Effects of Self-Efficacy, Body Mass, and Cardiorespiratory Fitness on Exercise Motives in Chinese College Students

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Abstract

Background: Researchers have studied exercise determinants primarily from cognitive and social psychology perspectives, which typically give minimal attention to the body as a physical and biological entity. With the belief that tapping into multi-dimensional variables would potentially help us better understand motivation in exercise, we designed this study to examine the influences of self-efficacy, body mass, and cardiorespiratory fitness level on Chinese college students’ leisure-time exercise motives.

Methods: 208 college students completed measures of self-efficacy and exercise motives during regular physical education classes. Their body mass and cardiorespiratory fitness level data were derived from the latest annual physical training test. Multiple regression analyses were conducted to investigate the effects of self-efficacy, body mass, and cardiorespiratory fitness on exercise motives.

Results: Cardiorespiratory fitness level and self-efficacy in exercise significantly contributed to both psychological and interpersonal motives. Body mass was the only significant predictor for body related motives. However, analyses of health and fitness motives did not result in any significant predictors.

Conclusion: Physical and psychological variables have both independent and specialized functions on exercise motives. Future motivational studies in exercise should pay greater attention to ecological approaches that account for physical, psychological, and social factors.
Exercise Motives and Determinant 3

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Physical activity is an important part of cardiovascular disease prevention and overall health promotion. Researchers have established that regular physical activity reduces the risk of premature mortality and disability from a variety of health conditions, especially cardiovascular disease. Although the benefits of exercise are well documented, a global problem of physical inactivity exists. Particularly, college students’ physical activity levels are of concern. In China, approximately 40% to 60% of college students do not participate in adequate amounts of physical activity to accrue health benefits. It is discouraging that college students’ physical activity behaviors have not improved while in higher education, as demonstrated by the reported decline in physical activity levels with each year in college. Because motivation is a driving force for individuals’ physical activity and exercise engagement, it is essential to understand Chinese college students’ motivation characteristics and other influential factors.

An important distinction concerning motivation in exercise is between intrinsic and extrinsic motives for participation. Intrinsically motivated behaviors are those performed for the satisfaction one gains from engaging in the activity itself. Exercising for reasons such as enjoyment, revitalization, and challenge reflect intrinsic motivation, as they are associated with positive emotions one has while experiencing exercise. By contrast, extrinsically motivated behaviors are those that are performed in order to obtain rewards or outcomes that are separate from the behavior itself. Based on the degree of relative autonomy, extrinsic motivation can be either self-determined or not self-determined. For example, exercising in order to lose weight and improve appearance reflects motivation that is extrinsic and not self-determined, as they indicate a desire to attain ego enhancement or feelings of self-worth. Other exercise motives,
such as affiliation, fitness, and health-related reasons, may represent self-determined extrinsic motivation, as they reflect personal values that are not as dependent on external approval. Researchers support the idea that intrinsic, rather than extrinsic, motives are more likely to sustain long-term exercise participation.

Given the significant role of motives on exercise participation, it is important to consider possible determinants of these motives when developing effective motivational strategies. To date, researchers have studied exercise determinants primarily from cognitive and social psychology perspectives, which typically give minimal attention to the body as a physical and biological entity. This constitutes a paradoxical phenomenon that impedes the advancement of knowledge within the fields of exercise and physical activity behavior because physical activity inherently involves the body. An adequate understanding of exercise and physical activity behavior must integrate cognitive and social factors as well as the role of the physical body.

Recognizing the importance of an integrative analysis of behavior in exercise, we designed this study. Specifically, we used self-efficacy, body composition, and cardiorespiratory fitness level as representatives of psychological and physical variables to investigate how they work collectively to influence exercise motives.

Self-efficacy refers to a judgment about one’s capability to successfully perform a task at given levels. Based on Bandura’s statement, self-efficacy is the most influential component of self-knowledge in people’s everyday lives. Individuals who perceive higher self-efficacy demonstrate better behavior, enhanced performance, and more intrinsic motivation than those who find these needs thwarted. Accordingly, Chase found that adolescents’ self-efficacy was significantly associated with positive attitude and intrinsically motivated leisure-time exercise behaviors. Consistent results have been found in other studies.
From a physical perspective, the relationship of body mass and cardiorespiratory fitness level with exercise have been explored. Due to the increase in body-related concerns among contemporary societies, researchers have investigated the influences of body mass on exercise engagement. For example, Ingeldew, Hardy, and De Sousa examined the effects of body mass on the exercise motives of European adults. They found that among men, body mass predicted weight management motives while among women, a discrepancy between actual and ideal body mass predicted weight management motives. The authors suggested that men were more likely to exercise for weight management reasons if they were actually overweight; however, women were more likely to exercise for weight management reasons if they were dissatisfied with their body size. Ingledew and Sullivan further confirmed this hypothesis in adolescents.

