
The Relationship between Smartphone Addiction and Anxiety Levels in Adolescents at SMK Kesehatan Matorkis Padangsidimpuan

Layla Fadhilah Rangkuti¹, Yolanda Putri²

¹ Akademi Kebidanan Matorkis, Indonesia

² Akademi Kebidanan Matorkis, Indonesia

*Correspondence Author, Email: layla@akbid-matorkis.com

ABSTRACT

Introduction: Smartphone addiction is an increasingly common concern among adolescents and has been associated with elevated anxiety symptoms; however, evidence from vocational health-school populations in Indonesia remains limited. This study examined the relationship between smartphone addiction and anxiety levels among adolescents at SMK Kesehatan Matorkis Padangsidimpuan.

Methods: A cross-sectional correlational study was conducted at SMK Kesehatan Matorkis Padangsidimpuan, North Sumatra, from January to March 2026. A purposive sample of 150 adolescents aged 14–19 years completed the Smartphone Addiction Scale (SAS) short version and the anxiety subscale of the Depression Anxiety Stress Scales (DASS-21). Data were analyzed using Pearson correlation following a Kolmogorov–Smirnov normality test. Participants provided informed consent (with parental consent for minors), and ethical approval was granted by the Health Research Ethics Committee of the affiliated university.

Results: Moderate smartphone addiction was found in 56.7% of respondents and high addiction in 25.3%; 50.8% experienced anxiety ranging from mild to extremely severe. A statistically significant, moderate positive correlation was found between smartphone addiction and anxiety levels ($r = 0.524$, $p < 0.001$).

Conclusion: Smartphone addiction was moderately and positively associated with anxiety among adolescents at this vocational health school. Because the design was cross-sectional, causal or directional conclusions cannot be drawn; longitudinal studies are needed to clarify the temporal relationship between smartphone addiction and anxiety before specific intervention strategies are recommended.

Keywords: Smartphone addiction; Anxiety; Adolescents; Mental Health

INTRODUCTION

Smartphone addiction among adolescents has emerged as a pressing global health concern in the digital age. The proliferation of smartphones and unrestricted internet access has

fundamentally altered how young people interact, learn, and spend their leisure time. According to the Indonesian Internet Service Providers Association, internet penetration among Indonesian adolescents has continued to increase in recent years

(APJII, 2024). While technology offers numerous benefits for education and social connection, excessive and uncontrolled smartphone use has been linked to adverse mental health outcomes, particularly anxiety disorders.

Adolescence represents a critical developmental period characterized by significant biological, psychological, and social transformations. During this phase, individuals are particularly vulnerable to environmental influences, including digital stimuli. The World Health Organization identifies adolescents as a high-risk group for mental health disorders, noting that mental health conditions often first emerge during this period (WHO, 2021). Anxiety disorders, in particular, are among the most common mental health problems affecting this age group, manifesting as excessive worry, physical symptoms such as palpitations and sweating, and avoidance behaviors that can impair academic and social functioning.

Ciydem et al. (2026) examined 1,566 early adolescents and reported that greater digital device addiction was associated with higher anxiety and depression scores. Neuroimaging studies have also reported that smartphone addiction is associated with altered connectivity in brain regions involved in emotional processing, including the amygdala and prefrontal cortex, offering one plausible biological basis for the psychological association observed in behavioral studies although this evidence remains correlational rather than causal.

SMK Kesehatan Matorkis (Sekolah Menengah Kejuruan Kesehatan Matorkis, a vocational health high school) is located in Padangsidempuan City, North Sumatra, at Jalan HT. Rizal Nurdin No. 39, Kelurahan Sihitang. As an A-accredited health vocational school, it prepares students to become nursing assistants and other healthcare support professionals. Because students in health vocational programs are expected to develop emotional stability alongside technical competence, their

mental health has direct implications for the future quality of healthcare services in the region.

Informal observations at SMK Kesehatan Matorkis suggested that many students use smartphones extensively both at school and at home, with some reporting difficulty sleeping, distress when separated from their devices, and anxiety about missing information on social media. These observations motivated a systematic investigation into the relationship between smartphone use patterns and anxiety levels in this specific educational context.

The relationship between problematic smartphone use and anxiety has been documented extensively in the international literature (e.g., Ahmadi & Saghafi, 2013; Ciydem et al., 2026; Zhang et al., 2025). However, evidence from Indonesian vocational health-school populations who face a distinct combination of curricular and future clinical demands remains scarce. This study is best understood as a preliminary, single-site investigation rather than an attempt to establish broadly generalizable evidence of a novel mechanism: its contribution lies primarily in documenting this relationship within a specific, previously unstudied local context, rather than in the wider socio-cultural characteristics of the Padangsidempuan population, which were described qualitatively but not directly measured in this study.

