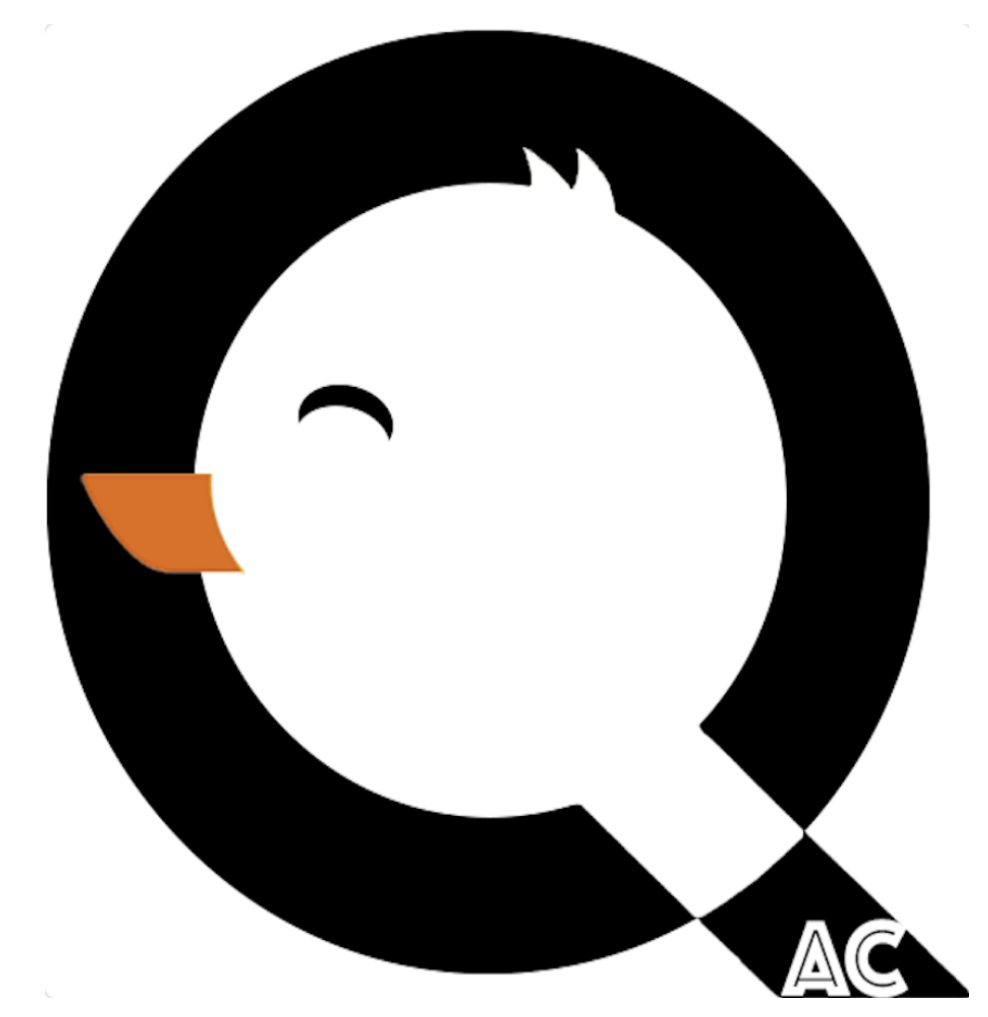


# The Role of Sleep Behaviors in the Exercise-Mental Health Relationship Among Adolescents



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## Introduction

- Pediatric emergency department visits related to mental health from 2011 to 2020 had almost doubled, reaching 7.8 million with an average annual increase of 8.0% (Bommersbach 2023).
- Prior studies have shown that frequent exercise is consistently associated with improved mental health, but it is also linked to other health behaviors, one of the most notable being sleep behavior. (Baron 2013, Chen 2024).
- It remains unclear whether sleep behaviors in adolescents explain (confound) the relationship between exercise and mental health.

## Research Questions

Is getting good sleep significantly associated with both frequently exercising and positive mental health in adolescents?

Does the average quality of sleep explain the positive relationship between exercise frequency and mental health status?

## Methods

### Sample

- Data were drawn from the 2021 Adolescent Behaviors and Experiences Survey (ABES), a nationally representative sample of 7,705 U.S. high school students (grades 9–12) from public, Catholic, or other private school (sample size after subsetting).

### Measures

- Exercises Frequently: physically active for at least 60 minutes  $\geq 5$  days, or exercises to strengthen or tone your muscles  $\geq 3$  days. (If either or both applied, labeled as "Frequent")
- Gets "Good" Sleep:  $\geq 8$  hours on an average night. (If applies, labeled as "Good" if not, then "Bad")
- Positive Mental Health: Asked "During the COVID-19 pandemic, how often was your mental health not good?" (Responses of "Never" or "Rarely" labeled as "Good", all other responses labeled as "Bad").

