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Association between gadget use intensity and emotional subdomains with menstrual cycle patterns among adolescent girls

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Abstract

Background: The rapid increase in gadget use among adolescents has raised concerns regarding its potential effects on emotional functioning and reproductive health. While previous studies have examined the relationship between screen time and mental health, limited evidence addresses how specific emotional subdomains relate to menstrual cycle patterns among adolescent girls.

Objective: This study aimed to analyze the association between gadget use intensity and emotional subdomains, as well as their relationship with menstrual cycle patterns among adolescent girls.

Methods: A cross-sectional analytic study was performed on 90 adolescent girls (15–17 years, selected through cluster random sampling from five senior high schools in Surabaya, Indonesia). Gadget intensity was grouped according to the daily duration of use. Emotional subdomains were evaluated by the Pediatric Symptom Checklist-17 (PSC-17), which consists of internalizing, attention, and externalizing domains. Patterns of menstrual cycles were assessed using a three-month menstrual calendar. Data were analyzed using Fisher's Exact test with a significance level of 0.05.

Results: Over half of participants mentioned 4–8 hours per day in their gadget use (55.6%). 56.7% of respondents reported emotional problems, primarily in the internalizing domain. Among participants, 57.8% had irregular menstrual cycles. There was no relationship of gadget use intensity to overall emotional problems or menstrual cycle patterns ($p > 0.05$). However, gadget use intensity was significantly associated with emotional difficulties ($p = 0.020$) in the attention subdomain.

Conclusion: Intensity of gadget use was not related to general emotional problems or menstrual cycle patterns in adolescent girls. However, elevated gadget use demonstrated an association with attention-related emotional difficulties in adolescents, indicating that some emotional subdomains may be more sensitive to excessive gadget exposure. Interventions aimed at adolescent gadget use should therefore emphasize attention-related emotional regulation, rather than general emotional outcomes.

Keywords: Gadget use intensity; Emotional subdomains; Reproductive health; Menstrual cycle patterns; Adolescent girls

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1. Introduction

Adolescence is a critical period in development when biological, psychological and social changes take place with great intensity. In this developmental stage, emotional regulation is also important for mental well-being, reproductive health and overall health among adolescent girls. The emotional and behavioural problems in adolescents continue to be a worldwide public health concern. According to the World Health Organization, about one in eight people worldwide has a mental disorder, with anxiety and depressive disorders being particularly prevalent during adolescence (World Health Organization, 2022). In Indonesia, national data indicate that emotional mental disorders affect a substantial proportion of individuals aged over 15 years, with notable prevalence in East Java (Risksedas, 2018).

Taken together with these mental health symptoms, there has been rapid technological development with gadget usage rates increasing significantly among adolescents. In the area of communication, education, and entertainment, a variety of electronics are useful, but heavy and persistent use has been linked to negative emotional and behavioral consequences. Several studies have reported associations between prolonged gadget use and emotional disturbances, sleep problems, reduced concentration, and behavioral issues among adolescents (Ahmad, 2019; Annisa et al., 2022). Indonesia is among the countries with the longest daily duration of mobile phone use, reflecting high exposure to digital devices among adolescents (APJII, 2023). Mental health services in East Java, notably in Surabaya, have reported an increase in adolescent gadget addiction cases, underlining how growing health concerns about the topic become public health relevant (Jawa Pos, 2024).

