship benefit, $\alpha = 0.911$							
1	I think I can talk to people who share my disease about my trouble with diabetes.	0.922	-0.036	-0.117	0.024	0.010	0.073
2	I think that I will feel better after speaking with people who share my disease.	0.872	0.117	-0.102	-0.022	-0.001	-0.075
3	I think that speaking to people who share My disease will encourage my continued medical treatment.	0.860	0.141	-0.054	-0.039	-0.047	-0.050
4	I think that people who share my disease can mutually help each other.	0.764	0.029	0.004	-0.024	0.071	0.112
5	I am concerned about people who share my disease.	0.761	-0.053	0.115	-0.115	-0.063	0.138
6	I think that the progress of diabetes can only be understood by people who share my disease.	0.604	-0.264	0.134	-0.028	-0.125	0.202
7	When I compare the state of the people who share disease with myself, I feel relieved that I am in a better condition than them.	0.600	-0.282	-0.061	-0.071	0.029	-0.055
8	I think that I can acquire new knowledge by talking with people who share my disease.	0.520	0.324	0.082	0.096	-0.002	-0.249
9	I think there is something I can do for people who share my disease.	0.494	0.008	0.108	0.089	0.041	0.171
10	Looking at the figures of the people, who are in better condition than I am, makes me have hope that I can be like them.	0.471	0.023	0.235	0.011	0.056	-0.153
11	I think that relationship with the people who share disease is a good thing.	0.414	0.333	0.033	0.051	-0.019	-0.192
Factor 2: Perceived barriers to the relationship, $\alpha = 0.841$							
12	*I think that people who share my disease will not be helpful for my condition.	-0.023	0.716	-0.077	-0.166	-0.071	0.068
13	*I do not think that the condition will change by having a relationship with people who share my disease.	-0.026	0.711	0.049	-0.126	0.009	-0.004
14	*I think it is meaningless to have a relationship with people who share my disease.	0.072	0.689	-0.036	0.004	0.112	-0.128
15	*I do not think there are any people who share my disease who would give me the information I want.	-0.174	0.683	0.046	-0.138	0.014	0.165
16	*I do not think I still need a relationship with the people who share disease.	-0.080	0.629	0.146	0.078	-0.229	0.302
17	*I think that the place of the relationship between patients is a difficult atmosphere to enter.	0.058	0.552	-0.131	0.153	0.002	0.209
18	*I feel nervous to entering a place of the relationship with patients.	-0.046	0.448	-0.062	0.282	-0.058	0.248
19	*I feel I do not want to talk about diabetes with the people who share disease.	0.126	0.431	-0.050	0.012	0.220	0.022
20	*I think that I will hardly meet the same sick person in my daily life.	-0.037	0.415	0.069	-0.016	0.176	-0.053
Factor 3: Perceived severity of diabetes, $\alpha = 0.834$							
21	I am afraid of developing complications.	-0.181	0.180	0.802	-0.056	-0.017	-0.141
22	I feel uneasy about whether diabetes is involved in changes to my body.	0.005	0.084	0.769	0.006	0.026	-0.118
23	I am careful about diabetes management in my life.	0.022	-0.111	0.754	-0.058	0.094	0.115
24	I think about the blood glucose level, I cannot stop my sinking feelings.	0.048	-0.034	0.600	-0.056	-0.119	-0.031
25	I always care about the content of my meals because of diabetes.	0.002	-0.095	0.587	0.020	0.132	0.125
26	I feel a sense of crisis in blood sugar control.	0.093	-0.006	0.532	0.159	-0.127	-0.033
27	I am making an effort to gain knowledge about diabetes.	0.151	-0.063	0.422	0.062	0.034	0.224
Factor 4: Positive attitude toward the relationship with others, $\alpha = 0.829$							
28	I think I can talk regardless of the age of the other person.	-0.083	-0.042	-0.037	0.939	-0.015	-0.023
29	I can talk with anyone comfortably.	-0.109	-0.082	-0.005	0.892	0.055	-0.030
30	I think that I will help people who have trouble.	0.099	-0.071	0.042	0.588	0.001	-0.044
Factor 5: Negative attitude toward relationships with others, $\alpha = 0.802$							
31	*I have nothing to brag about others.	-0.086	0.050	-0.002	-0.153	0.806	0.130
32	*I think that I am a useless human being	-0.004	0.070	-0.027	-0.028	0.766	0.005
33	*I do not think I will actively engage with people.	0.027	0.017	0.065	0.174	0.578	-0.022
34	I am not good at becoming friends with others.	0.074	-0.046	0.047	0.262	0.548	0.061
Factor 6: Perceived self-management ability, $\alpha = 0.719$							
35	*I think that I do not have the necessary knowledge to help people who share my disease.	0.049	0.095	0.035	-0.054	0.085	0.719
36	*I think that it is not possible to develop good self-management by talking with people who share my disease.	-0.004	0.216	-0.042	-0.037	0.051	0.600
Whole scale $\alpha = 0.893$							
Factor correlations (<i>r</i>)		1	0.475	0.515	0.297	-0.015	0.091
		2		0.117	0.228	0.187	0.227
		3			0.170	-0.148	0.004
		4				0.385	0.155
		5					0.111

Note.*Reverse-scored item.

RCT2DM = Relationship Consciousness for Japanese Patients with Type 2 Diabetes Mellitus.

