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# Chinese College Students' Physical Activity Correlates and Behavior: A Transtheoretical Model Perspective

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## Abstract

Guided by the Transtheoretical Model (Prochaska & DiClemente, 1982), this study investigated the differences of physical activity levels and correlates (i.e., self-efficacy, decisional balance, process of change) across different stages of change levels among Chinese college students. The relationships between students' physical activity correlates and physical activity behavior was also examined. The participants were 887 college students (365 males; $M_{age}$ = 20.51, *SD* = ± 1.67) recruited from four universities in south and south-canter China. Participants completed a battery of established questionnaires assessing their physical activity correlates (self-efficacy, decisional balance, process of change) and 1-week physical activity levels. Results suggested that Chinese college students in the high stage of change group reported significantly higher physical activity levels and correlates than those in the low stage of change group. Pearson correlation analyses suggested that students' self-efficacy was moderately related to other correlates and physical activity behavior. Yet, decisional balance and process of change were only modestly associated with physical activity levels for both groups. Regression analyses further revealed students' self-efficacy emerged as the only significant contributor of their daily PA levels across the two groups. However, decision balance and process of change failed to predict physical activity levels. The implications for practice and direction of future research were discussed.

**Keywords:** *Decisional balance, Physical activity levels, Process of change, Self-efficacy*

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**Introduction**

Although the benefits of regular physical activity participation are well-documented, most Chinese youth and adults are not regularly active and tend to drop out from structured physical activity programs (Li, Yang, Wu, & Yang, 2015; Sun, 2016). Research suggests that poor physical activity participation trends among college students are partially due to a lack of motivation (Dinger & Waigandt, 1997; Patrick, Covin, Fulop, Calfas, & Lovato, 1997; Wei, 2009) -- a driving force that "gets us going, keeps us moving, and helps us get jobs done" (Pintrich & Schunk, 1996, p. 4). Motivation influences students' achievement behaviors and outcomes such as effort, activity choice, and engagement. Consequently, it is critical for researchers to examine physical activity correlates in this population. Inquiry in this area will provide physical activity instructors information to aid in motivating college students to actively participate in physical activity, both in and out of a classroom setting. In the present study, we attempt to investigate Chinese college students' physical activity correlates and behavior from a Transtheoretical Model perspective.

The Transtheoretical Model is the most popular stage-based approach applied in physical activity contexts during the past three decades (Prochaska & DiClemente, 1981). The Transtheoretical Model is a theory of therapy which assess an individual's readiness to adopt a healthy behavior. Individuals applying the Transtheoretical Model progress through a series of stages consisting of different behavioral and psychological patterns with the intention of eventually accepting and implementing a healthy behavior. Individuals are classified into one of the following six stages when assessed on their readiness to engage in behavior change: precontemplation, contemplation, preparation, action, maintenance, and termination (Prochaska & DiClemente, 1982; Marcus & Forysth, 2003).

In the Precontemplation stage, an individual has no intention on change their behavior. This reluctance may be due to several factors – lack of motivation or information, for example. The second stage is contemplation. In this stage, individuals begin to think about changing their behavior within the next six months. Individuals in this stage often contemplate the pros and cons of adopting this new behavior. It should also be noted that individuals in the contemplation stage are not yet ready to act and change their behavior. The third stage is the preparation stage. Individuals in the preparation stage typically have a plan for how they intend to change their behavior, and intend to act within the first month of entering the stage. Action is the fourth stage of behavior change, and refers an individual acting on their previously developed behavior change plan. It should be noted that the action stage is the most variable stage, with individuals having the greatest risk of regressing to a previous stage. If an individual successfully obeys for six months or longer, they will enter the maintenance stage. The primary focus of the maintenance stage is preventing relapse to previous stages. Most individuals who have changed their behavior fall somewhere in the maintenance stage (Edberg, 2007). Individuals only enter the termination stage when they feel no desire to regress to previous stages or engage in the old behavior. Notably, behavior change interventions typically only observe the first five stages of the Transtheoretical Model as the termination stage can take much longer ($\geq$ 6 months) to be observed. Knowing the possible characteristics that each individual may possess during each stage of the Transtheoretical

Model is useful when designing the health intervention for each participant, and may even promote effective intervention outcomes.