Previous studies exploring the relationship between gadget use and adolescent emotional health have produced unclear results. For example, some studies observed positive associations between gadget addiction as a risk factor for emotional and behavioral problems (Ahmad, 2019; Suryani & Yazia, 2023), while others did not identify a significant influence between gadget use duration and overall emotional problems (Aziz et al., 2021). Perhaps the main cause of the discrepancy lies in the fact that we see emotional health, for many, as a holistic construct. In the case of adolescents, emotional functioning has several subdomains: internalizing symptoms, externalizing behavior, and attention-related difficulty (Santrock, 2012). The Pediatric Symptom Checklist-17 (PSC-17) is a validated tool that allows to measure these emotional subdomains independently of one another and provides a comprehensive picture of adolescent emotional functioning. New insights indicate that the use of gadgets and technology overuse could have a disproportional impact on attentional emotional development. Persistent exposure to digital media promotes multitasking and rapid attention switch-over might undermine adolescents focus and sustain attention, even with academic demands (Annisa et al., 2022; Suryani & Yazia, 2023). Nevertheless, researches directly investigating the association of intensity of device use with emotional subdomains, not with general emotional problems, are few and far between especially for adolescent girls in Indonesia. Adolescent emotional health relates well with reproductive health, in relation to the regulation of menstrual cycle regulation. Through the hypothalamic–pituitary–ovarian axis, hormonal balance will be disrupted by psychological stress and emotional disturbances that provoke menstrual irregularities. Past studies have shown strong links between emotional regulation and stress and menstrual cycle disturbances in adolescent girls (Cholifah et al., 2021; Ronanza et al., 2022). National data show that menstrual irregularities are still common among Indonesian adolescents living in urban areas like Surabaya (Risksedas, 2018). However, evidence also does not support a direct link between gadget use intensity and menstrual cycle patterns with some studies finding no significant association (Azizah et al., 2023). Most studies focused on gadget use have reported their relationship with emotional health or menstrual cycle pattern separately from emotional subdomains, without applying emotional subdomains as a plausible mode of explanation for why this relationship differs. As a result, the associations between gadget intensity of use, and the expression of certain emotional subdomains during the period and menstrual cycle for adolescent girls are barely investigated. This gap is of particular significance in Indonesia, where large-scale gadget use is accompanied by growing concerns about adolescent mental and reproductive health. Thus, the objective of this study is to examine the associations of gadget use intensity with emotional subdomains and their association with menstrual cycles in adolescent girls (15–17 years). The present study therefore strives to enhance the understanding of adolescent emotional functioning and the potential impact on reproductive health in a digital world by examining emotional subdomains, rather than general emotional status.

2. Method

2.1. Study Design and Setting.

This was an analytic observational cross-sectional study. The study was done among five senior high schools in Surabaya, Indonesia, on October 14–October 29, 2024: SMA Hidayatul Ummah, SMKN 10, SMAN 22, SMAN 15, and SMAN

19. In order to investigate the association between gadget use intensity, emotional subdomains, and menstrual cycle patterns at one point in time, we adopted a cross-sectional design.

2.2. Participants and Sampling.

The research sample consisted of adolescent females between 15 and 17 years old who attended senior high schools in Surabaya. The total population size was not known; thus the minimum sample size using the Lemeshow formula was calculated and the minimum number of participants needed for the estimation was 36. For increased statistical power and representation, this study had 90 subjects. The participants were drawn from cluster random sampling in which classes of each school were chosen randomly and all eligible students from selected clusters were invited to participate. Inclusion criteria were willingness to participate, presence during data collection, and regular use of gadgets. Exclusion criteria covered previous mental illness diagnosis, family history of severe mental illness, chronic disease, diagnosed endocrine disorders (diseases such as diabetes mellitus, hypo- or hyperthyroidism), current pregnancy, use of hormonal medication or contraception, reproductive system disorder, and inability to remember menstrual cycles from the prior three months.

2.3. Variables and Measurements

The independent variable of the present study was gadget use intensity defined as the average period of gadget use per day for educational, communication, and entertainment. The gadget use intensity was grouped into four classes: ≤ 2 hours/day, $>2-4$ hours/day, $>4-8$ hours/day, and >8 hours/day as was per previous research (Al-Rashidi & Alhumaidan, 2017). The main dependent variables were emotional subdomains and menstrual cycle patterns. Emotional subdomains were evaluated using the Pediatric Symptom Checklist-17 (PSC-17), a popular screening instrument to identify emotional and behavioral problems in adolescents. The PSC-17 has 17 measures across three subdomains that are internalizing, externalizing, and attention problems. The validity and reliability of the PSC-17 have been confirmed within various populations, reporting Cronbach's alpha values from 0.79 to 0.89 (Gardner et al., 2007). Emotional problems were classified, following established international cut-off scores: internalizing ≥ 5 , externalizing ≥ 7 , attention ≥ 7 , or total score ≥ 15 , indicative of risk for emotional problems. Menstrual cycle patterns were measured using a three-month menstrual calendar that ran from July to September 2024. Menstrual history was classified as regular if the period cycle length ranged between 21 and 35 days and was consistent throughout the three months; irregular in cases of <21 days, >35 days, or no menstruation in one or more months.

