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Cross-cultural adaptation of the Chronic Illness Resources Survey in Japanese patients with diabetes

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Abstract

Aim: The Chronic Illness Resources Survey (CIRS) is a tool for assessing multiple levels of resources for self-management in people with chronic illnesses. This study aimed to examine the reliability and validity of the Japanese version of the CIRS (CIRS-J) among patients with diabetes.

Methods: This study included 102 Japanese patients with diabetes. Patients completed the CIRS-J on two occasions with additional measurements, including the multidimensional scale of perceived social support (MSPSS), the summary of diabetes self-care activities (SDSCA), and the perceived health competence scale (PHCS). The construct validity, internal consistency reliability, and test–retest reliability were evaluated.

Results: Factor analysis resulted in six factors. The Cronbach's α coefficient was 0.82, indicating a high internal consistency. The intraclass correlation coefficient was 0.87, indicating that the CIRS-J is stable over time. The CIRS-J showed a positive moderate association with MSPSS, SDSCA, and PHCS, with a correlation coefficient value ranging from .34 to .44.

Conclusion: This study showed preliminary support for the reliability and validity of the CIRS-J. The availability of this instrument will help identify the spectrum of resources available for Japanese people with diabetes in both research and practical settings.

KEYWORDS
chronic illness resources survey, diabetes, Japanese, reliability, validity

1 | INTRODUCTION

Diabetes is a chronic disease with serious health consequences. In line with a worldwide increase in the number of diabetes patients, the number of people with diabetes in Japan has increased to 20 million (Ministry of Health, Labor and Welfare [MHLW], 2016), creating a significant public health issue.

Diabetes requires life-long management. People with diabetes engage in considerable amounts of everyday self-management, such as following a meal plan and engaging in appropriate physical activity, to prevent complications due to poor metabolic control, as well as to maintain their quality of life. Therefore, it is important to identify factors that will promote self-management behaviors.

A number of studies have examined factors influencing self-management behaviors for people with diabetes. Previous research showed that individual factors, such as illness beliefs (Harvey & Lawson, 2009), self-efficacy (King et al., 2010; Sarkar, Fisher, & Schillinger, 2006), and coping style

(Toobert & Glasgow, 1991), influence self-management. Apart from individual factors, social aspects are also important for managing self-management. For example, support from family, friends, and healthcare providers can promote self-management behaviors (Rosland et al., 2008). Support from the community and information from media resources positively influence the physical activity levels of patients (Gleeson-Kreig, 2008). Further work has highlighted the positive relationship between social-community resources and diabetes self-management behaviors (Fortmann, Gallo, & Philis-Tsimikas, 2011; Shaw, Gallant, Riley-Jacome, & Spokane, 2006).

The Chronic Illness Resources Survey (CIRS), developed by Glasgow, Strycker, Toobert, and Eakin (2000), is a tool to measure multiple levels of resources for self-management in people with chronic illness. It contains a broad range of domains that are relevant to self-management, such as personal, family and friends, health care, neighborhood, organizational, media and policy, and work environmental resources. This is based on a social-ecological approach, whereby the individual, as well as higher levels, such as social, organizational and environmental, and policy, all influence people's behaviors (Glasgow et al., 2000).

The original English version has been translated into several languages, including Spanish (Eakin et al., 2007), Chinese (Lou, Yates, McCarthy, & Wang, 2013), and Thai (Manit, Tuicomepee, Jiamjarasrangsi, & Taneepanichskul, 2011). Since the CIRS can be generally adapted for people with chronic illness, diabetes research benefits from using the CIRS (Barrera, Strycker, Mackinnon, & Toobert, 2008; Fortmann et al., 2011; Soto et al., 2015; Zhong et al., 2016).

There are several social support instruments available in diabetes research, but these are more likely to assess interpersonal support, such as support from family or close relations. To date, there are few instruments that assess multiple levels of social and community resources. As described, the management of diabetes is influenced by the situation wherein patients exist, such that multiple factors influence self-management behaviors. Beyond interpersonal factors, social contextual factors also influence how patients manage self-care behaviors. The CIRS is extremely beneficial as it covers a broad range of supportive resources in a socio-ecological context. However, there are few valid and reliable instruments for Japanese settings. The CIRS can be used to identify and provide specific areas of resources to enhance self-management in clinical practice. Moreover, the CIRS can be used as an outcome for evaluating intervention, since it is sensitive to changes in responses to intervention (Glasgow et al., 2012; Glasgow, Toobert, Barrera, & Strycker, 2005).

