Development of the "Social Participation Barriers in Patients With Diabetes" Questionnaire for Older Patients With Diabetes and Evaluation of its Reliability and Validity

Satoshi Ida, MD[1] iD **, Kanako Imataka, MD[1], Shoki Morii, MD[1], and Kazuya Murata, MD[1]**

Abstract

Objectives: To develop a questionnaire for evaluating the factors hindering social participation in older patients with diabetes (the Social Participation Barriers in Patients with Diabetes [SPBD] questionnaire) and assess its reliability and validity. **Materials and Methods:** This is a cross-sectional study. This study included outpatients aged ≥60 years having diabetes and undergoing treatment at the Ise Redcross Hospital. A draft questionnaire consisting of 20 questions was developed with reference to previous studies. Logistic regression analysis was conducted, and Cronbach's alpha coefficient was calculated. Exploratory factor analysis was conducted to test construct validity. Pearson's correlation coefficients between SPBD scores and frailty scores, social frailty scores and frequency of outings were calculated. **Results:** Overall, 353 patients were included in the analysis. After questions without an association in the logistic regression analysis were excluded and results of the exploratory factor analyses were obtained, 10 questions were excluded. As a result, we created a 10-item SPBD questionnaire. Cronbach's alpha coefficient was .87. The SPBD score was significantly associated with frequency of going out, and frailty. **Conclusions:** We created an SPBD questionnaire to assess barriers to social participation in older adult patients with diabetes. This study indicated the validity and reliability of the questionnaire.

Keywords

social participation, diabetes, older adult, validity

Introduction

The number of patients with diabetes continues to rise and is expected to reach approximately 400 million (Khan et al., 2020). The prevalence of diabetes in Japan is 3%–8% (Uehara et al., 2014). The number of older adult patients with diabetes has been increasing owing to the aging of the population (Danaei et al., 2011). Older adults with diabetes have less frequent interaction with others, have more complications and comorbidities, and use more drugs than those without diabetes (Ida & Murata, 2022a; Sinclair et al., 2015). Those with large glycemic fluctuations or who use insulin have less frequent interaction with others (Ida et al., 2020). Diabetic complications decrease social roles (Ida et al., 2021). In them, barriers to social participation may be huge (Ida & Murata, 2022b).

Social participation is not uniform, but it is regarded as "the person's involvement in activities that provide interactions with others in a society or a community." (Levasseur et al., 2010). Levasseur et al. proposed a taxonomy of social activities based on an individual's levels of involvement with others and the goals of these activities (Levasseur et al., 2010). The taxonomy consists of 6 levels, with levels 3 to 6 (i.e., activities generating interaction with others) denoting social participation activities.

[1]Ise Red Cross Hospital, Ise-shi, Japan

Corresponding Author:
Satoshi Ida, Department of Diabetes and Metabolism, Ise Red Cross Hospital, 1-471-2, Funae, 1-chome, Ise-shi 516-8512, Japan.
Email: bboy98762006@yahoo.co.jp

Specific social participation activities include being involved in sports groups, hobby groups, learning activities, neighborhood associations, volunteer activities, and work and interaction with friends (Levasseur et al., 2010; Tomioka et al., 2017; Yokobayashi et al., 2017).

Previous studies have developed questionnaires to examine social participation in community-dwelling older adults (Kelders et al., 2012; van Brakel et al., 2006) or social activities in older adults requiring assistance (Hirano et al., 2020). In addition to evaluating the frequency of social participation, it is vital to facilitate social participation in older adults by identifying factors that hinder their social participation. Previous studies (Cabinet Office, 2021; Hand & Howrey, 2019; Naud et al., 2019, 2021; Strobl et al., 2016) have reported that barriers to social involvement include loss of friends, strength or health limitations, and busy schedules. As described above, a comprehensive evaluation of barriers to social participation is important, necessitating a tool to assess such barriers.

To the best of our knowledge, no tool exists to assess barriers to social participation in older adult patients with diabetes. We believed that developing such a tool would facilitate their social participation and enable them to find social participation activities suited to them. This study aimed to develop a questionnaire for evaluating the factors hindering social participation in older adults with diabetes and confirm its reliability and validity.

