

【原著論文】

## Validation of the Stages of Exercise Behavior Change with Low, Moderate and Vigorous Physical Activity Behavior in Young Japanese Women

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### Abstract

The purpose of this study was to examine the construct validity of the stages of exercise behavior change for low, moderate, and vigorous physical activity behavior in female Japanese university students. Participants were 193 female Japanese university students in various stages of change regarding exercise; their physical activity was estimated using the International Physical Activity Questionnaire (IPAQ) in Japanese version (the usual 7 days, short, self-administered version). The mean age of the subjects is 19.8 years (SD=1.3, range 18 to 23). Results show that the participants classified as being in the action and maintenance stages exhibited the highest vigorous physical activity [ $F(4/188) = 65.2, p < 0.01$ ] and the total weekly physical activity [ $F(4/188) = 60.9, p < 0.01$ ]. These results offer an additional support for the validity of the stages of exercise behavior change in young Japanese women based on self-reported physical activity behavior.

**Key words :** Transtheoretical model, exercise, construct validity, female university students

## 1. Introduction

Regular exercise has been shown to be highly beneficial for physical and mental health. Despite such benefits, only 9.5% of young Japanese women were reported to participate in the regular exercise<sup>1</sup>. To promote physically active lifestyles, interventions based on the cognitive and behavioral determinants of behavior change have increasingly been conducted with results showing that theory-based interventions are most effective<sup>2</sup>.

The transtheoretical model<sup>3</sup> has increasingly been used as the theoretical basis for developing exercise behavior interventions. This model regards behavior change as a process that involves progression through a series of stages<sup>4</sup>. These stages applied to exercise behavior are precontemplation (PC: not intending to exercise), contemplation (C: intending to exercise within the next 6 months), preparation (P: exercising occasionally but not regularly), action (A: exercising regularly for less than 6 months), and maintenance (M: exercising regularly for more than 6 months).

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Numerous studies have investigated the construct validity of the stages of exercise behavior change for exercise<sup>5</sup>. The stages were found to be associated with self-reported exercise behavior as well as fitness level measures in pre-adolescents through adults<sup>6</sup>. Results of these validity studies show that the stages of exercise behavior change are positively associated with self-reported physical activity measures in young adults (e.g. Dannecker et al.<sup>5</sup>), adults (e.g. Marcus and Simkin<sup>7</sup>), older adults (e.g. Schumann et al.<sup>8</sup>). However, the evidence available regarding the validity of the stages of exercise behavior change based on self-reported physical activity in young Japanese women is inadequate.

The purpose of this study was to examine the construct validity of the stages of exercise behavior change for low, moderate, and vigorous physical activity behavior in female Japanese university students. It was hypothesized that significant differences would be detected in the amount of physical activity between the stages of exercise behavior change.

## II. Method

### A. Participants

The participants were 193 female Japanese students who were recruited from a women's university in Japan. The mean age of the subjects is 19.8 years (SD = 1.3, range 18 to 23). All the participants belonged to the same ethnic group and were of Asian origin. This study was approved by the ethics committee at Mukogawa Women's University. The nature, purpose, risks, and benefits of the study were explained to each participant prior to obtaining their written informed consent. The sampling method and participants were the same as the ones utilized by Matsumoto and Tanaka<sup>4</sup>.

### B. Measures

#### 1. Stages of Exercise Behavior Change

The stages of exercise behavior change were assessed using a five-item scale based on the questionnaire developed by Marcus and Simkin<sup>7</sup>, which was translated into Japanese by Oka et al.<sup>9</sup>. The partici-

pants were requested to endorse a single statement that best represented their readiness and/or involvement in exercise behavior. The PC item stated, "I currently do not exercise and do not intend to exercise for the next 6 months." The C item stated, "I currently do not exercise, but I intend to exercise within the next 6 months." The P item stated, "I currently exercise but not regularly." The A item stated, "I currently exercise regularly, but I have only begun to do so within the past 6 months." The M item stated, "I currently exercise regularly and have been doing so for more than 6 months." The term "regular exercise" was defined as exercise of at least moderate-intensity at least 2–3 times per week for at least 20–30 min.

