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# Factors Influencing Weight Gain and Perceived Barriers of Exercise in First Semester College Students

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FACTORS INFLUENCING WEIGHT GAIN AND PERCEIVED BARRIERS OF EXERCISE  
IN FIRST SEMESTER COLLEGE STUDENTS

by

Noah C Neuenfeldt

A thesis submitted to the Graduate College  
in partial fulfillment of the requirements  
for the Degree of Master of Science  
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# FACTORS INFLUENCING WEIGHT GAIN AND PERCEIVED BARRIERS OF EXERCISE IN FIRST SEMESTER COLLEGE STUDENTS

Noah C Neuenfeldt, M.S.

Western Michigan University, 2016

College students believe that university weight management interventions impact their health habits. This suggests that universities can play a large role in encouraging students to be active. The purpose of this study was to investigate this claim and to acquire a better understanding of weight change in first year college students in the first semester. We specifically sought to identify the variables that influence weight gain, as well as determine the awareness and usage of resources available to the students. A survey was given to first year students addressing the variables of interest including change in weight and Body Mass Index (BMI), as well as awareness, usage, and preference of resources on campus.

There were 176 participants in the study, 90 males and 86 females, with an average age of  $18.3 \pm 0.7$  (mean  $\pm$  SD) years. They gained an average of 1.6 lbs. ( $159.3 \pm 40.0$  to  $160.9 \pm 39.8$ ) and had an average increase in BMI of 0.2 ( $24.1 \pm 5.5$  to  $24.3 \pm 5.4$ ) in their first semester. Those who expected to gain weight may be at risk of gaining weight  $\chi^2(4, n=176)=27.729, p<.001$ . Many students are aware of the resources on campus but do not use them. This study shows that students who expectations influence weight status and that student awareness and usage of resources can be improved upon.

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Noah C Neuenfeldt

## TABLE OF CONTENTS

ACKNOWLEDGMENTS .....	ii
INTRODUCTION .....	1
METHODS .....	9
Subjects .....	9
Data Collection .....	9
Developed Questionnaire.....	10
Exercise Benefits & Barriers Questionnaire .....	12
Statistical Analysis.....	12
RESULTS .....	14
DISCUSSION.....	17
CONCLUSION.....	25
REFERENCES .....	26
APPENDICES	
Appendix A: FYE Email.....	29
Appendix B: Summarization of Study to FYE Instructors .....	31
Appendix C: Developed Questionnaire .....	33
Appendix D: Code Sheet for Developed Questionnaire .....	41
Appendix E: Exercise Barrier/Benefits Scale .....	48
Appendix F: Exercise Benefits/Barriers Scale Permission Letter .....	54
Appendix G: Anonymous Survey Consent.....	57
Appendix H: HSIRB Approval Letter .....	59

Table of Contents-Continued

Appendix I: Tables..... 61

## INTRODUCTION

According to the Merriam-Webster's online dictionary, adolescence is defined as "the period of life where a child develops into an adult" (Adolescence, n.d.). College students who are in adolescence are at a critical time of development, specifically in health behaviors (Williams, Holmbeck, and Greenley, 2002). This is a unique time for educators and professionals to help student develop healthy habits that will carry into the rest of the students' adult life.

Unfortunately, weight gain is a common occurrence in college students in universities across the nation (Clarke et al., 2013). Being overweight and/or obese may lead to other health consequences including chronic diseases such as cancer, diabetes, and coronary artery disease (Ehrman, 2010). In the United States, adults over the age of 20 classified as overweight rose from 65.6% to 69% from 2001 to 2012 while adolescents age 12-19 classified as obese rose from 16.7% to 20.5% in that same time period (Center for Disease Control and Prevention, 2012). Furthermore, the estimated annual cost of obesity-related illness in the United States is \$209.7 billion (Cawley and Meyerhoefer, 2012). As of 2012, 34.9% of the population was obese (Ogden, Carroll, Kit, and Flegal, 2013) while 68.6 % were either overweight or obese (Ogden, Carroll, Kit, and Flegal, 2014). If the current rise in obesity continues, it is estimated that by the year 2030, 51% of the population will become obese (Finkelstein, et al., 2012). Considering the projection of obesity in adults and the health implications, addressing college students may be an important step to to prevent this. Understanding the perceptions and behavior of college students, especially first-year students, may help in ultimately developing their health habits to prevent weight gain. This should improve their quality of life in college and will likely carry over into their adult life (Must, Jacques, Dallal, Bajema, and Dietz, 1992).



The Centers for Disease Control and Prevention (CDC, 2016) stated that less than 30% of adults aged 18-24 met the 2008 federal physical activity guidelines for aerobic exercise and muscular strengthening activity. While this number is higher than the adult average of 21.1%, any increase in those that meet the 2008 federal physical activity guidelines may help improve overall health, and may help alleviate the cost of obesity. In a report done by the National Education Center for Statistics (NECS) in early 2015, college enrollment from 2000 to 2015 increased by approximately 4.9 million students (Digest of Education Statistics, 2015). Not only is enrollment increasing, the number of students who are in the traditional college age group of 18 to 24 is also rising. The NECS found an increase of 4% in college students aged 18-24 between 2000 and 2013 (Digest of Education Statistics, 2015).

In 2008, Mihalopoulos, Auinger, and Klein investigated whether the “freshman 15” (defined as 15 lbs. gained in the first year of college) was a valid concern by sending a survey to college freshman to assess their health and weight at the beginning and end of their first year at college. 125 completed responses were received and the results showed that 51.3% of the respondents gained weight, with an average of 7 lbs. The researchers concluded this rate was six times faster than the general population, which, if sustained over the course of a few years, would lead the average student to become obese. The researchers also found that one third of the respondents had no weight change, where 19% of the respondents lost weight at an average of approximately 7 lbs.

Gropper, Simmons, Connell, and Ulrich (2012) performed a study over a four-year span, from freshman to senior year of college. In their study, body weight, Body Mass Index (ratio of mass-to-height squared, meant to classify weight based on body fatness as an indicator of health), body composition, and waist circumference were measured directly by the researchers,

rather than self-reported by the subjects. They found that 70% of students gained at least some weight, with 48% gaining at least 10 lbs. Additionally, results from body composition analysis showed that most weight gain came from an increase in fat ( $2.7\% \pm 3.3\%$ ), not lean mass ( $0.3\% \pm 2.6\%$ ). By the end of the study, 26% of the participants were classified as obese, which represented an 8% increase in weight from the start of college. In a similar study, Gropper, Simmons, Connell, and Ulrich (2012) examined changes in body weight, BMI, body composition, and waist circumference over a three-year span. They found that of the first three years, the first year was associated with the most weight gain compared to years two and three. Additionally, over the course of those three years, BMI increased from 22.6 to 23.3. This is still within a healthy range but weight was still gained over the course of three years. It is apparent that weight gain is not uncommon in college; however, the explanations remain unknown. It is important to understand why this occurs so proper steps can be taken to prevent this in college.

Gillen & Lefkowitz (2011) looked at weight changes over the course of the first three semesters of college and also sought to determine if certain variables led to weight gain. The researchers found that 56.1% of students gained weight in the first semester of college at an average of 2.6 lbs. and overall weight gain averaged 9.4 lbs. at the end of the three semesters. SAT (an admissions test to college) scores and campus groups were shown to have an impact. For every 10 point increase in the SAT, the odds of gaining weight decreased by 3% while for every campus group involved in the odds of gaining weight decreased 28%. These findings suggest that not only are there certain variables that may discourage weight gain, like high SAT scores and campus group involvement, but there may also be variables that lead to weight gain.

Taking a different approach, Web, Butler-Ajibade, Robinson, and Lee (2013) surveyed incoming first year college students to assess their perceptions, concerns, and expectations

regarding weight status during their first year. Of the 341 completed surveys, they found that 88.4% of the subjects believed that gaining weight was typical in college. 61% believed that 15 lbs. was the norm, and 42% were moderately concerned with gaining weight. However, only 12.3% expected to gain weight themselves. The researchers concluded that interventions should be utilized to correct faulty misperceptions to reduce the fear and anxiety of weight gain.

Taking this idea further, Clarke et al. (2013) looked at expectations and beliefs to see if they played a role in weight status. In addition, academic performance in high school was examined. They found that high school seniors with a high Grade Point Average (GPA) with the belief that they would graduate college were less likely to gain weight in college. The researchers concluded that if a student believes that they are in control of their life, their odds of having healthy behaviors in college increase

LaRose, Gorin, Clarke, and Wing (2011) also looked at perceptions, concerns, and expectations alongside weight status of college freshman. The researchers found that students were somewhat concerned with weight gain; conversely, men were less concerned than women. Interestingly, they found that 29% of freshman men were overweight according to BMI while only 14.2% believed themselves to be overweight. This suggests that high-risk college males may not think they need help when they actually do (LaRose et al., 2011). Students may have a limited understanding of what constitutes a “healthy” weight, which may make it even more difficult for them to maintain a healthy weight.

