ORIGINAL ARTICLE

Novel psychosocial factor involved in diabetes self-care in the Japanese cultural context

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ABSTRACT

Aims/Introduction: Recent evidence shows that cultural context can influence the management of diabetes mellitus. The aim of the present study was to examine the relationship between interdependence, which is valued in the Eastern cultural context, and diabetes self-care behavior in Japanese patients with type 2 diabetes mellitus.

Material and Methods: We carried out a cross-sectional survey of 161 Japanese adults with type 2 diabetes mellitus using well-established questionnaires. The association of an interdependent tendency with diabetes self-care activities was analyzed using multiple regression analysis.

Results: Diabetes self-care activities had a negative correlation with interdependent tendency ($r = -0.16$, $P = 0.047$), and they had positive correlations with age ($r = 0.42$, $P < 0.001$), emotional support ($r = 0.25$, $P = 0.001$) and diabetes self-care support ($r = 0.36$, $P < 0.001$). When patients were divided into two groups at the median age (68 years), multiple regressions showed that interdependent tendency ($\beta = -0.20$, $P = 0.048$), male sex ($\beta = -0.24$, $P = 0.023$), emotional support ($\beta = 0.22$, $P = 0.028$) and diabetes self-care support ($\beta = 0.39$, $P < 0.001$) were significant determinants of diabetes self-care activities only in the younger group.

Conclusions: Interdependence might influence diabetes self-care behavior, and intervention focusing on support from close others might lead patients to more successful care among Japanese adults with type 2 diabetes mellitus, especially those aged <68 years.

INTRODUCTION

In order to optimize health outcomes and quality of life of patients with diabetes mellitus, care providers should be aware of psychosocial factors, including complex environmental, social, behavioral and emotional factors[1]. Individual patient preferences, needs and values interact with contextual factors, such as culture, values, family, and social and community environment[2,3]. An approach that is respectful of and responsive to a patient's social and cultural context is helpful in leading patients to more successful diabetes self-care[1].

In Eastern cultures, people tend to value interdependence of the self with others, social harmony and connection with others[4,5], and emotional support from close others enhances people's sense of well being[6]. These are explained as the results of Eastern interdependent social orientation, and its influence on peoples' holistic cognition compared with Western

independent social orientation and analytic cognition[7]. We previously showed that the higher the interdependent tendency of Japanese patients, the more diabetes-related distress they perceived (possibly because those with higher interdependence feel that they are a burden for other people because of their health conditions), and that the perception of emotional support from close others relieved that distress[8]. The perceived emotional support from close others was found to be a significant predictor of diabetes self-care activity for Japanese female patients, whereas for USA patients it was not[9]. These findings are in accord with other reports from Asian countries[10–14]. Thus, an individual's value on interdependence with others among Japanese patients might increase psychological barriers due to concerns about potential friction, and might adversely affect their choices of diabetes self-care. However, no studies have focused on the clinical significance of an individual's value on interdependence as a restricting factor for diabetes self-care. In the current study, we examined the relationship between

interdependence and diabetes self-care behavior in Japanese patients with type 2 diabetes mellitus.

METHODS

Study Participants

Study participants were recruited from outpatients of Kyoto University Hospital in Kyoto, Japan, during June through July 2016. The eligibility criteria were age ≥20 years and having type 2 diabetes mellitus for >1 year. The protocol was approved by the Kyoto University Graduate School and Faculty of Medicine ethics committee. The study was carried out at Kyoto University Hospital according to the principles of the Declaration of Helsinki. All participants gave written informed consent.

Data Collection

The participants responded to questionnaires measuring diabetes self-care activities, perceived diabetes self-care support, perceived emotional support and interdependent tendency. Data regarding years from diagnosis, treatments and diabetes complications (neuropathy, stroke, cardiac infarct and foot ulcer) were also obtained from a self-report checklist. Retinopathy and nephropathy among diabetes complications, recent glycemic control (glycated hemoglobin [HbA1c]), age and sex were obtained from medical records.

