

## ORIGINAL ARTICLE

# Screen Media Dependency and Its Associated Factors Among Preschool Children in Kuala Lumpur

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## ABSTRACT

**Introduction:** Excessive screen time among young children is associated with screen dependency. At this moment, there is a lack of data on screen dependency among young children in Malaysia. This study aimed to measure the prevalence of screen dependency and its associated factors among preschool children in Kuala Lumpur. **Methods:** A cross-sectional study was carried out at registered preschools in Kuala Lumpur. 300 parents of preschool children aged 4 to 6 years old who fulfilled the inclusion and exclusion criteria were recruited via simple random sampling. The Screen Dependency Scale (SDS) were used to assess their dependency to screen media. Univariate and multivariate statistics were analysed using IBM SPSS version 27. **Results:** The prevalence of screen dependency among preschool children in Kuala Lumpur was 65.7%. Multivariate logistic regression analysis identified that using the screen to resolve children's quarrels (aOR 2.855, 95% CI 1.187 - 6.868), children who use smartphones (aOR 2.735, 95% CI: 1.244 - 6.013), children's screen time exceeds 2 hours over the weekend (aOR 2.261, 95% CI: 1.058 - 4.830) and having a television in the bedroom (aOR 5.562, 95% CI: 1.591 - 19.442) were predictors for screen dependency. While active co-use mediation (aOR 0.505, 95% CI: 0.302 - 0.845) were protective. **Conclusion:** The prevalence of screen dependency was high among preschool children in Kuala Lumpur. Active screening at health care clinics or in schools is essential to identify early children with risk factors for screen dependency.

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## INTRODUCTION

Screen dependency is defined as an 'addictive' behaviour related to screen media use that reflect impaired neurological reward-processing and impulse-control mechanisms (1). Screen media are devices which transmit media through a screen such as smartphones, tablets, laptops, television, portable video games, and so on (1,2). In literature, there are many interchangeable and overlapping terms, such as internet addiction disorder, video game addiction, mobile phone dependence, Facebook addiction and so on. And a substantial amount of research in this area focused on adolescence, teenagers and adults. There is a gap among young children. A general term is suitable for young children since their use of screen or media is not limited to a specific type since they use whatever is available for them (2). The term Screen dependency disorder was introduced as a general term that covers 'addiction' to

all types of screen or media (1). Screen dependency has the potential to be a significant public health issue since over the years, the use of screen media has increased and introduced earlier among young children (3). Since the pandemic, screen media devices ownership and use has increased due to undeniable necessity. Mobile smartphones are the most popular device (4), with 99.5% of Kuala Lumpur households accessing the internet with it (5).

Screen media use has many benefits, but a significant amount of literature has emerged in recent years of the significant health, physical and social complications associated with excessive screen time, especially among young children. More advanced countries such as the US, France and Canada has issued guidance on appropriate screen time. The most cited is from the World Health Organisation (WHO) and the American Academy of Paediatrics (AAP) which advised no screen time for children less than 2 years old and to limit screen time to  $\leq 1$  hour for children aged 2 – 5 years old (6,7).

Excessive screen time is negatively associated with physical, developmental, neurological, behaviour and

psychological changes. Physically, increased use of screen media is associated with overweight and obesity (8). Developmentally, excessive screen media use is associated with speech delay (9) and poor attention span (10). Increased screen time also negatively affects children's behaviour. Higher screen time is associated with a higher level of internalising behaviour (worthlessness, fearful, sad, etc.), externalising behaviour (e.g., threaten, tantrums, disobedience etc.) and peer problems (e.g., being bullied) (11). Psychologically, excessive screen time leads to depression and anxiety (12) and emotional lability (13) among children. Studies have also found neuroadaptation and structural neural changes among adolescents who are addicted to video games (1). Screen dependency is the end of the spectrum for behavioural issues associated with excessive screen time, with signs of addiction such as preoccupation, withdrawal symptoms, increasing tolerance, failure to reduce or stop screen activities, loss of outside interests, continuation despite negative consequences, lying about extent of use and use to escape adverse moods (1). Despite growing studies on excessive screen time among young children, there is paucity in literature on Screen dependency itself, especially among young children. This is because Screen dependency disorder is a novel term and there is, at the time of writing, a lack of a suitable screening tool (14). A narrative review found only 3 tools that can be used to screen for any type of screen addiction among young children, with only one that covers general screen use (14). This study is a continuation of our previous study entitled "Development and validation of a new gadget addiction scale (Screen Dependency Scale) among preschool children in Malaysia", which found that the prevalence of screen dependency among 386 preschool children in Kuantan, Pahang, Malaysia, was 49.2% (15).

