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# Analysis of the Physical Activity Levels and Literacy of Grand Valley State University Students

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HNR 499 Senior Thesis

## **Abstract**

*Introduction:* It's been said that students with higher physical activity (PA) levels, tend to get better grades in school. The research behind this topic is mixed, with most regarding children, not college-aged adults. *Methods:* A PA health questionnaire was designed in a similar format as a survey given by the Centers for Disease Control (CDC). The survey was voluntarily filled out by 94 randomly selected Grand Valley State University (GVSU) students. *Results:* No significant differences were found between PA levels and GPA or major of GVSU students. Significant differences were found between the American Heart Association's (AHA) guidelines for PA, and the predicted amount of PA needed for adults by the GVSU students. *Conclusion:* The significant difference in predicted and actual guideline's PA shows a need to improve their physical health literacy. High variance in the data also suggests that students are not getting enough PA, if any at all.

## **Introduction**

Physical activity (PA) is an important aspect of everyday life and vital to good health. This day and age, however, is a time of constantly being on the go. Careers and educations take precedence over a trip to the gym. Is there a link between the two, though? It has been stated again and again that physical activity levels and academic achievement are positively correlated. State recognized athletes are often also acknowledged for their academic honors as well. There are multiple studies that would support the claim that individuals who are physically active have higher grades and academic attainment (Käll, Nilsson, & Lindén, 2014) (Booth, Leary, Joinson, Ness, Tomporowski, Boyle, & Reilly, 2014) (Lees, & Hopkins, 2013) (Correa-Burrows, Burrows, Orellana, & Ivanovic, 2014) (Slade & Kies, 2015). While these studies conclude higher levels of physical activity result in higher test scores and academic ability, there are studies that concluded a significant difference did not exist. (Van Dijk, 2014) (Fröberg, A., & Jonsson, L., 2015). There were also studies that were much more specific when it came to physical activity. These studies were not looking at questionnaire data, but looked at the physical fitness levels of their subjects (Hansen, Herrmann, Lambourne, Lee, & Donnelly, 2014) (Sardinha, Marques, Martins, Palmeira, & Minderico, 2014) (Chen, Fox, Ku, & Taun, 2013) (Scudder, Federmeier, Raine, Direito, Boyd, & Hillman, 2014). Just because an individual is physically active, does not mean they are physically fit. It could make sense that a stronger correlation exists between increased fitness and academic achievement. A physically fit individual would be more likely to reap the benefits of physical activity, such as increased positivity, decreased stress, and decreased cardiorespiratory health issues.

There are a variety of reasons as to why some studies saw significant differences whilst others did not. The disagreement in the literature, however, made room for more studies to be produced.

Another hole in the literature that required future studies was the age range of subjects. Only one of the studies reviewed for this research was actually performed with subjects that were college-aged. This study looked at physical activity levels and test scores in first-year medical students (Slade & Kies, 2015). All other research reviewed for this study was elementary-aged to high school aged students. There was not enough background information to know if the trends seen in young children carried on to students in college, whose brains and bodies have reached maturity. In order to close the gap in the literature, this study was produced with the purpose to find if the physical activity levels of GVSU students were correlated to academia. It was also a point of interest to know where the levels of physical health literacy were at on GVSU's campus and if those literacy levels were linked to major of study. It was hypothesized that the correlation of PA and academics would carry on in this study and more physically active students would also have higher GPAs. In terms of health literacy, it was predicted that health majors would have a better understanding of what is expected of them in a physically active way, and in turn would have higher levels of PA than non-health major students.

## **Methods**

### Subjects

Participants were randomly selected from Grand Valley State University (GVSU), and voluntarily participated in the study. 94 students ( $22.28 \pm 4.66$  years) completed the survey. In order to attempt to represent the diversity of students on Grand Valley's campus, students represented a variety of majors, class and employment statuses. These students came from 34 different majors on campus, which were divided into health and non-health for analysis purposes. The students had a mean GPA of  $3.45 \pm 0.45$ , and represented all class statuses (7.4%

freshmen, 6.4% sophomores, 13.8% juniors, 34% seniors and 38.3% >4 years). 34% of the students were unemployed, 59.6% were employed part-time and 6.4% were employed full-time.

