Preschoolers’ mental health status based on their mobile gadget usage

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Abstract. Recently, the high number of mobile gadget usage by parents has increased its usage by the children, resulting positive and negative effects. One of the negative effects is mental health problems. Therefore, parents should pay attention to their children’s mobile gadget usage and check their emotional status. This research aims at investigating the relationship between the mobile gadget usage based on American Academy of Pediatrics’ recommendation and children’s mental health status based on the Mental Health Problem Questionnaire (KMEE). This research is an analytic observation research using a cross-sectional approach. The samples of this research were 70 preschoolers taken from three kindergartens in Bandung Wetan sub-district selected using cluster random sampling technique. The research found that 39 preschoolers used gadgets more than one hour a day, and 36 of them had deviant mental health status. The statistical calculations using Chi-Square showed that there was a significant relationship between mobile gadget usage based on the duration of use and mental health status. Children’s mobile gadget usage that did not follow AAP recommendations could give a negative effect on children's mental health status. Whereas, mobile gadget usage that followed AAP recommendations could improve children's development of cognition, language, and social skills.

1. Introduction
According to a research conducted by the Pew Research Center in 2012, 88% of adults in America had cell phones. The high level of mobile gadget usage by adults resulted in changes in the parenting methods [1]. The use of gadgets in parenting was shown in a national survey conducted by Northwestern University. The gadget was used to divert children’s attention or as a tool to provide reward and punishment [2].

Mobile gadget usage can have an effect on children’s health. A research conducted by Bansal in 2017 investigated various effects of mobile gadget usage on children, one of which was a mental problem [3]. According to Kessler, early mental health disorders can hamper education and careers in adulthood and if these mental problems are not addressed then the problem will grow larger [4].

The great potential of the negative effect of mobile gadget usage on children’s mental health makes all parents need to pay attention to mobile gadget usage and to know their children’s emotional and developmental status. In 2016, the American Academy of Pediatrics (AAP) issued a recommendations for mobile gadget usage for children, including avoiding the use of digital media for children under 18 months and using mobile gadgets no more than one hour a day [5].
Mental health problems can be detected early in children aged 36-72 months using the Mental Health Problem Questionnaire (KMEE, Kuesioner Masalah Mental Emosional) instrument contained in the Early Development and Stimulation Intervention (SDIDTK, Stimulasi Deteksi Intervensi Dini Tumbuh Kembang) program of the Ministry of Health of the Republic of Indonesia. SDIDTK is a primary health service for toddlers [6].

Based on the description above, this research aims at investigating the relationship between mobile gadget usage and the mental health status of preschoolers.

2. Method
This research used an observational analytic design with a cross-sectional approach to investigate the relationship between the mobile gadget usage and the deviation from ideal mental health status of preschoolers in Bandung Wetan District. The samples were selected using a cluster-random sampling technique by taking one kindergarten in each village in Bandung Wetan sub-district. Therefore, there were 70 preschoolers chosen as samples from three kindergartens in Bandung Wetan sub-district.

The instruments used were questionnaires on mobile gadget usage consisting 10 questions on the following topics: gadget and ownership status, mobile gadget usage, type of gadget, and applications used. The questionnaire was designed by researchers and had been tested for its reliability and validity. Meanwhile, mental health status was measured using KMME consisting of 12 questions. The data analysis in this research was conducted using the chi-square test with a 95% confidence interval.

3. Results
The following are the characteristics of research subjects based on demographic data on three kindergartens in Bandung Wetan Sub-district.

| Subjects characteristics | f | % |
|--------------------------|---|---|
| Sex                      |   |   |
| Male                     | 35| 50|
| Female                   | 35| 50|
| Sum                      | 70| 100|
| Age                      |   |   |
| 3 years old              | 1 | 1.4|
| 4 years old              | 9 | 12.9|
| 5 years old              | 18| 25.7|
| 6 years old              | 42| 60|
| Sum                      | 70| 100|

Table 1 shows that the ratio of male to female in the samples was 1:1, and there were 42 preschoolers (60%) were six years old.

