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THE RECIPROCAL INFLUENCE OF EXERCISE ON ACADEMIC PERFORMANCE AND RELATIONSHIPS

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Abstract

The current study seeks to better understand exercise habits among the college demographic. It examined the relationships between exercise patterns and aspects of college performance and life. The study explored how exercise influences the lives of college students including relationships, academics and work performance as outlined by Segar (2015). Specifically, the study explored the association between exercise and GPA, as well as the perceived interaction between exercise and academic performance, university and home friendships, and work performance. A survey was completed within a general education course at a midwestern university (81% response rate, N=502). Godin & Shephard's (1985) validated Leisure Time Exercise Questionnaire was used to measure total exercise scores, and measures of perceived exercise benefits were developed for the study based on Segar (2015). One-way analysis of variance (ANOVA) tests, Pearson bivariate correlations, and linear regression analyses were completed to evaluate differences in student GPA based on exercise habits, and the associations between exercise patterns and perceived benefits of exercise on academic performance, friend and family relationships, and work performance. Female participants with higher GPAs were found to report more exercise as compared to those with lower GPAs. The regression analyses found significant associations between the perception that exercise benefits academic performance and actual exercise patterns, and for female students, between the perception that exercise benefits work performance and actual exercise patterns. The results add to existing research on the relationship between exercise and academics by providing context for the college demographic (including exercise patterns and perceptions differences between male and female students), and by applying Segar's (2015) model of exercise benefits. Implications suggest strategies universities may implement in order to apply Segar's (2015) theory to fitness marketing and programming.

INTRODUCTION

Many studies have reported the positive impact physical activity has on a variety of aspects of one's life (Odgen, 2006; Warburton et al., 2006; Vogel et al., 2009). These benefits range across all aspects of an individual's life and are crucial aspects to consider when noting the importance of maintaining regular exercise patterns. In addition to the known physical health benefits, such as

decreasing blood pressure and stroke prevention (Vogel et al., 2009), there are extremely important secondary effects of sustained physical activity. For example, social relations, often associated with exercise patterns, have been found to decrease mortality rates (Holt-Lunstad, Smith and Layton, J. B., 2010). The need for exercise, and more motivation to do so, is at an all time high as our world is experiencing growing rates of obesity and health issues that are derivatives of poor lifestyle and diet choices (Odgen, 2006). Although U.S. obesity rates were found to remain stable at 17% youth and 32% for adults between 2003 and 2010 (Ogden et al., 2014), these rates are concerning and place the U.S. as the sixth most adult-obese country in the world (A Spotlight on World Obesity Rates, 2013).

As a result, physical activity has become an important research focus within the U.S. and beyond (World Health Organization, 2004), and particular demographics in need of further research have been identified in state of knowledge papers (Godbey & Mowen, 2010). The college student demographic has been identified as a demographic requiring research attention because of the noted decline in physical activity rates throughout the transition to college and life after high school (Godbey et al., 2005). Often, during the transition to college, exercise decreases and unhealthy habits may increase due to the new stresses of college. Hoffman et al. (2006) found that because of these stresses, fat and weight gain may occur, especially in the first year of college. These findings demand further motivational strategies for college-aged students to either continue or develop healthy, lifelong habits that could begin to evoke change in the overall health of one's population. The current study seeks to better understand exercise habits among the college demographic by examining the relationships between exercise patterns and aspects of college performance and life.

Although the influence of exercise on personal and work performance, and the importance of viewing exercise as a fuel for performance, has been documented in previous research (Segar, 2015), it has not yet been explored for the college demographic. Exercise essentially functions as the fuel and power source that gives one energy to fulfill other extremely important, crucial aspects of our lives. These "aspects" include who we are as a person be it a "parent, partner, professional, friend, or volunteer" (Segar, 2015, p. 156). Moreover, Segar (2015) posited that physical activity is the link to better life and that when an individual "feels good", they are more likely to fuel the most important roles of their life. Segar also noted the benefits of it, stating "moving our bodies in an activity we enjoy is exponentially beneficial: It lifts our mood, gives us more energy, enables us to focus better, promotes our immune system, and helps us to sleep better, all of which join together and enable us to enjoy our work more and be more loving to our loved ones" (Segar, 2015, p. 164-165). This study seeks to explore

this dynamic for college students in particular, by examining how exercise influences the lives of college students including their GPA and living, working, and social environments.

