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# Effect of screen time and physical activity on the mental health of students

**Waisul Quroni Azim[1abcd)*], Nanik Indahwati[2ace)]**

[12] Department of Physical Education, Health and Recreation, Faculty of Sport Sciences and Health, Universitas Negeri Surabaya, Indonesia

## ABSTRACT

Screen time has become an inseparable part of adolescents' lives in the digital era. Excessive screen time may affect mental health, while physical activity is often neglected as a result of this lifestyle. This study aims to analyse the influence of screen time duration and physical activity on the mental health of students at SMP Labschool UNESA 3. The research used a quantitative method with a correlational approach. The sample consisted of 90 students from grades 7 to 9, selected through random sampling. Data were collected using validated questionnaires covering screen time duration, physical activity level, and mental health based on the Mental Health Quality of Life (MHQoL) instrument. Data analysis was conducted using the Generalized Linear Model (GLM). The results showed that screen time duration and physical activity did not significantly affect students' mental health ($p > 0.05$). Most respondents demonstrated good to very good mental health conditions, although a small number of students were in the neutral to less favourable categories. The full model did not significantly improve on the intercept-only model (Omnibus test, $p = 0.280$), and the form of play (PB1) was the predictor closest to, though it did not reach, the significance threshold ($p = 0.073$), suggesting it warrants further investigation. Rather than duration alone, the findings underline the importance of attending to the type and quality of both screen-based and physical activities in supporting students' mental health.

**Keywords:** screen time; physical activity; mental health; junior high school students; MHQoL

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**Corresponding Author:** Waisul Quroni Azim, Department of Physical Education, Health and Recreation, Faculty of Sport Sciences and Health, Universitas Negeri Surabaya, Surabaya, Indonesia

email: waisul.22073@mhs.unesa.ac.id

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## INTRODUCTION

In the digital era, *screen time* is an inseparable aspect of daily life for adolescents. Devices such as *smartphones*, tablets, and computers have become primary tools for learning, entertainment, and social interaction. Excessive use of digital devices can raise concerns about adolescent mental health.

In Indonesia, this phenomenon goes hand in hand with increased access to the internet and social media, which contributes to passive lifestyle patterns such as reduced physical activity and diminished face-to-face social interaction (Thursina, 2023).

Physical activity is known to play an important role in maintaining the balance between physical and mental health. Sufficient physical activity not only helps prevent the risk of obesity but also influences reductions in stress, anxiety, and depression (Andermo et al., 2020). An uncontrolled increase in *screen time* is frequently linked to a range of mental health problems such as sleep disturbances, decreased concentration, and isolation from social interaction (Tang et al., 2021; Santos et al., 2023). Research in China showed that *screen time* had the largest impact on mental health, while physical activity had the largest positive impact on self-rated health. In addition, academic burden was not the largest social risk factor for adolescent health (Yang et al., 2023). A more recent cross-sectional analysis among Chinese adolescents likewise reported that higher physical activity levels and lower screen time were both associated with better mental health outcomes (Yu et al., 2024).

Early adolescence (around 12–15 years of age) is a period of significant cognitive, emotional, and social change. Adolescence is a critical phase in the formation of healthy habits that may influence quality of life in later years (Peng et al., 2022). The school environment plays an important role in encouraging the balance between physical activity and *screen time*. Physical education and extracurricular activities can provide an effective platform for raising adolescents' awareness of the importance of a healthy lifestyle (Saufi et al., 2024).

Several previous studies have examined the relationship between *screen time*, physical activity, and mental health, although the results remain mixed. Some studies have found significant relationships, while others have produced inconsistent findings (Liu et al., 2022; Cartanya-Hueso et al., 2022; Shannon et al., 2022). The research gap lies in the limited number of studies that specifically examine the combined influence of *screen time* duration, dominant time of use, form of digital activity, and physical activity patterns (form, duration, and frequency) on the mental health of junior high school students in Indonesia using a *Generalized Linear Model* (GLM) approach.

