

## Geographical Variation in Preschoolers' Screen Time: Parenting, Sibling, and Peer Relationships

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### ABSTRACT

**Introduction:** In the digital age, excessive screen time has become a significant concern for preschool children, affecting their social, emotional, and behavioral development. This study examined the influence of parenting patterns, sibling relationships, and peer interactions on screen time, considering differences in geographical contexts.

**Methods:** A cross-sectional quantitative design with cluster random sampling was conducted in Bandar Lampung City, Indonesia, covering mountainous (Kemiling) and coastal (Teluk Betung Timur and Bumi Waras) subdistricts. The sample included 301 families with children aged 4–7 years, living with both parents and having siblings. Data were analyzed using independent t-tests to compare differences between groups.

**Results:** Results indicated that disciplinary parenting patterns were more effective in coastal areas, while play-based parenting patterns were stronger in mountainous areas. Sibling interaction and acceptance were higher in mountainous regions, whereas sibling rivalry was greater in coastal areas. No significant differences were found in peer interactions between the two regions. Children in coastal areas exhibited higher screen time than those in mountainous areas.

**Conclusion:** These findings highlight the importance of geographical context in shaping children's screen-related behaviors and family dynamics. The study emphasizes the need for geographically tailored interventions, including culturally adapted parental guidance in coastal and mountainous areas, sibling-based alternatives to screen use in mountainous areas, and integration of caregiver training with equitable internet access policies within early childhood education frameworks. Public health campaigns should integrate the WHO and American Academy of Pediatrics-recommended screen time guidelines (<1 hour/day) while promoting non-digital activities, particularly in coastal populations with higher device exposure.

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## INTRODUCTION

The rising incidence of screen usage among preschool-aged children has sparked significant worries over its developmental repercussions. Empirical research has repeatedly shown that excessive screen exposure is connected with poor consequences, including delayed language acquisition and lower physical activity levels (1)(2). Meta-analyses also demonstrate the heightened risk of developmental impairments, notably in language abilities, among children with extended screen exposure (1). Structured settings that enforce screen time constraints have been connected to greater physical activity levels, suggesting a protective effect in early childhood development (3). Furthermore, research has established the broader detrimental impacts of excessive screen use, including cognitive and behavioral issues, sleep disruptions, obesity, and an increased risk of attention-deficit/hyperactivity disorder (ADHD) (4).

Screen time comprises activities undertaken on digital devices, including television, computers, mobile phones, and video games(5), whether sedentary or physically active (6). According to the American Academy of Pediatrics, screen usage for preschool-aged children (2–6 years) is limited to one hour per day (7). However, studies suggest that many children surpass this threshold, leading to concerns regarding health indicators such as obesity, poor sleep quality, and impaired psychological well-being (2)(8). Reduced physical activity levels in youngsters with high screen time compound these issues, contributing to long-term health effects(3). Parental mediation is an important moderating component, with research demonstrating that active parental engagement and rule-setting might ameliorate some of the detrimental impacts of screen exposure(9). Furthermore, the quality of screen interactions—such as content type and parental involvement—plays a critical role in determining developmental outcomes(10).

Screen time usage among young children in Indonesia shows notable urban-rural disparities that influence health outcomes. Studies demonstrate that children in urban areas generally engage in higher screen time than their rural counterparts, often exceeding the recommended two hours per day, which has been linked to an increased likelihood of obesity and unhealthy dietary habits (11). Specifically, 67% of children reported elevated total screen time during the COVID-19 pandemic, with younger children (under 5 years) averaging an additional 0.5 hours per day(12). Moreover, excessive screen exposure correlates with lower physical activity levels, especially in urban environments where media device availability is greater (12)(13). Despite substantial studies on screen time, a limited number of studies have examined its differences across diverse geographical contexts, such as coastal and mountainous regions, which may impact parenting behaviors and child development.

