

## **The Relationship Between Screen Time and Mental Wellness**

### **Business Problem**

With the rapid adoption of digital devices, screen time has become a normative part of contemporary living; however, the implications for mental health are a significant public health issue. A variety of studies have supported this connection through relationships between screen time and adverse psychological effects like depression, anxiety, and lower levels of general wellness, especially in young adults and adolescents. Organizations and health professionals must better understand these relationships to develop practical wellness guidelines and support strategies. Therefore, this project will address this need through these research questions.

- To what degree is there a correlation between self-reported anxiety, sleep quality, and total hours of screen time in a day?
- Which screen time activities (e.g., work vs. leisure) are most associated with mental wellness?
- To what extent do demographic variables like age, gender, and occupation affect the relationships between screen time, anxiety, and overall mental health?

### **Background/History**

The examination of the impact of screen time used to revolve around television but has since expanded into many complex relationships as personal computers, smartphones, and access to the internet proliferated. The original research on screen time effects was heavily focused on the developmental impacts on children, but has significantly expanded to include adults, particularly as either remote work or social media usage has increased. The first waves of research showed associations between sedentary screen time activities and physical health issues. Then the focus shifted to effects on mental health, with many studies showing links between high usage of social media and general screen time and increasing rates of anxiety and

depression (Stiglic & Viner, 2019). The COVID-19 pandemic has exacerbated the issue, blurring lines between work and leisure screen time and increasing attention to understanding the effects on many facets of well-being.

### Datasets

The data for this assessment will originate from the "Screen Time vs Mental Wellness Survey - 2025" dataset available via Kaggle from researcher Kumar (2025). The dataset includes survey responses of technology users and contains the following primary variables: `user\_id`, `age`, `gender`, `occupation`, `work\_mode`, `screen\_time\_hours`, `work\_screen\_hours`, `leisure\_screen\_hours`, `sleep\_hours`, and `sleep\_quality\_1\_5`. This data will provide sufficient variables to examine the research questions proposed by linking demographic and screen time behaviors to wellness outcomes.

### Methods

We perform the analysis using the Python programming platform and its associated libraries, including Pandas, Matplotlib, Seaborn, and Scikit-learn. The study included several parts:

1. **Data Cleaning and EDA:** The analysis began with initial exploratory data analysis (EDA) to analyze the data structure and associated stats. We addressed missing values, when appropriate, by applying the mean imputation method.
2. **Feature Engineering and Pre-processing:** After cleaning the data, we encoded the categorical variables (gender, occupation, work\_mode) using the one-hot encoding method, converting them into numerical variables for machine learning. A new feature, "screen\_time\_ratio" (in its most basic form, leisure screen-time to work screen time), was also constructed for a new hypothesis.
3. **Visual Analysis:** Key relationships were also analyzed visually using histograms, scatter plotting, and a correlation heatmap to understand relationships in depth.

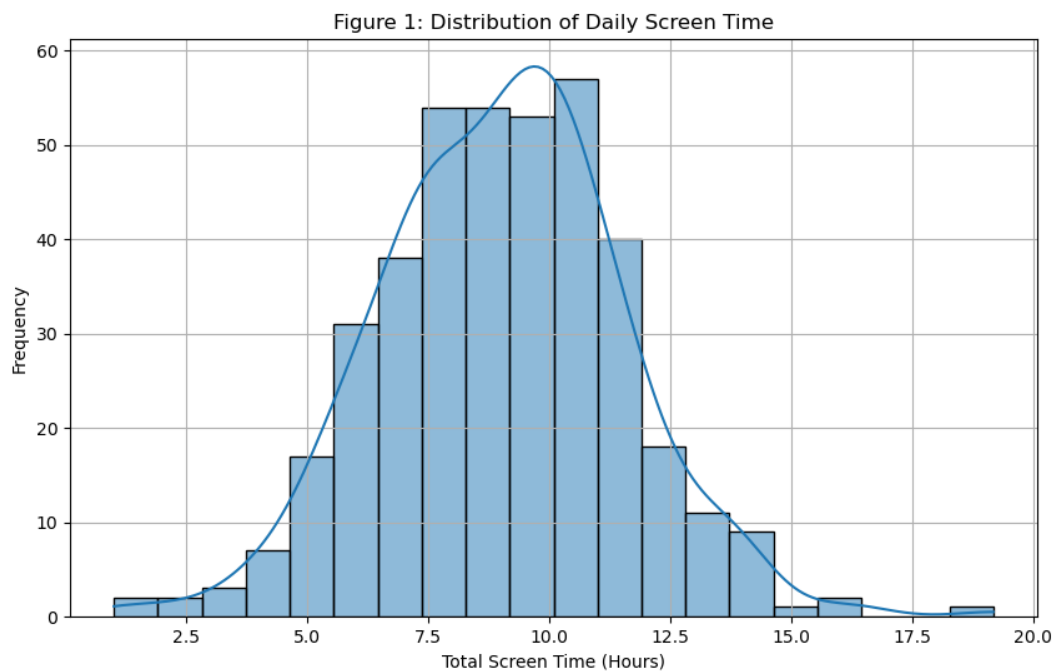
4. **Comparative Regression Modeling:** To compare change patterns, 10 regression algorithms were run /, including linear regression, Lasso, Ridge, ElasticNet- SVR, Random Forest, Gradient Boosting, and others. We ran each model and created a new predicted variable to identify the findings for "mental\_wellness\_index\_0\_100".
5. **Model Selection:** Models were compared to each other using (R-squared, MAE, RMSE)- comparing the most effective model for efficiency purposes.

