

Southern Chinese Collegiate Stage of Exercise Behavior Changes and Exercise Self-Efficacy

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Abstract

This study aimed to examine southern Chinese college student (N = 1983) stage of exercise behavior changes (SEBC) and their exercise self-efficacy (ESE). The SEBC and ESE scales were used to collect data. ANOVA was performed to investigate the differences in ESE by SEBC. Post Hoc Tukey tests were employed to determine which variables contributed to the differences. The data from the study indicated that those who maintained regular participation in exercise had significantly higher ESE than those who did not. It is concluded that improving college student ESE might lead to an increase in exercise.

Key words: Chinese college students, stages of exercise behavior changes, and exercise self-efficacy.

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Introduction

Obesity has become an epidemic across the world (World Health Organization, 1998) and no age, gender, or ethnicity is spared (U.S. Department of Health and Human Services [USDHHS], 2000). Reducing obesity in the general population has become one of the greatest challenges of our time (Keating, Guan, Castro, & Bridges, 2005a). To date, many efforts have been made to investigate the etiological factors concerning the increase of obesity since the 1980s (Eisenmann, 2006; Finkelstein, Ruhm, & Kosa, 2005). It is suggested that either genetic (i.e., defective genes) or environmental (i.e., adverse conditions or infectious agents) factors must be the cause if a disease happens persistently in a population over several generations (Jablonka, 2004). Because evolution of human

genetics is a very slow process, it is very likely that environmental variables have resulted in the epidemic of obesity in recently years (Brownson, Boehmer, & Luke, 2005; Eisenmann, 2006).

Although many environmental factors may have contributed to the obesity epidemic, as one of the critical factors, physical inactivity has captured tremendous attention among health and PA experts (National Institute of Health [NIH], 1996; USDHHS, 2001). Both individual current and lifetime PA levels have been targeted for change (Calfas et al., 2000; Thompson, Humbert, & Mirwald, 2003). Very limited success has been reached in increasing either current or lifetime PA levels in the general population, however, resulting in continuous calls for more action on this issue from public health institutes (e.g., USDHHS, 1996, 2000). Health and PA experts are frustrated by the fact that no effective approaches have been identified to change individual's PA behaviors. This gap in knowledge hinders preventive efforts to reduce chronic diseases caused by obesity and overweight.

In response to the long-term failure to significantly promote PA in the general population, public health professionals have come to the conclusion that effective intervention strategies sensitive to specific settings and cultural background are urgently needed (USDHHS, 2000). It has been suggested that strategies to enhance awareness, change behaviors, and create environments that support physically active lifestyle may produce enduring PA pattern changes (Bauman, Sallis, Dzewaltowski, & Owen, 2002; King, Stokols, Talen, Brassington, & Killingsworth, 2002).

Studies have shown that the steepest decline in PA occurs during adolescence (i.e., 15 to 18 years of age) and young adulthood (i.e., 20 to 25 years of age) (USDHHS, 1996). Because it is difficult getting adults to be physically active, public health associations have set up several national health objectives targeting adolescents and young adults in an effort to establish habitual PA patterns as early as possible in life (USDHHS, 2000). As the last opportunity to

educate a large segment of young adults, higher education plays an important role in producing physically active individuals for society (Keating et al., 2005a). Once individuals leave education systems, their PA behaviors become completely voluntary. In addition, it has been indicated that PA patterns established in college are very likely to be carried throughout one's entire adulthood and thereby influence long-term health (Sparling & Snow, 2002). Thus, it is critical to ensure there are ways to help college students establish habitual PA patterns.

Studies in both the United States (US) and the People's Republic of China (PRC), however, have found that, on average, about two thirds of college students were classified as physically inactive (Behrens & Dinger, 2003; Huang et al., 2003; Keating et al., 2006). Although many health and PA professionals have begun to pay attention to college student PA (American College Health Association [ACHA], 2002; Sallis et al., 1999; Suminski & Petosa, 2002), similar to that in the general population, significant improvement of student PA behaviors still remains to be seen. As a result, higher education has been one of the primary settings that is targeted to change student PA levels (ACHA, 2002).