Responses: 1 = disagree; 2 = slightly disagree; 3 = unsure; 4 = slightly agree; 5 = agree.

factors, “positive attitude toward the relationship with others,” and “negative attitude toward relationships with others,” were based on “attitude toward relationship with others” from the framework. The reason for dividing this factor into two separate factors was that it is affected from each factor about “self-esteem that you are not worth connecting to others” and “confidence that you can

connect with others” is there. From these two factors, it is possible to grasp the patient's attitude toward interpersonal relationship from the viewpoint of the self-esteem of the patient and the patient's confidence in interpersonal relationships. Previous research [18] has demonstrated that some patients with T2DM cannot relate to other patients who share their disease because of their low self-

Table 3
Correlation between RCT2DM scale and reciprocity consciousness scale (r).

Scale	RCT2DM scale						
	Total	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Reciprocity Consciousness Scale	0.419**	0.439**	0.204**	0.296**	0.199**	0.151*	0.023

Note: Spearman's rank correlation coefficients. ** $P < 0.001$, * $P < 0.05$.

The mean item scores of each subscale was used as the subscale score.

RCT2DM = Relationship Consciousness for Japanese Patients with Type 2 Diabetes Mellitus.

esteem and their beliefs that they are unworthy of having a relationship with other patients with T2DM. To understand these two factors, which are the attitudes of patients toward others with the same disease, is from the viewpoint of recommending relationships between patients with the same disease. Medical staff must grasp the patient's attitude toward interpersonal relationships, and recommend developing relationships between T2DM patient and others who share their disease. Thus, these two factors are important concepts from the viewpoint of recommending relationship between patients.

The sixth factor, "Perceived self-management ability," is comprised of items from "the barriers of having the relationship with other patients with T2DM" aspect of the framework. This factor contained information on whether the patient has knowledge that can be of use to other patients with T2DM and whether they are engaging in self-care that they can share with others. One possible reason for this factor's independence is related to being conscious of self-management behavior in T2DM. There are reports that T2DM patients maintaining good blood glucose control live by devising means to interact with people who share their disease for self-management support [25]. From this, it can be inferred that consciousness concerning self-management behavior is an important concept in grasping the consciousness about the relationship with the people who share their disease.

4.2. Concurrent validity

A correlation was found between the RCT2DM scale total score and the reciprocity consciousness scale ($r = 0.419$). There was also a correlation between three of the subscales ("the benefit of having the relationship with other patients with T2DM," "the barriers of having the relationship with other patients with T2DM," and "diabetes susceptibility, severity"), and the reciprocity consciousness scale ($r = 0.439, 0.204, \text{ and } 0.296$, respectively). However, the reciprocity scale did not correlate with the "a positive attitude toward the relationship with others," "negative attitude toward relationships with others," and "perceived self-management ability" subscales. "A positive attitude toward the relationship with others," and "negative attitude toward relationships with others" consist of items that are focused on a person's personality with regards to interpersonal relationships. The "perceived self-management ability" subscale reflects participants' self-management ability for diabetes. Therefore, a potential reason that those three factors did not correlate with reciprocity consciousness scale was their difference from reciprocity consciousness. Alternatively, this might be due to a unique factor concerning the relationship between patients with T2DM. Nevertheless, the above results largely support the concurrent validity of the scale.

4.3. Content validity

As a result of calculating the I-CVI score to examine the content validity of the scale, 7 items of the I-CVI score 0.8 or more, and out of the 36 items on the scale, 29 items were 1.0. The S-CVI of the final

version of RCT2DM scale was 0.97, suggesting that the content validity was adequate.

4.4. Reliability

The final RCT2DM scale contained 36 items in six factors. The Cronbach's α coefficient of the whole scale and the subscales ranged from 0.719 to 0.911. All scales were above 0.7, which is the standard reference value for Cronbach's α . Additionally, as a result of the good-poor analysis, significant differences ($P < 0.05$) were observed between the upper group and the lower group (25% in the upper group and 25% in the lower group) on all items, which indicates that the reliability and internal consistency could be deemed acceptable.

4.5. Relevance to nursing practice

Through understanding patients' relationship consciousness for others who share their disease in clinical practice, nurses can start recommending ways of establishing relationships between patients that suit these patients' particularly relationship consciousness levels, and carry out better care. Both the total score, which assesses overall relationship consciousness and each subscale score, which evaluate patients' detailed perceptions of their relationship with other patients, would be useful for this purpose. In the future, it is necessary to identify the types of care that are effective for changing patients' consciousness of their relationship others who share their disease; this could not be clarified in this study. Furthermore, clarifying the factor structure of the scale could aid us in further grasping T2DM patients' relationship with other patients, and thereby help nurses better cultivate these relationships between patients.

4.6. Limitations

Since this research is conducted in Japan, it is unclear if the results will generalize to other cultures. We recommend that this study is replicated in other populations.

5. Conclusion

The RCT2DM scale demonstrated satisfactory validity and reliability for measuring the relationship consciousness of Japanese T2DM patients for those who share their disease. This relationship consciousness was initially conceptualized as having four factors ("perceived benefits of the relationship," "perceived severity of diabetes," "perceived relationship barriers," and "attitude toward relationship"). These four were extracted, along with a novel factor: "perceived self-management ability." Of these factors, "attitude toward their relationship with others" was divided into two elements: "a positive attitude toward the relationship with others" and "negative attitude toward relationships with others." In addition, it was extracted together with a novel factor; "perceived self-management ability."

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2018.09.007>.

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