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Digital Technology Use and Lifestyle Behaviors as Correlates of Health-Related Scores

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Abstract: *This research investigates associations between digital technology usage, lifestyle behaviors, and health-related scores using a dataset of 16,000 records. Social media use, AI tool use, sleep, physical activity, and mental and physical health scores were analyzed descriptively, with group comparisons, Pearson correlations, and visualizations. Negative associations were found between social media use and mental health (r=-0.40) and physical health scores (r=-0.31), while sleep and physical activity were positively correlated with both outcomes. Overall, AI tool usage was only weakly correlated with health scores. Because the dataset is synthetic, and association does not establish causation or statistical significance, the findings should be interpreted as exploratory patterns rather than health evidence from real-world data.*

Keywords: Social media use; AI tool use; Sleep; Physical activity; Health scores.

INTRODUCTION

The growing prevalence of social media and AI tools makes it necessary to study their associations with health-related outcomes and lifestyle behaviors. This study investigated daily social media usage, daily usage of AI tools, duration of sleep, physical activity, and scores in mental and physical health. Looking into them together gives a systematic approach to finding patterns and relationships in the data.

Based on 16,000 records, this study uses descriptive statistics, correlation analysis, and Age, Gender and Education group comparisons. It also explores the relationships between technology use, lifestyle factors, and health scores using statistical analysis. The goal is to describe these relationships and examine patterns in the data generated. The dataset is synthetic, and therefore the results are considered computational observations that should not be generalized to real students or considered as confounding evidence of causal effects.

RESEARCH GAP

Previous work has looked at associations between social media use and both mental health and sleep, but there is inconsistency in this relationship across populations and measures of social media use. Most studies into the use of AI tools have been specific, lending an opportunity to study the association with more general long-term health and behavior markers. Integrated evidence on AI use, social media use, sleep, physical activity, and mental and physical health in one joint analytic framework is limited. This research fills the gap, employing various descriptive statistical methods, correlation analysis, and multivariable regression to jointly analyse these variables. The study uses demographic characteristics to identify associations between the use of digital technologies, lifestyle behaviors and health outcomes in the observed data.

LITERATURE REVIEW

Ahmed et al. Marino et al. (2024) examine the associations of social media use on youth mental health and sleep using systematic reviews and meta-analysis. They found small associations between general social media use and depression and anxiety, but problematic use was more consistently associated with poorer well-being and sleep problems. These results lend credence to the need to study social media in the context of mental health and sleep duration, although the current study does not directly assess problematic social media use [1].

Wang et al. (2025) conducted an epidemiological study to investigate the associations of social media use with physical activity, depression, and anxiety among university students. Their analyses serve a theoretical basis for the exploration between digital engagement and physical activity with respect to mental health outcomes. However, the data from actual students cannot be assumed to be indicative of the same population and measurement represented in this dataset [2].

Sala et al. MethodsDa, E. (2024): an umbrella review of the existing reviews on social media use and adolescents' mental health and well-being. The authors found that outcomes were likely to differ by user characteristics, use patterns, and platform content and design. This evidence suggests to research social media use alongside demographics and not just take into account usage time when explaining health outcomes [3].

Plackett et al. (2023) conducted a systematic review of interventions targeting social media use to improve mental well-being. They found mixed results, but generally reducing or altering social media use was not beneficial to well-being across interventions. It indicates that association between working hours of social media use and health scores should not always be interpreted as a causal effect [4].

Shahzad et al. with partial least squares structural equation modelling to study relationships of AI use, social media use, academic performance, and mental well-being among Chinese university students (2023). In their model, they found positive associations of technology use with selected

academic and well-being outcomes. While different variables and analysis context, this study relates to the examination of AI and social media usage in the current study [5].

Vincente-Benito, A., & Ramírez-Durán, N. (2023). Social media usage, body image, and well-being in adolescents and young adults: a systematic review using the PRISMA approach. The review explored associations between social media use and the outcomes related to body image (body dissatisfaction), psychological well-being, and other psychopathological aspects. Although body image is not measured in this study, these results demonstrate the complex relationship between digital engagement and health [6].

