

Research Article

# Relationship Between Screen Time Duration and Sleep Duration with Emotional Behavioral Problems in Preschool Children in Kindergartens In Denpasar City

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## Abstract

Emotional behavioral problems in children are quite serious problems because they affect their development, cause disabilities, reduce their productivity and quality of life. In this digital era, the use of gadgets has become a habit and has been introduced to children since preschool age. Excessive screen time can have an impact on children's sleep quality, one of which is reduced sleep duration. Excessive screen time and insufficient sleep duration are often associated with the child's development process. This study aims to prove that screen time and sleep duration have a significant relationship with the incidence of emotional behavioral problems in preschool children in Denpasar City Kindergartens. This study used a cross-sectional design with an analytical method conducted during the period January 2024–March 2024 using the emotional behavior problems questionnaire. The sample size used was total sampling in the research sampling, which was 108 children. For the result mental emotional problems experienced in 38.9% subjects. The gender that experienced the most mental emotional problems was male at 52.4%. Working and highly educated mothers were more dominant in children who experienced mental emotional problems with a percentage of 69% and 78.6%. Children who experienced complications at birth were 9.5% experiencing mental emotional problems. There was a significant relationship between screen time duration ( $p=0.045$  [PR 2.25; 95% CI 1.01-5.04]) and sleep duration ( $p=0.023$  [PR 2.66; 95% CI 1.12-6.29]) with emotional behavioral problems in preschool children. Screen time >1 hour and sleep duration <11 hours have been shown to have a significant relationship with emotional behavioral problems in preschool-aged children.

## Keywords

Duration, Emotional Behavioral Problems, Preschool-aged, Screen Time, Sleep

## 1. Introduction

Emotional behavior refers to efforts made by an individual to adapt to their environment and experiences. The development of emotional behavior in children is beneficial for focusing attention, controlling emotions, and communicating with their surroundings. Emotional behavioral problems in

children are quite serious, as they can interfere with development, cause disabilities, and lower both productivity and quality of life. [1]

The preschool period, between 60 to 72 months of age, is a critical stage in which children's skills and cognitive processes

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develop rapidly. During this time, children begin to express their desires alongside their physical and mental growth. Not only do they interact within their home environment, but they are also introduced to external environments, such as outdoor play and social interactions with peers. As children are being prepared for formal schooling, their sensory organs, stimulus reception systems, and memory processes must be ready to support effective learning. [2]

The prevalence of emotional behavioral problems in preschool-aged children is quite high. According to the National Institute of Mental Health (NIMH), the global prevalence of such problems in this age group is around 10–15%. [3] The 2018 Indonesian Basic Health Research (Riskesdas) report stated that the prevalence of emotional behavioral problems in Indonesia was 9.6%, an increase from 6.0% in 2013. [4] A study conducted by Subekti et al. [5, 6] in Semarang in 2019 revealed that 57.1% of preschool children living in coastal areas experienced emotional and mental disturbances. However, data on the prevalence of emotional behavioral problems among preschool children in Bali, particularly Denpasar City, remains scarce.

Several factors can contribute to emotional behavioral problems in children. In the study by Subekti et al. [5] in Semarang, the most influential factors included mothers who did not work (68%), low maternal education, mostly at junior high school level (67.9%), low parental income (63%), multiple parental marriages (83.3%), and children who were stepchildren (100%). Another study conducted in Sukabumi in 2020 using the Emotional Behavioral Problems Questionnaire reported that such problems were influenced by authoritarian parenting style [OR = 5.88 (95% CI: 3.45–10.02)], birth complications [OR = 3.36 (95% CI: 1.95–5.81)], divorced parents [OR = 3.00 (95% CI: 1.09–8.23)], working mothers [OR = 1.77 (95% CI: 1.04–3.00)], and low maternal education [OR = 1.74 (95% CI: 1.02–2.95)]. [7]

In this digital era, gadget use has become a habit and is often introduced to children from preschool age. The World Health Organization (WHO) defines screen time as the amount of time children spend watching various screen-based media, such as television, computers, mobile devices, tablets, and so on. Screen time is typically a sedentary activity, where children remain relatively inactive while watching screens. Prolonged sedentary screen time is now believed to contribute to various health issues, developmental delays, and behavioral and cognitive problems in children. Excessive screen time can also disrupt sleep patterns. Most sleep disturbances in children result from inadequate sleep duration (quantity) or fragmented sleep (poor quality). Both prolonged screen time and sleep disturbances are frequently associated with emotional behavioral issues in preschool-aged children. [7, 8]

