

PART I. DISEASES AND PROBLEMS DISTINGUISHED BY WHO AND FAO  
DZIAŁ I. CHOROBY I PROBLEMY WYRÓŻNIONE PRZEZ WHO I FAO

SCREEN TIME INFLUENCE ON EARLY CHILDHOOD SOCIAL-EMOTIONAL  
DEVELOPMENT

WPŁYW CZASU SPĘDZANEGO PRZED EKRANEM NA ROZWÓJ SPOŁECZNO-  
EMOCJONALNY WE WCZESNYM DZIECIŃSTWIE

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Summary

**Background.** The World Health Organization calls for avoidance of screen-based media usage for children below the age of one and for limitation of screen time to not more than an hour per day for children under the age of five due to public health concerns. This study is aimed to determine the prevalence of excessive screen time and its association with early childhood social-emotional development among Malaysian children.

**Material and methods.** Self-administered questionnaires were distributed to 600 Malaysian parents of children aged 18 and 36 months old. Child's social-emotional development was measured using the "Ages and Stages Questionnaire: Social Emotional-2". Multivariate logistic regression method was utilized for data analysis.

**Results.** A total of 82.2% of children did not adhere to screen time recommendations. Mean screen time recorded was 141.7 (SD 131.6) minutes per day. The odds of children with excessive screen time having poor mastery of social-emotional development is 2.5 times higher than children adhering to screen time recommendations, with this association persisting after adjustment to confounders (AOR: 2.50, 95% CI: 1.07-5.86).

**Conclusions.** Excessive screen time among children is linked to paucity in active parent-child interaction and hindrance in the process of learning and development which consequently leads to a delayed attainment of social-emotional milestones.

**Keywords:** social-emotional development, screen time, public health

Streszczenie

**Wprowadzenie.** Światowa Organizacja Zdrowia wzywa do unikania korzystania z urządzeń z ekranem przez dzieci poniżej pierwszego roku życia oraz do ograniczenia czasu spędzanego przed ekranem do nie więcej niż godziny dziennie w przypadku dzieci poniżej piątego roku życia ze względu na obawy dotyczące zdrowia publicznego. Niniejsze badanie ma na celu określenie rozpowszechnienia nadmiernego czasu spędzanego przed ekranem i jego związku z wczesnodziecięcym rozwojem społeczno-emocjonalnym wśród malezyjskich dzieci.

**Materiał i metody.** Kwestionariusze do samodzielnego wypełnienia rozdano 600 malezyjskim rodzicom dzieci w wieku 18 i 36 miesięcy. Rozwój społeczno-emocjonalny dziecka mierzony był za pomocą kwestionariusza „Ages and Stages Questionnaire: Social Emotional-2”. Do analizy danych zastosowano metodę wieloczynnikowej regresji logistycznej.

**Wyniki.** Łącznie 82,2% dzieci nie stosowało się do zaleceń dotyczących czasu spędzanego przed ekranem. Średni czas przed ekranem wynosił 141,7 (SD 131,6) minut dziennie. Prawdopodobieństwo, że dzieci spędzające nadmiernie dużo czasu przed ekranem będą wykazywały słabe opanowanie rozwoju społeczno-emocjonalnego jest 2,5 razy większe niż u dzieci przestrzegających zaleceń dotyczących czasu przed ekranem, przy czym związek ten utrzymuje się po dostosowaniu do czynników zakłócających (AOR: 2,50, 95% CI: 1,07-5,86).

**Wnioski.** Nadmierny czas spędzany przez dzieci przed ekranem wiąże się z niedostatkami aktywnej interakcji rodzic-dziecko i utrudnieniem procesu uczenia się i rozwoju, co w konsekwencji prowadzi do opóźnionego osiągnięcia kamieni milowych w sferze społeczno-emocjonalnej.