### General Procedure

A survey was created on an online survey-making website, surveyplanet.com. The Adult Physical Activity Questions on the National Health Interview Survey (NIHS) was used as a guide in order to maintain consistency with physical activity questionnaires used nationally. Additional questions were created to find a relationship between academia and physical activity. The survey used by the researcher can be seen in Figure 1. In order to have a random sample, a series of randomization tests were performed.

GVSU offers courses in 109 different subjects.

50 random course subjects were selected with a random number generator. Within each subject, a course was randomly selected, and from there a specific section. The professor of that section was emailed the link to the survey and a brief description of the purpose of the study. From there, professors voluntarily forwarded the email to their students, and the students voluntarily completed the survey. The

survey remained open for 15 days. After the 15 days, it was closed to the public and the data was analyzed.

Physical Activity Health Questionnaire

Age

Gender  
☐ Female  
☐ Male

Class Status  
☐ Freshman  
☐ Sophomore  
☐ Junior  
☐ Senior  
☐ >4 Years

Major

GPA (If Freshman, GPA you graduated high school with):

Employment Status  
☐ Full-Time  
☐ Part-Time  
☐ Unemployed

Do you have any health conditions that prevent you from participating in physical activity?  
☐ Yes  
☐ No

Do you feel that you get as much exercise as you need, or less than you need?  
☐ As much as needed  
☐ Less than needed

Would you say that you are physically more active, less active, or about as active as other people your age?  
☐ More active  
☐ Less active  
☐ As active

Compared to your physical activity levels 1 year ago, would you say that you are now more active, less active, or about the same as you were then?  
☐ More active  
☐ Less active  
☐ The same

Have you participated on an organized sports team in the last 12 months?  
☐ Varsity  
☐ Club  
☐ Intramural  
☐ Recreational  
☐ No

Light or moderate leisure-time physical activities are activities that cause light sweating or slight increases in breathing or heart rate. How many minutes do you participate in these a week?

Vigorous leisure-time physical activities are activities that cause heavy sweating or large increases in breathing or heart rate. How many minutes do you participate in these a week?

The American Heart Association has set guidelines on the duration of exercise that adults should get per week. How much exercise do you think that is?

Are you aware of the physical activity programs available to you at Grand Valley State University?

Do you think it is easy to find information about the physical activity programs available at Grand Valley?

Do you want more information on the physical activity programs at Grand Valley?

Figure 1. Physical Activity Health Questionnaire.

### Statistical Analysis

Analysis of the data was performed using IBM SPSS 22. The relationship between major of study and total amount of exercise was analyzed with a two sample independent T-test. With T-tests, knowledge of the AHA Guidelines, and the amounts of light and vigorous exercises were also analyzed by major of study. Light to moderate exercise as well as total exercise amounts, and guideline approximations were compared to 150 in a one-sample T-test. Vigorous exercise was compared to 75 in a one-sample T-test. Descriptive analyses were completed to find any other relationships within the data.

### **Results**

An independent two-sample T-test indicated that no significant difference existed between major of study and total amount of exercise ( $p = 0.202$ ). Additionally, there were no difference between major of study and amount of vigorous exercise ( $p = 0.297$ ) or amount of light to moderate exercise ( $p = 0.284$ ). There was however, a significant difference in the estimated amount of exercise that the AHA guidelines suggest ( $p = 0.035$ ); this difference can be explained as non-health majors predicting the AHA guidelines ( $354.73 \pm 304.17$  min/week) to be significantly greater than the predicted AHA guidelines of the individuals with health majors ( $240.54 \pm 137.12$  min/week). Both of these predictions are significantly greater than the 150 min/week of moderate exercise that are actually stated in the AHA guidelines for physical activity (non-health:  $p = 0.000$ , health:  $p = 0.001$ ). While there was no difference between total exercise for health and non-health majors, the total amount of exercise for GVSU students ( $247.72 \pm 209.67$  min/week) was significantly greater than the 150 min/week suggested by the guidelines ( $p = 0.000$ ). The differences in predicted AHA guidelines and total exercise from 150 can be seen in Figure 2. A significant difference could not be concluded between the amount of

light to moderate physical activity GVSU students get ( $153.05 \pm 130.32$  min/week) and 150 minutes as stated by the guidelines ( $p = 0.824$ ), and both non-health majors ( $118.90 \pm 151.96$  min/week) and health majors ( $89.66 \pm 103.01$  min/week) had mean vigorous physical activity durations that did not significantly differ from the 75 min/week as recommended by the AHA guidelines (respectively,  $p = 0.072$ ,  $p = 0.319$ ).