Accordingly, this study aimed to examine the relationship between smartphone addiction and anxiety levels among adolescents at SMK Kesehatan Matorkis Padangsidempuan. It was hypothesized that smartphone addiction would be positively associated with anxiety levels in this population (H_1 : there is a significant positive correlation between smartphone addiction and anxiety levels; H_0 : there is no significant correlation between the two variables).

MATERIALS AND METHOD

Research Type

This study employed a cross-sectional survey design with a quantitative correlational approach to examine the relationship between smartphone addiction and anxiety levels. A total of 150 adolescents aged 14–19 years were recruited from SMK Kesehatan Matorkis Padangsidempuan using purposive sampling. Data were collected using self-administered, paper-based questionnaires from January to March 2026, comprising the Smartphone Addiction Scale (SAS) short version and the anxiety subscale of the Depression Anxiety Stress Scales (DASS-21). Following a normality assessment, Pearson correlation analysis was used for hypothesis testing.

Population and Sample

Adolescents aged 14–19 years who were active students at SMK Kesehatan Matorkis Padangsidempuan during the 2025/2026 academic year constituted the study population. The accessible population was approximately 240 students across the school's health-related skill programs.

Recruitment took place during regularly scheduled class sessions. On the days data collection was conducted, only Nursing-program classes were available for recruitment; consequently, all 150 respondents in the final sample were Nursing-program students.

Inclusion criteria were: active student status, age 14–19 years, owning and using a smartphone, and willingness to participate by providing informed consent. Exclusion criteria were absence during data collection and incomplete questionnaire responses (>10% missing data). Sample size was calculated using the Slovin formula with a 5% margin of error, yielding a minimum required sample of 150 from a population of 240; replacement sampling was used to maintain this target when incomplete responses were excluded.

Research Location

The study was conducted at SMK

Kesehatan Matorkis Padangsidempuan, located in a mixed urban and semi-urban area of North Sumatra. Padangsidempuan is the largest city in the Tapanuli region, and its population includes several ethnic groups, including Batak Mandailing, Batak Angkola, Javanese, and Minangkabau. This description of the setting is provided as context; no formal measurement of socio-cultural or ethnic variables was undertaken as part of this study.

Instrumentation

The independent variable, smartphone addiction, was measured using the Smartphone Addiction Scale (SAS) short version (Kwon et al., 2013), which consists of 10 items rated on a 6-point Likert scale (1 = Strongly Disagree to 6 = Strongly Agree; total score range 10–60). Higher scores indicate greater addiction severity. For descriptive purposes, total scores were categorized into low, moderate, and high addiction levels [author to state the exact cut-off values applied and their source].

The dependent variable, anxiety, was measured using the anxiety subscale of the Depression Anxiety Stress Scales (DASS-21) (Lovibond & Lovibond, 1995), which consists of 7 items rated on a 4-point Likert scale (0 = Did not apply to me at all to 3 = Applied to me very much). Subscale scores were doubled following standard DASS-21 scoring procedures and categorized as normal (0–7), mild (8–9), moderate (10–14), severe (15–19), and extremely severe (≥ 20).

Both instruments were translated into Indonesian using a forward–backward translation procedure. Prior to the main study, both instruments were pilot-tested on 30 respondents with characteristics similar to the study sample (outside the main sample). Item validity was assessed using Pearson product-moment correlation against a significance criterion of $r > r\text{-table}$ ($\alpha = 0.05$, $n = 30$, $r\text{-table} = 0.361$), and reliability was assessed using Cronbach's alpha with an acceptable threshold of > 0.70 .

Data Collection Procedures

Data were gathered over three months (January–March 2026) using a paper-based questionnaire administration method. Prior to data collection, the researcher obtained official permission from the school principal and coordinated with guidance counselors and homeroom teachers to schedule administration times that minimized disruption to academic activities.

A consent form containing instructions for completing the questionnaire, the purpose of the study, confidentiality assurances, and the voluntary nature of participation was provided to each potential respondent. For respondents under the age of 18, parental consent was obtained in addition to the adolescent's own assent. The researcher explained the questionnaire items and addressed respondents' questions before administration began.