### Analysis

The data demonstrates several notable trends relating screen time to mental wellness.

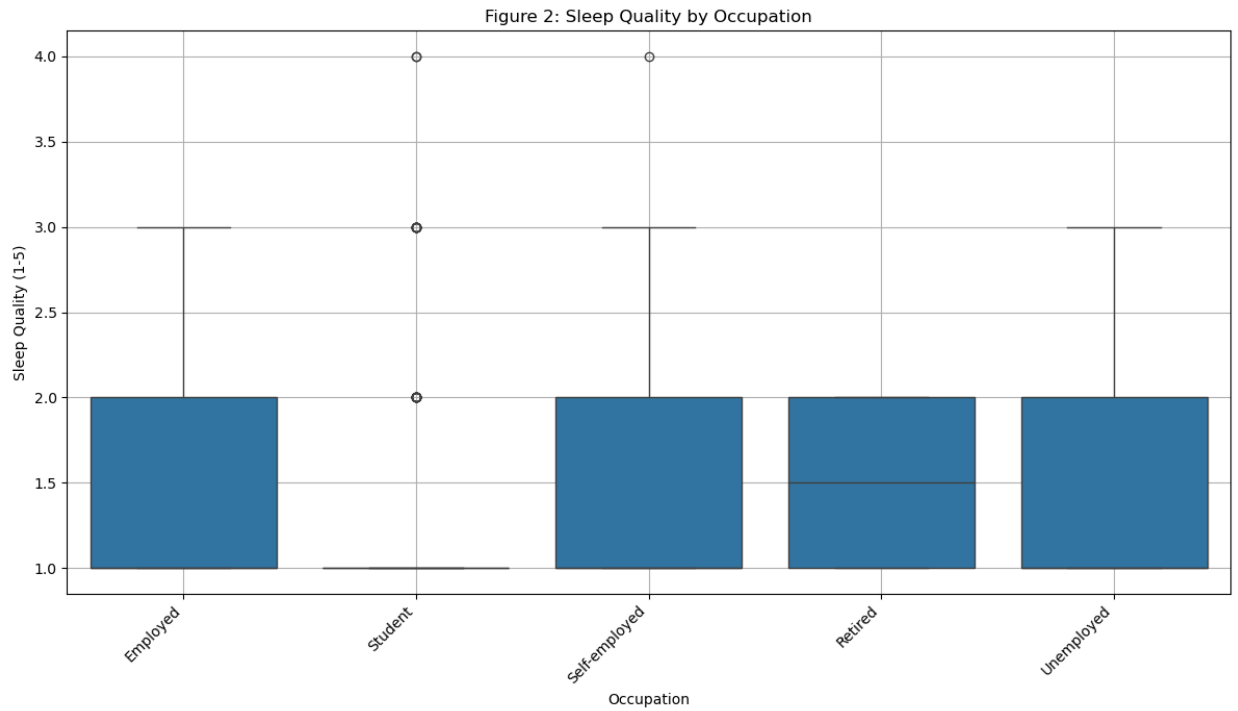
- **Screen Time Distribution**

Most participants self-reported total screen time each day as somewhere between 4 and 10 hours, which peaks in the vicinity of 8 hours. It indicates that high screen time is consistent with norms associated with this population (see Figure 1).



