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The Influence of Exercise Motivation on Exercise Behavior among Thai Youth

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Introduction

Getting involved in exercise is known for both its physiological and psychological benefits. Data have linked exercise or physical activity to decreased risk of cardiovascular disease, reduction of blood pressure, assistance in weight management, mood improvement and mortality rate reduction (American College of Sport Medicine [ACSM], 1990; Blair, 1993). Exercise or physical activity also reduces the risk of developing diabetes and some forms of cancer, promotes healthy muscles, bones and joints (U.S. Department of Health and Human Services, 1996). Psychologically, exercise has also been associated with reduced state anxiety, reduced tension, moderated depression, and an increased sense of well-being (ACSM, 1990; Byrne and Byrne, 1993; Yeung, 1996). However there is still a large percentage of individuals who do not participate in regular exercise at any of the various ranges of age and intensity level. (National Coalition for Promoting Physical Activity, 1996; Weinberg and Gould, 1995), and this is also the case in Thailand (National Statistical Office of Thailand, 2000).

A major question regarding how to motivate more people to get involved in exercise for health still remains and is the main interest /responsibility for people in the field of exercise psychology. To increase the number of people getting involved in regular exercise, we should promote this activity as early as possible. Exercise or physical activity during childhood and adolescence is the predictor of physical activity in adults (Coakley and White, 1992; Risto et al., 2000). We therefore need to understand those young people's reasons for getting involved in exercise.

The understanding of factors that motivate people to engage in exercise is an important part of research agenda, in particular, the motivation factors among different age groups of people (Campbell et at., 2001). Motivation is a psychological mechanism

that governs the direction, intensity, and persistence of behavior (Iso-Ahola and Clair, 2000). Consequently, motivation concerns energy, direction, and persistence – all aspects of activation and intention (Ryan and Deci, 2000).

Self determination Theory (SDT)

Deci and Ryan's (1985) self-determination theory (SDT), concerning the perception of choice and having those choices to be the determinants of one's action, has become increasingly popular in studies of human motivation. Deci and Ryan (1985, 1991) proposed a multidimensional conceptualization of motivation. SDT has differentiated types of motivation (Ryan and Deci, 2000). The lowest stage of self-determination starts with **amotivation,** which is the state of lacking the intention to act. The next stage is **extrinsic motivation**. Extrinsic motivation covers the continuum between amotivation and intrinsic motivation, and varies in the extent to which their regulation is autonomous. The extrinsically motivated behaviors that are least autonomous are referred to as **externally regulated.** Such behaviors are performed to satisfy an external demand or reward contingency. The second type of extrinsic motivation is labeled **introjected regulation**. Introjection involves taking in a regulation but not fully accepting it as one' own. It is a relatively controlled form of regulation in which behaviors are performed for reasons such as pride. Thus, external regulation (beginning as interpersonally controlled) and introjected regulation (beginning as intrapersonally controlled) have been combined to form a controlled motivation composite (Ryan and Deci, 2000).

Another form of extrinsic motivation is **identification regulation.** Identification reflects a conscious valuing of a behavioral goal or regulation, such as the action being accepted or owned as personally important. Finally, the most autonomous form of extrinsic motivation is **integrated regulation**. Integration occurs when identified regulations are fully assimilated to the self, which means they have been evaluated and brought into congruence with one's other values and needs. Actions characterized by integrated motivation share many qualities with intrinsic motivation, although they are still considered extrinsic because they are done to attain a separable outcome rather than for their inherent enjoyment (Ryan and Deci, 2000). With the latter, the theory suggests that there are different types of extrinsically motivated behaviors (external, introjected, indentified, and integrated regulation) and these types of motivation orientation are transformed through a regulation process called

internalization, which describes the transformation of controlling types of motivation regulated (Li, 1999)

The highest level of self-determination is **intrinsic motivation**. Intrinsically motivated actions occur without any indication of external reward, that is, the action emanates from the self and is thus self-determination. Deci (1975) suggested that the general intrinsic motivation construct can be separated into more specific motives. Vallerand et al. (1989) proposed a tripartite taxonomy of intrinsic motivation termed as **intrinsic motivation to know**, **intrinsic motivation to accomplish** task, and **intrinsic motivation to experience stimulating sensations** while engaging in an activity.

Exercise is an intensive physical activity which involves time, effort and commitment. Therefore, more than 50% of people generally withdraw from participating in formal exercise within six months to a year (Dishman, 1988). This important phenomenon urges exercise psychologists to identify motivation factors that keep people staying involved in exercise activity. Motivation is a psychological mechanism that governs the direction, intensity, and persistence of behavior (Iso-Ahola and Clair, 2000), and has been found to have a significant impact on exercise behavior (Frederick and Ryan, 1993; Douthitt, 1994; Frederick, Morrison and Manning, 1996).

Exercise Motivation Scale (EMS)

The Exercise Motivation Scale (EMS) is a potential psychological measure due to its rationalities of measurement, its theoretical background and to its having been validated (Li, 1999). The EMS includes 31 items that were developed specifically to assess all eight dimensions of self-determined motivation in exercise context. The scale consists of answers to the main question, "Why are you currently participating in this activity?" using a 6-point Likert-type scale ranging from 1 "strongly disagree" to 6 "strongly agree". The EMS has been validated within the college-aged population and tested mainly in studies of people in the US (Li, 1999, Yan and McCullagh, 2002; Wetherington, 2004). The scale reported reliable and valid values of measure and is expected to be appropriate for different groups of people outside the US such as people in Thailand.

Li (1999) examined differences between regular exercisers' (more than twice per week) and non-exercisers' (1 bout or less per week) scores with the EMS. He found that regular exercisers displayed higher levels on (1) intrinsic motivation to learn, (2)

intrinsic motivation to experience sensations, (3) integrated regulation, and (4) identified regulation subscales.

