Validity and Reliability of Thai Versions of Questionnaires Measuring Leisure-time Physical Activity, Exercise-Related Self-Efficacy, Outcome Expectations and Self-Regulation

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Abstract: This study examined the validity and reliability of Thai versions of questionnaires measuring leisure-time physical activity, exercise-related self-efficacy, outcome expectations and self-regulation. Three steps were used: translation, back-translation and expert committee confirmation; test-retest reliability; and exploratory factor analysis. Twenty-nine female bilingual Thai undergraduate students participated in the test-retest procedure, and 364 Thai female undergraduate students participated in the exploratory factor analysis. The Thai versions of the questionnaires have acceptable test-retest reliability, concurrent validity; construct validity, and internal consistency reliability. The questionnaires have suitable psychometric properties and can be used to assess their stated topics in Thai female undergraduate students. These results also provide validation of these constructs in a non-North American sample. In this study we found that these valid and reliable measures of these constructs are useful for conducting research and interventions that target health behaviour changes in Thai population. Health practitioners such as nurses can use these constructs to try to effect changes in physical activity behaviour among Thai people, and future research on the use of these questionnaires is warranted.

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Introduction

Regular physical activity is important for the health and wellbeing of people of all ages. Being regularly active can increase exercise capacity and physical fitness which, in turn, leads to many health benefits.[1] Physical activity can be promoted and maintained through theoretically based interventions.[2-3] For example, Social Cognitive Theory (SCT) has been used to explain and promote individual's physical activity behaviour.[4-5] Self-efficacy, outcome expectancy, and self-regulation are SCT constructs that are related to physical activity adoption and adherence.[6-8] Since increased self-efficacy, outcome expectancy, and self-regulation levels are important factors in promoting and maintaining individual physical activity, it is necessary to have valid and reliable measures of these constructs for use in research and interventions. However, the majority of the research examining

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psychosocial correlates of physical inactivity has taken place with North American and European populations, and less research has examined work in developing countries. This may be due, in part, to the lack of translated instruments as well as the lack of any valid evidence that constructs such as self-efficacy are also relevant in non-Western cultures. An important first step in addressing this gap in evidence is to translate questionnaires, obtain validity evidence, and assess their relevance in the cultures of influence.

Evidence from epidemiological studies supports the idea that the health and quality of life-related burdens of physical inactivity, and overweight and obesity are increasing around the world, particularly in Asian and south-east Asian populations where the ill-health related outcomes seem to be even more severe than for predominantly Caucasian populations.[9-10] For example, Thailand is an Asia-Pacific country regarded as a developing economy which is showing increased prevalence of overweight and obesity as well as decreased physical activity frequently associated with an economic shift from traditional to western type economies.[10-11] As such, it is important to determine whether prognostic indicators that have been found to be important in Western countries (for example, SCT constructs) are meaningful in Thailand.

Literature Review

In population-based research, physical activity behaviour, self-efficacy, outcome expectations, and self-regulation are typically measured by self-reported questionnaires. The Godin-Shephard Leisure-Time Physical Activity Questionnaire (GSLTPAQ) has been shown to be a valid and reliable measure of leisure-time physical activity.[12-17] There also exist valid and reliable questionnaire measures of exercise-related self-efficacy (the multidimensional self-efficacy for exercise scale; MSES),[18-20] outcome expectations,[21] and self-regulation.[22] Tasks, coping, and scheduling self-efficacy as assessed by the MSES have been found to predict physical activity in a variety of settings including the general population[23]; women initiating exercise[24]; and cardiac rehabilitation.[25] Similarly, the Outcome Expectations Questionnaire (OEQ) and the Self-regulation Questionnaire (SRQ) have been found to be valid and reliable measures of outcome expectations in adolescence[21] and self-regulation in undergraduate students, respectively.[22] However, these self-report questionnaires were originally developed in North American populations and previous studies have shown that cultural and language differences could exist when an English version questionnaire is translated into other languages.[26-27] It has also been shown that when previously developed instruments are adapted or translated to other languages, the internal structure of the instrument may change resulting in possibly lower validity and reliability than the original versions.[28] Even though standard translation and back-translation procedures are used, the new version of the instrument may not capture proper emotion concepts of the original version.[29] Thus, once an instrument has been translated, researchers must make sure that this version of the instrument is fully equivalent to the original version.[28] That is, researchers should analyze the internal structure (for example, using factor analysis) and internal consistency (for example, the alpha coefficient) of the questionnaire. Tests of the questionnaire's validity should also be conducted.[28]

