

Development of an evaluation scale for self-management behavior related to physical activity by type 2 diabetes mellitus patients

Yuri Nakawatase, BS, RN¹ Chiemi Taru, MS, RN¹ Akimitsu Tsutou, MD, PhD²
Hideyuki Shiotani, MD, PhD² Yoshiaki Kido, MD, PhD³ Takeshi Ohara, MD, PhD⁴
Wataru Ogawa, MD, PhD³ Ikuko Miyawaki, PhD, RN²

¹Kobe University, Division of Health Sciences

²Kobe University, Faculty of Health Sciences

³ Kobe University, Internal Medicine, Metabolism, and Endocrinology

⁴Hyogo Prefectural Kakogawa Hospital, Internal Medicine

Running title:

Self-management of physical activity

Corresponding author:

Yuri Nakawatase

Address: 7-10-2 Tomogaoka, Suma-ku, Kobe 654-0142, Japan

E-mail: yuri.nakawatase@gmail.com

Received for publication 8 April 2007 and accepted in revised form 16 July 2007.

Abstract

Objective

This study aimed to assess the reliability and validity of an evaluation scale for self-management behavior related to physical activity by type 2 diabetes mellitus patients (ES-SMBPA-2D).

Research Design and Methods

Outpatients with type 2 diabetes ($n = 146$) completed a self-administered questionnaire supported by a semi-structured interview based on literature review. The content, factor, and concurrent validity and internal consistency and reproducibility of the scale were analyzed. Pearson's correlation coefficients for the ES-SMBPA-2D and International Physical Activity Questionnaire (IPAQ) subscale scores were calculated to evaluate the concurrent validity.

Results

The ES-SMBPA-2D was divided into two parts, the first dealing with self-management behavior to enhance physical activity in daily life and the second with behavior to maintain the level of physical activity. Factor analysis showed that the first part comprised four factors and the second five. The ES-SMBPA-2D correlated with the IPAQ subscales. Cronbach's α coefficient was between 0.56 and 0.90 and the intraclass test-retest correlation coefficient of the subscales was between 0.60 and 0.88.

Conclusions

The ES-SMBPA-2D is reasonably reliable and valid and is expected to prove useful for the assessment of patients' self-management behavior and for individualized instruction.

Introduction

Regular physical activity is recommended for type 2 diabetic patients, since this is commonly known to improve metabolic disorders and prevent complications such as cardiovascular disease (1). Even moderately intense physical activity through daily activities is beneficial for management of this condition (2, 3). However, many patients fail to achieve the recommended level of physical activity (4) due to barriers such as the commonly given reason of “perceived difficulty in exercising” (5). Self-management education aims to enable patients to acquire knowledge and skills to improve their diabetic state, identify barriers that hinder improvement, and attain problem-solving and coping skills to achieve effective self-care behavior (6). Thus, medical personnel need to provide patients with strategies to enhance and maintain the required level of physical activity.

Self-management education also involves individualized instruction, based on assessment of patients’ psychosocial factors and self-management skills and behaviors (7), of strategies to enhance and maintain the required level of physical activity. Most scales designed for this purpose evaluate environmental and psychosocial factors (8–11), the frequency of diabetic self-care behaviors (12), and perceived adherence to patients’ self-care recommendations (13). No tools exist, however, to evaluate self-management behavior related to patients’ physical activity.

This study therefore aimed to develop an evaluation scale for self-management behavior related to physical activity by type 2 diabetes mellitus patients (ES-SMBPA-2D).

Research Design and Methods

The Ethics Committee of Kobe University approved the protocol of this study, which was conducted from February to June 2006. Patients were selected from the outpatient clinic of Kobe University Hospital’s Department of Internal Medicine with these selection criteria: type 2 diabetes, performance of any kind of required physical activity, completion of the self-administered instrument and having received the same clinical diabetes treatment for at least 6 months. After written consent had been obtained, detailed information about the clinical course was collected from hospital records. To evaluate the reproducibility of the scale, one month later the instrument was again administered to the same 59 subjects.