Cultural factors in exercise motivation

Participation in exercise may also be affected by cultural factors. The study of Yan, and McCullagh (2002) found cultural influences on motivation in the physical activity of participants (Chinese, American born Chinese-ABC and American-USA) and suggested that understanding cultural differences in motives for participation may result in a better organization of physical activity experiences. In populations in Hong Kong and the United Kingdom, different motivational components of exercise adherence in sport and exercise were found (Tsang, Szabo and Robinson, 2003).

The study of motivation factors in exercise behavior among the Thai population should then add more beneficial information regarding self determination theory.

Method

Overall Research Design

This study employed a cross-sectional correlation design. Through a 2-stage sampling process, cross-sectional survey data were collected from youth within randomly selected provinces to examine the factorial structure of a Thai version of the Exercise Motivation Scale (TEMS) among Thai youth. Structural equation modeling methodologies were employed to examine the tenability of the multidimensional exercise motivation construct based on self-determination theory (Deci and Ryan, 1985, 1991), and to examine the relationships between dimensions of exercise motivation and exercise behavior.

Study Sampling and Participants

Due to the nature of the questionnaire and the aim of the present study on the relationship between motivation factors and exercise behavior (frequency, duration and intensity of exercise level), the sample consisted only Thai youth of, (age rang 18 to 22 years old) who engaged in exercise activities within public parks, health clubs, fitness

centers, or exercise/sport community stadiums. The participants in the main part of this study were recruited through a 2-phase sampling process. This sampling strategy was considered practical and economical for study of a widely distributed population (Pilot and Hungler, 1995).

The survey on study participants was then conducted within each selected province through a nonrandom process. Thirteen provinces (3 from each region) in Thailand were randomly selected from a total of 75 provinces located throughout 4 regions of Thailand (North, Northeast, South, and Central) and Bangkok. Specifically, participants were approached in local public places, such as parks, health clubs, fitness centers, or exercise/sport community stadiums. The process resulted in a sample of 2,007 participants (males = 1013, females = 994; mean age = 19.87, SD = 1.31), and 1912 questionnaires were completed for analysis.

Procedures

At the time of the data collection, all subjects were participating in a variety of exercise activities in local public parks, health clubs, fitness centers, or exercise/sport community stadiums. Research assistants approached potential individuals at these public places and asked them whether they would be interested in participating in a survey study on exercise motivation. All individuals received information about the research and were told that their participation in this research was strictly voluntary. Individuals who agreed to participate and signed an informed consent form completed the survey, which took about 10 to 15 minutes. All subjects were thanked for their participation in the study after the data were collected.

Measures

A two-part questionnaire was administered to the participants.

First part: demographic information, and exercise behavior

The demographic section of the survey provided information on the age and gender of the participants, the types of exercise they participated in and their exercise experience.

The exercise behavior portion of the survey asked the participant to report their level of participation including: exercise frequency (i.e., "How many days per week do you spend on exercise?"), exercise duration (i.e., "How long do you spend exercising each day?"), and exercise intensity, as it is defined by the Borg Rate of Perceived Exertion Scale (RPE) (Borg, 1982). The RPE measured the amount of effort made by the participants when exercising, with the scale ranging from 6 (*very very light*) to 20 (*very very hard*).

Second part: the Thai version of the Exercise Motivation Scale (TEMS)

In order to identify reasons for participating in exercise, the study measure needed to be tested. The 31-item TEMS was developed based on the Li Exercise Motivation Scale (EMS) (Li, 1999). The TEMS reported a Cronbach's alpha coefficient of .82. All 8 subscales of TEMS were found to be reliable (Cronbach's alpha .60 to .76), and details were presented in the table below (table 1)

Table 1: TEMS subscales and its item numbers in the study measure

TEMS subscales	Items Number
Amotivation, (e.g., I can't understand why I am doing this).	7, 16, 23
External regulation, (e.g., Because other people believe that it's a good idea for me to exercise).	3, 8, 13, 25
Introjected regulation, (e.g., Because I must exercise to feel good about myself).	4, 12, 21, 31
Identified regulation, (e.g., Because I believe that regular exercise is a good way to enhance my overall development).	5, 9, 18, 24
Integrated regulation, (e.g., Because it is consistent with what I value).	6, 14, 22, 29
Intrinsic motivation to learn, (e.g., For the satisfaction it gives me to increase my knowledge about this activity).	2, 10, 15, 27
Intrinsic motivation to accomplish the tasks, (e.g., For the pleasure of mastering this activity).	17, 20, 28, 30
Intrinsic motivation to experience sensation, (e.g., For the pleasure it gives me to experience positive sensation from the activity).	1, 11, 19, 26

The TEMS asked the participants who were exercising at the time of data collection to respond to the stem "Why are you currently participating in this activity?" and indicated their degree of agreement with each of the TEMS item on a 6-point Likert scale (1 = strongly disagree, 6 = strongly agree).

Statistical Analyses

Descriptive statistics including percentage, means, standard deviation, kurtosis, and skewness are presented.

Model testing. Confirmatory factor analysis (CFA) was used to examine the factorial structure of TEMS in Thai youth. Based on an *a priori* specified theoretical model (Li, 1999), eight latent factors were specified, each measured by 3 or 4 items. Following CFA, a structural model was specified and tested by linking the dimensions of exercise motivation to exercise behavior. All structural equation models were tested by the method of latent variable structural equation modeling using the LISREL (LInear Structural RELations) computing program (version 8.53) (Jöreskog and Sörbom, 2002). Analyses were conducted on covariance matrices.