2.4. Data Collection Procedure

Data was collected following ethical approval and institutional permission by relevant authorities. Informed consent forms were given to participants and both the participants and their parents or guardians were asked to fill in and sign. Data were collected in two steps: at first screening to verify eligibility in terms of inclusion and exclusion criteria, followed by filling out the PSC-17 questionnaires and menstrual cycle calendar. All questionnaires were self-administered with researcher oversight.

2.5. Statistical Analysis

Descriptive and inferential statistics were used to analyze the data. Participant characteristics and distributions of variables were summarized using descriptive statistics. Associations between gadget use intensity and emotional subdomains with menstrual cycle patterns were analyzed using bivariate analyses. Fisher's Exact test was applied for inferential analysis because some contingency tables displayed low expected cell counts that broke the statistical assumptions for applying the chi-square test. Statistical significance was set at $p < 0.05$ with a 95% confidence level. All analyses were performed in suitable statistical software.

The study was approved by the Health Research Ethics Committee of Faculty of Medicine, Universitas Airlangga (Approval No. 127/EC/KEPK/FKUA/2024) on October 13, 2024, and valid until October 13, 2025. Participation was voluntarily undertaken and participant anonymity/confidentiality was strictly maintained..

3. Result

3.1. Participant Characteristics and Prevalence

The analysis included 90 adolescent girls aged 15–17 years. Most participants had a gadget use intensity of more than 4–8 hours per day (55.6%), followed by more than 8 hours per day (28.9%). Usage with gadgets was estimated at ≤2 hours per day (4.4%) in a handful of participants. When it came to emotional health, 56.7% of the participants were recognized as being at risk of experiencing emotional problems according to the criteria of PSC-17. Out of subdomains of emotional stress, internalizing symptoms appeared most often, while attention-related problems were observed in a smaller but notable proportion of participants. Through the menstrual cycle assessment, approximately 57.8% experienced irregular menstrual cycles during the three-month observation period.

Table 1 Prevalence of Gadget Use Intensity, Emotional Problems, and Menstrual Cycle Patterns (n = 90)

Variable	Category	n (%)
Gadget use intensity	≤2 h/day	4 (4.4)
	>2–4 h/day	10 (11.1)
	>4–8 h/day	50 (55.6)
	>8 h/day	26 (28.9)
Emotional problems (PSC-17)	At risk	51 (56.7)
	Not at risk	39 (43.3)
Menstrual cycle pattern	Regular	38 (42.2)
	Irregular	52 (57.8)

3.2. Association Between Gadget Use Intensity and Emotional Subdomains

Table 2 Association Between Gadget Use Intensity and Emotional Subdomains (Fisher’s Exact Test)

Emotional domain	p-value
Overall emotional problems	0.496
Internalizing	0.518
Attention	0.020
Externalizing	0.444
Total PSC-17 score	0.564

According to the bivariate analysis of Fisher’s Exact test, there was no significant association between gadget use intensity and overall emotional problems ($p = 0.496$). Also, no significant associations were found for the internalizing ($p = 0.518$) and externalizing ($p = 0.444$) subdomains, nor for the total PSC-17 score ($p = 0.564$). A statistically significant association was found for gadget use intensity with the attention subdomain of PSC-17 ($p = 0.020$), suggesting that higher gadget use intensity was associated with increased attention-related emotional difficulties.

3.3. Association Between Gadget Use Intensity and Menstrual Cycle Patterns

Table 3 Association Between Gadget Use Intensity and Menstrual Cycle Patterns (Fisher’s Exact Test)

Outcome	p-value
Menstrual cycle pattern	0.699

Analysis revealed no significant association between gadget use intensity and menstrual cycle patterns among adolescent girls ($p = 0.699$). Irregular menstrual cycles were observed across all categories of gadget use intensity, with no clear dose–response pattern.

4. Discussion

The current research provides evidence that intensity of use of gadgets is independent of the generality of emotional problems and menstrual cycle patterns among adolescent girls, but that it is significantly related to the sub-domain of attention to emotional functioning. These results indicate heightened exposure to devices may impact particular emotional states, rather than general emotional well-being, which may be the reason for the mismatch of previous studies.