As individuals progress through each stage of the Transtheoretical Model, it is crucial to adjust intervention strategies to address the unique psychological and cognitive requirements of each stage. It should be noted that the Transtheoretical Model is not linear. That is, individuals do not progress from one stage to the next, but instead may enter the model at any stage or even regress to previous stages in the model. Thus, tailoring each stage of the intervention will not only increase intervention retention, but will also lighten resistance to participation in the desired behavior (Prochaska & Marcus, 1984). Therefore, the Transtheoretical Model usage has been prominent in facilitating the development and implementation of behavior change interventions in physical activity and health.

In the past, the Transtheoretical Model has been implemented when evaluating college students' physical activity (Levy & Cardinal, 2006). However, an insufficient literature source exists regarding the use of the Transtheoretical Model to examine physical activity correlates and behavior in a Chinese college student sample. A Transtheoretical Model-based perspective to better understand college students' physical activity correlates and behavior in China is warranted. Therefore, the purposes of the present study were two folds: 1) to examine the differences of physical activity levels and correlates across different stage levels among Chinese college students; and 2) to investigate the relationships between students' physical activity correlates (i.e., self-efficacy, decisional balance, process of change) and physical activity behavior.

## Methods

### *Participants*

A total of 887 college students (365 males; $M_{age}$= 20.51 years old, $SD$ = ± 1.67) from four universities in south and south-canter China were recruited for this study. The data collection was conducted in 2016-2017. Inclusion criteria for this study were: (1) 18-25 years old; (2) body mass index ≥ 18.5; (3) no self-reported diagnosed physical or mental disability; and (4) provided informed consent.

### *Outcome Variables*

*Physical Activity Levels.* The 6-item self-reported Chinese version of International Physical Activity Questionnaire (IPAQ-SF) (Macfarlane et al., 2007) was used to assess Chinese college students' physical activity levels. The IPAQ required participants to recall physical activity engagement of ≥10 minutes in duration within the last seven days. The 6-item IPAC-C has also shown acceptable measurement properties with Chinese populations. In the present study, we estimated hours of physical activity per week by exercise intensity levels (moderate and vigorous), and calculated the estimated metabolic equivalent (MET) for each participant based upon the American College of Sports Medicine and the American Heart Association physical activity recommendations (Haskell et al., 2007). In this study, we treated walking as 3.3METs, moderate physical activity as 4.0METs, and vigorous PA as 8.0 METs. When evaluating physical activity levels, the American College of Sports Medicine and the

American Heart Associations' physical activity recommendations of 30 min of moderate-intensity physical activity at least 5 days per week or 20 min of vigorous-intensity physical activity at least 3 days per week, or greater than 450 METs per week when combining moderate- and vigorous-intensity physical activity, were used to categorize participants.

*Body Mass Index.* Body mass index were calculated for each subject using weight (kilograms) divided by height (meters) squared. Body mass index was assessed and calculated.

*The Transtheoretical Model variables*. Psychosocial variables aligned with the Transtheoretical Model were evaluated using self-efficacy, decisional balance, and process of change (behavioral and experimental processes). Self-efficiency was measured by a 9-item scale established and tested by Rodgers and colleagues (2008). During this assessment, participants will rate how confident they feel in specific exercise situations (e.g., "…exercise when you feel discomfort" or "…exercise when you lack energy") using a percentage scale (0%: not confident – 100%: extremely confident). Decisional balance was assessed by the Decisional Balance Questionnaire (Marcus & Owen, 1992; Marcus, Rakowski & Rossi, 1992). While taking this 6-item questionnaire, participants will be asked questions regarding the positive and negative perceptions of changing exercise behavior. Participants will be asked to assess the importance of items regarding their decision to exercise, responding on a 5-item scale with a pro and con subscale (5: extremely important – 1: not important at all). Process of change was evaluated by a 40-item measure established and tested by Marcus, Rossi, Selby, Niaura, and Abrams (1992). This questionnaire aims to evaluate the experimental (social liberation, self-reevaluation, dramatic relief, environmental reevaluation, and conscious raising) and behavioral (self-liberation, stimulus control, reinforcement management, helping relationships, and counterconditioning) processes regarding the Transtheoretical Model stages of behavior change. The questionnaire uses a 5-point Likert scale (5: Repeatedly – 1: Never) to assess the degree to which an individual uses different behavior change strategies.

### *Procedures*

The procedures were approved by the ethics review committees at the participating universities. Consent was also obtained prior to the start of this study. All data were collected by the primary researchers during regular college physical education classes. Data collection was completed by the end of school years in 2016 and 2017, respectively. Participation was voluntary, and no extra credit was awarded to participating students. That is, college students interested in participation provided consent and completed questionnaires in their college physical education classes. The questionnaires were comprised of general demographic information and self-reported measures assessing physical activity levels, stages of change, self-efficacy, decisional balance, and process of change. In addition, students' heights and weights were measured in class.