Model fit evaluation. Several goodness-of-fit indices were used: the Chi-Square statistic (χ^2), the Root Mean Square Error of Approximation: RMSEA (Sateiger, 1990), the Non-Normed Fit Index: NNFI (Tucker and Lewis, 1973), and the Comparative Fit Index: CFI (Bentler, 1990). The RMSEA values less than .08 indicate acceptable fit, and values less than .05 are reflective of close model fit (Browne and Cudeck, 1993). For the indices of NNFI and CFI, values closer to 1.0 represent a good fit of the model under investigation. In order to assess the model fit, all parameter estimates were examined and interpreted in light of the hypothesized relationships among variables in the model. Significant parameters in the model are denoted by t-values $\geq$ 1.96 (at .05) and $\geq$ 2.54 (at .01). To set the matrix for each latent variable in the measurement model, one factor loading was set to 1.0 and thus was not estimated for significance.

Results

Descriptive statistics indicated that means for the 31 item ranged from 2.25 to 5.15 and standard deviation ranged from .88 to 1.49. The values of skewness and kurtosis of all observed variables in both the validation and calibration samples were lower than 3.75, which is accepted for the assumption of multivariate normality (Tabachnick and Fidell, 1996). Therefore, this data is suitable for the CFA in the analysis.

Of the means and standard deviation among the 8 subscales of TEMS, identified regulation was most strongly endorsed in this sample (M = 5.08, SD = .72), followed by IM to sensation (M = 4.72, SD = .69), integrated regulation (M = 4.69, SD = .75), IM to learn (M = 4.05, SD = .69), IM to accomplishment (M = 4.39, SD = .75), introjected regulation (M = 4.05, SD = .89), external regulation (M = 3.07, SD = .96), and amotivation (M = 2.73, SD = 1.08).

The data of demographic information showed 44.5% of the sample participated in exercise activity (e.g. aerobic dance, walking, jogging, cycling, and weight training etc.), 33.2% participated in sport activity (e.g. football, volleyball, basketball etc.) and 22.3% participated in combined activities. However, the majority of males engaged in sport activity while the majority of females engaged in exercise activity.

With regard to exercise experience, the participants' responses showed that the majority of participants (46.6%) had been engaged in their exercise program for over 1 year, 8.3% for 6-12 months, 12.5% for 3-6 months, 19.1% for 1-3 months and 13.5% for less than 1 month respectively. In addition, there were over 60% of females who had been exercising less than 6 months, while over 60% of males had been exercising more than 6 months.

An examination of the exercise habits (including frequency of exercise, duration of each exercise session and intensity of workout) of the participants was undertaken. ACSM (1990) recommended guidelines for exercise as follows: a minimum of 3-5 days per week (at least 3 days), 20-60 minutes per session (at least 20 minutes) and at intensity level 12-16 on RPE (at least 12-16 RPE), (Borg, 1982). The majority of participants engaged in over 20 minutes of exercise per session, with only 7.8% engaging in less than 20 minutes per session. The majority of women (30%) exercised for 20-30 minutes per session, while the majority of men (37.9%) exercised over 60 minutes per session.

The data of frequency and intensity to exercise showed participants exercised an average of 3.74 days per week, and at an average RPE of 14.00. Males exercised an average of 4.25 days per week, and at an average RPE of 14.28. Females exercised an average of 3.23 days per week, and at an average RPE of 13.74. Thus, on average of the demographic data, the participants in this study met the guidelines from ACSM, for frequency, duration and intensity of exercise behavior.

Construct Validity of TEMS and the SEM of Exercise Motivation

The Overall Fit of TEMS: CFA

The test of the CFA in this study proceeded in two stages. Stage 1 analysis involved the assessment of the measurement model of TEMS. Stage 2 analysis provided a test of the second order of TEMS.

The results of the **TEMS measurement model testing** for the 1912 samples were as follow. Overall, the TEMS model fitted the empirical data reasonably well, χ^2 = 3409.48, df 406, RMSEA =0.065 (0.063:0.067), NNFI = 0.95, CFI = 0.96. An inspection of factor loadings (standardized, *t*-value) indicated that all measured items were significantly loaded for their respective latent factors. However, the squared multiple correlations showed that item 3 (on the external factor), item 4 (on the introjected factor), and item 30 (on intrinsic motivation to accomplishment) have the lowest explained variance (.06, .19, .16) (Table 2). These lower case magnitudes of variance indicate a poor or weak relationship between measured items and their latent constructs. Therefore, these three items were removed from the TEMS measurement model in the subsequent analyses (Jöreskog and Sörbom, 2002).

Table 2: Standardized Loadings, Factor Loadings (t value), Errors Variance, and Squared Multiple Correlations for the TEMS measurement

TEMS Items	Standardized Loading	t value	Error variance	R^2
Amotivation (AM) 7	1.00	-	22.78	0.56
Amotivation (AM) 16	1.03	28.28	24.58	0.50
Amotivation (AM) 23	1.05	30.58	21.08	0.61
External Regulation (EX) 3	1.00	-	30.48	**0.06**
External Regulation (EX) 8	3.66	9.96	21.26	0.58
External Regulation (EX) 13	2.74	9.48	28.21	0.29
External Regulation (EX) 25	3.45	9.89	23.86	0.50
Introjected Regulation (INT) 4	1.00	-	28.87	**0.19**
Introjected Regulation (INT) 12	1.44	14.67	27.29	0.28
Introjected Regulation (INT) 21	1.64	14.92	26.85	0.30
Introjected Regulation (INT) 31	1.59	14.84	27.01	0.30
Identified Regulation (ID) 5	1.00	-	26.81	0.45

Table 2: (Continued)

