JPS. Volume 11 No 2. Nov 2022
e-ISSN:2716-358X; p-ISSN:2355-2409
DOI: 10.20473/jps.v11i2.34589
Available online at https://e-journal.unair.ac.id/JPS/index

Systematic Review

Association of Excessive Screen Time in Children with Language Delay During Covid-19 Pandemic: A Systematic Review

Ulima Mazaya Ghaisani[1], Amalia Rasydini Salam[2]
[1]General Hospital Citra Arafiq Depok
[2]Emergency Hospital Covid-19 Jakarta

OPEN ACCESS

ARTICLE INFO
Received: March 28, 2022
Revised: July 28, 2022
Accepted: October 20, 2022
Published: November 30, 2022

*) Corresponding Author :
ulimaluli@gmail.com

Keywords: COVID-19, Children, Language Delay, Pandemic, Screen Time

ABSTRACT

Introduction: COVID-19 pandemic and the associated lockdown have confined children to their homes and have resulted in an exponential increase in screen usage among children. This review aimed to scrutinize changes in screen time rate and duration in children and the correlation with increased risk of language delay in children under two years old with any screen time or screen time for more than 1 hour in children 2—5 years old during the COVID-19 pandemic. **Method:** In this systematic review journal, we searched the database from PubMed and Google Scholar with the keywords of screen time OR computer OR television OR video game OR YouTube OR digital screen time AND COVID-19 OR SARS-Cov-19 AND preschool children OR birth to 5 years on January 13th, 2022. **Result:** After the review, 19 articles were included. The majority of articles were cross-sectional. Nineteen articles (including two systematic reviews and meta-analyses) have been published concerning the increased rate and duration of screen time in children. One of the articles reported on a clear association between screen time in children and vocabulary development during the COVID-19 lockdown. There is an escalation of screen time in children during the COVID-19 pandemic. The risk of language delay in toddlers and preschool children is higher with the increase in screen time. **Conclusion:** In summary, children's screen time has increased during the COVID-19 pandemic. The longer the screen time is, the higher the risk of language delay in children It is recommended that screen time should be reduced while parents and caregivers should give more two-way communication opportunities other than screen viewing.

Cite this as: Ghaisani. U.M., Salam. A.R. "Association of Excessive Screen Time in Children with Language Delay During Covid-19 Pandemic: A Systematic Review". Jurnal Psikiatri Surabaya, vol. 11, no. 2, pp. 95-106 2022, doi: 10.20473/jps.v11i2.34589

INTRODUCTION

The COVID-19 pandemic has been found in Indonesia since March 2020 until now. Physical distancing and lockdown regulations have been regulated many times, such as Work from Home and distance learning. Those regulations give negative impacts on society especially for having more screen time than before the pandemic happened, including for preschool children aged two to five years old. A systematic review reported in the initial phases (in the year 2020) of the pandemic, the majority of adults and children had increased time in screen time. The American Academy of Pediatrics (AAP) gives recommendations for screen time for children. Children under the age of two years should not be exposed to any media except video chatting, meanwhile, children aged two to five years old are less than one hour per day [1, 2]. The definition of screen time is the time that people spent on any digital media such as television, smartphone, computer, tablet, and consoles. Previous studies explained the negative impacts on cognitive, language, and motor skills in children who have excessive screen time [2, 3].