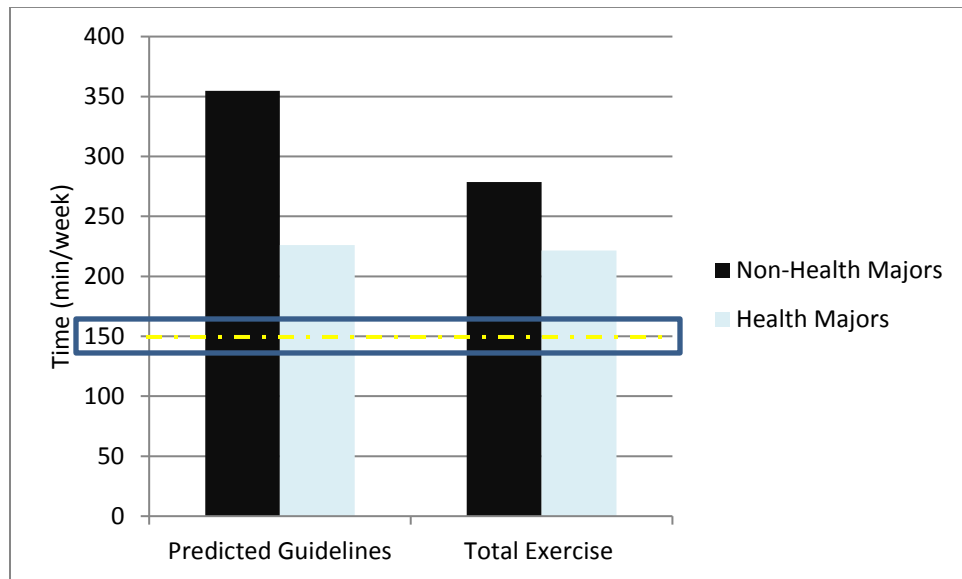


Figure 2. A comparison of predicted amount of exercise per week and total amount of exercise per week between health and non-health majors with 150 minutes, as stated by the American Heart Association's guidelines for physical activity in adults.

## Discussion

The purpose of the study was to see if there was a relationship between duration of physical activity per week and academic ability. To go further in depth, it was necessary to analyze the physical activity literacy of students and also the major of study. It had been hypothesized that health majors with higher GPA's would have increased levels physical activity in their life and have a better understanding of the guidelines expected of them to follow. The results were



somewhat inconclusive in terms of finding significant differences in the statistical analysis, but there was much to be learned from this study.

When trying to compare physical activity with academic ability, using GPA as a factor of academic ability, no significant difference was able to be ascertained. This was greatly due to the fact that the range of GPA is so small. GPA is on a 4 point scale, but to maintain student status, students must keep their GPA above a 2.0. Any student with a GPA below a 2.0 gets put on academic probation and failure to improve their GPA, students get expelled. This limited the scale on which student's GPAs could be, so a significant relationship between GPA and duration of physical activity could not be expected. These results were supported by a number of previous studies on different aged subjects (Van Dijk, 2014) (Fröberg, A., & Jonsson, L., 2015). One reason explained by Bezold et al. for increases in academic ability due to participation in physical activity is socioeconomic status (SES) (Bezold, et al., 2014). The relationship with socioeconomic status also can be seen in other studies done of students (Basch, 2011) (Coe, et al. 2013). It can be assumed that there are no individuals at GVSU are from low SES. Students at four year universities tend to be at a SES where paying for college isn't impossible. The fact that there were no significant differences between physical activity and GPA could relate to the fact that there are significant differences in socioeconomic status.

While significant results were not found between academia and the amount of physical activity, differences were found in the literacy of physical activity guidelines. This indicates that on average GVSU students are getting enough exercise, but they don't understand how much is needed for their health. A common consensus, with 71.3% of those sampled, of students is that they feel they are not getting enough exercise. However, students had a significantly greater predicted guideline amount of physical activity than the 150 minutes per week of moderate to

vigorous exercise (Pescatello, 2014). Since GVSU students are not knowledgeable of how much exercise they should be getting, it is apparent that students need to be more educated. Additionally, while there were no differences in physical activity amounts (for light to moderate, vigorous, and total) from the guideline amounts (150 min/week moderate, 75 min/week vigorous) for all students and between majors, the standard deviations for these means were extremely high. With such high standard deviations and a lack of homogeneity and normality of variances, it would be nearly impossible to see significant differences in the data. This variation may not make it possible to conclude a significant difference, but the variation does explain a lot about the physical activity in GVSU students. This high variation in minutes of exercise per week shows that all students are not close to the same duration of physical activity a week. The wide spread of data indicates that some students are getting enough exercise, but many students are not getting enough, if any, physical activity. If all students were getting enough exercise, a much smaller standard deviation would be calculated for the data. Since all students are not getting enough exercise, changes need to be made on GVSU's campus.