TEMS Items	Standardized Loading	t value	Error variance	R^2
Identified Regulation (ID) 18	1.03	27.01	25.77	0.51
Identified Regulation (ID) 24	1.03	25.49	27.02	0.44
Integrated Regulation (INTE) 6	1.00	-	28.57	0.39
Integrated Regulation (INTE) 14	1.14	24.06	28.15	0.42
Integrated Regulation (INTE) 22	1.11	23.45	28.49	0.39
Integrated Regulation (INTE) 29	1.10	24.81	27.63	0.45
Intrinsic to Learn- (IM-L) 2	1.00	-	29.46	0.34
Intrinsic to Learn- (IM-L) 10	1.14	23.51	28.37	0.44
Intrinsic to Learn- (IM-L) 15	1.12	23.24	28.56	0.43
Intrinsic to Learn- (IM-L) 27	1.15	23.68	28.23	0.45
Intrinsic to Accomplish- (IM-A) 17	1.00	-	28.95	0.35
Intrinsic to Accomplish- (IM-A) 20	0.96	22.56	28.41	0.38
Intrinsic to Accomplish- (IM-A) 28	1.01	23.92	27.16	0.45
Intrinsic to Accomplish- (IM-A) 30	0.80	15.83	30.39	**0.16**
Intrinsic to Exp sensation- (IM-SE) 1	1.00	-	29.44	0.35
Intrinsic to Exp sensation- (IM-SE) 11	1.13	23.26	29.06	0.39
Intrinsic to Exp sensation- (IM-SE) 19	1.09	23.33	29.03	0.39
Intrinsic to Exp sensation- (IM-SE) 26	1.09	23.42	28.98	0.40

Note: t-values $\geq$ 1.96 are significant ($p < .05$), and t-values $\geq$ 2.54 are significant ($p < .01$)

When the 3 items of TEMS were removed, the TEMS model fitted data better (RMSEA from 0.065 to 0.057 (0.055:0.059), χ^2 = 2342.46, df 322, NNFI = 0.97, CFI = 0.97). However, the outputs of LISREL showed that the modification indices suggested the addition of the error covariance. Based on self-determination theory and statistical analysis, therefore, the researcher set the error covariance free. The TEMS model fit showed data well χ^2 = 1786.63, df = 317, RMSEA = 0.049 (0.047:0.051), NNFI = 0.97, CFI = 0.98 (Table 3).

Table 3: Modified TEMS Measurement Model Fit Statistics

TEMS	χ^2	N	Df	RMSEA	NNFI	CFI
28 items	2342.46	1912	322	0.057 (0.055:0.059)	0.97	0.97
Modified	1786.63	1912	317	0.049 (0.047:0.051)	0.97	0.98

Note: χ^2 = Chi-Square, RMSEA = Root Mean Square Error of Approximation; NNFI = Non-Normed Fit Index; CFI = Comparative Fit Index.

The next step was to **test the second order of the measurement model.** The model tested the relationship between 28 items, 8 variables of exercise motivation and 3 variables in the second order (amotivation, extrinsic motivation, intrinsic motivation). The second order fit index showed a poor fit model χ^2 = 4741.74, df = 343, RMSEA = 0.097 (0.095:1.00), NNFI = 0.93, CFI = 0.93 (Table 4 Figure 1). An examination of the correlation matrix indicated excessively high within-dimension correlations (i.e., within extrinsic and intrinsic motivation constructs) and between-dimension correlations (i.e., between extrinsic and intrinsic motivation constructs). Factor correlations among three extrinsic motivation latent factors equaled 1.00 (Identified, Introjected, Integrated), and three intrinsic motivation latent correlations factors equaled 0.91. The correlations between extrinsic motivation latent factors and intrinsic motivation latent factors were even higher in magnitudes. These high correlations are indicative of poor discriminate validity of TEMS constructs, particularly with respect to the dimensions of extrinsic and intrinsic motivation. To remedy this problem, items for the factors of identified, introjected and integrated were modified to extrinsic motivation factor. The items for factors of intrinsic motivation to learn, intrinsic motivation to accomplish and intrinsic motivation to sensation were modified to intrinsic motivation factor. Then, the second order of the TEMS measurement model was modified into 4 factors (amotivation, externalizing, extrinsic motivation, and intrinsic motivation). This resulted in a revised four-factor TEMS measurement model tested in the second order, and the model fit index showed good fit χ^2 = 1785.94, df = 331, RMSEA = 0.049 (0.047:0.051), NNFI = 0.97, CFI = 0.98 (Table 4, Figure 2). When it come to modeling the relationships between these latent factors and the exercise behavior outcome, the multicolineality among some of the latent factors in the TEMS was of concern.

Table 4: The Second Order of TEMS Measurement Model Fit Statistics

TEMS	χ^2	df	RMSEA	NNFI	CFI
3 factors	4741.74	343	0.097 (0.095:1.00)	0.93	0.93
4 factors	1785.94	331	0.049 (0.047:0.051)	0.97	0.98

Note: χ^2 = Chi-Square, RMSEA = Root Mean Square Error of Approximation; NNFI = Non-Normed Fit Index; CFI = Comparative Fit Index.

