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Article

Risk Factors of Smartphone Addiction on Pre-School Children in Indonesia: Path Analysis

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A B S T R A C T

Generally, parents have introduced smartphones as their children's learning facility, whereas children are groups of high risk for addiction. This study aims to analyze the risk factors of smartphone addiction on pre-school children. A cross-sectional study was conducted on 1392 mothers with children aged 3-6 years. The data were collected by using a questionnaire. The data were analyzed bivariate with chi-square by IBM SPSS 22 software and multivariate with path analysis by IBM STATA 13 software. The directly factors which make children addicted to smartphone are mother's age (b= 2.12; CI 95%= 1.68–2.69; p= 0.000), mother's occupation (b= 1.69; CI 95%= 1.35–2.12; p= 0.000), parents' control (OR= 1.93; 95% CI= 1.55 to 2.40; p= 0.000), and smartphones ownership by children (OR= 1.69; 95% CI= 1.31 to 2.17; p= 0.000). Mother's education, rules of smartphone usage in the family and rules of smartphone usage at school affects on children addicted to smartphone indirectly. There is a direct effect of mother's age, mother's occupation, parents' control on the smartphone usage and smartphones child's personal smartphone to the risk of smartphone addiction to pre-school children. Meanwhile, there is an indirect effect on a mother's education, rules of smartphone usage in the family, and school effects to the risk of smartphone addiction to pre-school children.

I. INTRODUCTION

Alpha generations are children born after 2010. They are generations who are born and grow up when information technology is developing rapidly, including in Indonesia. Alpha generation are familiar with smartphone and internet. They tend to use smartphone and the internet in daily life in early childhood.

The existence of information technology that rapidly develops can offer various facilities. Parents have introduced a smartphone as a learning tool for children[1]. Alpha generation is estimated to be smarter than the previous generations.

However, besides the sophistication and ease in accessing information through smartphones, there is a danger that can affect children in the alpha generation. Children aged 3-6 years are generally very interested in moving and sounding images like those displayed on smartphones, so the possibility of children becoming addicted to using smartphones continuously becomes greater.

Smartphone addiction is a phenomenon related to the uncontrolled use of smartphones[2]People experience social,psychological, and health problems[2]. Smartphone addiction on children can cause fatigue, sleep disturbance, impaired vision and hearing, disruption of the children's relationship with parents, and can even be fatal. It is possible to create a developmental disorder and depression on the children[3–7].

In the world, smartphones were used by 1.85 billion people in 2014. This number was estimated to be 2.32 billion in 2017 and 2.87 billion in 2020[8]. The data obtained based on a survey from the Indonesian Internet Service Provider Association (APJII) in 2018 explained that from 264.16 million Indonesians, there were 171.17 million people using smartphones. This means that 64.8% of Indonesians aged five years and over had used the smartphone[9].

There is no data percentage on smartphone addictions in children in Indonesia. Dr.Tjhin Wiguna, child and adolescent psychiatrist at the Department of Mental Health Services, FKUI RSCM stated that the phenomenon of smartphone addiction on children began to increase in the last three years. The number of parents who came to ask for a smartphone addiction consultation to a child protection agency or bring their child to a psychologist and psychiatrist also increased. The Child Protection Institution handled 17 cases of smartphone addiction in 2003 while the National Commission for Child Protection handled 42 cases of children addicted to smartphones[9].

Especially, children are a high-risk group for smartphone addiction. Children are interested in new technology and can operate such devices easier than adults. Moreover, if they are given smartphones at an early age without control from parents, this will create one of the high-risk factors of smartphone addiction in pre-school children. In addition to family factors, several other factors affecting smartphone addiction in children include gender, age, duration of smartphone use, use patterns, type of school, personality, and social network[10].

The rapid development of information technology currently cannot be avoided by parents. The presence of smartphones and the internet is helpful for children's learning tools, but it is also dangerous if they excessively use smartphones become addicted. Therefore, raising and educating children in the alpha generation has its challenges for parents.

