

# Children's Screen Time At Home: A Study of Parents' Knowledge, Attitude and Practice

**Nur Fatin-Aqilah Arrippin**

Universiti Brunei Darussalam

**Mardiah Haji Mahmud**

Universiti Brunei Darussalam

**Hanif Abdul Rahman** (✉ [hanif.rahman@ubd.edu.bn](mailto:hanif.rahman@ubd.edu.bn))

Universiti Brunei Darussalam

**Kolinmo-Yumni A. Aliy-Yuin**

Universiti Brunei Darussalam

**Swee Ching Linda Lai**

Universiti Brunei Darussalam

**Khadizah H. Abdul-Mumin**

Universiti Brunei Darussalam

---

## Research Article

**Keywords:** Screen time, Children, Parent's knowledge, Parent's attitude, Parent's practices

**Posted Date:** June 10th, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-574122/v1>

**License:** © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

---

## Abstract

# Background

The present study investigated the parent's knowledge, attitude, practice and experience of the screen time spent by their children at home aged below five years old, identify the common screen-based devices use, content type and level of screen time spent by the children and identify the association between sociodemographic variables and parent's knowledge, attitude and practice on screen time.

## Methods

We assessed target population of parents having children aged zero to four years old attending the Maternal and Child Health Care Clinics in four districts in Brunei Darussalam.

## Results

Parents' attitude and practice of screen time spent by their children are generally positive, however, the health knowledge level is poor with scores of < 50%. Children studied (< 2 years old and 3 to 4 years old) found to spent more time watching television. Interactive form of screen time content was mostly spent by the children (50%). Statistically significant association observed between children of both aged group with time spent on tablet device ( $p = 0.037$ ) and ( $p = < 0.001$ ). Also, significant association between parent's knowledge, attitude and practice with gender of the parents, household income and total number of children was reported.

## Conclusion

The children in our study exceeds the recommended guidelines on screen time behavior and the parent's health knowledge with regards to screen time was poor which emphasized the need for improvement and further study.

## Introduction

'Screen time' is defined by the World Health Organization (WHO) as the amount of sedentary time spent passively on screen-based devices without active physical activity [1]. WHO (2019) has released a WHO 24-hour movement guidelines recommending that children aged two to four years should have less than one hour of screen time per day while limiting to not recommended for infants below two years of age [1]. However, given the rapid pace of technological change nowadays whereby ownership of technological devices was made easier, children growing up with technology has increased rapidly, thus raising concern on the negative impacts it brings to their overall aspect of health that could hinder their optimal growth and well-being [2].

Many findings have linked excessive screen time among children to be accounted for a variety of health risks [3,4]. Conditions such as hypertension, heart problems, hyperlipidemia and other health risk are another screen time-associated ill effects that have direct associations with sedentary screen time behavior as a result of lower physical activity and poor sleep quality [3,5]. Disrupted quality family time [6], emotional and behavioral problems such as depression [7,8], anxiety [8,9], conduct problems [7,10], social problems [7], thought problems [7] and hyperactivity problems [9,10,11] also found to be associated with excessive screen time and could be mediated by poor sleep quality in terms of less sleep duration [3,4,12,13] and later bedtimes [4,5,14,15]. According to the American Academy of Sleep Medicine guidelines in 2016, screen-based devices should not be allowed in the children's bedroom [16]. Furthermore, sedentary screen-time also has its significant negative impact whereby overexposure to screen-time activity can also lead to addiction [3].

In Brunei, there are no known published local articles about the level of engagement the Bruneian children had spent with screen-based devices that have been publicly disclosed or made possible to access. In view of this, it is the researcher's interest to investigate parent's knowledge, attitude and practice on their children's screen time and the level of screen time spent by the children at home to obtain insight into Brunei's current situation.

## Methods

### Study Design and Setting

A cross-sectional study using self-administered questionnaire. The parents of children aged zero to four years old attending the Maternal and Child Health Care Clinics in four districts in Brunei Darussalam was invited to participate in this study. The study site was chosen in view that the service solely provides support access to mothers and children with adequate health care facilities, making Maternal and Child Health Care Clinics a highly suitable choice.

## **Population and sample**

The target population is parents having children aged zero to four years old attending the Maternal and Child Health Care Clinics in four districts in Brunei Darussalam. The inclusion criteria was (1) individual with parental responsibility for a child such as a mother or a father, (2) have children they cared for age ranging from zero to four years and (3) the parents also needed to have sufficient literacy to read in either English or Malay language, whereas exclusion criteria include: (1) have children aged 5 years and above or have no children, (2) parents who present difficulty to access the online questionnaire through Qualtrics link (e.g. internet problem) and (3) parents who have problem reading both in English and Malay language.

## **Research Instrument**

A self-reported questionnaire conducted via online questionnaire using Qualtrics consisting of three sections namely; (1) Sociodemographic, (2) Screen-Based Devices and Screen Time Spent by Children at Home and (3) Parent's Knowledge, Attitude and Practice of Screen Time Spent at Home. This questionnaire has been modified after pre-tested to five mothers having the same inclusion criteria to ensure that the questions are well-defined and clearly understood between one parent and another. All research team members approved the final version of the questionnaire.

## **Statistical Analysis**

Data was analyzed using R Studio Desktop version 1.2.1335. The statistical analyses included descriptive statistics and Fisher's exact test to determine the parent's level of knowledge, attitude and practice of the screen time spent by their children at home as well as determining common screen-based devices use, content type and level of screen time spent by their children. All statistical tests are two-sided and a p-value less than 0.05 is considered significant.

## **Ethical Consideration**

This study has been approved by the institutional review board (XXX) and the study protocol is performed in accordance with the relevant guidelines. Written informed consent has been obtained prior to participations.