Questionnaire administration took approximately 15–20 minutes per session and was conducted in classroom settings during non-instructional periods. Completed questionnaires were checked for completeness immediately after collection; questionnaires with more than 10% missing data were excluded, and replacement sampling was used to maintain the target sample size of 150.

Data Analysis

Data were analyzed using SPSS version 26.0 for Windows in three stages. First, univariate analysis described respondent characteristics (age, gender, grade, skill program) and the distribution of smartphone addiction and anxiety levels, presented as frequencies, percentages, means, and standard deviations. Second, the normality assumption

was tested using the Kolmogorov–Smirnov test ($p > 0.05$ indicating normal distribution), justifying the use of parametric correlation analysis. Third, the Pearson product-moment correlation test examined the relationship between smartphone addiction (independent variable) and anxiety level (dependent variable), interpreted using the following criteria: 0.00–0.199 (very weak), 0.20–0.399 (weak), 0.40–0.599 (moderate), 0.60–0.799 (strong), and 0.80–1.00 (very strong); the null hypothesis was rejected if $p < 0.05$ (two-tailed).

Because this study relied on bivariate Pearson correlation, potential confounding variables (e.g., age, grade level, family socioeconomic status) were not statistically controlled; this is addressed as a limitation. Two main sources of bias were considered: selection bias arising from purposive, single-program sampling, and information bias arising from self-reported measures. Both are discussed further under Limitations and Cautions.

Ethical Approval

This study received ethical approval from the Health Research Ethics Committee of the affiliated university (Approval No. 25125/AP/ABM/V/2026). Before participation, all respondents gave informed consent, with parental or guardian consent additionally obtained for those under 18 years of age. Confidentiality was maintained throughout the study: identification numbers rather than names were used on all questionnaires, and data were stored on password-protected computers accessible only to the research team. Participants were informed that they could withdraw at any time without academic consequence, and no financial incentives were offered

RESULT

A total of 150 respondents completed the questionnaires; their characteristics are presented in Table 1. All respondents were

enrolled in the Nursing program (see Population and Sample, above).

Regarding smartphone addiction, 56.7% of respondents ($n = 85$) showed moderate addiction, 25.3% ($n = 38$) showed high addiction, and 18.0% ($n = 27$) showed low addiction (Table 2). The mean smartphone addiction score was 34.2 ($SD = 8.7$) on a possible range of 10–60.

Regarding anxiety, 50.8% of respondents experienced anxiety ranging from mild to extremely severe: mild (16.0%, $n = 24$), moderate (18.7%, $n = 28$), severe (12.0%, $n =$

18), and extremely severe (4.0%, $n = 6$); 49.2% ($n = 74$) were classified as normal (Table 3). The mean anxiety score was 8.6 ($SD = 6.3$).

The Kolmogorov–Smirnov test indicated that both variables were normally distributed ($p > 0.05$ for both; Table 4), supporting the use of Pearson correlation. The Pearson correlation test showed a statistically significant, moderate positive correlation between smartphone addiction and anxiety levels ($r = 0.524$, $p < 0.001$; Table 5)

Table 1. Distribution of Respondent Characteristics ($n = 150$)

No	Characteristic	Category	Frequency	Percentage (%)
1	Gender	Male	48	32.0
		Female	102	68.0
2	Age	14–15 years	35	23.3
		16–17 years	78	52.0
		18–19 years	37	24.7
3	Grade	Grade X	48	32.0
		Grade XI	52	34.7
		Grade XII	50	33.3
4	Skill Program	Nursing	150	100.0

Table 2. Distribution of Smartphone Addiction Levels ($n = 150$)

No	Addiction Level	Frequency	Percentage (%)
1	Low	27	18.0
2	Moderate	85	56.7
3	High	38	25.3

Note. Overall mean score = 34.2 ($SD = 8.7$), range 10–60.

Table 3. Distribution of Anxiety Levels ($n = 150$)

No	Anxiety Level	Score Range	Frequency	Percentage (%)
1	Normal	0–7	74	49.2

No	Anxiety Level	Score Range	Frequency	Percentage (%)
2	Mild	8–9	24	16.0
3	Moderate	10–14	28	18.7
4	Severe	15–19	18	12.0
5	Extremely Severe	≥20	6	4.0

Table 4. Validity Test Results for Smartphone Addiction Scale (SAS) Short Version (n=30)

Item No	r calculated	r table (0.05;28)	Status
1	0.712	0.361	Valid
2	0.685	0.361	Valid
3	0.743	0.361	Valid
4	0.698	0.361	Valid
5	0.721	0.361	Valid
6	0.654	0.361	Valid
7	0.709	0.361	Valid
8	0.677	0.361	Valid
9	0.735	0.361	Valid
10	0.691	0.361	Valid