II. METHODS

Study Design

This study is an analytical observational study with a cross-sectional approach. The sampling technique selected was the accidental sampling. The study was approved by The Health Research Ethics Committee STIKES Ngudia Husada Madura (No. 536/KEPK/STIKES-NHM/EC/II/2020)

Participants

After obtaining ethics approval from The Health Research Ethics Committee STIKES Ngudia Husada Madura, this study is conducted on preschool children aged 3-6 years on five large islands in Indonesia, namely Sumatra, Java, Kalimantan, Sulawesi, and Eastern Island in Indonesia. The data was collected by researchers from February to June 2020 using questionnaires. A total of 1392 mothers who had children aged 3-6 years were the subjects in this study who were selected by accidental sampling. The respondents were given an explanation of the research objectives and procedures as well as an informed concent page before filling out the questionnaire.

Tools

Socio-demographic Questionnaire: The data obtained regarding the characteristics of respondents, smartphone usage habits, parents' control of smartphone use, and school regulations about smartphone use at school were taken through demographic questionnaires. The questionnaires were self-developed and reliabilited through a pilot study using different samples from the current study with the Chonbach's Alpha of alpha 0.758 for parents control and alpha 0.753 for school regulation.

*Smartphone Addiction Scale (*SAS) : Because there is no gold standard for SAS (Smartphone Addiction Scale) for children aged 3-6 years, the researchers made their own questionnaire to categorize children addicted to smartphones or not. There are 14 questions in the questionnaire about smartphone addiction that must be filled in by mothers/caregivers who have previously tested the validity and reliability (Conbarch alpha = 0.758), if the answer is <50% then it is said to have a low risk smartphone addiction and if the answer is ≥50% then is said to have a high risk of smartphone addiction.

Procedure

This research started from our anxiety since preschoolers often use smartphones without being able to be controlled by adults, while data on smartphone addiction in children in Indonesia are difficult to find. Researchers conducted a careful literature study to explore information about smartphone addiction in pre-school children. Prior to data collection, we conducted a research ethic test. Due to the covid-19 pandemic, we collect respondent data through questionnaires that are accessed online on social media for a certain time limit. We collected data from respondents throughout Indonesia for later analysis.

Statistical Analysis

The data about the characteristics of respondents were explained using a frequency distribution. The data about mother's age, mother's education, mother's occupation, parents' control regarding smartphone use on children, child's personal smartphone, family rules on smartphone usage at home, school regulation on smartphone usage at school on their effects on the risk of smartphone addiction on pre-school children were analyzed bivariate using chi-square assisted with IBM SPSS 22 with 95% confidence interval and multivariate analysis using path analysis assisted with IBM STATA 13.

III. RESULT

Table 1 desribes the sociodemographic

of respondent. The respondents who mostly participated in this study came from Java, which is the island with the most populous population in Indonesia, as many as 373 people (26.7%). Most respondents in this study were less than 35 years old, consisting 984 mothers (70.7%) and had less than 2 children. Based on the age of the children, most of them were 6 years old, consisting 524 children (37.6%) and most of them were educated in the Kindergarten, as many as 728 children (52.3%) (Table 1).

Table 1. Socio-Demographic of Respondents

Characteristics	Category	N	%
Domicily	Sumatra Island	256	18.4
	Java Island	373	26.7
	Kalimantan Island	298	21.4
	Sulawesi Island	268	19.2
	Eastern Indonesia	197	14.3
Mother's age	< 35 years	984	70.7
	≥ 35 years	408	29.3
Number of children	< three	1072	77.0
	≥ three	320	23.0
Child's age	3 years	364	26.2
	4 years	292	21.0
	5 years	212	15.2
	6 years	524	37.6
Child's sex	Male	689	49.5
	Female	703	50.5
Child's school level	At Home	384	27.6
	Play Group	280	20.1
	Kindergarten	728	52.3
Mother's education	< Bachelor degree	333	23.9
	≥ Bachelor degree	1059	76.1
Mother's occupation	Unemployed (housewife)	544	39.1
	Employed	848	60.9
Family income*	< average income Indonesia	728	47.7
	≥ average income Indonesia	664	52.3