Das and Evans (2014) looked at behavior management, perceptions, and challenges on the college campus using the Health Belief Model. Using nominal group technique, the researchers looked at five issues: susceptibility to weight gain, the seriousness of managing weight, the barriers to managing weight, how effective the students thought they were at

managing weight, and techniques used to manage weight. They found that most students were concerned with gaining weight in college and understood its importance and benefits. However, students thought there were many barriers to being physically active including lack of time, knowledge, and motivation. Men tended to think their careers were influenced by weight gain while women thought it affected their independence. This research suggests that most students are aware of the benefits of being physically active, but it may not be sufficient motivation.

Looking at other variables, Quick et al. (2014) addressed the issues of weight gain in college students (ages 18-24) by looking at the influence of eating, sleeping, and physical activity on weight gain. Based on the National Cancer Institute Fruit/Vegetable Screener, the researchers found that a fifth of the participants consumed at least 5 cups of fruits and vegetables a day. In regards to sleep, 49% received less than 7 hours of sleep with a sleep quality rating of “poor” on the Pittsburgh Sleep Quality Index (PQSI). Using the International Physical Activity Questionnaire, the researchers reported that 46% of the students received a “low” or “very low” rating. They concluded that weight gain might be related to low eating competence (the ability to plan and eat healthy), inadequate sleep, and low levels of physical activity. In addition, females were more likely to gain weight due to emotional eating.

Madonia, Cox, and Zahl (2014) looked at competence and autonomy in 124 first year college students based on past experiences in high school. Using the Behavioral Regulation in Exercise Questionnaire-2 as an online survey, the researchers reported that if the college students participated in competitive sport and/or resistance training in high school, their feelings of competence and autonomy in college improved, which decreased the risk of gaining weight. This suggests the importance of physical activity at earlier stages in life in avoiding weight gain during the first year of college.

Perceptions, expectations, and concerns may play a role in weight status, as well as sex differences. From the evidence presented, one of the issues for health educators and fitness professionals is how to prevent weight gain by promoting physical activity. Gow, Trace, and Mazzeo (2010) looked at the effectiveness of three different interventions: an internet weight gain prevention program, a feedback intervention, and a combination of feedback and internet internet intervention. The Internet intervention group was presented material online by the principal investigator which focused on healthy eating and exercise. There were also online discussion platforms and assignments given to the group. The feedback intervention group self reported their weight online once a week to the principal investigator online. There was also a group that did both interventions. Researchers found that the group that did both interventions was the most effective in decreasing BMI.

According to Das and Evans (2014), students believe that university-sponsored weight management interventions impact their physical activity and nutrition habits. This suggests that universities can play a large role in encouraging students to be active. In order to improve their physical activity levels, some students suggest there be more campus opportunities for physical activity (Das and Evans, 2014). Nonetheless, it should be considered that some students may not be aware of the opportunities already in place provided by their university, which as far as the researchers reported, was not studied.

The tendency of weight gain in the freshman year of college has been documented (Mihalopoulos et al., 2008; Gropper et al., 2012a; Gropper et al., 2012b; Gillen & Lefkowitz, 2011). Reasons as to why has been eluded, but much remains unknown. Past experiences with physical activity seems to play a role (Madonia et al., 2014) while other variables such as campus group involvement, GPA, and SAT scores also seem to influence the chances of weight

being gained (Gillen and Lefkowitz, 2011; Clarke et al., 2013). Das and Evans (2014) demonstrated that students may understand the importance and the benefits of physical activity, but still do not participate in physical activity. Based on the research of Web et al. (2013) and Larose et al. (2011), the expectation of weight gain and concern with weight gain may influence weight change in the first semester of college. Therefore, the primary purpose of this study was to find the overall change in weight and BMI in first year students, and to analyze the variables that may have an influence on weight status.

The variables for this study included current GPA, campus group involvement, past activity in high school, expectation of weight gain, concern with weight gain, BMI, and weight status at the beginning and end of the semester. We also sought to see how these variables influenced the perceived benefits and barriers to physical activity measured by the “Exercise Benefits/Barriers Questionnaire” (EBBS; Sechrist, Walker, and Pender, 1987). In addition, because of the evidence presented by Das and Evans (2014) regarding students’ barriers to physical activity and the impact universities have in influencing health behaviors, this author developed a questionnaire to assess students’ knowledge of available resources and the types of resources they would find helpful. Universities have resources in place, yet it is unclear if students are aware of these resources. To our knowledge, there have not been any studies that have examined first year students’ awareness of resources related to health and physical activity on campus.

Based on previous research it was hypothesized that first year students with a high current GPA and/or involved in more than one campus group, were less likely to gain weight by the end of the semester. It was also hypothesized that students who either participated in resistance training and/or competitive sport in high school, did not expect to gain weight, and/or

were concerned with gaining weight were less likely to gain weight. In addition, it was hypothesized that the top perceived barrier faced in being physically active would be time, the resource with the most awareness would be intramural sports and the resource used the most would be intramural sports.

## METHODS

### Subjects

Subjects were recruited from the First Year Experience (FYE) course for incoming students at Western Michigan University. Prior to recruitment, the Human Subjects Institutional Review Board at Western Michigan University approved this study (Appendix H). An email was sent to the FYE instructors in all sections explaining the study protocol and the goal of the study (Appendix A). Attached to the email was a summary of the study that they could reference. Ten instructors expressed interest in allowing their students to participate in the study. A class session was confirmed when the researcher would attend each class and administer the questionnaires. Classes were attended by the researcher between November 30<sup>th</sup>, 2015 and December 13<sup>th</sup>, 2015. All students in the FYE course were freshmen students, which was one of two criteria to participate in the study, the other being at least 18 years old.

### Data Collection

During the scheduled class session, the risks, benefits, and purpose of the study were explained to the participating FYE sections verbally by the researcher. This was done prior to the students completing the survey. All questions were addressed to the satisfaction of the students. The surveys were distributed to all students in the class; however, if a student did not wish to take it they were instructed to leave it blank. The students were given 10-15 minutes for the survey and returned it back to the researcher once it was completed. A total of 176 students turned in a survey. Once all the surveys were collected the FYE instructor continued with the plans for the day when the researcher left. After the ten classes were completed, the researcher coded each question numerically for the first questionnaire. Once the coding was completed,



every question with a response was entered into the Excel spreadsheet. If a question was left unanswered nothing was inputted.

## Instrumentation

### Developed Questionnaire

The developed questionnaire (Appendix C) was divided into five segments: (1) demographics and general information, (2) campus resources, (3) habits, (4) feelings, and (5) potential resources. All questions asked the students to circle one, or multiple responses, depending on the specific question.

In section one, or the demographic and general information section, contained questions about sex, age, race, and place of residence. There were questions related to high school GPA, type of activity they participated in when they were in high school, etc. An example question from this section is “Please indicate if you live on campus. If you do, please circle the neighborhood you live in.” Some of the answer choices for this question were “I do not live on campus,” “Valley Residential,” and “Center Residential.”

The campus resources section of the questionnaire addressed whether or not the students were aware of resources available in the Sindecuse Health Center and the Student Recreation Center (SRC). Students were asked to circle all the services they thought were available to them. It also contained questions of whether or not the students used the available resources. An example question addressed in this section was “Please circle the resources that are available at the Student Recreation Center.” Some of the answer options for this question were “Fitness Classes,” “Climbing Wall,” and “Pool.”

The habits sections asked questions that addressed factors that may influence weight status in students; factors such as sleep habits, nutritional habits, physical activity, involvement

in campus groups, and their college GPA. In addition, this section was designed to identify barriers that might potentially influence students to be inactive and lead to an unhealthy lifestyle. There were also various questions that addressed what the students thought would help them overcome these barriers. One of the questions was “What is the biggest barrier that prevents you from exercising? Please circle.” Some of the answer choices for this question included, “Not motivated,” “Hard to make time,” and “Not sure what to do.”

The feelings section addressed perceptions, feelings of competence, concerns, and expectations that students had with exercise. The goal of this section was to determine how confident students felt in exercise, the weight that they consider themselves (overweight, normal weight, underweight), and if they were concerned with gaining weight. Typical questions in this section addressed non-health related topics such as whether they believed they will graduate and how satisfied they were with campus life. An example question was “How concerned are you with gaining weight?” This question was scored on a 1-5 Likert Scale, 1 meaning not at all concerned and 5 meaning very concerned. Students were instructed to circle the number they related to the most.