It is known that there is a positive relationship between physical activity levels and SCT variables.[30-31] Also, self-efficacy, outcome expectancy, and self-regulation are positively related. For example, individuals who have higher self-efficacy were likely to set higher goal and expect higher outcome.[32] Moreover, previous studies have found gender and activity level effects on rating scales of exercisers,[33] and on rating scales of self-efficacy.[19,34] In general, men rated higher self-efficacy than women.[19,34] Exercisers rated higher self-efficacy than non-exercisers.[19] In

addition, it is known that Thai female undergraduate students were not likely to participate in physical activity compared with Thai male undergraduate students.[35] Thus, it is essential for this present study to target only females when these findings have been taken into account.

Despite considerable research showing the benefits of physical activity,[36] and the role of self-efficacy, outcome expectancy, and self-regulation[37-38] in physical activity behaviour, there are no validated Thai language questionnaires of these constructs. The development of such measures is important in measuring physical activity in this country. For example, only about 2% of Thai female university students are active enough to achieve health benefits.[35] Prior to developing interventions targeting this population, adequate measurement tools are needed. Thus, the purpose of this study was to translate the GSLTPAQ, MSES, OEQ, and SRQ into Thai, and then to examine the validity and reliability of these versions of the questionnaires.

Method

Measures: The GSLTPAQ. This Questionnaire, developed by Godin and Shephard,[14] includes three questions that measure weekly frequencies of mild, moderate, and strenuous physical activity for periods of more than 15 minutes during free time. The weekly frequency of mild, moderate, and strenuous activities can be converted into metabolic equivalent (MET) values by multiplying by 3, 5, and 9 METs, respectively. The sum of these scores provides a total weekly MET value.[13] Participants are also asked to report how frequently they are involved in an exercise activity long enough to work up a sweat on a scale of often, sometimes, and never/rarely. The GSLTPAQ demonstrated a one-month test-retest reliability of 0.62 and concurrent validity coefficients of 0.32 with an objective indicator (accelerometer), 0.56 with Vo_2Max, and 0.43 with percentage body fat.[15]

The MSES. A 9-item self-report questionnaire was developed by Rodgers and Sullivan[18] and Rodgers and colleagues[19] to measure the magnitude and strength of self-efficacy. The Questionnaire begins with the following definition of exercise, *"Three thousand to six thousand steps are the equivalent of performing moderate intensity physical activity (MPA) for 30 to 60 minutes".* Three items each measure task, coping, and scheduling efficacy for performing the physical activity behaviours (that is, MPA at least for 30 min/day for 3 days a week). The question in each item starts with the statement, *"How confident are you that you can..."*, and follows with the specific statement to measure the task, coping and scheduling efficacies. Example questions include: *"How confident are you that you can complete MPA at least 30 min/day for 3 days a week?"* (task), *"How confident are you that you can perform MPA at least 30 min/day for 3 days a week when you feel discomfort when performing physical activity?"* (coping), and *"How confident are you that you could include MPA at least 30 min/day for 3 days a week in your daily routine?"* (scheduling). All items are rated on a scale ranging from 0% (no confidence) to 100% (complete confidence).

The OEQ. A 9-item self-report questionnaire was developed by Dishman and colleagues[21] to assess outcome expectancy. In this study, the Questionnaire began with the following statement, *"Some people think performing MPA at least 30 min/day for 3 days a week will improve their health, and others think it will improve their mood. Do you think the following benefits and values of performing MPA will occur to you?"* The statements are followed by 9 items which are rated on belief and value scales. For example, item 1 states "It would help me spend more time with my friends."Each item is rated on a belief scale using a 5-point scale ranging from disagree a lot (1) to agree a lot (5), then on a value scale using a 5-point scale ranging from very unimportant (1) to very important (5). Outcome expectancy values are obtained as the sum of all the beliefs items and all the values items.