In Indonesia, issues concerning early childhood screen time have been noted by the National Statistics Agency(14), which claims that many youngsters surpass the recommended daily limit. Data suggest that among youngsters aged 0–4 years, 25.5% use mobile phones, while 18.79% use the internet. These percentages for children aged 5–6 jump to 52.76% and 39.97%, respectively (14). Internet connection is increasingly concentrated in western Indonesia, notably Java(15). However, digital inequities exist owing to physical difficulties such as hilly terrain and distant places that restrict internet infrastructure development (16). Lampung Province has grown considerably in internet connectivity among children over the previous five years, with urban usage growing by 26.38% and rural usage by 34.88%(14). Family features in Lampung differ depending on geographic location, with coastal populations involved mainly in fishing and marine activities, while highland households rely on agriculture (17). These contextual variables likely impact parental techniques, sibling relationships, and peer interactions, eventually shaping children's screen usage behaviors.

Bronfenbrenner's ecological systems theory underlines the importance of the microsystem—including family, peers, and local surroundings—in child development (18). Parenting practices have a vital role in modulating children's digital engagement, with prior studies revealing that parental conduct strongly influences children's screen exposure (9)(19)(20). Additionally, sibling connections and peer relationships contribute to screen time patterns, with good family dynamics potentially buffering their detrimental impacts (21). In collectivist cultural contexts, where family interdependence and hierarchical roles are emphasized, sibling and peer influences may function differently than in individualist cultures. This suggests that children's screen time behaviors cannot be understood solely as individual choices but must be seen as embedded in family and peer systems that reflect broader cultural orientations.

Children's screen time behavior is affected by siblings and peers. The influence of sibling relationships on children's screen time is a complex problem, as siblings strongly affect one another's actions. Research reveals that

siblings may substantially affect a child's media consumption behaviors beneficially and detrimentally. Bogl et al. observed that having a sibling of comparable age can result in heightened screen time, since siblings may participate together in screen-related activities (22). Kracht and Sisson observed that siblings who demonstrate physical exercise can limit screen time and develop healthy behaviors (23). Children commonly mimic older siblings in screen usage, resulting in heightened screen time, notably when parental control is lacking (24). Dunifon et al. believe that siblings may counteract reduced parental engagement by increasing screen time during unstructured play (25). Moreover, heightened screen time has been connected with sedentary behavior among siblings, especially when older siblings indulge in excessive screen activities (26). Parents recognize this influence and frequently see siblings as partners in the loop of rising screen usage, making awareness and monitoring vital (27). In collectivist frameworks, such sibling modeling is often reinforced by cultural expectations of obedience and emulation of older siblings, which may amplify these effects. Comprehending these linkages can assist in designing ways to properly limit screen time in families with several children.

Peers are believed to have a higher effect on scheduled physical activities, whereas siblings' influence is more clearly felt on informal and spontaneous physical activities. In screen time behavior, friends substantially affect the information youngsters seek to consume. However, siblings have a more direct and palpable impact on what youngsters see (27). Various studies have demonstrated that peer influence is essential in molding children's behavior and screen time habits (28). High screen usage among children is connected with several behavioral issues, signs of hyperactivity or inattention, and less prosocial conduct, showing the influence of screen use on children's behavior (29). Other research has revealed that peers are crucial in developing children's behaviors and preferences (30). The presence of peers who engage in screen time activities might affect children's behavior, which is the impact of peer modeling on children's choices (31). In collectivist societies, however, peer influence is often filtered through family authority and sibling hierarchies, meaning that while peers shape preferences and shared activities, their impact tends to be negotiated within the boundaries of familial expectations. This distinction highlights the importance of considering cultural orientation in evaluating how sibling and peer influences interact to shape screen time behavior. Taken together, these findings suggest that sibling and peer influences on screen time cannot be interpreted uniformly across contexts. In collectivist cultures, sibling hierarchies and family interdependence often magnify sibling effects, whereas peer influence operates within family boundaries. Recognizing these cultural distinctions adds theoretical rigor and situates children's screen time behaviors within broader sociocultural systems.

Notably, the effect of digital technology on everyday parenting remains an underexplored issue, particularly addressing how diverse geographical contexts alter parental mediation tactics and children's screen habits (32). Crucially, prior research has focused mainly on urban-rural divisions or socioeconomic determinants, missing how various geographical contexts, such as coastal vs mountainous regions, impact screen time behaviors through distinctive cultural, vocational, and infrastructural dynamics. This divide is particularly prominent in Indonesia, an archipelagic nation distinguished by substantial regional disparities in internet access and community activities. It pioneers a regional comparative perspective to screen time studies, expanding beyond conventional urban-rural frameworks. This study intends to solve a crucial research gap by analyzing the differences in screen time among preschool children in coastal and highland regions of Indonesia. By analyzing the interplay between parental practices, sibling connections, and peer interactions, this research offers context-specific insights to inspire interventions that encourage better screen habits and support good developmental trajectories.