Methods

Patient Selection

This was a cross-sectional study involving patients with diabetes (types 1 and 2) who were undergoing outpatient treatment. This study included outpatients who received treatment for diabetes at xx, Ise City, Mie Prefecture. The ethics committee of the xx approved the study (Approval number: xx), and it was conducted in accordance with the Declaration of Helsinki. All patients provided written informed consent. The eligibility criteria for the study were individuals who were outpatients aged ≥ 60 years with diabetes and received treatment at our hospital between July 2022 and December 2022. The exclusion criteria were alcohol abuse, severe psychiatric disorders, or inability to cooperate with the study independently. In the planning stage of this study, we estimated that the questionnaire would consist of 10 to 30 questions. Given that 10 respondents were required for each question, we calculated that the required sample size was more than 300. The Kaiser–Meyer–Olkin Measure of Sampling Adequacy was 0.88, indicating that factor analysis was conducted with an adequate sample size (de Vet et al., 2005).

Definition of Social Participation

Based on previous studies (Levasseur et al., 2010; Tomioka et al., 2017; Yokobayashi et al., 2017), social participation was defined as "a person's involvement in activities that allow interactions with others." Social activity participants are those who engaged at least once a month in (1) work, (2) volunteer activities, (3) hobby or social clubs, (4) learning activities, (5) sports or exercise activities, (6) quality time with friends or neighbors, (7) neighborhood associations, and (8) activities to share special skills and experiences.

Preparation of the Draft Social Participation Barriers in Patients With Diabetes (SPBD)

The literature was searched on Medline, Web of Science, CINAHL, CiNii, and the Japan Medical Abstracts Society databases to examine the factors hindering social participation on July 1, 2022. An example of a search strategy is provided below. The search terms used are: ("social participation" [MeSH Terms] OR "social participation" [All Fields] OR "social capital" [MeSH Terms] OR "social capital" [All Fields] OR "social networking" [MeSH Terms] OR "social network*" [All Fields] OR "social* engage*" [All Fields] OR "social* activ*" [All Fields] OR "social* disconnect*" [All Fields] OR "social relation*" [All Fields OR "social* integrat*" [All Fields OR "social tie*" [All Fields OR "social contact*" [All Fields] OR "social* connect*" [All Fields] OR "social alienation" [All Fields] OR "leisure activ*" [All Fields] OR "recreational" [All Fields] OR "volunteer activ*" [All Fields] OR "social* involvement*" [All Fields] OR "community participation" [All Fields] OR "community engage*" [All Fields] OR "community involvement*" [All Fields]) AND "elderly" [All Fields] OR "elder" [All Fields] OR "old age" [All Fields] OR "old people" [All Fields] OR "older" [All Fields] OR "aging" [MeSH Terms] OR "aging" [All Fields] OR "ageing" [All Fields]). The literature search extracted original research articles written in English or Japanese. References in the extracted articles were manually searched if needed.

Based on the extracted literature and discussion with physicians, nurses, and caseworkers, 20 draft questions were created. These questions included health, interaction with others, diabetic complications and treatment, and willingness for social participation. The SPBD questionnaire is self-administered, and the responses were given on a 4-point scale: "1. Strongly disagree," "2. Disagree," "3. Agree," and "4. Strongly agree." We confirmed the clarity of the questionnaire by collecting opinions from 10 patients with diabetes aged ≥ 60 years who were receiving outpatient treatment at our hospital. They were asked whether the questions were easy to understand (Yamazaki et al., 2021). As a result, in Question 1 "I think I am unable to participate if the information is limited," some respondents reported that they did not understand what this information was about. Thus, Question 1 has been revised: "I think I cannot participate if the information on social activities is limited."

Regarding Question 8, "I think I am unable to participate if I have diabetic complications," some reported that specific complications should be described. Thus, Question 8 has been revised as follows: "I think I am unable to participate if I have diabetic complications, such as numbness on the hands or feet, physical appearance, and kidney disease." The development of the SPBD draft has been completed through the above process.

Relationship Between Questions and Social Participation

To determine whether each question of the SPBD questionnaire was associated with social participation, logistic regression analysis was conducted using social participation as the dependent variable and each question as the explanatory variable. The odds ratio of each question to social participation was calculated. Questions without a statistically significant association in the logistic regression analysis were excluded (Yamazaki et al., 2021).

Confirmation of Reliability and Validity

Cronbach's alpha coefficient was calculated to evaluate internal consistency. The correlation between each item and the total score (I-T correlation) was calculated, and items with a correlation value <.3 were deleted as they indicated that the corresponding item did not correlate (Boateng et al., 2018). Exploratory factor analyses (principal axis factoring, varimax rotation, and promax rotation) were conducted to test construct validity and confirm the number of factors used in the questionnaire. Questions with factor loadings ≥0.4 were included in the questionnaire (Boateng et al., 2018; Field, 2013), whereas questions with a correlation coefficient ≥.7 were deleted (Boateng et al., 2018). Using the above process, the questions to be used in the questionnaire were determined, and the total score of the questionnaire was represented as an SPBD score. As criterion-related validity, Pearson's correlation coefficient was calculated to determine the correlation among SPBD scores, frequency of social activities, homeboundness, physical frail scores, and social frail scores.