This study was conducted at SMP Labschool UNESA 3 to explore in greater depth the relationships between *screen time* duration, physical activity, and their effect on students' mental health. The aim of this study is to analyse the influence of *screen time* and physical activity on the mental health of students at SMP Labschool UNESA 3, so that the results can provide insight for educators, parents, and policy makers regarding the importance of managing *screen time* and increasing physical activity as a preventive step in safeguarding adolescent mental health (Macharla et al., 2025).

## METHOD

This study used a quantitative method with a correlational approach that focuses on the study of relationships between variables. The research was conducted at SMP Labschool UNESA 3, located in Surabaya, East Java.

### *Population and Sample*

The population of the study comprised all junior high school students from grades 7 to 9 aged 12–15 years, totalling 211 students. The sample consisted of 90 students who represented grades 7 through 9. Sampling was conducted using *random sampling*, so that the characteristics of the sample reflect those of the population. More specifically, simple random sampling was applied, and the sample size was determined using Slovin's formula, $n = N / (1 + Ne^2) = 211 / (1 + 211 \times 0.08^2) \approx 90$, with a margin of error of 8%.

***Instruments and Data Collection Procedure***

Data on *screen time* duration and students' physical activity were collected using validated questionnaires. The *screen time* questionnaire covered three aspects: (1) the amount of time spent using digital devices each day (SC1), (2) the dominant time of device use (SC2), and (3) the form of activity carried out while using the device (SC3) (Indahwati et al., 2024; Brauchli et al., 2024; Neshteruk et al., 2020). The physical activity questionnaire also covered three aspects: (1) form of play (PB1), (2) duration of play (PB2), and (3) frequency of play per week (PB3) (Indahwati et al., 2024).

Information on students' mental health was obtained through a mental health measurement scale based on *The Mental Health Quality of Life Questionnaire* (MHQoL) developed by van Krugten et al. (2022). The MHQoL instrument consists of seven dimensions that assess quality of life related to mental health, with a response scale of 1 to 5.

The measurement involved *informed consent* from the student participants, as well as approval and support from the physical education (PJOK) teachers. All data were collected over a two-week period through observation and self-administered questionnaires in the school environment. Brief, informal interviews with students were also conducted solely to help contextualise and clarify their questionnaire responses; these interviews were not formally analysed and did not contribute to the statistical results reported below.

***Data Analysis***

The data analysis technique used in this study was the *Generalized Linear Model* (GLM). This method aims to analyse the influence of *screen time* and physical activity on students' mental health. GLM was selected because it allows for non-linear relationships between dependent and independent variables through the use of a *link function*. In this study, mental health served as the dependent variable in the form of five ordered categories (from very poor to very good), and the GLM was specified with a logit-based link function appropriate for an ordinal categorical outcome. Testing was conducted through the *Goodness of Fit* test, *Omnibus Test*, and *Tests of Model Effects* using IBM SPSS statistical software.

**RESULTS**

This study used the *Generalized Linear Model* (GLM) as the data analysis method. This technique was used to test whether there is an effect among the variables under study, namely *screen time* and physical activity, on students' mental health. In addition, the demographic characteristics of the respondents were analysed, and the frequency distribution results are presented in detail in Table 1.

**Table 1. Frequency Distribution of Students' Demographic Characteristics**

| Sex | Frequency | Percentage |
|---|---|---|
| Male | 46 | 51.11% |
| Female | 44 | 48.89% |
| **Total** | **90** | **100%** |

Based on Table 1, of a total of 90 respondents, 46 students (51.11%) were male, while 44 students (48.89%) were female. Thus, the proportion of male students was slightly higher than that of female students in this study.