Measures

The ES-SMBPA-2D is based on the “Outcome Measurement Process” proposed by the American Association of Diabetes Educators (6). Semi-structured interviews were conducted with 21 diabetic individuals selected from the outpatient clinic files. The standardized interview sought responses to two questions: 1) What do you do to enhance physical activity?; 2) What do you do to maintain your level of physical activity? The responses were then analyzed to generate a pool of definite items, from which only those that reflected self-management behavior related to the enhancement and maintenance of daily physical activity was selected for inclusion in the ES-SMBPA-2D. The result was a 38-item scale with two parts. Part 1 deals with self-management behavior to enhance physical activity in daily life (17 items) and Part 2 with self-management behavior to maintain the

level of physical activity (21 items).

Four specialists examined the content validity of the scale, and all of them concluded that the items were relevant and representative samples of possible self-management behaviors of diabetic patients. Responses to the items were rated on a 5-point Likert scale (1 = never to 5 = always), with the higher subscale score indicating higher frequency of self-management behavior as a regimen. To examine the concurrent validity of Part 1, the Japanese version (long version) of the International Physical Activity Questionnaire (IPAQ) (14–16) was used. The IPAQ is useful for assessing physical activity across various life domains and during leisure time. Various background factors were also examined, such as age, sex, occupation, academic background, living situation, treatment of diabetes, mean value of HbA1c for the past 6 months and BMI at the time of examination.

Data analysis

Since most clinical scales are based upon traditional psychometric theory, the reliability and validity of this scale were therefore thoroughly evaluated. Exploratory factor analysis (EFA) using the principal factor method and promax rotation was performed for each part to test the validity of models based upon postulated constructs, i.e., whether all the items for a single factor loaded > 0.35 and to confirm that the item loadings were theoretically coherent. Initial factor selection was based on eigen values > 1.0 . After items that did not load > 0.35 for a given factor had been removed, factor analysis was performed followed by confirmatory factor analysis (CFA) to test the models for items that loaded < 0.35 . The ratio of χ^2 to the degrees of freedom (χ^2/df), Akaike's information criterion

(AIC), the comparative fit index (CFI), and root mean square error of approximation (RMSEA) were used to evaluate the fit of the models to the data. For the AIC, the smallest value represented the best classification. Moreover, RMSEA values of 0.05 and below reportedly indicate a close fit of the model and those between 0.05 and 0.08 indicate a reasonable error in approximating a given structure (18). A $\chi^2/df < 2.0$ and a CFI value > 0.9 were considered to indicate an adequate fit. Selection of the final measurement model was then determined by examining the four indices of fit and choosing the model with the best indices. To evaluate concurrent validity, Pearson's correlation coefficients for the ES-SMBPA-2D and IPAQ subscales were calculated, and Cronbach's α coefficient was calculated for each of the subscales to assess their internal consistency. Intraclass correlation coefficients, which measure the strength of agreement between repeated measurements (19), for test and retest were calculated to evaluate test-retest reliability. SPSS 14.0 and Amos 6.0 for Windows were used for the analysis and the level of significance was defined as 5% (two-sided test).

Results

Subjects' backgrounds

Of the 156 patients invited to participate in the study, 146 agreed (response rate: 93.6%) and gave valid responses to the questionnaire. The 10 patients who did not agree to join this study did so because of lack of time (9) and poor health (1). The instrument for the test-retest was collected from 44 of 59 of the original subjects (response rate: 74.6%) and all 44 gave valid responses. Table 1 presents the subjects' background characteristics.

Factor validity

Part 1: Self-management behavior to enhance daily physical activity (Table 2)

Factor analysis of Part 1 generated four factors for a total of 16 items. These factors were “Increasing the number of steps through shopping activities,” “Increasing the frequency of household activities,” “Deliberately increasing the amount of exertion required in daily activities,” and “Increasing the number of steps through commuting activities” with an eigen value of > 1.0 ($\chi^2/df = 1.77$, $AIC = 249.73$, $CFI = 0.93$, $RMSEA = 0.073$). All the variables contributed to any one factor with a factor loading of > 0.35 .