Some studies, such as Yu et al. (2006) and Fedewa and Ahn (2011), have examined the relationship between exercise on GPA on K-12 participants. However, many fewer studies have examined the college demographic (Trockel, Barnes & Egget, 2000). High school students who exercised less were found to have depressive tendencies, spent less time on homework, and had a lower GPA as compared to those who exercised regularly (Field, Diego & Sanders, 2001). Also, Trudeau and Shephard (2008) reported that breaks for exercise for students enrolled in physical education classes drastically improved one's performance in the classroom, their health, and were a large component of academic success (in an elementary and high school sample). Fedewa and Ahn (2011) conducted a meta-analysis examining the effects of exercise on GPA in children and concluded that the existing research supported a significant, positive effect of physical activity on academic achievement where aerobic exercise had the greatest influence.

Despite Fedewa and Ahn's (2011) meta analysis, the evidence of exercise benefiting GPA is not unanimous within the literature. For example, Yu et al. (2006) found no correlation between more exercise and improved GPA or on better school conduct in their China-based study of children 8-12 year olds. Although Taras (2005) associated exercise with short-term improvements in things such as concentration, he also claimed that "long-term improvement of academic achievement as a result of more vigorous physical activity is not well substantiated" when referring to school-aged population (Taras, 2006, p. 214). Podulka Coeet al. (2006) also reported inconclusive results as they found no significant differences between students who performed physical activity classes in differing semesters (in a middle-school sample), but did find significant improvements in GPA for the students who displayed higher exercise patterns as demonstrated by meeting the Healthy People 2010 guidelines.

Because there is not a definitive result regarding the relationship between physical activity and academic performance as distinguished by GPA, especially for the college demographic, the need for further studies on this topic is apparent. The purpose of this study was to explore the association between exercise and GPA, as well as the perceived interaction between exercise and academic performance, university and home friendships, family relationships, team/club peer relationships, and work performance. This study sought to explore Segar's (2015) dynamic of using exercise as fuel for performance in college students in particular, by examining how exercise influences the lives of college students. Some factors analyzed include their GPA and living, working, and social environments. Finally,

the goal was to better understand exercise habits among the college demographic by examining the relationships between exercise patterns and aspects of college performance and life.

METHODS

Participant Recruitment and Demographics

During fall, 2016, college students in a general education course were invited to participate in a survey as an option for course credit. If students wished not to participate, an alternative assignment was administered for students to achieve course credit without being part of the study. With IRB approval, the survey was administered via the course website using Qualtrics survey software. Students received instructions for accessing and achieving credit for the survey in their course syllabus, on the course website, and from their course instructors during class sessions. The students had a period of two weeks to complete the survey. An 81% response rate was achieved (N=502) and the participants were predominantly (96%) between 18-21 years of age, mostly first year students (72%), and relatively evenly split for gender (53% female, 47% male). The participants reported relatively high GPAs (75% above a 3.0, which is a "B"). Only 4% of the participants reported GPAs of less than 2.0, and half of those participants reported GPAs of 0. Considering those students were first year college students, the 4% below 2.0 were dropped from further analysis because they had not yet established an academic record, and they were too few in number for the statistical tests.

Table 1. Participant characteristics, % (n).

Gender	**Age** (Years, N=502)	**GPA** (N=473)	**Student Status** (N=501)
Male	18-19: 82.6% (195) 20-21: 12.3% (29) 22-23: 3.0% (7) 24+: 2.1% (5)	<2.0: 3.7% (8) 2.00-2.49: 8.6% (19) 2.50-2.99: 17.1% (38) 3.00-3.49: 36.9% (82) 3.50-4.00: 33.8% (75)	First Year: 69.4% (163) Sophomore: 27.2% (64) Junior: 3.0% (7) Senior: 0.4% (1)
Female	18-19: 88.7% (236) 20-21: 8.3% (22) 22-23: 1.9% (5) 24+: 1.1% (3)	<2.0: 4.8% (12) 2.00-2.49: 4.4% (11) 2.50-2.99: 13.5% (34) 3.00-3.49: 41.8% (105) 3.50-4.00: 35.5% (89)	First Year: 73.7% (196) Sophomore: 17.3% (46) Junior: 7.5% (20) Senior: 1.5% (4)

Survey Instrument

The Qualtrics survey inquired about student demographics and academic performance, exercise patterns using the Leisure Time Exercise Questionnaire, and perceptions of the benefits of exercise on different realms of college life. Participants took on average 23 minutes to complete the survey.