### *Data Analyses*

The data were analyzed in four steps. First, a one-way (2 groups) analysis of variance

(ANOVA) was conducted to examine if students from high stage or low stage would differ in physical activity levels. Students who reported in the first three stages (precomtemplation, comtemplation, preparation) were classified as low stage of change; while the rest (action, maintenance) were classified as high stage of change. Second, a one-way multivariate analysis of variance (MANOVA) was performed to determine whether stage group differences existed among students' self-efficacy, decisional balance, and process of change. Third, Pearson Product Moment correlation coefficient (PPMCC) was calculated to identify significant relations among students' self-efficacy, decisional balance, process of change, and physical activity levels. Fourth, two simultaneous multiple regressions were performed to assess the relative contributions of self-efficacy, decisional balance, and process of change to students' physical activity levels for the two stage groups.

## Results

### *Group Differences in the Outcome Variables*

Table 1 details the descriptive statistics for the whole sample and two stage groups, respectively. ANOVA was conducted to examine stage group effect on students' self-reported physical activity levels. Results indicated that students from high stage group ($M_{METs}$ = 483.83) reported significantly higher physical activity levels than those from low stage group ($M_{METs}$ = 333.16), $F_{71, 760}$ = 74.80, $p < 0.001$, $\eta^2$=.09.

Table1

*Descriptive Statistics among the Outcome Variables (N = 875)*

| Variable | Total sample | | Low stage | | High stage | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| Self-efficacy | 2.62 | .84 | 2.43 | .79 | 2.98 | .82 |
| Decision balance | 3.40 | .55 | 3.35 | .56 | 3.49 | .53 |
| Process of change | 3.04 | .61 | 2.94 | .60 | 3.21 | .59 |
| Physical activity | 389.91 | 244.05 | 333.16 | 207.26 | 483.83 | 270.35 |

*Note. SD* = standard deviation.

Before conducting the MANOVA analysis, we screened the assumption of multivariate normality and homogeneity of variance-covariance matrices. The values of skewness ranged from - .52 to - 1.44, suggesting the outcome variables (self-efficacy, decisional balance, process of change and physical activity levels) were approximately normally distributed. In addition, the Box M test yielded no violation of the assumption of homogeneity of variance-covariance matrices ($F$ = .67, $p > 0.05$). The results of MANOVA revealed a significant main effect for group (Wilks' $\Lambda$ = 0.897, $F_{3,871}$ = 33.23, $p < 0.001$, $\eta^2$=.103). Further, univariate F tests, as shown in Table 1, suggested that high stage students reported significantly higher scores than low stage students on self-efficacy, $F$ (1, 873) = 98.21, $p < 0.001$, $\eta^2$ = 0.101; decisional balance, $F$ (1, 873) = 13.82, $p < 0.001$, $\eta^2$ = 0.016; and process of change, $F$ (1, 873) = 38.59, $p < 0.001$, $\eta^2$ = 0.42.

**Pearson Product Moment Correlations**

The correlations among the outcome variables for the two groups are detailed in Table 2. In general, self-efficacy was moderately positively related to physical activity levels and the other the Transtheoretical Model beliefs across the two groups ($r$ = 0.32 -0.55). These correlations suggest students who had positive ability beliefs were more likely to report high levels of physical activity and demonstrate positive attitudes towards physical activity. Similarly, students' decisional balance and process of change were moderately positively associated with each other across the two groups ($r$ = 0.49 - 0.52). However, the positive relationships between decisional balance, process of change and physical activity were modest ($r$ = 0.15 - 0.24).

Table2

*Correlation Analyses among the Outcome Variables (N = 875)*

| Variables | Low stage (N = 469) | | | | High stage (N = 283) | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 1. self-efficacy | - | | | | - | | | |
| 2. decision balance | 0.322 | - | | | 0.382 | - | | |
| 3. process of change | 0.492 | 0.489 | - | | 0.549 | 0.521 | - | |
| 4. physical activity | 0.331 | 0.145 | 0.212 | - | 0.423 | 0.228 | 0.235 | - |

Note. * $p$ < .001.

