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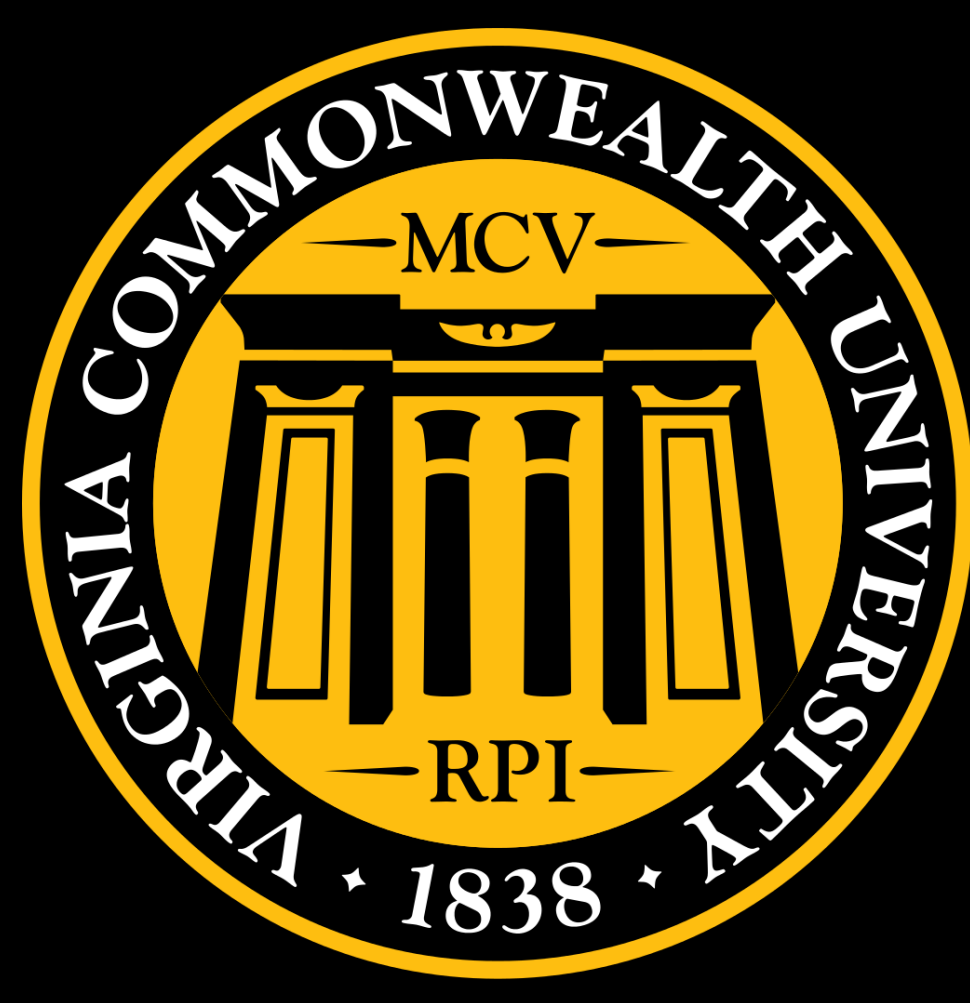
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-Facts & Statistics. (2014, September). Retrieved from <http://www.adaa.org/about-adaa/press-room/facts-statistics>. -Depression. (2016, February 3). Retrieved from <http://www.cdc.gov/nchs/fastats/depression.htm>. -Arnone, D., Job, D., Selvaraj, S. et al. (2016, February 8). Computational meta-analysis of statistical parametric maps in major depression. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1002/hbm.23108/full>. -He, Y., Xu, T., Zhang, W., Zuo, X. (2016, March). Lifespan anxiety is reflected in human amygdala cortical connectivity. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1002/hbm.23094/full>. -Trivino-Paredes, J., Patten, A., Gil-Mohapel, J., Christie, B. (2016). The effects of hormones and physical exercise on hippocampal structural plasticity. Retrieved from <https://www.clinicalkey.com/#!/content/playContent/1-s2.0-S0091302216300097?returnurl=null&referrer=null>. -Derogatis, L., Cleary, P. (October, 1977). Confirmation of the dimensional structure of the SCL-90: A study in the construct validation. Retrieved from <http://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?sid=0670d497-f5af-4d32-9aff-d100ab589a81%40sessionmgr4004&vid=1&hid=4207>. -Craig, C., Marshall, A., Sjostrom, M., et al. (2003, January) International physical activity questionnaire: 12-country reliability and validity. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/12900694>. -Jette, M., Sidney, K., Blumchen, G. (1990, August). Metabolic equivalents in