Measures

Total exercise scores were calculated using an adaptation of the validated Leisure Time Exercise Questionnaire (LTEQ) (Godin and Shephard 1985; Jacobs, Ainsworth, Hartman and Leon 1993; Kucuk, Doymaz and Urman 2010; You and Shin 2016). The LTEQ measures self-reported exercise bouts of at least 15 minutes within a week separated by intensity. The LTEQ lists example exercises that correspond with each intensity level so that participants are more able to accurately rate their physical activity. Strenuous exercise is described as, "heart beats rapidly, e.g. running, hockey, football, soccer, basketball, cross country skiing, vigorous swimming, vigorous bicycling". The number of self-reported exercise bouts are then weighted based on their intensity using MET values (metabolic equivalent of physical activity in multiples of resting oxygen consumption), as outlined by Wilson et al. (2004). Exercise bouts are weighted scores that reflect MET values (Metabolic Equivalent) based on multiples of resting oxygen consumption (Wilson et al., 2004). In this study, strenuous, moderate, and light bouts were multiplied by 9, 5, and 3 times their value, respectively. The weighted values were summed to achieve a total exercise score.

Exercise benefits scores included participant ratings of how much exercise helps with academic performance, family relationships, friend relationships, and work performance. The four items were rated on a 5-point Likert scale, ranging from 1 (does not help) to 5 (helps tremendously). The particular items were chosen because they parallel the components listed by Segar (2015) as items that matter most to an individual and that can be 'fueled' by exercise. Segar (2015) also included parent and partner relationships, however, those were left out of the current study to fit with the college demographic.

Data Analyses

One-way analysis of variance (ANOVA) tests were used to identify differences in total and moderate/strenuous exercise scores between male and female participants. One-way ANOVA tests and Tukey HSD post hoc analyses were used to identify differences in total and moderate/strenuous exercise scores between the GPA categories. Pearson bivariate correlation results were reported to demonstrate the relationship between perceived academic performance, the betterment items, and exercise scores. Linear multiple regression analyses were completed to evaluate the betterment items as predictors of total and moderate/strenuous exercise scores.

RESULTS

Self-Reported Exercise Patterns for Male and Female Participants

The total and moderate/strenuous patterns of male and female participants were compared in order to examine whether further analyses should be completed using total or intensity-specific exercise scores, and with the whole sample or independently for each gender. Although male and female participants did not differ with respect to the total exercise scores, male participants reported significantly more moderate/strenuous exercise as compared with female participants. Considering the difference in exercise patterns based on gender, further analyses were conducted for the total sample as well as for male and female participants independently.

Differences in Exercise Scores based on GPA

The mean exercise scores for all participants (male and female) tended to increase with each rising GPA category. However, the ANOVA tests indicated significant differences only for female participants. Tukey HSD multiple comparison tests identified significant differences between the 2.0-2.49 GPA category and the 3.5-4.0 category for females for both total exercise (p=.05), and moderate/strenuous exercise (p=.02) scores.

Table 2. Self-reported exercise patterns of male, female, and all participants (LTEQ calculated by using MET values).

	Male		Female		Total		p
	M	*SD*	*M*	*SD*	*F*	*df*	
Total exercise	75.36	25.98	71.82	26.00	2.32	1, 500	.13
Moderate/Strenuous exercise	59.67	23.20	53.93	23.85	7.44	1, 500	.01

Table 3. Differences in total and moderate/strenuous exercise scores based on GPA for male participants.

Exercise Scores (n=214)	GPA				*df*	*F*
	2.0-2.49	2.5-2.99	3.0-3.49	3.5-4.0		
Total exercise, *M (SD)*	64.37 (25.84)	75.16 (25.53)	73.66 (23.71)	79.63 (26.92)	3, 210	2.02
Moderate/strenuous exercise, *M (SD)*	51.58 (23.08)	60.32 (22.03)	58.04 (20.15)	63.15 (25.71)	3, 210	1.53

Table 4. Differences in total and moderate/strenuous exercise scores based on GPA for female participants.

Exercise Scores (n=239)	GPA[a]				*df*	*F*
	2.0-2.49	2.5-2.99	3.0-3.49	3.5-4.0		
Total exercise, *M (SD)*	55.64_{a} (23.79)	66.32_{ab} (23.33)	71.76_{ab} (25.99)	75.47_{b} (26.24)	3, 235	2.58*
Moderate/strenuous exercise, *M (SD)*	37.64_{a} (21.37)	46.82_{ab} (22.40)	54.76_{ab} (22.96)	56.73_{b} (24.52)	3, 235	3.27*

*p<.05.
[a]Mean scores with a common subscript letter do not differ significantly from each other at the .05 level.