Among studies on changing college student PA levels, the stages of exercise behavior change (SEBC) have been an important line of research on this topic in the US (Dannecker, Hausenblas, Connaughton, & Lovins, 2003; Wallace & Buckworth, 2001, 2003). It was found that individuals' PA levels were not the same and people needed to go through different stages to eventually change their PA behaviors (Marcus & Simkin, 1994; Pinto & Marcus, 1995; Seefeldt, Malina, & Clark, 2002). Based on the stages-of-change model (Prochaska & DiClemente, 1983), Marcus and associates (Marcus, Selby, Niaura, & Rossi, 1992) adopted it to investigate exercise behavior change. Using a self-reported method, five SEBC could be classified. They were precontemplation (PC), contemplation (C), preparation (P), action (A), and maintenance (M). According to Dannecker and associates (Dannecker et al., 2003), PC was the stage in which individuals were not physically active and had no intention to change their exercise behaviors. C stage was for those who had the intention but no actual actions to change their PA levels. People in P stage not only had intentions but also made some actions to change their PA behaviors. A stage was defined as the stage that individuals had begun consistent behavior change. People in the stage of M were most physically active and had participated in adequate amount of PA on a regular basis (i.e., three or more times per week, and 20 or more minutes each time) for at least six months (Marcus et al., 1992; Pinto & Marcus, 1995). The strengths of the SEBC were twofold. First, it focused on habitual PA behaviors (i.e., last longer than six months), providing a more accurate PA assessment than those which usually used one week or three days to represent individuals' PA patterns. And second, its low cost made it very feasible, even though it inherits all the weaknesses of self-reporting methods such as participant biases, and possible errors caused by inaccurate memory. If participants are adults and have no personal gains from the study, and the measures are habitual behaviors, the above weaknesses can be minimized to a great degree. In terms of costs and benefits, this scale has been very appealing to many researchers and has been used in various studies investigating PA behaviors of college students in the US (Leenders, Silver, White, Buckworth, & Sherman,

2002; Rosen, 2000; Wallace & Buckworth, 2001, 2003). Furthermore, the SEBC scale has been validated using self-reported PA in different samples of college students in different countries (Dannecker et al., 2003; Keating et al., 2005b).

The identification of SEBC was believed to be helpful for us to better understand who are ready to change their exercise behaviors and what interventions should be implemented accordingly (Keating et al., 2005a; Suminski & Petosa, 2002; Wallace, Buckworth, Kirby, & Sherman, 2002). In general, it has been reported that about 10-15%, 25 - 30 %, 15-20%, 15-20%, and 20-30% of American students were in PC, C, P, A, and M stages, respectively (Dannecker et al., 2003; Wallace & Buckworth, 2001, 2003; Wallace et al., 2000). This suggested that about two thirds of American college students were not physically active. On the other hand, data on Chinese southern college student PA levels suggested that student total PA declined steeply after the second year of higher education, providing empirical evidence that Chinese higher education has failed to promote PA among college students (Keating et al., 2006). Therefore, research on Chinese SEBC is needed so that results from such studies could shed light on how student PA behaviors changed during the four years in higher education. As a result, appropriate interventions can be implemented among students at different SEBC.

Along with research on SEBC, exercise self-efficacy (ESE) has been investigated to help understand PA behavior determinants in the western literature (Cardinal, Bauer, McCubbin, Kosma, & Gardner, 2006; Hager, 2002). Similar to other populations in the US, it has also been found that ESE is an important determinant for American college student PA behaviors (Sullum, Clark, & King, 2000; Wallace et al., 2000). Researchers indicated that ESE was positively related to levels of PA participation (Marcus et al., 1992; Sullum et al., 2000). Of more importance, ESE was one of the most influential variables on female college students' SEBC (Wallace & Buckworth, 2003; Wallace et al., 2000). Therefore, it has been suggested that the ESE enhancement of females might result in the increase of their PA levels, providing valuable guidance to female PA interventions (Keating et al. 2005a).

While individuals' PA behaviors have captured global attention, research on Chinese college student PA levels is still in its infancy (Keating et al., 2006). Fundamental data concerning student PA behaviors and determinants have not been available. This situation undermines the promotion of PA in higher education, which is also the last chance to educate a large group of young adults in PRC. In addition, volunteer PA behaviors play an extremely critical role to the wellness of Chinese in general as there are few, if any, PA intervention programs for adults and less exercise facilities and equipment available for students, compared to those in western countries (Keating et al., 2006). Thus, college student PA warrants a high level of attention among PRC health associations.