Measurements

Diabetes Self-Care Activities

Diabetes self-care activities were evaluated using the Summary of Diabetes Self-Care Activities Measure (SDSCA)[15]. Participants answered six questions about diet and exercise, and how many days of the past week they followed their plans. The score was the average of six questions.

Interdependent Tendency

Interdependent tendency was measured using the independent and interdependent self-construal scale[16]. Participants rated their agreement with each item on a scale of 1 (does not describe me at all) to 5 (describes me very much) for 10 questions regarding independence (e.g., "I am not concerned if my ideas or behavior are different from those of other people."), and 10 questions regarding interdependence (e.g., "I often have the feeling that my relationships with others are more important than my own accomplishment."). The score was calculated as the average of interdependent score minus the average of independent score.

Perceived Emotional Support

Perceived emotional support was measured by a self-reported questionnaire consisting of 16 items about perception of receiving sympathy, encouragement and other forms of emotional support from close others[6] (e.g., "He/she cheers you up when you are depressed." 'He/She will almost always listen to your story with interest."). Participants were asked to think about close others, and to rate each item from 1 (definitely no) to 5 (definitely yes). The score was the average of 16 questions.

Perceived Diabetes Self-Care Support

Perceived diabetes self-care support was measured by nine questions (Table 1). Participants were asked to think about a person who was close to them, such as a family member or a friend, and to rate the degree that the person was likely to offer diabetes self-care support for diet, exercise and taking medicine (e.g., "He/she will prepare meals that are good for patients with diabetes mellitus.", "He/she will think about my diabetes self-care with me."). Participants chose an answer from 1 (definitely no) to 5 (definitely yes). The score was the average of nine questions.

Statistical Analysis

The correlations among HbA1c, SDSCA, interdependent tendency, emotional support, diabetes self-care support and age were assessed by Pearson's correlation coefficient. To identify predictors of SDSCA, multiple regression analyses with interdependent tendency, age, sex and either emotional support or diabetes self-care support as simultaneous independent variables were carried out in two groups divided at the median age (68 years), and in each sex in the younger group. All analyses were carried out with JMP version 13 (SAS Institute, Cary, NC,

Table 1 | Questionnaire about diabetes self-care support

	Questions
1	He/she will prepare meals that are good for diabetes patients
2	He/she will eat meals together with me that are good for diabetes patients
3	He/she will take exercise together with me or encourage me to take exercise
4	He/she will remind or help me not to forget to take medicine or insulin
5	He/she will give me advice and information on treatment of diabetes
6	When I am in trouble with or anxious about diabetes, he/she will accept my consultation
7	He/she will care about my condition; for example, hypoglycemia
8	When I am sick, he/she attends to my diabetes self-care instead of me
9	He/she will think about my diabetes self-care with me

The participants were asked, "In the following questions, you will be asked what kinds of support and help you usually receive from people around you. First, imagine a person who is close to you, such as your parents, siblings, friends, significant others or teachers. Then read each of the following statements and judge the extent to which those people are likely to offer the type of support or help described in the statement. Please circle the most appropriate number from the scale." The scale was scored as follows: 1, "Definitely no"; 2, "Probably no"; 3, "Uncertain"; 4, "Probably yes"; and 5, "Definitely yes."

USA). Two-tailed $P < 0.05$ was considered statistically significant.

RESULTS

A total of 189 participants were enrolled in the present study. Participants with missing data in HbA1c ($n = 5$) or questionnaires ($n = 23$) were excluded, and 161 participants were included in the analyses (Table 2). The attending physicians of these 161 participants were 31 different doctors.

In Pearson's correlation analysis, HbA1c showed significant negative correlations with SDSCA ($r = –0.17$, $P = 0.032$), emotional support ($r = –0.19$, $P = 0.014$), diabetes self-care support ($r = –0.25$, $P = 0.002$) and age ($r = –0.19$, $P = 0.014$; Table 3). SDSCA had a significant negative correlation with interdependent tendency ($r = –0.16$, $P = 0.047$), and also had significant positive correlations with emotional support ($r = 0.25$, $P = 0.001$), diabetes self-care support ($r = 0.36$, $P < 0.001$) and age ($r = 0.42$, $P < 0.001$). Emotional support and diabetes self-care support showed a strong positive correlation ($r = 0.66$, $P < 0.001$).