Correlations between the Betterment Items and Exercise Scores

The Pearson bivariate correlations demonstrated strong positive relationships between the total and moderate/strenuous exercise scores, as well as between the betterment items. The exercise scores were also significantly correlated with the betterment items at the 0.01 level, with *r* values between 0.33 and 0.40, with the correlation between moderate/strenuous exercise and academic performance being the strongest at 0.40.

Table 5. Betterment Items and Exercise Scores Correlation Matrix.

Variables	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**
1. Total exercise score	-					
2. Moderate/strenuous exercise score	.96**	-				
3. Academic performance	.37**	.40**	-			
4. Being a committed family member	.34**	.37**	.72**	-		
5. Being a committed friend	.33**	.36**	.72**	.90**	-	
6. Work/job performance	.33**	.36**	.64**	.68**	.66**	
M	73.18	56.31	3.24	2.99	3.13	3.28
SD	25.99	25.20	1.22	1.30	1.31	1.32

**p<.01.

Betterment Survey Items as Predictors of Exercise Patterns

For male and female participants, two separate multiple regression analyses were conducted to test if the participant ratings of the extent exercise helped with academics, relationships, and work performance significantly predicted participant's moderate/strenuous exercise scores and their total exercise scores (Tables 5 and 6).

For male participants, the results of the total exercise regression found those variables to predict 15% of the variance (R^2=.16, F(4, 228)=10.99, p< 0.001), and the moderate/strenuous exercise regression indicated the betterment variables explained 19% of the variance (R^2=.20, F(4, 228)=14.21, p< 0.001). In both analyses, academic performance was the only significant predictor of the exercise scores (β=.31, p<.001, and β=.29, p<.001) for moderate/strenuous and total exercise, respectively.

The regression analyses were also significant for female participants, where the betterment variables were found to predict 14% of the variance in the total exercise model (R^2=.16, F(4, 228)=11.79, p< 0.001), and 16% in the moderate/strenuous exercise model (R^2=.17, F(4, 257)=13.53, p< 0.001). Academics was a significant predictor of exercise scores in both models (β=.21, p<.01, and β=.18, p<.05) for moderate/strenuous and total exercise, respectively, and work/job performance was also a significant predictor of total exercise scores (β=.16, p<.05).

Table 6. Perceived academic performance and betterment items as predictors of exercise for males.

	Male Moderate/Strenuous Exercise			Male Total Exercise		
	B	*SE B*	*β*	*B*	*SE B*	*β*
Academic performance	5.62	1.91	.31***	6.01	2.19	.29***
Being a committed family member	3.33	2.32	.19	3.66	2.70	.19
Being a committed friend	-.15	2.31	-.08	-2.33	2.65	-.12
Work/job performance	1.11	1.52	.06	1.24	1.74	.06

***p<.001.

Table 7. Perceived academic performance and betterment items as predictors of exercise for females.

	Female Moderate/Strenuous Exercise			Female Total Exercise		
	B	*SE B*	*β*	*B*	*SE B*	*β*
Academic performance	4.31	1.64	.21**	3.93	1.81	.18*
Being a committed family member	-.78	2.74	-.04	-.46	3.02	-.02
Being a committed friend	2.76	2.66	.15	2.76	2.94	.13
Work/job performance	2.89	1.51	.16	3.23	1.66	.16*

*p<.05, **p<.01.

CONCLUSIONS

The lack of significant differences in GPA based on exercise patterns in this study supports Taras' (2005) caution that the expectation of a clear relationship between exercise and academics may not be substantiated. Many studies claim that exercise has well-noted benefits outside of academics such as increasing concentration and memory and decreasing suicidal thoughts and rates of depression, among others. These studies have been performed on varying demographics, but few illustrate these effects on college aged students. This profound gap in the literature is the purpose of this study: to analyze University of Wisconsin-Whitewater student responses to determine if an association exists between academic performance (or GPA) and physical activity. The study also sought to examine whether the student body perceives college and work performance benefits from exercise, consistent with theories posited by Segar (2015).

Upon data analysis, this study identified a significant association and positive relationship between GPA and total leisure activity (TLA) scores as well as moderate/strenuous exercise scores. Overall, the data confirm Podulka Coe et al.'s 2006 conclusion that students who performed some physical activity or physical activity that meets general recommendations for a healthy lifestyle had higher grades as compared with those who exercised less. Moreover, although our data showed significant differences in GPA based on exercise for female students only, the sample was comprised of primarily first year students (72%), and we would expect bigger differences had students from all ages been sampled. Still, our results as they relate to the female participants supports Field, Diego and Sanders' 2001 findings that those students who exercise more tend to have higher GPAs as compared to those who do not engage in regular physical activity.