## **Results**

The final sample included 113 parents of which 91.2% were mothers. The participants were predominantly of the Melayu-Brunei ethnicity (78.8%) and about 57.5% of parents having at least two children aged < 4 years old. An overall total of 194 children was gathered whereby approximately 52.1% are male, the majority were below the age of 2 years old (62.9%) and about 83% do not attend a nursery and/or daycare services. In terms of household screen-based devices, most parents reported having < 6 number of devices (75.2%) available at their home and each has at least both television and a smartphone. The descriptive characteristics of the study sample and their children are as displayed in Table 1.

Table 1  
Demographic characteristics of the sample (n = 113)

	n	(%)
<b>Parents</b>		
Mother	103	(91.2)
Father	10	(8.8)
<b>District</b>		
Brunei-Muara	99	(87.6)
Tutong	9	(8.0)
Belait	2	(1.8)
Temburong	3	(2.7)
<b>Race</b>		
Melayu-Brunei	89	(78.8)
Tutong	4	(3.5)
Dusun	2	(1.8)
Belait	2	(1.8)
Kedayan	5	(4.4)
Murut	0	(0)
Bisaya	0	(0)
Others	11	(9.8)
<b>Income</b>		
0-500	21	(18.6)
501-1000	26	(23.0)
1001-2000	28	(24.8)
2002-3000	15	(13.3)
3001-4000	8	(7.1)
4001-5000	7	(6.2)
More than 5000	8	(7.1)
<b>No. of children</b>		
1	40	(35.4)
2	65	(57.5)
3	8	(7.1)
<b>Children</b>		
Gender		
Male	101	(52.1)
Female	93	(47.9)
Age		

n = Frequency % = Percentage

	n	(%)
1	79	(40.7)
2	43	(22.2)
3	48	(24.7)
4	24	(12.4)
<b>Nursery/Daycare</b>		
Yes	33	(17.0)
No	161	(83.0)
<b>No. of household screen-based devices</b>		
1 to 3	45	(39.8)
4 to 6	40	(35.4)
More than 7	28	(24.8)
<b>Screen-based devices types</b>		
Television	113	(37.7)
Computer/Laptop	43	(14.3)
Tablet device	31	(10.3)
Smartphone	113	(37.7)
n = Frequency % = Percentage		

Table 2 presents descriptive characteristics of the children's total time spent on each screen-based device by gender. When examining the total screen time spent by all children in the study, regardless of whether they are attending a nursery and/or daycare service, it was found that television was commonly used screen-based devices among the children of both aged < 2 years old groups compared to other screen-based devices. For children attending nursery and/or daycare service, the majority of children aged < 2 years old (70.6%) spent more time watching television (between < 30 minutes to > 2 hours) during nursery and/or daycare day. A similar pattern was also observed during non-nursery and/or daycare days and during public holiday for children aged < 2 years old (82.3% and 88.2% respectively). It was also found that children aged < 2 years old (47%) spent more time on a smartphone between less than 30 minutes to 1 hour during non-nursery and/or daycare day compared to nursery and/or daycare day (23.6%). Likewise, increment in the number of children aged 3 to 4 years old engaging in television-viewing of > 1 hour during nursery and/or daycare day (18.8%), non-nursery and/or daycare day (43.8) and public holiday (62.6%) was observed. However, no significant difference was reported in children of both age groups attending the nursery and/or daycare day with total screen time spent on each screen-based device at home during nursery and/or daycare day, non-nursery and/or daycare day and public holiday.

Table 2  
Children's total screen time spent at home rating scores by age

	< 2 years old		3–4 years old		Total		P = value
	(n = 17)		(n = 16)				
<b>Nursery/daycare day (for children attending nursery and/or daycare only)</b>	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>	
Television							0.617
None	5	(29.4)	5	(31.3)	10	(30.3)	
Less than 30 minutes	7	(41.2)	4	(25.0)	11	(33.3)	
Between 30 minutes to 1 hour	2	(11.8)	4	(25.0)	6	(18.2)	
Between 1 hour to 2 hours	3	(17.6)	2	(12.5)	5	(15.2)	
More than 2 hours	0	(0.0)	1	(6.3)	1	(3.0)	
Computer/Laptop							0.571
None	14	(82.4)	15	(93.8)	29	(87.9)	
Less than 30 minutes	1	(5.9)	0	(0.0)	1	(3.0)	
Between 30 minutes to 1 hour	1	(5.9)	1	(6.3)	2	(6.1)	
Between 1 hour to 2 hours	1	(5.9)	0	(0.0)	1	(3.0)	
More than 2 hours	0	(0.0)	0	(0.0)	0	(0.0)	
Tablet Device							0.098
None	15	(88.2)	12	(75.0)	27	(81.8)	
Less than 30 minutes	2	(11.8)	0	(0.0)	2	(6.1)	
Between 30 minutes to 1 hour	0	(0.0)	3	(18.8)	3	(9.1)	
Between 1 hour to 2 hours	0	(0.0)	1	(6.3)	1	(3.0)	
More than 2 hours	0	(0.0)	0	(0.0)	0	(0.0)	
Smartphone							0.500
None	13	(76.4)	9	(56.3)	22	(66.7)	
Less than 30 minutes	2	(11.8)	2	(12.5)	4	(12.1)	
Between 30 minutes to 1 hour	2	(11.8)	4	(25.0)	6	(18.2)	
Between 1 hour to 2 hours	0	(0.0)	0	(0.0)	0	(0.0)	
More than 2 hours	0	(0.0)	1	(6.3)	1	(3.0)	
<b>Non-nursery/daycare day (for children attending nursery and/or daycare only)</b>	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>	<b>P = value</b>
Television							0.724
None	3	(17.6)	1	(6.3)	4	(12.1)	
Less than 30 minutes	5	(29.4)	3	(18.8)	8	(24.2)	
Between 30 minutes to 1 hour	3	(17.6)	5	(31.3)	8	(24.2)	
Between 1 hour to 2 hours	5	(29.4)	6	(37.5)	11	(33.3)	
More than 2 hours	1	(5.9)	1	(6.3)	2	(6.1)	