Based on the result that age showed a moderate correlation with SDSCA, we divided participants into two groups at the median age (68 years; Table 2). Compared with the younger group, the older group had a higher number of cardiac infarcts and foot ulcers, and higher SDSCA score (Table 2).

In multiple regression analysis, interdependent tendency ($\beta = –0.20$, $P = 0.048$) and male sex ($\beta = –0.24$, $P = 0.023$) were significant negative predictors of SDSCA in the younger group (Table 4). Emotional support ($\beta = 0.22$, $P = 0.028$) and age ($\beta = 0.27$, $P = 0.009$) were significant positive predictors of SDSCA in the younger group. In contrast, in the older group, no significant predictors were observed. These results did not change when we compared diabetes self-care support in place of emotional support. Interdependent tendency ($\beta = –0.24$, $P = 0.013$; Table 5) and male sex ($\beta = –0.19$, $P = 0.045$) were significant negative predictors of SDSCA only in the younger group, together with significant positive predictors, diabetes self-care support ($\beta = 0.39$, $P < 0.001$) and age ($\beta = 0.27$, $P = 0.005$).

In the younger group, emotional support ($\beta = 0.35$, $P = 0.007$) and age ($\beta = 0.31$, $P = 0.017$) were significant positive predictors of SDSCA in men (Table 6). In contrast, for women in the younger group, interdependent tendency ($\beta = –0.44$, $P = 0.012$) was a significant negative predictor of SDSCA. These results did not change when we compared diabetes self-care support in place of emotional support. Diabetes self-care support ($\beta = 0.52$, $P < 0.001$; Table 7) and age ($\beta = 0.31$,

Table 2 | Characteristics of participants

	All	Younger (aged <68 years)	Older (≥68 years)
n	161	88	73
Female	57 (35.4%)	35 (39.8%)	22 (30.1%)
Age (years)	65.1 ± 12.2 (22–88)	57.3 ± 10.8 (22–67)	74.4 ± 5.3 (68–88)
BMI (kg/m³)	24.5 ± 4.0 (14.8–38.7)	25.3 ± 4.2 (17.5–38.7)	23.6 ± 3.6 (14.8–34.8)
	$n = 157$	$n = 86$	$n = 71$
HbA1c (%)	7.5 ± 1.2 (5.5–12.0)	7.6 ± 1.3 (5.5–12.0)	7.3 ± 0.9 (5.5–9.7)
Duration of diabetes (years)	15.3 ± 10.1 (1–50),	14.0 ± 9.6 (1–35),	15.7 ± 11.0 (1–50),
	$n = 126$	$n = 68$	$n = 58$
Treatment (%)			
Diet alone	16 (9.9)	7 (8.0)	9 (12.3)
OHA alone	72 (44.7)	40 (45.5)	32 (43.8)
Injection alone	30 (18.6)	17 (19.3)	13 (17.8)
Injection and OHA	43 (26.7)	24 (27.3)	19 (26.0)
Diabetes complication (%)			
Retinopathy	46 (34.8), $n = 132$	29 (37.2), $n = 78$	17 (31.5), $n = 54$
Nephropathy	30 (19.2), $n = 156$	19 (21.8), $n = 87$	11 (15.9), $n = 69$
Neuropathy	22 (13.7)	13 (14.8)	9 (12.3)
Stroke	5 (3.1)	1 (0.6)	4 (5.5)
Cardiac infarct	13 (8.1)	3 (1.9)	10 (13.7)
Foot ulcer	8 (5.0)	0	8 (11.0)
SDSCA	4.0 ± 1.4	3.6 ± 1.3	4.6 ± 1.2
Interdependent tendency	–0.07 ± 0.9	–0.04 ± 0.9	–0.11 ± 0.8
Emotional support	3.7 ± 0.7	3.6 ± 0.8	3.8 ± 0.6
Diabetes self-care support	3.5 ± 0.9	3.3 ± 0.9	3.7 ± 0.7

Continuous variables are described as the mean ± standard deviation (range), and categorical variables are expressed as numbers (%). BMI, body mass index; OHA, oral hypoglycemic agent; SD, standard deviation; SDSCA, Summary of Diabetes Self-Care Activities Measure.

