# Introduction

Physical activity is commonly linked to improvements in physical health and cognitive function. Although several studies in recent years have demonstrated positive correlations between physical activity, cardiovascular fitness, and academic achievement in school-aged children, the effects of physical health in the academic outcomes of college-aged students is still under review. A straightforward, quantifiable measure of physical activity is daily step count. If physical activity enhances cognitive performance in university settings, we would expect a positive relationship between students' step counts and their grade point averages (GPAs). In other words, do students who take more steps each day tend to earn higher GPAs?

Data Methods

To address this question, we analyzed individual-level data from 581 first-semester freshmen at Oral Roberts University during the Fall 2017 semester, obtained from Figshare. Step counts and active minutes were recorded using Fitbit devices as part of a mandatory health and physical activity component in the university's "Introduction to Whole Person Education" course. Students also completed a lifestyle assessment survey and participated in a 1-mile field test. Semester GPAs and demographic information (age and gender) were collected at the end of the term, and the dataset was fully de-identified prior to analysis.
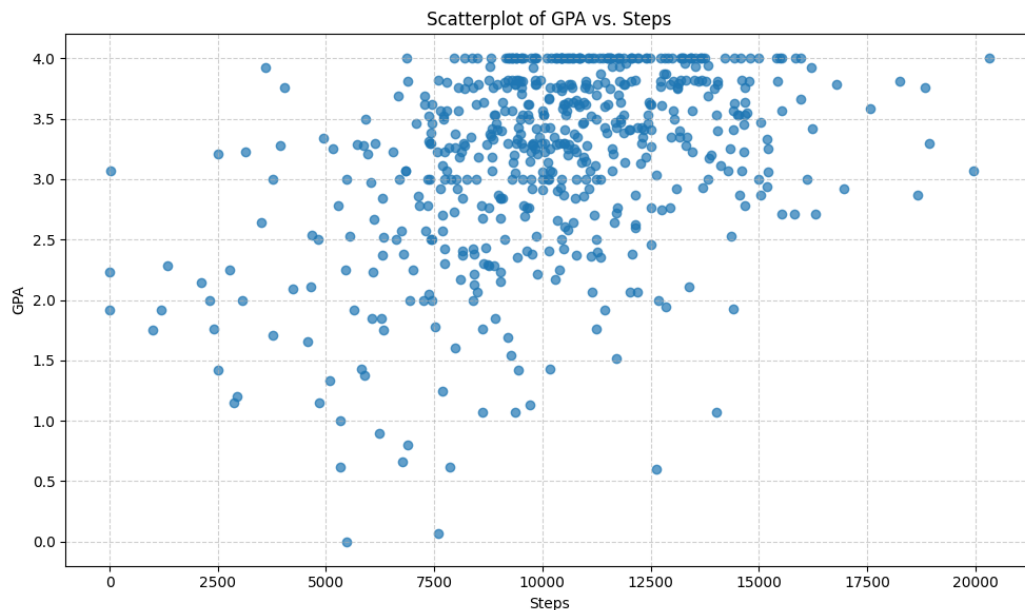
The students in the study showed considerable variation in physical activity levels, with some meeting or exceeding recommended daily step goals, while others fell well below these thresholds. GPA values were similarly distributed, allowing for a meaningful examination of the relationship between academic performance and physical activity. Gender, treated as a binary variable, was included as a control and coded as 0 for male students and 1 for female students. Because the average step counts were similar across genders, this suggests that the impact of physical activity on academic performance is comparable for both groups.

It should be noted, however, that the scope of the data is relatively limited in that it only observes data from freshman students at a single university, as well as does not take into account other confounding variables such as economic or college-major differences in academic performance and GPA.
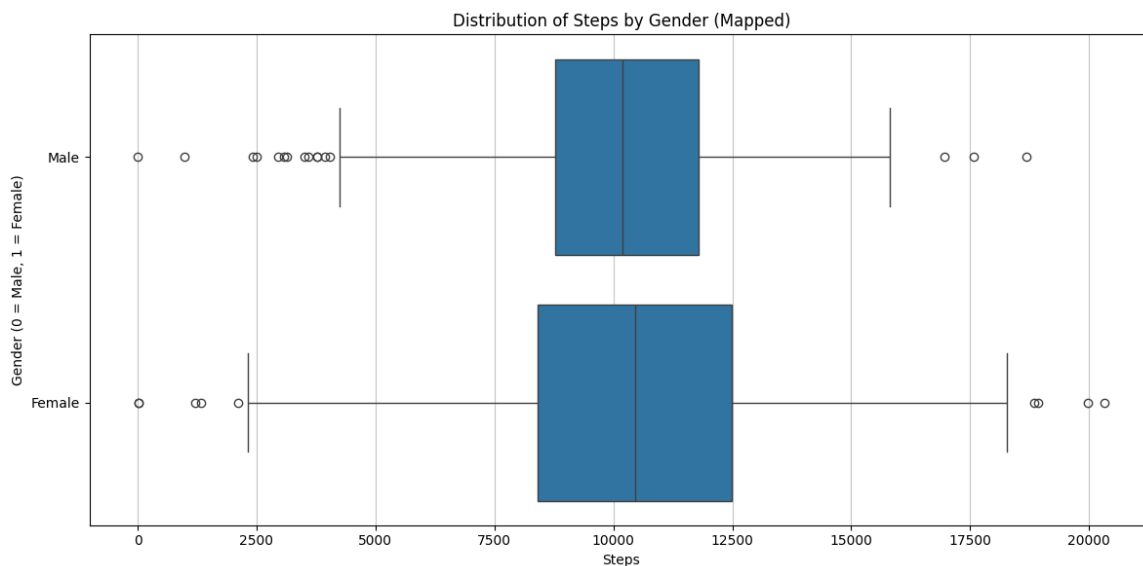
Statistical Methods