n = Frequency % = Percentage <sup>a</sup> Fisher's exact test

	< 2 years old (n = 17)		3–4 years old (n = 16)		Total		
Computer/Laptop							0.719
None	13	(76.4)	14	(87.5)	27	(81.8)	
Less than 30 minutes	2	(11.8)	1	(6.3)	3	(9.1)	
Between 30 minutes to 1 hour	0	(0.0)	0	(0.0)	0	(0.0)	
Between 1 hour to 2 hours	1	(5.9)	0	(0.0)	1	(3.0)	
More than 2 hours	1	(5.9)	1	(6.3)	2	(6.1)	
Tablet Device							0.450
None	12	(75.0)	10	(62.5)	22	(66.7)	
Less than 30 minutes	3	(17.6)	2	(12.5)	5	(15.1)	
Between 30 minutes to 1 hour	1	(5.9)	2	(12.5)	3	(9.1)	
Between 1 hour to 2 hours	1	(5.9)	0	(0.0)	1	(3.0)	
More than 2 hours	0	(0.0)	2	(12.5)	2	(6.1)	
Smartphone							0.462
None	9	(52.9)	6	(37.5)	15	(45.5)	
Less than 30 minutes	4	(23.5)	4	(25.0)	8	(24.2)	
Between 30 minutes to 1 hour	4	(23.5)	4	(25.0)	8	(24.2)	
Between 1 hour to 2 hours	0	(0.0)	0	(0.0)	0	(0.0)	
More than 2 hours	0	(0.0)	2	(12.5)	2	(6.1)	
<b>Public holiday (for children attending nursery and/or daycare only)</b>	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>	<b>P = value</b>
Television							0.290
None	2	(11.8)	1	(6.3)	3	(9.1)	
Less than 30 minutes	6	(35.3)	2	(12.5)	8	(24.2)	
Between 30 minutes to 1 hour	3	(17.6)	3	(18.8)	6	(18.2)	
Between 1 hour to 2 hours	1	(5.9)	5	(31.3)	6	(18.2)	
More than 2 hours	5	(29.4)	5	(31.3)	10	(30.3)	
Computer/Laptop							0.512
None	14	(82.4)	14	(87.5)	28	(84.9)	
Less than 30 minutes	1	(5.9)	0	(0.0)	1	(3.0)	
Between 30 minutes to 1 hour	1	(5.9)	0	(0.0)	1	(3.0)	
Between 1 hour to 2 hours	0	(0.0)	0	(0.0)	0	(0.0)	
More than 2 hours	1	(5.9)	2	(12.5)	3	(9.1)	
Tablet Device							0.480
None	12	(70.6)	10	(62.5)	22	(66.6)	
Less than 30 minutes	3	(17.6)	1	(6.3)	4	(12.1)	

n = Frequency % = Percentage <sup>a</sup> Fisher's exact test

	<b>&lt; 2 years old</b>		<b>3–4 years old</b>		<b>Total</b>		
	<b>(n = 17)</b>		<b>(n = 16)</b>				
Between 30 minutes to 1 hour	1	(5.9)	1	(6.3)	2	(6.1)	
Between 1 hour to 2 hours	1	(5.9)	2	(12.5)	3	(9.1)	
More than 2 hours	0	(0.0)	2	(12.5)	2	(6.1)	
Smartphone							0.178
None	11	(64.7)	4	(25.0)	15	(45.4)	
Less than 30 minutes	2	(11.8)	3	(31.3)	5	(15.2)	
Between 30 minutes to 1 hour	3	(17.6)	5	(31.3)	8	(24.2)	
Between 1 hour to 2 hours	1	(5.9)	2	(12.5)	3	(9.1)	
More than 2 hours	0	(0.0)	2	(12.5)	2	(6.1)	
	<b>&gt; 2 years old</b>		<b>3–4 years old</b>		<b>Total</b>		
	<b>(n = 105)</b>		<b>(n = 56)</b>				
<b>Weekdays and weekends (for children not attending nursery and/or daycare only)</b>	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>	<b>P = value</b>
Television							0.094
None	21	(20.0)	6	(10.7)	27	(16.8)	
Less than 30 minutes	30	(28.6)	12	(21.4)	42	(26.1)	
Between 30 minutes to 1 hour	24	(22.9)	15	(26.8)	39	(24.2)	
Between 1 hour to 2 hours	15	(14.3)	17	(30.4)	32	(19.9)	
More than 2 hours	15	(14.3)	6	(10.7)	21	(13.0)	
Computer/Laptop							0.703
None	93	(88.6)	52	(92.9)	145	(90.1)	
Less than 30 minutes	7	(6.7)	3	(5.4)	10	(6.2)	
Between 30 minutes to 1 hour	2	(1.9)	0	(0.0)	2	(1.2)	
Between 1 hour to 2 hours	0	(0.0)	0	(0.0)	0	(0.0)	
More than 2 hours	3	(2.9)	1	(1.8)	4	(2.5)	
Tablet Device							<b>0.037</b>
None	83	(79.0)	35	(62.5)	118	(73.3)	
Less than 30 minutes	9	(8.6)	3	(5.4)	12	(7.5)	
Between 30 minutes to 1 hour	7	(6.7)	12	(21.4)	19	(11.8)	
Between 1 hour to 2 hours	3	(2.9)	2	(3.6)	5	(3.1)	
More than 2 hours	3	(2.9)	4	(7.1)	7	(4.3)	
Smartphone							<b>&lt; 0.001</b>
None	57	(54.3)	17	(30.4)	74	(46.0)	
Less than 30 minutes	27	(25.7)	9	(16.1)	36	(22.4)	

n = Frequency % = Percentage <sup>a</sup> Fisher's exact test

	< 2 years old (n = 17)		3–4 years old (n = 16)		Total	
Between 30 minutes to 1 hour	12	(11.4)	15	(26.8)	27	(16.8)
Between 1 hour to 2 hours	3	(2.9)	11	(19.6)	14	(8.7)
More than 2 hours	6	(5.7)	4	(7.1)	10	(6.2)
<b>Content type</b>					<b>n</b>	<b>(%)</b>
Interactive					104	(50.0)
Educational					45	(21.6)
Passive					41	(19.7)
Others					18	(8.7)
n = Frequency % = Percentage <sup>a</sup> Fisher's exact test						

For children not attending the nursery and/or daycare service, there is a significant association observed between the age of children and their total screen time spent on a tablet device ( $p = 0.037$ ) and smartphones ( $p = < 0.001$ ). No other significant differences were detected. Furthermore, interactive form of screen time was the common content type of screen-based activities mostly spent by the children (50%) compared to educational (21.6%) and passive (19.7%) forms of screen time content.