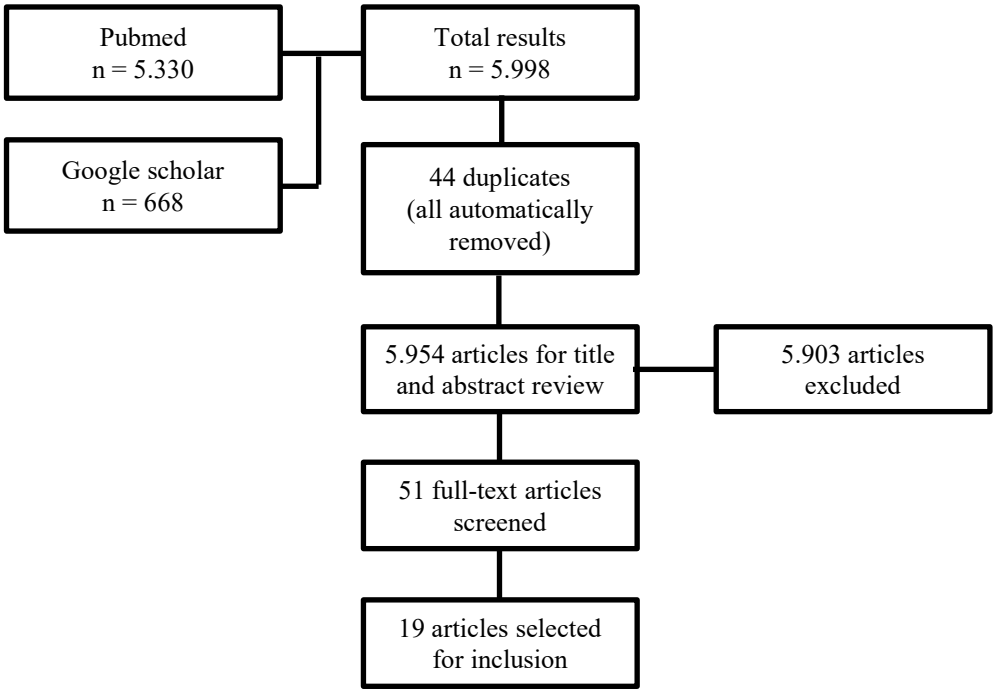
The Indonesian Pediatric Society (Ikatan Dokter Anak Indonesia) stated that 5—8% of preschool children in Indonesia have language delays [1, 4, 5]. A study by Arizona et al found that expressive language disorder become ten of the most frequent diagnosis in the child psychiatric clinic at Dr. Soetomo general hospital [6]. Increased screen time is associated with language delay in early childhood. One of the mechanisms explaining this relationship is that screen time is believed to reduce the opportunity for parent-children interaction and playing, parental observation of word count, and conversation in children aged 2—48 months [7, 8]. To conclude, these changes in screen time rate and duration during the COVID-19 pandemic and the correlation with the increased risk of language delay have not been systematically reviewed and discussed. It was therefore the aim of this review to scrutinize the changes in screen time rate and duration in children and the correlation with the increased risk of language delay during the COVID-19 pandemic.

METHODS

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Articles were searched on two web database journals for this systematic review; PubMed and Google Scholar, on January 13th, 2022. Keywords and synonyms that had been searched using PubMed were: screen time OR computer OR television OR video game OR YouTube OR digital screen time AND COVID-19 OR SARS-Cov-19 AND preschool children OR birth to 5 years. Then, we filtered within the years 2020—2022. We used the boolean "AND" for each keyword and "OR" for the synonyms. For google scholar, we searched for screen time and language delay in toddlers and preschoolers.

After searching the keywords above, we obtained some articles. Titles and abstracts of the remaining studies were independently screened for inclusion by two authors (UMG; ARS). Following title and abstract screening, the full texts of all potentially eligible papers were reviewed independently by two authors (UMG; ARS). We made the selection by any type of study; the article must be in English; and published within the year 2020—2022. We sought the following information in the free-full-text records: journal information (authors and year of publication), study design, participant aged (under 5 years), information about screen time (increased rate or mean/median screen time daily use pre and during the COVID-19 pandemic), and information about language delay and its association with screen time (odd ratio). We excluded some articles whose participants have organic abnormalities, congenital syndromes, or acquired health problems.

Figure 1. PRISMA flow diagram of study selection



RESULT

The initial search yielded 5.998 results, of which 44 were removed as duplicates, leaving 5.954 articles to be screened at the title and abstract level. Of these, 51 were selected for full-text screening. After the full-text assessment, 19 articles were selected for inclusion. The majority of articles were cross-sectional (6 articles), followed by longitudinal (5 articles), cohort (4 articles), systematic reviews, and meta-analyses (2 articles). Seventeen articles used the quantitative method and 2 articles used the qualitative method. Nineteen articles (including two systematic reviews and meta-analyses) have been published concerning the increased screen time in children during the COVID-19 pandemic, while one of the articles reported a clear association between screen time in children and vocabulary development.