Part 2: Self-management behavior to maintain the level of physical activity (Table 3)

Factor analysis of Part 2 generated five factors for a total of 16 items. These factors were “Selecting a suitable place or time for physical activities,” “Self-monitoring of physical activities,” “Making active behavior a habit,” “Exercising to stimulate the enjoyment of eating,” and “Creating situations to enhance active behavior” with an eigen value of > 1.0 ($\chi^2/df = 1.89$, $AIC = 261.94$, $CFI = 0.91$, $RMSEA = 0.078$). Although “Keeping daily activity records to stay motivated” showed a loading of < 0.35 for factor 2 (“Self-monitoring of physical activities”), CFA results prompted us to include this item as a factor.

Concurrent validity

Pearson’s correlation coefficients for the ES-SMBPA-2D and IPAQ subscale scores are shown in Table 4. As was hypothesized, “Increasing the number of steps through shopping activities” correlated with the domains of the three activities shown in Table 4, and “Increasing the frequency of household

activities” with the domains of “household and yard work activities” and “self-powered transport”. Furthermore, “Increasing the number of steps through commuting activities” correlated with the domain of “self-powered transport” but “Deliberately increasing the amount of exertion required in daily activities” showed no significant correlation with any of the subscales of the IPAQ.

Internal consistency

Cronbach’s α coefficient for all the subscales was between 0.56 and 0.90 (Table 5).

Reproducibility

The intraclass correlation coefficient for each of the subscales, calculated from data for the 44 subjects who returned the test-retest responses, was between 0.60 and 0.88 (Table 5).

Conclusions

For type 2 diabetic patients who require long-term self-management care, medical personnel should consider not only what type of self-management behaviors patients should engage in but also what type of self-management behaviors patients can engage in in their daily life. Since each of the items of the scale represents self-management behavior that patients can carry out in their daily life and easily incorporate into their lifestyle to maintain their activity level, we believe that medical personnel can instruct their patients in this regimen in addition to what they conventionally teach about the type, frequency, duration, and intensity of physical activity.

Since most clinical scales are based upon traditional psychometric theory, the reliability and validity of the scale were therefore thoroughly evaluated.

The benefits of moderately intense daily

physical activity for preventing and managing type 2 diabetes and preventing cardiovascular disease are becoming well known (2, 3). “Increasing the number of steps through shopping activities”, “Increasing the frequency of household activities” and “Increasing the number of steps through commuting activities” are included in what patients can do to increase their daily physical activity, although these activities have recently been found to be decreasing (20). An increase in walking pace is reportedly associated with a reduction in mortality for type 2 diabetic patients (21). Factor 3, “Deliberately increasing the amount of exertion required in daily activities” is included in such activities in general. Therefore, Part 1 constitutes a valid method for incorporating daily physical activity into patients’ lifestyle.

Although regular physical activity is essential for type 2 diabetes, numerous barriers need to be overcome (4). When diabetic patients face such barriers, they find it difficult to maintain their level of physical activity and many relapse into a sedentary lifestyle (22). They may then feel guilty and consequently get discouraged from exercising further (22, 23). It is therefore important for medical personnel to introduce self-management behaviors to encourage patients to maintain their level of physical activity. Cognitive-behavioral techniques such as “self-monitoring”, “self-reinforcement”, and “goal setting” have been used to promote adherence to physical activity (22), while “Self-monitoring of physical activity,” “Exercising to stimulate the enjoyment of eating,” and “Creating situations to enhance active behavior” are ways for patients to maintain their level of physical activity by using these skills. “Exercising to stimulate the enjoyment of eating,” may enable patients to eat greater