Cardiorespiratory fitness level has been associated with disability from a variety of health conditions. Some evidence suggests that health status plays a role in exercise engagement, particularly with cardiac rehabilitation. In addition, reductions in major coronary risk factors are typical adaptations to exercise training. Pinta et al. reported that cardiorespiratory fitness can influence college student’s satisfaction in exercising and preferred exercise intensity. They recommend that monitoring cardiorespiratory fitness levels may provide useful information regarding possible paths by which physical variables might influence physical activity participation.

The purpose of this study was to investigate the influence of self-efficacy, body mass, and cardiorespiratory fitness level on Chinese college students’ leisure-time exercise motives. Given documented gender-specific perceptions and beliefs in the correlates of physical activity, we used gender as a category variable in the analyses. The questions this study sought to answer were: (a) to what extent did exercise motives differ between male and female
Chinese college students? and (b) to what extent did the three psychological and physical variables influence exercise motives?

To date, research on Chinese college student exercise motivation is still in the early stages and few studies on this topic have been reported. We would argue that this represents a significant void in the existing literature. An important contribution of this study is the simultaneous examination of physical and psychological variables in the physical activity domain, which explores the students’ collective associations with leisure-time exercise motives. In addition, the Chinese represent a distinct social, cultural, and ethnic population when compared to those in western countries. Thus, this study will provide useful information for further understanding the influences of cultural, social, and ethnic factors in exercise behavior.

Method

Participants and Setting

Participants in this study consisted of 218 undergraduate college students attending a large public university, of approximately 20,000 undergraduate students, in Shanghai, China. Among the participants, 10 were unable to complete all measures due to absences and other reasons, thus, the final sample consisted of 208 students (105 men and 103 women, age range=18-23 years, mean age=20.1 years). Participants were mainly freshmen and sophomores majoring in the fields of nursing, social work, and biology. Participants were recruited during their compulsory physical education classes. Permission to conduct the study was obtained from the university review board and the participants prior to the investigation.

Unlike the United States, physical education in China is a compulsory course for all undergraduate students. The State Committee of Education stipulates that college students must receive at least two hours of physical education every week in their first two years of college.
Additionally, in order to enhance students’ fitness level and physical activity participation, since the 1990’s the State Committee of Education has enacted a set of physical standards called the ‘National Physical Culture Training Standards’. College students must meet the criteria of these standards to pass their physical education requirement. These standards list measures and assessments for health-related fitness, such as measuring cardiovascular endurance with a long-distance run test (i.e., 1000-meter run for men and 800-meter run for women), muscular strength using pull-ups or push-ups, and body composition using height and weight. These standards have enhanced the development of physical education in Chinese schools.

**Variables and Measures**

*Exercise motives.* Motives for participating in leisure-time exercise were measured using a 51-item Exercise Motivations Inventory version 2 (EMI-2), which was designed to measure a broad range of exercise participation motives. The 51 items were randomly placed in the scale and attached with a 6-point Likert type scale (5=very true for me, 0=not true at all for me) for students to rate reasons why they exercise. The EMI-2 measured 14 motives for exercising: Stress Management, Revitalization, Enjoyment, Challenge, Social Recognition, Affiliation, Competition, Health Pressures, Ill-Health Avoidance, Positive Health, Weight Management, Appearance, Strength & Endurance, and Nimbleness. Each of the scales from the EMI-2 demonstrates good internal reliability, ranging from .69 to .95. For data reduction purposes, the 14 motives could be further grouped according to conceptual relatedness into five submodels. These submodels were labeled: Psychological Motives (i.e., Stress Management, Revitalization, Enjoyment, and Challenge); Interpersonal Motives (i.e., Social Recognition, Affiliation, and Competition); Health Motives (i.e., Health Pressures, Ill-Health Avoidance, and Positive Health); Body Related Motives (i.e., Weight Management and Appearance); and Fitness Motives (i.e.,
Strength and Endurance, and Nimbleness). There is strong support for the factorial validity of the instrument and invariance of the factor structure across gender.\textsuperscript{22}

Out of many instruments available for measuring exercise motives, \textsuperscript{23, 24} we selected the EMI-2 because it is able to assess a broad range of exercise motives. Although theoretically-driven measurements have proven useful in testing theory-related research questions, such instruments have a restricted range of motives and are not very applicable due to the broad and more differentiated conception of motives in exercise.\textsuperscript{25} To promote physically active lifestyles, researchers \textsuperscript{26, 22} have argued that understanding direct and surface level participation motives are important because they can help tailor practical exercise interventions to meet personal needs.