Figure 1
The Second Order of TEMS: 3 factors

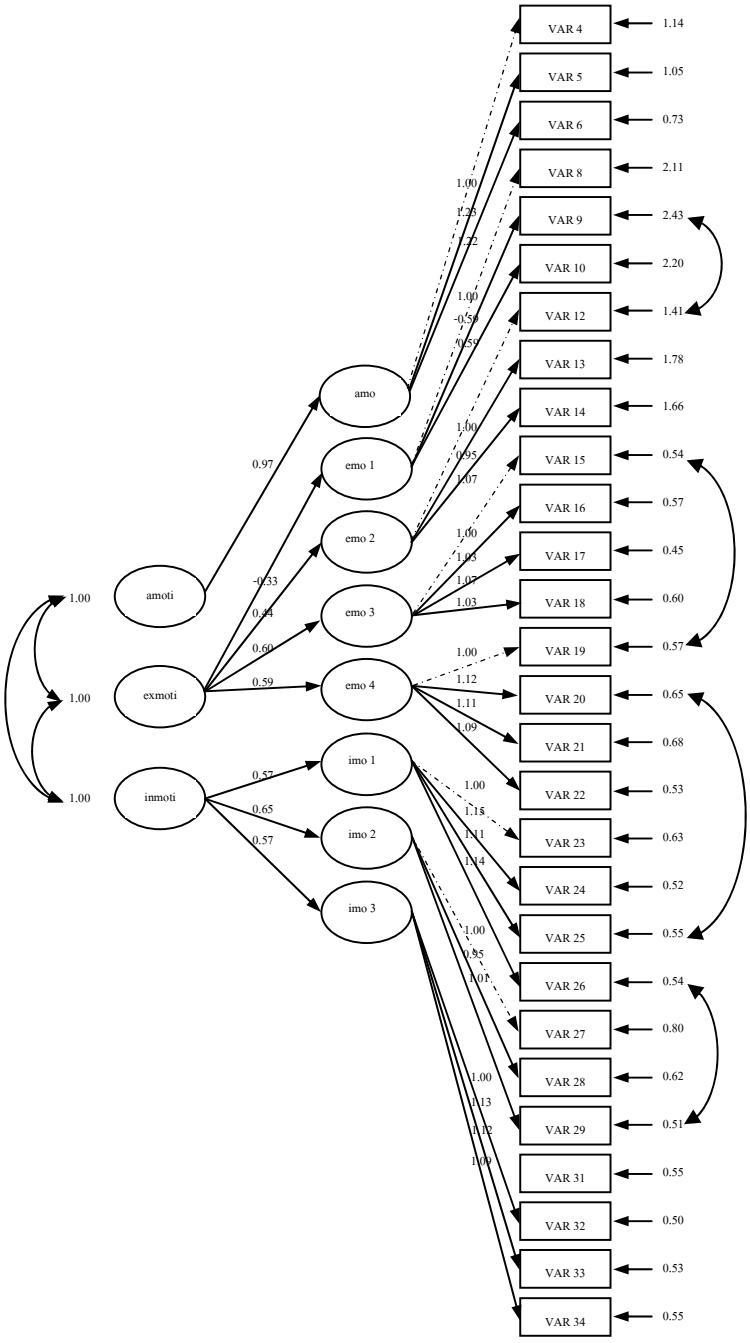
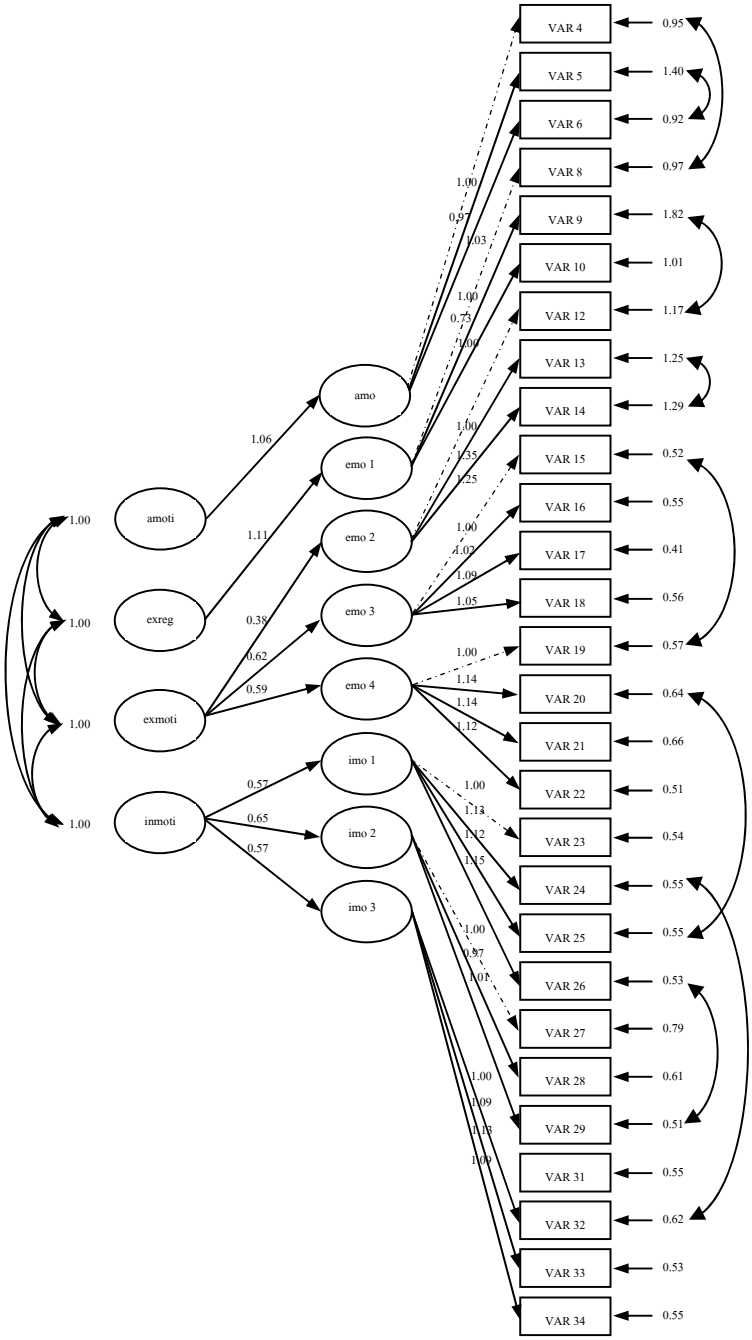


Figure 2
The Second Order of TEMS: 4 factors



The Structural Equation Model of Exercise Motivation and Exercise Behavior

A structural equation model was tested relating the four motivation factors to the exercise behavior. The exercise behavior factor was measured by the indicators of exercise frequency, duration, and intensity.

The structural model fit the data well, χ^2 = 2024.63, df = 427, RMSEA = 0.047 (CI: 0.045:0.049), NNFI = 0.97, CFI = 0.98. The results of the relationship between exercise motivation (amotivation, externalizing, extrinsic motivation and intrinsic motivation) and exercise behaviors (frequency duration and intensity) model are presented in Table 5. The parameter estimates indicated that extrinsic motivation and intrinsic motivation were shown to be significantly related to exercise behavior ($p < .01$).