The additional resources section was implemented to get a better idea of how the university can better accommodate students. It was used to identify additional help that the university could potential provide. Based on previous research, other questions addressed potential new resources that could help students manage their weight. An example was “How likely would you participate in an online fitness community to help you with leading a healthy lifestyle?” The answer choices for this question were “Online fitness community,” “a university course,” and “an in person support group that meets once a week.”

## Exercise Benefits & Barriers Questionnaire

The “Exercise Benefits/Barriers Questionnaire” (EBBS; Sechrist, Walker, and Pender, 1987) had been tested for validity of its constructs, internal consistency, and test-retest reliability. Two scales were used separately in the current study: the Benefits Scale and the Barriers Scale. The questions were given as statements and the participants were asked to respond as “Strongly Agree”, “Agree”, “Disagree”, or “Strongly Disagree”. These responses were scored as a 4, 3, 2, 1, respectively and then summed at the end per the instructions given by the authors. A specific, and separate set of questions were summed for both the Benefits Scale and the Barriers Scale.

The Benefits Scale was scored from 29 to 116 with a higher score meaning the participant perceived more benefit to exercise. The Barriers Scale was scored from 14 to 56 with the higher score indicating the participant perceived more barriers to exercise. The researcher used this questionnaire to further understand students’ perceptions to the benefits and barrier to exercise.

## Statistical Analysis

Descriptive statistics were used to identify the average age, height, weight, ethnicity, and place of residency for all the participants who completed the survey. Frequencies were calculated in numbers and percentages, specifically in five different areas. The first area was how many students were aware of resources in the Student Recreation Center, as well as how many of those resources were used by those that took the questionnaire. The second area of interest was how many students participated in resistance exercise and/or competitive sport their senior year of high school. The third area of interest was the common barriers to exercise and which barrier was perceived as the biggest. The fourth area of interest was which potential resources were the most popular and were perceived as the most likely to help. These included online fitness

community, more university sponsored events, a course on time management, in-person support community, easy access to social media, better public transportation, and more campus opportunities for activities. The fifth area of interest was in weight status and weight expected to gain.

Chi Squared goodness of fit tests were used to determine if there was an even distribution between the following variables: weight classification at the end of the semester, BMI classification at the end of the semester, campus groups involvement, self categorization of weight, concern with gaining weight in college, expectation of weight status at the end of college, and weight expected to gain. Chi Squared tests of independence were used to examine the relationship between weight classification and BMI classification at the end of the semester and the following variables: campus groups involvement, self categorization of weight, concern with weight gain, expectation of weight status at the end of college, and current GPA. An *a priori* alpha value of  $p \leq 0.05$  was used to determine statistical significance. Statistical Packages for the Social Sciences (SPSS) (version 23.0) was used for all analyses.

## RESULTS

A total of 176 surveys were received from the first year students. The response rate for the questionnaire varied for each question. The average weight gain for this group was 1.6 lbs. (mean  $\pm$  SD: 159.3 $\pm$ 40.0 to 160.9 $\pm$ 39.8) with the average BMI increasing about 0.2 points (24.1 $\pm$ 5.5 to 24.3 $\pm$ 5.4) over the course of the first semester. The average age was 18.3 $\pm$ 0.7 years split between 90 males and 86 females, or 51.1% and 48.9%, respectively.

With the question “By the end of college, do you expect to have...,” the options were either lost weight, maintained weight, or gained weight. Of the 175 responses to this question, 46 expected to lose weight (26.3%), 75 expected to maintain weight (42.1%), and 54 expected to gain weight (30.7%). Of the 127 students that answered the question “...how much weight do you expect to gain?,” 55 did not expect to gain weight (43.3%), 15 expected to gain between 0 and 5 lbs. (11.8%), 23 expected to gain between 5 and 10 lbs. (13.1 %), 27 expected to gain between 10 and 15 lbs. (15.3%), 5 expected to gain between 15 and 20 lbs. (3.9%), and 2 expected to gain more than 20 lbs. (1.6%).

A total of 176 students responded to the questions “Please circle the resources of which you are aware of at the Student Recreation center” and “Please circle the resources that you use at the rec center regularly.” The resources included fitness classes, intramural sports, personal training, basketball courts, racquetball courts, tennis courts, climbing wall, pool, locker rental, towel rental, club sports, and campus runs. The resource with the most awareness was the basketball courts with 88.0% of the students being aware of it while the resource with the least amount of awareness was towel rental with 25.6% being aware of it. The resource with the most usage was fitness classes with 22.0% of the students using them while the resource with the least usage was the towel rental with only 2.3% using it.

For the question, “What do you feel is a major barrier that prevents you from exercising? Please circle all that apply” there were 151 responses. Lack of time and lack of motivation were the most circled answers with 60.3% of the students circling time and 52.3% of the students circling lack of motivation.

For the question “Please circle two options of what you think would help you most to overcome any barriers to exercising” there were 176 responses. The most circled option out of eight options was “more campus opportunities for activities” with 37.5% of the students circling that option. The least circled option was “easy access to information via social media” with 11.4% of the students circling that option.

Chi Squared goodness of fit tests revealed that weight classification and BMI classification were not evenly distributed at the end of the semester  $\chi^2(4, n=176)=24.838, p<.001$  and  $\chi^2(4, n=176)=53.698, p<.001$ , respectively, with weight gained and BMI classification of normal weight being the most frequently observed. The test also revealed that the self categorization of weight and expectation of weight status at the end of college was not evenly distributed  $\chi^2(4, n=176)=99.611, p<.001$  and  $\chi^2(4, n=176)=7.69, p=.021$ , respectively, with most students classifying themselves as underweight and most students expecting to maintain weight. Campus group involvement and weight expected to gain were also unevenly distributed  $\chi^2(4, n=176)=117.409, p<.001$  and  $\chi^2(4, n=176)=87.346, p<.001$ , respectively with most students being involved in zero campus groups and most students not expecting to gain any weight.

Chi Squared tests of independence revealed that there was a significant relationship between self categorization of weight and weight classification at the end  $\chi^2(4, n=176)=11.772, p=.019$  and a significant relationship between BMI classification at the end of the semester and self-categorization of weight  $\chi^2(4, n=176)=59.457, p<.001$ . It also revealed a significant

relationship between weight classification at the end of the semester and expectation of weight status at the end of the semester  $\chi^2(4, n=176)=27.729, p<.001$  and a significant relationship between BMI classification at the end of the semester and expectation of weight status at the end of college  $\chi^2(4, n=176)=17.095, p=.002$ .

Table 1  
*Descriptive Statistics for Study Participants*

Variable	n	Mean	SD
Age (years)	175	18.3	0.7
Height (inches)	173	67.7	4.2
Weight (lbs.)	161	160.9	39.8

## DISCUSSION

The purpose of this study was to acquire a better understanding of weight change in first year college students. We specifically sought to identify the variables that influence weight gain, as well as determine the awareness and use of resources available to the students.

Over the course of the Fall 2015 semester, 23.1% of the students lost weight, 25.0% maintained weight, while 51.9% gained weight. The percentage of those that gained weight in the current study is similar to the percentage Mihalopoulos et al. (2008) reported of 51.3%. The average weight gain for all participants was 1.6 lbs. ( $159.3 \pm 40.0$  to  $160.9 \pm 39.8$ ) in approximately a 3-month span. At this rate, a total of 3.71 lbs. would be gained by the end of the academic school year in May and 6.4 lbs. would be gained in a calendar year. If this rate were to continue, the average weight gain would be about a lb. more than what Mihalopoulos et al. (2008) found in a 7-month span (2.7 lbs.).

The annual rate presented in the current study is nearly 6 times greater than the general population weight gain of just under 1 lb. a year. (Levitsky, Halbamaier, and Mrdjenovic, 2004). Gillen and Lefkowitz (2011) found weight gain in the first semester of 2.6 lbs. for first year students, or about 0.87 lbs. per month. This is an even higher rate of weight gain than what was found in the current study. In the three-year study done by Gropper et al. (2012), the results showed that the average weight gain by the end of the study was 4.6 lbs. This rate is about 1.7 lbs. per year, which is much smaller than what was estimated in the current study (6.4 lbs.).