Knowledge of Chinese college student SEBC and ESE would help us better understand their PA patterns and the process of exercise behavior change. This information could shed light on the effects of higher education toward fostering physically active graduates for society. Furthermore, this information could guide purposeful interventions. In addition, data concerning student SEBC and ESE in PRC could make cross-cultural comparisons of PA available so that effective intervention strategies developed

in different countries might be shared. Therefore, the primary purpose of the study was to examine the relationship of SEBC and ESE using Chinese college students. The secondary objective of the study was to investigate the levels of student ESE by gender, age, and years in college in order to provide baseline data for further research on this topic. It is hoped that the study would stimulate more research on this topic so that physical inactivity among students in Chinese higher education can be deterred. It is hypothesized that students in the stage of M had the strongest ESE. Because it was found that ESE was positively related to American college student SEBC, it was very likely that ESE might also influence Chinese student SEBC. It was also hypothesized that students with unacceptable BMI had lower ESE than those with acceptable BMI. Given that students with acceptable BMI exercised more than those with unacceptable (Keating et al., 2006), those with unacceptable BMI might be in the earlier SEBC such as stages of PC, and C. In addition, the authors hypothesized that student ESE increased as their years in higher education increased. This was because Chinese college students were required to take physical education for the first two years and to pass fitness testing every year for four years. As a result, it was expected that Chinese students might improve their ESE through physical education in higher education. Finally, it was hypothesized that no gender differences in ESE should exist. The assumption was based on the fact that Chinese society encourages both genders to participate in sports and provides a relatively equal opportunity to education to those who passed the standardized national college entrance exam.

Method

This study was one component of a larger study on Chinese college student PA and its determinants. As a result, the participants, instrument translation and validation procedures, and data collection were identical to other parts of the study. More detailed information concerning the participants, instrument development, and data collection is available elsewhere (i.e., Keating et al., 2006; Keating et al., 2005b).

Participants

Students from four state universities ($N = 1843$) in a southern province were the participants. The four universities were selected because they represented southern regional universities (Keating et al., 2006). Unlike most western countries, almost all students lived in student dormitories on campus. The percentages of males and females were 55.3% and 44.6%, respectively. All participants were young adults ($M = 20.61$), ranging from 17 to 24 years old. The distributions of students in different years of college (i.e., freshmen, sophomore, junior, and senior) were about even (i.e., 25.3%, 25.9%, 25.1% and 23.7%).

Measures

Both the SEBC and the ESE were originally developed in English. They were translated into Chinese by the senior author. Then Chinese-American tenure track or tenured full-time faculty members ($N = 7$) in departments of kinesiology and/or health in the US verified the accuracy of the translation. Those selected faculty members have got Masters Degrees and Ph.Ds in kinesiology/health in China and the US, respectively. A pilot test was conducted to ensure the feasibility of the survey before actual data

collection began.

The SEBC. The SEBC scale modified by Marcus et al. (1992) was employed in the study. There are five statements in the scale, representing five SEBC. A yes or no answer was used to identify student SEBC. The Chinese version of the scale was tested using the same sample of participants and acceptable concurrent validity was reported (see Keating et al., 2005b).

The ESE. The ESE scale developed by Saunders and associates (Saunders, Pate, Felton, Dowda, Weinrich, Ward et al., 1997) was employed to collect ESE data. Regular exercise in the survey was defined as three or more times per week, and 20 or more minutes each time in order to be consistent with that in the SEBC scale. This scale was originally designed to measure children's perceived confidence in their ability to participate in regular exercise. Given the exercise barriers (i.e., time, exercise skills, weather, and social support) included in the survey were about the same as those found in college students (e.g., Keating et al., 2005a), it was deemed that the survey was also appropriate for college students. In total, 12 items were employed to assess individuals' beliefs in overcoming those exercise barriers. A 5-point Likert type scale was utilized to measure the strength of ESE with "5" standing for the strongest endorsement.

A principle component factor analysis with VARIMAX rotation was conducted on the 12-item ESE to determine whether or not it represented a complete construct. The results showed that one factor was retained in its entirety. The factor accounted for 38.87% of the variance and all factor loadings for the items equaled or exceeded .37 (.37 - .71). Internal consistency was acceptable with an alpha coefficient of .85 for the ESE factor.

Demographic information. Only basic demographic variables such as gender, age, year in college, height and weight were included in the survey along with other scales (e.g., Keating et al., 2006). Given the surveyed province did not have students with different races, ethnicity was not included in the demographic information. The data concerning height and weight were also collected for calculating the body mass index (BMI), using the self-reported method. It was believed that the self-reported height and weight data were accurate as their physical education professors assessed them during the standard fitness testing right before the data collection began.

