

TITLE PAGE

Title of project:

**Relationship Between Health Behaviors and Academic Performance in Pharmacy Students in their
Didactic Years**

Course Title: PhPr 898B

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ABSTRACT

Specific Aims: To explore the relationship between health behaviors and academic performance amongst PharmD candidates.

Subjects: Pharmacy students in their 1st, 2nd, and 3rd year of PharmD program at the University of Arizona College of Pharmacy.

Methods: An online survey was emailed to PharmD students in their didactic years at the University of Arizona, including a cover letter explaining the project, informed consent, and due date to submit responses. The survey utilized Qualtrics software to collect the responses from participants on their demographic characteristics, academic performances, and health behaviors, including study habits, sleep patterns, and physical activity (type, intensity, location, frequency). Additionally, data on leadership positions status, hours worked per week, and consumption of tobacco and alcohol were also collected.

Main Results: A total of 91 PharmD students completed the survey. 58 (63.7%) respondents were female, 59 (64.8%) were in the 23–27-year-old age range, and 60 (65.9%) identified as White/Caucasian. Of the 91 students, 39.6% met recommended health guidelines for physical activity, while 70.3% met the recommendations for alcohol consumption. There was a significant difference in GPA for students who met physical activity recommendations ($p=0.04$) compared to those who did not. However, there was no significant difference in GPA between those who met the recommended guidelines for alcohol or nicotine-containing product consumption versus those who did not ($p=0.32$).

Conclusions: The results of this study suggest an association between health behaviors and academic performance. Meeting certain recommended health behaviors, such as physical activity, were associated with a higher GPA among PharmD students in their didactic years.

Relationship Between Health Behaviors and Academic Performance in Pharmacy Students in their Didactic Years

INTRODUCTION

Limited studies have been conducted to date to examine the effects of health behaviors and their association with academic performance among Doctor of Pharmacy (PharmD) students during their didactic years.^{1,2,3,4} These factors include but are not limited to Body Mass Index (BMI), amount of exercise, type of exercise, amount of sleep per night, stress level, alcohol use, and tobacco consumption.⁵ Health behaviors can substantially impact one's quality of life by aiming at the prevention or detection of illnesses. The correlation between these health markers and behaviors, including their impacts on the pharmacy students' grade point averages (GPA), remains unknown.

With the rigor of the program, it may be inevitable that students experience constant stress, pressure, and eventually, burnout which makes it difficult to follow recommended health behaviors.^{6,7} The aspect of time management is essential within the PharmD program in order to balance work, school, relationships, extracurricular activities, social life, and other expectations and requirements for the degree such as fulfilling intern hours and rotations. Often students feel overwhelmed as a result of maintaining these aspects and being a competitive, prospective new hire in the field they choose to pursue within the profession of pharmacy.

Existing studies have demonstrated that exercise can lead to improved academic performance compared to students who do not.^{1,4} Others have also evaluated physical activity, fitness measures, and BMI. However, there are limitations to these studies in that they did not examine other facets of health behaviors such as study habits and the use of alcohol or nicotine-containing products. Therefore, the purpose of this study is to determine the relationship between these health behavioral factors on academic performance amongst students in their didactic years at the University of Arizona College of Pharmacy.

METHODS

Design: This was an observational study comparing health behaviors and the academic performance of pharmacy students.

Subjects: Students were eligible to participate in this study if they were current University of Arizona College of Pharmacy students (386) in the classes of 2021, 2022, and 2023. The study was approved by the University of Arizona Human Subjects Protection Program.

Measures: Data was collected from students using an online Qualtrics survey. Students were asked to complete a questionnaire containing 17 questions related to academics and health behaviors, and five questions related to participant demographics. Health behavior questions included intensity and time spent participating in physical activity per week, and average alcohol intake per day. Questions relating to academics included GPA, leadership positions, time spent studying, and hours worked per week. Academic performance was measured by collecting students' GPAs.

Data Collection: The questionnaire was administered to students in their didactic years via email at the beginning of the 2020 fall semester. An email list from The University of Arizona College of Pharmacy Internal Links was used to identify participants. The classes of 2021, 2022, and 2023 were emailed, using listserv, a cover letter that explained the project, confidentiality, and due date, as well as a link to the online Qualtrics survey. Students voluntarily completed all or part of the questionnaire. Qualtrics software anonymously recorded student's responses. The survey responses were stored in a secure server in the College of Pharmacy server with a protective password. Only the adviser and students listed were able to access the data files.