Gropper et al. (2012) also found that BMI increased from 22.6 to 23.3 in a three-year span, while another study (Gropper et al., 2012) found an increase of 23.5 to 25.7 in males and a 22.4 to 23.1 increase in females over a four-year span (freshman to senior year of college). These monthly rates are an increase in BMI of 0.02 in the three-year study and 0.05 and a 0.02 for



males and females, respectively, for the four-year study. In the current study, the average increase of BMI went up 0.2 points ( $24.1 \pm 5.5$  to  $24.3 \pm 5.4$ ) in three months, or about 0.06 points per month. This is a larger increase than what Gropper et al. (2012) found. At this rate, the average BMI for this group of first year students in 9 years would be a 30.7, classifying them as obese.

Many students lost weight (23.1%) and some maintained weight (25%), but the largest portion gained weight (51.9%). It is quite clear that weight gain occurs in college. The rates vary reported from study to study, but one thing remains consistent, that is the rate of weight gain is faster than the average adult rate of gaining weight. Why this occurs is still not understood. Das and Evans (2014) reported that students understood the benefits of physical activity including physical attractiveness, better quality of life, and better mental and physical health. Despite the many known benefits, students seem to still have a hard time being habitually physically active. Greaney et al. (2009) examined barriers and enablers to achieving a healthy weight. Lack of motivation and lack of time were both reported as being large barriers to being physically active. This is in agreement with the current study with lack of motivation and lack of time being selected as the top barriers. Lack of motivation was selected 79 times ( $n=151$ ) and lack of time was selected 91 times ( $n=151$ ). Compared to the other barriers options, these were selected much more often with not knowing what to do selected 28 times ( $n=151$ ) and other 5 times ( $n=151$ ). This is in agreement with Das and Evans (2014), who also found that lack of time and motivation were frequently listed barriers to managing weight.

In the current study, to overcome the identified barriers that prevent exercise, the highest percentage of students thought that more campus opportunities (37.5%) would be a good resource to do so. The second highest percentage of students thought that a course on on weight

management should be offered (26.5%) as a resource. These results agree with the findings of both Das and Evans (2014) and Greaney et al. (2009). Both studies concluded that students desired curriculum and weight management knowledge provided to them by the university. Future studies should test different types of weight management courses and campus opportunities to see how students respond. Universities play a crucial role in encouraging their students to be physically active (Das and Evans, 2014) and there is a great opportunity for higher education to play an even larger role in student health (Das and Evans, 2014; Greaney et al., 2009). The results from this study strengthen the argument that universities should devote more time and resources to address these needs of students. Not only can university's play a large role but students desire their universities to be involved.

Students understand they are susceptible to weight gain and are interested in preventing this (LaRose et al., 2011). However, some students may not be aware of what is already available through the university. In the current study, awareness of resources was examined and it was found that of the twelve resource options, there was not one that all students were aware of, with the resource with the most awareness being the basketball courts (88.0%). These results suggest that universities have an opportunity to improve on advertising these resources and that new ideas should be implemented to improve student awareness. In the future, researchers should test the awareness of resources at other large public universities and investigate which methods are effective to increase awareness.

This study also analyzed the usage of resources at the SRC. Usage seemed low, with the most used resource (fitness classes), only being used by 22.0% of the students in this group. This could be due to lack of time or motivation or something altogether different, such as lack of knowledge. For now, the findings demonstrate that there is an opportunity to increase the number

of students that use the resources at the SRC.

The first step to understanding how to best to do this is to understand student perceptions. Web et al. (2013) found that 88.4% of the participants thought that weight gain was typical in the first year of college while 43.4% expected to maintain weight. This is almost identical to the findings in the current study in that 43.3% expected to maintain weight. Web et al. (2013) also found that 61% of their participants believed that 15 lbs. was the norm for weight gain in college while in the current study, only 5.5% thought they would actually gain at least 5.5 lbs. This demonstrates that students may think that individually they are not at risk to gaining weight while everyone else is more likely to. However, the current study did reveal that the students were good at identifying which weight category they fell under according to both weight classification  $\chi^2(4, n=176)=11.772, p=.019$  and BMI classification  $\chi^2(4, n=176)=59.457, p<.001$  at the end of the semester. These results conflict with the idea that students tend to have a limited understanding of what is overweight and normal weight (LaRose et al., 2011). Future research should address this conflict by comparing the students weight and BMI classification with how they perceive themselves.

Concerns and expectations may also play a role. Web et al. (2013) found that 42% of students were moderately concerned with gaining weight. The current study did not find a relationship between concern with gaining weight in college and the weight category they fell under at the end of the semester  $\chi^2(4, n=176)=9.998, p=.265$ . Web et al. (2013) also found that 12.3% expected to gain weight in college, while in the current study 30.7% expected to gain weight. Of that, 21.3% expected to gain 10-15 lbs. The current study found that expectation of weight status at the end of college at a strong relationship with the category of weight class students fell under at the end of the semester. Chi Squared test of independence found that most

of the students that expected to gain weight in college fell in the category of having gained weight in the first semester  $\chi^2(4, n=176)=27.729, p<.001$  and having a higher BMI by the end of the first semester  $\chi^2(4, n=176)=17.095, p=.002$ . Future research should address how to change attitudes coming into college and how to target students who specifically expect to gain weight.

One possible way to change attitudes is to introduce activity at an earlier age. Madonia, et al. (2014) found that students who participated in resistance exercise and competitive sport their senior year of high school helped them feel more autonomous and competent in exercise. In the current study, 59.1% of the students stated that they participated in competitive sport in their senior year high school, while only 17.0% participated in resistance training. Having a background in resistance training and competitive sport in high school may help prevent weight gain in college through the increased likelihood of participation in exercise (Madonia, et al., 2014). Madonia, et al. (2014) also found that there should be an increase effort in keeping college students involved in competitive sport and resistance training longer. Future studies should also see if those that participate in these activities at an earlier age, are more likely to participate in physical activity later in life. With more autonomous behavior towards exercise, students' perceptions towards exercise may improve, increasing the likelihood of exercise participation. This may lead students to not expect to gain weight in college. Future research should address whether or not resistance training and competitive sport participation in college affects this expectation.

It is possible that other variables may influence expectations while the students are in college. Clarke et al. (2013) found that the lower the high school GPA, the more at risk a college student was for gaining weight. Gillen and Lefkowitz (2011) found that the more campus groups in which a student was involved, the less likely they were to gain weight. In the present study,

neither current GPA nor campus group involvement were related to a higher weight classification at the end of the semester ( $\chi^2=14.947$ ;  $p=.134$ ) ( $\chi^2=4.057$ ;  $p=.669$ ). Future studies should look at current GPA and campus group involvement while exploring other variables that may influence weight gain.

The present study suggests that weight gain can be influenced by expectation of weight gain. Understanding how to influence these expectations can allow researchers and educators create interventions. Gow et al. (2010) tested different intervention programs and their effectiveness in decreasing BMI. An internet intervention, combined with a feedback intervention, was the most effective strategy. This entailed face to face contact with group members along with checking and reporting weight once a week. In the current study, it was asked if an online fitness community and/or an in-person support group would be best to overcome barrier to exercise. Both examples are similar to the interventions that Gow et al. (2010) used. The online fitness community was selected by 17.6% ( $n=176$ ) of the participants while the in person support community was selected by 18.8% ( $n=176$ ) of the participants. Although the options seem to be viable, from the current study, they did not seem to be very popular in the eyes of current first year students.

One point to consider when creating an intervention is that one student's barrier may actually be another student's enabler (Greaney et al., 2009). While the results from this study indicate that campus activities and a weight management course are the most popular ways to prevent weight gain, this was only the responses of a group of 176 first year students at the same public university. Gow et al. (2010) demonstrated that combined internet and feedback intervention was effective, yet some students may become dissatisfied with their body if they continuously monitor their body weight. For students such as this, another type of intervention,

other than weight monitoring, may be a better idea. It is possible that other students may prefer other methods such as an online fitness community or a course on time management. Future studies should compare more interventions with students with different backgrounds, personalities, genders, etc. For example, those that participate in resistance training in high school feel more competent in exercise (Madonia, et al., 2014) and may respond better to a weight monitoring intervention. On the other hand, those that do not have much experience in exercise may not respond well to a weight monitoring intervention, but rather an exercise duration intervention.

Increasing student awareness should be another goal for educators and administrators, but helping them understand the benefits of exercise is also important. One way to do this is to develop an intervention that will increase student's perceptions of benefits and decrease their perceptions of barriers. As Das and Evans (2014) demonstrated, universities play a large role in influencing students to be healthy. Additional resources should be developed to help reach every individual and their needs while promoting the current resources.