Data Collection

This study did not use informed consent forms because there is no such practice in the PRC at the present time. The US guidelines for studies involving human subjects, however, were nevertheless followed when the data were collected. All participants who agreed to participate in the study were given a cover letter debriefing the purposes, the procedures, and the freedom to withdraw their participation before the surveys were distributed. For confidentiality, no student names were used in the study. Instructors of the selected classes administrated the surveys at the end of class in April-May. All the data were collected in four weeks to avoid errors caused by the timing of data collection. In total, 1843 out of 1914 were usable, resulting in a return rate of 96.3%. It is necessary to point out that the high return rate is associated with the sampling method used in the study.

Data Analysis

The BMI was computed using the Quetelet Index (body weight in kilograms divided by his or her height in meters squared). According to widely accepted guidelines set by the Obesity Education Initiative (Obesity Education Initiative, 1998), BMI was initially grouped into the following four categories: “BMI < 20.0 = underweight”, “BMI 20.0 – 24.44 = acceptable”, “BMI 24.45 – 29.44 = overweight”, and “BMI > 30 = obese”. Because there were few participants ($n = 4$) with BMI > 30, it was deemed not appropriate for any data analysis. Therefore, those with BMI > 25 were classified as “unacceptable” in the study.

For the ESE, the means and standard deviations of the 12 items were computed. Then the differences of ESE in the five SEBC were tested by one-way analyses of variance (ANOVA). ANOVA was further employed to test the differences of ESE by BMI, and years in university. Post Hoc Tukey tests were performed for all significant ANOVAs to identify where differences were in existence. Independent t-test was utilized to examine ESE difference in gender. A p value < .05 was considered significant. Age was not tested due to the fact that participants were all young adults and there was a very small age difference (i.e., maximum seven years of difference) among those students.

Result

Student SEBC and their ESE

Overall SEBC. Close to a half of the participants (46.0%) were not ready to change their PA behaviors as they were at the stage of PC. The percentage of students in the C stage was 15.5%. Less than one fifth (i.e., 19.0%) of the participants were about to change their PA behaviors (i.e., P stage). As a result, 80.5% of the surveyed students (i.e., 46.0% + 15.5% + 19.0%) were not engaged in regular PA. Only 12.0% students were physically active (i.e., M stage) while 7.4% were at the stage of A, beginning to participate in PA on a regular basis.

ESE by SEBC. An increase of ESE across the five stages was observed (see Table 1). The result of one-way ANOVA indicated that there was a significant ESE difference in SEBC [$F_{(4, 1790)} = 90.98, p < .001$]. The follow-up tests suggested students in stages of A and M had significantly higher ESE than those in the other three stages. No significant ESE differences between stages PC and C, and C and P were found.

Student ESE and Differences in Demographic Variables

ANOVA revealed that no significant ESE differences in BMI were found [$F_{(2, 1842)} = 2.49, p > .05$]. Regarding the ESE by year in university, the differences were significant [$F_{(3, 1842)} = 39.54, p < .01$]. Post Hoc tests indicated that seniors had significantly lower ESE than freshmen, sophomores, and juniors. Freshmen and sophomores had no difference in ESE. Juniors had a significantly higher average score than the others. Independent t-test suggested that males reported significantly higher ESE scores than their female counterparts. Table 2 presents detailed information concerning students ESE by demographic variables.

Discussion

Knowledge of SEBC is important as it may provide guidance to PA interventions. This study marks the first attempt to identify

southern Chinese college student SEBC. Future research can be built upon the results from the study and thereby improve the overall health of Chinese college students. On the other hand, ESE has been found to be strongly related to student SEBC in western literature. Information concerning student ESE, therefore, could help us better understand student PA behaviors. Four findings from the study warrant the attention of PA professionals in the PRC. First, serious interventions on college student PA levels are urgently needed as about four fifths of students were classified as physically inactive; second, as in the US, ESE is related to student SEBC. The improvement of student ESE might result in the increase of SEBC; third, student ESE declined during the last year of university, indicating the failure of physical education in higher education to promote PA among students; and finally, females had lower ESE than males and more attention should be given to female students. Each of the findings will be addressed in more detail.