**Słowa kluczowe:** rozwój społeczno-emocjonalny, czas przed ekranem, zdrowie publiczne

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## Introduction

The rapid pace of technological change has resulted in early exposure to screen-based media, gradually changing the way young children live, learn and interact. Screen-based media usage is documented as early as infancy and increases within the first three years of life [1]. Three-quarters of children less than two years old are exposed to touch screen media and more than 90% children aged two to three years old use them daily [2]. The World Health Organization (WHO) and American Academy of Pediatrics (AAP) however calls for avoidance of screen-based media usage for children below the age of one and for limitation of screen time to not more than one hour per day among children aged two to five years old [3,4]. Toddlers need to socially interact with caregivers and have hands-on exploration of their environment for optimal development of cognitive, language, motor and social-emotional skills, which can be impeded by usage of screen-based media [4].

Interruption of personal interactions that occur due to screen-based media devices is not only caused by excessive child screen time, but also due to problematic parental media behavior and weak enforcement of home media rules which make up the environment that a child lives in [5]. Thus, using an ecological approach to study the effect of screen time on childhood development would also mean to include parental media behavior and home media environment factors that fundamentally shape early childhood development [6]. Most studies on children's media exposure and its influence on early childhood development are conducted in high-income countries [7-9]. The excessive screen time of more than two hours per day reported among more than half the population of Malaysian children below six years old indicates the need for a local study that delves further into this problem [10]. Hence, the aim of this study is to determine the association of screen time and early childhood social-emotional development in Malaysia.

## Material and methods

This cross-sectional study was conducted from August 2019 to January 2020 in five health clinics of Gombak district located in the state of Selangor, Malaysia. Malaysian parents aged above 18 years old with children aged 15 to 21 months or 33 to 42 months old attending the health clinics were invited to participate and acted as proxies. 600 parent-child dyads participated in the study. Cluster sampling technique was used to determine study sites, whereby respondents were recruited from five health clinics, one from each administrative zone under the Gombak District Health Office. Exclusion criteria of study subjects are as follows:

- a parent or guardian of children with congenital abnormalities;
- a parent or guardian with sensorineural disability or undergoing any form of psychiatric treatment at the time of data collection;
- a parent or guardian refusing participation in the study.

Ethical clearance was obtained from the Ministry of Health Malaysia (NMRR-18-3444-44236). Written informed consent was taken from the respondents who were agreeable to participate. Minimum sample size required for the study was calculated using Epi-Info version 6, based on data obtained from a previous study of a similar setting [11], totaling to 600 respondents.

### *Child screen time as main independent variable*

Child screen time is calculated by getting parents to report on time spent by children for watching television, using computer, laptop, mobile phone, tablet and games consoles during a typical weekday and typical weekend. Average screen time per day is measured in minutes using the Global Time Estimate method; whereby typical weekday screen time is multiplied by five and added with typical weekend screen time multiplied by two, and the sum is divided by seven [12]. Table 1 summarizes the classification of screen time for the purpose of this study based on WHO and AAP Guidelines [3,4].

**Table 1.** Screen time classification

Child's age	Excessive screen time	
	Yes	No
15-21 months	Presence of any screen time	No screen time exposure
33-42 months	1 hour and more of screen time	Less than 1 hour of screen time

*Social-emotional development as main dependent variable*

Social-emotional development of children in the study was assessed using the “Ages and Stages Questionnaires: Social-emotional, 2<sup>nd</sup> edition” (ASQ:SE-2). ASQ:SE-2 is an instrument designed to assess the social-emotional development of children from ages 12 to 72 months with good internal consistency (Cronbach’s Alpha 0.84) and an inter-rater reliability of 0.91 [13]. Two sets of ASQ:SE-2 were used in this study: (1) the 18-Month Questionnaire (assesses children 15 to 21 months old) and (2) the 36-Month Questionnaire (assesses children 33 to 42 months old). The total score of the questionnaire is classified as “no or low risk”, “monitor”, or “refer” based on the cut off value – with a higher score indicating poor mastery of social-emotional development.