A weight management course was found to be one resource that could help students in both this study and in a study done by Das and Evans (2014), which also showed that easy access to information on social media could make a big difference in many students' lives as well. In addition, the use of incentives of some type to get students to be active may be helpful as well as improving dining hall options to not only be healthier, but to taste better. These changes may improve student health (Das and Evans, 2014). Quick et al. (2014) found that obesity prevention programs should be in place to help students become more competent in nutrition and sleep habits. Some of these interventions could be easily implemented, like putting out easy access information on social media. Some motivators may take more effort on the part of the university

administrators. Future studies could continue to explore effective intervention ideas that will improve students competence in exercise and their knowledge in weight management.

The study has several limitations. All of the data was self reported and the developed questionnaire had not been tested for reliability nor validity which limits its usefulness as a tool. Furthermore, not all questions were answered by every student, which resulted in some gaps in the data collected. In addition, this population may not represent the whole first year student population, as the participants were only students in the FYE course at this university. It was assumed that the students all answered the questions honestly, but there was no guarantee. Some students may have had to estimate their weight while others may have known exactly what it was. The students were also at a young age ( $18.3 \pm 0.7$  years) and some may have still been growing in that first semester of college. This would have influenced BMI and the accuracy of it as a measuring tool. We also cannot be certain if weight gain was from fat mass or lean mass, which further limits the conclusions that were drawn. The researchers focused primarily on physical activity and not nutrition. Nutrition is equally, if not more important, than physical activity in weight management. This would have given more insight into the barriers students face and how the universities could have provided more help.

## CONCLUSION

The results in this study add to the literature in that weight gain occurs at a fast rate in the first semester of college. Most of the students that that expected to gain weight in college gained weight in the first semester. This suggests that those that expect to gain weight are at an increased risk of gaining weight. Most students perceive lack of time and lack of motivation as the bigger barriers that prevented them from being physically active, thus, preventing weight gain and/or managing it. Most students' were aware of the resources that are available, but many did not use them. Future work should be aimed to develop interventions that will help change student's perceptions, specifically to weight gain and concern to gaining weight. Furthermore, universities should give students multiple options as resources to assist them in maintaining a healthy weight.



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## Appendix A: FYE Email

Hello Instructors!

I hope that you all had a great first week of classes and are off to a great start on your second week! I want to say thank you to you all for your interest. With your help, and if all goes well, the results of this study will have a positive impact on not only your students, but also students across the nation.

I am sure most of you recall my presentation on Saturday, August 31st before the semester started. If you cannot recall, I have a one page handout attached that you can reference (same handout you all received that day).

To make it brief, at the end of the semester I would like to come to your classes and conduct the questionnaire for your students. The questionnaire will be assessing the barriers first year students face that prevent them from leading a healthy lifestyle. About 87% of you preferred me to come to your classroom and 80% preferred it to be on paper instead of online. Because of that, I decided it is best for me to come to your classroom and give the questionnaire. The questionnaire will likely be conducted by using a scantron with the questions being multiple choice and likert scale based.

Some of you also expressed interest in me talking to your students about the importance of a healthy lifestyle and being physically active. If that still interests you, please plan on reserving 50 minutes of class that day for me. Between the questionnaire and the presentation, it should take about 50 minutes tops. Please let me know if this is the route you would like to take.

If you are not interested in me given a presentation, plan on the questionnaire taking 5-10 minutes. I could come at the start or at the end of class. My committee members and myself believe the best time for me to come during the semester would be sometime during the week of thanksgiving break and the week after break.

If you are not interested anymore, please email me back and let me know. I plan on having the questionnaire completed next month so look for an email from me around that time. I will keep you all in the loop.

If any of you have questions, please email me. You can also call, or text me at 810 845 7748.

Thank you for you time and good luck with your semester!

Sincerely,

Noah Neuenfeldt

## Appendix B: Summarization of Study to FYE Instructors

**Thesis Committee:** Noah Neuenfeldt, Dr. Nicholas Hanson, Dr. Timothy Michael, Dr. Carol Weideman,

**Contact information:**

Noah Neuenfeldt, Student Investigator: [noah.c.neuenfeldt@wmich.edu](mailto:noah.c.neuenfeldt@wmich.edu) or (810) 845-7748

Dr. Carol Weideman, Committee Member: [carol.weideman@wmich.edu](mailto:carol.weideman@wmich.edu)

**Purpose of Questionnaire:** Assess the student's knowledge of available resources and their ability to use them as well as identification of potential resources that they might find helpful.

Variables to be addressed related to weight gain...

- Social media/internet (Gow et al 2012)
- Factors that lead to weight gain during and after college (Lloyd Richards et al 2009)
- Behavior and environmental factors (Das & Evans 2014)
- How much time devoted to working and how much sleep students get(Quick et al 2013)
- Expectations of graduation (Clarke et al 2013)
- Sex differences (Lackman et al 2015)
- Involvement in campus groups and ACT scores (Gillen & Lefkowitz 2012)

**Overall goal of questionnaire:** To understand more about the reasons that prevent students from exercising that first semester by understanding what resources they are aware of and what barriers they face. This information should be useful to the university and educators

Other info...

- Questionnaire should take 10 minutes to complete.
- Ideal time to conduct questionnaire would be week after Thanksgiving break.
- Questionnaire will be completed by end of September/early October

## Appendix C: Developed Questionnaire



Demographics & General Information

What was your height at the beginning of the semester?

Feet:\_\_\_\_\_ & Inches:\_\_\_\_\_ (or) Meters:\_\_\_\_\_

What was your weight or mass at the beginning of the semester?

Pounds: \_\_\_\_\_ (or) Kilograms:\_\_\_\_\_

What is your current weight or mass?

Pounds: \_\_\_\_\_ (or) Kilograms:\_\_\_\_\_

What sex do you identify as? Please circle.

M      F

What is your age? Years: \_\_\_\_\_

What is your ethnicity? Please circle.

White/Caucasian      Latino/Hispanic      Black/African American

Other: \_\_\_\_\_

Please indicate if you live on campus. If you do, please circle the neighborhood you live in.

I do not live on campus      Valley Residential      Center Residential

South Residential      West Residential

What was your high school GPA? Please circle.

0-0.5      0.6-1.0      1.1-1.5      1.6-2.0      2.1-2.5  
2.6-3.0      3.1-3.5      3.6-4.0      4.0+

What type of activities did you participate in during your senior year of high school? Please circle all that apply.

Competitive sport	Recreational Sport	Aerobic Exercise
Resistance exercise	Organized Activity	Recreational Activity
Club Sports		

Have you tried any new type of physical activity since the start of this semester?

Yes                  No

If yes, please circle all that apply and list specifically what that activity was.

Organized Activity	Recreational Activity
Club Sport	Recreational Sport
Resistance Exercise	Aerobic Exercise

List specific activity(s) here (i.e soccer, dance etc.): \_\_\_\_\_

Campus Resources

Please circle the resources of which you are aware of at the Student Recreation Center.

Fitness Classes	Intramural Sports	Personal Training
Basketball Courts	Racquetball Courts	Tennis Courts
Climbing wall	Pool	Locker Rental
Towel Rental	Club Sports	Campus Runs

Please circle the resources that you use at Rec center regularly.

Fitness Classes	Intramural Sports	Personal Training
Basketball Courts	Racquetball Courts	Tennis Courts
Climbing wall	Pool	Locker Rental
Towel Rental	Club Sports	

Are you comfortable using the facilities at the Rec Center?

Yes                      No

If you are not, please indicate the possible reasons. Circle all that apply.

No time                      Other priorities                      No motivation

No energy                      Other (please list): \_\_\_\_\_

If you have not used the resources at the rec center, what is preventing you? Please circle all that apply.

Don't have time                      Not motivated to go                      Not important for me to go

Too far away                      I workout elsewhere                      Didn't know about the resources

Please circle the resources of which you are aware of at Sindecuse.

Health education                      Sports medicine                      Physical therapy

Counseling services

Please circle the resources at Sindecuse that you have used before.

Health education                      Sports medicine                      Physical therapy

Counseling services

Which health education resources at Sindecuse have you used before?

Nutrition counseling                      Wellness workshops                      Cholesterol screening

Eating Disorder assessment/treatment

If you have not used the resources at Sindecuse, what is preventing you? Please circle all that apply.

Don't need them                      Don't have time                      Not motivated to go

Too far away                      Didn't know about the resources

Habits

On average, how many hours of sleep do you get a night?

Less than 4                  4-5                  5-6                  7-8                  More than 8

How many campus groups/clubs (i.e Fraternity/sority, club sports etc.) are you involved with?

0                  1                  2                  3                  4                  5 or more

Where do you usually eat your meals?

On campus                  Off campus                  In my dorm/apartment/home

On average, how much time per week do you spend exercising? Please circle.

Less than an hour                  About an hour                  About 2.5 hours                  About  
3.5 hours                  About 4.5 hours                  Over 4.5 hours

On average this semester, how many days per week have you exercised? Please circle.