quantities of food or snacks after adequate exercising, which is likely to encourage patients who experience a loss of freedom with regard to eating (24). Patients who exercise adequately can expect to be able to eat greater quantities of food or snacks. Since people generally expect psychological benefits, enhancement of body image and health benefits from adequate exercising (25, 26), exercising sufficiently in the hope of allowing oneself to eat more than usual may be specific to patients with type 2 diabetes. They feel distressed not only when they follow instructions for their dietary regimen but also when they fail to do so (27). On the other hand, when they exercise to stimulate the enjoyment of eating, patients with type 2 diabetes can eat what they want and in greater quantities without feeling guilty about eating too much. However, even if patients exercise enough, they should not eat excessively (28), so that further research is needed to determine whether “Exercising to stimulate the enjoyment of eating” constitutes unqualified good behavior. In connection with “Selecting a suitable place or time for physical activity,” it has been reported that vigorous, moderate, or recommended activity peaks in the summer, whereas inactivity peaks in the winter (29). Because patients need to try and avoid seasonal fluctuations in their level of physical activity, the aim of “Making active behavior a habit” is to suggest to patients that they try to perform physical activity consistently at the recommended level.

The IPAQ was used to assess the concurrent validity of Part 1 only, since there is no appropriate scale to evaluate the concurrent validity of Part 2. The results were almost the same as expected (Table 4). Factor 3, “Deliberately

increasing the amount of exertion required in daily activities,” was a concept that was not included in the IPAQ as it did not show a significant correlation with any of the IPAQ subscales. There were no other items particularly difficult to interpret, which suggests that the concurrent validity is satisfactory.

Cronbach’s α coefficient was 0.56 for Factor 5 in Part 2 (Table 3). However, since this factor includes important items such as “stimulus control,” “helping relationships,” and “goal setting” (22, 30, 31), we decided to include it as a subscale in the ES-SMBPA-2D. Cronbach’s α coefficient of 0.73 or higher for the other subscales confirmed a strong internal consistency. Moreover, the intraclass correlation coefficient of 0.60 or higher indicates good reproducibility.

Further studies are now required to

determine the scale’s application to ethnic populations other than Japanese.

The ES-SMBPA-2D was found to be reasonably reliable and valid and is expected to prove a useful scale for the assessment of patients’ self-management behavior and individualized instruction.

Acknowledgments

This work was supported by a grant from the 21st Century Center of Excellence Program, “Center of Excellence for Signal Transduction Disease: Diabetes Mellitus as a Model,” from the Ministry of Education, Culture, Sports, Science and Technology of Japan.

The authors are grateful to the patients who participated in the study and to the staff members of the outpatient clinic of Kobe University Hospital.