Since there are, to date, no studies on the prevalence and associated factors of screen dependency, our literature review was on the factors associated with young children's excessive screen time. Parental factors, such as gender, education level and type of parental mediation, are some of the associations with children's excessive screen time (13,16,17). Among these, parental mediation is seen as a factor with the potential for intervention. Parental mediation is the interaction between parents and their children related to media use (18). Parental mediation practices are usually described as restrictive mediation, technical mediation, monitoring, co-use, active mediation, and active co-use mediation (19,20). The EU Kids Online Survey found that active mediation is the best method to balance between a child's online risk and harm while reaping the benefit of online opportunities (21). However, a local study in Selangor found that technical restriction was significantly related to positive internet use while interaction restriction and active co-use mediation were negatively associated with internet use (22). Another interesting factor is the age of the child. Older

children were positively associated with excessive internet use and increased screen time (23,24). This is because personal autonomy rises with age (23). Children's environment plays an important setting for excessive screen time. There was a significant association between easy internet accessibility at home and internet addiction (25), and readily accessible television and video games in the bedroom was associated with higher screen time (24). Studies found that children who had siblings were positively associated with screen time (24), and those who shared computers with their siblings were 4 times more likely to develop internet addiction (25).

The prevalence of young children's screen dependency is still unknown and whether this potential public health issue exists is still unanswered. Therefore, the objective of this study was to determine the prevalence of screen dependency among preschool children in Kuala Lumpur and its significant associated factors, using the newly developed Screen Dependency Scale.

## MATERIALS AND METHODS

### Study design and population

A cross-sectional study was carried out among parents of preschool children aged 4 to 6 years old at registered preschools in Kuala Lumpur. The study was conducted from June 2021 to October 2021, involving 300 respondents who were recruited via simple random sampling. The respondents were parents or guardians of preschool children aged 4 to 6 years who used any screen media and attended preschool registered under the Department of Education Kuala Lumpur. Parents or guardians with children diagnosed with autism spectrum disorder (ASD) or attention deficit hyperactive disorder (ADHD) were excluded from the study.

### Sampling method

Using the single mean formula, the number of standard errors away from the mean is 1.96, the precision is 1 and the standard deviation used is 7.663 based on findings from previous study among preschool children in Kuantan, Pahang (15). Hence, our minimum number of respondents that were calculated from the formula is 230. We estimated 20% of incomplete data. Therefore, the number of respondents was 300, and we have achieved the target sample size.

### Data collection technique

The list of registered preschool centres and consent for research was obtained from the Department of Education Kuala Lumpur. All children were numbered, and the respondents were randomly selected using online random sampling generator. Emails with the list of names of selected children were sent to each kindergarten. With the help of teachers, the parents were approached for participation in the study. The teachers informed the parents who agreed to participate regarding the inclusion

and exclusion criteria via Kindergarten WhatsApp group. The link to the questionnaire was distributed to the selected preschool children's parents with the help of the teachers using their kindergarten's WhatsApp group. Respondents gave their consent and answered the questionnaire via Google form. Questionnaires were collected by the researcher and were checked for completeness.

### Study instrument

The Screen Dependency Scale (SDS) was used to assess the preschool children's dependency to screen media. The SDS was developed in the Malaysian community and is in the Malay language and is a parent report measure. Comparative fit index (CFI) > 0.9 and root mean square error of approximation (RMSEA) < 0.08 showed that the SDS has a good fit and confirms the dimensional structure found via EFA (15). The final questionnaire consists of 15 items with 4 factors structure and has excellent internal consistency reliability of 0.9 (15).

The possible lowest score for the SDS is 15 and the maximum is 60, the higher the score indicates higher dependence (15). ROC curve was used to define the best sensitivity and specificity of a cut-off point in the scores (15). Meanwhile, the cut-off score for the SDS was determined by using the Youden index (15). A score of 24.50 is the cut-off score which the SDS differentiates non-dependence versus dependence on the screen, with a sensitivity of 55% and specificity of 80%. The area under the curve (AUC) is acceptable which is 0.7 (15).

### Statistical analysis

Data were analysed using IBM SPSS version 27. Descriptive analysis was used to describe respondents' sociodemographic data. Categorical variables were expressed as frequency and percentage. Numerical variables were checked for normality test using stem leaf plot, Kolmogorov – Smirnov and Shapiro – Wilk test; and were explained as median and interquartile range because data were not normally distributed.