**Table 2. Distribution of Screen Time, Physical Activity, and Mental Health Characteristics**

| Characteristic | Frequency | Percentage (%) |
|---|---|---|
| ***Screen Time (n = 90)*** | | |
| *Average daily phone use* | | |
| 1–5 hours | 39 | 43.3 |
| 6–10 hours | 36 | 40.0 |
| 11–15 hours | 11 | 12.2 |
| 16–20 hours | 4 | 4.4 |
| *Dominant time of phone use* | | |
| Morning | 1 | 1.1 |
| Midday | 3 | 3.3 |
| Afternoon | 26 | 28.9 |
| Night | 60 | 66.7 |
| *Form of activity* | | |
| Social media | 48 | 53.3 |
| Playing games | 38 | 42.2 |
| Studying | 3 | 3.3 |
| Work / business | 1 | 1.1 |
| **Physical Activity (n = 90)** | | |
| *Form of play* | | |
| Sports / outdoor play | 4 | 4.4 |
| Phone-based play | 27 | 30.0 |
| Both | 59 | 65.6 |
| *Duration of play* | | |
| 1–4 hours | 62 | 68.9 |
| 5–8 hours | 23 | 25.6 |
| 9–12 hours | 5 | 5.5 |
| *Frequency of play per week* | | |
| Once | 1 | 1.1 |
| Twice | 8 | 8.9 |
| Three times | 13 | 14.5 |
| Four times | 12 | 13.3 |
| ≥ 5 times | 56 | 62.2 |

| Characteristic | Frequency | Percentage (%) |
|---|---|---|
| **Mental Health (n = 90)** | | |
| Very poor | 0 | 0.0 |
| Poor | 1 | 1.1 |
| Neutral | 10 | 11.1 |
| Good | 58 | 64.4 |
| Very good | 21 | 23.3 |

*Note: Percentages are rounded to one decimal place and may not total exactly 100%. Screen-time figures refer to students' self-reported total daily use across all digital devices; the 16–20-hour category therefore reflects combined multi-device exposure rather than continuous single-device use.*

Based on Table 2, of the 90 respondents, the average daily phone use was as follows: 39 students (43.3%) used their phones for 1–5 hours, 36 students (40.0%) for 6–10 hours, 11 students (12.2%) for 11–15 hours, and only 4 students (4.4%) for 16–20 hours. The dominant time of phone use was at night (60 students, or 66.7%), followed by the afternoon (26 students, or 28.9%), midday (3 students, or 3.3%), and morning (1 student, or 1.1%). The main activities while using the phone consisted of social media (48 students, or 53.3%), playing games (38 students, or 42.2%), studying (3 students, or 3.3%), and work or business (1 student, or 1.1%).

With respect to physical activity, 4 students (4.4%) chose sports or outdoor play, 27 students (30.0%) more often played using their phones, and the majority of students, namely 59 students (65.6%), did both. By duration, 62 students (68.9%) played for 1–4 hours per day, 23 students (25.6%) for 5–8 hours, and only 5 students (5.5%) played for 9–12 hours. The frequency of play per week showed that 1 student (1.1%) played once a week, 8 students (8.9%) twice a week, 13 students (14.5%) three times a week, 12 students (13.3%) four times a week, and the majority, 56 students (62.2%), played five times or more per week.

As for the mental health variable, the distribution of respondents across five categories is shown. No respondents (0%) fell into the very poor category. Only 1 respondent (1.1%) was classified as poor, while 10 respondents (11.1%) fell into the neutral category. Most respondents, namely 58 students (64.4%), were in the good category, and 21 respondents (23.3%) were in the very good category. These results indicate that the majority of respondents had good to very good mental health (87.7%), with only a small proportion in the poor or neutral categories.

**Table 3. Goodness of Fit Test Results**

| Goodness of Fit | Value | df | Value/df |
|---|---|---|---|
| Deviance | 40.740 | 72 | 0.566 |
| *Scaled Deviance* | 40.740 | 72 | — |
| *Pearson Chi-Square* | 40.205 | 72 | 0.558 |
| *Scaled Pearson Chi-Square* | 40.205 | 72 | — |
| *Log Likelihood* | -255.749 | — | — |

| Goodness of Fit | Value | df | Value/df |
|---|---|---|---|
| *Akaike's Information Criterion (AIC)* | 547.499 | — | — |
| *Bayesian Information Criterion (BIC)* | 592.495 | — | — |