Data analysis: Data from survey responses were analyzed using inferential statistics. The primary outcome compared The U.S. Department of Health and Human Services (HHS) recommended physical activity guidelines and a cumulative pharmacy school GPA. The secondary outcome compared recommended alcohol consumption and cumulative GPA. The outcomes were analyzed using an

independent sample t-test and reported as a mean, standard deviation, and p-value.

RESULTS

The demographic characteristics are shown in Table 1. Survey respondents were primarily female (63.7%), White/Caucasian (65.9%), and in the 23 to 27 years-old age range (64.8%). The survey response rate was 25%, and 36 of the 91 (39.6%) participants met recommended health guidelines for physical activity. The statistical analysis of meeting HHS requirements compared to GPA is shown in Table 2. The recommended guidelines for alcohol consumption were met by 64 of the 91 (70.3%) participants. There was a significant difference in GPA for students who met physical activity recommendations versus those who did not (3.69 ± 0.25 vs. 3.57 ± 0.32 , $p=0.04$). However, there was no significant difference in GPA for students who met alcohol consumption recommendations versus those who did not (3.61 ± 0.31 vs. 3.65 ± 0.28 , $p=0.56$). The statistical analysis for physical activity and alcohol use are shown in Tables 3 and 4, respectively. Similarly, there was no significant difference in GPA between those who used tobacco/nicotine products and those who did not (3.50 ± 0.39 vs. 3.63 ± 0.28 , $p=0.32$, Table 5). There was no significant difference between average hours of sleep per night versus GPA and hours spent working each week versus GPA, shown in Graphs 1 and 2, respectively.

DISCUSSION

The primary finding of this study is that students who met HHS recommended physical activity guidelines had a higher mean GPA than those who did not. Those who met the recommended guidelines for alcohol consumption did not have a significantly different GPA than those who did not. Similarly, tobacco/nicotine use was not associated with a significant difference in GPA. Of the variables examined in this study, meeting HHS recommendations for physical activity was the only factor that had a statistically significant impact on student's GPA.

Health behaviors can substantially impact one's quality of life by aiming at preventing or detecting illnesses. These behaviors can also have an impact on personal relationships, physique, and

academic performance. Similar to our study, a 2009 study by Flynn et al. found a positive association between physical activity and GPA. In this study, the researchers found that students with higher GPAs were more likely to participate in vigorous physical activity than those with a lower GPA.¹ In contrast, studies done by Xu et al. and Gonzalez et al. found no significant association between physical activity and GPA.^{2,3} Other studies, such as those by Caletine et al. and Deliens et al., chose to examine the academic impact of other health-related factors that our study did not, such as work habits and course load.^{4,5}

There were several limitations to this study. First, the study used data that was self-reported and subjective. Also, the survey was sent via email, so there is a possibility that students did not see the email, open the survey link, or chose not to participate. Lastly, the survey presumes the participants understood the survey questions and respond honestly and accurately.

CONCLUSIONS

Meeting recommended health behaviors such as exercise was associated with a higher GPA among PharmD students in their didactic years. This study indicates a need to emphasize positive health behaviors amongst students to positively impact GPA. Furthermore, this can motivate students to carry out a better lifestyle which will translate to their work as a pharmacist and allow for a more personal connection when counseling on recommended health behaviors and healthy lifestyle choices.

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Table 1.

Characteristics of Study Subjects

Characteristics	N (%)
Gender	
Female, n (%)	58 (63.7%)
Male, n (%)	31 (34.1%)
Prefer not to answer	2 (2.2%)
Ethnicity	
White/Caucasian	60 (65.9%)
Asian/Pacific Islander	19 (20.9%)
Other	12 (13.2%)
Age Categories (years)	
18-22	7 (7.7%)
23-27	59 (64.8%)
28-32	13 (14.3%)
33-37	8 (8.8%)
Over 37	4 (4.4%)
BMI Categories	
Underweight	1 (1.1%)
Normal	63 (69.2%)
Overweight	19 (20.0%)
Obese	8 (8.8%)

Table 2.

Statistical Analysis Overview

Guidelines	Physical Activity		Alcohol Consumption		Tobacco/Nicotine Use	
	Yes	No	Yes	No	Yes	No
Met Requirements	Yes	No	Yes	No	Yes	No
Mean GPA	3.69	3.57	3.61	3.65	3.50	3.63
SD	0.25	0.32	0.31	0.28	0.39	0.28
df	85		54		10	
T-stat	2.51		-0.59		-1.04	
p-value	0.04		0.56		0.32	

Table 3.