Table 3 illustrates the parents' knowledge, attitude and practice based on their scoring of 'correct' and 'agree' only. Analysis revealed that there is no significant difference between parents and knowledge but it was observed that both parents have poor overall scores of < 50% on knowledge of screen time. For attitudes, there is a significant association found between parents and attitudes. It was observed that both mother and father significantly agreed to have the responsibility of controlling their children's screen time and the appropriateness of the activity ( $p = 0.035$ ) and that children's use of screen time interferes with family quality time ( $p = 0.030$ ). Next, both parents generally score higher on practice and there is a significant association found between parents with practice ( $p = 0.008$ ). It was observed that both mother (84.5%) and father (80%) significantly practiced the idea of taking over their children's screen-based devices at home when they play or have social activities.

Table 3  
Parents' knowledge, attitude and practice based on 'correct' and 'agree' scores.

	Mother (n = 103)		Father (n = 10)		Total (n = 113)		
Knowledge (correct only)	n	(%)	n	(%)	n	(%)	P = value
Q1	37	(35.9)	1	(10.0)	38	(33.6)	0.098
Q2	41	(39.8)	3	(30.0)	44	(39.0)	0.158
Q3	17	(16.5)	1	(10.0)	18	(15.9)	0.390
Q4	15	(14.6)	1	(10.0)	16	(14.2)	0.924
Q5	29	(28.2)	4	(40.0)	33	(29.2)	0.672
Q6	49	(47.6)	3	(3.0)	52	(46.0)	0.199
Attitude (Agree only)	n	(%)	n	(%)	n	(%)	P = value
Q1	94	(91.2)	8	(80.0)	102	(90.3)	<b>0.035</b>
Q2	8	(7.8)	2	(20.0)	10	(8.6)	0.424
Q3	44	(42.7)	2	(20.0)	46	(40.7)	0.272
Q4	41	(39.8)	5	(50.0)	46	(40.7)	0.821
Q5	31	(30.1)	4	(40.0)	35	(31.0)	0.070
Q6	71	(68.9)	7	(70.0)	78	(69.0)	0.176
Q7	69	(70.0)	5	(50.0)	74	(65.5)	<b>0.030</b>
Q8	64	(62.1)	5	(50.0)	69	(61.1)	0.322
Practice (Agree only)	n	(%)	n	(%)	n	(%)	P = value
Q1	86	(83.5)	8	(80.0)	94	(83.1)	0.872
Q2	87	(84.5)	8	(80.0)	95	(84.1)	<b>0.008</b>
Q3	77	(74.8)	7	(70.0)	84	(74.3)	0.668
Q4	41	(39.8)	5	(50.0)	46	(40.7)	0.715
Q5	77	(74.8)	9	(90.0)	86	(76.1)	0.537
Q6	34	(33.0)	5	(50.0)	39	(34.5)	0.534
Q7	64	(62.1)	8	(80.0)	72	(63.7)	0.481
n = Frequency % = Percentage <sup>a</sup> Fisher's exact test							
Knowledge							
Q1 Increased in children's screen time likely to decrease their effort in physical activity.							
Q2 Children's sleep pattern and quality can be disrupted by increased in their screen time.							
Q3 Increased children's screen time may increase risk of the children being overweight/obesity							
Q4 Increased children screen time more likely to increase consumption of soft drinks and snacks							
Q5 Children that spend more screen time are at risk of emotional, mental and behavioral problems							
Q6 Uncontrolled children's screen time can lead to addiction to the devices							
Attitude							
Q1 I have the responsibility to control out child(ren)'s screen time by paying close attention on the appropriateness of the screen time activities.							

	Mother (n = 103)	Father (n = 10)	Total (n = 113)
Q2 I should not be concerned about our child(ren)'s screen time and they can engage for as long as they want			
Q3 It is challenging to manage our child(ren)'s screen time when there is a lot of screen-based devices available in our household.			
Q4 It is difficult to constantly supervise our child(ren)'s screen time activity when there is increase household and/or work demand.			
Q5 I would not consider my child(ren)'s level of screen time to be a serious matter if he/she/they is/are active, healthy and well-behaved.			
Q6 I am aware that our child(ren) engagement with screen time is influenced by our use of screen-based devices and/or by others (e.g. siblings and/or friends).			
Q7 I observed that our child(ren)'s use of screen device interferes with our family quality time.			
Q8 I am concerned about our children unhealthy food intake when engaging in screen-based activity.			
Practice			
Q1 I encourage my child(ren) to play with toys or talk face-to-face rather than spending time every waking hour, using mobile phone, watching TV/video, and on laptop.			
Q2 I ensure that I take away my child(ren) screen-based devices at home when they play or have social activities.			
Q3 I try to limit or not use screen-based devices whenever I am with my child(ren).			
Q4 I give screen-based devices to my child(ren) to keep them temporarily occupied and be quiet especially in time when I am busy and when he/she get fussy or moody.			
Q5 I usually stop my child(ren)'s screen time at least an hour before bedtime to get him/her fall asleep			
Q6 I offer screen-time to my child(ren) as a reward for good behavior and removing it as a punishment for bad behavior.			
Q7 I do not allow my child(ren) to have any kinds of screen-based devices during family time (e.g. meal time) or in his/her/their bedroom.			