## **METHOD**

### **Research Design and Location**

This study uses a quantitative research design. The research location was in Lampung Province, Indonesia. Internet access over the last 5 years has increased in Lampung Province. According to BPS (14), the increase in the number of children aged 5 years and over who access the internet in Lampung province from 2018 to 2022 is urban (26.38%) and rural (34.88%).

### **Participant and Procedure**

The sampling method used was a cluster sampling method, namely, coastal and mountainous areas. The selected coastal area is Teluk Betung Timur Subdistrict for several reasons, including the fact that it has the most

villages with beaches (six villages), the village population is concentrated around the coast, the land elevation is 2-5 meters above sea level, and 90 percent of families work as fishermen (33). The second coastal area, Bumi Waras District, was selected based on considerations such as having five villages directly facing the coast, an elevation of 2-5 meters above sea level, a population concentrated on the coast, and a variety of occupations such as fishing, fish auctioning, kemplang making, and fish processing (33). The selected mountainous area is the Kemiling District, based on reasons including its elevation of 700 meters above sea level (33).

Kindergartens in each subdistrict were selected using simple random sampling with a sample fraction of 10%, resulting in the selection of 8 kindergartens in Kemiling Subdistrict (mountainous area), six kindergartens in Teluk Betung Timur Subdistrict (coastal area), and two kindergartens in Bumi Waras Subdistrict (coastal area). The number of samples consisted of 10 kindergartens on the coast and eight kindergartens in the mountains.

This study's subjects were parents with kindergarten children aged 4-7. The subject criteria included being an intact family (mother and father living together), having a 4-7-year-old child, having siblings, and having gadgets at home. The number of respondents in this study was 301 parents. Ethical approval for this study was granted by the Ethics Committee for Research Involving Human Subjects of Bogor Agricultural University, with Number: 1452/IT3.KEPMSM-IPB/SK/2024. Respondents provided written informed consent and received no financial incentives to participate in this study.

### **Measurement**

The data collection method used survey techniques and questionnaire tools. The role of the parenting instrument used in this study was adopted by Hastuti and Alfiasari (34). It consists of 4 dimensions: motor/play stimulation, cognitive/academic, social, and discipline. There are 22 statement items and answer options, namely never (score 1), rarely (score 2), often (score 3), and always (score 4), with a Cronbach's alpha value of 0.870. Data for parenting was collected through the self-report method by measuring based on the mother's perception.

The sibling relationship instrument used the Sibling Relationship Questionnaire (Parental Version)(21). This instrument has dimensions including sibling interaction, sibling acceptance, sibling rivalry, and sibling warmth. The Cronbach's Alpha value is 0.864. There are 23 questions with answer options of never (score 1), rarely (score 2), often (score 3), and always (score 4). Data were collected through the self-report method by measuring based on the mother's perception.

The measurement of peer relationships used the Preschool Version of the Social Skills Rating System questionnaire (35). This instrument has three dimensions: self-control, interpersonal skills, and verbal affirmation. The Cronbach's Alpha value of this questionnaire is 0.871. There are 18 questions with answer options of never (1), rarely (2), often (3), and always (5). Data were collected through the self-report method by measuring based on the mother's perception.

Measure children's screen time activity by recalling 24 hours during school days (weekdays) and holidays (weekends) filled by the mother. The measurement consisted of the duration dimension and the type of content used. Screen time was calculated in minutes/day. Measure children's non-screentime activities by recalling 24 hours of children's activities during school days and holidays filled in by mothers.

### **Processing and Data Analysis**

The data that has been obtained is processed through the process of editing, coding, scoring, data entry, cleaning, and data analysis. Data processing was performed using Microsoft Office Excel software, and data analysis was performed using the Statistical Package for the Social Sciences (SPSS) 25.0 program. Descriptive analysis included minimum value, maximum value, mean, and standard deviation used to identify child characteristics (child age, number of siblings, number of friends), family characteristics (mother's age, mother's years of education, father's age, father's years of education, and family income), gadget access, and screen time. The screen time category used by the American Academy of Pediatrics (7) category, namely, a duration of less than 1 hour/day and a duration greater than or equal to 1 hour/day. Comparative test using t-test.