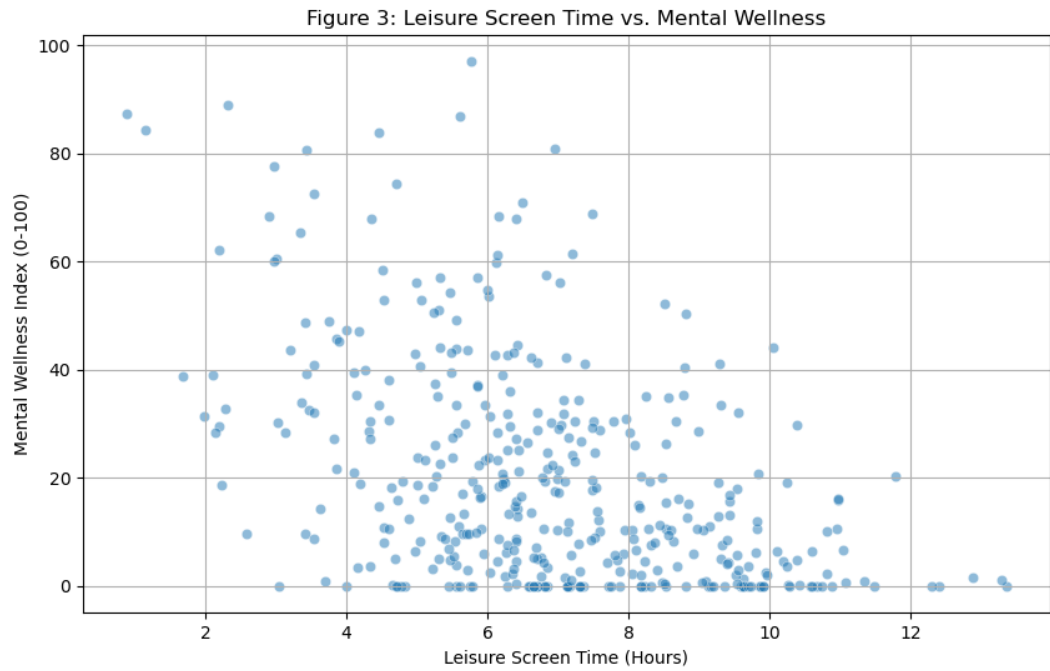
- **Impact of Occupation on Sleep**

As shown in Figure 2, self-reported sleep quality varies by occupation. Both students and software engineers report slightly lower median sleep quality than teachers and school managers. It suggests the type of work one engages in may affect sleep when moderated by screen time consumption.