Table 5. Validity Test Results for DASS-21 Anxiety Subscale (n=30)

Item No	r calculated	r table (0.05;28)	Status
1 (Anxiety-1)	0.724	0.361	Valid
2 (Anxiety-2)	0.698	0.361	Valid
3 (Anxiety-3)	0.756	0.361	Valid
4 (Anxiety-4)	0.713	0.361	Valid
5 (Anxiety-5)	0.689	0.361	Valid
6 (Anxiety-6)	0.742	0.361	Valid
7 (Anxiety-7)	0.707	0.361	Valid

Table 6. Reliability Test Results for Research Instruments (n=30)

Instrument	Number of Items	Cronbach's Alpha	Criterion	Status
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SAS Short Version	10	0.876	0.7	Highly Reliable
DASS-21 Anxiety Subscale	7	0.842	0.7	Highly Reliable

Table 7. Summary of Validity and Reliability Test Results (n=30)

Instrument	Items	r table (df=28;α=0.05)	r calculated Range	Validity Status	Cronbach's Alpha	Reliability Status
SAS Short Version	10	0.361	0.654 - 0.743	100% Valid	0.876	Highly Reliable
DASS-21 Anxiety Subscale	7	0.361	0.689 - 0.756	100% Valid	0.842	Highly Reliable

Table 8. Normality Test Results (Kolmogorov–Smirnov)

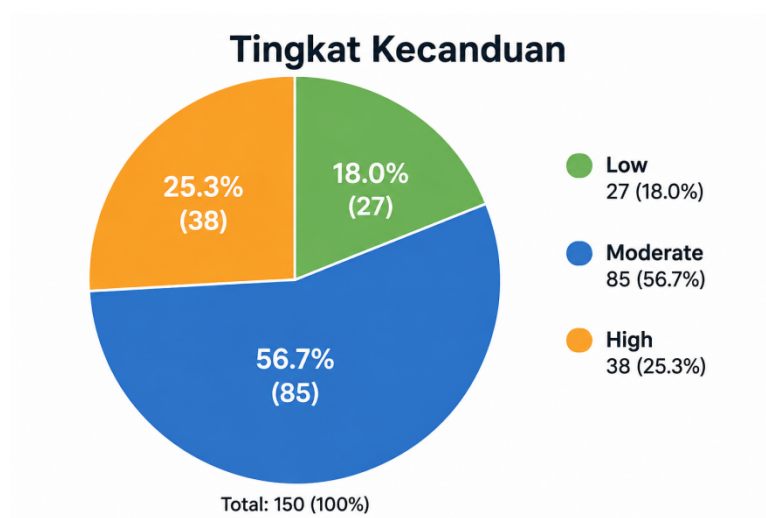
No	Variable	Kolmogorov–Smirnov Z	p-value	Description
1	Smartphone Addiction	0.089	0.082	Normal
2	Anxiety Level	0.076	0.200	Normal

Table 9. Pearson Correlation Test Results

Variable	Smartphone Addiction	Anxiety Level
Smartphone Addiction	1	0.524**
Anxiety Level	0.524**	1

Note. ** $p < 0.001$ (2-tailed).

Figures

**Figure 1.** Distribution of smartphone addiction levels

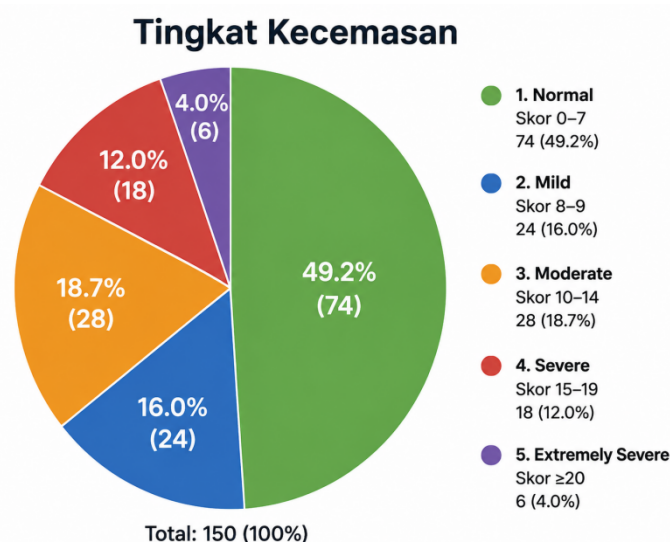


Figure 2. Distribution of anxiety levels

DISCUSSION

Interpretation of Key Findings

Smartphone addiction was significantly correlated with anxiety symptoms in this sample ($r = 0.524$, $p < 0.001$), a moderate association consistent with the broader literature on digital device use and adolescent mental health. The finding that 56.7% of respondents showed moderate addiction and 25.3% showed high addiction suggests that smartphone addiction was common in this population; the finding that 50.8% experienced mild to extremely severe anxiety suggests that anxiety symptoms were similarly prevalent.