## RESULTS

### Socio-demographics of Respondents

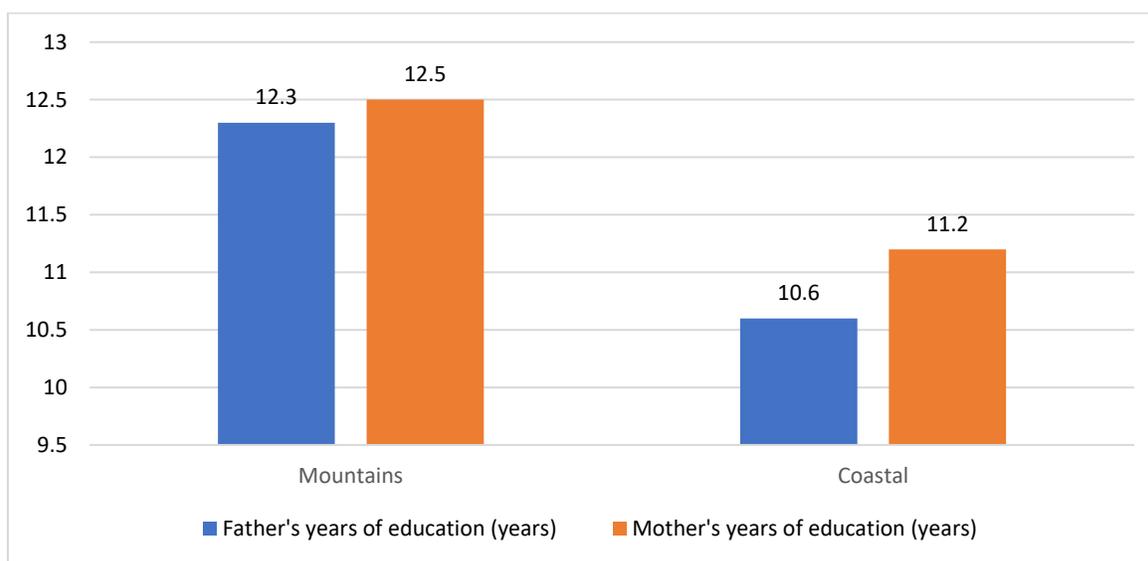
Based on the analysis (Table 1), it is known that the average age of children (Mountain = 5.4 years, Coastal = 5.5 years), the average number of siblings (M= 2 people, C= 2 people), and the average number of friends (M = 7 people, C= 8 people). The results stated the average age of the father (M=39.8 years, C=38.9 years) and the average age of the mother (M=36.8 years, C=35.6 years). Average years of father's education (M=12.3 years, C=10.6 years), average years of mother's education (M=12.5 years, C=11.2 years). The average number of family members (M=5 people, C=5 people). In addition, the average family income (M= IDR 3,993,877, C= IDR 3,496,788).

**Table 1.** Distribution of respondents based on family socioeconomic characteristics

No	Category	Mountains	Coastal	p-value
1	Age of child (years)	5.4 ± 0.6	5.5 ± 0.6	0.149
2	Number of siblings (people)	2.0 ± 1.0	1.9 ± 1.0	0.536
3	Number of friends (people)	6.7 ± 5.5	7.8 ± 6.8	0.182
4	Father's age (years)	39.8 ± 7.0	38.9 ± 6.5	0.266
5	Mother's age (years)	36.8 ± 5.7	35.6 ± 5.9	0.106
6	Father's years of education (years)	12.3 ± 2.5	10.6 ± 2.8	0.000**
7	Mother's years of education (years)	12.5 ± 2.9	11.2 ± 2.8	0.000**
8	Number of family members (people)	4.8 ± 0.9	4.8 ± 1.0	0.839
9	Family income (IDR)	3,993,877 ± 2,969,217	3,496,788 ± 3,737,027	0.250

Notes: \*\* significant at  $p \leq 0.05$

The results (Figure 1) showed that only the father's and the mother's years of education showed significant differences between mountain and coastal areas. In contrast, other variables, such as child age, number of siblings, number of friends, father's age, mother's age, number of family members, and family income, did not show statistically significant differences ( $p\text{-value} > 0.05$ ). The significant difference in the length of parental education indicates a disparity in the level of formal education between the two regions, which geographical factors, accessibility of education, or differences in socio-cultural patterns could influence.



