

Individual and Environmental Factors Related to Stage of Change in Exercise Behavior: A Cross-Sectional Study of Female Japanese Undergraduate Students

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Background: The purpose of the current study was to examine the association between the level of exercise behavior and individual and environmental factors related to exercise behavior among female Japanese undergraduate students. **Methods:** The participants were 2482 female Japanese undergraduate students. Participants' level of exercise behavior was measured by the stage of change to exercise in the transtheoretical model. Individual and environmental factors related to exercise behavior were assessed using body mass index, self-efficacy, social support, perceived positive and negative aspects of exercise, perceived neighborhood environment, attitude toward physical education lessons in childhood and puberty, and depression. **Results:** Scores for self-efficacy, social support, positive aspects of exercise, and perceived neighborhood environment were significantly higher among women who were more active compared with those who were inactive. On the other hand, scores for negative aspects of exercise and depression were greater among inactive women compared with those who were insufficiently active and/or active. In addition, past attitude toward exercise in primary school, junior high school, and high school was associated with current level of exercise behavior. **Conclusions:** This cross-sectional study confirmed that psychosocial and environmental factors were closely associated with level of exercise behavior among female Japanese undergraduate students.

Keywords: college women, psychosocial factors, stage of change, transtheoretical model

Physical inactivity is associated with an increased risk of various chronic health conditions across all age groups, including certain cardiovascular and musculoskeletal diseases, some cancers, unhealthy weight gain, and some mental disorders.^{1,2} Data from the Japan Ministry of Health, Labor and Welfare³ indicated that the prevalence of participation in regular leisure-time physical activity (30 minutes or more of moderate-intensity physical activity at least 2 times per week) for young Japanese women, aged 20–29 years, was the lowest of all age groups for both sexes (approximately 14%). Therefore, it is important to understand the factors affecting current sedentary behavior before designing strategies for bringing exercise behavior closer to optimal levels for young Japanese women.

Psychosocial theories such as social cognitive theory (SCT) and transtheoretical model (TTM) are widely used as the theoretical basis for exploring health behavior determinants. Previous studies related to exercise behavior using the theories have reported that psychosocial

factors such as self-efficacy (SE), social support (SS), and the perception of positive and negative aspects of exercise besides demographic factors such as age, sex, figure, and health status are closely associated with level of exercise behavior.^{4,5} In addition, some researchers have reported that an individual's mental health such as depression are affected by exercise behavior.^{6,7} Furthermore, a number of recent studies have demonstrated that not only demographic and psychosocial factors but also environmental characteristics (eg, neighborhood safety, access to recreational facilities, and aesthetics) influence exercise behavior in various age groups, races, and both sexes.^{8,9} Therefore, comprehensive studies including both individual and environmental factors as correlates of exercise behavior are needed to deeply understand the determinants of exercise behavior. However, there is currently a lack of epidemiological studies with large samples that comprehensively examine individual and environmental factors affecting levels of exercise behavior in young Japanese women.

The purpose of the current study was to examine the associations between levels of exercise behavior and body mass index (BMI), psychosocial and environmental factors related to exercise behavior, and mental health among female Japanese undergraduate students. Exercise behavior of participants was assessed using the TTM: stage of change to exercise.¹⁰ TTM was originally

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developed by Prochaska and DiClemente as a synthesis of various theories describing the processes involved in adopting and maintaining health behavior, and was one of the most popular models for studying behavioral change in health education/promotion programs.¹¹ TTM is now more commonly known as the "stage of change" model, functioning as a 5-stage (see detail of measurements in methods section) theory to explain changes in health behaviors. A meta-analysis by Marshall and Biddle¹² found support for the application of TTM in predicting and explaining exercise behavior.

Methods

Study Design and Participants

The participants in this study were a convenience sample of 2482 young women recruited from 19 universities throughout Japan. In 2007, we selected 19 universities including various regions and departments, and requested that a senior staff member in health psychology, physical education, or nutrition conduct questionnaire surveys. Responses were obtained from all of the universities we approached. Participants completed the questionnaire, which included measures of demographic factors, stage of change to exercise, and psychosocial and environmental factors related to exercise behavior, and mental health. The questionnaire survey was completed by 2273 of the

2482 women to which it was administered; 182 did not include BMI and 53 failed to complete some items in the depression scale. Therefore, analysis of the relationship between exercise behavior, BMI, and depression was conducted for 2091 and 2220 women, respectively. Details of participants' characteristics are shown in Table 1. All participants gave written informed consent to participate in this study.