Because the data are cross-sectional, these findings describe an association rather than a causal pathway. Excessive smartphone use may contribute to anxiety, but it is equally plausible that adolescents experiencing anxiety turn to smartphones as a coping strategy, or that both are influenced by shared underlying factors. This study cannot distinguish between these possibilities.

This finding is broadly consistent with Ciydem et al. (2026), who reported that greater

digital device addiction was associated with higher anxiety and depression symptoms among 1,566 early adolescents. The present study extends this literature by describing this relationship within an Indonesian vocational health-school context that had not previously been examined; consistent with the point raised in review, this contribution should be regarded as a preliminary, local description rather than a demonstration of a novel mechanism.

Some neuroimaging studies have reported that smartphone addiction is associated with altered amygdala connectivity and reduced prefrontal cortex activity, patterns that could plausibly relate to heightened emotional reactivity and reduced emotion regulation. This literature offers one possible biological explanation for associations of the kind observed here, but because this study did not include neuroimaging or physiological measures, this mechanism cannot be confirmed by the present data and should be read as background context rather than as an explanation supported by these results.

Comparison with Previous Studies

This study's results are broadly in line with those of Ahmadi and Saghafi (2013), who

reported that Iranian adolescents with higher internet addiction exhibited elevated psychosocial risk relative to their peers. Similarly, a daily-diary study of Chinese high-school students found a significant association between anxiety and the severity of smartphone addiction, with a notable difference in addiction severity by sex (Zhang et al., 2025). A related study among Turkish adolescents found that smartphone addiction and trait anxiety mediated the relationship between self-regulation skills and mental well-being (Akat, 2025).

The present findings extend this literature by focusing specifically on vocational health students, a population that has received comparatively little research attention. Health vocational students face distinct stressors including clinical practice requirements and early exposure to patient-care responsibilities that may shape how smartphone use relates to anxiety, although this study did not directly measure these stressors, so this interpretation remains speculative.

The moderate strength of the correlation ($r = 0.524$, $r^2 \approx 0.27$) indicates that smartphone addiction and anxiety are related but not synonymous; other factors such as family environment, peer relationships, academic stress, and individual vulnerability likely account for a substantial share of the remaining variance, consistent with a biopsychosocial understanding of adolescent mental health.

Limitations and Cautions

This study has several limitations. First, the cross-sectional design restricts the ability to establish causation. While a correlation between smartphone addiction and anxiety was observed, it cannot be concluded that smartphone addiction causes anxiety, nor can the possibility be ruled out that anxiety predisposes adolescents to smartphone overuse as a coping mechanism. The bidirectional relationship suggested by other researchers

(Nesi, 2020) remains plausible and requires testing through longitudinal designs.

Second, the use of self-reported data may have introduced bias, such as over- or under-reporting of smartphone use and anxiety symptoms. Future studies could strengthen validity by incorporating objective measures, such as smartphone usage-tracking applications or clinical diagnostic interviews.

Third, findings may not generalize to other contexts due to the study's geographic and institutional focus. Padangsidempuan is a mid-sized city in North Sumatra with cultural characteristics that may differ from other Indonesian regions, and, as noted under Population and Sample, all respondents were drawn from a single program (Nursing) at a single, predominantly female (68%) vocational health school. This further limits generalizability to co-educational general high schools, other health skill programs, or vocational schools in other settings.

Fourth, potential confounding variables (e.g., age, grade level, family socioeconomic status) were not statistically controlled, since only bivariate correlation was used; associations reported here may partly reflect the influence of unmeasured variables.

Fifth, the exclusion of students absent during data collection could have introduced selection bias if absent students differed systematically from present students for example, if students with more severe anxiety were more likely to be absent, potentially leading to an underestimation of anxiety prevalence in this sample.

Recommendations for Future Research

Future research should prioritize longitudinal designs to help establish the temporal and possibly causal relationship between smartphone use patterns and anxiety outcomes, following cohorts of adolescents over time with repeated measurement of both variables.