**Figure 1.** Distribution of respondents based on parents' education

### The Role of Parenting Pattern

The analysis (Table 2) showed significant disciplinary and play parenting differences between coastal and mountainous regions. Disciplinary parenting was higher in coastal areas ( $79.3 \pm 19.8$ ) than in mountainous areas ( $73.0 \pm 23.9$ ) ( $p = 0.027$ ). Play parenting also differed significantly ( $p = 0.049$ ), with higher scores in mountainous

areas ( $41.8 \pm 9.9$ ) than in coastal areas ( $39.3 \pm 11.3$ ). However, all respondents scored in the low category ( $<60$ ), indicating suboptimal implementation. No significant differences were found in academic ( $p = 0.840$ ) and social ( $p = 0.402$ ). The total mean parenting score was comparable, with  $66.0 \pm 9.9$  in mountainous areas and  $65.4 \pm 9.0$  in coastal areas ( $p = 0.622$ ).

**Table 2.** Distribution of respondents based on parenting patterns

No	Category	Mountains (Mean±Std)	Coastal (Mean±Std)	p-value
1	Discipline Parenting	$73.0 \pm 23.9$	$79.3 \pm 19.8$	0.027**
2	Academic parenting	$40.1 \pm 10.1$	$44.9 \pm 9.6$	0.840
3	Social Parenting	$43.8 \pm 10.1$	$44.9 \pm 9.6$	0.402
4	Play Parenting	$41.8 \pm 9.9$	$39.3 \pm 11.3$	0.049**
5	Parenting Pattern Total	$66.0 \pm 9.9$	$65.4 \pm 9.0$	0.622

Notes: \*\* significant at  $p \leq 0.05$

### Sibling Relationship

The analysis (Table 3) showed significant differences in sibling interaction, acceptance, and rivalry. Interaction was higher in the mountains ( $52.8 \pm 19.9$ ) than on the coast ( $47.8 \pm 20.8$ ) ( $p = 0.015$ ). Sibling acceptance was greater in the mountains ( $62.3 \pm 17.5$ ) than on the coast ( $56.5 \pm 16.9$ ) ( $p = 0.007$ ). Sibling rivalry was higher in the coast ( $64.7 \pm 21.6$ ) than in the mountains ( $55.6 \pm 21.4$ ) ( $p = 0.001$ ). No significant differences were found in sibling warmth ( $p = 0.464$ ) and overall relationships ( $p = 0.330$ ). Findings indicate stronger sibling interaction and acceptance in the mountains, while rivalry is higher on the coast. Warmth and overall relationships remain similar. This is an important behavioral finding, as sibling rivalry may serve as a mediator of children's screen overuse: when rivalry intensifies, children might turn to digital devices as a coping strategy or form of withdrawal, which in turn increases sedentary behavior and reduces opportunities for prosocial sibling exchanges. Interpreted through developmental psychology theories, rivalry can undermine supportive sibling functions, such as role modeling and emotional security, thereby indirectly fostering excessive screen engagement. Situating rivalry within this theoretical lens highlights its potential pathway in linking sibling dynamics with children's digital habits.

**Table 3.** Distribution of respondents based on sibling relationship

No	Category	Mountains (Mean±Std)	Coastal (Mean±Std)	p-value
1	Interaction	$52.8 \pm 19.9$	$47.8 \pm 20.8$	0.015**
2	Acceptance	$62.3 \pm 17.5$	$56.5 \pm 16.9$	0.007**
3	Rivalry	$55.6 \pm 21.4$	$64.7 \pm 21.6$	0.001**
4	Warmth	$52.3 \pm 16.2$	$50.7 \pm 17.3$	0.464
5	Sibling Relationship	$60.1 \pm 12.7$	$58.6 \pm 10.6$	0.330