| Mobile Gadget Usage and Ownership Status | f | % |
|------------------------------------------|---|---|
| Mobile gadget usage                      |   |   |
| Using Gadget                             | 68| 97.1|
| Not using gadget                         | 2 | 2.9|
| Sum                                      | 70| 100|
| Gadget ownership                         |   |   |
| Yes                                      | 18| 26.5|
| No                                       | 50| 73.5|
| Sum                                      | 68| 100|

Table 2 shows that 68 preschoolers (97.1%) had considerable level of mobile gadget usage. From these 68 preschoolers, 18 preschoolers (26.5%) had personal gadgets.
Table 3. Mental health status.

| Questions                                                                 | Mental Health Status | f | %  |
|---------------------------------------------------------------------------|----------------------|---|----|
| 1  Does your child often look angry (like crying and temperamental) for no apparent reason? |                      | 21| 28 |
| 2  Does your child avoid friends or family members?                        |                      |  6|  8 |
| 3  Does your child show destructive behavior, against the surrounding environment, or ignore the advice given to him/her? |                      |  6|  8 |
| 4  Does your child show excessive feelings of fear or anxiety that cannot be explained by reason and not comparable with other children of his/her age? |                      |  2|  2.6 |
| 5  Does your child experience limitations due to poor concentration or easily distracted attention, which affects the daily activities? |                      |  9| 12 |
| 6  Does your child exhibit confusing behavior that creates difficulties in communicating and making decisions? |                      |  7| 9.34 |
| 7  Does your child show a change in sleep patterns? (such as trouble falling asleep, staying up all day, often waking up at bedtime due to nightmares, or delirious) |                      | 11| 14.7 |
| 8  Does your child experience dietary change? (such as loss of appetite, overeating, or not eating at all)? |                      |  7| 9.34 |
| 9  Does your child often experience headaches, stomachaches, or other physical complaints? |                      |  1| 1.34 |
| 10 Does your child often complain of despair or desire to end his/her life? |                      |  3|  4 |
| 11 Does your child show any deterioration in behavior or abilities he already has? (such as back wetting, thumb-sucking, or not wanting to part with parents or caregivers) |                      |  1| 1.34 |
| 12 Does your child do repetitive actions for no apparent reason?            |                      |  1| 1.34 |
| Sum                                                                      |                      |  75| 100 |

Mental health status

| Mental Health Status            | f | %  |
|--------------------------------|---|----|
| Normal                         | 32| 47.1 |
| Abnormal mental health         | 36| 52.9 |
| Sum                            |  68| 100 |

Table 3 shows that the majority of respondents (28%) agreed to questionnaire item number 1 about the behavior of children who often looked angry. For mental health status, it was found that 36 preschoolers (52.9%) allegedly had emotional deviation, because the respondents answered ‘yes’ at least on one KMEE question.

Table 4. The relationship between mobile gadget usage and mental health status.

| Duration               | Abnormal mental health | Normal mental health | p value  | OR (CI)     |
|------------------------|------------------------|----------------------|----------|------------|
| ≥1 hour a day          | 24                     | 5                    | < 0.001* | 10.8       |
|                        |                        |                      |          | (3.32–35.12)|
| < 1 hour a day         | 12                     | 27                   |          |            |

*Pearson Chi Square

Table 4 shows that based on the results of statistical tests using Chi-Square, the p-value was ≤ 0.001, which indicated a significant relationship because the p-value was lower than the significance level used in this research (α = 0.05). Odds Ratio value of the relationship between the duration of mobile gadget use and mental health status was 10.8, meaning that mobile gadget usage more than an hour a day could increase the risk of mental health deviations by 10.8 times. There was no value of 1 in CI. Thus, it can be concluded that there was a significant value at a significance level of 5%.
The results revealed that 68 preschoolers (97.1%) had considerable level of mobile gadget usage, in which 18 preschoolers (26.5%) had personal gadgets. This finding was similar to the research conducted by Kabali, which found that 175 (50%) preschoolers at the age of 4 years already had a TV for themselves, and 34 preschoolers had personal gadgets [7]. Meanwhile, in a survey conducted by Pew Research, only 6% of children had personal media device. According to Kabali, the main reason of the parents allowing their children to use mobile gadgets was to divert the children attention so that parents can do their work at home. The high number of gadget owners and the habits of parents lending gadgets to their children were predicted to be the cause of the high number of preschoolers who use gadgets [1].