## Results

## Discussion

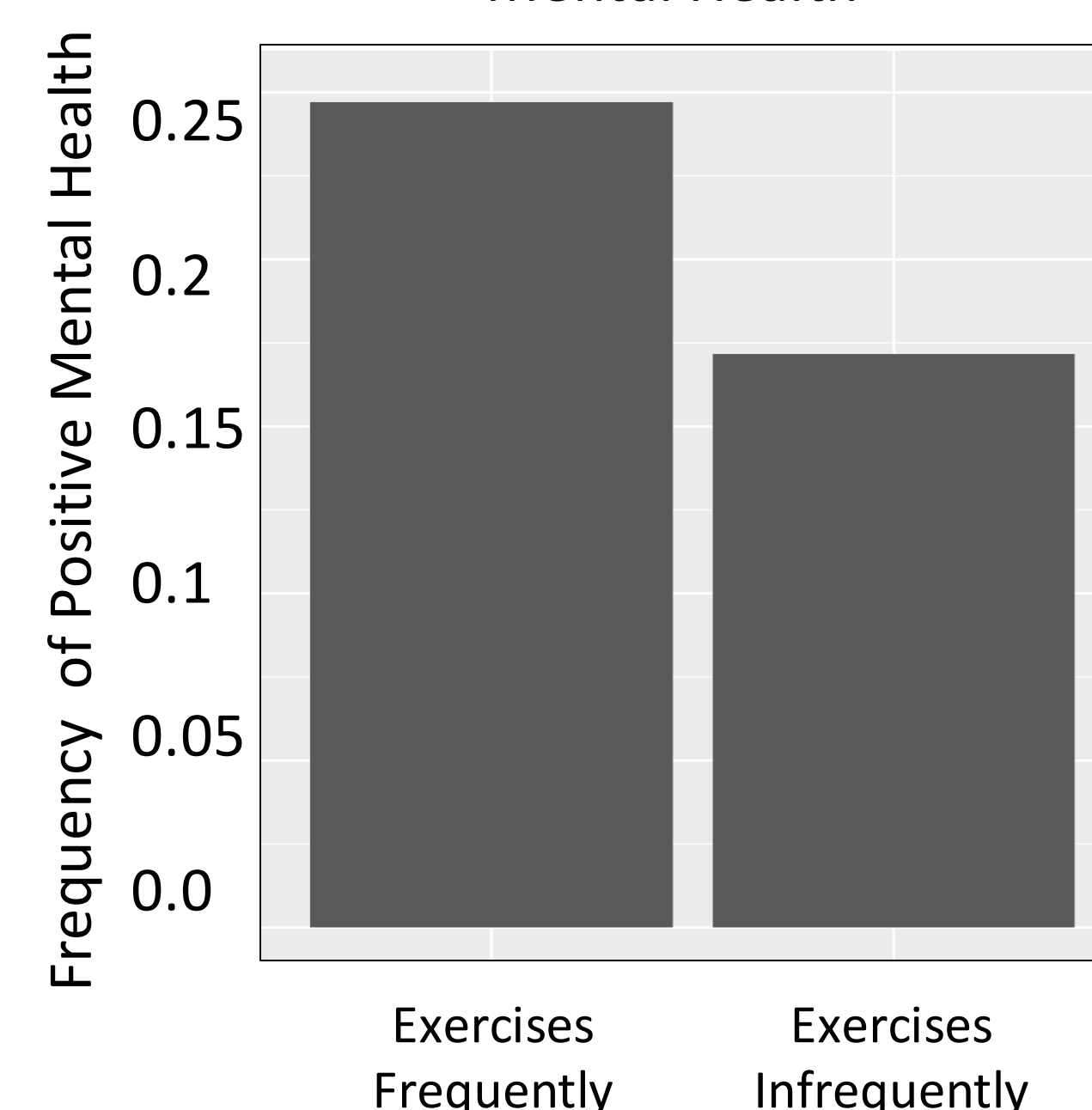
### Bivariate

- Chi-Square analysis showed that exercising frequently was significantly associated with "Positive" Mental Health ( $p < 0.001$ ). 17.1%  $\rightarrow$  24.7% (**Fig. 1**).
- Chi-Square analysis showed that frequent exercise was significantly associated with "Good" sleep ( $p < 0.001$ ). 20.8%  $\rightarrow$  28.9% (**Fig. 2**).
- Chi-Square analysis showed that sleep was significantly associated with "Positive" Mental Health in adolescents who exercise ( $p < 0.001$ ). 20.8%  $\rightarrow$  33.8% (**Fig. 3 – First 2 bars**).