Notes: \*\* significant at  $p \leq 0.05$

### Peer Relationship

The analysis (Table 4) revealed no significant differences in peer relations between mountain and coastal areas. Self-control scores were slightly higher in the mountains ( $54.2 \pm 11.7$ ) than on the coast ( $52.7 \pm 14.4$ ) ( $p = 0.325$ ). Interpersonal skills were similar, with mean scores of  $69.9 \pm 15.5$  in the mountains and  $71.2 \pm 17.3$  on the coast ( $p = 0.494$ ). Verbal affirmation levels also showed no significant difference ( $p = 0.928$ ), with mean scores of  $64.8 \pm 17.0$  in the mountains and  $65.1 \pm 18.6$  on the coast. Peer relations overall remained stable across both regions ( $p = 0.953$ ), with mean scores of  $66.7 \pm 12.1$  in the mountains and  $66.6 \pm 14.6$  in the coast. These findings indicate that geographical location does not significantly influence children's self-control, interpersonal skills, verbal affirmation, or peer relations. Social-emotional development appears consistent across both regions, suggesting other environmental factors may play a greater role.

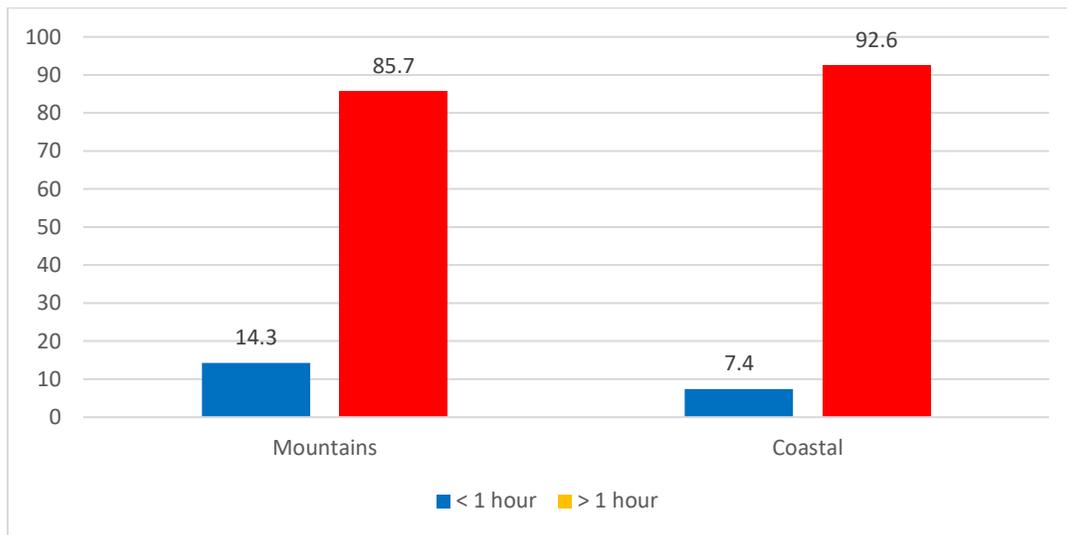
**Table 4.** Distribution of respondents based on peer relationships

No	Category	Mountains (Mean±Std)	Coastal (Mean±Std)	p-value
1	Self-control	54.2 ± 11.7	52.7 ± 14.4	0.325
2	Interpersonal Skills	69.9 ± 15.5	71.2 ± 17.3	0.494
3	Verbal Affirmation	64.8 ± 17.0	65.1 ± 18.6	0.928
4	Peer Relationship	66.7 ± 12.1	66.6 ± 14.6	0.953

Notes: \*\* significant at  $p \leq 0.05$

**Screen Time**

Figure 2 shows that comparing screen time between children in mountainous and coastal areas reveals striking patterns. In mountainous areas, 14.3% of children have less than one hour of daily screen time, while the majority (85.7%) exceed one hour. Similarly, in coastal areas, only 7.4% of children are within the recommended limit (< 1 hour), while 92.6% exceed it. The proportion of excessive screen time is higher in coastal areas, with a difference between the two categories ( $p = 0.064$ ;  $p < 0.10$ ). The average screen time duration was marginally higher among coastal children ( $2.7 \pm 1.3$  hours) than in mountainous areas ( $2.4 \pm 1.3$  hours). Minimum and maximum values also demonstrated a broader range in coastal areas (0.50–8.50 hours) compared to mountainous areas (0.25–6.50 hours). These results indicate a general trend of prolonged screen exposure in coastal environments.