A study conducted in Semarang by Lukmasari et al. [9] showed that most parents did not implement proper sleep hygiene practices for their children. Sleep hygiene includes enforcing consistent sleep schedules, using dim lighting at night, maintaining clean sleeping environments, and avoiding

electronic devices in bedrooms. Sleep disturbances were found to increase the risk of emotional problems by 2.7 times ( $p = 0.003$ ) and behavioral problems by 1.8 times ( $p = 0.005$ ). Another study by Chikmah et al. [8] in Pembina Tegal Kindergarten, in 2018 using the Emotional Behavioral Problems Questionnaire also found a significant relationship ( $p = 0.002$ ) between screen time duration and emotional behavioral problems in children.

Child development depends on the child's maturity. Maturity of the body and brain is the readiness to master various new abilities in children. Early childhood is a child who is in a period of growth and development because during this period there is basic growth that will affect the child's development in the future. Developmental delays caused by behavioral and emotional disturbances in infants and children can negatively affect social life and learning abilities. [10, 11] Early screening and diagnosis are necessary to detect such disorders. This study aims to prove the association between screen time duration and sleep duration with emotional behavioral problems in preschool children in kindergartens across Denpasar City.

## 2. Materials and Methods

This study used a cross-sectional design with an analytical approach to investigate the relationship between risk factors (screen time duration and sleep duration) and the incidence of emotional behavioral problems in preschool children attending kindergartens in Denpasar City from January to March 2024. The instrument used in this study was the Emotional Behavioral Problems Questionnaire (Kuesioner Masalah Perilaku Emosional/KMPE) completed by the parents or guardians of the subjects. The KMPE is a screening tool for emotional behavioral issues, with outcomes categorized as either normal or problematic. A child was considered to have a possible problem if there was at least one “Yes” response out of the 12 KMPE questions. The inclusion criteria were children aged 4–5 years attending kindergartens in Denpasar City and parents or guardians who agreed to participate in the study. Exclusion criteria were incomplete questionnaire responses, children with special needs, children with a previous diagnose of emotional behavioral disorders. Data were collected from questionnaire completed by the parents or guardians, which included age, gender, maternal occupation and education, average monthly parental income, parental marital status, presence of birth complications, daily screen time duration, daily sleep duration, and emotional behavioral status as determined by KMPE. A cluster sampling method was used, beginning with the random selection of 4 subdistricts in Denpasar City. From these, 10 kindergarten clusters were randomly selected, and within each selected cluster, subjects were chosen through systematic random sampling until the required sample size was achieved. The minimum sample size was calculated using the formula for unpaired categorical analytical studies, considering  $Z_{\alpha} = 1.96$  for 5% error,  $Z_{\beta} = 0.842$  for 20% error. For screen time > 1 hour  $P1 = 0.7$  (pro-

portion with emotional behavioral problems) and  $P2 = 0,4$  (proportion without problems) so the minimum sample size = 78. For sleep duration < 11 hours  $P1 = 0,8$  dan  $P2 = 0,3$  and the minimum sample size = 60. Therefore, 78 samples was used as the minimum sample size for this study.

Independent variables in this study were creen time duration classified as >1 hour or ≤1 hour per day (based on Indonesian Pediatric Society/IDAI recommendations) and sleep duration classified as <11 hours or ≥11 hours per day (recommended sleep duration for preschoolers is 11–12 hours/day by IDAI). Dependent variable is Emotional behavioral problems, based on KMPE screening outcomes.

Characteristic variable were age: 4 and 5 years. Gender: male or female. Maternal occupation: employed or housewife. Maternal education: low or high. Parental income: lower or highr then minimum wage of Denpasar City. Parent's marital status: married or divorce. Birth complications (e.g., admitted >14 days after birth): yes or no.

Data were analyzed using SPSS software and presented in tabular form. Bivariate analysis was performed using the Chi-square test to determine the relationship between screen time duration and sleep duration with emotional behavioral problems. A p-value < 0.05 was considered statistically sig-

nificant.

This study was approved by the Ethics Committee of the Faculty of Medicine, Udayana University / Prof. I G.N.G. Ngoerah Hospital, with ethical clearance No: 0031/UN14.2.2.VII.14/LT/2023, and permission was granted by PAUD Cluster Chairperson Lely (Cluster IV) with letter number 05/G.Lely.II.2024.