Table 3 | Correlations between glycated hemoglobin, diabetes self-care activity and perceived support

	HbA1c	SDSCA	Interdependent tendency	Emotional support	Diabetes self-care support
SDSCA	−0.17*				
Interdependent tendency	−0.02	−0.16*			
Emotional support	−0.19*	0.25[†]	−0.06		
Diabetes self-care support	−0.25[†]	0.36[‡]	−0.04	0.66[‡]	
Age	−0.19*	0.42[‡]	−0.14	0.18*	0.18*

Pearson's coefficients: *$P < 0.05$, [†]$P < 0.01$, [‡]$P < 0.001$. HbA1c, glycated hemoglobin; SDSCA, Summary of Diabetes Self-Care Activities Measure.

Table 4 | Multiple regression analysis for Summary of Diabetes Self-Care Activities Measure with emotional support as one of the independent variables

Predictors	Younger (aged <68 years, $n = 88$)			Older (aged ≥68 years, $n = 73$)		
	Standardized coefficient	P	Adjusted R^2	Standardized coefficient	P	Adjusted R^2
			0.19			−0.04
Interdependent tendency	−0.20	0.048		−0.04	0.779	
Emotional support	0.22	0.028		0.06	0.626	
Age	0.27	0.009		0.12	0.339	
Sex	−0.24	0.023		0.01	0.939	

Sex, male = 1, female = 0.

Table 5 | Multiple regression analysis for Summary of Diabetes Self-Care Activities Measure with diabetes self-care support as one of the independent variables

Predictors	Younger (aged <68 years, $n = 88$)			Older (aged ≥68 years, $n = 73$)		
	Standardized coefficient	P	Adjusted R^2	Standardized coefficient	P	Adjusted R^2
			0.30			−0.03
Interdependent tendency	−0.24	0.013		−0.03	0.826	
Diabetes self-care support	0.39	<0.001		0.08	0.555	
Age	0.27	0.005		0.12	0.331	
Sex	−0.19	0.045		−0.02	0.898	

Sex, male = 1, female = 0.

Table 6 | Multiple regression analysis for Summary of Diabetes Self-Care Activities Measure with emotional support as one of the independent variables in each sex in the younger group

Predictors	Male ($n = 53$)			Female ($n = 35$)		
	Standardized coefficient	P	Adjusted R^2	Standardized coefficient	P	Adjusted R^2
			0.19			0.23
Interdependent tendency	−0.11	0.387		−0.44	0.012	
Emotional support	0.35	0.007		−0.04	0.780	
Age	0.31	0.017		0.20	0.226	

SDSCA, Summary of Diabetes Self-Care Activities Measure.

$P = 0.007$) were significant positive predictors of SDSCA in men, and interdependent tendency ($\beta = −0.40$, $P = 0.019$) was a significant negative predictor of SDSCA in women.

DISCUSSION
In the present study, interdependent tendency in Japanese patients with type 2 diabetes mellitus showed a negative impact

Table 7 | Multiple regression analysis for Summary of Diabetes Self-Care Activities Measure with diabetes self-care support as one of the independent variables in each sex in the younger group

Predictors	Male ($n = 53$)			Female ($n = 35$)		
	Standardized coefficient	P	Adjusted R^2	Standardized coefficient	P	Adjusted R^2
			0.38			0.20
Interdependent tendency	−0.20	0.076		−0.40	0.019	
Diabetes self-care support	0.52	<0.001		0.11	0.489	
Age	0.31	0.007		0.20	0.218	

SDSCA, Summary of Diabetes Self-Care Activities Measure.

on diabetes self-care activities, especially in patients aged <68 years. This is the first report to show involvement of a particular Eastern cultural-psychological factor in diabetes self-care behavior. One qualitative study carried out in the USA showed that diabetes symptoms challenged family harmony among Chinese Americans[17]. Chinese American patients were seldom supposed to make disease management decisions independent of their concerns for family well being and their role in the family[17]. Individuals in Eastern cultural contexts are unintentionally motivated to fit in and adjust themselves to the expectations and needs of others[6,18]. Therefore, the tendency of interdependence among patients in Eastern cultures is an important and notable cultural factor to be recognized in the context of diabetes care.