Table 4 demonstrates the association between parent's knowledge and practice based on 'correct' and 'agree' scores with demographic factors, primarily focusing on parent's income and their total number of children. Analysis revealed that there is no significant difference between parents and practice, thus it will not be reported in our findings. First, the analysis revealed that there is a significant association between the income of < 2000 and parent's knowledge on screen-time associated sleep problems (Q2,  $p = 0.033$ ), screen-time associated emotional, mental and behavioral problems (Q5,  $p = 0.038$ ) and screen time addiction (Q6,  $p = 0.042$ ) than those who have an income of > 2001. Additionally, parents of having at least 2 children had significant knowledge on associated emotional, mental and behavioral problems (Q5,  $p = 0.014$ ) than those having less or more than 2 children. Furthermore, there is a significant association between parent's attitude (Q4) and income as well as the total number of children reported in the analysis, whereby it was observed that parents with an income between 1000 to 3000 ( $p = 0.009$ ) and having at least 2 children ( $p = 0.037$ ) were found to significantly give screen-based devices to their children to keep them temporarily occupied in time of a busy hour or when their children get fussy or moody. No significant differences were detected in other factors.

Table 4  
Factors associated with parent's knowledge, attitude and practice scores (n = 119)

	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8	
Knowledge (correct only)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
<b>Income</b>																
0-500	11	(29.0)	14	(31.8)	5	(27.7)	2	(12.5)	9	(27.3)	17	(32.7)				
501-1000	9	(23.6)	10	(22.7)	3	(16.7)	3	(18.7)	8	(24.2)	11	(21.1)				
1001-2000	8	(21.0)	9	(20.4)	5	(27.7)	5	(31.3)	9	(27.3)	10	(19.2)				
2001-3000	2	(5.3)	3	(6.8)	1	(5.6)	1	(6.3)	1	(3.0)	3	(5.8)				
3001-4000	2	(5.3)	2	(4.6)	1	(5.6)	2	(12.5)	1	(3.0)	3	(5.8)				
4001-5000	2	(5.3)	2	(4.6)	1	(5.6)	0	(0.0)	2	(6.1)	3	(5.8)				
More than 5000	4	(10.5)	4	(9.1)	2	(11.1)	3	(18.7)	3	(9.1)	5	(9.6)				
P = value	0.070		<b>0.033</b>		0.310		0.174		<b>0.038</b>		<b>0.043</b>					
<b>No. of children &lt; 4 years of age</b>																
1	8	(20.0)	15	(37.5)	5	(12.5)	4	(10.0)	8	(20.0)	16	(40.0)				
2	28	(70.0)	23	(57.5)	24	(60.0)	27	(67.5)	24	(60.0)	22	(55.0)				
3	4	(10.0)	2	(5.0)	11	(27.5)	9	(22.5)	8	(20.0)	2	(5.0)				
P = value	0.150		0.353		0.421		0.476		<b>0.014</b>		0.422					
<b>Attitude (agree only)</b>																
<b>Income</b>																
0-500	21	(20.5)	2	(20.0)	10	(21.7)	5	(10.9)	6	(17.1)	18	(23.1)	16	(21.6)	17	(24.6)
501-1000	21	(20.5)	1	(10.0)	7	(15.2)	6	(13.0)	10	(28.6)	15	(19.2)	14	(18.9)	16	(23.2)
1001-2000	25	(24.5)	4	(40.0)	11	(23.9)	11	(23.9)	10	(28.6)	17	(21.8)	18	(24.3)	13	(18.8)
2001-3000	14	(13.7)	1	(10.0)	10	(21.7)	11	(23.9)	2	(5.7)	10	(12.8)	12	(16.2)	9	(13.0)
3001-4000	7	(6.6)	0	(0.0)	3	(6.5)	4	(8.7)	1	(2.9)	5	(6.4)	4	(5.4)	3	(4.4)
4001-5000	7	(6.6)	1	(0.0)	2	(4.4)	6	(13.0)	3	(8.6)	7	(9.0)	5	(6.8)	6	(8.7)
More than 5000	7	(6.6)	1	(10.0)	3	(6.5)	3	(6.5)	3	(8.6)	6	(7.7)	5	(6.8)	5	(7.3)
P = value	0.642		0.497		0.303		<b>0.009</b>		0.227		0.440		0.596		0.285	

n = Frequency % = Percentage <sup>a</sup> Fisher's exact test

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
<b>No. of children &lt; 4 years of age</b>								
1	32 (31.4)	1 (10.0)	12 (26.1)	10 (21.7)	13 (37.1)	27 (34.6)	24 (32.4)	21 (30.4)
2	62 (60.8)	8 (80.0)	29 (63.0)	30 (65.2)	20 (57.1)	44 (56.4)	43 (58.1)	41 (59.4)
3	8 (7.8)	1 (10.0)	5 (10.9)	6 (13.0)	2 (5.7)	7 (9.0)	7 (9.5)	7 (10.1)
P = value	0.082	0.137	0.188	<b>0.037</b>	0.590	0.675	0.415	0.361
n = Frequency % = Percentage <sup>a</sup> Fisher's exact test								

## Discussion

The findings indicated that all parents have television at their home and watching television was the most commonly used sedentary screen-based activity among the children with smartphones being the second regardless of whether they are attending the nursery and/or daycare service or not. This finding supported earlier research conducted in Korea, whereby television and smartphones are the most popular devices among the children sample [17]. This shows that despite the growing technological advancement whereby devices with screens become more sophisticated and accessible, television remained an important medium in the family time since its introduction in the 1950s [18] which could potentially explain the reported finding. Children's sedentary television viewing can be an outcome of co-viewing with their parents due to its perceived benefits as an educational medium and early learning [19]. However, the finding obtained showed that 50% of children are exposed to an interactive form of screen time content compared to educational (21.6%) and passive (19.7%), this shows that the concept of giving screen time is leaning more towards recreational basis rather than learning. In Brunei, it has become a culture seen in parents' ways of parenting to give screen time to their children as a source of entertainment or distraction tool, which was on par with the finding in our study whereby 40.7% of parents practiced the idea of giving screen-based devices to keep their children temporarily occupied when they are busy or when the children get fussy or moody. Parent's screen time behavior can be a potential causal factor contributing to the children's television viewing as 69% of the parents reported that they are aware that their use of screen-based devices influenced their children sedentary screen time behavior which supported earlier research stating that children learned the behavior of their parents' use of screen-based devices as an indicative sign that encourages them to maximally fulfill their screen time as means of personal interest just like their parents [3]. However, we are unable to confirm this assumption as information on the nature of parents' screen time behavior is not available. Hence, this finding should be served as a baseline to further expand current findings targeting the association between parent's screen time and children's level of screen time, thus, contributing to existing literature.