**Figure 2.** Distribution of respondents based on screen time, American Academy of Pediatrics category

**DISCUSSION**

Parenting trends in both highland and coastal locations are typically moderate to good. However, there is a considerable variation in disciplinary techniques between the two locations, with mountainous area parents demonstrating weaker discipline than coastal area parents. This is due to the increased number of working parents in the highlands, requiring children to be more independent. In contrast, coastal moms, who are typically home, may enforce more regimented discipline. This conclusion fits with A'la et al.(36), which implies that working parents foster increased independence in children. Additionally, parental discipline is impacted by the mother's educational degree(37)(20).

Play parenting varies dramatically across highland and coastal places, with increased participation in mountainous regions. Parents in the mountains give more play resources, including books, musical instruments, and outdoor activities, and actively participate in play, especially on weekends. In contrast, parents in coastal areas limit outdoor play because environmental conditions, including topography and spatial dynamics, contribute to this inequality, with mountainous areas offering more opportunities for active and varied play(38).

In contrast, despite giving recreational options, coastal locations may not give the same level of physical involvement due to flatter topography and distinct biological interactions(39). Furthermore, mountainous places' cultural and social dynamics may support a more active parenting style, since families generally rely on outdoor play for enjoyment and social bonding(40). This contrasts with coastal settings, where play may be more organized and less physically demanding(41). Thus, the combination of geography, ecology, and cultural behaviors contributes to the observed disparities in play parenting across these two dissimilar environments.

Significant disparities emerged in sibling variables' interaction and acceptance between the mountain and coastal areas. This suggests that sibling relationships' interaction and accepting components are better in the highlands than in the coastal region. In addition, a substantial difference in the competitiveness dimension of the sibling variable between the mountainous region and the coastal zone is observed. This suggests that the competitive dimension of sibling relationships in coastal settings is higher than in highland places. Research by Fortuna et al. indicated that positive attachment circumstances linked to improved sibling relations and acceptance(42). The results of this study are similar to those of Jiang et al., who observed that good interactions, characterized by trust and efficient communication, enhance acceptance. In contrast, conflict might lead to competitiveness and negative dynamics(21). Parental treatment and perceived attention imbalance might intensify siblings' competitiveness, reducing their relationship quality(43).

Based on the findings of the analysis, it is known that the average percentage of respondents on the interpersonal skill component of coastal peer connections is greater than in the mountainous area. This is because the coastline section of the city of Bandar Lampung is the provincial capital, which connects the island of Java with the island of Sumatra. Thus, access to information in coastal locations is faster than in highland places. In addition, the features of coastal communities tend to be more open compared to communities in mountainous locations, which are impacted by different social and environmental elements. Coastal towns frequently see higher levels of variety owing to tourism and migration, which develops a culture of openness and adaptation(44). These broader contextual dynamics are directly reflected in the measured dimensions of peer interaction and relational development, as children in coastal areas are more frequently exposed to diverse social exchanges that strengthen interpersonal competence(45). This exposure to other cultures and lifestyles allows inhabitants to build more inclusive social networks and interpersonal abilities, promoting interactions among different groups(46).

In contrast, communities in mountainous places may display more insular features, primarily due to geographic isolation and restricted access to external influences. Social dynamics in these places generally stress tight family ties and traditional beliefs, which might lead to a more closed approach to new relationships and social interactions(44). The limitations of living in distant places may also lead to an emphasis on local group cohesiveness rather than broader social participation(47). In addition, economic activities prominent in coastal locations, such as fishing and tourism, generally involve collaboration and communication, fostering open social traits(46). In contrast, economic activity in mountainous locations focuses more on agriculture and resource management, which may lead to distinct social connections that value family and local communities above external links(48).

Based on the findings of the investigation, it is known that the average amount of screen time in Alpine and coastal locations varies from 2 to 3 hours. This implies that screen time has surpassed the American Academy of Pediatrics recommendation, which specifies that screen time should be less than 1 hour for early development(7)(49). In addition, this also suggests that the internet has reached numerous places in Indonesia that have unique regional features, one of which is the highlands and beaches. High screen usage among children is connected with reduced prosocial conduct, demonstrating the influence of screen use on children's behavior(28)(50)(51).