Student SEBC and ESE. It is alarming that most students were at stages of PC and C, indicating they were not only physically inactive but also not ready to change their PA behaviors. This finding echoes the result reported by Keating et al. (2006) that most students did not participate in enough PA on a regular basis. An overwhelming body of documents has suggested that adequate amounts of PA are necessary to maintain sound health (China's Department of Education, 2000; USDHHS, 2000). Therefore, it is puzzling why most students in the study still adopted inactive lifestyles. Regardless of the reasons resulting in the above phenomena, health and PA professionals need to take serious action to effectively increase student PA levels.

The data from the study confirmed the hypothesis that students in the M stage had the highest ESE. This suggested that a certain level of ESE was needed in order to be physically active, though it is beyond the scope of the study to indicate a specific magnitude of ESE for changing SEBC. This contention was supported by the result that no significant difference in ESE was found between stages of PC and C where both stages had no regular PA behaviors. In addition, the increasing trend of ESE across the five SEBC further provides evidence to support the above notion (see Table 1). As noted earlier, the result is in line with that reported in the US literature (Sullum et al., 2000). Therefore, it is necessary to enhance student ESE in order to increase student PA levels. Caution, however, needs to be exercised as it is still unclear if ESE is the causative factor to SEBC.

Student ESE and demographic variables. It is interesting to note that no ESE difference in BMI was found, which was different from the hypothesis. Unfortunately, no data in the literature were available to explain why students with different BMI had the same ESE in PRC. There is one possible reason. The unexpected result might suggest that western BMI standards are not appropriate for the Chinese sample used in the study, because it has been noted that different BMI cut-off values for obesity were needed for Chinese (Cheng, 2003). More studies on the BMI cut-off values are needed in the future if this index is to be continuously used to classify obesity among Chinese.

It was unexpected that seniors had the lowest ESE. As pointed out by Keating et al. (2006), students were required to take physical education for the first two years in higher education in PRC. It was logical to expect students to increase their ESE as their educa-

tion went on, assuming that physical education programs did what they were designed to do. Unfortunately, the result from the study did not confirm this assumption completely, even though juniors had the highest ESE score (see Table 2). The significant decline of ESE in the fourth year of higher education is distressing as it indicated that students were not confident in their ability to exercise on a regular basis by the time they were about to graduate. With such low ESE, it is very unlikely that those students could participate in regular exercise on their own after they begin work and family life. Thus, physical education in higher education in PRC needs to investigate why student ESE declined in the last year of their education and modify the curricula to ensure to increase or at least maintain the increased ESE of the third year.

The hypothesis that no gender differences in ESE should be found was not confirmed. To date, however, it is unclear why gender difference in ESE was found as Chinese society in general encourages female youth to perform the same, if not better, as their male counterparts in sports and education. The data from the study might suggest that PA is different from sports and Chinese female athlete performance in the Olympics in recent years did not significantly help Chinese female students improve their ESE in PA. Because self-efficacy was found to be one of the most critical variables to female SEBC (Wallace & Buckworth, 2003; Wallace et al., 2000), it is necessary to pay more attention to female ESE.

Summary

It has been found that the identification of student SEBC was the first step to effective interventions on their PA behaviors. Many studies have indicated that individuals were at different SEBC and corresponding intervention strategies should be implemented. In addition, ESE was found to be a critical factor to SEBC. The data from the study suggested that most students were in the stages of PC and C and were not ready to change their PA behaviors. In regards to SEBC and ESE, an increasing trend of ESE across the five stages was found, confirming the results reported in the western literature. Moreover, student ESE reached the highest point in the third year and dramatically decreased during the fourth year in university, suggesting the need to reform physical education programs in order to better physically educate students. Surprisingly, gender difference in ESE was found and females had significantly lower ESE than male students in the PRC where the society promotes equal opportunity for sports and education for both genders. Finally, BMI was not a significant variable to student ESE using the cut-off values adopted by health professionals in the US. More research is needed to investigate the appropriate standards of BMI for obesity among Chinese samples.