Dishman and colleagues [21] reported internal consistency coefficients of 0.72 and test-retest reliability correlations of 0.72 across one week. In the current study, one additional open-ended question about outcome expectancy was asked in the third (EFA) study: *"In addition to the benefits and values mentioned in the table, what other benefits and values did you expect when you participated in MPA?".* This question was added in case there were other beliefs and values specific to Thai culture not captured in the original questionnaire.

The SRQ. The 10-item Exercise Goal-Setting Scale (EGS) and the 10-item Exercise Planning and Scheduling Scale (EPS) self-report scales developed by Rovniak and colleagues[22] measure self-regulation. The EGS includes items related to goal setting, self-monitoring, and problem solving. For example, Item 1 states: *"I often set PA goals."* The EPS includes items related to scheduling and planning exercise as part of one's daily routine. For example, Item 1 states: *"I never seem to have enough time to have PA."* The answers range on a 5-point scale from 1 (does not describe) to 5 (describes completely). The Scale showed internal consistency coefficients 0.89 for the EGS and 0.87 for the EPS and test-retest reliability correlations were 0.87 for the EGS and 0.89 for the EPS.

Procedure: Based on the recommendations of Marin and Marin, [28] three steps were used to develop the Thai versions of the GSLTPAQ, MSES, OEQ, and SRQ.

Step 1: Back-translation and committee approach. This step contained three stages. First, the original questionnaires were translated into Thai language by two bilingual translators. Second, the Thai version questionnaires were back-translated by two new bilingual translators. Third, two native English speakers compared the original English version and the back-translated English version. The recommendations from the two native English speakers were used to improve the questionnaires and the procedure was repeated from the first step. After the equivalence between the original and back-translated versions was accepted, Thai versions of the questionnaires were developed.

Step 2: The test-retest procedure. Participants in the test-retest procedure were 29 female bilingual Thai undergraduate students studying in North America universities (two Canadian and two American). The mean age, weight, and height of participants was 21.59 ± 2.03 years old, 54.18 ± 10.22 kilograms, and 161.70 ±4.41 centimeters, respectively. A minimum of 20 participants is needed for this procedure.[39] Participants were recruited by e-mails and questionnaires and information letters were sent by e-mails to interested participants. First, the recruitment letters were sent to the President of Thai Students'Association of universities in Canada and USA to ask whether their members were willing to participate in this study. Second, information letters and the questionnaires were sent to Thai students who were willing to participate in this study. Twenty-nine female bilingual Thai undergraduate students replied to the recruitment letters and completed the questionnaires. The English and Thai versions of the questionnaires were sent via e-mails to participants at baseline and two weeks later. At each time, roughly half completed the English version followed by the Thai version. The remainder completed the questionnaires in the opposite order. Spearman correlation coefficients (r_s) were calculated to evaluate the test-retest reliability and concurrent validity between the English and Thai versions of the GSLTPAQ, MSES, OEQ, and SRQ.

Step 3: Exploratory factor analysis (EFA). EFA was chosen to assess the validity of the Thai versions of MSES, OEQ, and SRQ instead of confirmatory factor analysis (CFA). This decision was made because, according to Gerbing and Hamilton,[40] although the original versions of the

questionnaires were analyzed and the number of factors were already known, they do not always hold when the questionnaires are translated into different languages and used in populations that differ in culture and way of life. These differences can lead to misfit in CFA, which can be misleading given that such approaches are essentially hypothesis-test driven. Thus, the EFA was used as a precursor for further studying these constructs with a Thai population.

Participants in EFA were 364 Thai female undergraduate students studying at two universities in Thailand. The mean age, weight, and height of participants were 21.53 ± 1.85 years old, 54.34 ± 12.67 kilograms, and 162.92 ± 7.06 centimeters, respectively. Generally, 300 participants are considered to be good in EFA.[41] Participants were recruited by e-mails and questionnaires and information letters were sent by e-mails to interested participants. First, recruitment letters were sent by e-mails into list serves of Bangkok University and Silpakorn University in Thailand. Second, information letters and the questionnaires were sent by e-mails to participants who were interested to participate in this study. Three hundred and sixty four Thai female undergraduate students replied to the recruitment letter and completed the questionnaires. Among those, 300 participants returned the questionnaires in the first week and the remainder (n = 64) returned the questionnaire in the second week after e-mails had been sent.