To address this need, it is necessary to investigate the cross-cultural adaptation of the CIRS for assessing patients with diabetes in Japan. This study aims to examine the reliability and validity of the Japanese version of the CIRS (CIRS-J) in patients with diabetes.

2 | METHODS

2.1 | Participants and study design

Participants were recruited at two outpatient units in Japan between August 2015 and February 2016 with the assistance of physicians. The inclusion criteria were as follows: patients diagnosed with type 1 or type 2 diabetes, patients diagnosed before at least 1 year, and patients who were aged 30–74. The exclusion criteria were as follows: patients who needed assistance in daily activities on a daily basis, patients undergoing dialysis, and patients with serious mental disorders. Participants were asked to answer the self-administered questionnaire. In order to determine test–retest reliability, we asked patients to complete questionnaires twice. The first questionnaire included demographic and clinical characteristics, the CIRS-J, and other measurements. The second questionnaire included only the CIRS-J. Participants were asked to complete the second questionnaire 2 weeks after the first test. We recruited 102 and 94 patients for the first and second questionnaires, respectively (Figure 1).

Written informed consent was obtained from all individual participants included in the study. The study protocol was reviewed and approved by the institutional review board of the university and the institutions from which the patients were selected.

2.2 | Translation of CIRS in Japanese

We obtained permission from the original developer to translate the original English version to Japanese, following the procedure of forward translation, expert panel discussion, back-translation, and confirmation of conceptual equivalence, as recommended by the literature (Streiner, Norman, &

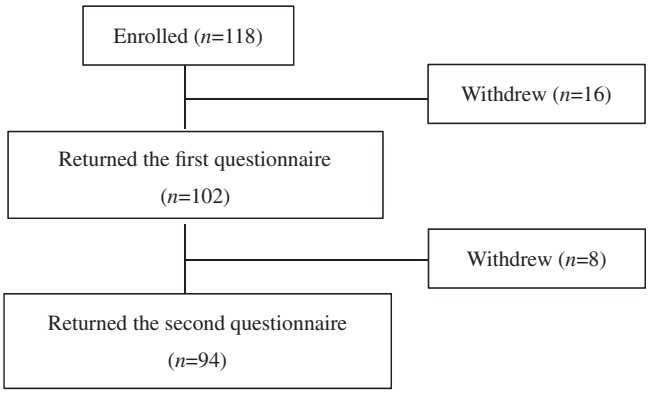

FIGURE 1 Flow diagram of participants and retention results

Cairney, 2015). The English version of the CIRS was first independently translated to Japanese by two native Japanese speakers: a researcher fluent in English and a professional translator. The two translations were compared and synthesized by the original translator along with three other bilingual experts: a researcher with experience in instrument development and two physicians specializing in diabetes. Back-translation was performed by a native professional translator familiar with terminology in this area, but who was not informed of the purpose. The back-translation was reviewed by the developer of the original version to achieve conceptual equivalence. Therefore, we used the back-translation version for the CIRS-J.

We added or rephrased some sentences in the original version with permission from the original developer. In question 2 ("Your doctor or other health care advisor listened carefully to what you had to say about your illness"), the sentence of "nurses, nutritionists and laboratory technicians" was added after "other health care advisor" in order to make the context clearer for a Japanese setting. In question 21 ("Your workplace had rules or policies that made it easier for you to manage your illness, such as no smoking rules or time off work to exercise"), we rephrased "time off work to exercise" to "leave to attend medical examinations," as "break times for exercise" is not common in Japan.

2.3 | Measurements

The CIRS-J uses a 22-item scale and is comprised of six domains, including personal (three items), family/friends (three items), healthcare team/physician (three items), neighborhood/community (four items), organizations (three items), and media/policy (three items). In addition, a work domain (three items) can be added to incorporate employment status. Responses were measured using a five-point Likert scale: not at all, a little, a moderate amount, quite a bit, and a great deal (scored 1 to 5). The total score was calculated by taking the mean score of all the items.

Social support was assessed by the multidimensional scale of perceived social support (MSPSS). It is a 12-item assessment tool designed to measure the perception of social support from three sources: family, friends, and a significant other (Zimet, Dahlem, Zimet, & Farley, 1988). This scale utilizes a seven-point Likert scoring method, with higher scores indicating that more support was received.