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Reference

- American College Health Association. (2002). *Healthy Campus 2010: Make it happen*. Baltimore, MD: Author.
- Behrens, T.K., & Dinger, M.K. (2003). A preliminary investigation of college students' physical activity patterns. *American Journal of Health Studies, 18*(2/3), 169-172.
- Bauman, A.E., Sallis, J.F., Dziewaltowski, D.A., & Owen, N. (2002). Toward a better understanding of the influences on physical activity: The role of determinants, correlates, causal variables, mediators, moderators, and confounders. *American Journal of Preventive Medicine, 23*(2S), 5-14.
- Brownson, R.C., Boehmer, T.K., & Luke, D.A. (2005). Declining rates of physical activity in the United States: What are the contributors? *Annual Review of Public Health, 26*, 421-443.
- Calfas, K.J., Sallis, J.F., Nichols, J.F., Sarkin, J.A., Johnson, M.F., Caparosa, S. et al., (2000). Project GRAD: Two-year outcomes of a randomized controlled physical activity intervention among young adults. *American Journal of Preventive Medicine, 18*, 28-37.
- Cardinal, B.J., Bauer, J.J., McCubbin, J.A., Kosma, M., & Gardner, R.E. (2006). Psychosocial determinants of stages of change and physical activity among adults with physical disabilities. *Adapted Physical Activity Quarterly, 23*(1), 49-65.
- Cheng, T.O. (2003). Lower body mass index cut-off values for obesity in China. *Nutrition Reviews, 61*(12), 432-433.
- China's Department of Education. (2000). *Current status of college student health and fitness*. Beijing (China): People's Publisher.
- Dannecker, E.A., Hausenblas, H.A., Connaughton, D.P., & Lovins, T.R. (2003). Validation of a stages of exercise change questionnaire. *Research Quarterly for Exercise and Sport, 74*, 236-247.
- Eisenmann, J.C. (2006). Insight into the causes of the recent secular trend in pediatric obesity: Common sense does not always prevail for complex, multi-factorial phenotypes. *Preventive Medicine, 42*, 329-335.
- Finkelstein, E.A., Ruhm, C.J., & Kosa, K.M. (2005). Economic causes and consequences of obesity. *Annual Review of Public Health, 26*, 239-357.
- Hager, R.L. (2002). Evaluation of an internet, stage-based physical activity intervention. *American Journal of Health Education, 33*(6), 329-335.
- Huang, T.T.K., Harris, K.J., Lee, R.E., Nazir, N., Born, W., & Kaur, H. (2003). Assessing overweight, obesity, diet, and physical activity in college students. *Journal of American College Health, 52*(2), 83-86.
- Jablonka, E. (2004). Epigenetic epidemiology. *Epidemiology, 33*, 929-935.
- Keating, X.D., Haung, Y., Guan, J., Deng, M., Zhu, L. & Dwan, C. (2006). Southern Chinese collegiate student leisure-time physical activity patterns. *ICHPER-SD of Journal of Research, 1*(2), 18-26.
- Keating, X.D., Guan, J., Castro, J. & Bridges, D. (2005a). A meta-analysis of college student physical activity levels. *Journal of American College Health, 64*, 116-215.
- Keating, X.D., Guan, J., Haung, Y., Deng, M., Wu, J., & Qu, S. (2005b). A cross-culture validation of the stages of exercise behavior change scale. *European Physical Education Review, 11*(1), 71-83.
- King, A.C., Stokols, D., Talen, E., Brassington, G.S., & Killingsworth, R. (2002). Theoretical approaches to the promotion of physical activity: Forging a transdisciplinary paradigm. *American Journal of Preventive Medicine, 23*(2S), 15-25.
- Leenders, N.Y.J.M., Silver, L.W, White, S.L., Buckworth, J., & Sherman, W.M. (2002). Assessment of physical activity, exercise self-efficacy, and stages of change in college students using a street-based survey method. *American Journal of Health Education, 33*(4), 199-205
- Marcus, B.H., Selby, V.C., Niaura, R.S., & Rossi, J.S. (1992). Self-efficacy and the stages of exercise behavior change. *Research Quarterly for Exercise and Sport, 63*, 60-66.
- Marcus, B.H., & Simkin, L.R. (1994). The transtheoretical model: Applications to exercise behavior. *Medicine and Science for Sports and Exercise, 26*, 1400-1404.

National Institute of Health (1996). Physical activity and cardiovascular health. *The Journal of American Medicinal Association*, 276, 241-246.

Pinto, B.M., & Marcus, B.H. (1995). A stages of change approach to understanding college student's physical activity. *Journal of American College Health*, 44, 27-31.

Prochaska, J.O., & DiClemente, C.C. (1983). Stages and processes of self-change in smoking: Towards an integrative model of change. *Journal of Consulting and Clinical Psychology*, 51, 390-395.