In the current study, age had positive correlations with SDSCA, diabetes support and emotional support, and it was an independent positive predictor of SDSCA in the younger group. The positive relationship between age and diabetes self-care was previously reported[11]. The authors speculated that it was due to younger patient's engagement in their careers and social interactions, and a consequent lack of energy and time to spend on the management of diabetes mellitus[11,19]. To our surprise, we found that diabetes self-care activities in younger patients were impacted significantly by their perceived expectations and needs of others. Younger patients are more vulnerable to interdependent tendency in achieving diabetes self-care. Given that older patients showed a higher SDSCA score, and that age and interdependent tendency were not significant determinants of SDSCA in the older group, older patients are supposed to be resilient to interdependent tendency in achieving diabetes self-care. The older patients might have achieved a suitable fit between their interdependent tendency and diabetes self-care activities they incorporate.

In the younger group, interdependent tendency was a negative predictor of SDSCA in women, and support was a positive predictor of SDSCA in men. One explanation for these results might be a higher tendency of empathy or sympathy in women, and another might be a traditional woman's role as a wife and caregiver preparing family meals[20–22]. Men tend to rely on their wives for support, whereas women tend to rely on female family members and friends[22]. Thus,

successful self-care in men with type 2 diabetes mellitus might depend on the support they receive, whereas that in women with type 2 diabetes mellitus on their interdependent tendency.

Emotional support measured in the present study was general sympathy and not specific to diabetes mellitus. Diabetes self-care support measured in this study focused on action to support diabetes self-care. The emotional support and the diabetes self-care support showed a relatively strong correlation with each other. Because of this correlation, these two factors were included in multiple regression analysis separately, and showed a significant positive association with better diabetes self-care activities in younger patients. These results showed that the understanding and action of people who are close are considerably effective. This result is in accordance with previous reports, which showed that a family-based educational intervention is effective to improve diabetes self-care activities and glycemic control in Asian patients with type 2 diabetes mellitus[23,24]. Another possible approach is peer support intervention. The positive effects of peer coaches on HbA1c have been reported for patients with diabetes mellitus, especially those of Hispanic ethnicity[25]. A cultural emphasis on interdependence is also known to be a characteristic of Hispanic cultures[26]. Further examinations are required to investigate the effectiveness of peer support intervention in Japanese patients with diabetes mellitus.

The present study shows that the impact of interdependent tendency on diabetes self-care activities in a Japanese cultural context is noteworthy and should be recognized. It might not be easy to change the interdependent tendency, but support to reduce possible friction derived from diabetes self-care activities among those with interdependent tendencies can be effective. Interventions focusing on emotional and diabetes self-care support from family or friends are promising ways to lead to more successful care in Japanese patients with type 2 diabetes mellitus, especially those aged <68 years.

DISCLOSURE

The authors declare no conflict of interest.

REFERENCES

1. Young-Hyman D, de Groot M, Hill-Briggs F, et al. Psychosocial care for people with diabetes: a position statement of the American Diabetes Association. *Diabetes Care* 2016; 39: 2126–2140.

2. Marrero DG, Ard J, Delamater AM, et al. Twenty-first century behavioral medicine: a context for empowering clinicians and patients with diabetes: a consensus report. *Diabetes Care* 2013; 36: 463–470.

3. Powers MA, Bardsley J, Cypress M, et al. Diabetes self-management education and support in type 2 diabetes: a joint position statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics. *J Acad Nutr Diet* 2015; 115: 1323–1334.

4. Cristina-Corina B. Independent-interdependent self-construal's and values' appreciation in competitive and cooperative conditions. *Procedia Soc Behav Sci* 2012; 47: 1632–1637.