### 3. Results

This study involved parents or guardians of students in selected kindergartens who were asked to complete the questionnaire. A total of 7 kindergartens were included, with a combined total of 476 students. However, some students were not picked up by their parents, which meant their guardians could not complete the questionnaire. Ultimately, 108 parents who met the inclusion and exclusion criteria were present, willing to participate, and completed the questionnaire. Among these, 38.9% of the children were identified as having possible emotional behavioral problems. Table 1. shows the general characteristics of the study subjects based on emotional behavioral status.

**Table 1.** Characteristics of subjects based on emotional behavioral profile.

characteristics	Emotional behavior profile	
	Possible problem (n=42)	Normal development (n=66)
Gender, n (%)		
Male	22 (52.4)	23 (34.8)
Female	20 (47.6)	43 (65.2)
Mother's occupation, n (%)		
Employed	29 (69)	42 (63.6)
Housewife	13 (31)	24 (36.4)
Mother's education, n (%)		
low	9 (21.4)	13 (19.7)
high	33 (78.6)	53 (80.3)
Parental income, n (%)		
< min. wage	14 (33.3)	21 (31.8)
> min. wage	28 (66.7)	45 (68.2)
Marital status, n (%)		
Married	42 (100)	64 (97)
Divorce	0 (0)	2 (3)
Komplikasi saat lahir, n (%)		
Ya	4 (9.5)	3 (4.5)
Tidak	38 (90.5)	63 (95.5)

characteristics	Emotional behavior profile	
	Possible problem (n=42)	Normal development (n=66)
Screen time duration, n (%)		
> 1 hour	28 (66.7)	31 (47)
< 1 hour	14 (33.3)	35 (53)
Durasi tidur, n (%)		
< 11 hours	32 (76.2)	36 (54.5)
> 11 hours	10 (23.8)	30 (45.5)

Most subjects were 5 years old (86.1%), with 41.7% boys and 58.3% girls. The majority of mothers had higher education (senior high school or university) at 79.6%. A greater proportion of mothers were employed (65.7%) compared to housewives. Most families had incomes equal to or above the Denpasar minimum wage (67.6%), and only 1.9% of parents were divorced. More children had screen time >1 hour per day and sleep duration <11 hours per day compared to those who met the recommended durations.

Children whose screen time and sleep durations did not meet recommended standards were more likely to experience

emotional behavioral problems. The relationship between these two variables and emotional behavioral outcomes was analyzed using the Chi-square test, as shown in Table 2.

The results in Table 2 show a significant relationship between both screen time and sleep duration with emotional behavioral problems. Preschool children with screen time >1 hour per day were 2.25 times more likely to have emotional behavioral problems (95% CI: 1.01–5.04). Similarly, those who slept less than 11 hours per day were 2.66 times more likely to experience emotional behavioral issues (95% CI: 1.12–6.29).

**Table 2.** Relationship between screen time and sleep duration with emotional behavioral problems.

		Possible emotional behavior problem		PR (95% CI)	p-value
		Yes	No		
Screen time duration	>1 hour	28	31	2.25 (1.01 – 5.04)	0.045
	<1 hour	14	35		
Sleep duration	<11 hours	32	36	2.66 (1.12 – 6.29)	0.023
	>11 hours	10	30		

## 4. Discussion

The World Health Organization (WHO) recommends that preschool-aged children should have no more than 1 hour of screen time per day. Excessive screen time at this age is associated with multiple risks, including obesity, poor sleep quality, delayed development, cognitive-academic problems, and behavioral-emotional disorders. [12]

This study showed that children with screen time exceeding 1 hour per day (66.7%) were more likely to experience emotional behavioral problems compared to those with ≤1 hour

per day (33.3%). Bivariate analysis revealed that preschoolers with >1 hour of screen time were 2.25 times more likely to experience emotional behavioral problems, with a significant p-value ( $p = 0.045$ ). Similar findings were reported by Chikmah et al. (2018) in TK Pembina Tegal, where a significant correlation was found between screen time duration and emotional behavioral problems in preschoolers. [8]

Excessive screen time has been consistently linked to various emotional and behavioral issues in children. A study analyzing 62,395 Chinese children and adolescents found that increased screen time correlated with poorer mental health outcomes, including heightened emotional problems and reduced prosocial behaviors. Notably, these associations were

more pronounced during weekdays and varied by gender and educational stage. Similarly, a study involving 8,900 preschoolers in China revealed that children engaging in two or more hours of screen time daily exhibited higher scores on behavioral problem assessments, such as the Strengths and Difficulties Questionnaire (SDQ) and the Clancy Autism Behavior Scale (CABS) [13].