Measurements

Stage of change to exercise was assessed using the 5-point ordered categorical scale proposed by Marcus et al¹⁰: precontemplation (not participating in exercise and not thinking about starting in the next 6 months), contemplation (not participating in exercise but thinking about starting within 6 months), preparation (doing some exercise but below a criterion level), action (started participating in exercise above a criterion level in the last 6 months), and maintenance (participating above a criterion level for over 6 months). People who belong to action or maintenance were classified as regular exerciser, whereas people who belong to precontemplation, contemplation, or preparation were nonexerciser. The criterion level was defined as exercising 2 times per week for over 30 minutes at moderate and/or vigorous intensity in accord with the Japanese national recommendation.³ Exercise SE was measured with a 4-item scale.¹³ The scale focuses on SE expectations relating to the degree of confidence to

Table 1 Characteristics of Participants

Variables (range of scores)	Number of participants	Mean (SD) ¹	N (%) ²
Age (years) ¹	2273	19.8	(2.5)
Stage of exercise behavior	2273		
Precontemplation ²		431	(19.0%)
Contemplation ²		839	(36.9%)
Preparation ²		609	(26.9%)
Action ²		160	(7.0%)
Maintenance ²		234	(10.3%)
BMI (kg/m ²) ¹	2091	20.6	(2.5)
Self efficacy for exercise (5–20) ¹	2273	9.9	(4.0)
Social support for exercise (5–25) ¹	2273	15.2	(4.8)
Perceived positive aspects of exercise (5–50) ¹	2273	35.4	(5.5)
Perceived negative aspects of exercise (5–50) ¹	2273	25.3	(5.8)
Perceptions of neighborhood environments for exercise (6–24) ¹	2273	15.7	(3.5)
CES-D score (0–60) ¹	2220	18.3	(9.5)
Attitude toward physical education lessons in primary school, junior high school, and high school	2273		
Like ²		1633	(71.8%)
Dislike ²		640	(28.2%)

Abbreviations: M (SD), Mean (Standard deviation); BMI; Body Mass Index; CES-D, Center for Epidemiologic Studies Depression Scale.

exercise in the face of barriers (bad weather, being busy, tiredness, and being lazy), rated on a 5-point Likert scale ranging from 1 (not at all confident) to 5 (very confident). The overall scores on this scale ranged from 5–20, with higher scores indicating a higher exercise SE. Internal consistency was $\alpha = .87$. Exercise SS was measured with a 5-item scale.¹⁴ The scale assessed functional, emotional, and informational social support for exercise (advice/instruction, understanding/sympathy, encouragement/reinforcement, joint implementation, and compliment/appreciation), rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Total scores ranged from 5 to 25, with higher scores indicating a higher social SS. Internal consistency was $\alpha = .85$. Perceived positive and negative aspects of exercise were measured with a 10-item scale.¹⁵ This scale assessed individual perceptions of benefit (eg, if I exercise regularly, I will feel less stressed, it be easier for me to perform routine physical tasks, I will be thin, healthier and fitter etc.) and burden (eg, if I exercise regularly, I will have less time for my family and friends, it will disturb my work, or will take up too much time) for exercise, rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The total scores for each dimension ranged from 5–50, with higher scores indicating individuals' positive and negative perceptions of exercise. Internal consistency values for the benefit and burden scales were $\alpha = .78$ and $.77$, respectively. Perceived neighborhood environment for exercise was measured on a 6-item scale.¹⁶ This scale focused on participants' perceptions of their exercise environment (road safety such as the presence of sidewalks, street-lighting, absence of heavy traffic, hills, enjoyable scenery, frequently seeing others exercising, exercise equipment at home), rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Total scores ranged from 6–24, with higher scores indicating better perceptions of neighborhood environment for exercise. Internal consistency was $\alpha = .66$. All scales were from questionnaires validated in a previous Japanese study.¹⁷ Participants also responded to 1 item about their attitude toward physical education lessons in primary school, junior high school, and high school (like or dislike) and mental health was assessed using the Center for Epidemiologic Studies Depression Scale (CES-D).¹⁸ The CES-D contains 20 items that are responded to on a 4-point Likert scale, with response categories ranging from 0 (rarely or none of the time) to 3 (most or all of the time). These ratings are summed up to a total score, ranging from 0–60, with a higher score indicating more severe depressive symptoms.