**Multiple Regressions**

To examine the predictive utility of students' self-efficacy, decisional balance, and

Table 3

*Results of Regression Analyses on Students' Physical Activity Levels*

| Variables in Equation | $R^2$ | $R^2$ Change | β | *p* |
|---|---|---|---|---|
| *Low stage* | | | | |
| Model | 0.335 | 0.113 | | 0.001 |
| Self-efficacy | | | 0.296* | 0.001 |
| Decision balance | | | 0.023 | 0.654 |
| Process of change | | | 0.055 | 0.316 |
| *High stage* | | | | |
| Model | 0.43 | 0.185 | | 0.001 |
| Self-efficacy | | | 0.408* | 0.001 |
| Decision balance | | | 0.09 | 0.159 |
| Process of change | | | -0.036 | 0.615 |

*Note.* β values are standardized regression coefficients from the final stage of the regression analysis; * $p$ < .001.

process of change to their physical activity levels, we conducted two simultaneous multiple regression analyses (see Table 3). Our data suggests that self-efficacy was the only significant and positive predictors for physical activity levels for students with low stage of change, $F$ (3, 465) = 19.71, $p < 0.001$, $\beta = 0.30$. Similarly, self-efficacy emerged as the only predictor for physical activity levels for those with high stage of change, $F$ (3, 279) = 21.06, $p < 0.001$, $\beta = 0.41$. In other words, neither decisional balance nor process of change significantly predicted students' physical activity levels across the two groups.

**Discussion**

This study was an initial attempt to draw on the the Transtheoretical Model to identify the mean values of Chinese college students' physical activity levels and correlates across different stage levels. The study also examined the relationships between college students' the Transtheoretical Model-based correlates (i.e., self-efficacy, decisional balance, and process of change) and physical activity behavior. In general, students displayed relatively low levels of physical activity behaviors as proved by the self-reported METs; these trends were particularly prominent among the students in low stage of change. Pearson correlations revealed significant and positive relationships among college students' self-efficacy and other the Transtheoretical Model outcomes, as well as physical activity levels. Further analysis suggested that self-efficacy emerged as the only significant predictor for physical activity levels.

The first research purpose of the present study was to discern the difference of students' physical activity levels and correlates as a function of stage group. As expected, Chinese college students in the high stage of change group had significantly higher physical activity levels and the Transtheoretical Model-based correlates (self-efficacy, decisional balance, and process of change) than those in the low stage of change group. This finding is in accordance with previous studies indicating that individuals in the high stage of changes would demonstrate high level of physical activity correlates and behavior (Levy & Cardinal, 2006; Marcus & Forsyth, 2003). It is known that individuals in the action and maintenance phases tend to be more physically active than those in the first three phases (e.g., Marcus & Forsyth, 2003). Also, individuals in the action and maintenance phases are more likely to be confident about their ability to engage in and demonstrate positive attitudes toward physical activity. Nevertheless, the present study provides new empirical evidence to support the Transtheoretical Model in the field of physical activity and health among Chinese college students. Future research possibilities may also include college students from other countries to compare the differences of physical activity levels and correlates across different cultural groups.

The second research objective was conducted to examine the relationships that exist between students' self-efficacy, decisional balance, process of change, and physical activity behavior. The data suggests that self-efficacy was moderately and positively related to decisional balance and process of change in this population. This relationship suggests that individuals who are efficacious tend to display positive attitudes more frequently than negative attitudes, and individuals who display positive attitudes are more likely to believe they can perform the given behavior in comparison with their negative-attitude counterparts. These

findings are in line with the statement proposed by the Transtheoretical Model (Prochaska & DiClemente, 1982, 1983; Marcus & Forsyth, 2003).

Regarding the relationship among students' the Transtheoretical Model-based correlates and physical activity behavior, the results suggest that students' self-efficacy was moderately related to physical activity, but decisional balance and process of change were only modestly associated with physical activity for both groups. Further regression analysis suggested that self-efficacy emerged as the only positive predictor of physical activity levels for both high and low stage groups. However, college students' decisional balance and process of change failed to significantly predict their physical activity levels. These results partially support the research literature as they are in line with the extant studies indicating that self-efficacy play critical roles in an individuals' physical activity behavior (Griffin-Blake & DeJoy, 2006; Kim & Cardinal, 2009; Kim, Cardinal, & Lee, 2006). Particularly, students are more likely to engage in physical activity when they believe they can accomplish the specific activity or task. Health professionals should aim to maintain high self-efficacy among students, and assist them in avoiding the perception of inadequacy. To achieve this, professionals should learn an individual's level of ability, attempt to produce a sense of accomplishment by providing specific and timely feedback, and use student role models which offer secondhand experiences (Gao, Lee, & Harrison, 2008; Gao, Xiang, Lee, & Harrison, 2008). Furthermore, researchers and professionals should positively reinforce task completion as well as assist students in successfully completing specific tasks as mastery experience is crucial in enhancing self-efficacy.