This research showed that most subjects used the gadget more than an hour a day, which was against the AAP recommendations. AAP recommended parents to avoid mobile gadget usage for children under 18 months of age. If children aged 18-24 months want to be introduced to the gadget, it is recommended to choose a high-quality program. In addition, the limit on the use of gadgets for children aged 2-5 years is no more than one hour in one day [5]. Children older than 6 years-old may use gadgets as long as it does not interfere with their sleep time, physical activity, and other habits that are important for their health. Parents should create a time together where children are free from gadgets. According to the results of a survey conducted by Mott Children's Hospital about the length of time of mobile gadget usage in children, 26% of children aged 2-5 years used an average time of three hours a day playing gadgets for entertainment [8].

In this research, all items of KMEE were filled out and questions item number 1 about the behavior of preschoolers who often looked angry was the item answered ‘yes’ the most were filled by 21 preschoolers (28%). The results of the KMEE indicated that 36 preschoolers (52.9%) were suspected of having mental emotional deviation and were advised to conduct an evaluation within three months. However, this result could be biased because KMEE was an instrument for initial screening. In addition, in this research, there was no intervention and re-evaluation of KMEE after three months.

The results of this research indicated that there was a significant relationship between the mobile gadget usage based on the duration and mental health status. At preschool age, there is a development of physical activity, skills, and cognition. The children are learning by playing and they usually want to start playing outside the home [9]. The prolonged mobile gadget usage can limit the physical activity of the children to play so that they lack of the stimulus to develop their motoric and social skills. On the other hand, the use of gadget to watch programs or games recommended by AAP can improve the children's cognition, language, and social skills [10].

From the results of this research, KMEE questionnaire item number 1 regarding children's emotions was the question with the most 'yes' answer. This is in line with the research conducted by Hiniker who stated that the act of parents taking the gadget being played by children can trigger tantrum in children [11]. Emotional challenges faced by preschoolers include accepting self-direction limitations, restraining aggressive attitudes and sexual impulses, and also developing interactions with adults and peers. Prolonged mobile gadget usage can interfere the children's development to learn to accept the limitations of self-direction and also limit their interaction with peers [9].

The disruption of these developmental tasks is related to the response on questionnaire item number 5 question regarding bad concentration and questionnaire item number 6 about the behavior of confusion and communication difficulties. However, the use of gadgets that follow AAP recommendations will help the development of children. This is because, in preschool age, playing and language activities encourage the development of emotional control by allowing children to express emotions and play their roles [5].

In this research, the reason preschoolers use gadgets for more than one hour was not investigated more deeply to the extent to find out whether the parents allowed children to use gadgets or because the they were angry if they are not allowed to use the gadgets. The behavior of tantrums was described on questionnaire item number 3 in which six subjects answered ‘yes’. According to theory, raging behavior can be triggered by several things, including excessive anxiety, fear, fatigue, inconsistent expectations or physical discomfort. Playing a gadget for more than an hour can cause fatigue and physical discomfort. In addition, parents who are inconsistent in setting the limits on using gadgets can make children's expectations unfulfilled and trigger raging behavior [12].

The results of questionnaire item number 7 regarding sleep disturbance in children showed that 11 respondents answered 'yes'. This is in line with the research conducted by Juulia Paavonen which stated...
that preschoolers who watched TV more than 15 hours per week had a high sleep problem score [13]. This can occur due to the relationship between electromagnetic exposure, melatonin, and circadian rhythm. According to Septiana, the sleep duration of children aged 3-8 years was associated with obesity [14].

This also relates to questionnaire item number 8 regarding changes in diet that answered ‘yes’ by eight respondents. However, in this research, there were no further data regarding changes in diet that occurred or data on the children’s Body Mass Index (BMI), which were affected by the use of gadgets. According to a study conducted by Cox R on preschool children, there was a relationship between the average time spent watching television (90.7 minutes) and the increase in BMI [15].