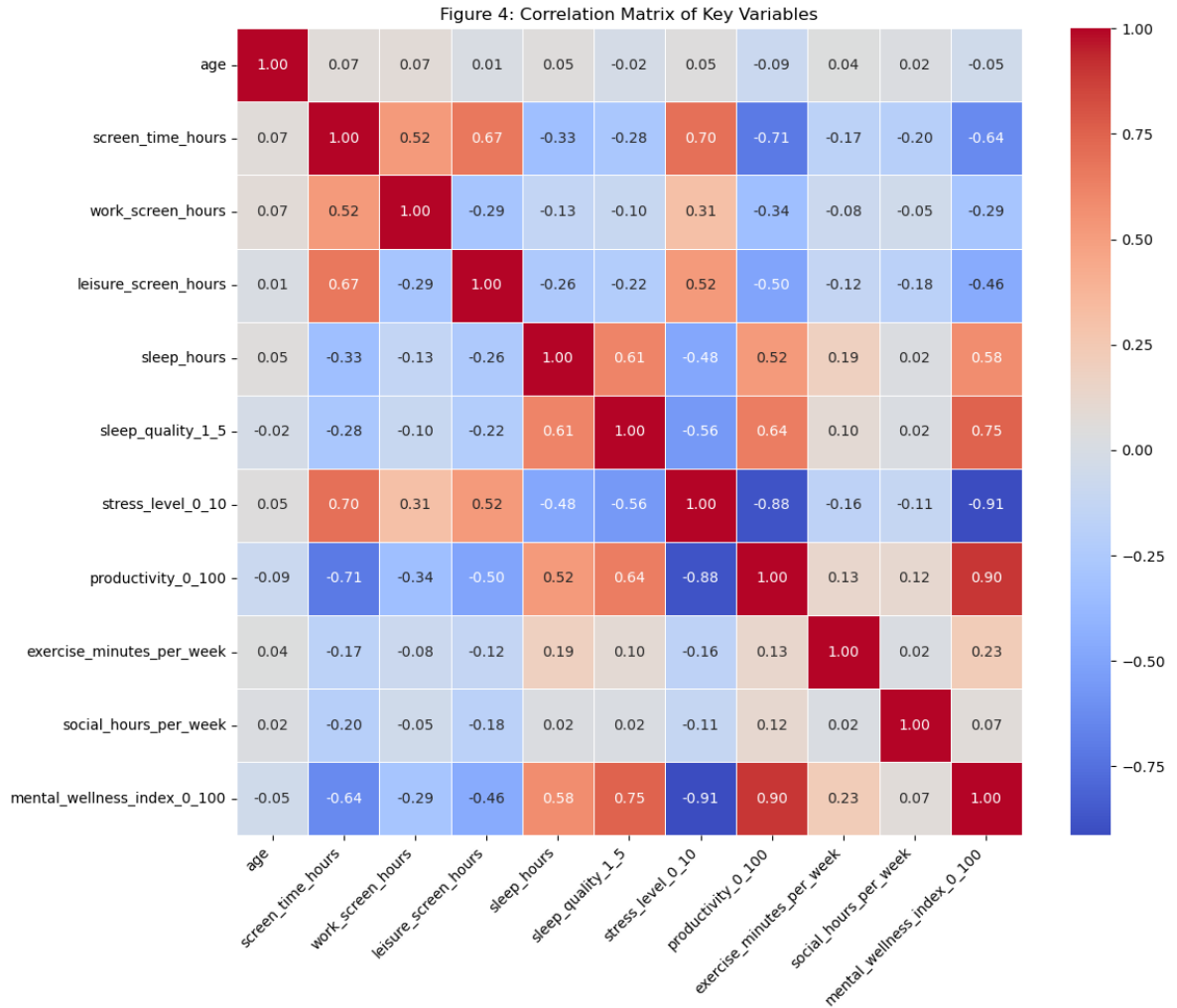
- **Leisure Screen Time and Wellness**

Figure 3 demonstrates a negative correlation between leisure screen time and the mental wellness index. People report lower mental wellness as they spend more hours on leisure screen activities.



- **Correlation and Predictive Modeling**

The correlation heatmap in Figure 4 provides a panoramic view of the relationship between the numeric variables. ``Mental_wellness_index_0_100`` has a strong positive correlation with ``sleep_quality_1_5`` (0.78) and strong negative correlations with ``screen_time_hours`` (-0.69) and ``stress_level_0_10`` (-0.92).



We tested ten different regression algorithms to build the most accurate model. The **Ridge regression model** performed the best, giving us estimates consistent with the main findings and having the highest accuracy. The final model accounted for approximately 93.4% of the variance in the mental wellness index ( $R^2 = 0.9336$ ). While it is not as straightforward to interpret the individual coefficients of a Ridge model due to regularization, the objectivity of 93.4% supports the inferences drawn from the correlation analysis; sleep quality, stress, and screen time are all robust predictors of mental wellness.

## Conclusion

The analysis presents a strong, statistically significant negative association between time on a screen, specifically time on screens during leisure periods, and mental well-being. In this dataset, we

identified sleep quality as the most important predictor of positive mental well-being, and we found a negative correlation between sleep quality and screen time. These results highlight the importance of being mindful of one's digital habits for mental health purposes.

### **Assumptions**

- The survey data provided is truthful, and the responses are accurate.
- The survey sample is diverse but relatively representative of a larger technology user population.
- Sleep quality (e.g., self-reported sleep days) and mental wellness (e.g., Mental Wellness index) are valid measures of a person's actual state.

### **Limitations**

- **Correlation vs. Causation:** This study identifies strong correlations but cannot prove causation. Poor mental health could lead to increased screen time, rather than the other way around.
- **Self-Reported Data:** All data is self-reported and subject to recall and social desirability biases.
- **Generalizability:** The data come from a specific online community, so we may not be able to generalize the findings to all populations.

