The Impact of Lifestyle Choices and Habits on Academic Performance

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Abstract— This research analyzes the relationship between the habits of college students' lifestyle and their academic performance (CGPA). We conducted a survey among about 90 students to find out how much these students sleep (how many hours and how consistently) and how much they spend each day in front of screens as well as evaluating their quality of the diet and physical fitness. Statistical analyses consisted of Pearson correlations and an AI machine-learning feature importance model (random forest regression) as well as visual comparisons of the distributions of CGPA across the different lifestyle categories. We determined that there was the highest positive association with diet quality and adequate sleep with students' high GPAs, while screen time had very little linear effect in determining resulting academic performance. Fitness level also demonstrated a slight positive tendency. This corresponds to earlier literature of student health and learning and implies that behavioral intervention for regular sleep and diet may increase academic success.

Index Terms - Academic performance, CGPA, diet quality, physical activity, screen time, sleep quality.

INTRODUCTION

Academic performance of the students has been related to numerous health and lifestyle factors. It is well known that proper sleep boosts memory and learning. In fact, length, quality, and regularity of sleep are all correlated positively with grades in college students. Students monitored over a semester are found that measures of sleep explained about 25 % of the grade variance [1]. Also, there has been association between fitness and physical activity to academic results. High cardiorespiratory fitness (e.g. VO_2max) correlates with high GPA in students and the experimental data support that exercise sessions (180 min per week) might modestly improve previous motivation and academic achievement. Nutrition is another crucial factor: Healthy eating (balance diets) improves cognitive function and concentration and studies find that healthy eating habits (regular breakfast and fruit & vegetable intake) correlate with school grades. In contrast, there is often suspected damage to performance resulting from excessive screen usage (smart phones, gaming or social media). Main findings from Meta-analyses seem to indicate that they have a weak or null association with academic outcome measures, but activities, heavy gaming for example, or late-night cell phone time can interfere with studying. For instance, heavy smartphone reliance associates with poor grades and heightened distractions. The previous studies take up one or two factors. In this work, we study this set of all lifestyle variables as a set using survey data from ~90 undergraduates. Each student reported the average number of hours that they sleep at night, their sleep consistency (Very/Somewhat/Not) daily amount of screen time (hours), self-rated fitness level (1–5), diet quality (Mostly Healthy/Mixed/Unhealthy) and total GPA (1–10 scale). We will calculate pairwise correlation and train a random forest regressor to predict CGPA and have feature importances. We will also graph CGPA distributions for categories (for example by sleep hours and people's diet group). Such extensive analysis would enable us to compare relative effects and to speak about anomalies (e.g. unexpected patterns) relative to the existing research.

LITERATURE REVIEW

Title of the Paper	Authors	Literature Review Comments	Outcome of the Paper
Sleep quality, duration, and consistency are associated with better academic performance in college students	K. Okano, J. R. Kaczmarzyk, N. Dave, J. D. E. Gabrieli, and G. S. Grossman	Study links various sleep parameters with academic outcomes using objective sleep measurements and GPA data; highlights importance of regular sleep habits.	Better sleep quality, longer duration, and consistency are positively correlated with higher academic performance.
Association between screen media use and academic performance among children and	M. Adelantado-Renau, D. Moliner-Urdiales, I.	Systematic review and meta-analysis summarizing multiple studies; strong emphasis on	Higher screen media use is associated with lower academic

adolescents: A systematic review and meta-analysis	Cavero-Redondo, M. R. Beltran-Valls, V. Martínez-Vizcaíno, and C. Álvarez-Bueno	how excessive screen use affects academic results negatively.	performance among children and adolescents.
Relationship between physical fitness and academic performance in university students: A systematic review	L. Redondo-Flórez, D. J. Ramos-Campo, and V. J. Clemente-Suárez	Review of existing literature on physical fitness levels and academic outcomes; discusses methodological limitations and future research needs.	Positive association between higher physical fitness and better academic performance in university students.
Associations between dietary intake and academic achievement in college students: A systematic review	T. L. Burrows, M. C. Whatnall, A. J. Patterson, and M. J. Hutchesson	Comprehensive review linking diet quality with academic outcomes; highlights inconsistencies across dietary assessment methods.	Healthier dietary intake is generally linked to higher academic achievement.
Physical activity improves stress load, recovery, and academic performance-related parameters among university students: A longitudinal study on daily level	M. Teuber, D. Leyhr, and G. Sudeck	Longitudinal design enhances causal inference; examines physical activity's daily impacts on stress, recovery, and academic measures.	Increased physical activity improves stress management and academic-related outcomes over time.
Exercise makes better mind: a data mining study on effect of physical activity on academic achievement of college students	S. Du, H. Hu, K. Cheng, and H. Li	Uses data mining techniques for large dataset analysis; highlights correlations between physical activity habits and academic performance.	Regular exercise is associated with improved academic performance among college students.
Problematic Smartphone Use and University Students' Academic Performance	D. Agostini and C. Petrucco	Focuses on the impact of excessive smartphone use; discusses behavioral addictions and distractions affecting studies.	Problematic smartphone use negatively impacts academic performance among university students.
The influence of eating habits on the academic performance of university students	P. R. Reuter, B. L. Forster, and S. R. Brister	Investigates direct relationships between eating patterns (healthy/unhealthy habits) and GPA; uses cross-sectional design.	Better eating habits are associated with higher academic performance, while poor dietary behaviors correlate with lower GPA.