*Average income of Indonesian people is 59 million per year or Rp. 4.916.666 per month in 2020

Table 1 also shows that most of the mothers' education level is bachelor's degree, totaling 1059 people (76.1%). The majority of mothers work outside, consisting 848 (60.9%). While based on the amount of income, most families have income below the average income of the Indonesian population per year, which is 728 (47.7%).

Table 2 describes the usage habits of smartphones on children in Indonesia. It shows that most of children in Indonesia use smartphones at least once a day (35.3%) within 1-2 hours (38.4%). Most of children can use the internet through their parents' smartphones or through their own smartphones, as many as 820 children (58.9%). In general, most of children watched YouTube on smartphones, as many as 1181 children (84.8%).

Table-2 : Smartphone Use Behavior on Pre School Children in Indonesia, 2020

Characteristics	Category	N	%
How much child using smarphone per day?	Not every day	**584**	**41.9**
	0 – 1 times	492	35.3
	2 – 3 times	228	16.4
	4 – 5 times	44	3.2
	More than 5 times	44	3.2
How long child using smartphone per times?	15 – 30 minutes	443	31.8
	31 – 59 minutes	161	11.6
	1 – 2 hours	534	38.4
	More than 2 hours	254	18.2
Can child use internet in own or parent's smartphone?	Yes	820	58.9
	No	572	41.1
Application that are often accessed by children	Photos and videos	19	1.4
	Youtube	1181	84.8
	Games	180	12.9
	Social Media	12	0.9

Table 3 explains the descriptive analysis of the research variables. Most of respondents were young, namely 984 young mothers (70.7%). Most of mothers had high education (76.1%) and worked outside (60.9%). Based on the parents' control on the usage of children's smartphones, the majority of respondents had weak control, which is 772 (55.5%). Most of the toddlers also have a personal smartphone, which is 1016 (73.0%). The implementation of rules of smartphone usage at home is largely still not done correctly, which is as many as 1152 people (82.8%). In the school environment, most had not have rules regarding the prohibition of using smartphones, which is as much as 908 (65.2%). Most of children had a high risk of smartphone addiction, which is as much as 848 (80.9%).

Table 3. Univariate analysis on determinants of smartphone addiction on pre school children in Indonesia, 2020

Characteristics	Category	N	%
Mother's age	Young mother	984	70.7
	Old mother	408	29.3
Mother's education	Low education	333	23.9
	High education	1059	76.1
Mother's occupation	Unemployed (housewife)	544	39.1
	Employed	848	60.9
Parent's control	Low control	772	55.5
	High control	620	44.5
Child personal smartphone	Have personal smartphone	1016	73.0
	Not have personal smartphone	376	27.0
Family smartphone rules	No	1152	82.8
	Yes	240	17.2
School regulation about smartphone use	Not have regulation	908	65.2
	Have regulation	484	34.8
Smartphone addiction	High risk	848	60.9
	Low risk	544	39.1

Table 4 describes the results of bivariate analysis of the independent variables on the dependent variable using chi square. The result of the analysis shows that there is a relationship among mother's age (OR = 2.12; 95% CI = 1.68 to 2.69; p = 0.000), mother's education (OR = 1.43; 95% CI = 1.11 to 1.86; p = 0.006), mother's occupation (OR = 1.69; 95% CI = 1.35 to 2.12; p = 0.000), parents' control on the use of a children's smartphone (OR = 1.93; 95% CI = 1.55 to 2.40; p = 0.000), child's personal smartphone (OR = 1.69; 95% CI = 1.31 to 2.17; p = 0,000), rules of smartphone usage in the family (OR = 1.96; 95% CI = 1.44 to 2.68 ; p = 0.001), and regulation of smartphones usage at school (OR = 1.58; 95% CI = 1.25 to 1.98; p = 0.000) on the risk of smartphone addiction on children.