Statistical Analysis of Physical Activity

	<i>Yes</i>	<i>No</i>
Mean	3.693	3.570
Variance	0.064	0.101
Observations	36	55
Hypothesized Mean Difference	0	
df	85	
t Stat	2.051	
P(T≤t) one-tail	0.022	
t Critical one-tail	1.663	
P(T≤t) two-tail	0.043	
t Critical two-tail	1.988	

Table 4.

Statistical Analysis of Alcohol Consumption

	<i>Yes</i>	<i>No</i>
Mean	3.607	3.646
Variance	0.095	0.078
Observations	64	27
Hypothesized Mean Difference	0	
df	54	
t Stat	-0.592	
P(T≤t) one-tail	0.278	
t Critical one-tail	1.674	
P(T≤t) two-tail	0.556	
t Critical two-tail	2.005	

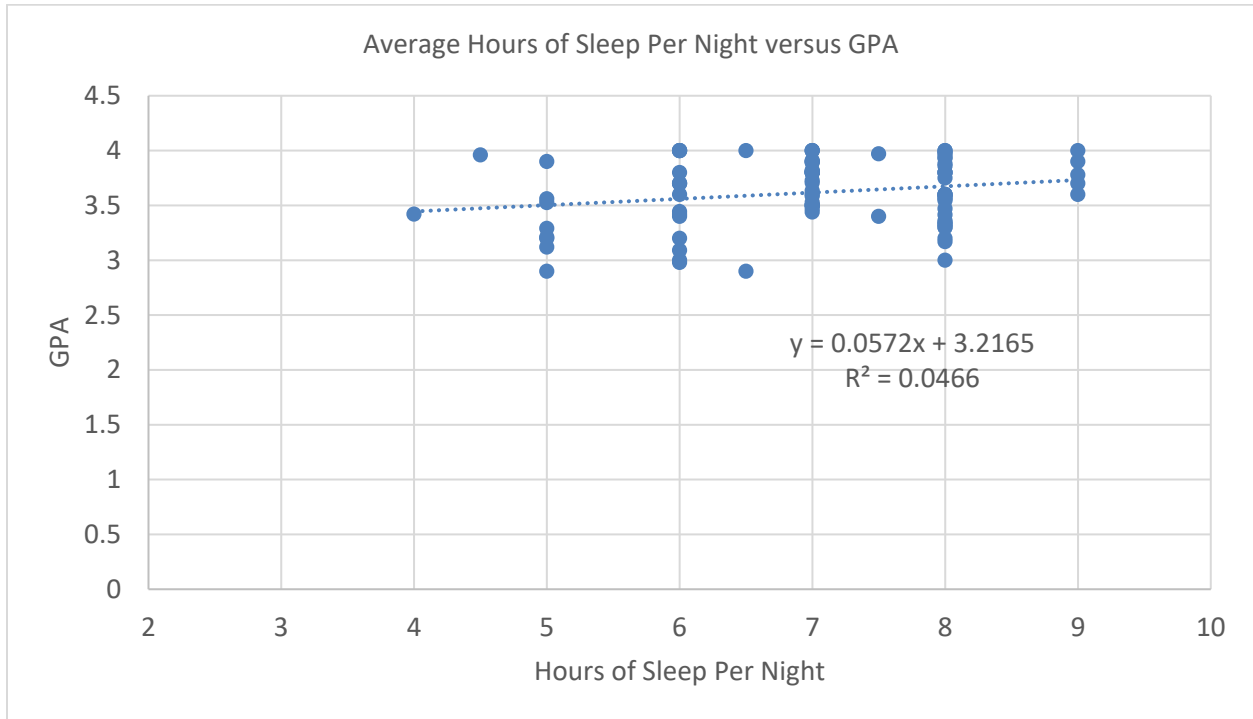
Table 5.