Further research could also examine specific mechanisms that may mediate this relationship, such as sleep quality, social comparison processes, physical activity levels, and emotion-regulation skills, to inform more targeted interventions.

Broadening research to a wider range of cultural, institutional, and demographic contexts including co-educational schools, other health skill programs, and other regions of Indonesia would help clarify how far these findings generalize.

Finally, intervention research is needed before specific recommendations for practice can be made with confidence. Experimental studies could evaluate school-based programs that limit smartphone use during school hours, family-based interventions establishing device-free times at home, or individual-level cognitive-behavioral approaches, with outcomes assessed rigorously before such programs are broadly recommended.

CONCLUSION

This study found a statistically significant, moderate positive correlation between smartphone addiction and anxiety levels among adolescents at SMK Kesehatan Matorkis Padangsidempuan ($r = 0.524$, $p < 0.001$), with 56.7% of respondents showing moderate addiction and 50.8% reporting anxiety ranging from mild to extremely severe. Because the cross-sectional design does not permit causal inference, these findings should be interpreted as describing an association rather than a directional or causal relationship, and the study's single-program, single-school sample limits how far the findings generalize. Longitudinal research is needed to clarify whether smartphone addiction precedes anxiety, follows it, or both, and intervention studies are needed before specific smartphone-restriction programs can be recommended with confidence; in the meantime, schools and families may benefit from remaining attentive

to adolescents' digital habits as this evidence base develops.

BIBLIOGRAPHY

- Ahmadi, K., & Saghafi, A. (2013). Psychosocial profile of Iranian adolescents' Internet addiction. *Cyberpsychology, Behavior, and Social Networking*, 16(7), 543–548. <https://doi.org/10.1089/cyber.2012.0237>
- Akat, M. (2025). Examining the relationship between smartphone addiction, trait anxiety, mental well-being, and self-regulation skills in adolescents. *International Journal of Turkish Education Sciences*, 13(3), 1943–1971. <https://doi.org/10.46778/goputeb.1706780>
- Asosiasi Penyelenggara Jasa Internet Indonesia (APJII). (2024). Survei Penetrasi Internet Indonesia 2024. [Author to insert the full report reference/page number for the specific adolescent internet-penetration figures cited in the Introduction; this could not be independently confirmed during this revision.]
- Arifin, E. N. (2023). The effect of online game addiction on sleep quality in adolescents (Undergraduate thesis). UIN Sunan Ampel Surabaya.
- Ciydem, E., et al. (2026). The relationship between digital device addiction and anxiety and depression in early adolescents. *Journal of Psychosocial Nursing and Mental Health Services*, 64(2), 38–48. <https://doi.org/10.3928/02793695-20250707-03>
- Kwon, M., Kim, D.-J., Cho, H., & Yang, S. (2013). The smartphone addiction scale: Development and validation of a short version for adolescents. *PLoS ONE*, 8(12), e83558. <https://doi.org/10.1371/journal.pone.0083558> (Note: this replaces the citation “PLoS ONE, 8(2), e56936” in the original bibliography, which refers to a different Kwon et al. 2013 paper the original, longer SAS not the short version described and used in the Method section.)
- Lovibond, S. H., & Lovibond, P. F. (1995). Manual for the Depression Anxiety Stress Scales (2nd ed.). Psychology Foundation of Australia.

- Nesi, J. (2020). The impact of social media on youth mental health: Challenges and opportunities. *North Carolina Medical Journal*, 81(2), 116–121. <https://doi.org/10.18043/ncm.81.2.116>
- Nasrul, E. (2026, April 9). Research reveals the dangers of smartphone addiction, these are the impacts on the adolescent brain. *Republika Online*.
- Republika. (2023, September 24). Children addicted to gadgets are at risk of depression to narcissism. *Republika Online*.
- Sekartini, R. (2024, July 24). Preventing cyberbullying, growth and development expert asks to limit children's gadgets. *Tempo.com*.
- Suryani, et al. (2023). Effectiveness of group counseling with self-management techniques to reduce gadget addiction in grade VIII students of MTs Negeri 4 Bantul. *Universitas Ahmad Dahlan*.
- Zhang, C., Han, Y., Li, B., & Wang, J. (2025). The relationship between high school English learners' anxiety and their smartphone addiction: Evidence from a daily diary approach. *Frontiers in Psychiatry*, 16, Article 1581404. <https://doi.org/10.3389/fpsyt.2025.1581404>