Data Analysis: Data analysis in the EFA proceeded in three steps. First, descriptive statistics were calculated to check if the data set was appropriate for factor analysis. Second, principal components analysis was performed for factor extraction. The Keiser-Guttman rule (eigen-values >1.0) and the scree plot were used for factor retention. Direct oblimin rotation was performed for factor rotation. Finally, internal consistency coefficients (Cronbach's α) were calculated for items retained from the EFA procedures. All data were analyzed using the Statistical Package for Social Sciences (SPSS for Windows 18.0, SPSS Inc., Chicago, IL). The significance level was set at 0.05.

Results

Step 1 (Back-Translation and Committee Approach)

The Thai versions of the GSLTPAQ, MSES, OEQ, and SRQ were appropriately developed after two translations.

Step 2 (Test-Retest Procedure)

The English and Thai versions of the GSLTPAQ, MSES, OEQ, and SRQ were highly correlated to each other (see **Table 1**). Similarly, the test-retest reliability coefficients of the English and Thai versions of the GSLTPAQ, MSES, and OEQ were very strong; but the test-retest reliability of the SRQ was only moderate to high (see **Table 2**).

Step 3 (Exploratory Factor Analysis)

The MSES (Thai Version). The Kaiser-Meyer-Olkin measure of sampling adequacy (0.886) and Bartlett's test of sphericity ($\chi^2 = 3252.06$, $df = 36$, $p < .001$) suggested that the data set was appropriate for an EFA. A principal component analysis showed two factors with eigen-values >1. Based on the scree plot, the number of factors appeared to range from 2 to 3. Given that the original version of questionnaire contained three factors, we decided to use a three factor solution in further analysis. Then a principle factoring method was used to extract the three factors. The results are shown in **Table 3**. The three factors explained 88.18% of common variance, with saturations that ranged between .86 and .98, which are considered to be good.[42] Also, simple structure was found in the sense that each item only loaded on one factor. As shown in Table 3, factor 1 (task efficacy; eigen-value = 6.07, $\alpha = .93$), explained 67.46% of the common variance. Factor 2 (coping

efficacy; eigen-value = 1.03, α = .93), explained 11.41% of the variance. Factor 3 (scheduling efficacy; eigen-value = 0.84, α = .93) explained 9.30% of the variance. The correlation coefficients showed moderate correlation between the three factors, indicating appropriate classification.

Table 1 : Concurrent validity between the Thai version and the English version of the GSLTPAQ, MSES, OEQ, and SRQ administered at the same time

Questionnaires	English version		Thai version		r_s
	M	SD	M	SD	
GSLTPAQ	26.52	17.15	28.72	20.41	.95
MSES	36.79	23.23	37.11	23.73	.99
OEQ	67.17	13.77	67.72	11.87	.93
SRQ	52.96	8.77	52.65	9.11	.93

Note: r_s = Spearman correlation coefficient. All r_s in the table are significant at $p < .01$ (two-tailed significance).

Table 2 : Test-retest reliability of the English and the Thai versions of the GSLTPAQ, MSES, OEQ, and SRQ

Variables	English version					Thai version				
	Test 1		Test 2		r_s	Test 1		Test 2		r_s
	M	SD	M	SD		M	SD	M	SD	
GSLTPAQ	25.91	17.15	27.00	17.80	.94	28.70	21.25	27.83	21.08	.96
MSES	34.83	22.98	33.53	23.35	.97	35.24	23.67	32.88	23.12	.98
OEQ	66.65	14.68	66.13	11.08	.84	67.43	12.35	66.87	10.61	.78
SRQ	52.09	8.83	50.87	10.62	.66	51.61	9.18	51.09	11.09	.61

Note: r_s = Spearman correlation coefficient. All r_s in the table are significant at $p < .01$ (two-tailed significance).