During infancy (under 2 years), the child's brain structure and function are still limited in terms of attention, recognition, memory storage, and three-dimensional processing. At this age, introducing screen-based digital media and providing screen time does not offer opportunities for children to master new knowledge. In contrast, during preschool age (3–6 years), the brain develops more complex executive functions such as reasoning, creativity, and emotional regulation. These abilities develop best through responsive, interactive activities between children and their caregivers. However, most digital media content today is not designed to promote such parent–child interaction. [14, 15]

Sleep duration is also linked to emotional behavior. Sleep is a reversible state of reduced responsiveness and interaction with the environment and consists of two main components: REM (rapid eye movement) and non-REM sleep. The REM phase is crucial as it is associated with the release of neurotransmitters such as noradrenaline to the medial prefrontal cortex and amygdala. Disrupted sleep can affect neurotransmitter balance in the emotional control centers (e.g., amygdala). Sleep disorders have been associated with emotional and behavioral disturbances in children and adolescents. [16] Children's sleep disturbances may be due to inadequate sleep duration or poor sleep quality. Sleep needs vary with age. At age 2 is 13 hours/day, at ages 3–4 is 12 hours/day, and at age 5 is 11 hours/day. [16, 17] When a child's sleep needs are not met for several consecutive days, this leads to sleep debt, resulting in functional deficits between the amygdala and the ventral anterior cingulate cortex (vACC). This can cause mood disturbances and a heightened response from the amygdala to negative stimuli. Studies show that sleep debt is linked to mental health issues, including irritability, aggression, hyperactivity, and tantrums. [18, 19]

In this study, children who slept less than 11 hours per day (76.2%) had a higher prevalence of emotional behavioral problems than those who slept 11 hours or more (23.8%). Preschool children with <11 hours of sleep were found to be 2.66 times more likely to develop emotional behavioral problems. This finding is consistent with the study by Lukmasari et al. in Semarang, which found a relationship between sleep disorders and emotional behavioral problems in children aged 4–6 years. [9] Similarly, a cross-sectional study by Bauducco et al. among adolescents aged 12–16 found that those who slept less than the recommended duration tended to show emotional dysregulation, including anger, depression, and anxiety, as well as norm-breaking behavior. [20, 21]

Adequate sleep is vital for children's emotional regulation and overall well-being. A longitudinal study of rural preschool

children in China demonstrated that longer nighttime sleep duration was associated with fewer emotional and behavioral problems. Specifically, children who slept more at night showed significant reductions in total difficulties and prosocial behavior problems over time [22].

## 5. Study Limitations

This study has several weaknesses, namely the presence of recall bias which can affect the results of the study. This study did not include sleep quality, which may potentially contribute to emotional and behavioral problems in preschool-aged children.

## 6. Conclusions

This study found that nearly half of preschool children attending kindergartens in Denpasar City experienced possible emotional behavioral problems (38.9%). Among children with screen time >1 hour, 47% showed possible emotional behavioral issues. Similarly, 47% of children who had sleep duration <11 hours also experienced possible emotional behavioral problems. Bivariate analysis confirmed that both screen time duration of more than 1 hour per day and sleep duration of less than 11 hours per day were significantly associated with an increased risk of emotional behavioral problems in preschool-aged children.

## Abbreviations

WHO	World Health Organization
KMPE	Kuesioner Masalah Perilaku Emosional
IDAI	Ikatan Dokter Anak Indonesia
REM	Rapid Eye Movement
vACC	ventral Anterior Cingulate Cortex

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## Author Contributions

**Putu Satya Prameswari:** Data curation, Formal Analysis, Investigation, Software, Visualization, Writing-original draft

**I Gusti Ayu Trisna Windiani:** Conceptualization, Resources, Methodology, Validation, Supervision, Writing-review & editing

**I Gusti Agung Ngurah Sugitha Adnyana:** Conceptualization, Resources, Methodology, Validation, Supervision, Writing-review & editing



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## Data Availability Statement

The data supporting the outcome of this research work has been reported in this manuscript.

## Conflicts of Interest

The authors declare no conflicts of interest.

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