Statistical Analysis of Tobacco Use

	<i>Yes</i>	<i>No</i>
Mean	3.5	3.633
Variance	0.153	0.081
Observations	10	81
Hypothesized Mean Difference	0	
df	10	
t Stat	-1.042	
P(T≤t) one-tail	0.161	
t Critical one-tail	1.812	
P(T≤t) two-tail	0.322	
t Critical two-tail	2.228	

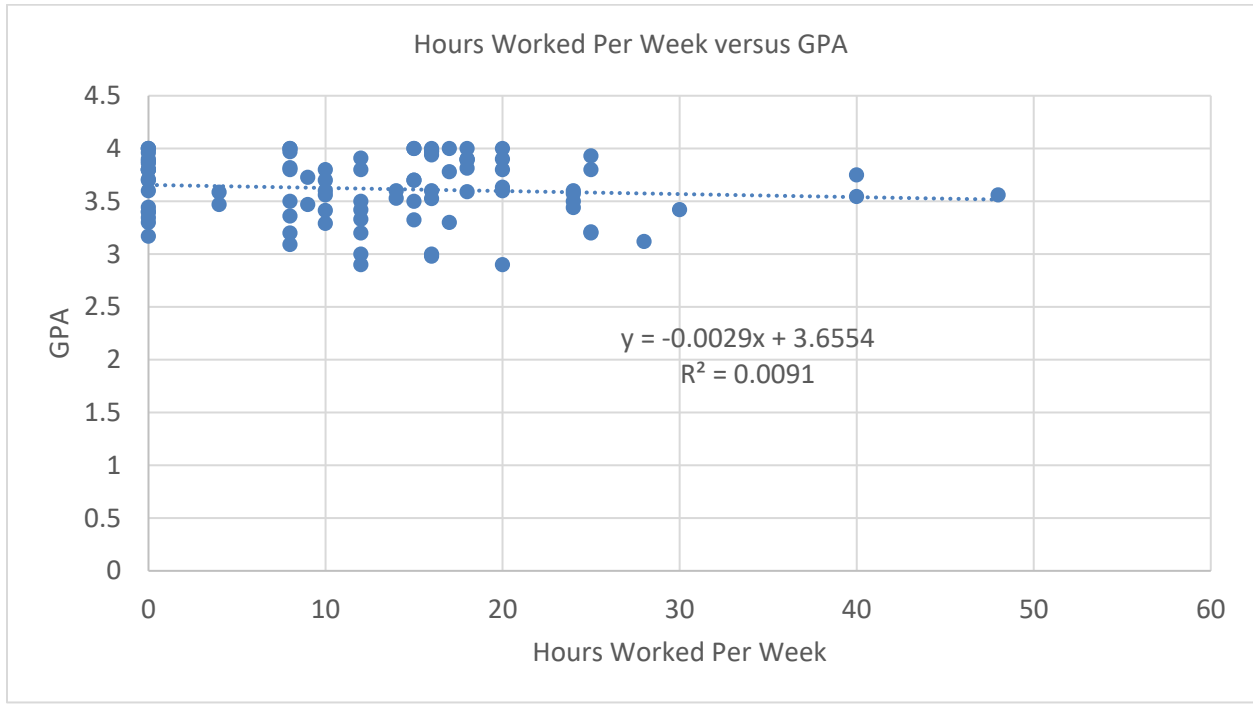
Graph 1.

Average Hours of Sleep Per Night versus GPA



Graph 2.

Hours Worked Per Week versus GPA



APPENDICES

Appendix A: Search Strategy

<u>Database</u>	<u>Keywords</u>
Embase	<ul style="list-style-type: none"> - Body Mass Index (BMI) - Grade Point Average (GPA) - Didactic - Physical activity - BMI - Activity type - Academic outcomes - Healthy behaviors
PubMed	<ul style="list-style-type: none"> - BMI - GPA - Learning capacity - PharmD students - Physical activity - Education/Graduate - College student - Academic outcomes - Fitness - Healthy behaviors
Access Pharmacy	<ul style="list-style-type: none"> - BMI - GPA - Physical activity - PharmD - Didactic - Fitness - Healthy behaviors

Appendix B:

**PhPr 862: Writing a Research Proposal
Documentation of Type of IRB Approval Required**

Project Title: Relationship between health behaviors and academic performance in pharmacy students in their didactic years

Student Names: 1) Gabriella Gambadoro
2) David Nisanov
3) Daniel Streng
4) Vincent Tran

Adviser(s): 1) Sandipan Bhattacharjee

Data Collection Site: University of Arizona College of Pharmacy

Source of Data: 1) Patient charts
2) Database
3) Questionnaire/interviews/focus groups
4) Published literature/studies
5) Public web-site
6) Laboratory (bench) research
7) Laboratory animals
8) Other _____

IRB form required: (Complete as instructed by Dr. Nix)
1) Human Research Determination
2) Application for Human Research
3) None—Research does not involve humans (e.g. systematic review, lab research)
4) Other _____

Supplemental Forms Required: (Complete as instructed by Dr. Nix)
1) Site permission letter
2) Written informed consent form
3) PHI authorization form
4) List of Research Personnel
5) CV's for key personnel (PI, Co-PI, adviser)
6) Data collection instrument
7) Other Approval by Dr. Lee

NOTE: Download all forms from the IRB website: <http://ocr.arizona.edu/hssp/forms>. If time from downloading and submission is more than 30 days, check to make sure new forms are not required.