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The Relationship Between Exercise and Depression and Anxiety in College Students

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INTRODUCTION

According to the Anxiety and Depression Association of America (ADAA), anxiety is the most common mental illness in America, affecting 18% of the population¹. The Center for Disease Control (CDC) reports that 7.6% of persons 12 years or older could be diagnosed with depression in a two-week period (2009-2012)² and the Anxiety and Depression Association of America states that 6.7% of adults 18 or older in a given year¹. Depression has been shown to decrease grey matter in the hippocampus³ and the amygdala plays a pivotal role in the regulation of anxiety⁴. Exercise has been proven to increase hippocampal neurogenesis, cell survival, and BDNF levels in adults⁵. These factors have been shown to decrease depressive symptoms⁵. This study is focused on the effects that exercise has on the rate of depression and anxiety among college students participating in the Spit for Science research project.

Research questions: (1) To determine the association between overall amount of exercise and the rate of depression and anxiety among college students (2) to see if there is an association between levels of exercise intensity and depression and anxiety.

Hypotheses:

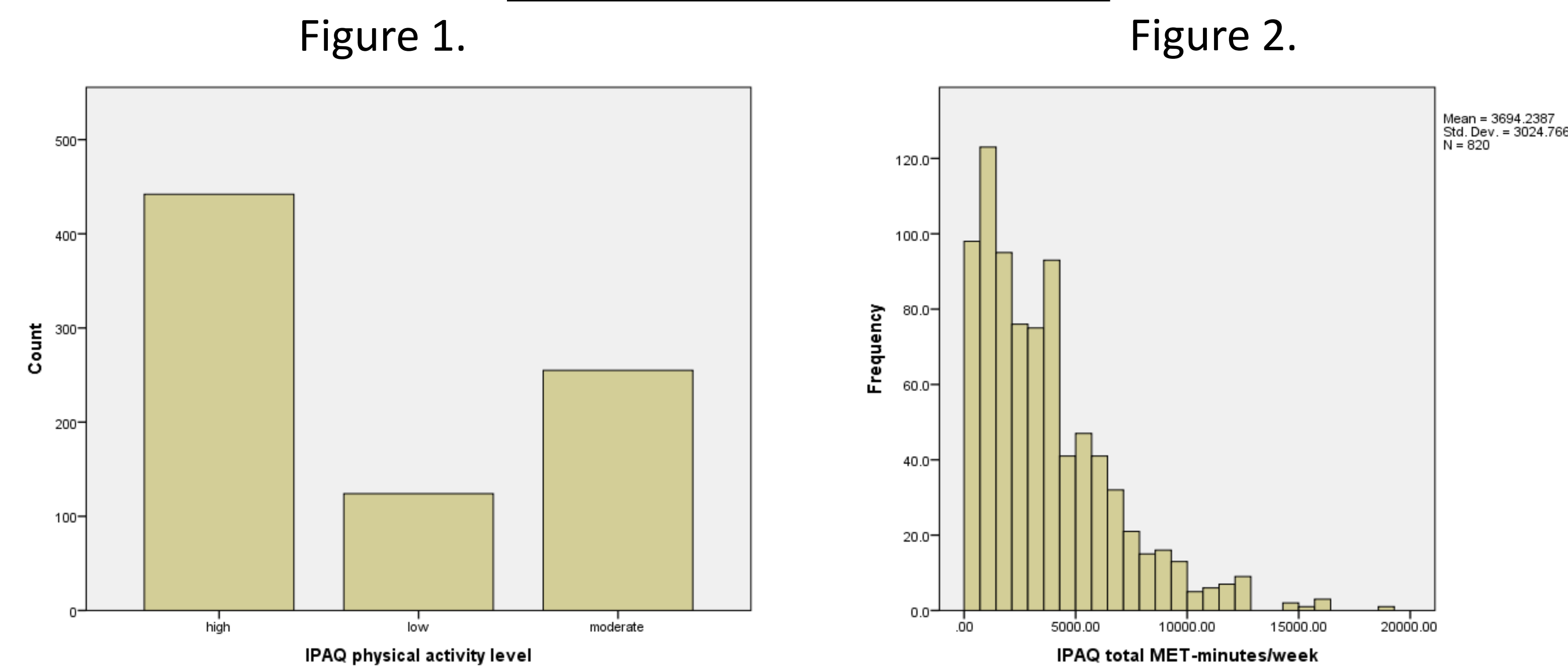
1. Overall physical activity will be associated with overall sum score of depression and anxiety.
2. Vigorous activity will have a greater negative association with depression and anxiety than both moderate and light intensity physical activity.