Future research should be conducted to better measure the levels of physical activity on campus and to find trends in the data. Increased accuracy of physical activity levels could be obtained would be through the measurement of fitness levels. Many studies had found that a significant relationship between academic ability and aerobic fitness, not just duration of physical activity (Hansen, et al., 2014) (Sardinha, et al., 2014) (Chen, Fox, Ku, & Taun, 2013) (Scudder, et al., 2014). If objective measures of aerobic fitness were taken from a large enough sample size, there could possibly be a connection found between GVSU student's physical fitness levels and their academic achievement. Additionally, steps need to be made on GVSU's campus to incite changes in the physical activity levels of its students. The first step taken following this study

was the introduction of Exercise is Medicine on Campus (EIM-OC) to GVSU. EIM-OC is a program created by the American College of Sports Medicine (ACSM). This program is designed to increase physical activity in college students, and brings in a healthcare aspect where practices can prescribe physical activity to students in certain situations (Exercise is Medicine, 2015). Physical activity is vital to individuals' health. There are many circumstances where physical activity could prove to improve health conditions, so it should be able to be prescribed. In addition to the healthcare aspect, EIM-OC is also intended to inform, educate, and give more opportunities for students to be proactive in their health through physical activity. EIM-OC will be a never-ending initiative to increase physical activity, but the first steps have been taken to give GVSU the title of being an EIM-OC university.

#### Assumptions and Limitations

While this study was informative and important in understanding the levels of duration of physical activity and physical activity literacy of GVSU students, it was not without its assumptions and limitations. First off, the data was gathered through a survey which is a subject measure of data. It had to be assumed that the students were answering honestly, but there is a probability of response bias. The response bias could be present in the study in two ways. One way the response bias could be present would be through untruthful answering of questions. While the survey was completely anonymous, some people may not have answered the questions honestly, and there was no way to adjust for this, it just has to be assumed that the answers are honest. Another way response bias was definitely present was questions not being answered correctly. Since some of the questions were open ended, students could have answered any way they wanted. Questions were designed to be very specific, but that still didn't control for people answering the way the researcher had wished. There were some questions that asked for duration

of physical activity in minutes per week, but responses were given like “3-5 times per week.” Even though the questions were very specific and followed the format of the CDC’s NIHS, the open ended factor allowed students to answer however they wished. The questions should have been written so students had to select one answer of multiple options given to be sure to get responses that actually answered the question. The study was also limited by non-response bias. In order to avoid selection bias, a series of randomizations occurred resulting in random professors being emailed and asked to give the survey to their students. Many professors did not send on the survey to their students, and students who were forwarded the email could have chosen to not complete the survey; both of these factors summed into the non-response bias of this study. While sample design bias was attempted to be minimized by using questions that already exist on a national survey, there was a distinct limitation caused by one of the questions. The question from the CDC’s NIHS was written regarding light or moderate physical activity in one category. The AHA’s guidelines, however, are 150 minutes of moderate to vigorous physical activity. Physical activity levels were being compared to the guidelines, but there was no separation between light and moderate. This weakened the comparison to the guidelines because the duration of light to moderate physical activity given by the students in the survey could have been all light physical activity, therefore, not meeting the guidelines at all. The question should have been reworded to be more consistent with the variable of interest.

### Conclusion

Overall, a significant difference was not found within the data when trying to link physical activity levels with academic achievement in GVSU students. There are a variety of confounding factors that lead to this result. Limitations aside, the spread of the data was way too large to ever find significant differences in the means. The widespread data shows that all students, regardless

of major or academic standing, need to ensure they are getting at least 150 minutes of moderate to vigorous exercise a week. An increased number of students having at least 150 minutes of exercise a week would decrease the spread of the data. The first step is education and GVSU is headed in the right direction, but progress needs to be made to improve the health and success of GVSU students.

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