To evaluate the main research question, we used the following regression model to predict students' semester GPA using their daily step count, gender, and the interaction between step count and gender:

$GPA_i = \beta_0 + \beta_1*FEMALE + \beta_2*Steps_i + \beta_3(FEMALE_i \times Steps_i) + \varepsilon_i$
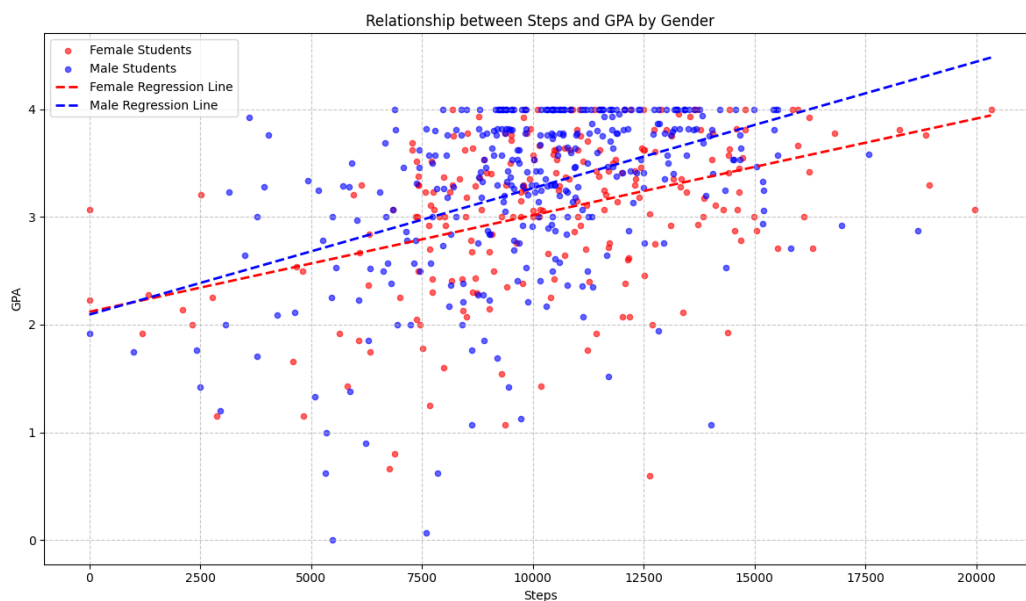

Figure 1 demonstrates the relationship between steps and GPA, with separate lines for male and female students.

Including both gender and the interaction between gender and steps allows for the examination of whether GPA differs between males and females and whether the effect of physical activity on GPA varies by gender. This approach provides a more complete understanding of the overall effect of steps on academic performance.

Results and analysis

The linear regression model produced the following output:

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                 coef      std err       t       P>|t|    [0.025    0.975]

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Intercept      2.0934     0.136      15.437   0.000    1.827     2.360

FEMALE         0.0258     0.198      -0.131   0.896    -0.362    0.414

Steps          0.0001     1.29e-05   9.075    0.000    9.2e-05   0.000

FEMALE:Steps  -2.769e-05  1.84e-05   -1.503   0.133    -6.39e-05  8.5e-06

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The model indicates that each additional step is associated with an approximate 0.0001 increase in GPA, a relationship that is highly statistically significant. This would happen by chance less than 0.10 percent of the time under the default null of no relationship ($p < 0.001$).

The interaction term between Steps and FEMALE is negative (0.00002769) but not statistically significant ($p = 0.133$). This suggests that, although female students may experience slightly lower returns in GPA from physical activity compared with male students, the evidence is insufficient to conclude that the slope of steps predicted by GPA differs by gender.

Conclusions

Our regression model indicates that higher step counts are associated with higher GPA, while gender differences in the effect of physical activity on academic performance are suggestive but not statistically significant. Overall, physical activity appears positively related to academic performance.

References

Adams, Paul, et al. *Dataset: Fitbits field-tests and grades — The effects of a healthy and physically active lifestyle on the academic performance of first-year college students.* figshare, 2017, https://figshare.com/articles/dataset/Dataset_Fitbits_field-tests_and_grades_The_effects_of_a_healthy_and_physically_active_lifestyle_on_the_academic_performance_of_first_year_college_students_/7218497/1.