METHODS

- Seniors in 2011 Spit for Science cohort (n=820)
- Spring 2015 follow-up survey
- Depression and Anxiety Sum-Scores using the Symptom Checklist 90 (SCL-90)⁶
 - Questions pertaining to depression (i.e. “feeling blue”) or anxiety (i.e. “nervousness or shakiness inside”) in the last 30 days
 - Answer choices: Likert scale ranging from “not at all” to “extremely”
 - Scores on questions pertaining to depression (i.e. “feeling blue”) or anxiety (i.e. “nervousness or shakiness inside”) are totaled to estimate risk each individual has to have the disorder
- International Physical Activity Questionnaire (IPAQ)⁷
 - Physical activity done in the past week
 - Measured in Metabolic Equivalents (MET’s)
 - MET’s are the amount of oxygen consumed while sitting at rest⁸
 - equal to 3.5 ml O₂ per kg body weight x min⁸
 - Physical activity is divided into three categories:
 - Light, moderate, and heavy physical activity
 - Determined by minutes of activity multiplied by the accepted value of MET’s for each activity level to get average energy expenditure of activity⁸
- SPSS used for analysis of data
 - ANOVA for levels of exercise versus depression/anxiety (with post hoc t-tests)
 - Regression between overall MET’s and depression/anxiety
 - Covariates accounted for: Ethnicity, sex, age