Internal consistency of the ASQ:SE-2 18-Month and 36-Months Questionnaires cross-culturally adapted to Malay or *Bahasa Melayu*, the national language of Malaysia shows good and acceptable level respectively, with a Cronbach’s Alpha of 0.731 for the ASQ:SE-2 18-Month Questionnaire and a Cronbach’s Alpha of 0.686 for the ASQ:SE-2 36-Months Questionnaire. Test-retest reliability of the ASQ:SE-2 18-Month and 36-Months Questionnaires is at excellent level; with an intraclass coefficient of 0.922 for the ASQ:SE-2 18-Month Questionnaire and 0.970 for the 36-Month Questionnaire.

For the purpose of this study, score outcome of ASQ:SE-2 is classified dichotomously. Children in the “no or low risk” and “monitor” categories are classified as “normal”. Children in the “refer” category are classified as having “poor mastery”. Children falling into the “monitor” category are monitored on their development during their next routine follow-up in the health clinic. Children in the “refer” category are referred for further assessment by a medical officer.

Parents provided their basic socio-demographic details such as gender, ethnicity, education level, employment status, and household income. For their child, information such as gender, age, birth weight, and whether they were premature, have been breastfed exclusively for 6 months, sent to the nursery and received non-parental care at home were provided. In addition, parental media behavior and home media environment were also recorded as they are factors that fundamentally shape early childhood development [6]. Parental media behavior was measured using the “Parent Problematic Digital Technology Use Scale” [5] and the “Media and Technology Usage and Attitudes Scale” [14]. Whereas, the variable home media environment was measured using “Technology Related Parenting Scale” [15]. All original instruments underwent cross-cultural adaptation and translation into the Malay language.

Statistical analysis of study data was worked upon using the IBM Statistical Package for Social Sciences (SPSS) version 24. Potential confounders were identified based on previous literature and expert opinion, from which multivariable logistic regression analysis was conducted to assess the association between excessive screen time and social-emotional development, identifying factors associated with delayed early childhood social-emotional development after adjusting for potential confounding factors [16]. The assumptions for model building were met. The block-wise method was used to enter explanatory variables into the regression model.

**Results**

Out of the 600 total participants (Table 2), 121 (20.2%) were male and 479 (79.8%) were female. The majority of the participants, 493 (82.1%), were Malay, followed by 54 (9.0%) Chinese, and 46 (7.7%) Indian. The mean household income was RM 4184.12 (SD 2489.32)

**Table 2.** Socio-demographic characteristics of subjects

Variables	Frequency, n	Percentage %
<b>Gender of respondents (n=600)</b>		
Male	121	20.2
Female	479	79.8
<b>Ethnicity (n=600)</b>		
Malay	493	82.1
Chinese	54	9.0
Indian	46	7.7
Others	7	1.2

<b>Father's education level (n=599)</b>		
No formal schooling	8	1.3
Primary school	13	2.2
Secondary school	310	51.8
Diploma and above	268	44.7
<b>Mother's education level (n=598)</b>		
No formal schooling	3	0.5
Primary school	8	1.3
Secondary school	258	43.1
Diploma and above	329	55.1
<b>Parents employment (n=600)</b>		
Both parents working	285	47.5
One parent working	315	52.5
<b>Household income in Ringgit Malaysia<sup>1</sup> (n=594)</b>		
≤ 3000	269	45.3
> 3000-6000	239	40.2
> 6000-9000	57	9.6
> 9000	29	4.9
<b>Gender of child (n=600)</b>		
Male	289	48.2
Female	311	51.8
<b>Age (n=600)</b>		
18 months (15-21 months)	300	50.0
36 months (33-42 months)	300	50.0
<b>Birth weight (n=600)</b>		
Less than 2500 gram	37	6.2
2500 gram and more	563	93.8
<b>Prematurity (n=600)</b>		
Less than 37 weeks	33	5.5
37 weeks and more	567	94.5
<b>Exclusive breastfeeding for 6 months (n=597)</b>		
Yes	289	48.4
No	308	51.6
<b>Sent to nursery (n=600)</b>		
Yes	166	27.7
No	434	72.3
<b>Non-parental care at home (n=600)</b>		
Yes	32	5.3
No	568	94.7

Notes: <sup>1</sup>One Ringgit Malaysia is equivalent to 0.22 USD as of 26<sup>th</sup> July 2022.