Self-management behaviors were assessed using the summary of diabetes self-care activities (SDSCA), with four items for diet and two items for exercise (Toobert, Hampson & Glasgow, 2000). Responses were measured using a scale to assess the frequency of adherence to each self-care activity in the preceding 7 days, ranging from 0 to 7. Diet and physical activity are important self-management behavioral outcomes for patients with diabetes.

Self-efficacy was assessed by the perceived health competence scale (PHCS) with eight items. This scale focuses on efficacy in managing general health-related outcomes and utilizes a five-point Likert scoring method, with higher scores indicating a greater sense of confidence in management (Smith, Wallston, & Smith, 1995).

The validity and reliability of the Japanese versions of the MSPSS, SDSCA, and PHCS have been confirmed (Daitoku et al., 2006; Iwasa et al., 2007; Togari, Yamazaki, Koide, & Miyata, 2006).

2.4 | Statistical analysis

Construct validity considers the relationship of one variable to other variables consistent with theoretically derived hypotheses (DeVellis, 2016). We examined construct validity in two ways. First, we assessed the extent to which CIRS-J items fit the structure of a hypothetical six-domain construct of the original version. Second, we examined the correlation of the CIRS-J with variables sharing a theoretical relationship. In the first approach, we used factor analysis (Goodwin, 1999). It is possible that cultural/social context may impact the factor structure; therefore, we initially performed an exploratory factor analysis (EFA), as recommended in the literature (DeVellis, 2016). For the EFA, we omitted three work domain items because only 44% ($n = 45$) of our sample was employed. We used a weighted least squares estimation with promax rotation. The Kaiser-Guttman criteria with an eigenvalue greater than one determined the number of factors. We considered factor loadings of 0.3 or above as relevant (Floyd & Widaman, 1995). Then we performed a confirmatory factor analysis (CFA) to evaluate the model obtained by the EFA results. The CFA was performed using a maximum likelihood method. The model fit was judged to be acceptable when the following fit indices were met: Chi-square/degrees of freedom (χ^2/df) < 3, root mean square error of approximation (RMSEA) < 0.08, and comparative fit index (CFI) > 0.90, based on the literature (Brown, 2015; Browne & Cudeck, 1993; Marsh & Hocevar, 1985). For the second approach, we employed a correlation analysis. We calculated Spearman correlation coefficients of CIRS-J with MSPSS, SDSCA, and PHCS, whereby MSPSS is a validated measurement of social support. Evidence shows that social support and resources are associated with diabetes self-management behaviors (Barrera et al., 2008; Gleeson-Kreig, 2008; Shaw et al., 2006). Moreover, supportive resources can be an important source of self-efficacy (Bandura, 2004; Duncan & McAuley, 1993). Therefore, there is theoretical reason that CIRS-J can be positively associated with MSPSS, SDSCA, and PHCS,

which have been employed in previous CIRS validation research (Eakin et al., 2007; Glasgow et al., 2000).

To assess reliability, we examined internal consistency using Cronbach's alpha (α) coefficient to obtain a total CIRS-J score and for each factor extracted through EFA. We also calculated Cronbach's α coefficient when an item was deleted to determine whether any item contributed poorly to CIRS-J. The Cronbach's α values that are considered acceptable is an unresolved issue due to published studies interpreting a range of possible acceptable or satisfactory values (Taber, 2018). Based on the literature (Cortina, 1993; Taber, 2018; Terwee et al., 2007), we interpreted a value of 0.70 or higher was acceptable for a total score of 21 items, but a value below 0.7 for each factor score using factor analysis may be possible. We calculated the intraclass correlation coefficient (ICC) between the first and second CIRS-J responses to assess the test–retest reliability. An ICC of 0.70 or higher indicated sufficient test–retest reliability (Terwee et al., 2007). All analyses, with the exception of the test–retest reliability, were based on participants returning the first questionnaire. Data analyses were performed using SPSS version 22.0 and Amos version 23.0 software packages.

3 | RESULTS

Table 1 shows the characteristics of the study participants. Among 102 participants, 38.2% of the participants were male. The mean age was 59.1 ± 10.7 years and 55.4% had an educational background beyond high school. Of the participants, 5.9% were controlled only by diet, and 44.1% of them were treated with insulin. The average HbA1c level was 7.1 ± 1.0%.