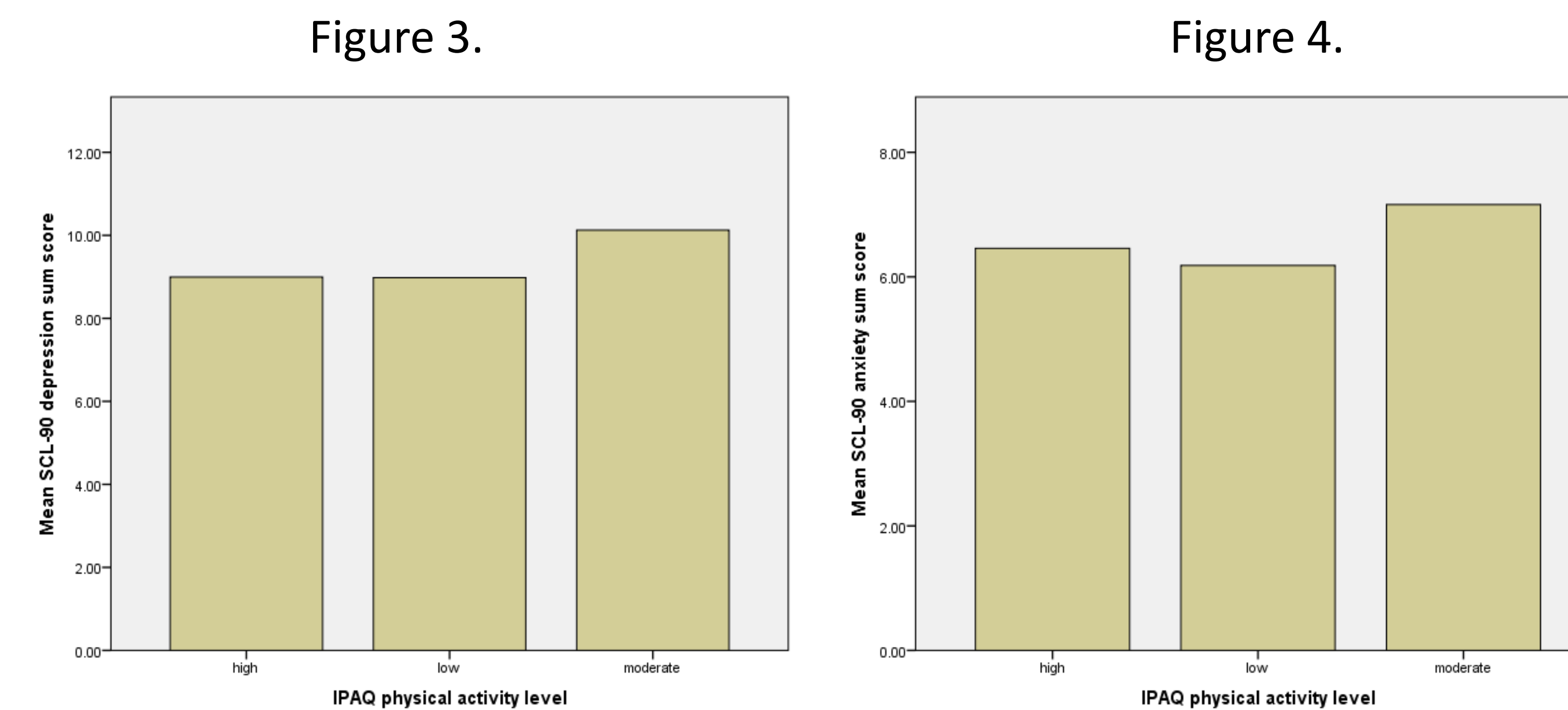
RESULTS

Overall Exercise



- Overall exercise count for the study (Figure 1):
 - High: 442 students. Low: 124 students. Moderate: 255 students
- Overall MET-minutes/week distribution (Figure 2):
 - Large decreases in frequency occurred around 4,285, 10,000, and 12,850 MET-minutes/week
 - Mean = 3,694.24 MET-minutes/week

Depression & Anxiety



- Figures 3 & 4 show the relationship between physical activity level and mean depression and anxiety, respectively.
- Research Question 1:
 - The ANOVA indicated **significant mean differences in depression between groups (p=0.001)**. Post hoc tests revealed significantly increased depression symptoms in the moderate exercise category compared to the low (p=0.027) and high (p=0.001) groups. There were no significant differences between low and high groups (p=0.999).
 - The ANOVA indicated **significant mean differences in anxiety between groups (p=0.005)**. Post hoc tests revealed significantly increased anxiety symptoms in the moderate exercise category compared to the low (p=0.016) and high (p=0.015) groups. There were no significant differences between low and high groups (p=0.681).
- Research Question 2:
 - After covarying for age, gender, and ethnicity in the regression model, **overall METs significantly predicted depression sum score (p=0.043, B<0.001)**.
 - After covarying for age, gender, and ethnicity in the regression model **overall METs showed no significant association (p<0.203) with anxiety sum scores**.

DISCUSSION

Implications

- Data show exercise may lead to a decreased risk of depression and depressive symptoms among college aged students.
- The data also shows that exercise is not significantly associated with anxiety.

Limitations

- Self-reported data
- Potential misinterpretation of questions
- Appropriation of MET’s among exercise categories
- Only one type of measurement of depressive symptoms
 - Possibility of gender bias

Conclusions

- Exercise has been well accepted among medical and academic societies as having profound benefits to many different bodily systems. The results of this study further validate these claims, showing that exercise is associated with a decreased risk of depression and depressive symptoms.
- Since depressive symptoms are closely related to hippocampal activity⁵, and this study shows that exercise has a positive impact on the regulation of these symptoms, exercise may be associated with a positive impact on the hippocampal regions of the brain.
- Although exercise is not significantly associated with anxiety in this study, physical activity plays a crucial role in maintaining well-being and could perhaps also play a minor role in anxiety related symptoms.

Future Directions

- Further tests on the difference between the levels of exercise and anxiety/depression scores
- Examine genetic differences between those who have higher depression and anxiety sum scores and those who have lower scores.
- Analysis of ethnicity differences and their effect on prevalence of anxiety
- Further examination of MET’s classification system

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