References

1. American Diabetes Association: Standards of medical care in diabetes-2006. *Diabetes Care* 29 (suppl. 1):S4-S42, 2006
2. Hu G, Eriksson J, Barengo NC, Lakka TA, Valle TT, Nissinen A, Jousilahti P, Tuomilehto J: Occupational, commuting, and leisure-time physical activity in relation to total and cardiovascular mortality among Finnish subjects with type 2 diabetes. *Circulation* 110:666-673, 2004
3. Nakanishi N, Takatorige T, Suzuki K: Daily life activity and risk of developing impaired fasting glucose or type 2 diabetes in middle-aged Japanese men. *Diabetologia* 47:1768-1775, 2004
4. Resnick HE, Foster GL, Bardsley J, Ratner RE: Achievement of American Diabetes Association clinical practice recommendations among U.S. adults with diabetes, 1999-2002: the National Health and Nutrition Examination Survey. *Diabetes Care* 29:531-537, 2006
5. Thomas N, Alder E, Leese GP: Barriers to physical activity in patients with diabetes. *Postgrad Med J* 80:287-91, 2004
6. Mulcahy K, Maryniuk M, Peeples M, Peyrot M, Tomky D, Weaver T, Yarborough P: Diabetes self-management education core outcomes measures: technical review. *Diabetes Educ* 29:768-803, 2003
7. Mensing C, Boucher J, Cypress M, Weinger K, Mulcahy K, Barta P, Hosey G, Kopher W, Lasichak A, Lamb B, Mangan M, Norman J, Tanja J, Yauk L, Wisdom K, Adams C: National standards for diabetes self-management education. *Diabetes Care* 29 (suppl. 1):S78-S85, 2006
8. Irvine AA, Saunders JT, Blank MB, Carter WR: Validation of scale measuring environmental barriers to diabetes-regimen adherence. *Diabetes Care* 13:705-711, 1990
9. Anderson RM, Fitzgerald JT, Funnell MM, Gruppen LD: The third version of the Diabetes Attitude Scale. *Diabetes Care* 21:1403-1407, 1998
10. Anderson RM, Funnell MM, Fitzgerald JT, Marrero DG: The Diabetes Empowerment Scale: a measure of psychosocial self-efficacy. *Diabetes Care* 23:739-743, 2000
11. Polonsky WH, Fisher L, Earles J, Dudl RJ, Lees J, Mullan J, Jackson RA: Assessing psychosocial distress in diabetes: development of the Diabetes Distress Scale. *Diabetes Care* 28:626-631, 2005
12. Toobert DJ, Hampson SE, Glasgow RE: The Summary of Diabetes Self-Care Activities Measure: results from 7 studies and a revised scale. *Diabetes Care* 23:943-950, 2000
13. Weinger K, Butler HA, Welch GW, La Greca AM: Measuring diabetes self-care: a psychometric analysis of the Self-Care Inventory-Revised with adults. *Diabetes Care* 28:1346-1352, 2005
14. Murase N, Katsumura T, Ueda C, Inoue S, Shimomitsu T: International standardization of the amount of physical activity - assessment of reliability and validity of IPAQ Japanese version - [in Japanese]. *Journal of Health and Welfare Statistics* 49:1-9, 2002
15. Craig CL, Marshall AL, Sjostrom M, Bauman AE, Booth ML, Ainsworth BE, Pratt

- M, Ekelund U, Yngve A, Sallis JF, Oja P: International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc* 35:1381-1395, 2003
16. Hagstromer M, Oja P, Sjostrom M: The International Physical Activity Questionnaire (IPAQ): a study of concurrent and construct validity. *Public Health Nutr* 9:755-762, 2006
 17. Fayers PM, Machin D: Principles of measurements scales. In *Quality of Life Assessments, Analysis and Interpretation*. England, John Wiley & Sons Ltd, 2000, p. 28-42
 18. Browne MW, Gudeck R: Alternative ways of assessing model fit. In *Testing Structural Equation Models*. Bollen KA, Long JS, Eds. California, SAGE publications, 1993, p. 136-162
 19. Fayers PM, Machin D: Scores and measurements: Validity, Reliability, Sensitivity. In *Quality of Life Assessments, Analysis and Interpretation*. England, John Wiley & Sons Ltd, 2000, p. 45-71
 20. Hill JO, Melanson EL: Overview of the determinants of overweight and obesity: current evidence and research issues. *Med Sci Sports Exerc* 31(suppl. 1):S515-S521, 1999
 21. Tanasescu M, Leitzmann MF, Rimm EB, Hu FB: Physical activity in relation to cardiovascular disease and total mortality among men with type 2 diabetes. *Circulation* 107:2435-2439, 2003
 22. Sallis JF, Owen N: Physical activity intervention with individuals. In *Physical Activity and Behavioral Medicine*. Sallis JF, Owen N, Eds. California, SAGE publications, 1999, p.135-152
 23. Krug LM, Haire-Joshu D, Heady SA: Exercise habits and exercise relapse in persons with non-insulin-dependent diabetes mellitus. *Diabetes Educ* 17:185-188, 1991
 24. Handeron DS, Leggett-Frazier NK: Utilizing content analysis of counseling session to identify psychosocial stressors among patients with type 2 Diabetes. *Diabetes Educ* 20:515-520, 1994
 25. Steinhardt MA, Dishman RK: Reliability and validity of expected outcomes and barriers for habitual physical activity. *J Occup Med* 31:536-546, 1989
 26. Resnick B, Zimmerman SI, Orwig D, Furstenberg AL, Magaziner J: Outcome expectations for exercise scale: utility and psychometrics. *J Gerontol B Psychol Sci Soc Sci* 55:352-356, 2000
 27. Taru C, Miyawaki I, Yada M, Miyata S, Kido Y, Taniguchi H: Development of a scale of dietary distress amongst patients with type 2 diabetes [in Japanese]. *Diabetes* 48:435-442, 2005
 28. Japan Diabetes Society: Exercise therapy. In *Evidence-Based Practice Guideline for the Treatment of Diabetes in Japan* [in Japanese]. Japan Diabetes Society, Eds. Tokyo, Nankodo, 2004, p.29-36
 29. Pratt M, Macera CA, Blanton C: Levels of physical activity and inactivity in children and adults in the United States: current evidence and research issues. *Med Sci Sports Exerc* 31(suppl. 1):S526- S533, 1999
 30. Marcus BH, Rossi JS, Selby VC, Niaura RS, Abrams DB: The stages and processes of exercise adoption and maintenance in a worksite sample. *Health Psychol* 11:386-395, 1992