Variable Measurement

The following variables were evaluated: age, sex, body mass index (weight [kg]/height [m²]), smoking habits, drinking habits, classification of diabetes (type 1 or 2), duration of diabetes, hemoglobin A1c (HbA1c), hypertension, dyslipidemia, diabetic retinopathy, diabetic nephropathy, depression, diabetic nephropathy, cardiovascular disease, living alone, homeboundness, physical frailty, social frailty, and use of antidiabetic agents. Diabetes was classified into type 1, type 2, and others according to the diagnostic criteria (Araki et al., 2020).

Hypertension was defined as systolic blood pressure ≥130 mmHg, diastolic blood pressure ≥80 mmHg, or intake of oral antihypertensive medication, whichever was met. For lipids, dyslipidemia was defined as either triglycerides ≥150 mg/dL, high-density lipoprotein-cholesterol <40 mg/dL, low-density lipoprotein-cholesterol (LDL-c) ≥120 mg/dL (LDL-c ≥100 mg/dL for patients with coronary artery disease), or intake of oral lipid-lowering drugs. Diabetic neuropathy was characterized by the presence of reduced Achilles tendon reflex, decreased vibration sensation on the lateral malleolus, or abnormal nerve conduction test result, whichever was met. The presence of cardiovascular disease was determined when the patient had either a current or a medical history of ischemic heart disease, such as angina pectoris or myocardial infarction, or cerebrovascular diseases, such as cerebral infarction. Homeboundness was evaluated using a self-administered questionnaire based on a previous study (Ida et al., 2020). Physical frailty was evaluated using a simple frail index developed by Yamada and Arai (Yamada & Arai, 2015). Social frailty was evaluated using a 5-item questionnaire developed by Makizako et al. (2015). The patients were instructed to answer Yes or No regarding smoking habit (Do you smoke?), alcohol habit (Do you drink?), and living alone (Do you live alone?). Furthermore, the use of diabetes drugs was confirmed by checking the patient interview form (if data was unavailable, medical records were used).

Statistical Analysis

Patient background factors and questionnaire score distribution were presented. The unpaired *t*-test was employed for continuous variables, and the chi-squared test for binary variables for group comparisons. The two-sided significance level was set at <.05. Statistical analyses were conducted using STATA version 16.0 (Stata Corporation LP, College Station, TX).

Results

Patient Background

A total of 353 patients (210 men and 143 women) who met the eligibility criteria were included in the analysis. The proportion of social participation was 75.6%, specifically (1) 36.5% for work; (2) 5.6% for volunteer activities; (3) 11.9% for hobby or social clubs; (4) 4.5% for learning activities; (5) 14.4%, sports, and exercise activities; (6) 41.3% for quality time with friends or neighbors; (7) 10.7% for neighborhood associations; and (8) 3.9% for activities to share special skills and experiences (Table 1).

The relationship between questions and social participation is demonstrated in Table 2. A significant association was not observed in questions 2, 3, 4, 6, 7, 15, and 16 in the logistic regression analysis, and these questions were deleted. The I-T correlation coefficient

Table 1. Characteristics of the Analysis Population.

	$n = 353$
Age (years), mean (SD)	72.1 (7.0)
Men, %	60.3
BMI (kg/m^2), mean (SD)	24.3 (4.6)
T1DM/T2DM, %	12.1/87.9
Duration of diabetes (years), mean (SD)	18.6 (11.9)
HbA1c (%), mean (SD)	7.6 (1.2)
Alcohol consumption, %	27.3
Smoking, %	38.7
Hypertension, %	62.8
Dyslipidemia, %	62.2
Retinopathy, %	32.0
Neuropathy, %	32.1
Nephropathy, %	48.1
Cardiovascular disease, %	21.5
Living alone, %	17.9
Physical frailty, %	58.0
Social frailty, %	42.3
Homeboundness, %	17.9
Oral hypoglycemic agents, %	84.9
Insulin, %	78.9
Social participation, %	75.6
Work, %	36.5
Volunteer, %	5.6
Hobby, %	11.9
Learning and culture, %	4.5
Sports and exercise, %	14.4
Engaging with friends and neighbors, %	41.3
Neighborhood association, %	10.7
Activities to share special skills and experiences, %	3.9
Number of social participation, mean (SD)	1.2 (1.1)

Note. SD = standard deviation; BMI = body mass index; T1DM/T2DM = type 1/type 2 diabetes mellitus; HbA1c = hemoglobin A1c.

of the remaining 13 questions was ≥.3, and Cronbach's alpha coefficient was .87. Principal axis factoring with nonrotation demonstrated that the eigenvalue decreased to 5.4, 1.2, and 0.8. The Kaiser–Meyer–Olkin Measure of Sampling Adequacy was 0.08, indicating that factor analysis was conducted with an adequate sample size.