Aside from academics, we measured values that monitored the influence that exercise had on our participants throughout daily life. The findings of this study are consistent with Michelle Segar's (2015) findings that physical activity makes individuals more positive and enhances many other areas of one's life as a result. Although the GPAs of male participants were not significantly different based on their exercise patterns, the regression of perceived exercise benefits demonstrated that male students perceive that exercise does help with academics. Therefore, although the GPAs are not significantly different, the findings coincide with Segar's (2015) suggestion that exercise makes one "feel good" and encourages them to perform healthy activities. If more students begin to believe that exercise is benefiting them in areas outside of their fitness, the reduction in stress and fat/weight gain they experience may help to begin to reverse the overall declining trends in physical activity and health measures as recorded by Godbey et al. (2005) and Hoffman et al. (2006).

Both male and female participants noted exercise helped their job and work performance. This mirrors the findings of Segar (2015), who stated that exercise is the fuel for areas not directly relating to physical activity, such as one's professional life. Although our study affirmed the premise of using exercise as fuel for job performance, it did not mirror the latter part of Segar's findings of improving who one is as a friend or partner. The results did not indicate significant associations between exercise patterns and beliefs that exercise helped them to be a more committed family member or friend. This demands more research on tactics to develop the sense of value of exercise in college students where it has already been shown in other demographics.

Further analysis showed pronounced and unique findings that differed between genders. Although females performed an average of less moderate/strenuous exercise than males, the difference in GPA based on exercise was significant for females but not for males. Still, despite the indifference of GPA and exercise habits for males, both genders felt that exercise helped them in their academic performance. Additionally, females generally perceived exercise as a method of betterment for areas outside of academics including improving their work performance. Males did not note increased work performance as a benefit of exercise.

Limitations

Since the data were collected in the spring, the majority of the students had, most likely, only completed one semester of college and their GPAs were overall very high. The investigators removed the low-GPA outliers, however, it is likely the high-end would decrease with time as students continue through their academic careers. While junior or senior students would have been a more ideal sample, the access to a general education study (including students outside the fields of health and kinesiology)

was desirable and only accessible at this early stage. A second limitation reflects the use of self-reported exercise habits rather than actual fitness assessments. Self-reported data may not be as accurate as first-hand fitness assessments, yet many studies have contributed useful additions to the research using self-reported data. A follow-up study using actual fitness assessments would be desirable.

Implications

Several potential strategies for improving the exercise habits among the university demographic can be drawn from the study results. For example, considering the identified perception that exercise benefits work performance among those more physically active students, colleges could implement student worksite wellness program for on-campus jobs. This would potentially help more students appreciate the benefits of exercise on work performance, while also likely increasing the physical activity patterns of students and benefiting the employer through increased work performance.

Also, for freshmen and sophomore students, increased emphasis on physical activity via residence life staff could encourage these habits. Fitness facilities, including those on campus, could focus some of their marketing campaigns on the benefits of exercise for maintaining healthy relationships (friendships and family) as well as work performance. Campus residence staff could be encouraged to create student programs that use the fitness facilities and involve exercise in fun and social ways, all the while emphasizing Segar's (2015) point that exercise improves relationships and life performance.

For those students not living not on campus, the invigorating role of exercise can be emphasized to justify making time for physical activity within a busy schedule. Students who see that although prioritizing physical activity will take some time out of their day, it actually ends up helping them become more efficient at all other tasks at hand by energizing them (Segar, 2015) and improving concentration (Taras, 2005), therefore saving them time in the long run.

Finally, a more general way to increase and integrate physical activity in college students is by having structured exercise classes that are required for graduation. Not only would these classes offer immediate benefits such as those stated above, but they could also peak the students' interest in a lifelong exercise habit. For those who do not currently exercise, fitness classes could introduce them to a new found enjoyment and affinity for daily workout routines. Fulfilment of these classes would be particularly beneficial if the course instructors explain the benefits of exercise. Additional benefits include increased job performance, energy levels, and health in life after college.

REFERENCES

Central Intelligence Agency. (2013). A Spotlight on World Obesity Rates. (2013, April 30). Retrieved October 30, 2017, from https://www.cia.gov/news-information/featured-story-archive/2012-featured-story-archive/obesity-according-to-the-world-factbook.html

Coe, D., Pivarink, J., Womack, C., Reeves, M., & Malina, R. (2006). Effect of physical education and activity levels on academic achievement in children. *American College of Sports Medicine,* 1515-1519. Retrieved February 22, 2018.