The Increased Rate and Duration of Screen Time in Children during the COVID-19 Pandemic

Some studies reported young children's screen time increased during the COVID-19 pandemic due to the lockdown compared to before the lockdown. A study by Bruni O et al (2022) reported that screen time (excluding online lessons) greatly increased during the lockdown, not only in older children but also surprisingly in younger children with 30,8% of 1—3 years old who spent more than 3 hours per day on screen during lockdown compared with 2,3% before the lockdown. Staying at home during lockdown is increasing the exposure of children and adolescents to digital screens because of their excessive use of virtual platforms (TV, laptop, mobile, etcetera) [8]. Another study by Aguilar-Farias N et al (2021) reported the same thing, recreational screen time increased by 1,4 hours per day (CI 95% 1.34, 1.45) [9]. A study by Sum KK et al (2022) found the proportion of parents who reported a significant increase in online socialization such as for social media or online games is 177 of 584 (30,3%) (paired Wilcoxon test, $p < .001$) and telephone or video calls is 220

of 586 (37,5%) (paired Wilcoxon test, p < .001) with friends and family during lockdown [10]. Another study by Tso W et al (2020) reported before the school closure for 2—5 years old mean (SD) is 0,31 (0,66) hours and after-school closure mean (SD) is 0,48 (0,87) hours [11]. In a cohort study by Li C et al (2022), children's average screen time increased at 18—36 months old and decreased at 42—54 months old with a slight increase at 60 months old. The duration of media exposure peaked at 1,4 hours per day at age of 36 months and 60 months. The intercept of the screen time was 2,206 hours per day (p < .01) and the slope was 1,449 hours per day (p = .001) [12]. Another cohort by Kahn M et al (2021), using two groups who have similarities reported that infant screen time was significantly greater in 2020 compared to 2019. Infants in 2020 were exposed to touch screens and televisions for 8,8 more minutes per day on average (SE ¼ 2.2, p ¼ .001), representing a 37,5% increase in screen time compared to 2019. Additionally, a significant age-by-time interaction effect was found (SE ¼ .04). Pairwise comparisons indicated that daily screen exposure was significantly greater in 2020 for older infants (13—18 months old; mean difference ¼ 18,3 min, SE ¼ 4.6, p < .001), whereas differences were not significant for infants 12 months or younger [13]. A study by Nyström C et al (2020) reported during the COVID-19 pandemic, Swedish children's physical activity, time spent outside on weekdays and weekend days, and screen time significantly increased (+53; +124; +68; +30 minutes per day, respectively, all p ≤ .001) [14]. A study by McNicholas J reported there was an increase in sedentary screen use by children aged < 5 years old with a mean difference of -0,33, 95% CI -0.441 -0.224, p < .001 [15]. Another same report by Lim M et al (2020) said preschool children spent a screen time mean (SD) of 1,05 (0,76) hours pre-pandemic COVID-19 lockdown and spent a mean (SD) of 2,49 (1,77) hours during the pandemic COVID-19 lockdown [16].

Some studies reported that adherence to screen time guidelines decreased during the lockdown. A study by Okely et al (2021) reported children spent 55 minutes a day more in sedentary screen time, while the proportion who met the screen time guideline dropped from 48 to 25% [17]. Another study by Hyunshik Kim et al (2021) reported weekday sedentary time (164 minutes to 174 minutes) and weekend sedentary time (175 minutes to 197 minutes) increased significantly. The rate of screen time adherence significantly decreased (27% to 19%) p = .010 [18]. Schmidt S et al (2020) reported that recreational screen time such as TV watching increased by 21,2 minutes, gaming increased by 21,5 minutes, recreational internet usage increased by 18,5 minutes, and the total amount of recreational screen time increased by 61,2 minutes per day. This translate into a 17,5% overall 920 decrease in adherence to the recreational screen time guideline during the lockdown with a substantially larger decrease for participants aged 14—17 years with 18,4 % compared to 4—5 years olds with 4,1% [19]. Another study by Ng JYY et al (2021) said that parents reported that children spent more time in sedentary screen time (95% CI (39.2, 97.6)), which resulted in a smaller proportion meeting the WHO guideline (p = .012). Based on parent reports, children's screen time increased by 69 minutes per day [20].