Interpretable factors were not identified after varimax and promax rotations, and it was considered a single-factor structure. In terms of factor loadings, question 1 was low at 0.170; thus, it was deleted. Correlation coefficients between the remaining questions (questions 5, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20) were ≥.7 in questions 9, 10, 11, 12, 13, and 14. Considering factor loading and clinical significance, questions 10 and 11 were deleted. The total score of the remaining 10 questions was expressed as an SPBD score (23.2 ± 6.2). The SPBD score was significantly associated with the number of social activities ($r = -.251, p < .001$), frequency of

going out ($r = .164, p < .001$), physical frailty ($r = .330, p < .001$), and social frailty ($r = .329, p < .001$). The adjusted odds ratio of the SPBD scores for social participation was 0.93 (95% confidence interval [0.88, 0.98]; $p = .011$) (Table 3).

Discussion

In this study, we developed the SPBD questionnaire, a self-administered questionnaire used to evaluate factors hindering social participation in older adults with diabetes. The reliability and validity of the questionnaire were confirmed. To the best of our knowledge, the SPBD questionnaire is the first tool for assessing factors hindering social participation in older adults with diabetes.

Herein, we discuss the 10 questions in the SPBD questionnaire. The highest factor loading questions were associated with diabetes treatment (questions 12, 13, and 14), followed by those associated with diabetic complications and hyperglycemia (questions 8 and 9) and other questions (questions 5, 17, 18, 19, and 20). The results indicated that diabetes treatment was a huge barrier to social participation. Previous studies that included older adults with diabetes have demonstrated that a low frequency of going out is associated with insulin use (Ida et al., 2020), scarce interactions with others are associated with significant glycemic fluctuations (Ida et al., 2020), and social roles are associated with diabetic nephropathy (Ida et al., 2021). These results support the findings of the current study to some extent, although the definition of social participation differs between the previous studies and this study. Previous surveys indicated that busy schedules, limited interactions with neighbors, and interactions with groups without young generations are factors hindering their participation in community activities (Cabinet Office, 2021; Hand & Howrey, 2019; Naud et al., 2019; Strobl et al., 2016).

In this paragraph, we discussed the association of SPBD scores with the number of social activities, frequency of going out, physical frailty, and social frailty. The correlation coefficient between the SPBD score and the number of social activities, physical frailty, and social frailty was .25 to .3, but that between the SPBD score and frequency of going out seemed too small (.16). This result suggested that, as compared with a low frequency of going out, less social interactions and decreased physical function were factors strongly related to less social participation in older adults with diabetes. As the theory proposed by Levasseur (Levasseur et al., 2010), social activities are not just an outdoor activity, but an activity related to interaction with others and to physical and mental function, suggesting that SPBD scores may be associated with social interactions and physical function. In the present study, a multivariate analysis after adjusting several variables, including physical and social frailty, showed a negative association between SPBD

Table 2. Item Scores and Their Relationship to Social Participation.