The results section is where you report the findings of your study based upon the methodology [or methodologies] you applied to gather information. The results section should simply state the findings of the research arranged in a logical sequence without bias or interpretation. A section describing results [or "findings"] is particularly necessary if your paper includes data generated from your own research.

The figure 1 shows the fit model after estimation with path analysis using the IBM SPSS STATA 13. There is a positive significantly direct effect of child's personal smartphone on the risk of smartphone addiction (b = 0.74; 95% CI = 0.46 to 1.01; p = 0.000). There is a positive significantly direct effect of parents' control on the risk of smartphone addiction (b = 0.59; 95% CI = 0.59 to 0.36; p = 0.000). There is a positive direct effect of parents'

occupation on the risk of smartphone addiction and is statistically significant (b = 0.52; 95% CI = 0.28 to 0.76; p = 0.000). There is a positive direct effect of parents' age on smartphone addiction risk and is statistically significant (b = 0.89; 95% CI = 0.63 to 1.14; p = 0.000), in detail it can be viewed in table 5.

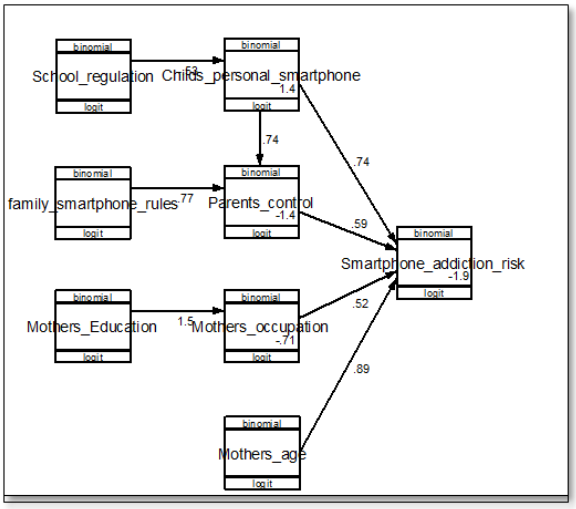

Figure 1. Path Analysis of Smartphone

Addiction on Pre School Children

Table 5 describe that there is a negative direct effect of school regulations on the child's personal smartphone and is statistically significant (b = -0.53; 95% CI = -0.80 to -0.27; p = 0.000). There is a positive direct effect of rules of smartphone usage at home on the parents' control and is statistically significant (b = 0.77; 95% CI = 0.47 to 1.07; p = 0.000). There is a positive direct effect of cchild's personal smartphone on the parents' control and is statistically significant (b = 0.74; 95% CI = 0.49 to 0.99; p = 0.000). There is a positive direct effect of mother's education on the mother's occupation and is statistically significant (b = 1.54; 95% CI = 1.27 to 1.80; p = 0.000).

Table 5. Path analysis on determinants of smartphone addiction on pre school children in Indonesia, 2020

Dependent Variable		Independent Variables	Path Coefficient	CI 95% Lower Bound	CI 95% Upper Bound	p
Direct Influence						
Smartphone addiction	←	Child personal smartphone	0.74	0.46	1.01	0.000
	←	Parents control	0.59	0.36	0.82	0.000
	←	Mother's occupation	0.52	0.28	0.76	0.000
	←	Mother's age	0.89	0.63	1.14	0.000
Indirect influence						
Child personal smartphone	←	School regulation	-0.53	-0.80	-0.27	0.000
Parents control	←	Family smartphone rules	0.77	0.47	1.07	0.000
Parents control	←	Child personal smartphone	0.74	0.49	0.99	0.000
Mothers occupation	←	Mothers education	1.54	1.27	1.80	0.000