Rosen, C.S. (2000). Integrating stage and continuum models to explain processing of exercise messages and exercise initiation among sedentary college students. *Health Psychology*, 19(2), 172-180.

Sallis, J.F., Calfas, K.J., Nichols, J.F., Sarkin, J.A., Johnson, M.F., Caparosa, S. et al., (1999). Evaluation of a university course to promote physical activity: Project GRAD. *Research Quarterly for Exercise and Sport*, 70, 1-10.

Saunders, R.P., Pate, R.R., Felton, G., Dowda, M., Weinrich, M.C., Ward, D., Parsons, M.A., & Baranowski, T. (1997). Development of questionnaires to measure psychosocial influences on children's physical activity. *Preventive Medicine*, 26, 241-247

Seefeldt, V., Malina, R.M., & Clark, M.A. (2002). Factors affecting levels of physical activity in Adults. *Sports Medicine*, 32(3), 143-168.

Sparling, P.B., & Snow, T.K. (2002). Physical activity patterns in recent college alumni. *Research Quarterly for Exercise and Sport*, 73, 200-205.

Sullum, J., Clark, B.M., & King, T.K. (2000). Predictors of exercise relapse in a college population. *Journal of American College Health*, 48, 175-180.

Suminski, R.R., & Petosa, R. (2002). Stages of change among ethnically diverse college students. *Journal of American College Health*, 51(1), 26-31.

Suminski, R.R., & Petosa, R. (2002). Stages of change among ethnically diverse college students. *Journal of American College Health*, 51(1), 26-31.

Thompson, A.M., Humbert, M.L., & Mirwald, R.L. (2003). A longitudinal study of the impact of childhood and adolescent physical activity experiences on adult physical activity perceptions and behaviors. *Qualitative Health Research*, 13(3), 358-377.

U.S. Department of Health and Human Services. (1996). *Physical activity and health: A report of the Surgeon General*. Atlanta, GA: U.S. department of health and human services, center for chronic disease prevention and health promotion.

U.S. Department of Health and Human Services. (2000). *Healthy People 2010* (2nd ed.). Atlanta, GA: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

U.S. Department of Health and Human Services. (2001). *The Surgeon General's call to action to prevent and decrease overweight and obesity*. Rockville, MD: Author.

Wallace, L.S. & Buckworth, J. (2001). Application of the transtheoretical model to exercise behavior among nontraditional college students. *American Journal of Health Education*, 32, 39-47.

Wallace, L.S. & Buckworth, J. (2003). Longitudinal shifts in exercise stages of change in college students. *Journal of Sports Medicine and Physical Fitness*, 43, 209-212.

Wallace, L.S., Buckworth, J., Kirby, T.E., & Sherman, W.M. (2000). Characteristics of exercise behavior among college students: Application of social cognitive theory to predicting stage of change. *Preventive Medicine*, 31, 494-505.

World Health Organization. (1998). *Obesity: Preventing and managing a global epidemic*.

Table 1. Student ESE by SEBC

Stage	N(%)	M _{ESE} (SD)
Precontemplation (PC) ¹	824(46.0)	2.71(.58)**1&3, 1&4, 1&5
contemplation (C) ²	278(15.5)	2.76(.59)**2&4, 2&5
Preparation (P) ³	341(19.0)	2.85(.53)**3&1, 3&4, 3&5
Action (A) ⁴	132(7.4)	3.12(.60)**4&1, 4&2, 4&3, 4&5
Maintenance (M) ⁵	216(12.0)	3.56(.81)**5&1, 5&2, 5&3, 5&4
Note: ** p < .01; the total did not add up to 1843 due to missing data.		

Table 2. Student ESE by BMI, Year in University, and Gender

Variables	N(%)	MESE(SD)
BMI		
Underweight	405	2.92(.63)
Acceptable	1378	2.86(.66)
Unacceptable	60	3.00(.83)
Year in University		
Freshmen	464	2.94(.63)*1&3; **1&4
Sophomore	478	2.93(.65)*2&3; **2&4
Junior	461	3.02(.77)* 3&1, 3&2; **3&4
Senior	440	2.59(.49)**4&1, 4&2, 4&3
Gender		
Male	1020	3.00(.69)**
Female	823	2.72(.59)
Note: * p < .05; ** p > .01; the total did not add up to 1843 due to missing data.		