Item no.	Questions	Mean (SD)	Odds ratios for social participation	Factor loading	Item-total correlation
1	I think I am unable to participate if information on social activities is limited.	2.7 (1.0)	1.31 [1.03, 1.67]		
2	I think I am unable to participate unless my friends or colleagues invite me.	2.4 (0.9)	1.11 [0.86, 1.42]		
3	I think I am unable to participate if I am not feeling well when going out.	3.1 (0.9)	0.88 [0.68, 1.14]		
4	I think I am unable to participate if I have a concern about my health.	3.1 (0.9)	0.88 [0.67, 1.15]		
5	**I think I am unable to participate because I am busy.**	**2.9 (1.0)**	**1.38 [1.08, 1.75]**	**0.408**	**.522**
6	I think I am unable to participate because I have already done enough activities.	2.3 (1.0)	0.99 [0.78, 1.26]		
7	I think I am unable to participate unless I am advised to do so by health professionals, such as physicians and nurses.	2.1 (0.9)	0.96 [0.74, 1.23]		
8	**I think I am unable to participate if I have diabetic complications, such as numbness on the hands or feet, physical appearance, and kidney disease.**	**2.8 (0.9)**	**0.74 [0.58, 0.96]**	**0.649**	**.693**
9	**I think I am unable to participate if my blood glucose levels is high.**	**2.4 (0.9)**	**0.63 [0.49, 0.82]**	**0.733**	**.754**
10	I think I am unable to participate if I have hypoglycemia.	2.7 (0.9)	0.75 [0.58, 0.97]		
11	I think I am unable to participate if I use injections such as insulin.	2.2 (0.9)	0.60 [0.46, 0.77]		
12	**I think I am unable to participate if I need to use injections, such as insulin, many times.**	**2.4 (1.0)**	**0.67 [0.53, 0.86]**	**0.783**	**.754**
13	**I think I am unable to participate if I need to take a large amount of oral medication many times.**	**2.0 (0.9)**	**0.53 [0.40, 0.70]**	**0.813**	**.795**
14	**I think I am unable to participate because I need to measure my blood glucose level.**	**2.0 (0.8)**	**0.53 [0.41, 0.71]**	**0.787**	**.772**
15	I think I am unable to participate if I do not feel an attachment to my community.	2.2 (0.9)	0.88 [0.69, 1.12]		
16	I think I am unable to participate if I have no financial leeway.	2.2 (0.9)	0.82 [0.64, 1.04]		
17	**I think I am unable to participate if I have few interactions with neighbors.**	**2.3 (0.9)**	**0.76 [0.58, 0.98]**	**0.635**	**.706**
18	**I do not want to participate because I like being alone.**	**2.1 (0.9)**	**0.63 [0.49, 0.81]**	**0.524**	**.587**
19	**I do not want to participate in activities mainly dominated by people around the same age as I am.**	**1.9 (0.8)**	**0.60 [0.45, 0.80]**	**0.549**	**.585**
20	**I do not want to participate because I am not a good talker.**	**2.0 (0.8)**	**0.55 [0.42, 0.73]**	**0.561**	**.610**

Note. Items in bold are significantly associated with social participation barriers. *SD* = standard deviation.

Table 3. Logistic regression with social participation as the outcome.

	Unadjusted		Adjusted	
	Odds ratios [95% CI]	p	Odds ratios [95% CI]	p
Age, per year increase			0.95 [0.91, 0.99]	.023*
Men (vs. Women)			0.79 [0.42, 1.47]	.459
HbA1c, per 1% increase			0.95 [0.76, 1.18]	.675
Numbers of comorbidity, per 1 increase			0.80 [0.68, 0.94]	.009*
Physical frailty (vs. no)			0.62 [0.32, 1.23]	.176
Social frailty (vs. no)			0.52 [0.28, 0.98]	.046*
Oral hypoglycemic agents (vs. no)			1.28 [0.55, 3.00]	.556
Insulin (vs. no)			0.84 [0.37, 1.90]	.677
SPBD, per 1 point increase	0.92 [0.88, 0.96]	<.001*	0.93 [0.88, 0.98]	.011*

Note. CI = confidence interval; HbA1c = hemoglobin A1c; SPBD = Social Participation Barriers in Patients with Diabetes; *P < 0.05.

scores and social participation. The SPBD questionnaire can comprehensively evaluate factors hindering social participation, such as treatment of diabetes, diabetic complications, and interaction with others. The present study showed that scores of the questionnaire were associated with a low frequency of social participation independent from other variables, including frailty, demonstrating the validity of the questionnaire.

Next, we discuss the frequency of social participation. The frequently reported social participation was engaging in quality time with friends or neighbors, work, and sports and exercise activities. Compared with previous studies that included (Kanamori et al., 2014; Tomioka et al., 2017; Yokobayashi et al., 2017), the proportion of engaging in quality time with friends or neighbors and work was similar between the present study and previous ones. However, the proportion of sports and exercise activities, hobbies, volunteer activities, and neighborhood associations was lower in this study than in previous studies. Two factors could explain this difference. First, people in poor physical condition are less likely to participate in hobby groups and volunteer activities (Cabinet Office, 2021; Naud et al., 2021; Strobl et al., 2016). This study included patients with diabetes, of whom many had complications and comorbidities. Second, women are more likely to participate in hobby groups and volunteer activities than men (Cabinet Office, 2021; Tomioka et al., 2017), and the proportion of men was higher in the present study. These two factors may result in less frequent participation in these two social activities.