31. Marcus BH, Bock BC, Pinto BM, Forsyth LH, Roberts MB, Traficante RM: Efficacy of an individualized, motivationally-tailored physical activity intervention. *Ann Behav Med* 20:174-180, 1998

Table 1—Characteristics of study population

Sex		
Male	88	(59.6)
Female	58	(40.4)
Employment status		
Employed	62	(42.5)
Unemployed	82	(56.1)
Unknown	2	(1.4)
Education		
Secondary or less	70	(47.9)
Tertiary or more	51	(34.9)
Unknown	25	(17.2)
Living situation		
Living with another or others	122	(83.6)
Living alone	23	(15.8)
Unknown	1	(0.6)
Treatment		
Diet and exercise	16	(11.0)
Tablets	100	(68.5)
Insulin	30	(20.5)
Duration of diabetes (years)		
< 3 years	19	(13.0)
3 – 10 years	40	(27.4)

>10 years	84	(57.5)
Unknown	3	(2.1)
Age (years)	63.7 ± 9.4	(31 - 83)
HbA1c (%)	7.1 ± 1.0	(5.7 - 11.6)
BMI (kg/m ²)	23.5 ± 3.7	(15.6 - 40.1)

Figures show numbers, percentages (in parentheses) or means ± SD and range (in parentheses). n = 146.

Table 2—Factor analysis of self-management behavior to enhance daily physical activity

	Factor	Factor	Factor	Factor
	1	2	3	4
Factor 1: Increasing the number of steps through shopping activities				
Spending a large amount of time on shopping	0.85	-0.03	0.03	-0.06
Shopping at various stores	0.82	0.12	-0.03	-0.06
Increasing the number of days for going shopping	0.82	0.07	-0.01	0.04
Going shopping several times a day	0.59	0.12	0.02	0.10
Factor 2: Increasing the frequency of household activities				
Cleaning the house carefully	0.03	0.87	-0.11	0.02
Cleaning the house frequently	0.15	0.70	-0.15	0.06
Doing the housework oneself instead of asking someone else to do it	0.06	0.44	0.05	0.07
Standing on tiptoe while cooking or washing one's face	0.04	0.42	0.26	-0.12
Factor 3: Deliberately increasing the amount of exertion required in daily activities				
Standing while taking a train or bus	0.03	-0.05	0.83	-0.21
Taking the stairs instead of the elevator	0.12	-0.11	0.64	0.01
Picking up the pace from leisurely to brisk	-0.21	0.08	0.53	0.24

when walking or cycling				
Stretching or walking while watching TV	-0.03	0.26	0.41	0.15
Factor 4: Increasing the number of steps through commuting activities				
Walking or cycling to a place instead of driving	-0.07	-0.02	-0.03	0.82
Choosing a hilly route when walking or cycling	-0.07	0.10	0.22	0.66
Making detours when going somewhere	0.33	-0.21	0.11	0.66
Wearing good shoes while walking	-0.01	0.19	-0.22	0.46

n = 146.