It conducts a swift systematic review of 9 papers including a total of 1,082 university students in order to examine studies on the influence of AI chatbot interventions on mental health and well-being (Nyakhar et al., 2025). While improvements in at least one mental health outcome were reported in many of the studies, the evidence was limited due to variability in study quality, participant attrition and outcome measurement. It is important to note that what they found gives some context for AI research but cannot be directly compared with the general use of daily AI tools as investigated in the current study [7].

Cabezas-Klinger et al. o A systematic review and meta-analysis of social media-based risk factors making positive and negative major avenues for mental disorders among adolescents and young adults (2025); With a pooled correlation of around \(r=0.217\) ($p<0.001$) and a high degree of heterogeneity between studies included. This provides a rationale for examining social media use and mental health together while acknowledging that associations may differ across populations and measurement strategies [8].

Khalaf et al. The best available evidence from studies of social media use and mental health among adolescents and young adults was reviewed by Seabrook et al. In their review, they acknowledged that interaction through social media is a double-edged sword, associated with psychological distress and other adverse outcomes, but also serving to enhance communication and social connection. This study establishes the backdrop for a previously overlooked approach that considers social media usage and mental health scores without presuming that duration of usage operates as sufficient proxy for outcomes in mental health [9].

Yu et al. (2024) performed a scoping review focused on social media and its relationships to sleep and mental health in young persons. This review identified associations between these factors, though evidence regarding their directionality and causation is limited. This paper is relevant to the current study since 3 social media activity, sleep duration, and mental health are examined within the same analytical framework [10].

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METHODOLOGY

Figure 1 presents a summary of the overall research methodology through which the sequential processes of research design, variable definition, data preparation, statistical analysis and interpretation were carried out.



Figure 1. Overall Framework

RESEARCH DESIGN AND DATA SOURCE

Study Design: This study was designed as a cross-sectional observational study to evaluate the associations between the use of digital technology, lifestyle behaviors, and health-related scores. This analysis was performed using a secondary dataset from Kaggle, which had 16,000 records and 10 variables. It contained information about age, sex, educational attainment, social media usage per day, AI tool usage per day, sleep hours daily, physical exercise, mental health, and physical health score. The original sampling procedure and how participants were recruited were not written in the notebook provided.

VARIABLE DEFINITIONS AND MEASUREMENT

The demographic characteristics contained three (eg, age, gender, and educational level), two technology-use variables (eg, daily social media hours and daily AI tool usage hours), two lifestyle

variables (eg, sleep hours and physical activity hours), and two health-related variables (eg, mental (PHQ-9) and physical health scores). Age, technology use, sleep, and physical activity were assessed in years and hours per day, respectively. Gender and education level were used as categorical variables, and the health scores were analyzed numerically. The scoring ranges and validation methods of the health measures were not reported in the files provided. Student_ID was used as an identifier, not as an analytic variable.

DATA PREPARATION AND QUALITY INSPECTION

Python and Pandas were used to do data preparation. The missing values, duplication of records, duplication of student identifiers, and variable data types in the data set were reviewed. There were no missing values or duplicate records found. To analyze the distribution, variability, and possible outliers of numerical variables, descriptive statistics and boxplots were used. Any outliers were removed unless there was sufficient justification to do so.

Data on gender, education level, and age were summarized using count plots. As can be seen in Figure 2, there were a significantly larger amount of male and female observations than non-binary observations. The highest category of education started at high school; age distribution was fairly uniform in the 13–25 age group. These visualizations gave an overview of the dataset and helped with the initial assessment of the structure of the data prior to further statistical analysis.