Another systematic review found that the lockdown due to the COVID-19 pandemic led to a screen time increase. A systematic review and meta-analysis by Trott M et al (2022) found that the total screen time increase in young children (0—5 years) is 0,6 hours per day (95% CI 0,3—0,9 hours per day). For leisure screen time (non-work/non-academic) in young children is 0,6 hours per day (95% CI 0,4—0,8 hours per day) [21]. Another systematic review by Proulx K et al (2022) found only 19% of studies focused on early learning and play during the COVID-19 pandemic, including

screen time among children, outdoor play, physical activities, and home-based learning. One study found that nearly 9 out of 10 Canadian parents reported increased screen time since the beginning of the pandemic among young children aged 18 months old to 5 years old. Dramatic decline in children's outdoor physical activity and much higher screen time use (average of 5 hours per day) during the initial period of the COVID-19 pandemic, compared with before the restrictions [22].

There are some factors during lockdown that lead to increasing screen time in young children. A study by Bergmann C et al (2022) reported differences in young children's screen time before and during lockdown full-null model comparison was significant ($\chi 2 = 32.95$, $df = 8$, $p < .001$). Children had more access to screen time during lockdown relative to before the lockdown. There are significant interaction effects such that longer lockdown duration was associated with a greater increase in screen time [23]. A qualitative study by Hood R et al (2021) found almost two-thirds described an increase in the use of devices, typically in relation to their use of them. Some parents used screen time for keeping children entertained while at home and the interaction among the family members decreased: "With the pandemic, we probably gave them [children] like more screen time. So then they wouldn't be interacting, I guess, with each other." [24]. Another qualitative study by Clarke J et al (2021) found that parents reported their child engaged in a range of sedentary activities during lockdown (like reading and drawing) but screen time was mentioned most frequently, with almost all parents reporting substantial increases. For many families, screen time filled the void left by being unable to go out or socialize. Many felt screen time had been useful during this difficult period, with one parent referring to it as a 'lifesaver'. For those trying to work from home, it was often the only way they could manage. Screen time was also used to provide a much-needed respite from the intensive parenting effort lockdown enforced. Parents often distinguished between 'good' and 'bad' screen time. Educational or interactive screen time was better than passive television watching [25].

Author(s)	Country	Age range	Study design	Methods	N	Screen time	Association with language delay
Lim M, et al	Singapore	Preschool (3-5) years, Primary school (7-10) years, Secondary school (13-15) years	Cross-sectional	Questionnaire	Preschool (139), primary school (336), secondary school (118)	Preschool spent a screen time mean (SD) of 1.05 (0.76) hours pre-Circuit Braker and spent a mean (SD) of 2.49 (1.77) hours during Circuit Brakers	No
Tso W, et al	Hong Kong	2-12 years	Cross-sectional	Questionnaire	Children aged 2-5 (12,163), children aged 6-12 (17,029)	Before school closure for age 2-5 years mean (SD) 0,31 hours (0.66), and after school closure mean (SD) 0.48 hours (0.87)	No
Okely A, et al	14 countries	3-4 years	Longitudinal	At Time 1 (T1) parent survey was conducted via interview, and follow up (Time 2, T2) data collection was conducted via telephone interview or online survey.	948	Children spent 55 min/day more in Sedentary Screen Time and the proportion who met the SST guideline dropped from 48 to 25%.	No