\textit{Self-efficacy.} Perceived self-efficacy in exercise was assessed using a 14-item Perceived Self-Efficacy Scale.\textsuperscript{27} The scale consisted of items that measured the confidence levels of individuals when participating in physical activity under various conflicting situations. The items were measured on a 100\% scale, ranging from 0\% (“I am not sure that I can do it”), through intermediate degrees of assurance (“I am somewhat sure that I can do it”), to complete assurance of 100\% (“I am very sure that I can do it”). The scale score was obtained by calculating the mean of all the item scores. An example of an item from this scale is, “I can exercise even though I’m tied up with family chores.” The Chinese version of the self-efficacy scale has been used in previous studies on exercise and has demonstrated acceptable reliability.\textsuperscript{28}

\textit{Body mass.} Body mass was assessed using Body Mass Index (BMI), which was calculated as weight in kilograms divided by height squared in meters. BMI has been found to be strongly related to various physiological measures of fatness.\textsuperscript{29} Its construct validity is well demonstrated. As an effective indicator of body composition, BMI has been broadly used in the study of health and exercise.\textsuperscript{30}
Cardiorespiratory Fitness (CF). Cardiorespiratory fitness was tested using a long-distance run test (1000-meter run for men and 800-meter run for women) taken at a 400-meter standard oval track field. The score was the time (in seconds) the students took to finish the test. Less time indicates a higher cardiovascular endurance level. Given the large student population and real school conditions, the long-distance run is the most applicable measurement to examine students’ CF level in China. Morrow, Jackson, Disch, and Mood supported that using long-distance run performance is acceptable for assessing adolescents’ overall CF level. The reader should take the limitation of such field-based (rather than physical-fitness laboratory-based) CF test into account when interpreting the findings.

Procedure

The questionnaires were translated into Chinese by the first author, who is fluent in both Chinese and English. The translation was then validated by bilingual Chinese-American scholars (n=4) in physical education and kinesiology not affiliated with the study. Back-translation from Chinese to English was later done by a native Chinese individual, fluent in English, who found no deviations in meaning. The Chinese version was then piloted on 30 college students to check that it was intelligible and acceptable. The students were not part of the main study sample.

Questionnaires were administered in regular physical education classes by the second author. The participants were encouraged to answer as truthfully as possible. They took approximately 35 minutes to complete the questionnaires. The participants’ height, weight, and long-distance run performance were derived from their latest annual physical training test, which was conducted two weeks prior to data collection. The second author was permitted by the school’s physical education department to record the participants’ test results.

Data Analysis
In a preliminary analysis, all data was subjected to an accuracy screening, descriptive analyses, and a series of statistical assumption tests. Reliability of the questionnaire data was examined using Cronbach’s approach for internal consistency. The psychometrics of the EMI-2 was examined using a principal-components factor analysis to inspect its factor structure. In turn, we conducted MANOVAs to examine the differences between men and women in exercise motives.

Subsequently, two Pearson Product-Moment correlation analyses, separately for men and women, were conducted to examine the bivariate associations between the variables. Finally, multiple regression analyses were conducted to investigate the effects of self-efficacy, BMI, and CF on exercise motives. In recognition of the fact that there were to be multiple tests of significance, we set the alpha at .01 rather than .05 to avoid possible type I error rates.

**Results**

A principal-components factor analysis was conducted to test the construct validity of the EMI-2 Chinese version in this study. The results (both orthogonal and oblique rotations) revealed the same five-dimensional factor structure of exercise motives as that assessed by the EMI-2 with British students. The five-factor solution accounted for 64.8% of the total variance in the EMI-2 data. Five items was deleted due to their cross loadings on different factors. In summary, factor 1 accounted for 16.5% of the variance and comprised the 11 items of Psychological Motives (eigenvaule=2.09), measuring exercise for Stress Management, Revitalization, Enjoyment, and Challenge. Factor 2 accounted for 14.1 % of the total variance and consisted of the 11 items of Interpersonal Motives (eigenvalue=2.05), measuring exercise for Social Recognition, Affiliation, and Competition. The third factor accounted for 12.2 % of the variance and comprised the 11 items of Health Motives (eigenvaule=1.46), measuring exercise for Health
Exercise Motives and Determinant 11

Pressures, Ill-Health Avoidance, and Positive Health. The fourth factor accounted for 12.0% of the variance and comprised the 8 items of Body Related Motives (eigenvaule=1.41), measuring exercise for Weight Management and Appearance. The fifth factor accounted for 10.0% of the variance and comprised the 5 items of Fitness Motives (eigenvaule=1.23).