Secondly, our findings reported that 70.6% of children aged < 2 years old spent more time watching television (between < 30 minutes to > 2 hours) during nursery and/or daycare day as well as during non-nursery and/or daycare day and on public holiday of 82.3% and 88.2% respectively. Our study also reported that 47% of children aged < 2 years old spent more time on a smartphone of < 1 hour during non-nursery and/or daycare day compared to nursery and/or daycare day of only 23.6%. Also, 18.8%, 43.8% and 62.6% of children aged 3 to 4 years old are found to engage in television viewing of > 1 hour during nursery and/or daycare day, non-nursery and/or daycare day and public holiday respectively. To compare these findings with the recommended guidelines for time spent on screen as according to WHO stating that children aged 2 to 4 years should have < 1 hour of screen time/day while limiting screen time to not recommended for infants below two years of age, it can be concluded that the most children in our study have exceeded the advised screen time recommendation [1]. This finding is consistent with other researches whereby 60.8% of children of 1.5 years old had screen time < 2 hours daily, with about 40% of it had > 2 hours spent on screen time/day [20]. Additionally, 96.1% of 259 infants samples were exposed as early as the age of 6 months with a mean total screen time of 152.7 minutes/day. Furthermore, a study conducted in Thailand found that 68% of the 200 pre-school children had screen time spent > 1 hour/day whilst 28% of them had screen time spent > 2 hours/day [21]. The parents' level of knowledge on screen may help to understand these findings. Despite the majority of parents significantly aware of the responsibility in controlling their children's screen time and its appropriateness ( $p = 0.035$ ) and believe that children's use of screen time interferes with their family quality time ( $p = 0.030$ ) which further constitutes their practice on taking over their screen-based devices when they play or have social activities ( $p = 0.008$ ) shows that they are aware of the importance of limiting their children's screen time, however, the reported low rate on the level of knowledge (< 50%) on screen time remains concerning given the association of screen time with other medical, emotional and behavioral risks it imposes and may explain the greater prevalence of excess screen time reported in findings. For children not attending the nursery and/or daycare service, there is a significant association observed between the age of children (aged < 2 years

and 3 to 4 years) and their total screen time spent on a tablet device ( $p = 0.037$ ) and very strong association on smartphones ( $p = < 0.001$ ). This shows that children as young as  $< 2$  years old have access to smartphones and tablet devices which in line with our finding whereby all the parents reported having smartphones. This is consistent with other earlier study conducted in Philadelphia, whereby out of the sample of families having children  $< 4$  years old being investigated, 83% owned a tablet device, 77% owned a smartphone and almost all of the children (96.6%) had used these devices even before turning 1 year old [22]. This clearly indicates that touch devices use is getting more prevalent among the children in Brunei.

Interestingly, our findings observed notable increments in children total screen time of both aged groups during nursery and/or daycare day/weekdays, non-nursery and/or daycare day/weekends and on public holiday and we postulated that every additional hour of free time is associated with an increase in screen time spent on screen-based devices. This is congruent with other research stating that pre-school children spent more time on weekends on average of less than 1 hour whereas children on weekends spent an average of more than 78 minutes [23]. A study conducted by Korea also reported that 39% of the children sample involved in sedentary behavior of watching television almost on daily basis and it is during weekends that the children watched television of  $> 1$  hour [17].

Lastly, a statistically significant association is observed between parents' socioeconomic status (income  $< 2000$ ) and their knowledge on screen time-associated sleep problems ( $p = 0.033$ ), emotional, mental and behavioral problems ( $p = 0.038$ ) and screen time addiction ( $p = 0.042$ ). This association is noteworthy as it may reflect that the lower the household income, increases the children sedentary screen time. This assumption is consistent with the earliest researches done which reported that excessive screen time is more prevalent among low-income children rather than high-income children [24,25,26]. Additionally, parents of 2 children were found to have statistically significant knowledge on emotional, mental and behavioral risks of screen time ( $p = 0.014$ ) and to the best of the author's knowledge, this area of association has not been studied previously. Moreover, a significant association between parent's income between 1000 to 3000 ( $p = 0.009$ ), having at least 2 children ( $p = 0.037$ ) with an attitude of parents giving screen time to their children to keep them temporarily occupied in time of busy hour were noted in the finding. This could reflect the idea of increasing workload and increase responsibility in childcare significantly contributes to increasing time spent on screen. However, the association between socioeconomic status, having siblings and total sedentary screen time is not well characterized as there are studies identified that they found no significant and/or unclear association [27,28]. Therefore, further investigation is warranted to explore the role of socioeconomic status and the presence of siblings on children's sedentary screen time to help in future interventions.

## Implications For Future Practice

The prevalence of excessive screen time has become a concerning problem worldwide and findings suggest that majority of the children aged  $< 4$  years old in Brunei also exceeds the minimum requirement of screen time which requires immediate attention. The incidence of poor screen time knowledge among parents also calls for intervention strategies. These findings should serve as a baseline to provide ground discussion for collaboration between professional health care practitioners and possibly coordinated school health committees to liaise in promoting healthy screen time behavior at every healthcare facilities and at school that accommodates service to children and/or the parents in guiding and education the importance of practicing screen time behavior in moderation. Evidence of health risks impact of screen time faced by the children in Brunei is lacking, thus, more prospective studies in the future, are warranted to bring substantial benefits to the community in providing evidence for health education and consultations necessary to support the child's overall health and well-being. Moreover, whether parent's media use, the influence of socioeconomic factors and the presence of siblings have a significant relationship with a child's sedentary screen time should be investigated.