0 days/week                  1-2 days/week 3-4 days/week  
5-6 days/week 7 days/week

What types of activities do you do for exercise? Please circle all that apply.

Run/Jog                  Walk                  Weight lifting                  Intramurals

Other (please list): \_\_\_\_\_

What do you feel is a major barrier that prevents you from exercising? Please circle all that apply.

Not motivated Hard to make time                  Not sure what to do

Other (please list)\_\_\_\_\_

### Feelings

How are you motivated to exercise? Please circle all that apply.

By the way I look                  By my health status                  By my weight status

By the way I feel                      Other (please  
list): \_\_\_\_\_

How confident are you in participating in any physical activity? Please circle.

Not at all 1                      2                      3                      4                      5 Very

In which category would you consider yourself?

Normal weight                      Under weight                      Overweight

How confident are you in your time management skills?

Not at all 1                      2                      3                      4                      5 Very

Do you expect to graduate from college?

Yes                      No

How concerned are you with gaining weight in college?

Not at all 1                      2                      3                      4                      5 Very

By the end of college, do you expect to have...

Lost weight                      Gained weight                      Maintained weight

If you expect to gain weight please circle how much weight you expect to gain

Don't expect to gain weight                      0-5lbs                      5-10lbs  
10-15lbs                      15-20lbs                      More than 20lbs

If the semester ended right now, what would your GPA be?

0-0.5                      0.6-1.0                      1.1-1.5                      1.6-2.0                      2.1-2.5  
2.6-3.0                      3.1-3.5                      3.6-4.0

How satisfied are you with campus life?

Not at all 1                      2                      3                      4                      5 Very

Do you have someone in your life that encourages you to exercise?

Yes                      No

If so, does this encouragement help?

Yes                      No

Potential Resources

Please circle TWO options of what you think would help you most to overcome any barriers to exercising.

- Online fitness community                      More university sponsored events
- Course on time management    In person support community
- Course on weight management                      Provided easy access info on social media
- Better public transportation    More campus opportunities for activity

What would you prefer for a weight prevention program? Please circle one.

Make them pick one of two?

- Online fitness community                      A university course
- In person support group that meets once a week

How likely would you participate in an online fitness community to help you with leading a healthy lifestyle?

Not at all 1                      2                      3                      4                      5 Very

How effective do you think an online fitness community would be?

Not at all 1                      2                      3                      4                      5 Very

How likely would you enroll in a weight management class?

Not at all 1                      2                      3                      4                      5 Very

How effective do you think a weight management class would be?

Not at all 1                      2                      3                      4                      5 Very

How likely would you participate in an in person support group?

Not at all 1                      2                      3                      4                      5 Very

How effective do you think an in person support group would be?

Not at all 1                      2                      3                      4                      5 Very

## Appendix D: Code Sheet for Developed Questionnaire



## Questions...

- Height
- Weight @ beginning
- Weight @ end
- Weight Change
- Weight Change End: 1= Gained weight, 0= Lost weight, 2= No change
- BMI Beginning
- BMI End
- BMI Class End: 1= underweight, 2= normal, 3= overweight
- BMI Change
- 1 = male, 2 = female
- age
- 1 = white, 2 = latino, 3 = black 4 = other
- 1 = not living on campus, 2 = Valley, 3 = Center, 4= south, 5= west, 6= other
- 1= 0-.5, 2= .6-1.0, 3= 1.1-1.5, 4= 1.6-2.0, 5= 2.1-2.5, 6=2.6-3.0, 7=3.1-3.5, 8=3.6-4.0, 9= 4.0+
- Types of activities done senior year of high school? 1=yes, 0=no
  - Resistance Exercise senior year?,
  - Competitive Sport senior year?
  - Any of above others?
- Tried a new type of PA this semester? 1=yes, 0=no
- Circle activities you have tried

- Resistance Exercise? 1=yes, 0=no
  - Any others? 1=yes, 0=no
- # of Resources aware of at SRC
- # of Resources that you use
- Comfortable using SRC? 1= yes, 0= no
- If not comfortable, why? 1=yes, 0=no
  - no time
  - other priorities
  - no motivation
  - no energy
  - other
- If you have not used resources at src, what is preventing you? 1=yes, 0=no
  - don't have time
  - not motivated to go
  - not important for me to go
  - too far away
  - I workout elsewhere
  - Didn't know about the resources
- # of resources aware of at Sindecuse
- # of resources used before
- Health education resources used at Sindecuse

- 1= nutrition counseling, 2= wellness workshops, 3= cholesterol screening, 4= eating disorder assessment/treatment
- What is preventing you from using Sindecuse resources? 1 = yes, 0 = no
  - don't need them,
  - don't have time,
  - not motivated
  - too far away
  - didn't know about resources
- Hours of sleep a night
  - 1= less than 4, 2= 4-5, 3= 5-6, 4= 7-8, 5= more than 8
- # Campus groups involved in
- Where are meals eaten
  - 1= on campus, 2= off campus, 3= in my dorm/apartment/home
- Time spent a week exercising
  - 1= less than an hour, 2= about an hour, 3= about 2.5 hours, 4= about 3.5hours, 5= about 4.5 hours, 6= over 4.5 hours
- Days a week spent exercising
  - 1= 0 days, 2= 1-2 days, 3= 3-4 days, 4= 5-6 days, 5= 7 days
- Primary activities for exercise? 1=yes, 0 = no
  - run
  - walk,
  - weight lifiting,

- IM's,
- other/swimming
- Major barrier that prevents you from exercising? 1=yes, 0=no
  - not motivated,
  - hard to make time,
  - not sure what to do,
  - other
- What motivates you to exercise? 1=yes, 0=no
  - by the way I look,
  - by my health status,
  - by my weight status,
  - by the way I feel,
  - other
- Confidence level with PA
- How to categorize yourself
  - 1= normal weight, 2= under weight, 3= overweight
- Confidence level with Time M skills
- Expectation to graduate? 1= yes, 0= no
- Concern with gaining weight in college
- End of college, what you expect?
  - 1= lost weight, 2= gained weight, 3= maintained weight
- If you expect to gain weight, how much?

- 1= don't expect to gain weight, 2= 0-5, 3= 5-10, 4= 10-15, 5= 15-20, 6= more than 20
- GPA right now?
  - 1= 0-.5, 2= .6-1.0, 3= 1.1-1.5, 4= 1.6-2.0, 5= 2.1-2.5, 6=2.6-3.0, 7=3.1-3.5, 8=3.6-4.0,
- Satisfaction with campus life
- Someone in life who encouraged to exercise?
  - 1= yes, 0= no
- Does this help?
  - 1= yes, 0=no
- Two options that would help in overcoming barrier to exercise?1=yes, 0=no
  - online fitness community,
  - more university sponsored events,
  - course on time management,
  - in person support community, 5
  - course on weight management, 6
  - provided easy access info on social media,
  - better public transportation,
  - more campus opportunities for activity
- Preference for weight prevention program
  - 1= online fitness community, 2= a university course, 3= in person support group that meets once a week

- Likert
- Likert
- Likert
- Likert
- Likert
- Likert

## Appendix E: Exercise Barrier/Benefits Scale

1987

Health Promotion Model - Instruments to  
Measure HPM Behavioral Determinants :  
Exercise Benefits/Barriers Scale [EBBS]  
(Adult Version)

Sechrist, Karen R.; Walker, Susan N.; Pender, Nola J.

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### EXERCISE BENEFITS/BARRIERS SCALE

DIRECTIONS: Below are statements that relate to ideas about exercise. Please indicate the degree to which you agree or disagree with the statements by circling SA for strongly agree, A for agree, D for disagree, or SD for strongly disagree.