METHODOLOGY

Roughly 90 participants (participants) were college students recruited through campus notice. The survey sought average sleep duration in hours and minutes (averaged over nights), sleep consistency (in terms of very consistent, somewhat consistent and not consistent) average screen time (hours spent during the day on devices), physical fitness levels (rated 1 for lowest and 5 for highest), diet quality (mostly healthy, mixed or mostly unhealthy) and current CGPA (1 to 10). Most values were self-reported. For analysis, both, sleep duration and screen time were converted to numeric hours. Sleep consistency and diet were coded on ordered scale (e.g. Very Consistent=1, Somewhat=2, Not Very Consistent=3; Healthy=1, Mixed=2, Unhealthy=3) for correlation purposes. To investigate linear associations, we calculated Pearson correlation coefficient for each of the pairs of variables. We then applied a random forest regression model (with CGPA as target) to obtain feature importance scores that indicate relative encoding effect of each variable in predicting GPA. To visualize the data, we made scatter plots and box/violin plots between CGPA and every other lifestyle factor. We tabled this, for example, sleep duration classified into ranges (<4, 4–6, 6–8, >8 hours) and plotted violin distributions of CGPA for each bin. We also plotted a scatter of CGPA against continuous variables (sleep hours, screen hours) with regression lines and boxplots for categorical factors (fitness

levels 1–5, diet categories). These plots can be viewed in Figures 1–6. All analyses were run in Python (pandas, scikit-learn, matplotlib) and R (plotting).

RESULTS

I. Correlation and predictive importance

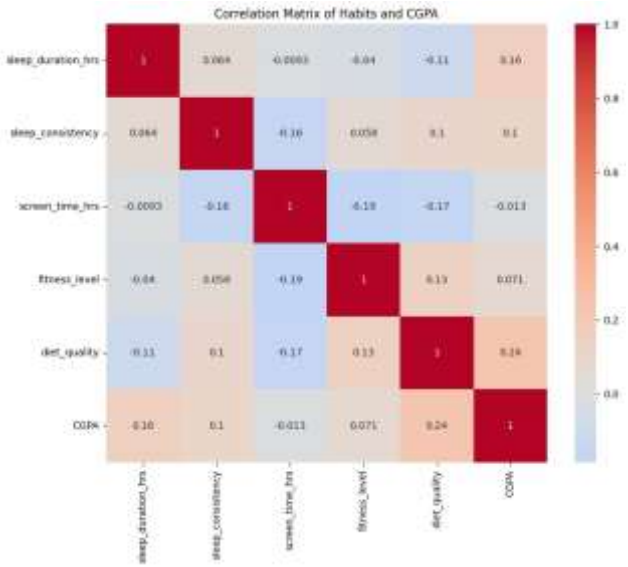

FIGURE 1. CORRELATION MATRIX OF LIFESTYLE VARIABLES AND CGPA FOR PREDICTING CGPA. CORRELATIONS ARE INDICATED BY COLOR (RED=POSITIVE, BLUE=NEGATIVE)

The observed correlation matrix (Fig. 1) indicates that CGPA correlates most positively with an individual's diet quality ($r \approx +0.24$). There is also a positive correlation with sleep duration ($r \approx +0.16$). The sleep consistency is weakly positive ($r \approx +0.10$). There is virtually no correlation between screen time ($r \approx -0.01$) and fitness level ($r \approx +0.07$). Special feature inter-correlations are also modest (e.g. screen time vs. fitness –0.19, suggesting more screen use sort of goes along with lower fitness).