5. Uchida Y, Kitayama S. Happiness and unhappiness in east and west: themes and variations. *Emotion* 2009; 9: 441–456.

6. Uchida Y, Kitayama S, Mesquita B, et al. Is perceived emotional support beneficial? Well-being and health in independent and interdependent cultures. *Pers Soc Psychol Bull* 2008; 34: 741–754.

7. Varnum M, Grossmann I, Kitayama S, et al. The origin of cultural differences in cognition: the social orientation hypothesis. *Curr Dir Psychol Sci* 2010; 19: 9–13.

8. Ikeda K, Fujimoto S, Morling B, et al. Social orientation and diabetes-related distress in Japanese and American patients with type 2 diabetes. *PLoS One* 2014; 9: e109323.

9. Ikeda K, Fujimoto S, Morling B, et al. Cross-cultural comparison of predictors for self-care behaviors in patients with type 2 diabetes. *J Diabetes Investig* 2018; 9: 1212–1215.

10. Stopford R, Winkley K, Ismail K. Social support and glycemic control in type 2 diabetes: a systematic review of observational studies. *Patient Educ Couns* 2013; 93: 549–558.

11. Huang M, Zhao R, Li S, et al. Self-management behavior in patients with type 2 diabetes: a cross-sectional survey in western urban China. *PLoS One* 2014; 9: e95138.

12. Gao J, Wang J, Zhu Y, et al. Validation of an information-motivation-behavioral skills model of self-care among

Chinese adults with type 2 diabetes. *BMC Public Health* 2013; 13: 100.

13. Song Y, Nam S, Park S, et al. The impact of social support on self-care of patients with diabetes: what is the effect of diabetes type? Systematic review and meta-analysis. *Diabetes Educ* 2017; 43: 396–412.

14. Xu Y, Toobert D, Savage C, et al. Factors influencing diabetes self-management in Chinese people with type 2 diabetes. *Res Nurs Health* 2008; 31: 613–625.

15. Toobert DJ, Hampson SE, Glasgow RE. The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. *Diabetes Care* 2000; 23: 943–950.

16. Singelis TM. The measurement of independent and interdependent self-construals. *Pers Soc Psychol Bull* 1994; 20: 580–591.

17. Chesla CA, Chun KM, Kwan CM. Cultural and family challenges to managing type 2 diabetes in immigrant Chinese Americans. *Diabetes Care* 2009; 32: 1812–1816.

18. Morling B, Kitayama S, Miyamoto Y. Cultural practices emphasize influence in the United states and adjustment in Japan. *Pers Soc Psychol Bull* 2002; 28: 311–323.

19. Weijman I, Ros WJ, Rutten GE, et al. The role of work-related and personal factors in diabetes self-management. *Patient Educ Couns* 2005; 59: 87–96.

20. Nam S, Song HJ, Park SY, et al. Challenges of diabetes management in immigrant Korean Americans. *Diabetes Educ* 2013; 39: 213–221.

21. Song M, Lee M, Shim B. Barriers to and facilitators of self-management adherence in Korean older adults with type 2 diabetes. *Int J Older People Nurs* 2010; 5: 211–218.

22. Chesla CA, Kwan CM, Chun KM, et al. Gender differences in factors related to diabetes management in Chinese American immigrants. *West J Nurs Res* 2014; 36: 1074–1090.

23. Choi SE. Diet-specific family support and glucose control among Korean immigrants with type 2 diabetes. *Diabetes Educ* 2009; 35: 978–985.

24. Cai C, Hu J. Effectiveness of a family-based diabetes self-management educational intervention for Chinese adults with type 2 Diabetes in Wuhan. *China. Diabetes Educ* 2016; 42: 697–711.

25. Patil SJ, Ruppar T, Koopman RJ, et al. Peer support interventions for adults with diabetes: a meta-analysis of hemoglobin A1c outcomes. *Ann Fam Med* 2016; 14: 540–551.

26. Kitayama SDS, Uchida YK. Self as cultural mode of being. In: Kitayama S, Cohen D (eds). The Handbook of Cultural Psychology. New York, NY: Guilford, 2006; 136–176.