IV. DISCUSSION

The Effect of Mother's Age on the Smartphone Addiction for Pre-school Children

The result of this study indicated that young mothers (less than 35 years old) had the most high risk of smartphone addiction for their children. Younger mothers had a 2.12 times greater risk of having children with smartphone addictions compared to older mothers. The path analysis result in this study also shows that there is a direct effect of parents' age on smartphone addiction for children. This effect is positive and statistically significant. This might happen because mothers who are younger tend to use smartphones very often in their daily life compared to older mothers. Younger mothers are generally more familiar with the use of smartphones as part of social norms. So, this might be the reason children tend to become addicted to smartphones because they often see their mothers using smartphones. Parents are role models for children, especially mothers. Several works Fischer-Grote *et al,* (2019) and Gladkaya *et al*, (2018) have described that excessive use of smartphones by mothers will cause children to be more at risk of experiencing smartphone addiction.

The Effect of Mother's Education Level on the Smartphone Addiction for Pre-school Children

The result of the path analysis indicate that there is an effect of mother's education level on the smartphone addiction for children through mother's occupation. This effect is positive and statistically significant. The lower mother's education level is, the lower chance for mothers to get a job is. Mothers who do not work or become housewives have more frequent intensity with children so that children get more opportunities to borrow the smartphone or use the internet (portable wifi hotspot) from the smartphone. This has become one of the factors increasing the risk of children addicted to smartphones.

The results of this study also show that mothers having low education have a 1.43 times greater risk of smartphone addiction for their children. Mothers having low education generally also have less knowledge of the dangers of smartphone use for prechoolers, so they tend to lack control over smartphone usage for their children. In addition, mothers with low education tend not to understand about how to apply mediation techniques in limiting the use of smartphones on children.

Some other studies also show the influence of parental education on the risk of smartphone addiction in children stating that mothers having low education have a higher risk of experiencing smartphone addiction for their children because mothers having low education will tend to approach children less and do not consistently apply mediation techniques in limiting the use of smartphones on their children[1,11].

The Effect of Mother's Occupation on the Smartphone Addiction for Pre-school Children

The results of the path analysis show that mother's occupation directly influences smartphone addiction on the children. This effect is positive and statistically significant. Unemployed mothers (housewives) are 1.69 times more likely to have children with smartphone addiction than employees. The reason stated is that mothers who only work at home (housewives) spend more time with children at home so that children have greater opportunities to use smartphones. In addition, the number of household chores can be a trigger factor for the frequent use of smartphones on children, because mothers tend to give smartphones to children so that children do not fuss when mothers do household work. This claimed as same as with Terras and

Ramsay (2016) that mothers occupation is influences of smartphone addiction on children

The Effects of Parents' Control on the Smartphone Addiction for Pre-school Children

Parents' control is a factor that directly influences smartphone addiction on the children. The result of the path analysis is positive and statistically significant. The result of this study indicates that mothers with weak control on the smartphone usage by children at home increases the risk 1.93 times which causes smartphone addiction on children compared to mothers who have high control. Mothers with weak control are often not accompanying their children when playing smartphone, letting their children play smartphone in a long duration, giving a smartphone when the children are tantrumed. The most frequent reason is that mothers give smartphones to their children in order that they can freely do household chores, or vice versa. They give smartphones in order that they can relax and rest in peace without being disturbed by their children.

Parents with weak control can make their children linger using smartphones whenever they want[6,11]. This study shows quite astonishing results, from the 1392 respondents who collected the questionnaire, most of pre-school children play smartphone once a day in 1 to 2 hours. The more often and the longer the duration of children play smartphone, the higher the risk of being addicted to a smartphone[10]. Previous study also found that paternal permissive and authoritarian parenting style were positively correlated with internet addiction level on adolescents. Parents who applied permissive parenting style with low strictness/supervision can't control their children's behavior and let them freely, so it can give impact to children become depend on others people, difficult to control impulse that attrack them, and more prone to fall into smartphone addiction[12]. Applied authoritative parenting style, increase parent-child attachment, additionally provide toys or alternative games suitables for the children's age to manage the use of smartphones in children[13].