To date, research utilizing the Transtheoretical Model to increase physical activity has exclusively been completed among individuals with disabilities (Kosma, Gardner, Bauer, & McCubbin, 2006), populations of mixed race/ethnicity (Kim & Cardinal, 2009), and multiple child and adult samples (Levy & Cardinal, 2006; Lewis, Marcus, Pate, & Dunn, 2002; Papandonatos et al., 2012; Pope et al, 2015). Past research and further investigations have regarded self-efficacy (i.e., situational self-confidence for a behavior) and divisional balance (i.e., pros and cons of engaging in a behavior) as the most noteworthy and affected constructs within the Transtheoretical Model (Griffin-Blake & Dejoy, 2006; Kim & Cardinal, 2009; Kim, Cardinal, & Lee, 2006). For instance, in a 12-month randomized controlled trial conducted by Papandonatos et al. (2012), significant increases in physical activity-related self-efficacy and decision balance were observed in both the print- and phone-based intervention after 6 months, with additional improvements observed in the print-based group at 12 months, and improvements in physical activity were observed as a result. Furthermore, reviews of the Transtheoretical Model and the model's constructs – self-efficacy and decisional balance – have supported the aforementioned research, suggesting this model to be useful in promoting behavior change (Lewis et al., 2002). In summation, the Transtheoretical Model-based approach to behavior change interventions gives health professionals the opportunity to offer stage-tailored health interventions which have demonstrated higher success rates for behavior change than other non-stage tailored approaches. (Lewis et al., 2006; Park et al., 2008).

The finding that decisional balance and process of change failed to emerge as a predictor of students' physical activity levels was not expected as the Transtheoretical Model suggests these two correlates are related to an individual's behavior (Prochaska & DiClemente,

1982, 1983). A plausible explanation may be that the question items assessing these constructs were not sensitive to the target population in the present study. This finding further suggests that in-depth investigation of Chinese college students is warranted for future research.

This study has several strengths and limitations. A major strength of the study is the inclusion of a large sample of Chinese college students, an understudied population in the developing countries, and the comparison of physical activity levels in students with high stage of change and low stage of change. The present study also reported detailed physical activity levels among Chinese college students and their Transtheoretical Model-based correlates. However, a major limitation of this study is the use of a self-reported physical activity questionnaire to assess college students' past 7-day physical activity behavior. To offer decent validity of research findings, more accurate and objective physical activity instruments, such as health wearables or accelerometers, should be adopted in the future. Second, this study is limited by its cross-sectional design, which did not allow us to conclusively determine the direction of relationships among physical activity correlates and behavior.

To our knowledge, this is the preliminary study investigating physical activity behavior within a large Chinese college student sample. The conclusions drawn by this study contribute to the growing literature pool regarding college physical activity participation in a developing country population. These findings may help inform researchers and educators on the status of Chinese college students' physical activity behavior and trends, as well as strengthen existing college-level physical activity programs. For future trials, it is necessary to use randomized controlled trials to examine the effectiveness of physical activity interventions given that most Chinese college students reported relatively low physical activity levels. Future physical activity interventions could potentially focus on developing and maintaining a physically active lifestyle.

In summary, this study implemented the rigorous theoretical framework the Transtheoretical Model (Prochaska & DiClemente, 1982, 1983) to examine physical activity correlates among Chinese college students; with the ultimate goal of improving the pool of knowledge and practice techniques related to physical activity behaviors from a psychosocial perspective. Additionally, this study allowed for the examination of physical activity psychosocial processing among college students from a developing country. Research focused on promoting college students' physical activity levels and health is warranted. Not only does this study broaden our understanding of the implementation and maintenance of a physically active lifestyle, it also assists in the creation of a holistic program that addresses a broad range of psychosocial factors which will assist college students in adopting a physically active lifestyle. Undoubtedly, the conclusions drawn from the study can be used to inform researchers and educators on effective promotion of Chinese college students' physical activity correlates and physical activity levels, with the ultimate goal of improving health and preventing chronic diseases.

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