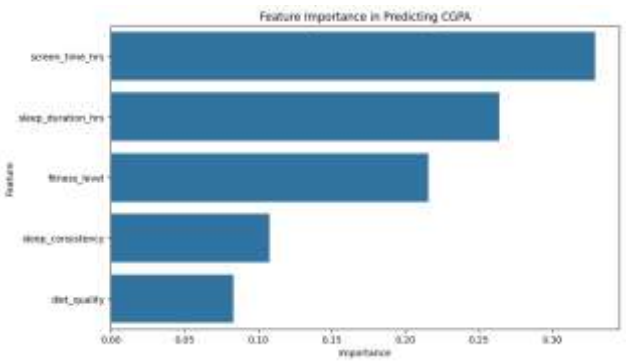

FIGURE 2. FEATURE-IMPORTANCE SCORES FOR PREDICTING CGPA. FEATURE IMPORTANCES DERIVE FROM A RANDOM FOREST REGRESSOR.

It may be noted from the feature importance of the random forest model (Fig. 2) that screen time is the absolute single predicator of GPA (≈0.33) and then sleep duration (≈0.27) and fitness level (≈0.21). Sleep consistency (≈0.10), diet quality (≈0.08) are the least important in the model. This shows that although diet has the strongest simple correlation with grades, the model discovered screen time to have more impact in predicting results. The discrepancy suggests non-linear interactions: for instance, such students may blend the screen time with other habits that have effects on grades.

II. Sleep patterns

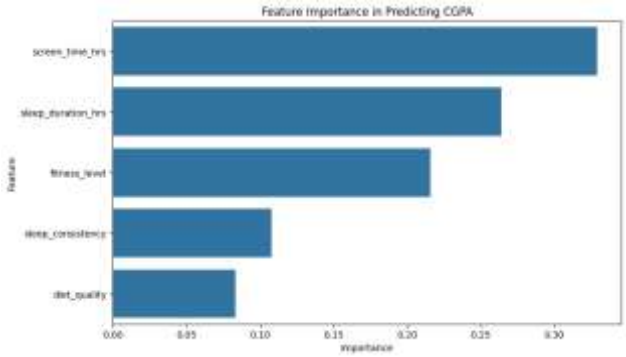

FIGURE 3.1. CGPA VS. SLEEP DURATION (HOURS) WITH REGRESSION LINE.

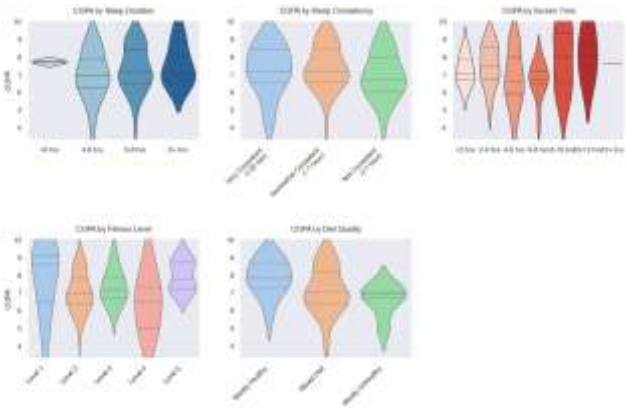

FIGURE 3.2. VIOLIN PLOTS OF CGPA BY SLEEP CATEGORY AND BY SLEEP-DURATION BINS.

Figure 3.1 and 3.2 illustrates sleep-related factors. Students who scored between 6-8 hours of sleep had highest GPAs. From the scatterplot (Fig. 3.1, sleep hours vs. CGPA) and violin plots (Fig. 3.2, grouped sleep bins), both in typical slope direction, there is a positive trend up to ~8 hours. Those sleeping <4 hours or 4 – 6 hours had lower median GPAs (~6 – 7) while sleepers of 6 – 8 hours had a median of ~8. A straightforward regression line is sloping to go up. This pattern is in line with previous discovery: that college students who slept for long hours and of high quality scored higher grades significantly [1]. It reinforces the hypothesis that inadequate sleep over impaired memory consolidation and learning.

Sleep consistency (Fig. 3.2) results in less intuitive one. In our sample, students who reported "Not Consistent" schedules had a slightly higher median GPA (~8) than "Very Consistent" (~7.5). However, these differences are insignificant, and category sizes vary. Most literature holds the position that regular sleep (for example, fixed bedtimes) is good for cognition so our data might that is sampling variability. It may be that some high performers are extreme "late-nighters" and have

sleep a lot, or that the self-report measure was imprecise. Consistency seems to only have a weak effect on this overall.