Table 2 shows the EFA results, which identified six factors similar to the original construct. The six factors together explained 67.4% of the item variance of the CIRS-J. Items 1–3, items 4–6, and items 7–9 were grouped together to define the healthcare team/physician factor, family/friends factor, and personal factor, respectively. Item 12 was combined with items 14, 15, and 16 to define media/policy factor; item 11 was combined with items 17, 18, and 19 as organizations factor; and items 10 and 13 were combined for neighborhood/community factor. Item 19 was associated with media/policy factor and organizations factor, but was assigned to organizations factor based on the item content. Figure 2 shows the results of the CFA. The model fit indices of the factor model obtained in EFA were as follows: χ^2/df = 1.3, RMSEA = 0.06, and CFI = 0.90.

Table 3 presents the Cronbach's α coefficient and the ICC of the total and each factor of the CIRS-J. The Cronbach's α coefficient for the total CIRS-J was 0.82 and the ICC of the CIRS-J total score was 0.87. The Cronbach's α coefficient for each factor ranged from 0.59 to 0.82, and the ICC for each factor ranged from 0.64 to 0.89. Cronbach's α values showed little change when either item was deleted (ranging from 0.81 to 0.83; not shown in tables).

Table 4 shows the associations between CIRS-J and MSPSS, SDSCA, and PHCS. The CIRS-J was significantly correlated with all variables with a correlation coefficient value of 0.34–0.44.

TABLE 1 Demographic and clinical characteristics and CIRS-J mean score (n = 102)

	N	%[a]
Age, years, mean ± SD	59.1 ± 10.7	
Gender		
Male	39	(38.2%)
Female	63	(61.8%)
Education level		
Completing high school or less	45	(44.6%)
Junior college/professional school	28	(27.7%)
University/graduate school	28	(27.7%)
Self-rated economic status		
Very good	9	(8.9%)
Good	57	(56.4%)
Bad	27	(26.7%)
Very bad	8	(7.9%)
Type of diabetes		
Type 1	21	(21.6%)
Type 2	76	(78.3%)
Diabetes treatment		
Only diet	6	(5.9%)
Oral antidiabetic	51	(50.0%)
Insulin	45	(44.1%)
HbA1c, mean ± SD	7.1 ± 1.0	
CIRS-J, mean ± SD	2.7 ± 0.5[b]	

Abbreviations: CIRS-J, Japanese version of the Chronic Illness Resources Survey.
[a]Missing values excluded.
[b]Possible range of 1 to 5.

4 | DISCUSSION

This is the first study to adapt the Japanese version of the CIRS for patients with diabetes in Japan. The results demonstrate preliminary support for the reliability and validity of the CIRS-J.

The Cronbach's α of the CIRS-J total score was 0.82, indicating a high internal consistency (Terwee et al., 2007). We retained all items since the Cronbach's α showed little

TABLE 2 Result of exploratory factor analysis of CIRS-J

	Healthcare team/ physician factor	Family/ friends factor	Media/ policy factor	Organizations factor	Personal factor	Neighborhood/community factor
Item 1	**0.71**					
Item 2	**0.95**					
Item 3	**0.71**					
Item 4		**0.70**				
Item 5		**0.69**				
Item 6		**0.89**				
Item 7					**0.66**	
Item 8					**0.97**	
Item 9			0.32		**0.43**	
Item 10						**0.77**
Item 11				**0.90**		
Item 12			**0.32**			
Item 13						**0.43**
Item 14			**0.76**			
Item 15			**0.53**			
Item 16			**0.59**			
Item 17			0.36	**0.47**		
Item 18				**0.62**		
Item 19			0.37	**0.35**		
% of variance; total 67.4%	25.7	12.1	8.9	7.6	7.2	5.9

Note: Items of work domain were excluded. Values 0.30 and lower were suppressed. Domains of the original version: items 1 to 3, health care team/physician; items 4 to 6, family/friends; items 7 to 9, personal; items 10 to 13, neighborhood/community; items 14 to 16, media/policy; items 17 to 19, organizations. Analysis was performed using the first responses.

Abbreviations: CIRS-J, Japanese version of the Chronic Illness Resources Survey.

change when any one item was removed from the calculation. However, the Cronbach's α coefficients for neighborhood/community factor, media/policy factor, and organizations factor were under 0.7. These values are still comparable to the previous CIRS validation research (Eakin et al., 2007; Glasgow et al., 2000). For test–retest reliability, the ICC for the CIRS-J total score showed satisfactory levels, demonstrating that the CIRS-J is stable over time.