In order to categorize the severity of screen dependency among those who score SDS > 24.5, we use tertile percentile analysis. From the tertile percentile analysis, SDS score 24.5 - 29.0 (below 33rd percentile) is mildly dependent, SDS score 29.1 – 35.0 (33rd - 66th percentile) is moderately dependent and SDS score > 35.0 (above 66th percentile) is severely dependent. These categorizations were used to review the prevalence results in finer detail.

For analysis on association, we divided into two categories: not dependent or dependent. Chi-square and Fisher exact test were used to find the association between unpaired categorical variables. Mann Whitney U test was used to find the association between not normally distributed numerical variables and categorical variables. Multiple logistic regressions were used to

assess predictors of screen dependency.

### Ethical consideration

Ethical approval to conduct this study was obtained from the Research and Ethics Committee (IREC 2021-192) of the International Islamic University of Malaysia.

## RESULTS

### Sociodemographic factors

Table I shows the respondents (parents or guardians) and their children's factors. The respondents' ages were not normally distributed even after the data were transformed. Therefore, the respondents' median age was 35.5 (IQR=7) years, with the youngest being 18 years old (sister) and the eldest being 61 years old (grandmother). The majority of the respondents were mothers (86.7%), Malays (83.3%), Muslims (88.3%), had tertiary education level (65.0%) and were employed (68.0%).

Most of the parents allowed their children to use screen media (95%), thought that screen media usage was both beneficial and not beneficial to their children (74.7%), and practised restrictive mediation type of parental mediation (83.0%) followed by monitoring (80.0%). The majority (50.3%) of parents allow their children to use screen media when busy. The questions asked in the questionnaire to determine the type of parental mediation practice are listed and described in Table II.

### Children's factors

The majority of the children were 6 years old (47.0%), boys (51.0%), had 1 to 3 siblings (79.7%) and started using screen media ≤ 2 years old (47%). The children's factors are shown in Table I.

### Environmental factors

The majority of respondents were from urban areas (96.7%), had internet facilities (92.3%), with Wi-Fi (69.7%) was the internet facility most used. The least number of screen media used was 1, and the highest number of screen media used were 13. The majority had 3 to 4 screen media at home (48.0%), and 3.0% had more than 9 screen media. In this study, most parents used screen media in front of their children (93.7%). Only 10.3% had a television in the bedroom, and 6.0% had a background television in which they always switched on the tv even though no one was watching it. The environmental factors as portrayed in Table III.

### Media viewing habits

Table III shows the media viewing habits among preschool children in Kuala Lumpur, Malaysia. Majority used smartphone (88.0%) and streaming video (80.0%). Most children used screen media for 1 to 2 hours over the weekday (48.7%) and more than 2 hours over the weekend (56.7%).

**Table I: Parental and children’s factors in Kuala Lumpur, Malaysia**

1. Parental factors		N (%) / Median (IQR)
<b>Age</b>		<b>35.5 (7)</b>
<b>Relationship</b>	Father	31 (10.3%)
	Guardian	9 (3.0%)
	Mother	260 (86.7%)
<b>Race</b>	Malay	250 (83.3%)
	Chinese	32 (10.7%)
	Others	18 (6.0%)
<b>Religion</b>	Islam	265 (88.3%)
	Buddha	27 (9.0%)
	Others	8 (2.7%)
<b>Education Level</b>	College/University	195 (65.0%)
	Secondary School	92 (30.7%)
	Primary School/ No formal education	13 (4.3%)
<b>Employment Status</b>	Employed	204 (68.0%)
	Not Employed	96 (32.0%)
<b>Allow child to use screen media</b>	Yes	285 (95.0%)
	No	15 (5.0%)
<b>Opinion whether the use of screen media is beneficial or not</b>	Beneficial	65 (21.7%)
	Not beneficial	11 (3.7%)
	Both	224 (74.7%)
<b>Parental mediation practice</b>	Restrictive mediation	249 (83.0%)
	Technical mediation	94 (31.3%)
	Active co-use mediation	143 (47.7%)
	Monitoring	240 (80.0%)
<b>Situation that causes the parents to allow children to use screen media</b>	When the parents are busy	159 (53.0%)
	In the vehicle	63 (21.0%)
	For learning purpose	60 (20.0%)
	While eating	46 (15.3%)
	To resolve a quarrel among children	43 (14.3%)
	During free time	34 (11.3%)
	Before sleep	34 (11.3%)
	As a reward	16 (5.3%)
	As an entertainment	9 (3.0%)
<b>2. Children’s Factors</b>		
Age (years old)	4	28 (9.3%)
	5	131 (43.7%)
	6	141 (47.0%)
Age started using screen media (years old)	< 2	141 (47.0%)
	3 – 4	121 (40.3%)
	5 – 6	38 (12.7%)
Gender	Female	147 (49.0%)
	Male	153 (51.0%)
Number of siblings	1 – 3	239 (79.7%)
	4 – 6	61 (20.3%)