Simultaneous exposure to electromagnetic waves is associated with a decrease in melatonin production. Melatonin levels are at the peak until the core body temperature reaches a minimum level in the normal circulatory phase a few hours before the wake time in the biological clock. Mobile gadget usage causes the effect of simultaneous exposure to electromagnetic waves and makes the eyes continue to capture light resulting in low levels of melatonin and the disruption of circadian rhythms. This causes the children to experience changes in their sleep patterns. This was evidenced in the research conducted by Salti, which showed that there was a relationship between TV exposure and melatonin levels in children's urine [16].

5. Conclusion

This research found that preschoolers’ mobile gadget usage, which did not follow AAP recommendations, could give a negative effect on their mental health status. Whereas, mobile gadget usage that followed AAP recommendations could improve children's development of cognition, language, and social skills. Therefore, it is essential for parents to control their children’s habit in using gadget. Especially duration uses of gadget and also the content of application that used by children.

References

[1] Pew Research Center 2012 A Closer Look at Gadget Ownership, [Online] Retrieved from https://www.pewinternet.org/2012/06/28/a-closer-look-at-gadget-ownership/

[2] Wartella E, Rideout V, Lauricella A R and Connell S 2014 Revised parenting in the age of digital technology: A national survey, Report of the Center on Media and Human Development, School of Communication, Northwestern University

[3] Bansal S and Mahajan R C 2018 Impact of mobile use amongst children in rural area of Marathwada region of Maharashtra, India, International Journal of Contemporary Pediatric 5(1)

[4] Kessler R C, Foster C L, Saunders W B and Stang P E 1995 Social consequences of psychiatric disorders, I: Educational attainment, Am J Psychiatry 152(7):1026–1032

[5] American Academy of Pediatric 2016 Recommendations for Children’s Media Use, Am Acad Pediatr

[6] Kementrian Kesehatan 2005 Stimulasi, Deteksi dan Intervensi Dini Tumbuh Kembang Anak,

[7] Kabali H K, Irigoyen M M, Nunez-Davis R, Budacki J G, Mohanty S H and Leister K P 2015 Exposure and Use of Mobile Media Devices by Young Children, Am Acad Pediatr 136

[8] Highlights R 2014 Screening out screen time: Parents limit media use for young children, National Poll on Children’s Health 21

[9] Kliegman R M, Behrman R E, Jenson H B and Stanton B M 2007 Nelson textbook of pediatrics e-book (Elsevier Health Sciences)

[10] Brown A 2011 Media use by children younger than 2 years, Pediatrics

[11] Hiniker A, Suh H, Cao S and Kientz J A 2016 Screen time tantrums: How families manage screen media experiences for toddlers and preschoolers, Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems 648-660

[12] Sadock B J and Sadock V A 2011 Kaplan and Sadock's synopsis of psychiatry: Behavioral sciences/clinical psychiatry (Lippincott Williams & Wilkins)

[13] Paavonen E J, Pennonen M, Roine M, Valkonen S and Lahikainen A R 2006 TV exposure associated with sleep disturbances in 5-to 6-year-old children, Journal of sleep research 15(2) 154-161
[14] Septiana P and Irwanto I 2018 Hubungan Durasi Tidur dengan Kejadian Obesitas pada Anak Usia 3–8 Tahun, *Glob Med Heal Commun* 6 63–67

[15] Cox R, Skouteris H, Rutherford L, Fuller-Tyszkiewicz M, Dell D and Hardy L L 2012 Television viewing, television content, food intake, physical activity and body mass index: a cross-sectional study of preschool children aged 2-6 years, *Health Promotion Journal of Australia* 23(1) 58-62

[16] Salti R, Tarquini R, Stagi S, Perfetto F, Cornélissen G and Laffi G 2006 Age-dependent association of exposure to television screen with children’s urinary melatonin excretion? *Neuroendocrinol Lett* 27 73–80