The path coefficients and t-value showed amotivation and extrinsic motivation were negatively related to the exercise behavior while externalizing and intrinsic motivation were positively related to the exercise behavior (Figure 3).

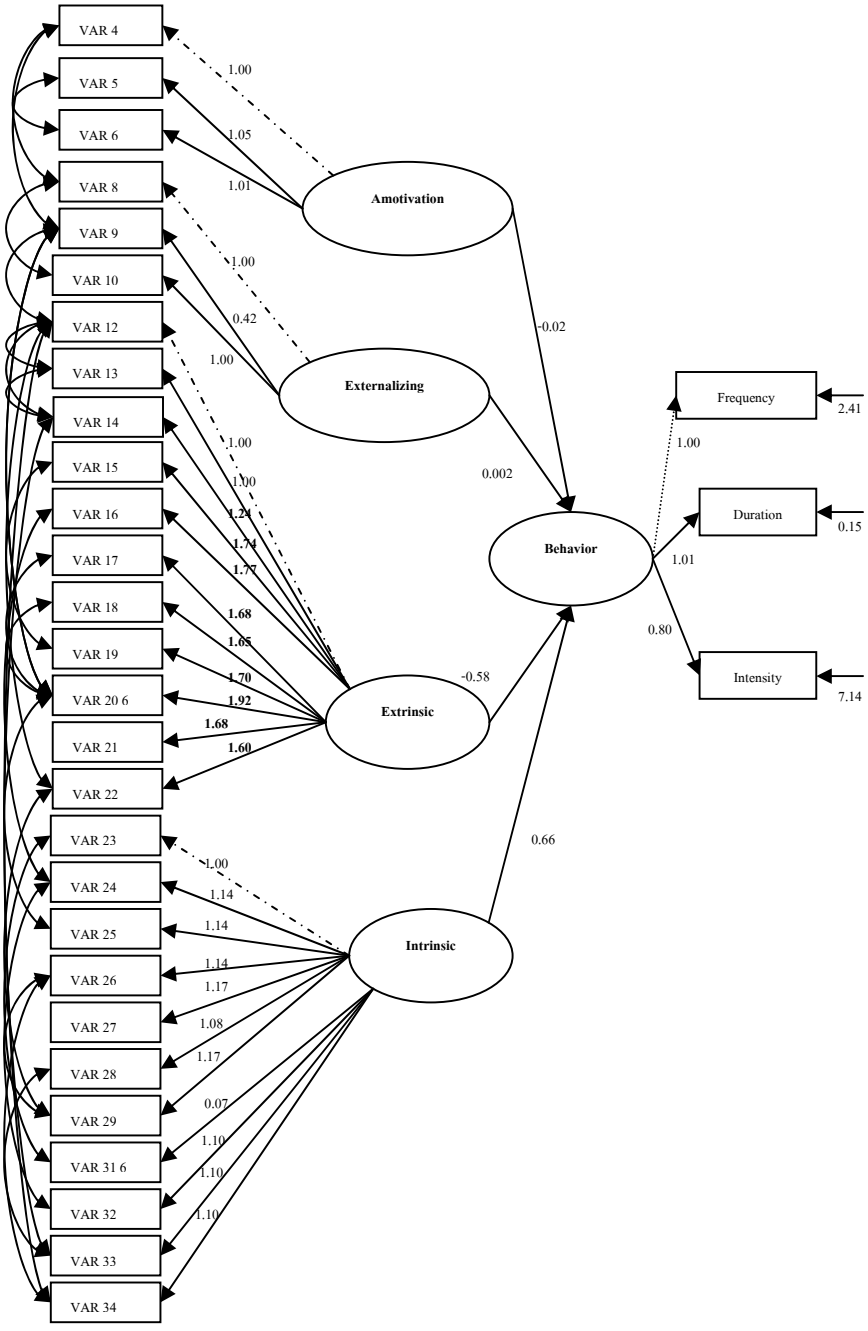
The structural equation model of exercise motivation and exercise behavior was examined and showed that extrinsic motivation and intrinsic motivation are related to exercise behavior of Thai youth. Additionally, intrinsic motivation is the most influential factor in the exercise motivation of young Thai participants and this is followed by the factor of extrinsic motivations.

Table 4: Structural Path Coefficients Results

Structural	Coefficient	t value	Error
Amotivation – Behavior	-0.02	-0.67	0.025
Externalizing – Behavior	0.002	0.18	0.014
Extrinsic motivation – Behavior	-0.58	-2.86**	0.20
Intrinsic motivation – Behavior	0.66	4.56**	0.14

Note: t-value $\geq$ 2.54 are significant ($p < .01$) *

Figure 3
The structural equation model



Discussion

This study was conducted to test the relationship between exercise motivation and exercise behaviours based on self-determination theory (Deci and Ryan, 1985) among Thai youth.

The test of TEMS measurement model indicated reasonably good fit of data. From the statistical process the 4 types of subscales were considered for further analysis. The second order test of TEMS found that the related 8 subscales of TEMS did not fit for three types of motivation. The results showed factor correlations among three extrinsic motivation latent factors (identified, introjected and integrated), and three factors of intrinsic motivation (intrinsic motivation to know, intrinsic motivation to accomplish, and intrinsic motivation to sensations). Therefore, these TEMS subscales were revised into two factors called “Extrinsic Motivation” and “Intrinsic Motivation”. The second order test of TEMS found that the relationship of 8 subscales of TEMS to 4 types of motivation showed good fit. This result showed that the continuum of self-determination could not explain motivation in Thai youth as being of eight types. This grouping process was also employed in previous studies (Pelletier et al., 1995; Liukkonen et al., 2003).