Accordingly, the exercise motive measures were constructed by averaging the scores of all the items in each dimension. The internal consistency coefficients (Cronbach α) in the measures ranged from .78 to .89. Gender invariance was also demonstrated. Thus, the results from the factor analysis provided validation support for the revised EMI-2 Chinese Version. The Cronbach α, means, standard deviations, and possible range for all variables are reported in Table 1.

**Gender Differences in Exercise Motivators**

A MANOVA was used to determine if men and women differed in exercise motives. Results indicated that men had higher exercise motivation for interpersonal reasons \(F_{(1, 206)} = 20.26, p < .01, \eta^2 = .10\) than did women. Women, however, had higher exercise motivators for body-related reasons \(F_{(1, 206)} = 17.17, p < .01, \eta^2 = .08\) than did men. Differences in other exercise motivators were not found.

**Correlation Analysis**

Table 2 displays the correlations between self-efficacy, BMI, CF, and exercise motives. Overall, a positive correlation was found between CF and self-efficacy for both men and women. A weak and negative correlation was observed between CF and BMI for men but not for women. There was no correlation between BMI and self-efficacy for either gender. Although some of the correlations between exercise motives were strong, they were not high enough to precaution multicollinearity problems in the regression analyses.32
Regression Analyses

Multiple regression analysis, separately for men and women, were used to examine the influences of the predictor variables on different exercise motives. The basic model tested on each motive included the main effects for self-efficacy, BMI, and CF. In addition, because it is assumed that psychological and physical factors may interact to influence exercise motivation and behavior, secondary regression analyses were followed to include interactions between self-efficacy, BMI, and CF as predictors in addition to the original predictors.

Table 3 reports the results of the regression analyses. For men, CF was the only significant predictor for psychological motives when the contribution of BMI and self-efficacy was not significant. The model predicted 16% of the variance in psychological motives. However, for women, self-efficacy was the only significant predictor. The impacts of CF and BMI were not found. The model predicted 22% of the total variance. There were no significant interaction effects.

The analysis for interpersonal motives resulted in two positive predictors for men: CF and self-efficacy. In the analysis, the model accounted for 20% of the variance in interpersonal motives. For women, self-efficacy was the only valid predictor, and a contribution from CF was not found. The model accounted for 18% of the variance. For both men and women, BMI did not predict interpersonal motives. Similarly, the interactive effects of the predictive variables on interpersonal motives were not found.

For both men and women, BMI was the only significant predictor in the analysis for body related motives. The model accounted for 18% and 14% of the variance for men and women respectively and no interactive effect emerged. The analyses of health and fitness motives did not
find any significant predictors for either gender, suggesting that BMI, CF, and self-efficacy may not be directly associated with health-related and fitness motives for exercise.

Discussion

Our study was designed to explore the influences of body mass, cardiorespiratory fitness, and self-efficacy on Chinese college students’ leisure-time exercise motives. The results support that male and female Chinese college students have different motives for exercise. Psychological and physical variables have independent and specialized effects on motivating Chinese college students’ participation in leisure-time exercise.

Compared with women, the male participants had higher interpersonal motivators (e.g., Social Recognition, Competition, and Affiliation), suggesting that men were more likely to participate in exercise for social purposes. Exercise and physical activities may provide a platform for male students to pursue interpersonal goals. On the other hand, the female participants had higher exercise motivators for body related reasons (e.g., Weight Management and Appearance), suggesting that women were more likely to participate in exercise due to body concerns. Because beliefs about the body are culturally defined and reflect patterns of social relations within the society, we suspect the Chinese cultural expectations that women should be thin may have influenced female students’ motives for exercise.

There was a positive correlation between cardiorespiratory fitness level and self-efficacy for both men and women. This finding suggests that cardiovascular endurance was associated with self-efficacy to some extent. In other words, students with higher CF were more likely to have higher self-efficacy in exercise than their counterparts with lower CF. This result echoes Pinta and colleagues’ finding concerning the function of cardiorespiratory fitness on motivation. Nevertheless, the relatively moderate correlation between the two indicated that self-
efficacy could explain variance in exercise motives that is not explained by cardiorespiratory fitness level.

BMI was negatively correlated with CF in men, suggesting that in men, CF was reflected in their BMI. Higher body mass was likely to result in a lower CF level. However, a similar correlation was not found in women, suggesting that female cardiovascular endurance level was not related to BMI. This result is inconsistent with those of Mota, Flores, Riberiro, and Santos, who found that female European adolescents’ BMI negatively influenced their CF. We attributed the discrepancy to the overall homogeneous BMI of the female participants’ ($M=20.3$, $SD=2.37$) in this study. The lack of variation might diminish the potential connection between CF and body mass.