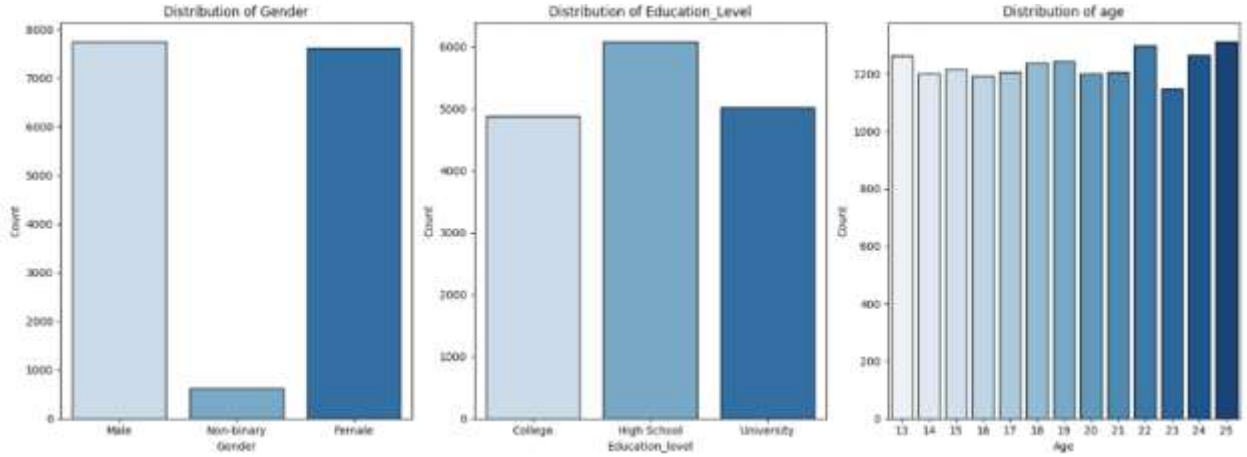


Figure 2. Distribution of observations by gender, education level, and age.

DESCRIPTIVE AND GROUP-BASED ANALYSIS

The numerical variables were summarized using descriptive statistics. Grouped means: means, standard deviations, and numbers of health and lifestyle variables selected were calculated at the group level by age, gender, and education. The notebook also produced mental health score comparisons, physical health score comparisons, sleep duration, physical activity, and technology

usage between the demographic groups. These analyses were exploratory and were employed to provide a description of the patterns within the data, but not to identify statistically significant differences between groups.

CORRELATION AND VISUAL ANALYSIS

Pearson correlation coefficients were calculated for selected pairs of numerical variables, such as technology use, sleep, physical activity, and health scores. Linear correlation between/among the quantitative variables was summarized using a correlation matrix and heat map. Selected relationships between sleep duration and mental health scores and between social media use and mental health scores (colored by gender) were visualized on scatterplots. Other plots included average lifestyle measures over age, and distributions over several demographic subgroups. Correlation coefficients were used to interpret correlation as correlation and not as causal association.

SOFTWARE AND ANALYTICAL SCOPE

Python, Pandas, Matplotlib, and Seaborn were used for analysis. Data inspection, descriptive summaries, grouped comparisons, Pearson correlations, and visual exploration were implemented in the notebook provided. It used no multivariable regression or formal hypothesis testing, so only descriptive and bivariate associations were possible. The results need to be evaluated based on the set of variables used and the scant documentation of the original collection and measurement process of the data.

DISTRIBUTION OF NUMERICAL VARIABLES

There was noticeable variation in distribution patterns for technology use, lifestyle behaviors, and health scores (as shown in Figure 3). The distribution of social media and AI tool use is right-skewed; the distribution of sleep duration is approximately bell-shaped. The distribution of physical activity is right-skewed and is concentrated at zero. The mental health scores are grouped primarily from 65 to 85, while the physical health scores are grouped mostly from 90 to 100. It is important to note that these differences in distribution and possible floor or ceiling effects need to be taken into account when interpreting the subsequent correlations and relationships.