The EFA results showed that CIRS-J consists of six factors and accounts for 67.4% of the total variance. Based on the EFA results, we performed CFA, and obtained the following indices of model fit: $\chi^2/df = 1.3$, RMSEA = 0.06, and CFI = 0.90. They indicated there was relative good fit. Our examination of factor analysis using EFA and CFA provided evidence of construct validity of the CIRS-J. The multidimensional six-factor structure of the CIRS-J corresponded to the original version. Except for two items (item 11 and item 12), all items combined together corresponded to the domain of the original version. It indicated that the factor structure is likely to be stable across cultures.

Items 11 and 12 originally belonged to the neighborhood/community domain. However, item 11 (walk or perform other exercise activities with neighbors) also belonged to the organization factor with a high factor loading value. This may be because such activities are more likely supported by community organization. The national government has proposed a national health promotion policy called "Healthy Japan 21", and each local government has established a regional plan to promote the health of people in local communities (MHLW, 2012). One of the basic goals is to improve physical activity and exercise. To meet this goal, local government organizations have proceeded with community programs (Wakabayashi et al., 2007), which may explain why item 11 was more likely characterized as a resource provided by government organizations than neighborhood relationships. Item 12 (eat at a restaurant that offered a variety of tasty, low-fat food choices) also belonged to the media/policy factor. Neighborhood food availability, including accessibility to restaurants, is an important community resource. Indeed,