It is noteworthy that it was possible to construct the relative autonomy index or self-determination index, which has been used as a continuum variable of motivation varying from external to true intrinsic motivation (Pelletier et al., 1995), due to the high correlations between 3 factors of extrinsic motivation (identification, introjection, and integrated regulation) and 3 factors of intrinsic motivation.

Liukkonen et al., (2003) found a correlation between identification, introjection, and intrinsic motivation. This relationship can be formulated by combining the levels of the motivation continuum so that intrinsic motivation, identified, introjected, integrated regulation, include varying levels of self-determination, whereas extrinsic motivation does not (Vallerand, 2001).

Descriptive data show that 44.5% of the whole sample participated in exercise activity (aerobic dance, walking, jogging, cycling, weight training), 33.2% participated in sport activity (football, volleyball, basketball) and 22.3% participated in combined activity. However the majority of males engaged in more sport activity while

females engaged in more exercise activity. The majority of participants (46.6%) had been engaged in their exercise programs for over 1 year, which indicated that these participants were out of the dropout phase. Exercise participants' adherence to various forms of physical activity shows that approximately one half of individuals who do join organized exercise programs drop out within six months to a year (Dishman, 1988, 2001). However over 60% of women in the current study had been exercising less than 6 months while over 60% of men had been exercising more than 6 months.

An examination of the exercise habits (including frequency of exercise, duration of each exercise session and intensity of workout) of the participants was undertaken. ACSM (1990) guidelines for exercise are exercising a minimum of 3-5 days per week (at least 3 days), 20-60 minutes per session (at least 20 minutes) and at intensity level 12-16 on the RPE . The majority of participants engaged in over 20 minutes of exercise per session, at average of 3 days a week with average RPE of 14. Thus, the participants in this study met the guidelines from ACSM for frequency, duration and intensity of exercise.

In addition, the descriptive data for the exercise routine of these participants show that males engaged in sport activity for approximately 60 minutes per day, and females engaged in exercise activity approximately 30 minutes per day. Therefore, promotion for exercise adherence should set the duration of time goals to these levels in all sport activity programs for males and females respectively.

The structural model fit index indicated that the structure model of exercise motivation to Thai exercisers has fit. The extrinsic and intrinsic motivations were shown to be significantly related to exercise behavior ($p < .01$). Participants have both extrinsic and intrinsic reasons for participation in their exercise activities. In fact, some participants engage in their exercise because they are resolved on getting a healthy body and mind, and feeling good about doing it, while some participants exercise because they like to be with other people and wish to keep their expected weight and body shape. Intrinsic and extrinsic factors have been studied to determine their relationship to exercise behavior. In general, extrinsic factors such as weight control and appearance have been linked to exercise initiation (Dishman, 1988), while intrinsic factors such as mastery of task and enjoyment have been linked to greater exercise adherence (McAuley, Wraith and Duncan, 1991; Oman and McAuley, 1993).

Wetherington (2004) employed EMS to analyze only regular exercisers' responses to the following scales of the EMS: amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, intrinsic motivation to learn, intrinsic motivation to accomplish things and intrinsic motivation to experience sensations. On average, regular exercisers scored higher on the intrinsic motivation scales than the amotivation and extrinsic motivation scales. With the exception of the scale reflecting intrinsic motivation to learn, participants' scores tended to increase with the number of questions reflecting intrinsic motivation. Regular exercisers' scores on the scales of intrinsic motivation support the notion that having intrinsic motivation to exercise facilitates long-term exercise behavior.

Dunn and Rollnick (2003) stated that intrinsic motivation and the autonomous motivation are imperative in maintaining preferable health behaviors in the long-term. Li (1999) found higher intrinsic motivation and integrated internalization were related to higher exercise effort and interest. Similarly, Frederick and Ryan (1993) examined participation motivation and found that people who participated in individual sport were more greatly motivated by interest and enjoyment of their activity, which is indicative of intrinsic motivation, while those involved in fitness activities were driven to participate for motives concerned with body appearance, which is indicative of extrinsic motivation. In this study, the data showed that participants engaged in both activities (sport and exercise activity), so that both extrinsic and intrinsic motivation were influences on exercise behavior.

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References

American College of Sport Medicine. 1990. Position stand on the recommended quantity and quality of exercise for developing and maintaining cardio respiratory and muscular fitness in health adults. *Medicine and Science in Sport and Exercise*. 22: 256-274.

Bentler, P. M. 1990. Comparative fit indices in structural models. *Psychological Bulletin.* 107(2): 238-246.

Blair, S. 1993. Physical activity, physical fitness and health. *Research Quarterly for Exercise and Sport.* 64: 365-376.

Borg, B. A. 1982. Psychophysiological bases of perceived exertion. *Medicine and Science in Sports and Exercise.* 14: 377-381.

Browne, M. W. and Cudeck, R. 1993. Alternative ways of assessing model fit. In K. A. Bollen and J.S. Long (eds.), *Testing structural equation models.* Newbury Park, California: Sage.

Byrne, A. and Byrne, G. 1993. The effect of exercise on depression, anxiety and other mood states: A review. *Journal of Psychosomatic Research.* 37: 565-574.

Campbell, P. G., MacAuley, D., McCrum, E. and Evans, A. 2001. Age differences in the motivation factors for exercise. *Journal of Sport and Exercise Psychology.* 23: 191-199.

Coakley, J. J. and White, A. 1992. Making decisions: Gender and sport participation among British adolescents. *Sociology of Sport Journal.* 9: 20-35.

Deci, E. L. 1975. *Intrinsic motivation.* New York: Plenum Press.

Deci, E. L. and Ryan, R. M. 1985. *Intrinsic motivation and self-determination in human behavior.* New York: Plenum Press.

_____. 1991. A motivation approach to self: Integration in personality. *Nebraska Symposium on Motivation.* 38: 237-288.

_____. 2000. The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry.* 11: 227-268.

Dishman, R. K. 1988. Exercise adherence: Its impact on public health. Champaign, Illinois: Human Kinetics.