	Strongly Agree	Agree	Disagree	Strongly Disagree
1. I enjoy exercise.	SA	A	D	SD
2. Exercise decreases feelings of stress and tension for me.	SA	A	D	SD
3. Exercise improves my mental health.	SA	A	D	SD
4. Exercising takes too much of my time.	SA	A	D	SD
5. I will prevent heart attacks by exercising.	SA	A	D	SD
6. Exercise tires me.	SA	A	D	SD
7. Exercise increases my muscle strength.	SA	A	D	SD
8. Exercise gives me a sense of personal accomplishment.	SA	A	D	SD
9. Places for me to exercise are too far away.	SA	A	D	SD
10. Exercising makes me feel relaxed.	SA	A	D	SD
11. Exercising lets me have contact with friends and persons I enjoy.	SA	A	D	SD
12. I am too embarrassed to exercise.	SA	A	D	SD
13. Exercising will keep me from having high blood pressure.	SA	A	D	SD
14. It costs too much to exercise.	SA	A	D	SD
15. Exercising increases my level of physical fitness.	SA	A	D	SD
16. Exercise facilities do not have convenient schedules for me.	SA	A	D	SD
17. My muscle tone is improved with exercise.	SA	A	D	SD
18. Exercising improves functioning of my cardiovascular system.	SA	A	D	SD
19. I am fatigued by exercise.	SA	A	D	SD
20. I have improved feelings of well being from exercise.	SA	A	D	SD
21. My spouse (or significant other) does not encourage exercising.	SA	A	D	SD

(Continued on reverse side)

	Strongly Agree	Agree	Disagree	Strongly Disagree
22. Exercise increases my stamina.	SA	A	D	SD
23. Exercise improves my flexibility.	SA	A	D	SD
24. Exercise takes too much time from family relationships.	SA	A	D	SD
25. My disposition is improved with exercise.	SA	A	D	SD
26. Exercising helps me sleep better at night.	SA	A	D	SD
27. I will live longer if I exercise.	SA	A	D	SD
28. I think people in exercise clothes look funny.	SA	A	D	SD
29. Exercise helps me decrease fatigue.	SA	A	D	SD
30. Exercising is a good way for me to meet new people.	SA	A	D	SD
31. My physical endurance is improved by exercising.	SA	A	D	SD
32. Exercising improves my self-concept.	SA	A	D	SD
33. My family members do not encourage me to exercise.	SA	A	D	SD
34. Exercising increases my mental alertness.	SA	A	D	SD
35. Exercise allows me to carry out normal activities without becoming tired.	SA	A	D	SD
36. Exercise improves the quality of my work.	SA	A	D	SD
37. Exercise takes too much time from my family responsibilities.	SA	A	D	SD
38. Exercise is good entertainment for me.	SA	A	D	SD
39. Exercising increases my acceptance by others.	SA	A	D	SD
40. Exercise is hard work for me.	SA	A	D	SD
41. Exercise improves overall body functioning for me.	SA	A	D	SD
42. There are too few places for me to exercise.	SA	A	D	SD
43. Exercise improves the way my body looks.	SA	A	D	SD

## **EXERCISE BENEFITS/BARRIERS SCALE**

### Scoring Information

The instrument may be scored and used in its entirety or as two separate scales. The instrument has a four-response, forced-choice Likert-type format with responses ranging from 4 (strongly agree) to 1 (strongly disagree). Barrier Scale items are reverse-scored. Items on the Barrier Scale are numbers 4, 6, 9, 12, 14, 16, 19, 21, 24, 28, 33, 37, 40 and 42.

Missing data may be handled in one of two ways. If more than five percent of the items are unanswered, it is recommended that the response be discarded. If the missing item response rate is less than five percent, median substitution prevents falsely low scores.

Scores on the total instrument can range from 43 to 172. The higher the score, the more positively the individual perceives exercise. When the Benefits Scale is used alone, the score range is between 29 and 116. When the Barriers Scale is used alone, scores range between 14 and 56. If used alone, the Barriers Scale does not need to be reverse-scored. In this instance, the higher the score on the Barriers Scale, the greater the perception of barriers to exercise.

## Appendix F: Exercise Benefits/Barriers Scale Permission Letter

## ***Health Promotion Model Instrumentation Group***

Nola J. Pender, PhD, RN, FAAN • Susan Noble Walker, EdD, RN, FAAN • Karen R. Sechrist, PhD,

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RN, FAAN

Dear Colleague:

Thank you for your interest in the Exercise Benefits/Barriers Scale (EBBS). The EBBS was developed in response to a need for an instrument designed to determine perceptions of individuals concerning the benefits of and barriers to participating in exercise. Items for the scale were obtained inductively from interviews and from the literature.

The EBBS is a 43-item summated rating scale consisting of two subscales, Benefits and Barriers. Ratings are obtained using a four-point response system. The EBBS has been tested for internal consistency, validity of its constructs, and test-retest reliability. A sample of 650 individuals over 18 years of age, primarily from northern Illinois, participated in the initial testing of the EBBS. Calculation of Cronbach's alpha for the 43-item instrument yielded a standardized alpha of .954. The 29-item Benefits Scale has a standardized alpha of .954 and the 14-item Barriers Scale has a standardized alpha of .866. Factor analysis yielded a nine-factor solution initially with an explained variance of 65.2%. Second order factor analysis yielded a two-factor solution, one a benefits factor and the other a barriers factor. Test-retest reliability was accomplished with a sample of 66 healthy adults at a two-week interval. Test-retest reliability was found to be .89 on the total instrument, .89 on the Benefits Scale and .77 on the Barriers Scale. Additional information on the development and initial testing of the EBBS can be found at in the following article:

Sechrist, KR, Walker, SN, and Pender, NJ. (1987). Development and psychometric evaluation of the Exercise Benefits/Barriers Scale. *Research in Nursing & Health*, 10, 357-365.

You have our permission to download and use the EBBS for non-commercial data collection purposes such as research or evaluation projects as long as the following conditions are met:

- The EBBS will be used without any modifications other than translation into a language other than English (see information on translation, if required);
- The copyright statement will appear on the bottom of all copies of the EBBS; and
- All study participants will be over 18 years of age since the EBBS was not validated in younger populations.

Copyright of the EBBS and all translations is held by Karen R. Sechrist, PhD, RN, FAAN, Susan Noble Walker, EdD, RN, FAAN, and Nola J. Pender, PhD, RN, FAAN. Individuals translating the EBBS into another language may place their name as translator following the copyright statement.

The EBBS may be reproduced in the appendix of a dissertation, thesis, or research grant proposal. Reproduction for any other purpose, including publication of study findings, is prohibited.

A copy of the EBBS with scoring information is available for download. A Spanish translation of the EBBS is also available. If you need additional information, you may contact Dr. Karen Sechrist by e- mail (krsech@pacbell.net).

Best wishes with your research,

A handwritten signature in black ink, reading "Karen R. Sechrist". The signature is written in a cursive style with a large initial 'K'.

Karen R. Sechrist,  
PhD, RN, FAAN for  
Pender/Walker/Sech  
rist

## Appendix G: Anonymous Survey Consent



## **Anonymous survey consent**

You are invited to participate in a research project entitled "*Perceived Barriers of Exercise and Awareness of Resources on a College Campus to Improve Healthy Lifestyle*" designed to assess first year students' knowledge of campus resources, barriers they face to using them, and potential resources that they might find helpful to improve health. Dr. Nicholas Hanson and Noah Neuenfeldt from Western Michigan University, Department of Human Performance and Health Education are conducting the study. This research is being conducted as part of the **thesis** requirements for **Noah Neuenfeldt**.

This study involves two questionnaires. One is comprised of 47 multiple choice and fill in the blank questions while the other consists of 43 Likert scale questions where an option must be circle. Combined, both questionnaires should take approximately 10 minutes to complete. Your replies will be completely anonymous; so do not put your name anywhere on the form. You may choose to not answer any question and simply leave it blank. If you choose to not participate in this study, you may either return the blank survey or you may discard it in the box provided. Returning the questionnaire indicates your consent for use of the answers you supply.

The benefits of the questionnaires give you the opportunity to reflect on your current state of physical activity, which may result in a change. The results of the study may also benefit you directly by giving the university more reason to provide you, as a student, with additional and helpful resources.

Should you have any questions, you may contact **Dr. Hanson** at **269-387-2670**, or **Noah Neuenfeldt** at **noah.c.neuenfeldt@wmich.edu**, the Human Subjects Institutional Review Board (269-387-8293) or the vice president for research (269-387-8298).

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board as indicated by the stamped date and signature of the board chair in the upper right corner. You should not participate in this project if the stamped date is more than one year old.

Appendix H: HSIRB Approval Letter

Date: November 11, 2015

To: Nicholas Hanson, Principal Investigator  
Noah Neuenfeldt, Student Investigator for thesis  
Timothy Michael, Co-Principal Investigator  
Carol Weideman, Co-Principal Investigator

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 15-10-47

This letter will serve as confirmation that your research project titled “Perceived Barriers to Exercise and Awareness of Resources on a College Campus to Improve Healthy Lifestyle” has been **approved** under the **exempt** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may **only** be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., *you must request a post approval change to enroll subjects beyond the number stated in your application under “Number of subjects you want to complete the study.”*) Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

**Reapproval of the project is required if it extends beyond the termination date stated below.**

The Board wishes you success in the pursuit of your research goals.