Author(s)	Country	Age range	Study design	Methods	N	Screen time	Association with language delay
Schmidt S, et al	Germany	4-17 years old	Longitudinal	Questionnaire.	1711 (Age 4-5 years old n=317, age 6-10 years old n=647, age 11-13 years old n=343, age 14-17 years old n=404)	TV watching increased by 21.2 min, gaming increased by 21.5 min, recreational internet usage increased by 18.5 min, and the total amount of recreational ST increased by 61.2 min per day. This translate into a 17.5% overall decrease in adherence to the recreational ST guideline during the lockdown with a substantially larger decrease for participants aged 14-17 years with - 18.4 % compared to 4-5 years olds with - 4.1%.	No
Hyunshik K, et al	Japan	3-5 years	Longitudinal	Questionnaire.	T1 (2019) = 301, T2 (2020) = 290	The rate of screen time adherence significantly decreased (27% to 19%) with p-value of 0.010.	No
Bergmann C, et al	12 countries	8-36 months	Cohort	Questionnaire.	2209	Differences in young children's screen time prior to and during lockdown based on the full-null model comparison were significant, $\chi2 = 32.95$, df = 8, $p < 0.001$. Children had more access to screen time during lockdown relative to before the lockdown. There is significant interaction effect such that longer lockdown duration was associated with a greater increase in screen time.	They examined whether the lockdown-related increase in children's screen time impacted children's vocabulary development, such that those children who reported to have had more screen time during lockdown were also reported to show smaller gains in vocabulary development during the lockdown, separately for children's receptive and expressive percentile score. The full-null model comparison for the receptive model was not significant, $\chi2 = 13.02$, df = 7, p = 0.072, while the full-null model comparison for the expressive model was significant, $\chi2 = 14.92$, df = 7, p = 0.037.
McNicholas J, et al	Australia	0-12 years	Cross-sectional	Questionnaire.	1371	Sedentary screen time for age < 5 years mean difference -0.333 95%CI -0.441 - -0.224 p-value <0.001.	No
Nyström C, et al	Sweden	0-5 years	Longitudinal	Questionnaire	176	Screen time significantly increased (+53; +124; +68; +30min/day, respectively, all p-values ≤ 0.001).	No
Bergmann C, et al	12 countries	8-36 months	Cohort	Questionnaire.	2209	Differences in young children's screen time prior to and during lockdown based on the full-null model comparison were significant, $\chi2 = 32.95$, df = 8, $p < 0.001$. Children had more access to screen time during lockdown relative to before the lockdown. There is significant interaction effect such that longer lockdown duration was associated with a greater increase in screen time.	They examined whether the lockdown-related increase in children's screen time impacted children's vocabulary development, such that those children who reported to have had more screen time during lockdown were also reported to show smaller gains in vocabulary development during the lockdown, separately for children's receptive and expressive percentile score. The full-null model comparison for the receptive model was not significant, $\chi2 = 13.02$, df = 7, p = 0.072, while the full-null model comparison for the expressive model was significant, $\chi2 = 14.92$, df = 7, p = 0.037.

Author(s)	Country	Age range	Study design	Methods	N	Screen time	Association with language delay
Trott M, et al	Sysrev	Adults (>18yrs), and children (<18yrs). Children were also stratified into three sub-groups were available: adolescents (11−17years), primary aged children (6−10years), and young children (<5 years).	Systematic Review and Meta-Analysis	Database searched	Total screen time for young children: 7 studies with 5991 participants. Leisure screen time for young children: 3 studies with 1767 participants	Total screen time increase in young children (0−5 years) is 0,6 hrs/day 95%CI 0,3−0,9 hrs/day. For leisure screen time (non-work/non-academic) in young children is 0,6 hrs/day; 95%CI 0,4−0,8 hrs/day.	No
Sum K, et al	Singapore	1-4,5 years old	Cohort	Questionnaire.	604	A large proportion of parents reported significant increases in online socialization (eg, social media or online games, 177 of 584 [30.3%], paired Wilcoxon test, $P < .001$) and telephone or video calls (220 of 586 [37.5%]; paired Wilcoxon test, $P < .001$) with friends and family after lockdown.	No
Bruni O, et al	Italy	1-18 years, subdivided into age groups: 1-3, 4-5, 6-12, and 13-18 years.	Cross-sectional	Questionnaire.	4314. 1-3 years 1263 (29.3%), 4-5 years 893 (20.7%), 6-12 years 1848 (42.8%) and 13 -18 years 310 (7.2%).	Another important finding of the study was that the screen time (excluding online lessons) greatly increased during the lockdown, mainly in older children but also surprisingly in younger children with 30.8% of 1- to 3-year-old subjects that spent more than 3 h/day on-screen during lockdown vs. only 2.3% before.	No
Kahn M, et al	US	1-18 months old	Cohort	Questionnaire	1518	Infant screen time was significantly greater in the 2020 infant cohort compared to the 2019 infant cohort. Infants in 2020 were exposed to touch screens and televisions for 8.8 more minutes per day on average (SE ¼ 2.2, p ¼ 0.001), representing a 37.5% increase in screen time compared to 2019. Additionally, a significant age-by-time interaction effect was found (p ¼ 0.04). Pairwise comparisons indicated that daily screen exposure was significantly greater in 2020 for older infants (13e18-month-old; Mdifference ¼ 18.3 min, SE ¼ 4.6, p < 0.001), whereas differences were not significant for infants 12 months or younger.	No
Clarke J, et al	UK	3-5 years old	Qualitative	Interview	20	Parents reported their child engaged in a range of sedentary activities during lockdown (like reading, and drawing) but screen time was mentioned most frequently, with almost all parents reporting substantial increases. For many families, screen time filled the void left by being unable to go out or socialize. Many felt screen time had been useful	No