III. Screen time

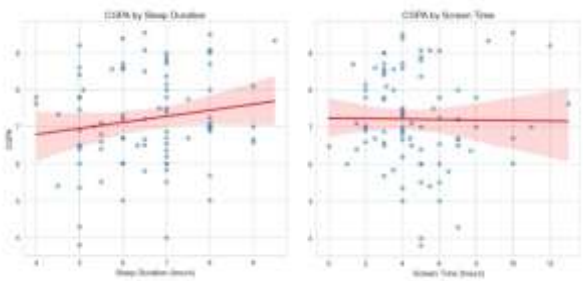

FIGURE 4. CGPA VS. SLEEP DURATION AND DAILY SCREEN TIME WITH TREND LINE.

Figure 4 presents CGPA against screen time per day. There is no discernible linear correlation: GPAs are spread across all gradations of screen usage. There is a minor downward trend for very high users but many of the moderate users also have very high GPAs. The flattened regression line corresponds to the nearly zero Pearson r. This result fits with the meta- analysis [2] where there was no overall significant association between total screen time and school grades. It implies that little screen time is not determinative; rather, context matters. As can be expected, other research finds that excessive or problematic use (e.g. gaming addiction, checking smartphones in class) is in fact related to lower academic performance specifically. Only the heaviest users had some GPA dip for our sample.

IV. Physical fitness

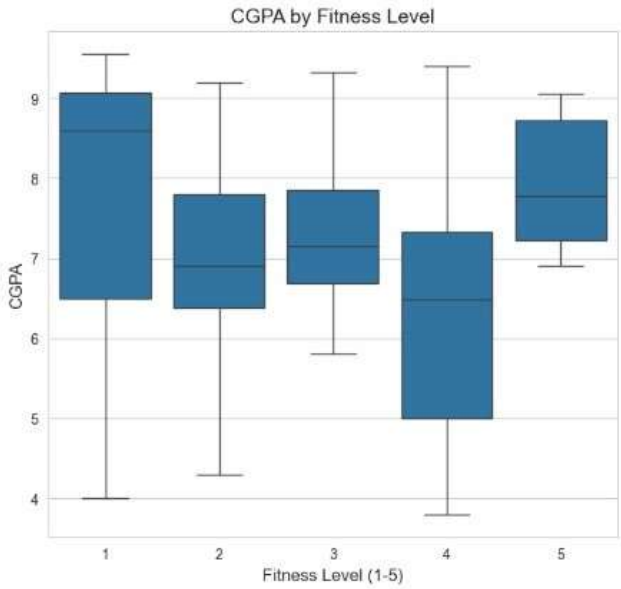

FIGURE 5. BOXPLOT OF CGPA BY FITNESS LEVEL.

Figure 5 presents boxplots of CGPA by self-reported fitness level (1to 5). Overall, in a general upward movement form Level 1 (least fit) through to Level 4, median GPA runs from ~7.0 to ~8.5. Level five (the highest fitness) has a median slightly lower (~8.2) than Level 4. Admittedly, fitter students tended to be more successful academically. This supports the assumption that continual exercise improves concentration, and stress resilience. Similarly in another study, [3] high-GPA students had significantly higher VO_2max than low-GPA peers (47.9 vs. 40.3 mL/kg/min). It was noted that students who do exercise regularly (frequency ~10 sessions/week) do better on tests [3]. Although our analysis does not allow us to establish causation, the correlation (despite being only modest, r≈+0.07) strengthens the assumption that a more active lifestyle might contribute to academic success.