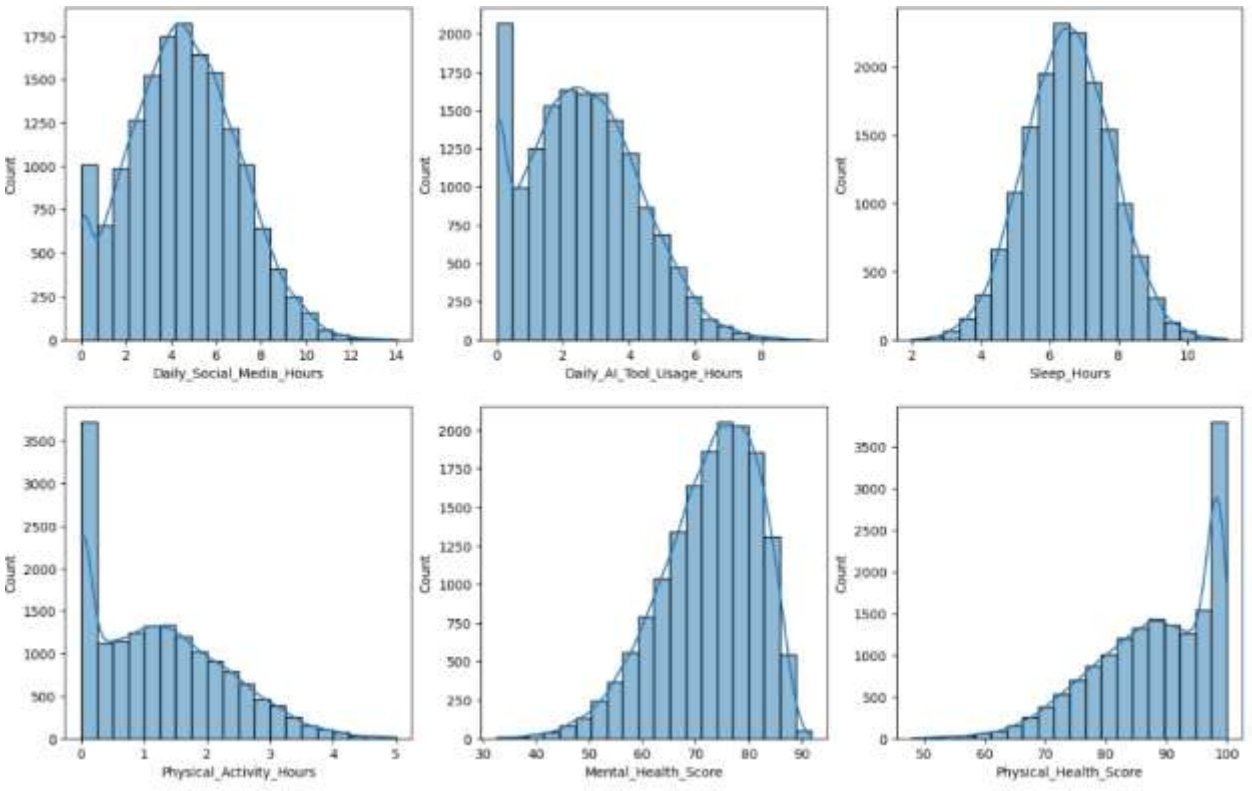


Figure 3. Distributions of numerical study variables.

CORRELATION ANALYSIS

The Pearson correlation matrix of demographic, technology-use, lifestyle, and health-related variables is provided in Figure 4. There was a negative correlation between the use of social media and mental health scores (r=-0.40) and physical health scores (r=-0.31). Conversely, mental health scores (r=0.31) and physical health scores (r=0.27) were positively associated with sleep duration. Physical activity was associated with positive correlations with mental health scores (r=0.25) and physical health scores (r=0.42), the highest positive correlation with physical health among all variables studied

There were weak negative correlations between the use of AI tools and mental health score (r=-0.11) and physical health score (r=-0.023). There were very weak correlations between age and both health measures. The heatmap shows that there are varying patterns of association between technology use, lifestyle behaviors, and health scores. These correlations are linear and are not causal or significant.