With the maximum recorded overall screen time of 900 minutes per day, the mean screen time for all children in the study is 141.71 (SD=131.49). Mean screen time of children in the 18-month group is 101.58 (SD=112.18), and for children in the 36-month group it is 181.84 (SD=137.27). A total of 493 (82.2%) children in the present study reported to having excessive screen time, defined as any type of screen-based media exposure in the first two-years of life or more than an hour of screen time for children aged two to five-years old. For social-emotional developmental assessment, children who scored above cut-off value indicating poor mastery, comes to 46 (15.3%) children in the 18-month group and 37 (12.3%) children in the 36-month age group.

The characteristics of the participants that may correlate with a poor social-emotional development level are mother's education level ( $p=0.041$ ), not exclusively breastfeeding the child for six months ( $p=0.005$ ) and excessive screen time ( $p=0.020$ ) (Table 3).

**Table 3.** Characteristics of participants based on their social-emotional development

Variables	Social-emotional development		p-value (Chi-square test)
	Poor mastery (n=81)	Normal (n=519)	
<b>Gender of parent</b>			0.275
Father	20 (24.7%)	20 (24.7%)	
Mother	61 (75.3%)	61 (75.3%)	
<b>Ethnicity</b>			0.999
Malay	67 (82.7)	67 (82.7)	
Chinese	7 (8.6%)	7 (8.6%)	
Indian	6 (7.4%)	6 (7.4%)	
Others	1 (1.2%)	1 (1.2%)	
<b>Religion</b>			0.909
Islam	67 (82.7%)	67 (82.7%)	
Christian	2 (2.5%)	2 (2.5%)	
Buddhist	6 (7.4%)	6 (7.4%)	
Hindu	6 (7.4%)	6 (7.4%)	
Others	0 (0%)	0 (0%)	
<b>Father's education level</b>			0.755
Below diploma	46 (56.8%)	46 (56.8%)	
Diploma and above	35 (43.2%)	35 (43.2%)	
<b>Mother's education level</b>			<b>0.041*</b>
Below diploma	45 (55.6%)	45 (55.6%)	
Diploma and above	36 (44.4%)	36 (44.4%)	
<b>Parental employment</b>			0.406
One parent working	46 (56.8%)	269 (51.8%)	
Both parents working	35 (43.2%)	250 (48.2%)	
<b>Household income</b>			0.924
> RM 3000	58 (72.5%)	370 (72.0%)	
≤ RM 3000	22 (27.5%)	144 (28.0%)	
<b>Parents' marital status</b>			0.179
Married	78 (96.3%)	508 (97.9%)	
Divorced	3 (3.7%)	5 (1.0%)	
Widow	0 (0.0%)	2 (0.4%)	
Unmarried	0 (0.0%)	4 (0.8%)	
<b>Gender of child</b>			0.635
Male	41 (50.6%)	248 (47.8%)	
Female	40 (49.4%)	271 (52.2%)	
<b>Age</b>			0.189
18 months	46 (56.8%)	254 (48.9%)	
36 months	35 (43.2%)	265 (51.1%)	
<b>Birth weight</b>			0.136
≥ 2500 gram	73 (90.1%)	490 (94.4%)	
< 2500 gram	8 (9.9%)	29 (5.6%)	