Author(s)	Country	Age range	Study design	Methods	N	Screen time	Association with language delay
						during this difficult period, with one parent referring to it as a *'lifesaver'*. For those trying to work from home, it was often the only way they could manage. Screen time was also used to provide much needed respite from the intensive parenting effort lockdown enforced. Parents often distinguished between 'good' and 'bad' screen time. Educational or interactive screen time was better than passive television watching.	
Hood R, et al	Australia	9-15 months old	Qualitative	Interview	30	Almost two-thirds described an increase in the use of devices, typically in relation to their own use of them.	No
Proulx K, et al	30 countries	0-8 years old	Systematic Review and Meta-Analysis	Database searched	112 studies	Only 19% of studies focused on early learning and play during the COVID-19 pandemic, including screen time among children, outdoor play and physical activities, and home-based learning. One study found that nearly 9 out of 10 Canadian parents reported increased screen time since the beginning of the pandemic among young children aged 18 months old to 5 years old. Dramatic decline in children's outdoor physical activity and much higher screen time use (average of 5 hours/day) during the initial period of the COVID-19 outbreak, compared with before the restrictions.	No

Screen Time and Language Delay in Children during COVID-19 Pandemic

While twenty-two studies reported an increase of screen time during the COVID-19 lockdown, we found difficulties in finding stud about the correlation between screen time and language delay during the lockdown. However, we found one study reported that lockdown-related increased in children's screen time impacted children's vocabulary development. A study by Christina Bergmann et al (2022) reported that those children who reported to have had more screen time during lockdown were also reported to show smaller gains in vocabulary development during the lockdown, separately for children's receptive and expressive percentile scores. The full-null model comparison for the receptive model was not significant, $\chi2 = 13.02$, df = 7, p = .072, while the full-null model comparison for the expressive model was significant, $\chi2 = 14.92$, df = 7, p = .037. In the reduced model, the interaction between the lockdown stage and screen time was significant for expressive vocabulary, $\chi2 = 4.63$, df = 1, p = .031. While the results with regards to the significant interaction between lockdown stage and screen time should be treated with caution due to the marginally non-significant interaction in the full model, they suggested that those children who had smaller increases in screen time during lockdown relative to before lockdown were reported to have larger increases in expressive vocabulary during lockdown [23].

DISCUSSION

This systematic review including 19 articles, showed the reported changes in screen time during the COVID-19 pandemic and one article reported a correla-

tion with vocabulary development. The results from studies showed a significant increase in screen time. Many studies had been reported about children's screen time over years. For example, cohort studies on children aged 18 and 24 months found that watching TV or video increased at age 24 months[26]. Another cohort study from India reported that 89% of the children were exposed to at least one type of screen before the recommended age of 24 months. The mean screen time was 2,39 hours per day (95% CI: 2.23-2.54). The mean screen time for children aged < 2 years and those aged 2—5 years was 1,26 hours and 2,8 hours. The rates of excessive screen time among children aged <2 years and those aged ≥2 years were 73,3% (95% CI: 67.1-79.5) and 73,0% (95% CI: 69.2-76.8) [27]. A longitudinal study reported that media use increased over time: at 4 months, children engaged with electronic screen-based media for an average of 0,92 minutes per day (SD = 1.28). Meanwhile, at age 14 months, children engaged in an average of 48,3 minutes of screen time per day (SD = 58.06). And at age 24 months, children engaged in an average of 73,27 minutes of screen time per day [28].