**Table II: Questions asked to determine the type of parental mediation practice**

Questions	Interpretation of Parental Mediation Practice
Saya tidak menetapkan sebarang peraturan atau had masa. I do not set any rules or time limits.	None
Saya memantau kandungan media yang digunakan oleh anak saya. I monitor the media content used by my child.	Monitoring
Saya menetapkan jenis media yang boleh digunakan. I set the types of media that can be used.	Restrictive mediation
Saya menetapkan masa penggunaan media. I set the time for screen media use.	Restrictive mediation
Saya sentiasa menerangkan kandungan media kepada anak saya. I always explain the media content to my child.	Active co-use mediation
Saya menggunakan media bersama – sama anak saya. I use the media together with my child.	Active co-use mediation
Saya tidak membincangkan kandungan media kepada anak saya. I do not discuss the media content with my child.	None
Saya menggunakan ‘parental control software’. I use the parental control software.	Technical mediation

**Table III: Environmental Factors and Media viewing habits among preschool children in Kuala Lumpur, Malaysia**

1. Environmental Factors	N (%)
Residential Area	
Urban	290 (96.7%)
Rural	10 (3.3%)
Internet Facilities	277 (92.3%)
Types of Internets	
Sim card	111 (37.0%)
Wifi	209 (69.7%)
Broadband	21 (7.0%)
Parents use screen media in front of the children	281 (93.7%)
Television in the bedroom	31 (10.3%)
Background television	18 (6.0%)
Total number of screen media at home	
1 – 2	79 (26.3%)
3 – 4	144 (48.0%)
5 – 6	51 (17.0%)
7 – 8	17 (5.7%)
≥ 9	9 (3.0%)
<b>2. Media viewing habits</b>	
Type of Screen Media Used	
Smartphone	264 (88.0%)
Home television	250 (83.3%)
Laptop	91 (30.3%)
Tablet	85 (28.3%)
Videogame	21 (7.0%)
Television in the vehicle	20 (6.7%)
Desktop	3 (1.0%)
Purpose of Using Screen Media	
Video streaming	240 (80.0%)
Educational application	226 (75.3%)
Playing games	86 (28.7%)
Surfing the internet	63 (21.0%)
Use of screen media over the weekday	
< 1 hour	81 (27.0%)
1 – 2 hours	146 (48.7%)
>2 hours	73 (24.3%)
Use of screen media over the weekend	
< 1 hour	38 (12.7%)
1 – 2 hours	92 (30.7%)
>2 hours	170 (56.7%)

### Other activities

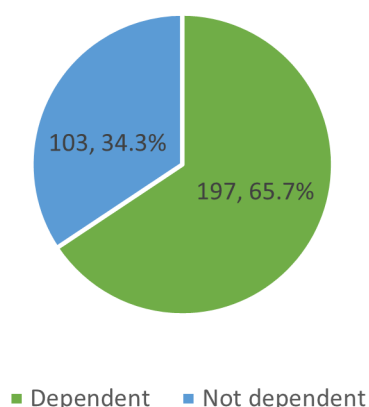
The majority of the children played outside less than 1 hour daily over the weekdays (66.3%) and the weekends (49.7%). Half of the children (51.0%) spend 1 to 2 hours daily playing inside their house over the weekdays and weekends. Less than 1 hour daily was spent reading books or being read, doing art activities and music and dancing over the weekday and weekend for most children. The duration spent on other activities over the weekdays and weekends is portrayed in Table IV.

**Table IV: The duration spent on other activities over the weekdays and weekends**

Other activities	< 1 hour [N (%)]	1- 2 hours [N (%)]	>2 hours [N (%)]
Over the Weekdays			
Playing outside (e.g., playing ball, cycling etc.)	199 (66.3%)	90 (30.0%)	11 (3.7%)
Playing inside (e.g., playing with toys, dolls, etc.)	92 (30.7%)	153 (51.0%)	55 (18.3%)
Read a book or being read a book	222 (74.0%)	67 (22.3%)	11 (3.7%)
Art activities (e.g., drawing, colouring etc.)	196 (65.3%)	87 (29.0%)	17 (5.7%)
Music and dance	233 (77.7%)	51 (17.0%)	16 (5.3%)
Over the Weekends			
Playing outside (e.g., playing ball, cycling etc.)	149 (49.7%)	120 (40.0%)	31 (10.3%)
Playing inside (e.g.: playing with toys, dolls, etc.)	81 (27.0%)	153 (51.0%)	66 (22.0%)
Read book or being read a book	220 (73.3%)	73 (24.3%)	7 (2.3%)
Art activities (e.g.: drawing, colouring etc.)	186 (62.0%)	95 (31.7%)	19 (6.3%)
Music and dance	217 (72.3%)	61 (20.3%)	22 (7.3%)