The results of the regression analyses support both physical and psychological variables have a significant impact on exercise motivation. Particularly, self-efficacy, BMI, and CF demonstrated independent and specialized roles in exercise motives. For example, the significant main effects of CF and self-efficacy on male interpersonal motives support that both CF and self-efficacy had independent impacts on male exercise motives for interpersonal reasons. High cardiorespiratory fitness level and self-efficacy can lead male college students to pursue social recognition, competition, or affiliation through exercise and physical activities. Dishman and Gettman suspected that physical and psychological variables had additive effects on exercise adherence in a clinical study. However, such a psychobiological assumption has not received much subsequent support, primarily because it is difficult to address effective psychological and physical factors within a real physical activity environment. Our results may fit within this assumption. Simultaneous assessment of self-motivation and physical condition may
substantially facilitate the production of effective intervention strategies to enhance Chinese college students’ physical activity involvement.

In addition to independent effects, we found that psychological and physical factors had significant specialized roles in different motives as well. These specialized functions were reflected not only in exercise motives but also in gender specialization, and, to some extent, the impact of psychological and physical factors on exercise motives was mediated by gender. For women, self-efficacy was the only significant predictor of exercise motives for psychological and interpersonal purposes. High self-efficacy might encourage female college students to adopt self-determined and intrinsic motivators for participation in leisure-time exercise. However, for men, CF was the strongest predictor among the three variables. Effective cardiorespiratory fitness level could directly motive male college students to participate in exercise for self-determined reasons.

Although there was a significant gender difference in the group means, both male and female exercise motives for body related reasons were positively predicted by their BMI. It is suggested that body dissatisfaction could provoke both genders to exercise for weight management reasons. Because weight management can be characterized predominantly as an extrinsic motive, we speculated that possessing an overweight image could initiate extrinsic motivations for Chinese college students’ leisure-time exercise.

We did not find a negative effect of BMI on any of the exercise motives. Higher body mass did not undermine the participants’ ability to exercise for intrinsic (e.g., psychological motives) and self-determined extrinsic reasons (e.g., interpersonal, health, and fitness motives). It is possible that Chinese college students would like to adopt multiple goals for participating in leisure-time exercise. In health intervention practices, this finding reminds us that many college
students are prompted by body dissatisfaction and begin exercise for weight management reasons. The role of health intervention is then to initiate the process of internalization.

It is assumed that psychological and physical factors may also interact to influence exercise motivation and behavior. Statistical support for this assumption would come in the form of an interaction (a psychological variable X a physical variable) on a single motive measure. However, our result did not support this assumption. There were no significant interactions among self-efficacy, BMI, and CF, indicating their interactive role in exercise motives was very minimal. We suggest that future research should further address this issue.

Last, our analyses did not found that self-efficacy, BMI, and CF could predict Chinese college students’ motives for health and fitness purposes. For both genders, there were no significant predictors for health and fitness motives. We suspect this condition may be attributed to the students’ perception of health and fitness. Although Chinese college students were able to recognize the potential benefits of exercise on health, the health- and fitness- related outcomes might be perceived as an incidental by-product of Chinese college students’ physical activity behaviors. Students might share a similar belief that exercise is good for health and fitness, regardless of psychological and physical differences. The high average of the two exercise motives in our descriptive analysis may support our assumption.

Conclusion

In summary, the findings of this study outlined the effects of self-efficacy, body mass, and cardiorespiratory fitness level upon exercise motives. Thus, the study comprised both psychological and physical variables. The results strongly support that physical and psychological variables have both independent and specialized functions on exercise motives. We recommend that future motivational studies in exercise and physical activity pay greater
attention to ecological approaches that account for physical, psychological, and social factors. Without such integration, we are likely to lose sight of the bigger picture involved in the complex motivational processes of exercise and physical activity engagement.
Reference


Exercise Motives and Determinant 19


Table 1

*Psychometric properties and descriptive statistics (men=105, women=103)*

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<th>Variable</th>
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Table 2:

Correlations among self-efficacy, BMI, CF, and exercise motives for men and women (men =105 and women =103)

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<td>.37**</td>
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Note. Correlations for women are above the diagonal, and correlations for men are below the diagonal. SE = Self-efficacy; PM = PsychologicalMotives; IM = Inter-personal Motives; BM = Body-related Motives; FM = Fitness Motives; HM = Health Motives.

* p<.05, ** p<.01.
Table 3

*Hierarchical Regression Analyses*

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