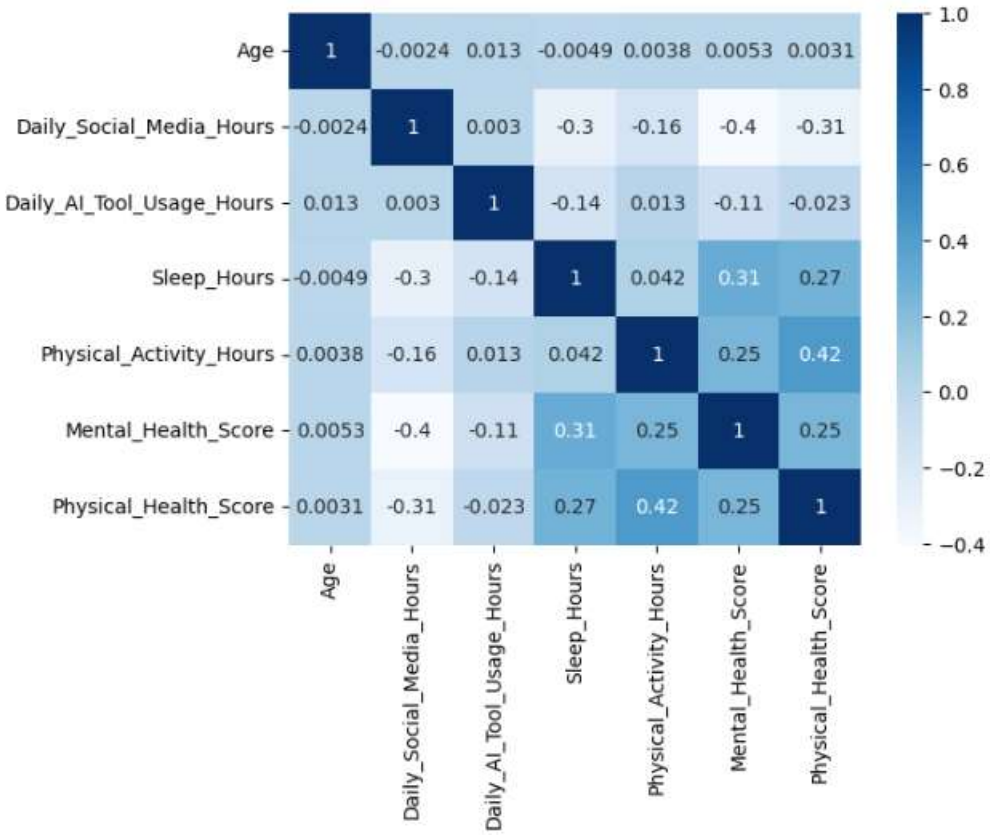


Figure 4. Pearson correlation heatmap of study variables.

SCATTERPLOT ANALYSIS

Figure 5 shows the association between sleep duration and mental health scores, as well as the association between daily social media use and mental health scores, stratified by gender. The scatterplots for sleep and social media indicate a positive and a negative association with mental health scores, respectively. There is, however, significant variation between observations and the distributions overlap between the gender categories. The patterns indicate that sleep duration and social media use are related to mental health scores, but neither of these factors account for the variation in mental health scores observed. The scatterplots show relationships, not cause and

effect.