Table 3 : A principal analysis with oblique rotation and pattern matrix of the Thai version of MSES

Item abbreviations	M	SD	I	II	III
Task self-efficacy (Cronbach's α = 0.93)					
...follow directions to complete MPA...	53.05	21.83	0.93		
...complete MPA... using proper technique	53.86	22.09	0.91		
...perform all activities required for complete MPA...	52.58	22.28	0.87		
Coping self-efficacy (Cronbach's α = 0.93)					
...perform MPA... when you lack energy	42.03	20.86		0.98	
...perform MPA... when you do not feel well	40.98	21.44		0.87	
...perform MPA... when you feel discomfort when performing physical activity	44.29	19.78		0.86	

Table 3 : A principal analysis with oblique rotation and pattern matrix of the Thai version of MSES (Continued)

Item abbreviations	M	SD	I	II	III
Scheduling self-efficacy (Cronbach's α = 0.93)					
...arrange your schedule to include MPA...	45.90	22.50			0.93
...include MPA... in your daily routine	46.30	22.14			0.92
...consistently perform MPA...	45.30	21.63			0.87
% variance explained			67.46	11.41	9.30
Eigen-value			6.07	1.03	0.84
Interfactor correlations			1.	2.	3.
1. Task self-efficacy			-		
2. Coping self-efficacy			.57	-	
3. cheduling self-efficacy			.63	.63	-

Note: MPA = moderate intensity physical activity. All items followed the same stem question ("How confident are you that you can... and after MPA following by... *at least 30 min/day for 3 days a week*"

The OEQ (Thai Version). The Kaiser-Meyer-Olkin measure of sampling adequacy (0.896) and Bartlett's test of sphericity (χ^2 = 1364.48, *df = 36, p* <.001) suggested that the data set was appropriate for an EFA. The factor analysis yielded two factors that explained 63.52% of the common variance, with saturations that ranged between .45 and .93, which are considered to be good.[42] Factor 1 (eigen-value = 4.55, α = .84) explained 50.59% of the common variance. Factor 2 (eigen-value = 1.16, α = .82) explained 12.93% of the variance. The factors were moderately correlated (see **Table 4**).

Table 4 : A principal analysis with oblique rotation and pattern matrix of the Thai version of OEQ

Item abbreviations	M	SD	I	II
Physical benefits and values (Cronbach's α = 0.84)				
It would make me look better	8.07	1.72	0.93	
It would help me control my weight	7.97	1.72	0.80	
It would help get or keep me in shape	8.20	1.71	0.76	
I would feel better about myself	8.03	1.74	0.71	
Mental and Social benefits and values (Cronbach's α = 0.82)				
It would be fun	7.57	1.88		0.82
It would help me spend more time with my friends	7.49	1.82		0.82
I would make new friends	7.17	2.07		0.80
It would put me in a better mood	7.75	1.85		0.61
It would make me better in sports or other activities	7.74	1.88		0.45

Table 4 : A principal analysis with oblique rotation and pattern matrix of the Thai version of OEQ (Continued)

Item abbreviations	M	SD	I	II
% variance explained			50.59	12.93
Eigen-value			4.55	1.16
Interfactor correlations			1.	2.
1. Physical benefits and values			-	
2. Mental and social benefits and values			.53	-

The results from the open-ended question of OEQ demonstrated that Thai female undergraduate students expected that physical activity would result in benefits such as: physical (that is, stronger, healthier, look better, good shape, and prevent disease), mental (that is, relax from stress of studying, sleep well, and fun), and social (that is, good for leisure time activity, spend more time with friends or family, and meet new friends).

The SRQ (Thai Version). The Kaiser-Meyer-Olkin measure of sampling adequacy (0.915 and Bartlett's test of sphericity ($\chi^2 = 2811.58$, $df = 190$, $p < .001$) suggested that the data set was appropriate for an EFA. A principal component analysis showed three factors with eigen-values greater than 1 (see **Table 5**). The three factors explained 53.96% of common variance, with saturations that ranged between .51 and .84, which are considered to be good.[42] Factor 1 (eigen-value = 6.74, $\alpha = .72$), explained 33.68% of the common variance. Factor 2 (eigen-value = 2.58, $\alpha = .89$), explained 12.89% of the common variance and Factor 3 (eigen-value = 1.48, $\alpha = .82$), explained 7.39% of the common variance. The correlations among the three factors were low, indicating three distinct factors.

The low-to-moderate correlations among the Thai version of the GSLTPAQ, MSES, OEQ, and SRQ are presented in **Table 6**.