#### 2. International Physical Activity Questionnaire (IPAQ)

Physical activity was assessed using the IPAQ translated into Japanese<sup>10</sup>. The IPAQ version was the short form of the usual 7 days recall questionnaire<sup>11</sup>. This version contains seven questions assessing the frequency and duration of subject participation in a vigorous, moderate intensity, and low-intensity activity (walking), as well as time spent sitting during a typical weekday<sup>12</sup>. The sum of vigorous, moderate intensity, and low-intensity activity score gives an indicator of total physical activity.

### C. Data Analyses

Separate ANOVAs with Bonferroni correction for multiple comparisons and Tukey's post hoc analyses were conducted to assess the differences among the stages of behavior change with regard to the physical activity measures and the sitting time. Effect sizes ( $\eta^2$ ) were also calculated to determine the significance of the results. Statistical tests were conducted using IBM SPSS 21.0 for Windows.

### III. Results

The participants were categorized into the different stages of change as follows: PC, 27 (14.0%) ; C, 40 (20.7%) ; P, 18 (9.3%) ; A, 14 (7.3%) ; and M, 94 (48.7%) .

The ANOVA results are displayed in Table 1 and indicated that significant stage differences were present in the vigorous, total weekly physical activity and the time spent sitting during a weekday. No significant differences in the moderate and low physical activity were observed among the stages. Table 1 also reported the descriptive statistics, ANOVA F-values, effect sizes ( $\eta^2$ ), and the results of Tukey's post hoc analyses for the different physical activity levels measured across the stages of behavior change.

### IV. Discussion

The purpose of this investigation was to assess the construct validity of the stages of exercise behavior change based on the self-reported physical activity. The vigorous and total weekly physical activity results partially supported the validity of the stages of exercise behavior change. Hellsten et al.<sup>2</sup> indicated that vigorous physical activity and self-reported overall MET provide strong validity evidence for the stages of exercise behavior change. The self-reported physical activity results replicate the previous evidence and give additional support for the Japanese version of the stages of exercise behavior

change scale. However, the moderate and low physical activity at the later stages of change was not higher than that at the early stages of change. The sitting time is not distinguished adjacent the stage of exercise change. The results suggest that the current conceptualization of the stages of exercise behavior change might not be appropriate for lower intensity exercise and sitting behavior.

Although the results of this study provide a novel additional support for the validity of the stages of exercise behavior change, the study does pose a number of limitations. First, it employed a cross-sectional design. As Horiuchi et al.<sup>13</sup> insisted, the use of cross-sectional design has been reported to provide a weak test of stage model of behavior change. Thus, prospective and experimental designs may offer better methodologies for examining the stages of exercise behavior change<sup>14</sup>. Second, the generalizability of our findings is limited since only female university students were examined. Therefore, it is uncertain whether the results of our study can be applied to other populations. The third limitation is that the physical activity measures were based on self-report. Self-report physical activity questionnaires remain the method of choice for physical activity assessment on the basis of money, time, subject costs<sup>15</sup>. It would be useful to produce more reliable evidence analyzing the effects of this construct in future studies.

Within the limitations noted, the findings of this study are an extension of current literature partially

Table 1. Different physical activity measures across stages of exercise behavior change

Variable	Stages of change					F (df=4)	$\eta^2$	Tukey's HSD
	PC	C	P	A	M			
Vigorous physical activity	13.3	0.8	23.3	784.3	979.5	65.2 **	.58	PC, C, P < A, M
(min/week)	50.8	4.7	58.7	675.7	517.0			
Moderate physical activity	193.3	100.8	277.2	225.0	240.9	n.s.	.04	—
(min/week)	278.9	223.3	412.3	176.1	324.9			
Low physical activity (Walking)	390.7	314.9	328.1	398.2	258.6	n.s.	.02	—
(min/week)	345.1	296.5	226.6	582.8	376.8			
Total weekly physical activity	36.2	24.1	39.6	141.5	160.9	60.89 **	.56	PC, C, P < A, M
(Mets/min/week)	29.2	27.9	32.9	75.5	69.9			
Sitting during a weekday	607.8	553.6	503.3	332.9	430.2	6.07 **	.11	PC, C > A, M
(min/week)	261.5	217.9	203.9	154.2	224.4			

Note. \_ PC=Precontemplation, C=Contemplation, P=Preparation, A=Action, M=Maintenance. Cell values are reported as mean scores and standard deviations.

\*\*  $p < 0.01$

supporting the validity of the stages of exercise behavior change scale for young Japanese women. Through the proper assessment of the stages of exercise behavior change for young Japanese women, this may help in achieving important national physical activity objectives.

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