The Child's Personal Smartphone on the Smartphone Addiction for Pre-school Children

The results of path analysis show that the child's personal smartphone directly affects on smartphone addiction. This effect is positive and statistically significant. Children who have personal smartphones are 1.69 times more likely to experience smartphone addiction than children who do not have smartphones. This might happen because having personal smartphones can make chidren free to play smartphones, especially if they can use the internet with their personal smartphone. The result of this study also shows that most of children (58.9%) could access the internet through their personal smartphones or through their parents' smartphones. Children having personal smartphones will more often use smartphones without any restrictions. The smartphone usage in these children will cause a high risk to addiction. The study by Raman et al. (2017) also said that chidren have high risk factors to addict smartphone if they have owned smartphones.

The child's personal smartphone also indirectly affects on smartphone addiction through parents' control. This effect is positive and statistically significant. This happens because parents' control over the children becomes weaker if the children have personal smartphones because they do not need to borrow parents' smartphone.

The Effect of Family Rules on the Smartphone Addiction for Pre-school Children

The result of the path analysis indicates that family regulations affect

on smartphone addiction on children through parents' control. The effect is positive and statistically significant. The rules in the family regarding the use of smartphones on children will affect parents' control in supervising their children using the smartphones3. Parents who do not apply the rules of smartphone usage to their children are 1.96 times more likely to have smartphone addiction than families who apply the rules. Children who are bound by family rules at home about everyday smartphone usage tend to be more disciplined in using smartphones by paying attention to the existing rules, while parents can control the use of a children's smartphone in accordance with the rules agreed upon together. Thus, it can reduce the risk of children becoming addicted to their smartphone. Parents can also give the information about potential danger in the internet use and share their experience using the smartphone. It can also build the good quality interaction between parents-children[15].

This is in line with a research conducted by Gladkaya et al. (2018) which stated that children aged 0-6 years would experience a higher risk of experiencing smartphone addiction if they did not have smartphone usage rules in their family environment.

The Effects of School Regulations on the Smartphone Addiction for Pre-school Children

The result of path analysis in this study indicate that there is an effect of school regulations on smartphone addiction through the child's personal smartphone. This effect is positive and statistically significant. School as children's learning area has an effect on the smartphone ownership which then affects the risk of smartphone addiction on the children. School which does not have any regulations to forbid the use of smartphones in the school environment can encourage children to ask their parents for smartphones because they often see their friends have smartphones and bring it to school. Several studies have described that the existence of school regulations that prohibit children from carrying and using smartphones in the school environment can reduce the risk of children playing smartphone at school and the requests of having a personal smartphone[11,14,16].

The purpose of the discussion is to interpret and describe the significance of your findings in light of what was already known about the research problem being investigated, and to explain any new understanding or insights about the problem after you've taken the findings into consideration. The discussion will always connect to the introduction by way of the research questions or hypotheses you posed and the literature you reviewed, but it does not simply repeat or rearrange the introduction; the discussion should always explain how your study has moved the reader's understanding of the research problem forward from where you left them at the end of the introduction.

V. CONCLUSION

Mothers with young age, mothers who do not work, weak parents' control on the children's smartphone usage, children who have personal smartphones are increase the smartphone addiction risk for pre-schoole children. Mother's education, rules of smartphones usage in the family, and regulations of smartphones usage at school have an indirect effect on the risk of smartphone addiction for pre-school children.

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CONFLICT OF INTEREST

All authors declare no conflicts of interest.

ETHICAL CONSIDERATION

This study was approved by The Health Research Ethics Committee STIKES Ngudia Husada Madura (No. 536/KEPK/STIKES-NHM/EC/II/2020)

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