Statistical Analyses

One-way analysis of variance (ANOVA) was conducted to assess differences in BMI, exercise SE, exercise SS, perceived positive and negative aspects of exercise, and CES-D score between 5 exercise stages. Post hoc tests were applied using the Bonferroni correction. We used the

chi-square test to analyze the association between exercise stage and attitude toward physical education lessons in primary school, junior high school, and high school. All statistical comparisons were made at the .05 level of significance, using the Statistical Package for Social Science version 16.0 (SPSS Inc., Chicago, IL, USA). Data are presented as means and standard deviation (SD).

Results

Thirty-seven percent of women reported that they were currently sedentary but intended to do more exercise in the next 6 months (ie, contemplation). Twenty-seven percent of women indicated that they were currently exercising but not regularly (preparation), and 19% were doing no regular exercise and they had no plans to do more (precontemplation). Some women were categorized in the action and maintenance stages of regular exercise (7% and 10%, respectively). The ANOVA revealed that exercise SE, exercise SS, positive aspects of exercise, and perceived neighborhood environment for exercise scores were significantly higher among participants in the more active stage than in those in the inactive stage (Table 2). Negative aspects of exercise and CES-D scores were greater among inactive women than in insufficiently active and/or active women. Chi-square analyses revealed significant relationships between the stage of change to exercise and the attitude toward physical education lessons in primary school, junior high school, and high school.

Discussion

We examined the cross-sectional relationships between levels of exercise behavior assessed by the stage of change to exercise and individual and environmental factors in female Japanese undergraduate students.

Japanese exercise recommendations³ define a regular exerciser as person who participates in 30 minutes or more of moderate-intensity physical activity at least 2 times per week. The recommendation is lax compared with other national recommendations (eg, the US). Nevertheless, only approximately 14% of young women met the recommendation, according to national Japanese data.³ The current study revealed similar results; only 17% of the women surveyed were found to exercise regularly (action and maintenance stages).

Previous studies have consistently reported that exercise behavior is affected by various demographic, psychosocial, and environmental factors. In several studies of Japanese, for example, people with stronger perceptions of exercise SE, exercise SS, positive aspects of exercise, and their neighborhood environment for exercise, and weaker perceptions of the negative aspects of exercise exhibited a higher level of exercise behavior.^{5,9,17,19} Our results supported this notion, revealing that scores for 3 psychosocial variables (exercise SE; $P = .000$, exercise SS; $P = .000$, and positive aspects of exercise; $P = .000$)

Table 2 The Associations Between Stage of Change to Exercise and Individual and Environmental Factors

Variables (range of scores)	PC			C			P			A			M			Post hoc tests
	Mean	(SD)		Mean	(SD)		Mean	(SD)		Mean	(SD)		Mean	(SD)		
BMI*	20.1	(2.6)		20.6	(2.3)		20.9	(2.8)		21.1	(3.0)		20.6	(2.4)		PC < P; PC < A
Self efficacy for exercise (5-20)**	7.4	(3.2)		9.1	(3.5)		10.5	(3.6)		11.6	(3.8)		14.3	(4.0)		PC < C; PC < P; PC < A; PC < M; C < P; C < A; C < M; P < A; P < M; A < M
Social support for exercise (5-25)**	12.5	(4.7)		14.8	(4.3)		15.6	(4.4)		17.0	(4.7)		19.0	(4.8)		PC < C; PC < P; PC < A; PC < M; C < P; C < A; C < M; P < A; P < M; A < M
Perceived positive aspects of exercise (5-50)**	33.0	(5.4)		35.8	(5.4)		35.3	(5.3)		35.2	(5.5)		38.1	(5.2)		PC < C; PC < P; PC < A; PC < M; C < P; C < A; C < M
Perceived negative aspects of exercise (5-50)**	28.2	(5.4)		25.5	(5.4)		24.7	(5.6)		24.0	(5.9)		21.9	(5.9)		PC < C; PC < P; PC < A; PC < M; C < P; C < A; C < M; P < A; P < M; A < M
Perceptions of neighborhood environments for exercise (6-24)**	14.3	(3.5)		15.7	(3.3)		16.2	(3.4)		16.0	(3.7)		17.0	(3.2)		PC < C; PC < P; PC < A; PC < M; C < P; C < A; C < M
CES-D score (0-60)***	18.8	(9.9)		18.4	(9.5)		18.3	(9.3)		19.1	(10.6)		16.4	(8.7)		M < PC; M < C
Attitude toward physical education lessons in primary school, junior high school, and high school***	N	(%)		N	(%)		N	(%)		N	(%)		N	(%)		P-value
Like	226	(13.8)		616	(37.7)		478	(29.3)		111	(6.8)		202	(12.4)		0.00
Dislike	205	(32.0)		223	(34.8)		131	(20.5)		49	(7.7)		32	(5.0)		