### Prevalence of screen dependency

The prevalence of screen dependency was 65.7% among preschool children who attended registered preschool under the Department of Education Kuala Lumpur (Figure 1) with a mean score of 28.38 ( $\pm$  0.448). Among children who had screen dependency, most of them had moderate screen dependency (25.3%), followed by mild dependency (22%) and severe dependency (18.3%).



**Figure 1: Prevalence of screen media dependency among preschool children in Kuala Lumpur, Malaysia**

### Univariable analysis of factors associated with screen dependency

Chi-square and Fisher exact test were used to find the association between unpaired categorical variables. Mann Whitney U test was used to find the association between not normally distributed numerical variables and categorical variables.

Table V compiles only the variables that were significantly associated with screen dependency upon univariable analysis with p-value < 0.05 which were active co-use parental mediation, using screen media when parents are busy, using screen media in the vehicle, screen media usage for learning purposes, used screen media to resolve quarrels among children, residential area, a television in the bedroom, smartphone, videogame, screen time over the weekdays and screen time over the weekends.

### Multivariable analysis of factors associated with screen dependency

All of the factors significantly (p-value <0.05) associated with screen dependency from the univariable analysis were included in the multivariable analysis. Analysis by multiple logistic regression showed that the factors that were significantly associated with screen dependency were when the parents allow their children to screen media to resolve quarrels (p = 0.019), smartphone usage (p = 0.012), had a television in the bedroom (p=0.007), used screen media more than 2 hours over the weekend (p = 0.035) and active co - use parental mediation (p = 0.009), after controlling for other factors. When the parents allow their children to screen media to resolve quarrels, there were 2.855 times to develop screen dependency (95% CI 1.187 - 6.868). A preschool child who used a smartphone was 2.735 times (95% CI 1.244 - 6.013) to develop screen dependency. On the other hand, those who had a television in the bedroom were 5.562 times more likely to have screen dependency (95% CI 1.591 - 19.442).

Moreover, those who spent time on screen media for more than 2 hours over the weekend were 2.261 times (1.058 - 4.830, p-value 0.035) to develop screen dependency compared to those who used screen media less than 2 hours over the weekend. Meanwhile, active co-use parental mediation was found to be a protective factor in our study, with the odds ratio 0.505 (95% CI: 0.302 - 0.845, p-value 0.009). The summary of screen dependency predictors among preschool children in Kuala Lumpur, Malaysia, is shown in table VI.

The model is fit because the Hosmer and Lemeshow Test showed p = 0.983 and Receiver Operating Characteristic (ROC) curve showed the model can accurately discriminate 70.3% of the cases. Tolerance was more than 0.9 and VIF was 1.0 showing no multicollinearity between the independent variables. All two ways interaction between independent variables

**Table V: Univariate analysis results of only the significant factors with screen media dependency**

Yes	Variables	Screen Media Dependency, n (%)		χ <sup>2</sup>	p-value
		Yes	No		
<b>Parental Mediation Practice</b>	Restrictive mediation	159 (80.7%)	90 (87.4%)	2.131	0.144
	Technical mediation	56 (28.4%)	38 (36.9%)	2.254	0.133
	Active co – use mediation	81 (41.1%)	62 (60.2%)	9.868	0.002*
	Monitoring	158 (80.2%)	82 (79.6%)	0.015	0.903
<b>Situation that causes the parents to allow children to use screen media</b>	When the parents are busy	114 (57.9%)	45 (43.7%)	5.459	0.019*
	In the vehicle	48 (24.4%)	15 (14.6%)	3.917	0.048*
	For learning purpose	32 (16.2%)	28 (27.2%)	5.060	0.024*
	While eating	36 (18.3%)	10 (9.7%)	3.822	0.051
	To resolve a quarrel among children	36 (18.3%)	7 (6.8%)	7.257	0.007*
	During free time	19 (9.6%)	15 (14.6%)	1.628	0.202
	Before sleep	26 (13.2%)	8 (7.8%)	1.985	0.159
	As reward	9 (4.6%)	7 (6.8%)	0.665	0.415
	As entertainment	4(2.0%)	5 (4.9%)		0.283 <sup>c</sup>
	<b>Residential Area</b>	Urban	187 (64.5%)	103 (35.5%)	
Rural		10 (100.0%)	0 (0.0%)		
<b>Television in bedroom</b>	Yes	28 (90.3%)	3 (9.7%)	9.322	0.002*
	No	169 (62.8%)	100 (37.2%)		
<b>Smartphone</b>	Yes	179 (67.8%)	85 (32.2%)	4.454	0.035*
	No	18 (50.0%)	18 (50.0%)		
<b>Videogame</b>	Yes	18 (85.7%)	3 (14.3%)	4.025	0.045*
	No	179 (64.2%)	100 (35.8%)		
<b>Screen media usage during weekday</b>	< 1 hour	47 (58.0%)	34 (42.0%)	6.155	0.046*
	1 – 2 hours	94 (64.4%)	52 (35.6%)		
	> 2 hours	56 (76.7%)	17 (23.3%)		
<b>Screen media usage during weekend</b>	< 1 hour	19 (50.0%)	19 (50.0%)	8.921	0.012*
	1 – 2 hours	55 (59.8%)	37 (40.2%)		
	> 2 hours	123 (72.4%)	47 (27.6%)		