Table 3—Factor analysis of self-management behavior to maintain the level of physical activity

	Factor	Factor	Factor	Factor	Factor
	1	2	3	4	5
Factor 1: Selecting a suitable place or time for physical activities					
Exercising during the daytime (warmer temperature) in winter	0.93	-0.03	-0.15	-0.08	-0.01
Exercising during the evening (cooler temperature) in summer	0.81	-0.02	0.04	-0.03	0.02
Exercising in a cool place (such as in the shade or indoors) in summer	0.78	0.01	0.07	0.02	0.12
Choosing places with a pleasant environment and interesting sights for walking, jogging, or cycling, to increase the enjoyment in the activity	0.46	0.00	0.32	0.02	-0.14
Exercising in various places depending on one's mood	0.36	0.06	0.17	0.20	-0.12
Factor 2: Self-monitoring of physical activities					
Using a pedometer to set a goal	0.00	1.00	0.02	-0.02	-0.07
Using a pedometer to count the number of steps	-0.02	0.95	-0.09	-0.03	-0.01
Keeping daily activity records to stay motivated	0.08	0.30	0.10	0.14	0.19
Factor 3: Making active behavior a habit					
Making time to enjoy my favorite physical activities	0.01	-0.02	0.92	-0.17	-0.09
Setting a date to enjoy my favorite physical activities	-0.13	0.01	0.67	0.09	0.08

Performing the same exercise routine daily in order to be able to monitor physical condition	0.03	-0.07	0.60	0.07	0.05
Factor 4: Exercising to stimulate the enjoyment of eating					
Feeling encouraged to snack more often after engaging in more exercise	0.02	-0.07	0.00	0.94	-0.08
Feeling encouraged to eat more food after engaging in more exercise	-0.04	0.04	-0.04	0.92	0.05
Factor 5: Creating situations to enhance active behavior					
Keeping exercise equipment at an accessible and highly visible place	-0.08	-0.03	0.00	-0.07	0.65
Asking family members or friends to remind one to exercise	0.07	-0.08	-0.05	0.02	0.54
Setting goals for exercise (such as weight loss)	0.09	0.09	0.25	0.00	0.43

n = 146.

Table 4—Correlations between the scale and IPAQ subscales

	IPAQ subscales			
	Self-powered transport	Household and yard work activities	Leisure time physical activities	Total
Factor 1: Increasing the number of steps through shopping activities	0.23**	0.26**	-0.19*	0.16**
Factor 2: Increasing the frequency of household activities	0.21*	0.29**	-0.10	0.15
Factor 3: Deliberately increasing the amount of exertion required in daily activities	0.07	0.12	0.16	0.14
Factor 4: Increasing the number of steps through commuting activities	0.22**	0.14	0.11	0.15

n = 146. *p < 0.05, **p < 0.01.

Table 5—Internal consistency and reproducibility of the scale

Subscale	Number of items	Mean \pm SD	α^*	ICC \dagger
Self-management behavior to enhance physical activity in daily life				
Factor 1: Increasing the number of steps through shopping activities	4	5.4 \pm 4.6	0.89	0.63
Factor 2: Increasing the frequency of household activities	4	5.6 \pm 3.4	0.74	0.84
Factor 3: Deliberately increasing the amount of exertion required in daily activities	4	6.8 \pm 3.8	0.73	0.83
Factor 4: Increasing the number of steps through commuting activities	4	7.6 \pm 3.9	0.77	0.72
Self-management behavior to maintain the level of physical activity				
Factor 1: Selecting a suitable place or time for physical activities	5	9.1 \pm 5.5	0.83	0.75
Factor 2: Self-monitoring of physical activities	3	3.8 \pm 3.9	0.80	0.88
Factor 3: Making active behavior a habit	3	6.0 \pm 3.8	0.74	0.72
Factor 4: Exercising to stimulate the enjoyment of eating	2	1.7 \pm 1.9	0.90	0.60
Factor 5: Creating situations to enhance active behavior	3	2.7 \pm 2.7	0.56	0.66

*Cronbach's α . \dagger intraclass correlation coefficient.