*Note: Dependent variable = Mental Health; Model = (Intercept), Sex, SC1, SC2, SC3, PB1, PB2, PB3.*

The *Goodness of Fit* test is used in statistical analysis to assess how well the model fits the observed data. Based on Table 3, the model shows a good level of fit based on the *Deviance/df* and *Pearson Chi-Square/df* ratios, which are 0.566 and 0.558 respectively (less than one). The model is therefore reasonably able to explain the relationship between the dependent and independent variables used. Values below one also indicate the absence of overdispersion (slight underdispersion), confirming that the model is adequately rather than over-fitted.

**Table 4. Omnibus Test Results**

| Omnibus Test | Likelihood Ratio Chi-Square | df | Sig. |
|---|---|---|---|
| *Full model vs Intercept-only* | 19.891 | 17 | 0.280 |

*Note: Dependent variable = Mental Health; Model = (Intercept), Sex, SC1, SC2, SC3, PB1, PB2, PB3.*

The *Omnibus* test is used to evaluate the overall estimated model by comparing a model that contains all predictors with one that contains only the intercept. Based on Table 4, a significance value of 0.280 (> 0.05) was obtained. This result indicates that, overall, the full model with predictors does not show a significant improvement over the basic (*intercept-only*) model. In other words, the combination of independent variables simultaneously does not significantly affect the dependent variable.

**Table 5. Tests of Model Effects Results**

| Source | Wald Chi-Square | df | Sig. |
|---|---|---|---|
| *(Intercept)* | 665.940 | 1 | **0.000*** |
| Sex | 0.534 | 1 | 0.465 |
| SC1 (Screen time duration) | 0.357 | 1 | 0.550 |
| SC2 (Dominant time) | 6.571 | 4 | 0.160 |
| SC3 (Form of activity) | 0.085 | 3 | 0.994 |
| PB1 (Form of play) | 5.239 | 2 | 0.073 |
| PB2 (Duration of play) | 0.026 | 1 | 0.871 |
| PB3 (Frequency of play) | 3.153 | 5 | 0.676 |

*Note: * significant at α = 0.05; Dependent variable = Mental Health.*

The *Tests of Model Effects* plays an important role in examining the contribution of each independent variable to the model. The method used is the *Wald Chi-Square Test*, which calculates a

test statistic to determine whether the regression coefficients (the effects of the independent variables) are significantly different from zero. Based on Table 5, only the intercept is statistically significant ($p = 0.000$), while all the other independent variables show non-significant results ($p > 0.05$). Even so, PB1 (form of play) was the predictor closest to, though it did not reach, the significance threshold ($p = 0.073$); this result is treated as a hypothesis-generating observation rather than evidence of an effect, as it rests on a single near-threshold value among eight predictors without correction for multiple comparisons.

## DISCUSSION

This study aimed to examine the influence of *screen time* and physical activity on the mental health of students at SMP Labschool UNESA 3 using the *Generalized Linear Model* (GLM) analysis method. The analysis covered demographics, the distribution of *screen time*, physical activity, and mental health characteristics, along with the evaluation of the statistical model through *Goodness of Fit*, *Omnibus Test*, and *Tests of Model Effects*.

In the *screen time* distribution, most students used their phones for 1–10 hours per day (83.3%). Phone use was most dominant at night (66.7%), with the main activities being social media (53.3%) and playing games (42.2%). These findings indicate that the majority of students' phone use is directed towards entertainment activities, which may potentially affect mental health, especially when consumed at night and disrupting sleep quality (Pereira et al., 2023; Macharla et al., 2025).

In the assessment of physical activity, most students (65.6%) engaged in a combination of outdoor play and phone-based play. The duration of physical activity that students typically performed ranged between 1–4 hours per day (68.9%), with the majority of students (62.2%) doing it five times or more per week. This pattern indicates that although many students are involved in physical activity, the intensity and quality of purely physical activity remain limited because it is mixed with screen-based activities.