_____. 2001. The problem of exercise adherence: Fighting sloth in nations with market economies. *Quest.* 53: 279-294.

Douthitt, V. L. 1994. Psychological determinants of adolescent exercise adherence. *Adolescence.* 29: 711-722.

Dunn, C. and Rollnick, S. 2003. *Lifestyle change.* London: Elsevier Limited.

Frederick, C. M. and Ryan, R. M. 1993. Differences in motivation for sport and exercise and their relations with participation and mental health. *Journal of Sport Behavior*. 16: 124-145.

Frederick, C. M., Morrison, C. and Manning, T. 1996. Motivation to participate, exercise affect, and outcome behaviors toward physical activity. *Perceptual of Motor Skill.* 82: 691-701.

Iso-Ahola, S. and Clair, B. 2000. Toward a theory of exercise motivation. *Quest.* 52: 131-147.

Jöreskog, K.G. and Sörbom, D. 2002. *LISREL 8.53.* Lincolnwood, Illinois: Scientific Software International.

Li, F. 1999. The exercise motivation scale: Its multifaceted structure and construct validity. *Journal of Applied Sport Psychology.* 11: 97-115.

Liukkonen, J., Jaakkola, T., Biddle, S. and Leskinen, E. 2003. Motivation antecedents of physical activity in Finnish youth. *Manuscript Submitted to the Scandinavian Journal of Medicine and Science in Sports.* [Online]. Available from: http://www.nuorisuomi.fi/files/ns/liikuntaharrastuksena [Accessed 2005 June 13].

McAuley, E., Wraith, S.C. and Duncan, T.E. 1991. Self-efficacy, perceptions of success and intrinsic motivation for exercise. *Journal of Applied Social Psychology*. 21: 139-155.

Mueller, R. 1996. *Basic principles of structural equation modeling: An introduction to LISREL and EQS.* New Orleans: Springer Press.

National Coalition for Promoting Physical Activity. 1996. *An agenda for physical activity and health: Public policy priorities of the National coalition for promoting physical activity.* [Online]. Available from: http://www.ncppa.org/ ncppa/ncprior.htm [Accessed 2002 May 15].

National Statistical Office of Thailand. 2001. *The survey of health status and security*. [Online]. Available from: http://www.nso.go.th/thai/stat/stat_23/toc_4/4.5-3 [Accessed 2003 April 18].

Oman, R. F. and McAuley, E. 1993. Intrinsic motivation and exercise behavior. *Journal of Health Education.* 24: 232-238.

Pappous, A. 2003. Predicting exercise adherence in fitness clubs. In *Proceedings XIth European congress of sport psychology*, July 22-27 (p.125). Copenhagen: University of Copenhagen Press.

Pelletier, L. G., Fortier, M. S., Vallerand, R. J., Tuson, K. M., Briere, N. M. and Blais, M. R. 1995. Toward a new measure of intrinsic motivation, extrinsic motivation, and amotivation in sport: The sport motivation scale (SMS). *Journal of Sport and Exercise Psychology.* 17: 35-53.

Polit, D.F. and Hungler, B.P. 1995. *Nursing research: Principle and methods.* Pennsylvania: Lippincott.

Risto, T., Xiaolin, Y., Lauri, L. and Jorma, V. 2000. Physical activity in childhood and adolescence as predictor of physical activity in young people. *American Journal of Preventive Medicine.* 13: 317-323.

Roberts, G. C. 1992. *Motivation in sport and exercise*. Champaign, Illinois: Human Kinetics.

Ryan, R. M. and Deci, E. L. 2000. Self–determination theory and the facilitation of intrinsic motivation, social development, and well–being. *American Psychologist.* 55: 68-78.

Steiger, J. H. 1990. Structural model evaluation and modification: An interval estimation approach. *Multivariate Behavioral Research.* 25: 173-180.

Tabachnick, B. G. and Fidell, H. H. 1996. *Using multivariate statistic*s (3rd ed.). New York: Harper Collins

Tsang, E. C. K., Szabo, A. and Robinson, A. 2003. A cross-cultural examination of motivational components of exercise adherence in sport and exercise. In *Proceedings XIth European congress of sport psychology* (p.172). Copenhagen: University of Copenhagen Press.

Tucker, L. R. and Lewis, C. 1973. A reliability coefficient for maximum likelihood factor analysis. *Psychometrika*. 39(1): 1-10.

U.S. Department of Health and Human Services. 1996. *Physical activity and health: A report of the surgeon general.* Atlanta, GA: Dept. of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

Vallerand, R. J. 2001. A hierarchical model on intrinsic and extrinsic motivation in sport and exercise. In G.C. Roberts (ed.), *Advance in motivation in sport and exercise* (pp.263-319). Champaign, Illinois: Human Kinetics.

Vallerand, R. J., Blais, M., Brière, N. and Pelletier, L. 1989. Construction & validation de l'Échelle de motivation en education. *Revue Canadienne Des Sciences Du Comportement.* 21: 323-349.

Weinberg, R. and Gould, D. 1995. *Foundation of sport and exercise psychology.* Champaign, Illinois: Human Kinetics.

Wetherington, J. 2004. *Relationships among emotion, motivation, and exercise behavior: regular exercisers' and sedentary individuals' subjective and cortical response to exercise stimuli.* Thesis of Master of Science. University of Florida.

Yan, J. H. and McCullagh, P. 2002, April. Children's motivation in physical activity: Cultural influences. In *Paper presented at the 2002 AAHPERD National convention and exposition.* [Online]. Available from: http://aahperd.confex.com/aapherd/2002/finalprogram/paper_1321.htm [Accessed 2003 June 12].

Yeung, R. 1996. The acute effect of exercise on mood state. *Journal of Psychosomatic Research.* 40: 123-141.