Here, we discuss factors associated with SPBD scores, that is, engaging in quality time with friends or neighbors, volunteer activities, and hobbies. Hyperglycemia decreases interaction with friends (Yokobayashi et al., 2017). A possible explanation for this is that eating with friends leads to the intake of more calories (Yokobayashi et al., 2017). Regarding hobby and volunteer activities, as aforementioned, the presence of comorbidities, use of many drugs (polypharmacy), and hyperglycemia may be the leading causes of less frequent social participation

(Klinedinst et al., 2022; Luster et al., 2022; Sinclair et al., 2015; Yokobayashi et al., 2017). The SPBD scores were not associated with sports and exercise activities or work. This could be explained by the fact that many patients in this study already had exercise habits, such as walking and resistance exercises, as part of their diabetes treatment. Thus, they were not hesitant to participate in sports and exercise activities. The SPBD scores were not associated with work; however, work was frequently reported as social participation. Although it is mere speculation, they may work for a living. Further evaluation will be required to investigate the relationship between SPBD scores and each social participation activity.

Cronbach's alpha values ≥.7 usually indicate an acceptable level of reliability (Boateng et al., 2018). In this study, Cronbach's alpha of SPBD was .873, indicating that this questionnaire was reliable. Furthermore, SPBD scores were significantly associated with physical and social frailties. Physical and social frailties are associated with less frequent participation in community activities in community-dwelling older adults (Bessa et al., 2018; Xie & Ma, 2021), indirectly suggesting that SPBD examines factors hindering social participation.

Next, we discuss the clinical significance of this study. Social participation is less frequent in patients with diabetes than in those without (Ida & Murata, 2022b). Examining factors that hinder social participation using SPBD may facilitate social participation in patients with diabetes. Among the SPBD questions, those with high factor loadings were those related to diabetes treatment. Multivariate analysis revealed that the actual use of oral hypoglycemic agents and insulin was not associated with social participation. The results indicated that older adults with diabetes might participate in social activities regardless of their treatment regimens (although they regarded diabetes treatment as a barrier to social participation). It is seemingly difficult to provide interventions for negative feelings possessed by patients with diabetes, corresponding to questions 17 and 20 (I am not a good talker [Q-17], I am not good

at interacting with others [Q-20]); however, a previous study suggested that invitation from others to join social activities or the presence of friends may attenuate such negative feelings (Okamoto, 2008). Interventions for any of the SPBD questions may simultaneously remove several factors that hinder social participation in older adults with diabetes. The specific use of the SPBD questionnaire includes reduction of the intake of antidiabetic agents or the frequency of their use and glycemic fluctuations, along with the proposal of activities tailored to their personal values (e.g., proposing activities that allow them to interact with young people, or activities without requiring constant communication). Further studies will be needed to evaluate how the SPBD questionnaire can be used in practice.

This study had several limitations. First, the participants were outpatients at a clinic specializing in diabetes; therefore, the results of this study are applicable to patients with stable glucose levels or those with diabetes who are managed under the careful supervision of a family physician. Second, the sample size was relatively small. Third, no analysis was conducted on data on cognitive function or educational history, which may affect the results. Finally, this was a cross-sectional study, and thus, we could not predict the prognosis of patients with a high SPBD score (i.e., those with many factors hindering their social participation) and examine how their SPBD scores changed through interventions.

Conclusion

In the present study, we developed an SPBD questionnaire that assessed barriers to social participation in older adult patients with diabetes. The validity and reliability of the questionnaire were confirmed. We believe that the SPBD questionnaire can be used to assess barriers to social participation in older adults with diabetes.

Author Contributions

SI designed the study and drafted the manuscript; KM worked on giving advice and reviewing the manuscript from a medical point of view, and KI and SM helped draft the manuscript. All authors have read and approved the final manuscript.

Ethical Approval

The ethics committee of the Ise Red Cross Hospital approved the study (Approval number: ER2022-36), and it was conducted in accordance with the Declaration of Helsinki. All patients provided written informed consent.

ORCID iD

Satoshi Ida https://orcid.org/0000-0003-4353-1226

Data Availability Statement

The data that support the findings of this study are available from the corresponding author, SI, upon reasonable request.