**Approval Termination: November 10, 2016**

## Appendix I: Tables

Table 2  
*Sex, Race, and Place of Residency for the First Year Students*

Variable	n	Percentage
<b>Sex</b>		
Male	90	51.1%
Female	86	48.9%
<b>Race/Ethnicity</b>		
White/Caucasian	131	76.2%
Latino/Hispanic	8	4.7%
Black/African-American	26	15.1%
Other	7	4.0%
<b>Place of Residency</b>		
Off Campus	13	7.5%
Valley Residential	88	50.6%
Center Residential	47	27.0%
South Residential	19	10.9%
West Residential	1	0.6%

Table 3  
*High School GPA (n=175)*

Classification	Frequency	Percentage
2.1 to 2.5	5	2.9%
2.6 to 3.0	59	33.7%
3.1 to 3.5	62	35.4%
3.6 to 4.0	47	26.9%
4.0+	2	1.1%

Table 4  
*Comfortable Using the Facility (n=171)*

Choices	Responses	Percentage
Yes	142	83.0%
No	29	17.0%

Table 5  
*Reasons Why Uncomfortable (n=41)*

Choices	Responses	Percentage
No time	17	41.5%
Other priorities	11	26.8%
No motivation	21	51.2%
No energy	11	26.8%
Other	11	26.8%

*Note.* The students were instructed to circle more than one choice if it was applicable.

Table 6  
*Reasons that Prevent the Use of the Recreation Center (n=73)*

Choices	Responses	Percentage
Don't have time	38	52.1%
Not motivated	36	49.3%
Not important	6	8.2%
Too far away	20	27.4%
Workout elsewhere	17	23.3%
Unaware of resource	3	4.1%

*Note.* The students were instructed to circle more than one choice if it was applicable.

Table 7  
*Reasons Resources at Sindecuse Health Center that were not Used (n=115)*

Choices	Responses	Percentage
Do not need them	115	100.0%
Do not have time	12	10.4%
Not motivated to go	18	15.7%
Too far away	1	0.9%
Did not know about them	21	18.3%

*Note.* The students were instructed to circle more than one choice if it was applicable.

Table 8  
*Hours of Sleep per Night (n=176)*

Choices	Responses	Percentage
Less than 4 hours	2	1.1%
4-5 hours	10	5.7%
5-6 hours	66	37.5%
7-8 hours	82	46.6%
More than 8 hours	16	9.1%

Table 9  
*Campus Group Involvement (n=176)*

Number of Groups	Responses	Percentage
0	100	56.8%
1	50	28.4%
2	19	10.8%
3	7	4.0%

Table 10  
*Where Majority of Meals were Eaten (n=175)*

Choices	Responses	Percentage
On campus	151	86.3%
Off campus	8	4.6%
At home	16	9.1%

Table 11  
*Time Spent Exercising in a Week (n=175)*

Choices	Reponses	Percentage
Less than an hour	45	25.7%
About an hour	28	15.9%
About 2.5 hours	44	25.1%
About 3.5 hours	24	13.7%
About 4.5 hours	11	6.3%
Over 4.5 hours	23	13.1%

Table 12  
*Days Spent Exercising a Week (n=175)*

Choices	Responses	Percentage
0 days	31	17.6%
1-2 days	85	48.3%
3-4 days	40	22.7%
5-6 days	11	6.3%
7 days	8	4.5%

Table 13  
*Primary Activities for Exercise (n=176)*

Activity	Responses	Percentage
Running/jogging	95	54.4%
Walking	73	41.5%
Weight lifting	74	42.0%
Intramurals	34	19.3%

*Note.* The students were instructed to circle more than one choice if it was applicable.

Table 14  
*Barriers to Exercise (n=151)*

Barrier	Responses	Percentage
Lack of motivation	79	52.3%
Lack of time	91	60.3%
Unsure of what to do	28	18.5%
Other	5	3.3%

*Note.* The students were instructed to circle more than one choice if it was applicable.

Table 15  
*Motivators to Exercise (n=174)*

Motivators	Responses	Percentage
Looks	127	73.0%
Health	64	36.8%
Weight	89	50.5%
Feelings	120	68.2%

*Note.* The students were instructed to circle more than one choice if it was applicable.

Table 16  
*Current GPA (n=170)*

GPA	Responses	Percentage
0-0.5	1	0.6%
0.6-1.0	1	0.6%
2.1-2.5	18	10.6%
2.6-3.0	34	20.0%
3.1-3.5	70	41.2%
3.5-4.0	46	27.1%



Table 17  
*Preferred Resources to Overcome Barriers (n=176)*

Resources	Reponses	Percentages
Online fitness community	31	17.6%
University sponsored events	37	21.0%
Course on time Management	47	26.7%
In person support community	33	18.8%
Couse on weight management	63	35.8%
Easy Access information on Social Media	20	11.4%
Better Public Transportation	36	20.5%
More campus opportunities for activities	66	37.5%

*Note.* The students were instructed to circle more than one choice if it was applicable.

Table 18.  
*Descriptive Statistics for Feelings*

Feeling	n	Mean	SD
Confidence Level with Physical Activity	176	3.6	1.1
Confidence Level with Time Management Skills	175	3.4	1.1
Concern Level with gaining weight in College	175	3.02	1.4
Satisfaction with Campus Life	175	3.4	1.0

*Note.* All questions were scored on a 1-5 Likert scale with 1 being not at all and 5 being very.

Table 19  
*Likelihood of Participation and Effectiveness of Potential Resources in Overcoming Barriers to Exercise*

Resource	n	Mean	SD
Likelihood of online fitness community helping	174	2.5	1.2
Effectiveness of online fitness community	174	2.8	1.1
Likelihood of enrolling in a weight management course	174	2.4	1.3
Effectiveness of a weight management course	174	3.3	1.1
Likelihood of participating in an in person support group	173	2.4	1.2
Effectiveness of an in person support group	173	3.2	1.1

*Note.* All questions were scored on a 1-5 Likert scale with 1 being not at all and 5 being very.

Table 20

*Exercise Benefits and Barriers Scale Scores*

Scale	n	Mean	SD
Benefits	175	116.1	25.7
Barriers	175	26.9	7.2

*Note.* The Benefits scale was scored from a 29 to 116, the higher the number the higher the perception the benefits of exercise while the Barriers scale was scored from a 14 to 56, the higher the number the greater the perception of barriers to exercise.

Table. 21

*Resource Usage at the Student Recreation Center (n=176)*

Resources	Frequency	Percentage
Fitness Classes	39	22.0%
Intramural Sports	28	15.8%
Personal Training	34	19.2%
Basketball Courts	33	18.6%
Racquetball Courts	8	4.5%
Tennis Courts	7	4.0%
Climbing Wall	11	6.2%
Pool	15	8.5%
Locker Rental	15	8.5%
Towel Rental	4	2.3%
Club Sports	5	2.8%

*Note.* The students were instructed to circle more than one choice if it was applicable.

Table 22

*Resource Awareness at the Student Recreation Center (n=176)*

Resources	Frequency	Percentage
Fitness Classes	149	84.6%
Intramural Sports	126	71.6%
Personal Training	74	42.0%
Basketball Courts	155	88.0%
Racquetball Courts	117	66.5%
Tennis Courts	115	65.3%
Climbing Wall	144	81.9%
Pool	150	85.2%
Locker Rental	80	45.5%
Towel Rental	45	25.6%
Club Sports	98	55.7%
Campus Runs	55	31.2%

*Note.* The students were instructed to circle more than one choice if it was applicable.

Table 23

*Resource Awareness at Sindecuse Health Center (n=176)*

Resource	Responses	Percentage
Health Education	139	78.5%
Sports Medicine	66	37.3%
Physical Therapy	99	55.9%
Counseling Services	152	85.9%

*Note.* The students were instructed to circle more than one choice if it was applicable.

Table 24

*Resource Usage at Sindecuse Health Center (n=176)*

Resource	Responses	Percentage
Health Education	43	24.3%
Sports Medicine	9	5.1%
Physical Therapy	6	3.4%
Counseling Services	14	7.9%

*Note.* The students were instructed to circle more than one choice if it was applicable.

Table 25

*Health Education Resources Usage at Sindecuse Health Center (n=176)*

Resource	Responses	Percentage
Nutrition Counseling	10	5.6%
Wellness Workshops	25	14.1%
Cholesterol Screening	0	0.0%
Eating Disorder Assessment/Treatment	4	2.3%

*Note.* The students were instructed to circle more than one choice if it was applicable.

Table 26

*Weight Expected to Gain in College (n=127)*

Category	Responses	Percentage
No weight	55	43.3%
0-5lbs.	15	11.8%
5-10lbs.	23	18.1%
10-15lbs.	27	21.3%
15-20lbs.	5	3.9%
20+lbs.	2	1.6%