4.1. Gadget Use and Attention-Related Emotional Difficulties

The relationship between the intensity of gadget use and attention-related emotional problems was found which could be related to the fact that exposure to prolonged digital media may exert some neurocognitive & behavioral regulation factors from which it could be expected that gadget use intensity is highly associated to problems. The constant interaction with gadgets promotes quick task switching, multitasking, and continuous viewing of hyper-stimulus content. These patterns may train teens' focus as they adjust to short attention spans and sustained attention deficits, especially when engaged during academic or structured programs. The same mechanisms have been suggested in reports reporting that excessive gadget consumption disrupts school-age adolescents' concentration and attention regulation (Annisa et al., 2022; Suryani & Yazia, 2023). Attention difficulties, as measured in the PSC-17, comprise symptoms such as difficulty concentrating, ease of distraction, and restlessness. These features are especially sensitive to environmental triggers such as exposure to digital media, hence the attention subdomain could be interpreted as meaningful in comparison with the internalizing and externalizing ones. This result is consistent with the sentiment that adolescents' affective functioning ought to be addressed within a multidimensional approach, as opposed to being a monolithic outcome (Santrock, 2012).

4.2. Absence of Association with Overall Emotional Problems

The lack of association between gadget use intensity and general emotional problems indicates that adolescent emotional impairments are multivariable and beyond the screen. Previous studies have repeatedly identified the family environment, parenting style, peer relationships, susceptibility to genetics and larger psychosocial stressors as a major cause of adolescent emotional health problems (Santrock, 2012; Aziz et al., 2021). In contexts where these factors play a dominant role, gadget use intensity may not independently predict global emotional problems.

Moreover, emotional problems such as anxiety and depressive symptoms often develop over prolonged periods and may require cumulative exposure to stressors. As a cross-sectional study, the present research captures associations at a single point in time, which may limit its ability to detect long-term emotional effects of sustained gadget use.

4.3. Gadget Use and Menstrual Cycle Patterns

This study found no significant association between gadget use intensity and menstrual cycle patterns. Biological and behavioral determinants, such as hormonal status, physical activity, stress, and nutritional status play an important role in menstrual cycle regulation. Prior studies have emphasized the influence of stress and emotion dysregulation on menstrual cycle disruption (Cholifah et al., 2021; Ronanza et al., 2022) while others have found no direct correlation between gadget use duration and regularity of menstruation (Azizah et al., 2023). Since no direct relationship was evident in this study, the fact that using these gadgets was not significantly associated with menstrual cycle patterns suggests that it is not the only individual factor which can affect the menstrual cycle system unless further influences such as chronic stress, sleep disturbance, metabolic imbalance and other mediating factors are present at a greater level. Using a gadget may lead to indirect effects on menstrual health mediated via sleep disruption or stress and that was not measured in the present study, it is reasonable to believe that. This discovery highlights the need to address mediating processes, rather than taking causation for granted.

4.4. Implications for Adolescent Health Interventions

This study's findings underscore the necessity of adolescent health interventions that go beyond technological restrictions as a whole towards specific emotional problems with particular targets. Attention-related emotional problems may be especially vulnerable to excessive screen-time exposure to digital gadgets and could affect academic performance and daily life in subsequent years. School-based and family-focused interventions could be expected to target healthy digital habits, skills in attending to attention, and balanced schedule for adolescents.

4.5. Strengths and Limitations

Importantly, in the PSC-17, this study was able to measure emotional subdomains across levels to present a more comprehensive examination for emotional functioning. Moreover, adding menstrual cycle assessment allows us to understand where the emotional and reproductive health of adolescent girls meet. Nevertheless, there are several limitations that need to be recognized. The cross-sectional design precludes causal inference. Menstrual cycle data were self-reported and may introduce recall bias. In addition, additional confounding variables including nutritional status, body mass index, sleep quality, physical activity, and perceived stress were also not performed. Future longitudinal research using these variables is suggested to demonstrate causal determinants and mediating processes.

5. Conclusion

This research confirms that gadget use intensity does not predict overall emotional problems or menstrual cycle patterns for girls from 15 years to 17 years old. Indeed, stronger gadget use intensity was significantly associated with attention-related emotional problems, implying that certain emotional subdomains may be more responsive to a high level of the exposure to digital media than general emotional outcomes. These outcomes point to the recommendations that the health interventions targeting adolescents should be directed at positive, healthy digital habits and attention regulation and further longitudinal research could be needed to determine what is going on with sleep quality, stress, and nutritional status.

Compliance with ethical standards

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Disclosure of conflict of interest

There was no conflict of interest.

Statement of ethical approval

Ethical clearance was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Airlangga (Approval No. 127/EC/KEPK/FKUA/2024) on October 13, 2024.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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