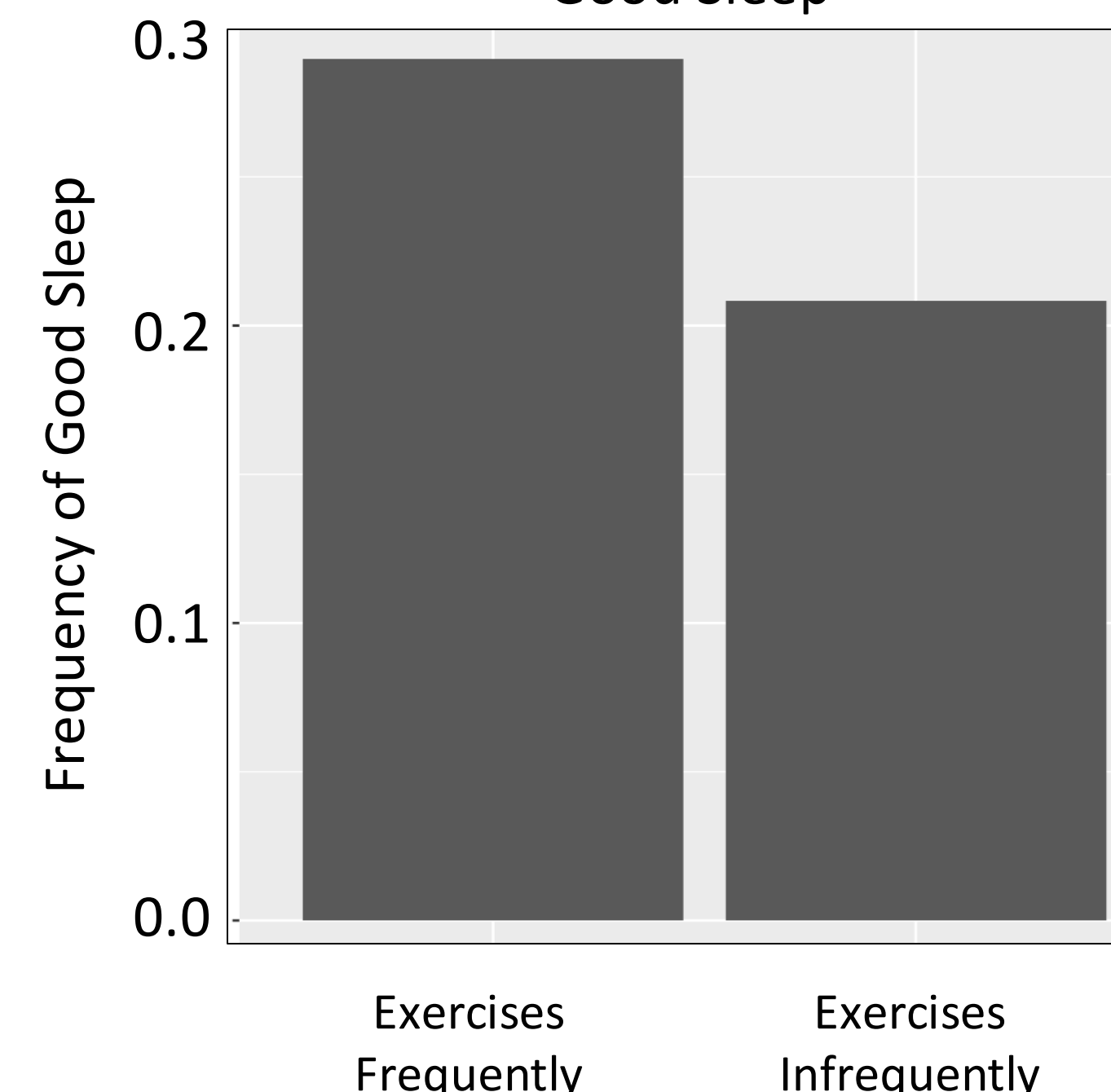
### Multivariate

- Logistic regression analyses showed that the positive association between frequent exercise and mental health status remained significant after controlling for sleep (OR 1.53,  $p < 0.001$ ). When sleep was not controlled (OR =1.58,  $p < 0.001$ ), 1.58  $\rightarrow$  1.53; minimal change, no meaningful confounding.
- When exercise was held constant, sleep was still significantly associated with mental health (OR =2.02,  $p < 0.001$ )
- Both exercise and sleep are independently associated with mental health status in adolescents. Sleep is associated, but does not meaningfully confound the relationship of exercise and mental health