Table 5 : A principal analysis with oblique rotation and pattern matrix of the Thai version of SRQ

Item abbreviations	M	SD	I	II	III
EGS (Cronbach's $\alpha = 0.89$)					
I often set PA goals	3.01	.90	0.84		
I usually have more than one major PA goal	3.08	.93	0.79		
My PA goals help to increase my motivation for doing physical activities	3.24	.89	0.78		
I usually keep track of my progress in meeting my PA goals	3.12	1.00	0.74		
I usually achieve the PA goals I set for myself.	3.12	.93	0.70		
I have developed a series of steps for reaching my PA goals	3.02	1.04	0.65		
I tend to break more difficult PA goals down into a series of smaller goals	3.00	.96	0.65		
I usually set dates for achieving my PA goals	3.00	.93	0.63		
If I do not reach a PA goal, I analyze what went wrong	3.01	1.01	0.54		
I tell other people about my PA goal	3.07	1.04	0.51		

Table 5 : A principal analysis with oblique rotation and pattern matrix of the Thai version of SRQ (Continued)

Item abbreviations	M	SD	I	II	III
EPS-negative statements (Cronbach's α = 0.72)					
I never seem to have enough time to have PA	3.15	.97		0.80	
Finding time for PA is difficult for me	3.13	.98		0.73	
PA is generally not a high priority when I plan my schedule	3.07	.87		0.69	
When I am very busy, I cut out my PA	3.54	1.07		0.69	
EPS-positive statements (Cronbach's α = 0.82)					
I write my planned activity sessions in an appointment book or calendar	2.89	1.12			0.81
I plan my weekly PA schedule	2.98	1.05			0.80
I schedule my PA at specific times each week	3.05	1.01			0.69
Everything is scheduled around my PA routine—both classes and work.	3.08	.93			0.68
I schedule all events in my life around my PA routine	3.06	.89			0.60
I try to have PA at the same time and same day each week to keep a routine going	3.13	.97			0.60
% variance explained			33.68	12.89	7.39
Eigen-value			6.74	2.58	1.48
Interfactor correlations			1.	2.	3.
1. EGS			-		
2. EPS (Negative statements)			.04	-	
3. EPS (Positive statements)			.47	.17	-

Note: PA = physical activity. EGS = exercise goal-setting scale. EPS = exercise planning and scheduling scale.

Table 6 : Descriptive statistics and bivariate correlations between self-report leisure-time physical activity, exercise-related self-efficacy, outcome expectations, and self-regulation

Variables	M	SD	1	2	3	4	5	6
1. METs	38.18	23.97	-					
2. Task self-efficacy	53.17	20.61	.47	-				
3. Coping self-efficacy	42.43	19.39	.33	.61	-			
4. Scheduling self-efficacy	45.83	20.76	.35	.67	.67	-		
5. Outcome expectations	70.00	11.63	.22	.30	.30	.25	-	
6. Self-regulation	60.21	10.12	.30	.41	.41	.41	.43	

Note: METs = metabolic equivalents. All r in the matrix are significant at $p < .01$ (two-tailed significance).

Discussion

The purpose of this study was to examine the validity and reliability of the Thai version of the GSLTPAQ, MSES, OEQ, and SRQ in assessing physical activity, self-efficacy, outcome expectancy, and self-regulation in female undergraduate students in Thailand. To the best of our knowledge, this is the first study translating these questionnaires and examining their validity and reliability in Thailand.

The results of the test-retest procedure demonstrated high reliability for the Thai version of the GSLTPAQ reliability and also high concurrent validity compared with the English version. The reliability of the Thai version of the GSLTPAQ was comparable with the original reliability studies of the GSLTPAQ.[12,14-17] Specifically, we found low reliability of mild physical activity in both English (.55) and Thai (.58) questionnaires. This is similar to previous research with the GSLTPAQ which showed low two week test-retest reliability (0.48) for mild physical activity.[14] Thus, it is suggested that the moderate to vigorous scales be used. Indeed, Godin[13] also made this recommendation.