Fedewa, A. L., & Ahn, S. (2011). The effects of physical activity and physical fitness on children's achievement and cognitive outcomes. *Research Quarterly for Exercise and Sport, 82*(3), 512-35.

Field, T., Diego, M., & Sanders, C. (2001). Adolescent depression and risk factors. *Adolescence*, 36(143), 491-8.

Godbey, G. C., Caldwell, L. L., Floyd, M., & Payne, L. L. (2005). Contributions of leisure studies and recreation and park management research to the active living agenda. *American Journal of Preventive Medicine, 28*(2), 150-158.

Godbey, G., & Mowen, A. (2011). The benefits of physical activity provided by park and recreation services: The scientific evidence. *Informit, 14*(1), 26-29. Retrieved February 22, 2018.

Godin, G., & Shephard, R. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Science,* 141-146. Retrieved February 22, 2018.

Hoffman, D. J., Policastro, P., Quick, V., & Lee, S. (2006). Changes in body weight and fat mass of men and women in the first year of college: A study of the" freshman 15". *Journal of American College Health, 55*(1), 41-46.

Holt-Lunstad, J., Smith, T., & Layton, J. (2010). Social relationships and mortality risk: a meta-analytic review. *SciVee*. Retrieved February 22, 2018.

House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *American Association for the Advancement of Science, 241*(4865), 540-545. Retrieved July 4, 2017.

Jacobs, D. R., Ainsworth, B. E., Hartman, T. J., & Leon, A. S. (1993). A simultaneous evaluation of 10 commonly used physical activity questionnaires. *Medicine & Science in Sports & Exercise, 25*(1), 81-91.

Kucuk, M., Doymaz, F., & Urman, B. (2009). Assessment of the physical activity behavior and beliefs of infertile women during assisted reproductive technology treatment. *International Journal of Gynecology & Obstetrics, 108*(2), 132-134. Retrieved February 22, 2018.

Ogden, C., Carroll, M., & Curtin, L. (2006). Prevalence of overweight and obesity in the United States, 1999-2004. *The JAMA Network, 295*(13), 1549-1555. Retrieved February 22, 2018.

Ogden, C., Carroll, M., & Kit, B. (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *The JAMA Network, 311*(8), 806-814. Retrieved February 22, 2018.

Segar, M. (2015). *No sweat: how the simple science of motivation can bring you a lifetime of fitness*.

Taras, H. (2005). Physical activity and student performance at school. *Journal of School Health, 75*(6), 214-218. Retrieved July 6, 2017.

Trockel, M.T., Barnes, M.D., & Egget, D.L. (2000). Health-related variables and academic performance among first-year college students: implications for sleep and other behaviors. *Journal of American College Health,49* (3): 125-131.

Trudeau, F., & Seapard, R. J. (2008). Physical education, school physical activity, school sports and academic performance. *International Journal of Behavioral Nutrition and Physical Activity,5* (10), 1-12. Retrieved July 6, 2017.

Vogel, T., Brechat, P., Lepretre, P., Kaltenbach, G., Berthel, M., & Lonsdorfer, J. (2009). Health benefits of physical activity in older patients: a review. *The International Journal of Clinical Practice, 63*(2), 303-320. Retrieved July 12, 2017.

You, S., & K. S. (2016). Body dissatisfaction and mental health outcomes among Korean college students. *Psychological Reports, 118* (3), 714-724. Retrieved July 6, 2017.

Yu, C. C., Chan, S., Cheng, F., Sung, R. Y., & Hau, K. (2006). Are physical activity and academic performance compatible? Academic achievement, conduct, physical activity and self-esteem of Hong Kong Chinese primary school children. *Educational Studies, 32*(4), 331-341. Retrieved July 6, 2017.

Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the evidence. *Canadian Medical Association Journal, 174*(6): 801-809. Retrieved July 6, 2017.

Wilson, P., Rodgers, W., Fraser, S., & Murray, T. (2004). Relationships between exercise regulations and motivational consequences in university students. *Research Quarterly for Exercise and Sport,75* (1), 81-91. Retrieved July 6, 2017.

World Health Organization. (2004). Global Strategy on Diet, Physical Activity & Health. Retrieved From http://www.who.int/dietphysicalactivity/strategy/eb11344/strategy_english_web.pdf