Abbreviations: PC, Precontemplation; C, Contemplation; P, Preparation; A, Action; M, Maintenance; BM, Body Mass Index; CES-D, Center for Epidemiologic Studies Depression Scale.

* N: PC = 401, C = 768, P = 564, A = 139, and M = 219.

** N: PC = 431, C = 839, P = 609, A = 160, and M = 234.

*** N: PC = 422, C = 821, P = 591, A = 159, and M = 227.

and a neighborhood environment for exercise ($P = .000$) were consistently higher among women who exercise regularly compared with those who insufficiently exercise and/or do not exercise. In contrast, the score for negative aspects of exercise showed a linear decrease relative to advancing the stage of change to exercise behavior ($P = .000$). Some previous studies have suggested that BMI is negatively associated with physical activity level.^{20,21} Our results do not support that association, possibly because the BMI scores for the participants in this study were very low (mean = 20.6 kg/m²), and only 5.5% of participants were classified as overweight (BMI = 25.0–29.9 kg/m²) and obese (BMI = over 30.0 kg/m²).

Several epidemiological studies have also demonstrated that depressive symptoms are associated with unhealthy lifestyle, including exercise behavior and impact on adherence to health behaviors.^{6,7,22} In line with this expectation, the present results revealed that nonexercisers exhibited worse mental health than regular exercisers ($P = .018$), regardless of the presence or absence of intent to exercise. These findings suggest that it is important to enhance psychosocial factors related to exercise behavior. Likewise, mitigating depression using interventions such as counseling may promote exercise behavior in young women.

Behavioral theories, such as the theory of reasoned action and the theory of planned behavior,^{23,24} have suggested that attitude is an important predictor for adherence and adoption of health behavior, including exercise behavior. For example, Graham et al²⁵ reported that adolescents are more active 5 and 10 years later, if they have more positive attitudes toward sports, exercise, and fitness. Our results showed that past attitude toward exercise in primary school, junior high school, and high school was associated with the current level of exercise behavior ($P = .000$). Women who exercised regularly and continued exercise over 6 months (maintenance) showed a higher rate of positive than negative attitudes toward physical education lessons (12% vs. 5%). On the other hand, women who did not participate in exercise and did not think about starting exercise (precontemplation) had more negative than positive attitudes toward physical education lessons (32% vs. 14%). These results suggest that past attitudes toward sports and exercise are linked to current exercise behavior. Therefore, creating positive attitudes toward exercise during physical education lessons in childhood and puberty may be important for bringing exercise behaviors closer to optimal levels in the future.

Conclusions

In summary, the data from this cross-sectional study confirmed that higher perceptions of exercise SE, exercise SS, positive aspects of exercise, and neighborhood environment for exercise, lower perceptions of negative aspects of exercise, better mental health, and positive attitudes toward physical education lessons in childhood and puberty were associated with higher levels of

exercise behavior among female Japanese undergraduate students; however, it should be noted that the causal directionality of these associations cannot be inferred from a cross-sectional study. Further research using a longitudinal randomized controlled study should be undertaken, to provide a more definitive interpretation of the present findings.

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