<sup>a</sup> median (IQR), <sup>b</sup> Mann U Whitney test, <sup>c</sup> Fisher's Exact Test  
 \* p < 0.05, statistically significant

**Table VI: The predictors of screen media dependency among preschool children in Kuala Lumpur, Malaysia**

Predictor	B	SE	Wald	df	p-value	OR (95% CI)
Parents allow their children to use screen media to resolve quarrels among them	1.049	0.448	5.489	1	0.019	2.855 (1.187 - 6.868)
Active co -use	- 0.683	0.262	6.774	1	0.009	0.505 (0.302 - 0.845)
Television in the bedroom	1.716	0.639	7.222	1	0.007	5.562 (1.591 - 19.442)
Smartphone	1.006	0.402	6.269	1	0.012	2.735 (1.244 - 6.013)
Screen media use more than 2 hours over the weekend	0.816	0.387	4.432	1	0.035	2.261 (1.058 - 4.830)

were not significant ( $p > 0.05$ ).

## DISCUSSION

This study showed that the prevalence of screen dependency in Kuala Lumpur is worrying at 65.7%, which is higher than a study done in Kuantan (49.2%), which used the same screening instrument (15). Kuala Lumpur is Malaysia's capital city, while Kuantan is a town on the east coast of Malaysia; however, there isn't much difference in the methodology and the participants' sociodemographic factors between both studies. Both studies were carried out during the COVID - 19 pandemic, which affected school closure in Malaysia. As mentioned before, there were no similar studies of screen dependency done pre-pandemic that we are aware of. The SDS itself was developed in 2020 at the start of the pandemic (15). Hence, we are unable to compare the prevalence of screen dependency before and during the pandemic. But we can compare the sociodemographic factors of our respondents to studies taken pre-pandemic on young children's excessive screen time.

Both sociodemographic variables of parents, the children and environment factors were similar but with slight differences: the study in Kuala Lumpur covered more urban areas (96.7%) than Kuantan (83.2%). And most of the participants in both studies have internet access facilities, with more in Kuala Lumpur (92.3%) than in Kuantan (87.6%) (15). The wider mobile broadband (4G internet) and internet access at home in Kuala Lumpur compared to Pahang might contribute to this higher prevalence. The Internet User Survey 2020 found that more than half of Malaysians used mobile broadband compared to other types of broadband, and the majority of the internet is accessed at home (26). The average 4G internet availability in Kuala Lumpur was 94.1% compared to 86.9% in Pahang in 2021 (27), and internet availability at home was 98% in Kuala Lumpur and 86.8% in Pahang in 2020 (5). Another study in Putrajaya for problematic mobile phone use among young children was 20.9% using a different screening instrument (28).

Parents play an important role in a child's screen use. Local studies on parental mediation have shown that Malaysian parents have a positive attitude towards technology (28–31). This positive attitude is also reflected in this study, where 95% of parents allowed their young children to use screen media. A positive attitude towards technology is commendable since the internet benefits a child's learning opportunities, especially if balanced with the risks (20,32). We found that in this study, a child's screen use was mainly for video streaming (80%), followed by for educational purposes (75.3%). The study in Putrajaya had almost similar findings, where the children in their research mainly used the mobile phone for entertainment purposes; however, in their study,

only 19.5% used the mobile phone for educational related purposes. Allowing the screen to be used as an entertainment tool shows a possible lack of awareness among parents of the risk of excessive screen time. Our study found that children who used the screen for educational purposes were more in the non-dependent group, and this difference was significant.