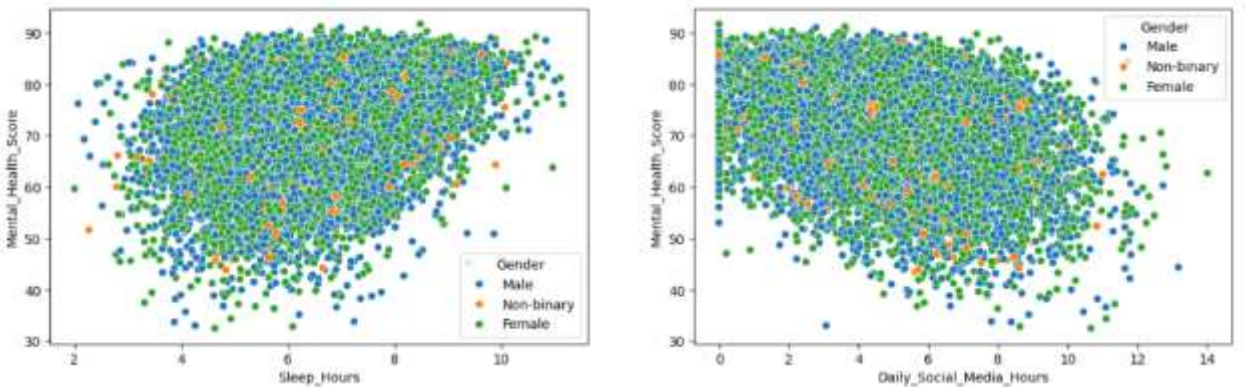


Figure 5. Scatterplots of sleep, social media use, and mental health scores.

DISCUSSION

The results show various relationships between the use of digital technology, lifestyle habits, and health-related scores. The use of social media was negatively associated with mental and physical health scores, with a greater association with mental health (r=-0.40). Conversely, the use of AI tools had weak correlations with health measures, indicating that the duration of use is not sufficient to draw strong conclusions about these relationships.

The duration of sleep was positively associated with mental health score and positively associated with physical health score, with the highest positive correlation being between physical activity and physical health score (r=0.42). The scatterplots also showed a great deal of individual variation, which suggests that individual variation in sleep duration and social media use is not enough to account for differences in mental health scores.

The findings overall demonstrate the importance of lifestyle behaviors and digital technology use in the context of health-related outcomes. The observational analysis, however, is unable to demonstrate causality, and the lack of multivariable regression and formal significance testing reduces the conclusions. These associations should be studied further with validated measures and statistical models that have been adjusted.

RESEARCH IMPLICATIONS

The results emphasize the need for understanding the behaviors associated with the use of digital technology together with lifestyle behaviors when analyzing health outcomes. The negative relationship between social media and health scores and the positive relationship between sleep and physical activity and health scores indicate that well-being studies on students require paying attention to both digital and daily lifestyle. Also, the low correlations of AI tool use suggest that duration does not necessarily reflect the relationship between use and health. The results of this

study can provide insights into future research and the creation of students' well-being programs, but they cannot establish causality in the present study.

LIMITATIONS AND FUTURE RESEARCH

There are some limitations to this study. It is designed in an observational manner and can be used to identify associations but does not allow for causal relationships. The data set consists of 10 variables and 16,000 records, but the original sampling methodology and participant recruitment methods for all health scores and the procedure used to validate the health scores were not recorded in the provided data files. These restrictions limit the validity of the measurement and the generalizability of the results. Further, there was no multivariable regression or formal significance testing, and the analysis was based on descriptive statistics and Pearson correlations.

Future studies should employ valid health measures with well-documented sampling techniques to enhance measurement reliability and generalizability. Use of multivariable regression, confidence intervals, and relevant statistical tests might help to evaluate the stability of the observed associations and control appropriate demographic and lifestyle factors. Future research investments in more comprehensive measures of social media involvement, media's purpose of use, sleep quality, and physical activity, as well as longitudinal studies, may further elucidate the links between digital technology usage, lifestyle behaviors, and health-related outcomes.

CONCLUSION

This study evaluated the correlations of digital technology use, lifestyle behaviors, and health-related scores. However, negative associations were found for mental and physical health scores and social media use, while positive associations occurred for sleep duration and physical activity score. There were weak associations found for both health measures for those who use AI tools. The results identify the need to consider digital behaviors in combination with lifestyle factors and the need for further studies to confirm the strength and applicability of observed dynamics.

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