V. Diet Quality

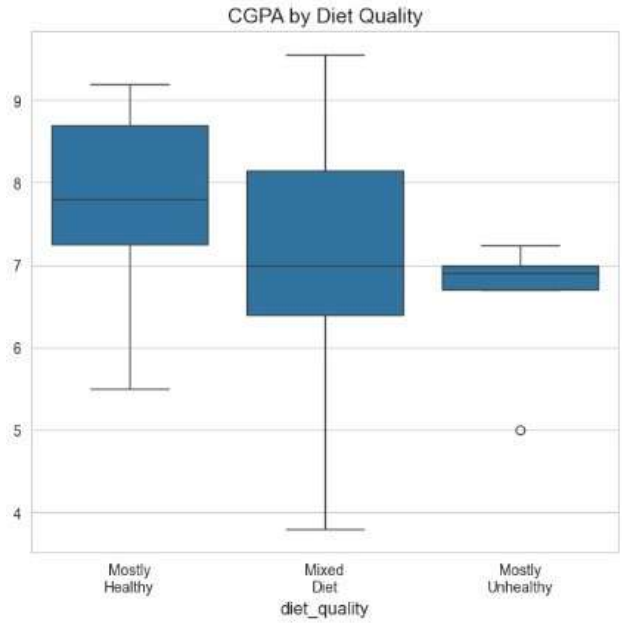

FIGURE 6. BOXPLOTS OF CGPA BY DIET QUALITY.

In Figure 6, CGPA has been compared for different diet categories. The students who reported a Mostly Healthy diet had the greatest median GPA (~8.0), so did those of Mixed (~7.5), and those of Mostly Unhealthy diet (~7.0). A clear positive association is indicated by the upward ordering by healthiness. This follows the positive correlation (r≈+0.24) seen for diet. Less low-end spread is observed in the "Mostly Healthy" group too. Such results are consistent with multiple nutritional studies. For example, colleges who were reviewed were discovered that healthy breakfast and a consumption of fruits were related to higher GPA [4]. It was reported in a large sample (N = 577) that frequent breakfast-taking was related to increased self-reported GPA and to consequent negative effects on the consumption of fast-food [5]. These findings together imply that correct nutrition (perhaps through enhanced energy levels and cognition) has a positive impact on academic performance.

DISCUSSION

Based on our analysis, sleep duration and diet quality are closely linked to academic performance, a relation that does not apply to screen time. These conclusions roughly conform with the available literature. As expected, the longer the sleep, the better grades are. The impact that diet quality has is well supported as well: Healthy eating and consistently eating breakfast has an impact in GPA. The lack of major screen-time effect time

appears to be supported by meta-analyses, however our result on feature importance reveals that in combination with several other variables screen time was a top predictor (potentially tapping hidden patterns of behavior or clusters of lifestyles).

The result that fitness is correlated positively albeit weakly with GPA corresponds with research on physical activity and learning. Aerobic exercises help manage stress and the cognitive function. For instance, it was demonstrated that those students followed consistent exercise habits tended to exceed peers in examinations [3].

Our finding endorses the advice that moderate activity should also be a part of students' routines.

Some anomalies merit discussion. Remarkably, our "sleep consistency" results differ from the expected: According to literature, consistent schedules help performance, but our "inconsistent" group has a slightly higher median GPA. This could be an artifact of self-report or the sample (maybe some high achievers distribute their sleep in an irregular fashion because they are busy). Similarly, the random-forest finding that screen time was the most important predictor appears paradoxical to its marginal correlation. This may be an indication that screen time combines with other habits (for instance, sedentary behavior or stress) whose composite effects grades.

Importance of features in such models sometimes highlights spitting variables even if they are not liner correlated. Therefore, while screens did not linearly correlate with CGPA, they may define subgroups (such as students who cram and use screens intensively).

Weaknesses of this study include low sample variability and self-reporting measures. A cross-section design prohibits causal claims (students who GPAs are high may value sleep and health, for instance). For some factors (fitness, diet), it was reported for coarse categories, hence reducing precision. We did not also measure socioeconomic and psychological variables which may mediate these relationships. In future research larger, longitudinal datasets should be used along with objective measures (acts. for sleep, logs for screen time). Despite limitations, our results support the same common educational message: healthy lifestyle habits support learning.

According to the data, students who sleep enough and have healthy food, are likely to have better grades. Though once moderate screen is not harmful per se, its excessive/uncontrolled use (particularly one that deprives the sleep) can cause damage. Educators and policy makers could even focus sleep hygiene, nutrition and exercise with study skills to promote student success.

Conclusion

This study of survey given to college students is showing a meaningful connection between lifestyle choices and academic performance. Good diet and good sleep correlate with higher CGPA, which was echoed in previous research. Fitness has a small positive but linear affect whereas overall screen time showed no strong linear impact among our sample.

Nevertheless, excessive screen use and excessive smartphone dependency are associated with poorer grades by some people. These results imply that balanced health habits, i.e. healthy sleep regimes, healthy meals and regular workouts, will support student learning outcomes positively. Such future efforts to support students' well-being are therefore likely to increase academic achievement as well.

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