Local studies had shown that Malaysian parents tend to use the screen media device as a method of parenting (28,31), and again, half (50.3%) of the respondents in this study allowed their children to use the screen when they were busy reflected a permissive attitude towards the screen. This could be because most of the respondents were in employment. A previous study found that parents in employment significantly increase problematic smartphone use (33); however, this factor is not significant in our study. Nevertheless, we found that parents who allowed their children the screen when they were busy, in the vehicle, and to resolve quarrels among children were significant associated factors for screen dependency. And using the screen to settle quarrels among children was found to be a strong predictive factor for screen dependency.

Among the children who participated in this study, the majority (80%) of them have siblings. In previous studies, children who have siblings are more likely to have screen dependency (24,25). And nearly half of the children in this study had started to use the screen less than 2 years old, which is a very young age, and this is in line with other studies locally (31,34,35) and abroad (21,33). However, this association is not significant in this study.

As explained before, parents play a crucial role in balancing their children's screen time to acquire the benefit and protect them from harm. Therefore, parental mediation of a child's screen media use is important. Most parents or guardians of preschool children in Kuala Lumpur practised restrictive mediation (83%) and monitoring (80%). This is probably the preferred choice since most respondents (68.0%) were working. Thus, they were only able to set verbal rules, time limits and monitor the children's screen media use from time to time. Less than half (47.7%) of the parents or guardians practised active co-use mediation, and this could be because more children have their own screen media rather than sharing the same screen media with their parents. The Malaysia Internet User Survey 2020 found that more than half (56.3%) of the children nowadays own personal screen media (26). Besides that, parents and children have different interests and favourite shows, making active co-use among the least practised type of parental mediation. A qualitative study among Malaysian parents echoes this, where parents seldom co-view and prefer to use restrictive mediation, especially time restriction since it is convenient but not necessarily effective (31). The second least popular

parental mediation practice is active co-use mediation, of which only 47.7% of parents are practising it. Active co-use mediation is a protective factor against screen dependency in this study. This finding aligns with other studies that suggest active mediation or active co-use mediation is the best parental mediation method. Although active mediation does not limit risk and harm as well as restrictive mediation, it also increases children's online skills by not restricting children's opportunities and encourages critical thinking (20,31). However, this differs from another local study which found that technical restriction was significantly related to positive internet use while interaction restriction and active co-use mediation were negatively associated with internet use (36). Only one third (31.3%) of our respondents practised technical mediation, similar to the Malaysia Internet User Survey 2020, which found that only 34.4% of parents in Malaysia used parental control in the device (26). Based on this survey, the awareness regarding parental control reduced from 62.4% in 2018 to 53.4% in 2020, which could be the reason for the poor usage of parental control. Poor use of technical restriction by parents was also found in other European countries (20).

Most of the respondents (48.0%) had at least 3 – 4 screen medias at home. Wilayah Persekutuan Kuala Lumpur has the highest mean income in Malaysia, RM 13257 according to the Department of Statistics Malaysia in 2020 (37). Due to the higher income among parents in Kuala Lumpur, this made them capable of owning more than one screen media. The most widely used screen media were the smartphone (88.0%) which is similar to the national smartphone use (98.7%) (26), and also the study in Kuantan (86.5%) (15). Home television is the second-highest screen media to be used by young children in this study (83.3%) which is similar to Kuantan (83.9%) (15). Television was previously the screen media of choice in young children (9,38), and while it is still popular, it is slowly losing place to the smartphone. This is due to the smartphone's advantage of being highly portable and accessible, which increases screen time. This study found that children who used smartphones have 2.735 times increased risk of developing screen dependency. Despite the television's non-portability, it is still popular among young children. This is because modern television has an internet facility which makes video streaming possible. Television channels via conventional broadcast are now less watched than video streaming. The majority (80%) of the participants in this study watch video streaming, which displays young children's main activity when using a screen media device. Other screen media activities such as playing games (28.7%) and surfing the internet (21%) are less popular among children this age due to the limitations of their understanding and capabilities. This information is useful when planning strategies in reducing screen time among preschool children.

As mentioned before, prolonged exposure to the screen could lead to screen dependency (23,39). It is evident that most children in this study spent a lot of time watching online streaming videos on screen media. The majority of children in this study spent 1-2 hours on screen media over the weekdays and more than 2 hours on screen media over the weekends, which is more than the screen time recommended by the American Academy of Pediatrics and World Health Organisation (7,40). The same screen time pattern was observed in the previous study conducted among four-year-old children in Sweden (41). Both excessive screen time was significant for screen dependency in this study. We also found that the use of screen media for more than 2 hours over the weekend increased the risk of the pre-schoolers developing screen dependency by 2.261 times, which is a similar finding from a study in Korea among pre-schoolers (33).