<b>Prematurity</b>			0.063
No ( $\geq 37$ weeks)	73 (90.1%)	494 (95.2%)	
Yes (< 37 weeks)	8 (9.9%)	25 (4.8%)	
<b>Exclusive breastfeeding for six months</b>			<b>0.005**</b>
Yes	27 (33.8%)	262 (50.7%)	
No	53 (66.3%)	255 (49.3%)	
<b>Child sent to nursery or childcare</b>			0.220
No	54 (66.7%)	380 (73.2%)	
Yes	27 (33.3%)	139 (26.8%)	
<b>Non-parental care at home</b>			0.050
No	73 (90.1%)	495 (95.4%)	
Yes	8 (9.9%)	24 (4.6%)	
<b>Excessive screen time</b>			<b>0.020*</b>
No	7 (8.6%)	100 (19.3%)	
Yes	74 (91.4%)	419 (80.7%)	
<b>Parental Media Behavior, mean (SD)</b>	15.58 (4.78)		0.100
<b>Home Media Environment, mean (SD)</b>	11.15 (3.09)		0.498

Notes: \**p*-value significant at <0.05, \*\**p*-value significant at <0.01.

Multivariable logistic regression method was used to assess the association between the main independent variable of the study, screen time with the dependent variable, early childhood social-emotional development when adjusted for identified confounders (Table 4). In the first model, only screen time variable was entered as an independent variable. In Model 2, child characteristics which include the child's gender, age, birth weight, prematurity and history of exclusive breastfeeding were added as a second block, with screen time in the first block. In Model 3, sociodemographic factors such as parental education, parental employment, marital status, household income, existence of non-parental care, and parent's marital status were entered as the second block with screen time as the first block. In Model 4, the first block entered was screen time, followed by child characteristics as the second block, and sociodemographic characteristics as the third block. In Model 5, parental media behavior variable was added to the fourth block. In Model 6, home media environment variable was added to Model 5. Excessive screen time, no exclusive breastfeeding of child's first six months of life, and mother's education above diploma level showed a significant association with poor mastery of social-emotional development upon adjusting for other explanatory variables.

**Table 4.** Association between excessive screen time and poor mastery of social-emotional development adjusted for confounders

Variables		B	S.E.	Wald	Df	Sig.	OR (95% CI)
<b>Model 1</b>	Screen time	0.92	0.41	5.08	1	0.02	2.52 (1.13-5.64)
<b>Model 2</b>	Screen time	0.95	0.42	5.25	1	0.02	2.59 (1.15-5.86)
	Exclusive breastfeeding	0.68	0.26	6.94	1	0.01	1.97 (1.19-3.25)
<b>Model 3</b>	Screen time	0.91	0.42	4.65	1	0.03	2.49 (1.09-5.72)
	Mother's education	0.85	0.32	7.15	1	0.01	2.33 (1.25-4.33)
<b>Model 4</b>	Screen time	0.90	0.43	4.36	1	0.04	2.45 (1.06-5.69)
	Exclusive breastfeeding	0.60	0.27	4.83	1	0.03	1.82 (1.07-3.12)
	Mother's education	0.75	0.33	5.22	1	0.02	2.11 (1.11-4.00)
<b>Model 5</b>	Screen time	0.87	0.43	4.06	1	0.04	2.38 (1.02-5.55)
	Exclusive breastfeeding	0.60	0.27	4.79	1	0.03	1.82 (1.07-3.12)
	Mother's education	0.78	0.33	5.38	1	0.02	2.13 (1.12-4.04)

<b>Model 6</b>	Screen time	0.92	0.44	4.43	1	0.04	2.50 (1.07-5.86)
	Exclusive breastfeeding	0.58	0.28	4.43	1	0.04	1.79 (1.04-3.06)
	Mother's education	0.77	0.33	5.61	1	0.02	2.17 (1.14-4.11)

## Discussion

The present study demonstrated that 82.2% of children in the study have recorded excessive screen time, by definition of children in the 18-month group with any screen time and children in the 36-month group with more than an hour of screen time, similar to other studies [17,18]. Exposure to any screen-based media was reported by 84.7% of children below two years old in this study, higher than what was reported among children of the same age category in the Malaysian National Health and Morbidity Survey in 2016 of 74.4% [10]. Increased accessibility to screen-based media among children could contribute to this difference. Even when confounding factors were adjusted for, children with an excessive screen time had 2.5 times the odds of having a poor mastery of social-emotional development.