Children's screen time used to have an upward trend. So there is maybe some bias. Is it just the children's trend of screen time which is increasing by their age or is it COVID-19 that made children's screen time increase? The cohort study by Kahn M et al (2021), using two groups from 2019 before the COVID-19 pandemic and 2020 during the COVID-19 pandemic who have similarities reported that infant screen time was significantly greater in 2020 compared to 2019. Infants in 2020 were exposed to touch screens and televisions for 8,8 more minutes per day on average (SE ¼ 2.2, p ¼ .001), representing a 37,5% increase in screen time compared to 2019. Additionally, a significant age-by-time interaction effect was found (p ¼ .04). Pairwise comparisons indicated that daily screen exposure was significantly greater in 2020 for older infants (13—18 months old; mean difference ¼ 18,3 minutes, SE ¼ 4,6, p < .001), whereas differences were not significant for infants 12 months or younger. This study can describe that lockdown increase exposure of screen to children [13].

Another question is if it is the COVID-19 pandemic that made increased screen time, what is the condition made by the pandemic that made an excessive increase in children's screen time? For Chinese children in Changsha, their daily duration of screen use increased with the advancement of age. To be more specific, the result showed that children's average screen time increased at 18—36 months, and decreased at 42—54 months, with a slight increase at 60 months. they claimed that this was probably because there were more limitations for children use by their caregivers from the information collected by the face-to-face follow-up interviews from their 36 months and 60 months (12). This needs further research about parent knowledge of AAP guidelines and the association with children's screen time. Meanwhile, the prevalence of children's adherence to the AAP guidelines in their 54—60 months increases, probably because of increased screen time during the isolation period at home caused by the COVID-19 panic. COVID-19 panic has been spreading around since 2020 and the Chinese were isolated at home during that period. Media use became the main activity for the Chinese during the isolation period at home since they had much more leisure time to consume, with their children were forbidden to play outside. In addition, media devices might be used as digital babysitters since their parents had to work from home during isolation periods [12]. Two qualitative studies have been done to know preschool behavior during COVID-19 restrictions. Just as we stated in the result of this systematic review, parents reported that preschool children had an increase in screen time. Some parents use it for keeping entertain their children and for some parents who use to work from home

it can be a 'lifesaver' [24, 25].

Now that we know that some conditions led by the COVID-19 lockdown made excessive screen time in children, should we worry about the risk of language delay or not because it is just sudden not long-term increasing? Many studies before the COVID-19 lockdown reported that screen time was negatively associated with speech and language development. A cohort study from Finland found that increased screen time and TV time were related to smaller vocabulary at 18 months. Parents' screen time and shared reading less than daily were also associated with smaller vocabulary at 24 months [26]. In another cohort study from Canada with 1.994 children as the subjects, compared to ≤ 1 hour per day (47%; n=935), children using the screen for 2 hours (36%; n=725) or ≥ 3 hours per day (17%; n=333) had an increased likelihood of reported behavioral problems (AOR 1.30—1.90), delayed achievement of developmental milestones (AOR 1.41—1.68), and poorer vocabulary acquisition (AOR 1.94). Twenty-five percent of children were in the at-risk range for externalizing difficulties (n=489) and internalizing difficulties (n=478), 17% (n=327) for language delay, and 32% (n=567) for delays in achieving developmental milestones [29]. A cross-sectional study from India reported that increased screen time was significantly associated with developmental delay, in particular, in the domains of language acquisition and communication. In children aged ≥ 2 years, a delay in ≥ 3 domains were associated with screen time (adjusted odds ratio [AOR] = 17.75, 95% CI: 5.04-2.49, p < .001), as was language delay (AOR = 52.92, 95%CI: 13.33-227.21, p < .001). In children aged < 2 years, a delay in 2 domains was associated with screen time (AOR = 16.79, 95% CI" 2.26-124.4, p < .001), as was language delay (AOR = 20.93, 95% CI: 2.68-163.32, P < .001) [27]. Meanwhile, we don't find a different result for the association of excessive screen time and language development. A large cohort study in 12 countries reported that those children who reported to have had more screen time during lockdown were also reported to show smaller gains in vocabulary development during the lockdown. Although some studies explained that toddlers face difficulties learning words from screens, these findings raised questions regarding why a sudden increase in screen time during lockdown is negatively associated with language and other developmental milestones [23].