### **Challenges**

The main challenge in the analysis process was separating the effect of different confounding variables. Lifestyle factors, such as diet, relationships with family/friends, and/or underlying health issues, are not fully reflected in the dataset but have an essential role in mental wellness.

### **Future Uses/Additional Applications**

The results of this study could inform:

- The development of workplace wellness programs to provide recommendations for employees on healthy screen time behaviors.

- The development of personalized educational materials for schools and universities to support students in managing their digital lives.
- The design of digital wellness tools that track screen time and offer personalized recommendations.

### **Recommendations**

1. **Promote digital hygiene:** Organizations should actively promote "digital hygiene" behaviors, such as taking breaks from screens, establishing a boundary between work and leisure time, and discouraging email-work after hours.
2. **Promote more mindful technology use:** Individuals should be encouraged to think more intentionally about their technology use and look for distinctions between high-value and low-value technology use, such as using technology to improve connections with family and friends (high-value) compared to scrolling through a newsfeed (low-value).
3. **Prioritize quality and quantity of sleep:** When considering the strong correlation between sleep and mental wellness, promoting good sleep practices would be the ultimate target in any wellness initiative.

### **Implementation Plan**

- **Phase 1 (Awareness):** Start a campaign on internal communications to inform your team about the findings related to digital wellness.
- **Phase 2 (Tools & Training):** Provide options for resources such as workshops on time management, mindfulness apps, and user guides on how to optimize your digital workspace.
- **Phase 3 (Policy & Culture):** Enact policies that promote work-life balance, such as "no-meeting Fridays" or dedicated "focus time."



## Ethical Assessment

When investigating data on mental health, ethical principles are essential to consider. The data included in this study were anonymized to protect personal privacy. We report all results carefully to safeguard individuals from stigma associated with being classified as having high screen time. Instead, we focus on trends across the system and work to provide positive, actionable recommendations. We also must be sure to analyze the data with a recognition that these data are representative of individuals and treat the information with the care for confidentiality it deserves.

## Appendix A: Data Dictionary

- `user\_id` - Unique identifier for each respondent.
- `age` - Age of the respondent.
- `gender` - Gender of the respondent.
- `occupation` - Occupation of the respondent.
- `work\_mode` - Work mode (e.g., Remote, In-person).
- `screen\_time\_hours` - Total hours spent on screens per day.
- `work\_screen\_hours` - Hours spent on screens for work per day.
- `leisure\_screen\_hours` - Hours spent on screens for leisure per day.
- `sleep\_hours` - Average hours of sleep per night.
- `sleep\_quality\_1\_5` - Self-reported sleep quality on a scale of 1 to 5.
- `stress\_level\_0\_10` - Self-reported stress level on a scale of 0 to 10.
- `productivity\_0\_100` - Self-reported productivity on a scale of 0 to 100.
- `exercise\_minutes\_per\_week` - Minutes of physical exercise per week.
- `social\_hours\_per\_week` - Hours spent in social activities per week.
- `mental\_wellness\_index\_0\_100` - A composite score indicating overall mental wellness.

### 10 Questions an Audience Would Ask

1. What evidence do you have to demonstrate that screen time caused an individual to have poor mental wellness, as opposed to merely being a sign of poor mental wellness in an individual?
2. Did you notice substantial differences in the findings across gender or age categories?
3. What was the most unexpected finding from the analysis?
4. How would the results differ if you used objective screen time data from a tracking application instead of individuals self-filling out the form?
5. You indicated occupation plays a part; which occupations seem most at risk?
6. Is all screen time considered "bad"? How did you distinguish non-productive screen time from productive screen time in the recommendations?
7. Your best regression model showed an R-squared of .934; what other factors could explain the remaining 6.6% variation in mental wellness?
8. How could a company use these findings to develop a concrete policy to help employees directly without being intrusive?
9. What one key take-home message do you want individuals to reflect on from this white paper?
10. What are the next steps for moving this research forward?

### References

Kumar, A. (2025). \*Screen Time vs Mental Wellness Survey - 2025\*. Kaggle.

<https://www.kaggle.com/datasets/adharshinikumar/screentime-vs-mentalwellness-survey-2025>

Stiglic, N., & Viner, R. M. (2019). Effects of screen time on the health and well-being of children and adolescents: a systematic review of reviews. \*BMJ Open\*, \*9\*(1), e023191.

<https://bmjopen.bmj.com/content/9/1/e023191>.