Appendix C: Questionnaire

Health Behaviors and Academic Performance Senior Project Survey

Start of Block: Informed Consent

Q1 Please read the informed consent form below and agree by clicking "OK" to continue to survey

Research consent

Click "OK" to consent to participate in this study

- OK (4)

End of Block: Informed Consent

Start of Block: Default Question Block

Q2 What is your cumulative pharmacy school GPA?

Q3 What was your cumulative pharmacy school GPA before Spring Semester 2020?

Q4 How many **hours** per week do you spend studying?

- 0 to 5 hours (1)
- 6 to 10 hours (2)
- 11 to 15 hours (3)
- 16 or more hours (4)

Q5 How many **minutes** per week do you spend participating in physical activity?

- 0 (1)
- less than 30 (2)
- 60 to 89 (3)
- 90 to 119 (4)
- 120 to 149 (5)

more than 150 (6)

Q6 How many **days** per week do you spend participating in physical activity?

- 0 (1)
- 1 (2)
- 2 (3)
- 3 (4)
- 4 (5)
- 5 (6)
- 6 (7)
- 7 (8)

Q7 What type of physical activity do you participate in (choose all that apply)

- Cardio (running, walking) (1)
- Strength Training (2)
- Recreational sports (3)
- Yoga (4)
- Household chores (dishes, gardening, cleaning, etc) (8)
- Other (9) _____
- I do not participate in physical activity (10)

Q8 Where do you typically participate in physical activity (choose all that apply)

- Gym (1)
- Home (2)
- Outdoors (3)
- I do not participate in physical activity (4)

Q9 Which of the following best describes your typical physical activity? (choose all that apply)

Intensity is defined as the following:

Light: non-sedentary waking behavior such as walking at a slow or leisurely pace, cooking activities, or light household chores. Moderate: Includes walking briskly, playing doubles tennis, or raking the yard.

Vigorous: Includes jogging, running, or participating in a strenuous fitness class.

- Light Intensity (6)
- Moderate Intensity (7)
- Vigorous Intensity (8)
- I do not participate in physical activity (9)

Q10 Do you use tobacco or nicotine products?

- Yes (1)
- No (2)

Q11 How many alcoholic drinks do you typically consume **per week**?

1 standard drink= 0.6 fl oz of 100% alcohol

1 drink is defined as:

12 oz of beer; 5 oz of wine, 8 oz of malt liquor, or 1.5 oz or a "shot" of liquor

Q12 How many days per week do you consume alcohol?

Q13 How many **hours** do you sleep on average each night?

Q13 Do you work?

- Yes (1)
- No (2)

Q14 How many **hours** per week do you work? If you said no to the above question, please input 0 in the box below.

Q15 Did you choose to opt for the pass/fail grade in any classes for the Spring 2020 semester?

- Yes (1)
- No (2)

Q16 If you said yes to the above question, how many credits did you opt for the pass/fail grade? If you

said no to the above question, please input 0 in the box below.

Q17 Are you involved in any student leadership positions (any organization in and outside UACOP including president-elect)?

- Yes (1)
- No (2)

Q18 What is your gender?

- Male (1)
- Female (2)
- Prefer not to answer (3)

Q19 What is your age?

- 18-22 (2)
- 23-27 (3)
- 28-32 (4)
- 33-37 (5)
- Over 37 (6)

Q20 What is your race?

- White/Caucasian (1)
- Asian/Pacific Islander (4)
- Other (5)

Q21 What BMI category do you follow into?

Use the following calculation:

$BMI = \text{weight (in pounds)} / \text{height squared (in inches)}$

- Underweight BMI (4)
- Normal BMI 18.5-24.9 (5)
- Overweight BMI 25.0-29.9 (6)
- Obese BMI 30 and above (7)

Q22 What is your anticipated graduation year?

- 2021 (1)
- 2022 (2)
- 2023 (3)