### **Limitations and Cautions**

This study is constrained by its reliance on maternal self-reports, which may introduce systematic biases in the assessment of child-related variables. Maternal perceptions are potentially shaped by employment status, prevailing cultural norms surrounding gendered parenting roles, and the extent of caregiving support available within the household. These factors may influence both the accuracy and scope of maternal reporting. Furthermore, such biases are unlikely to be uniform across contexts: in coastal areas, greater maternal labor force participation and exposure to diverse caregiving arrangements may shape responses differently compared to mountainous communities, where traditional caregiving practices and cultural expectations may prevail. Consequently, the findings

should be interpreted with caution, as they may reflect not only children's actual experiences but also mothers' subjective interpretations of them. Future research would benefit from triangulating maternal perspectives with those of fathers, alternative caregivers, and, where developmentally appropriate, the children themselves, to yield a more comprehensive and balanced understanding.

### **Recommendations for Future Research**

Future research should investigate environmental and socioeconomic determinants of regional disparities in screen time. At the same time, policymakers must advocate evidence-based regulations, such as integrating screen time limits into early childhood curricula. Crucially, interventions must maintain cultural sensitivity by leveraging existing strengths (e.g., strong sibling bonds in mountainous regions) while addressing contextual vulnerabilities (e.g., competitive sibling dynamics in coastal areas), ensuring scalability and sustainability across geographical contexts. Additionally, longitudinal studies should explore the long-term effects of livelihood cycles (e.g., fishing/farming seasons) on digital behaviors, informing socio-ecologically grounded strategies for holistic child development.

### **CONCLUSION**

This study highlights geographical disparities in child-rearing practices, sibling relationship dynamics, and screen time among preschool-aged children in mountainous and coastal regions of Indonesia. While overall patterns of moderate parenting were comparable, coastal areas exhibited weaker discipline- and play-based parenting alongside less cohesive sibling relationships (coastal: 58.6% vs. mountainous: 60.1%), contributing to significantly higher screen time (2.7 vs. 2.4 hours/day). Peer relationships and device access showed no regional variation, emphasizing contextual mediators—such as socio-demographic and cultural factors—as primary drivers of screen exposure.

These findings underscore the need for tailored interventions to mitigate excessive screen time in preschoolers by addressing modifiable familial and social factors. Within Bronfenbrenner's ecological systems theory, the microsystem highlights the role of parenting practices and sibling dynamics; thus, interventions should prioritize enhancing parenting quality, particularly in discipline and play-based practices, through regionally adapted parental education programs. Given significant disparities in disciplinary approaches and sibling relationships between regions, context-specific strategies are warranted, such as workshops emphasizing positive discipline techniques in coastal areas and structured family interaction programs to strengthen sibling acceptance in mountainous regions. In coastal communities, stronger parental guidance and affordable recreational alternatives at the mesosystem level can reduce screen time, while in mountainous regions, leveraging robust sibling bonds within the family microsystem may help model low-screen activities. At the exosystem level, public health campaigns should integrate WHO and American Academy of Pediatrics-recommended screen time guidelines (<1 hour/day) while promoting non-digital activities, particularly in coastal populations with higher device exposure. Community-based initiatives, including structured peer playgroups and parent-child collaborative projects, can reinforce supportive peer and sibling bonds, indirectly reducing gadget dependency. Finally, interventions at the macrosystem level require integrated cross-sectoral collaboration among educational institutions, healthcare providers, and local governments to provide equitable infrastructure and culturally relevant parenting resources. Policymakers must prioritize culturally adaptive caregiver training programs and supportive environments consistent with ecological systems theory, ensuring that children's digital habits are shaped through coordinated influences across multiple levels of their developmental ecology.

### **AUTHOR'S CONTRIBUTION STATEMENT**

VI: Conceptualization; Data Curation; Investigation; Methodology; Project Administration; Resources; Writing Original Draft. ML: Conceptualization; Data Curation; Formal Analysis; Investigation; Methodology; Validation; Review & Editing; Supervisor. DH: Conceptualization; Formal Analysis; Investigation; Methodology; Validation; Review & Editing; Supervisor.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

## DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

Not applicable.

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