## Limitations

Their present study possesses several limitations. One of which is the minimum sample size calculated using power calculation was not achieved and the results could inherit type 2 errors, which reduce the power of the study and affect the generalizability of our findings [29]. The external generalizability of these findings is potentially restricted to children age  $< 4$  years old only and not beyond. The parent-reported nature of the questionnaire could be subjected to response bias which may not provide an accurate overall representation of important variables due to the fact of the possibility of inaccurate and misclassification of information [30]. Next, our study was cross-sectional, which does not allow drawings of conclusions on the causal relationship of the association [31], thus, the direction of this relationship should be tested further in longitudinal study.

## Conclusion

To summarize, the parents' attitude and practice of screen time spent by their children are generally positive, however, the health knowledge level is poor which emphasized the need for improvement. It is suggested from the evidence that the majority of the children studied significantly spent more time on television, exceeding the recommended guidelines on screen time behavior which correlates with the trend worldwide. Further developing understanding through monitoring prospective studies on the association of parental media use, socioeconomic factor and presence of siblings for their effect on children's sedentary screen time could provide insight into strategies emphasizing healthy screen time behavior and improving parental efficacy.

## Declarations

### Funding:

Not applicable

### Conflicts of interest/Competing interests:

None.

## Ethics Approval

Granted by the Joint Research Ethics Committee of Pengiran Anak Puteri Rashidah Sa'adatul Bolkliah IHSREC, MHREC of Brunei's Ministry of Health and the University Research Ethics Committee (UREC) of the University of Brunei Darussalam on 14th September 2020 (UBD/PAPRSBIIHSREC/2020/56). The study protocol is performed in accordance with the relevant guidelines. Written informed consent has been obtained prior to participations. Consent for publication: All authors agree for publication of this manuscript.

## Availability of data and material

The datasets generated and/or analysed during the current study are not publicly available due to ownership of data belonging to the institution but are available from the corresponding author on reasonable request.

## Authors' contributions:

All authors contributed to the study's conception and design. Material preparation and data collection were performed by NFAA, KHAM, MM. Additionally, KYAY and LLSW also contributed towards data collection only. Data analysis was computed by NFAA and HAR. The first draft of the manuscript was written by Nur Fatin-Aqilah Arippin and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

## Acknowledgement:

The authors would like to thank the nurses involved as gatekeepers and participants for their contributions and exceptional support to the research.

## References

1. Ansari, M. (2019). WHO guidelines on physical activity, sedentary behaviour and sleep for children under 5 years of age. Geneva: World Health Organization; 2019. Licence: CC BY-NC-SA 3.0 IGO.
2. Bennetts, S. K., Mensah, F. K., Westrupp, E. M., Hackworth, N. J., & Reilly, S. (2016). The Agreement between Parent-Reported and Directly Measured Child Language and Parenting Behaviors. *Frontiers in Psychology*, 7, 1710. <https://doi.org/10.3389/fpsyg.2016.01710>
3. Canadian Paediatric Society. (2017). Screen time and young children: Promoting health and development in a digital world. *Paediatrics & child health*, 22(8), 461–477. <https://doi.org/10.1093/pch/pxx123>