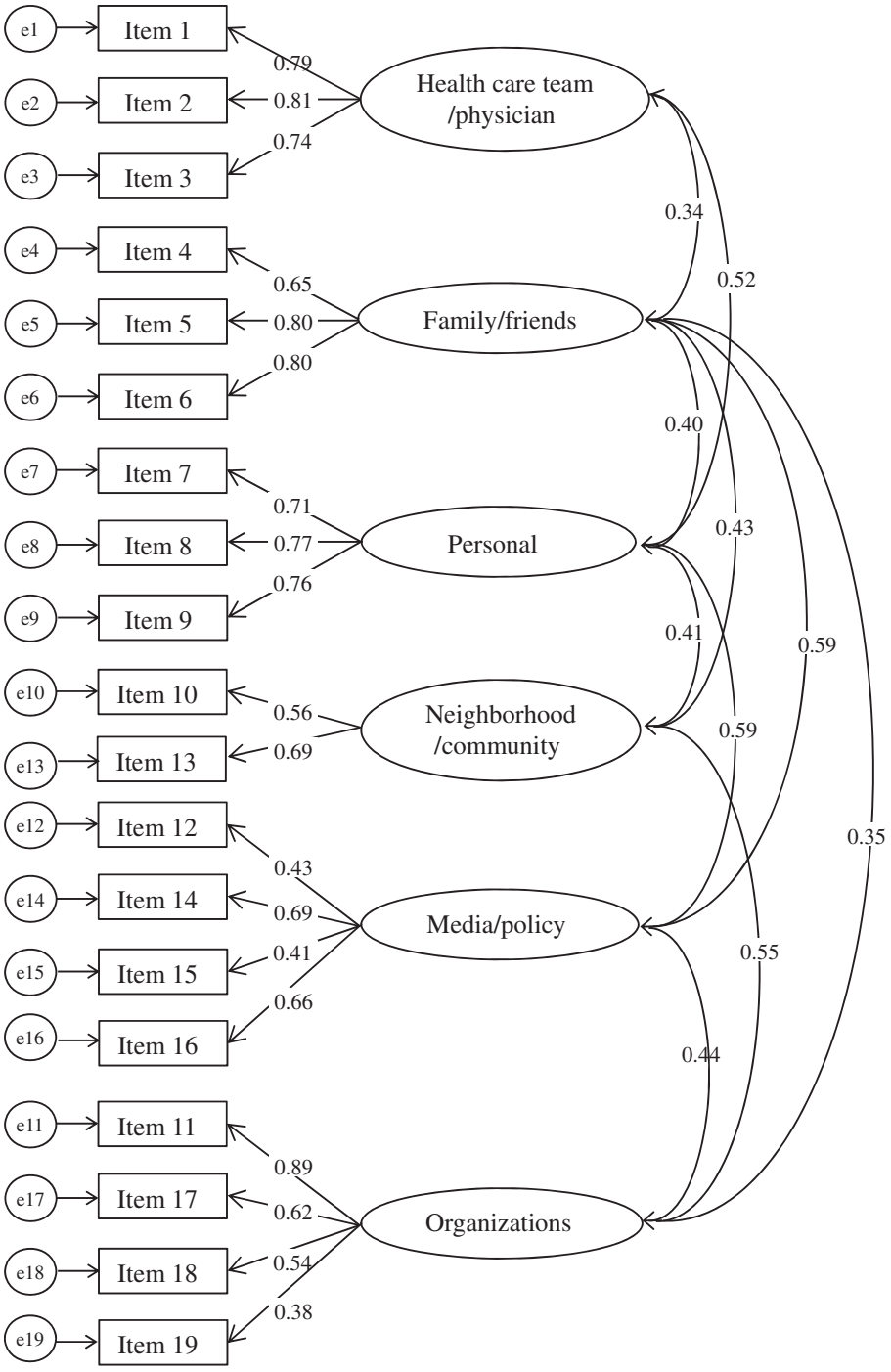

FIGURE 2 Result of the confirmatory factor analysis of CIRS-J. †Path coefficients which were significant are presented. ‡Chi-square/degrees of freedom (χ^2/df) = 1.3; root mean square error of approximation (RMSEA) = 0.06; comparative fit index(CFI) = 0.90. § CIRS-J, Japanese version of the Chronic Illness Resources Survey

evidence shows that differences in accessing food among neighborhoods are related to obesity (Larson, Story, & Nelson, 2009). Therefore, item 12 can be characterized as a resource within neighborhoods or communities. On the other hand, previous literature indicates that environments with access to food have four features, with informational environment, such as media and advertising, among them (Glanz, Sallis, Saelens, & Frank, 2005). This is a possible explanation why item 12 shared ideas with media/policy factors.

We evaluated convergent validity by examining the correlation of CIRS-J with MSPSS, SDSCA, and PHCS. The CIRS-J was significantly correlated with all variables with a correlation coefficient value of 0.34–0.44, indicating that there were moderate correlations among variables. It is hypothesized that CIRS-J can be positively associated with these measurements. The results provided evidence of convergent validity for the CIRS-J.

The main strength of this study is that it is the first study to adapt the CIRS to a Japanese setting. The results

TABLE 3 Cronbach's α and intraclass correlation coefficient (ICC) of CIRS-J

	Cronbach's α	ICC
Total score	0.82	0.87
Healthcare team/physician factor	0.82	0.73
Family/friends factor	0.80	0.85
Personal factor	0.78	0.64
Neighborhood/community factor	0.61	0.86
Media/policy factor	0.62	0.83
Organizations factor	0.59	0.89
Work ($n = 45$)	0.75	0.73

Abbreviations: CIRS-J, Japanese version of the Chronic Illness Resources Survey.
Cronbach's α was calculated using the first responses.
ICC was calculated between the first and the second responses.

TABLE 4 Associations of the CIRS-J total score with MSPSS, SDSCA and PHCS

	Correlation coefficients	*P*
MSPSS	0.44	<.001
SDSCA diet	0.34	.001
SDSCA exercise	0.36	<.001
PHCS	0.37	<.001

Note: Analysis was performed with the first responses.
Abbreviations: CIRS-J, Japanese version of the Chronic Illness Resources Survey; MSPSS, multidimensional scale of perceived social support; PHCS, perceived health competence scale; SDSCA, summary of diabetes self-care activities.

demonstrated evidence supporting a high internal consistency and test–retest reliability. There were also positive moderate associations of CIRS-J with SDSCA, PHCS, and MSPSS, and we confirmed a six-factor structural model with accepted model fit indices. However, the results should be interpreted with the following caveats. This study took place in facilities in urban regions in Japan, which did not guarantee a representative sample of individuals with diabetes in Japan. Moreover, participants had relatively good metabolic status as indicated by HbA1c levels. Further studies should include a more diverse pool of participants.

5 | CONCLUSION

This study is the first to adapt the CIRS in a Japanese setting and found preliminary support for the reliability and validity of the CIRS-J. This study will be the first step toward how to assess multiple levels of supportive resources in Japanese people with diabetes. The availability of this instrument will assist in identifying effective approaches that promote diabetes self-management in research and clinical settings.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

Study design: M.S., H.M., A.N. and N.S.; data collection and analysis: M.S., H.M., A.N., Y.O. and H.K.; manuscript writing: M.S.

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