References

Araki, E., Goto, A., Kondo, T., Noda, M., Noto, H., Origasa, H., Osawa, H., Taguchi, A., Tanizawa, Y., Tobe, K., & Yoshioka, N. (2020). Japanese clinical practice guideline for diabetes 2019. *Journal of Diabetes Investigation*, *11*(4), 1020–1076. https://doi.org/10.1111/jdi.13306

Bessa, B., Ribeiro, O., & Coelho, T. (2018). Assessing the social dimension of frailty in old age: A systematic review. *Archives of Gerontology and Geriatrics*, *78*, 101–113. https://doi.org/10.1016/j.archger.2018.06.005

Boateng, G. O., Neilands, T. B., Frongillo, E. A., Melgar-Quiñonez, H. R., & Young, S. L. (2018). Best practices for developing and validating scales for health, social, and behavioral research: A primer. *Frontiers in Public Health*, *6*, 149. https://doi.org/10.3389/fpubh.2018.00149

Cabinet Office. (2021). *The 2021 survey of daily living and local community participation in older adults*. https://www8.cao.go.jp/kourei/ishiki/r03/zentai/pdf_index.html.

Danaei, G., Finucane, M. M., Lu, Y., Singh, G. M., Cowan, M. J., Paciorek, C. J., Lin, J. K., Farzadfar, F., Khang, Y. H., Stevens, G. A., Rao, M., Ali, M. K., Riley, L. M., Robinson, C. A., & Ezzati, M. (2011). National, regional, and global trends in fasting plasma glucose and diabetes prevalence since 1980: systematic analysis of health examination surveys and epidemiological studies with 370 country-years and 2·7 million participants. *Lancet*, *378*(9785), 31–40.

de Vet, H. C., Adèr, H. J., Terwee, C. B., & Pouwer, F. (2005). Are factor analytical techniques used appropriately in the validation of health status questionnaires? A systematic review on the quality of factor analysis of the SF-36. *Quality of Life Research*, *14*(5), 1203–1224.

Field, A. (2013). *Discovering statistics using SPSS* (4th ed.). Sage Publications Ltd.

Hand, C. L., & Howrey, B. T. (2019). Associations among neighborhood characteristics, mobility limitation, and social participation in late life. *Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, *74*(3), 546–555. https://doi.org/10.1093/geronb/gbw215

Hirano, M., Saeki, K., & Ueda, I. (2020). Development of a social activities scale for community-dwelling older people requiring support. *Nursing Open*, *7*(6), 1887–1895. https://doi.org/10.1002/nop2.578

Ida, S., Kaneko, R., Imataka, K., Fujiwara, R., & Murata, K. (2021). Are diabetes-related factors associated with the social roles of elderly patients with diabetes? *Journal of Diabetes and Its Complications*, *35*(1), 107759. https://doi.org/10.1016/j.jdiacomp.2020.107759

Ida, S., Kaneko, R., Imataka, K., Okubo, K., Shirakura, Y., Azuma, K., Fujiwara, R., Takahashi, H., & Murata, K. (2020). Factors associated with social isolation and being homebound among older patients with diabetes: A cross-sectional study. *BMJ Open*, *10*(11), e037528. https://doi.org/10.1136/bmjopen-2020-037528

Ida, S., & Murata, K. (2022a). Social isolation of older adults with diabetes. *Gerontology and Geriatric Medicine*, *8*, 23337214221116232. https://doi.org/10.1177/23337214221116232

Ida, S., & Murata, K. (2022b). Social participation benefit in elderly patients with diabetes: A scoping review. *Gerontology and Geriatric Medicine*, *8*, 23337214221093887. https://doi.org/10.1177/23337214221093887

Kanamori, S., Kai, Y., Aida, J., Kondo, K., Kawachi, I., Hirai, H., Shirai, K., Ishikawa, Y., & Suzuki, K. (2014). Social participation and the prevention of functional disability in older Japanese: The JAGES cohort study. *PLoS One*, *9*(6), e99638. https://doi.org/10.1371/journal.pone.0099638

Kelders, R., van Brakel, W., Beise, K., & Irwanto. (2012). Testing and validating a simplified scale to measure social participation of people with disabilities in Indonesia. *Disability and Rehabilitation*, *34*(8), 638–646. https://doi.org/10.3109/09638288.2011.615369

Khan, M. A. B., Hashim, M. J., King, J. K., Govender, R. D., Mustafa, H., & Al Kaabi, J. (2020). Epidemiology of type 2 diabetes - Global burden of disease and forecasted trends. *Journal of Epidemiology and Global Health*, *10*(1), 107–111.