In addition, the test-retest procedure showed high reliability and concurrent validity of the Thai version of the MSES compared with the English version in assessing self-efficacy. Further, the EFA results demonstrated that the Thai version of MSES had construct validity to measure self-efficacy in Thai female undergraduate students. Similar to the English version of MSES,[19] our results demonstrated a three-factor solution for the Thai version of MSES that measures task, coping, and scheduling efficacies. Items loading on the three factors in the analyses presented here were similar to the English version factor analysis and the internal reliability of the Thai version that was comparable with the original internal reliability studies.[19-20] These results indicate that the Thai version of MSES can be used to measure individual self-efficacy levels in Thai female undergraduate students.

The Thai version of the OEQ demonstrated high reliability and concurrent validity compared with the English version in measuring outcome expectancy in Thai female undergraduate students. The reliability of the Thai version of the OEQ was comparable with the original.[21] Two factors were extracted for the Thai version; four items in the first factor were related to physical benefits and values and six items in the second factor were related with social and mental benefits and values. These two factors can reflect outcome expectancy about physical activity consistent with the purposes of the original English version. These factors also related to the answers received from the open-ended question.The National Statistical Office of Thailand in 2008 reported that among Thais who exercise, they did so for health benefits (76.9%), because friends invited them (8.5%), because of health problems (6.6%), stress relief and being less tense (3.1%), weight loss (2.6%), and other reasons (2.3%).[43] Thus, the Questionnaire reflects the expectations in this Thai population. Fixing the number of extracted factors to one, resulted in comparable internal consistency correlations among items (α = .88) with the original version study. [21]

Finally, our results showed that the Thai version of SRQ demonstrated high reliability and concurrent validity compared with the English version in measuring self-regulation in Thai female undergraduate students. The original SRQ reported test-retest reliability correlations of 0.87 for the goals scale (EGS) and 0.89 for the planning and scheduling scale (EPS)[22]; however, our study found lower test-retest reliability correlations for both the English and Thai versions (0.64 & 0.75 for the English version and 0.74 & 0.72 for the Thai version). Three factors were extracted for the Thai version of SRQ. All items about goal setting loaded on one factor.

Four items of planning and scheduling loaded on the second factor and six items on the third factor. The items in the second factor are related to negative statements. For example, Item 1 states that: *"I never seem to have enough time to exercise."* In contrast, the items in the third factor are related to positive statements. For example, Item 4 states that: *"I schedule all events in my life around my exercise routine."* The internal consistency of these three factors was acceptable and compatible with the original version study.[22] Also, these three factors were not highly correlated, which indicates that they can separately reflect physical activity goal setting, scheduling and planning of respondents. These results indicated that the Thai version of SRQ can be used to measure individual's self-regulation in Thai female undergraduate students.

This study also found correlations among scores from the Thai versions of the GSLTPAQ, MSES, OEQ, and SRQ. The obtained physical activity score (METs), three types of self-efficacy, outcome expectancy, and self-regulation scores were low to moderately correlate with each other. This supports other studies that have posited the importance of the relationship of SCT constructions to physical activity behaviours.[6-8, 32] Also, the correlations among three types of self-efficacy were consistent with the English version.[19]

In sum, these results indicate that the constructs of self-efficacy, outcome-expectations and self-regulation seem to exist in Thai female students and that the structure of the constructs is similar to North American samples. This is promising and allows for further examination of these constructs in relation to physical activity behaviour in ways that are theoretically consistent but have received minimal testing in Thai or other Asia Pacific groups. This is important as we cannot assume that constructs that have been shown to be valid in Western populations will generalize to other cultures and in other languages. Thus, more studies based on psychometric work, such as that reported in this study, are needed prior to using measures of these constructs in different populations.

Strengths and Limitations

This study followed the recommendation of Marin and Marin[28] in developing the Thai questionnaires from the English versions. However, some limitations of the study should be mentioned. First, data were collected via e-mails; therefore the findings are limited to students who can access the Internet. Somewhat mitigating this concern however are data reporting that 90% of Thai undergraduate students access the Internet and 75% of those access the Internet at university in sessions lasting 1 to 3 hours at a frequency of 1 to 3 times a week.[44] An additional limitation is that although most participants completed and returned the questionnaire in the first week, the rest of participants completed and returned the questionnaire in the second week after the questionnaire was sent. However, the results did not differ when all data were analyzed compared to data just the first week.