**FIG. 1** Association between Exercising and Mental Health

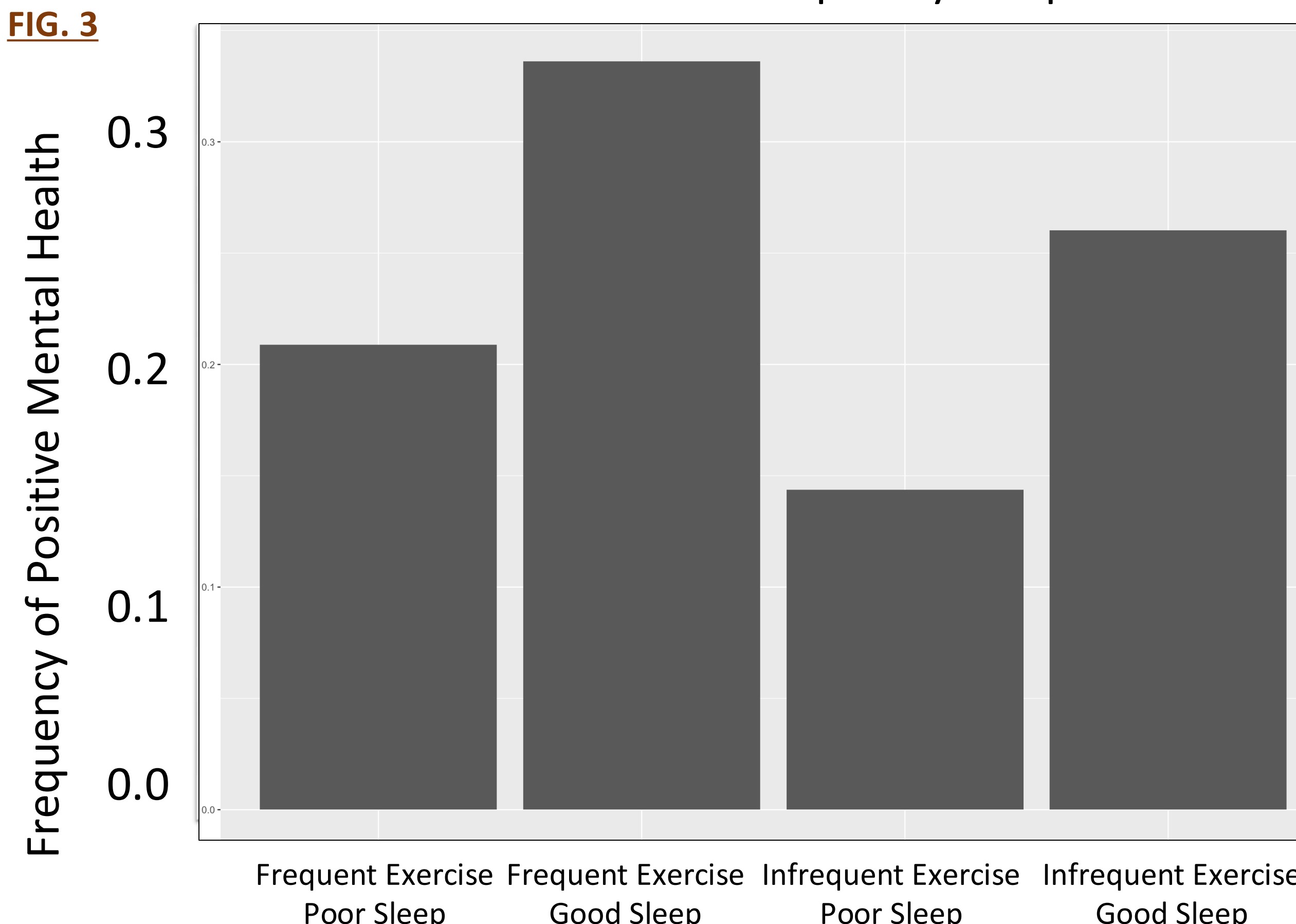


**FIG. 2** Association between Exercising and Good Sleep



Association Between Exercising and Mental Health Status in Adolescents Grouped by Sleep Levels

**FIG. 3**



- Both exercise and sleep are significantly associated with mental health among adolescents, even when each variable is controlled for the other.
- Although sleep is related to both exercise and mental health, it does **not meaningfully confound** their relationship.
- These findings show that promoting both good exercise and good sleep can contribute to better mental health outcomes in adolescents.
- Limitations of this study are that the data is self-reported and doesn't track people's mental health states before and after bad and good exercise habits, limiting causality.
- Further research would need to be done to analyze variables other than sleep, to see if there are potential moderators/confounders in the exercise and mental health association. This may help improve the methods for improving mental health in adolescents.

## References

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