4. Carson, V., Spence, J. C., Cutumisu, N., & Cargill, L. (2010). Association between neighborhood socioeconomic status and screen time among pre-school children: a cross-sectional study. *BMC Public Health*, 10, 367. <https://doi.org/10.1186/1471-2458-10-367>
5. Case, L. D., & Ambrosius, W. T. (2007). Power and sample size. *Methods in molecular biology* (Clifton, N.J.), 404, 377–408. [https://doi.org/10.1007/978-1-59745-530-5\\_19](https://doi.org/10.1007/978-1-59745-530-5_19)
- Arango, C. M., Páez, D. C., Lema, L., Sarmiento, O. L., & Parra, D. C. (2014). Television viewing and its association with health-related quality of life in school-age children from Montería, Colombia. *Journal of Exercise Science and Fitness*, 12(2), 68–72. <https://doi.org/10.1016/j.jesf.2014.07.002>
6. Chandra, M., Jalaludin, B., Woolfenden, S., Descallar, J., Nicholls, L., Dissanayake, C., Williams, K., Murphy, E., Walter, A., Eastwood, J., Eapen, V., & Watch Me Grow Study Group (2016). Screen time of infants in Sydney, Australia: a birth cohort study. *BMJ open*, 6(10), e012342. <https://doi.org/10.1136/bmjopen-2016-012342>
7. Chang, H. Y., Park, E. J., Yoo, H. J., Lee, J. W., & Shin, Y. (2018). Electronic Media Exposure and Use among Toddlers. *Psychiatry investigation*, 15(6), 568–573. <https://doi.org/10.30773/pi.2017.11.30.2>
8. Duch, H., Fisher, E. M., Ensari, I., & Harrington, A. (2013). Screen time use in children under 3 years old: a systematic review of correlates. *The International Journal of Behavioral Nutrition and Physical Activity*, 10, 102. <https://doi.org/10.1186/1479-5868-10-102>
9. Fletcher, E. N., Whitaker, R. C., Marino, A. J., & Anderson, S. E. (2014). Screen Time at Home and School among Low-Income Children Attending Head Start. *Child Indicators Research*, 7(2), 421–436. <https://doi.org/10.1007/s12187-013-9212-8>
10. Garmy, P., Clausson, E. K., Nyberg, P., & Jakobsson, U. (2018). Insufficient Sleep Is Associated with Obesity and Excessive Screen Time Amongst Ten-Year-Old Children in Sweden. *Journal of Pediatric Nursing*, 39, e1–e5. <https://doi.org/10.1016/j.pedn.2017.11.009>
11. Greever, C. J., Ahmadi, M., Sirard, J., & Alhassan, S. (2017). Associations among physical activity, screen time, and sleep in low socioeconomic status urban girls. *Preventive Medicine Reports*, 5, 275–278. <https://doi.org/10.1016/j.pmedr.2017.01.014>
12. Guerrero, M. D., Barnes, J. D., Chaput, J. P., & Tremblay, M. S. (2019). Screen time and problem behaviors in children: Exploring the mediating role of sleep duration. *International Journal of Behavioral Nutrition and Physical Activity*, 16(1). <https://doi.org/10.1186/s12966-019-0862-x>
13. Hale, L., Kirschen, G. W., LeBourgeois, M. K., Gradisar, M., Garrison, M. M., Montgomery-Downs, H., Kirschen, H., McHale, S. M., Chang, A. M., & Buxton, O. M. (2018). Youth Screen Media Habits and Sleep: Sleep-Friendly Screen Behavior Recommendations for Clinicians, Educators, and Parents. *Child and adolescent psychiatric clinics of North America*, 27(2), 229–245. <https://doi.org/10.1016/j.chc.2017.11.014>
14. Hawi, N. S., & Rupert, M. S. (2015). Impact of e-Discipline on Children's Screen Time. *Cyberpsychology, Behavior and Social Networking*, 18(6), 337–342. <https://doi.org/10.1089/cyber.2014.0608>
15. Hinkley, T., Salmon, J., Okely, A. D., & Trost, S. G. (2010). Correlates of sedentary behaviours in preschool children: a review. *The international journal of behavioral nutrition and physical activity*, 7, 66. <https://doi.org/10.1186/1479-5868-7-66>
16. Hirsh-Pasek, K., Zosh, J. M., Golinkoff, R. M., Gray, J. H., Robb, M. B., & Kaufman, J. (2015). Putting education in "educational" apps: lessons from the science of learning. *Psychological science in the public interest: a journal of the American Psychological Society*, 16(1), 3–34. <https://doi.org/10.1177/1529100615569721>
17. Lissak, G. (2018). Adverse physiological and psychological effects of screen time on children and adolescents: Literature review and case study. *Environmental Research*, 164, 149–157. <https://doi.org/10.1016/j.envres.2018.01.015>
18. Parent, J., Sanders, W., & Forehand, R. (2016). Youth Screen Time and Behavioral Health Problems: The Role of Sleep Duration and Disturbances. *Journal of Developmental and Behavioral Pediatrics: JDBP*, 37(4), 277–284. <https://doi.org/10.1097/DBP.0000000000000272>
19. Poulain, T., Ludwig, J., Hiemisch, A., Hilbert, A., & Kiess, W. (2019). Media use of mothers, media use of children, and parent–child interaction are related to behavioral difficulties and strengths of children. *International Journal of Environmental Research and Public Health*, 16(23). <https://doi.org/10.3390/ijerph16234651>
20. Robinson, T. N., Banda, J. A., Hale, L., Lu, A. S., Fleming-Milici, F., Calvert, S. L., & Wartella, E. (2017). Screen media exposure and obesity in children and adolescents. *Pediatrics*, 140, S97–S101. <https://doi.org/10.1542/peds.2016-1758K>
21. Sigmundová, D., Sigmund, E., Badura, P., Vokáčová, J., Trhlíková, L., & Bucksch, J. (2016). Weekday-weekend patterns of physical activity and screen time in parents and their pre-schoolers. *BMC Public Health*, 16 (1), 898. doi: 10.1186 / s12889-016-3586-8
22. Solomon-Moore, E., Matthews, J., Reid, T., Toumpakari, Z., Sebire, S. J., Thompson, J. L., ... Jago, R. (2018). Examining the challenges posed to parents by the contemporary screen environments of children: a qualitative investigation. *BMC Pediatrics*, 18(1), 129. <https://doi.org/10.1186/s12887-018-1106-y>

23. Song, Y., Li, L., Xu, Y., Pan, G., Tao, F., & Ren, L. (2020). Associations between screen time, negative life events, and emotional and behavioral problems among Chinese children and adolescents. *Journal of affective disorders*, 264, 506–512. <https://doi.org/10.1016/j.jad.2019.11.082>
24. Suchert, V., Hanewinkel, R., & Isensee, B. (2015). Sedentary behavior and indicators of mental health in school-aged children and adolescents: A systematic review. *Preventive Medicine*. Academic Press Inc. <https://doi.org/10.1016/j.ypmed.2015.03.026>
25. Tambalis, K. D., Panagiotakos, D. B., Psarra, G., & Sidossis, L. S. (2018). Insufficient sleep duration is associated with dietary habits, screen time, and obesity in children. *Journal of Clinical Sleep Medicine*, 14(10), 1689–1696. <https://doi.org/10.5664/jcsm.7374>
26. Tandon, P. S., Zhou, C., Lozano, P., & Christakis, D. A. (2011). Preschoolers' total daily screen time at home and by type of child care. *The Journal of pediatrics*, 158(2), 297–300. <https://doi.org/10.1016/j.jpeds.2010.08.005>
27. Tansriratanawong, S., Louthrenoo, O., Chonchaiya, W., & Charmsil, C. (2017). Screen viewing time and externalizing problems in pre-school children in Northern Thailand. *Journal of child and adolescent mental health*, 29(3), 245–252. <https://doi.org/10.2989/17280583.2017.1409226>
28. Twenge, J. M., & Campbell, W. K. (2018). Associations between screen time and lower psychological well-being among children and adolescents: Evidence from a population-based study. *Preventive medicine reports*, 12, 271–283.
29. Twenge, J. M., Hisler, G. C., & Krizan, Z. (2019). Associations between screen time and sleep duration are primarily driven by portable electronic devices: Evidence from a population-based study of US children ages 0–17. *Sleep medicine*, 56, 211–218.
30. Vittrup, B. (2009). What US parents don't know about their children's television use: discrepancies between parents' and children's reports. *Journal of Children and Media*, 3(1), 51–67.
31. Wang, X., & Cheng, Z. (2020). Cross-Sectional Studies: Strengths, Weaknesses, and Recommendations. *CHEST*, 158(1), S65–S71.