Numerous studies have reported a relationship between children's screen time and elements of social-emotional delay. In a Korean study comprising two-year old children with a television watching time of two to three hours, it had 2.7 times more risk of language delay than those with less than an hour of television watching time [19]. Another study reported that more screen time at 4-years old predicted lower levels of emotional understanding at the age of six-years old [20]. Parallel to the present study, infants who watched television two-hours or more per day were six times more likely to experience a delay in their language acquisition [21]. The same study also discovered that every additional hour of television viewing negatively impacted cognitive outcomes at ages six and seven, with cognitive development measured using four different instruments, showing the impact of screen-based media exposure in a developing child's life [17].

There are also reported findings of studies that contradict the negative influences of screen time on young children. One such example is a 2017 large-scale cross-sectional study comprising of nearly 20,000 children aged two to five-years old that shows no support for harmful links between digital screen use and young children's psychological well-being. However, the study did not assess the child's developmental skills specifically, but rather used a generalized approach of looking into the child's psychological well-being [22]. Contradicting the findings of the present research work, a prospective cohort study conducted in Thailand of children engaged in television viewing for two-hours and more in their first year of life, found that this was not associated with language delay at the age of 24 months old. However, the study only recorded 8% of the sample with developmental delay, limiting the power to find associations, a study limitation acknowledged by the authors themselves [18].

Besides this, exclusive breastfeeding is deemed to be a significant predictor of child's development in many studies [23-25]. The bioactive component of breast milk has distinguished itself to be an individual-specific biofluid that is a perfectly adapted nutritional supply, which contributes to a child's optimal growth and development. Apart from the environment a child grows up in and other psychosocial and biological factors, a child's nutritional status that includes exclusive breastfeeding is an important factor in the context of the child's development.

Furthermore, mothers having an education level above diploma was found to be significantly associated with poor mastery of social-emotional development of children in this study, a reverse finding to that of a previous study [26]. In the local setting, higher educated mothers are mostly career women who are occupied with their job. Women's employment rate in Malaysia has seen a marked increase in the past decade, from 46.4% in 2009 to 55.6% in 2019 [27]. Hence, lesser parent-child interaction may take place, contributing to lesser time spent together by the mother-child dyad, which in turn influences the social-emotional development attainment of the children.

The strength of this study lies in it being a pioneer work in Malaysia that explores the relationship between screen time and social-emotional development among children. In addition, this study has adapted the usage of a highly valid and reliable instrument. As a study that involves samples from health clinics in a district closely characterizing the Malaysian population in terms of sociodemographic features, the study respondents hail from various religious, race and socio-economic backgrounds. The study sample, which includes all elements of our target population, reflects the characteristics of the Malaysian population, hence it holds a high level of representativeness.

Despite the advantages, we acknowledge the limitations of our study, such as the reliance of screen time on parental reporting that may be subjected to recall bias and underestimation influenced by parental perception. However, other more reliable methods such as direct observation and diary recording require a high parental

effort and cooperation. Secondly, there may be other potential factors of social-emotional delay that this study failed to take into consideration, such as parental depression, parental stress, and parent-child attachment. Thirdly, though our study design will not be able to establish a temporal relationship between screen-based media usage and social-emotional development of children, it is able to offer a good baseline data that can be potentially used to be followed up as a cohort for future advanced studies.

## Conclusions

Excessive screen time among children is linked to paucity in active parent-child interaction and hindrance in the process of learning and development which consequently leads to delayed attainment of social-emotional milestones. Future longitudinal studies are needed to investigate children's engagement with electronic media and its influence over time to reaffirm this finding. Apart from the ability of creating community awareness with regards to early exposure of screen-based media among young children, it is hoped that this study may pave the way for the foundation of national policy development on screen time usage among children to be implemented at home and early childcare centers in Malaysia. It is of utmost important for us to analyze the influences of screen-based media in a young child's development during the early years of life and how balancing the exposure would help children live in a nurturing and enabling environment.

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