Conclusion

The results of this research provide validation of SCT constructs in a non-North American sample. The results also showed that the Thai versions of the GSLTPAQ, MSES, OEQ, and SRQ have suitable psychometric properties for use with Thai female undergraduate students. The findings are consistent with previous psychometric work on the English versions. The Thai versions of the questionnaires had satisfactory factor structure, test-retest stability, and internal consistency reliability. Thus, they would be valuable tools for assessing leisure-time physical activity, and exercise-related self-efficacy, outcome expectations and self-regulation in female university students in Thailand. The results of this research

suggest that the Thai versions of the GSLTPAQ, MSES, OEQ, and SRQ are valid and reliable with Thai people and are valuable for future studies that target health behaviour changes in Thai population. However, future psychometric studies should be done with other Thai populations including men and different age groups. The GSLTPAQ can be used to monitor physical activity levels related to health benefits,[13] and monitoring and reporting this information to Thai people may motivate them to participate in physical activity regularly. Since self-efficacy, outcome expectancy and self-regulation are important determinants of behaviour changes, valid and reliable measures of these constructs are useful for conducting research and interventions for health promotion. Health practitioners such as nurses can use these constructs to try to effect changes in physical activity behaviour among Thai people.

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ความตรงและความเที่ยงของแบบสอบถามการวัดกิจกรรมทางกายในยามว่าง และความเชื่อมั่นในตนเอง การคาดหวังผลลัพธ์ และการควบคุมตนเอง เกี่ยวกับการออกกำลังกาย ฉบับภาษาไทย

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บทคัดย่อ: การศึกษานี้ตรวจสอบความตรงและความเที่ยงของแบบสอบถามการวัดกิจกรรมทางกายในยามว่าง และความเชื่อมั่นในตนเอง การคาดหวังผลลัพธ์ และการควบคุมตนเอง เกี่ยวกับการออกกำลังกาย ฉบับภาษาไทย การศึกษาประกอบด้วย 3 ขั้นตอน คือ การแปลย้อนกลับและยืนยันโดยผู้เชี่ยวชาญ การหาความเที่ยงโดยการทดสอบซ้ำ และการวิเคราะห์องค์ประกอบเชิงสำรวจ นักศึกษาหญิงไทยระดับปริญญาตรีที่มีความสามารถด้านภาษาไทยและภาษาอังกฤษ จำนวน 29 คน เข้าร่วมการศึกษาหาความเที่ยงโดยการทดสอบซ้ำ และนักศึกษาไทยระดับปริญญาตรีจำนวน 364 คน เข้าร่วมในการวิเคราะห์องค์ประกอบเชิงสำรวจ ผลการศึกษาพบว่า แบบสอบถามฉบับภาษาไทยมีความเที่ยง ความตรงตามสภาพ ความตรงตามโครงสร้าง และสัมประสิทธิ์ของความสอดคล้องภายในแบบสอบถามฉบับภาษาไทยมีความเหมาะสมทางคุณสมบัติการวัดทางจิตวิทยาและสามารถนำไปใช้วัดระดับกิจกรรมทางกายในยามว่าง ความเชื่อมั่นในตนเอง การคาดหวังผลลัพธ์ และการควบคุมตนเอง เกี่ยวกับการออกกำลังกาย ในนักศึกษาหญิงระดับปริญญาตรี ผลการศึกษายังแสดงให้เห็นว่าแบบสอบถามมีความตรงในการวัดในกลุ่มประชากรนอกเหนือจากกลุ่มประชากรในประเทศอเมริกาเหนือ ความตรงและความเที่ยงของแบบสอบถามฉบับภาษาไทยดังกล่าวมีประโยชน์สำหรับการทำวิจัยและการจัดโปรแกรมเพื่อเปลี่ยนพฤติกรรมสุขภาพในกลุ่มคนไทย บุคคลากรทางสุขภาพ เช่น พยาบาล สามารถใช้แบบสอบถามฉบับภาษาไทยดังกล่าวในความพยายามที่จะก่อให้เกิดการเปลี่ยนแปลงของพฤติกรรมการมีกิจกรรมทางกายในกลุ่มคนไทย

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คำสำคัญ: แบบวัด กิจกรรมทางกายในยามว่าง ความเชื่อมั่นในตนเอง การคาดหวังผลลัพธ์ การควบคุมตนเองเกี่ยวกับการออกกำลังกาย

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