As for the distribution of mental health, the majority of students had good to very good mental health (87.7%), with only one student in the poor category and none in the very poor category. This indicates that, in general, the respondent group has a positive mental health profile. Even so, the role of *screen time* and physical activity in shaping mental health still deserves attention, given that most students use their phones for entertainment and physical activity is performed at relatively low intensity.

Based on the *Tests of Model Effects* using the *Wald Chi-Square Test*, only the intercept was statistically significant, whereas other independent variables, such as *screen time* and physical activity, did not show significance ($p > 0.05$). This result is consistent with the findings of Timotius et al. (2022), who reported no significant relationship between *smartphone* usage duration and the level of depression. This may occur because of *recall bias* in the study, that is, bias caused by various factors beyond the researcher's control that may also affect mental health. More proximate explanations also apply: common-method variance arising from the exclusive use of self-report, and a probable ceiling effect, given that 87.7% of respondents already reported good or very good mental health, which leaves limited variance for the predictors to explain.

On the other hand, these findings differ from the study by Cartanya-Hueso et al. (2022), which reported that children with three hours or more of *screen time* are at a higher risk of various problems, including emotional disturbance, conduct problems, peer relationship difficulties, and prosocial behaviour problems. This risk is much greater compared with children who use screens for less than one hour per day. Liu et al. (2022) similarly stated that the more time children spend using screens, the higher the likelihood that they will experience internalising problems such as depression, anxiety,

suicidal thoughts, feelings of loneliness, and low self-confidence. More recent reviews of social media use among adolescents also report consistent associations between problematic use and depressive symptoms, anxiety, and stress (Shannon et al., 2022; Azem et al., 2023; Ding et al., 2023).

Saufi et al. (2024) found that sport (physical activity) essentially has a substantial positive effect on mental health. The benefits include reductions in symptoms of depression and anxiety, improved mood, increased self-confidence, and better sleep quality. In addition, physical activity also plays a role in enhancing cognitive ability. Meta-analytic evidence among adolescents likewise supports a small-to-moderate beneficial effect of physical exercise on negative emotions (Wang et al., 2024; Peng et al., 2022). The differences in results suggest that cultural context, school environment, and sample characteristics can influence the pattern of the relationship between physical activity and mental health.

Even so, PB1 (form of play) showed a result close to the threshold of significance ($p = 0.073$), which suggests that this variable may play a more substantial role and merits further investigation. The form of play, whether active (outdoors) or passive (digital), appears to be more relevant than mere duration or frequency. This result reinforces the conclusion that the effect of *screen time* and physical activity on mental health is not yet clearly significant in this model, but the potential contribution of certain forms of physical activity warrants more in-depth study in future research.

The practical implication of these findings is that interventions targeting junior high school students' mental health should not be limited to merely restricting screen time duration or extending physical activity time. A more holistic approach is required, paying attention to the type and quality of activities, both digital and real-world, in order to optimally support adolescent mental health (Yu et al., 2024). A limitation of this study lies in the self-report-based data collection method, which has the potential to introduce bias, and the limited scope of the research to a single school. In addition, the cross-sectional correlational design does not permit any causal or directional inference, and the analysis reported statistical significance (p-values) without accompanying effect sizes or confidence intervals; future studies should report these so that the magnitude, and not only the presence, of associations can be judged.

## CONCLUSION

This study concludes that no significant influence of the independent variables (*screen time* and physical activity) on the mental health of students at SMP Labschool UNESA 3 was found. The majority of students (87.7%) were in the good to very good mental health categories. Even so, the variable *form of play* (PB1) was the predictor closest to, though it did not reach, the significance threshold ($p = 0.073$) and therefore warrants further in-depth analysis. These findings have implications for schools and parents in encouraging students to be more involved in physical activity and to limit *screen time* to more productive activities. Future research is recommended to expand the sample size, involve several schools with different backgrounds, and use objective measurement instruments (for example, *accelerometers* for physical activity) in order to obtain a more comprehensive picture.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this study.

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