Klinedinst, T. C., Nelson, T. L., Gloeckner, G. W., & Malcolm, M. P. (2022). Depression and polypharmacy are risk factors for activity limitation in type 2 diabetes. *Chronic Illness*, *18*(2), 320–329. https://doi.org/10.1177/1742395320959434

Levasseur, M., Richard, L., Gauvin, L., & Raymond, E. (2010). Inventory and analysis of definitions of social participation found in the aging literature: Proposed taxonomy of social activities. *Social Science & Medicine*, *71*(12), 2141–2149. https://doi.org/10.1016/j.socscimed.2010.09.041

Luster, J. E., Ratz, D., & Wei, M. Y. (2022). Multimorbidity and social participation is moderated by purpose in life and life satisfaction. *Journal of Applied Gerontology*, *41*(2), 560–570. https://doi.org/10.1177/07334648211027691

Makizako, H., Shimada, H., Tsutsumimoto, K., Lee, S., Doi, T., Nakakubo, S., Hotta, R., & Suzuki, T. (2015). Social frailty in community-dwelling older adults as a risk factor for disability. *Journal of the American Medical Directors Association*, *16*(11), 1003.e7–1003.e11. https://doi.org/10.1016/j.jamda.2015.08.023

Naud, D., Généreux, M., Alauzet, A., Bruneau, J. F., Cohen, A., & Levasseur, M. (2021). Social participation and barriers to community activities among middle-aged and older Canadians: Differences and similarities according to gender and age. *Geriatrics and Gerontology International*, *21*(1), 77–84. https://doi.org/10.1111/ggi.14087

Naud, D., Généreux, M., Bruneau, J. F., Alauzet, A., & Levasseur, M. (2019). Social participation in older women and men: Differences in community activities and barriers according to region and population size in Canada. *BMC Public Health*, *19*(1), 1124. https://doi.org/10.1186/s12889-019-7462-1

Okamoto, H. (2008). The investigation of factors promoting/hindering social activities in older adults: An interview survey of older Korean adults with long-term care needs who are living alone in Japan. *Journal of Japanese Social Welfare*, *48*, 146–160.

Sinclair, A., Dunning, T., & Rodriguez-Mañas, L. (2015). Diabetes in older people: New insights and remaining challenges. *Lancet Diabetes & Endocrinology*, *3*(4), 275–285. https://doi.org/10.1016/S2213-8587(14)70176-7

Strobl, R., Maier, W., Ludyga, A., Mielck, A., & Grill, E. (2016). Relevance of community structures and neighbourhood characteristics for participation of older adults: A qualitative study. *Quality of Life Research*, *25*(1), 143–152. https://doi.org/10.1007/s11136-015-1049-9

Tomioka, K., Kurumatani, N., & Hosoi, H. (2017). Age and gender differences in the association between social participation and instrumental activities of daily living among community-dwelling elderly. *BMC Geriatrics*, *17*(1), 99. https://doi.org/10.1186/s12877-017-0491-7

Uehara, A., Kurotani, K., Kochi, T., Kuwahara, K., Eguchi, M., Imai, T., Nishihara, A., Tomita, K., Yamamoto, M., Kuroda, R., Nagata, T., Omoto, D., Murakami, T., Shimizu, C., Shimizu, M., Miyamoto, T., Nagahama, S., Nakagawa, T., Honda, T., . . . Dohi, S. (2014). Prevalence of diabetes and pre-diabetes among workers: Japan Epidemiology Collaboration on Occupational Health Study. *Diabetes Research and Clinical Practice*, *106*(1), 118–127.

van Brakel, W. H., Anderson, A. M., Mutatkar, R. K., Bakirtzief, Z., Nicholls, P. G., Raju, M. S., & Das-Pattanayak, R. K. (2006). The participation scale: Measuring a key concept in public health. *Disability and Rehabilitation*, *28*(4), 193–203. https://doi.org/10.1080/09638280500192785

Xie, B., & Ma, C. (2021). Effect of social participation on the development of physical frailty: Do type, frequency and diversity matter? *Maturitas*, *151*, 48–54. https://doi.org/10.1016/j.maturitas.2021.06.015

Yamada, M., & Arai, H. (2015). Predictive value of frailty scores for healthy life expectancy in community-dwelling older Japanese adults. *Journal of the American Medical Directors Association*, *16*(11), 1002.e7–1002.11. https://doi.org/10.1016/j.jamda.2015.08.001

Yamazaki, S., Fujita, K., & Imuta, H. (2021). Development of a scale measuring barriers to going out among community-dwelling older adults. *Geriatrics and Gerontology International*, *21*(2), 238–244.

Yokobayashi, K., Kawachi, I., Kondo, K., Kondo, N., Nagamine, Y., Tani, Y., Shirai, K., & Tazuma, S. (2017). Association between social relationship and glycemic control among older Japanese: JAGES cross-sectional study. *PLoS One*, *12*(1), e0169904. https://doi.org/10.1371/journal.pone.0169904