When they do engage in non-screen activities, the majority of children choose to play outside (66.3%), read books (74%), engage in art activities (65.3%), and music/dance activities (77.7%), but in duration less than 1 hour. This percentage is generally reduced over the weekend. For example, most (66.3%) of the children in this study spent less than 1 hour daily playing outside over the weekdays, and this percentage (49.7%) is reduced further during the weekends. This is supported by a study that found out that children aged 4 – 6 years old who were heavy television users spent less time reading and playing outside (42). Since the children already spent more time on screen media, there was only a small amount of time left to spend on other activities and vice versa.

Most children use their screens for 1-2 hours during weekdays and more than 2 hours on weekends. When comparing between the screen and non-screen activities with the same amount of time spent: 48.7% of children use their screens for 1-2 hours during the weekdays, while for non-screen activities, only 30% chose to play outside, but 51% preferred to play inside their house for the same amount of duration. This preference to play inside their home is essential to know as an alternative to screen time for children this age.

The majority, 56.7% of children, spend more than 2 hours on screen media over the weekend, while playing inside the house reduced to 22%, and only 10.3% chose to play outside for the same duration. This shows the predominance of screen time in preschool children, especially over the weekends. Generally, we can conclude that for non-screen time activities, most children do spend on educational activities, but the duration is less than 1 hour. This means that screen time still exceeds beneficial non-screen activities. During the movement control order (MCO), children's outdoors activities were severely limited as the children were



only able to play outside within the home yard and were not allowed to play in the playground, this might have directly increased children's screen time as they were indoors more.

Worryingly, we found that despite only 31 (10.3%) children having a television in their bedroom, the majority of them, 29 (90.3%), had screen dependency. And those who had a television in the bedroom are 5.562 times more likely to develop screen dependency. This finding is supported by other studies which found out that child who had television the bedroom has excessive screen time (24,42). As mentioned from our study, excessive screen time more than 2 hours over the weekend increase risk of developing screen dependency. Having a screen media in the bedroom encourages prolonged use, which, among other effects, will inevitably shorten the sleeping period, give poor quality sleep, and disrupt the sleep-wake cycle, which is crucial for a young child's healthy mental and physical development (43).

This study was planned and conducted meticulously to the best of our capabilities. However, it has its limitations. First, it is a cross-sectional study, which will show the association between variables but may not be able to explain its relationship. A mixed method of qualitative and quantitative design may improve this. Second, Malaysia is a multiracial country with many languages. Although Malay is the primary language of this country and the screening tool can cater for this, there is the possibility of missing out on participants who might be more familiar with another language, hence limiting the results' generality. It is recommended to translate this tool to other languages such as English, Mandarin and Tamil to be better able to get a more generalised result to the Malaysian population. Third, this study was conducted in a single location. Although Kuala Lumpur is the capital city of Malaysia and empirical data from the most urbanised city in Malaysia gives some idea on the level of dependency among pre-schoolers, it is again recommended to do a nationwide study including urban and rural areas to have a better overview. Fourth, we focused only on one type of screen media in the bedroom: the television. Perhaps by including other screen media devices used in the bedroom, we will have a clearer perception of its significance on screen dependency. Apart from the above, this study was carried out during the middle of the pandemic era, where most of the kindergartens were using screen media for online teaching. This study did not differentiate between Discretionary Screen Time (DST) and non-DST. It is recommended to further divide screen use into these two types in future studies so that comparisons can be made. Another limitation is that the increased screen time use during the pandemic era may affect the results of this study and cannot be used as a generalisation of screen time use. And finally, there were no studies on Screen dependency conducted before the

pandemic that we are aware of, so comparisons cannot be made. Despite that, the results in this study still adds on to the lack of data in this area. We propose further studies during the endemic era, so that comparisons can be made during and after the COVID 19 pandemic.

## CONCLUSION

The prevalence of screen dependency among preschool children in Kuala Lumpur is high. Allowing the children to use screen media to resolve quarrels, the presence of television in the bedroom, children using smartphones, and excessive screen time more than 2 hours over the weekend significantly increased the risk of developing screen dependency. Meanwhile, active co-use mediation was the only protective factor that significantly may prevent screen dependency. Since we have identified these risk factors, prevention can be done. Guidelines on screen media related-use among children aged 4 – 6 years old can be constructed and implemented during routine child developmental follow up in our health clinics in Malaysia and subsequently when the children start studying in the kindergarten.

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