This study had some limitations. Because of the pandemic restriction, data collection was subjective due to self-reported bias. Many of the studies assessed children's screen time by recalling memories that might lead to some bias. Lastly, the study about the association between screen time and language delay was not much.

CONCLUSION

In conclusion, there is an escalation of screen time in children during the COVID-19 pandemic. The risk of language delay in toddlers and preschool children is higher with the increase in screen time. For maximum language development, parents and caregivers must give more two-way communication opportunities other than screen viewing. However, the literature on language delay due to excessive screen time during the COVID-19 pandemic is still limited and needs to be explored.

REFERENCES

[1] M. S. Maulana, "Risk of language delay in toddlers with prolonged screen time: Evidence based case report," JECIES J. Early Child. Islam. Educ. Study, vol. 01, 2020. DOI: 10.33853/jecies.v1i1.53

[2] J. J. John, R. Joseph, A. David, A. Bejoy, K. V. George, and L. George, "Association of screen time with parent-reported cognitive delay in preschool children of Kerala, India," BMC Pediatr., vol. 21, no. 1, Dec. 2021, doi: 10.1186/s12887-021-02545-y.

[3] E. Felix et al., "Excessive Screen Me-

dia Use in Preschoolers Is Associated with Poor Motor Skills.," Cyberpsychol. Behav. Soc. Netw., vol. 23, no. 6, pp. 418–425, Jun. 2020, doi: 10.1089/cyber.2019.0238.
[4] M. N. Suparmiati, Aries; Ismail, Djauhar; Sitaresmi, "Hubungan Ibu Bekerja pada Keterlambatan Bicara pada Anak," Sari Pediatr., vol. 14, no. 5, 2013. DOI: 10.14238/sp14.5.2013.288-91
[5] Y. Manipuspika, "Phonological Development of Children With Speech Delay," RETORIKA J. Ilmu Bhs., vol. 5, pp. 12–22, Apr. 2019, doi: 10.22225/jr.5.1.898.12-22.
[6] P. Arizona, Y. Setiawati, N. Febriyana, and R. T. Kalalo, "The Epidemiology of Pediatric Mental Disorders in Child Psychiatric Outpatient Clinic at Dr . Soetomo General Hospital Surabaya Scholars Journal of Applied Medical Sciences The Epidemiology of Pediatric Mental Disorders in Child Psychiatric Outpatient Cli," no. September, 2021, doi: 10.36347/sjams.2021.v09i09.016.
[7] D. R. Anderson and K. Subrahmanyam, "Digital Screen Media and Cognitive Development.," Pediatrics, vol. 140, no. Suppl 2, pp. S57–S61, Nov. 2017, doi: 10.1542/peds.2016-1758C.
[8] O. Bruni et al., "Changes in sleep patterns and disturbances in children and adolescents in Italy during the Covid-19 outbreak.," Sleep Med., vol. 91, pp. 166–174, Mar. 2022, doi: 10.1016/j.sleep.2021.02.003.
[9] N. Aguilar-Farias et al., "Sociodemographic Predictors of Changes in Physical Activity, Screen Time, and Sleep among Toddlers and Preschoolers in Chile during the COVID-19 Pandemic.," Int. J. Environ. Res. Public Health, vol. 18, no. 1, Dec. 2020, doi: 10.3390/ijerph18010176.
[10] K. K. Sum et al., "COVID-19-Related Life Experiences, Outdoor Play, and Long-term Adiposity Changes Among Preschool- and School-Aged Children in Singapore 1 Year After Lockdown.," JAMA Pediatr., vol. 176, no. 3, pp. 280–289, Mar. 2022, doi: 10.1001/jamapediatrics.2021.5585.
[11] W. W. Y. Tso et al., "Vulnerability and resilience in children during the COVID-19 pandemic.," Eur. Child Adolesc. Psychiatry, vol. 31, no. 1, pp. 161–176, Jan. 2022, doi: 10.1007/s00787-020-01680-8.
[12] C. Li et al., "Prevalence, correlates, and trajectory of screen viewing among Chinese children in Changsha: a birth cohort study.," BMC Public Health, vol. 22, no. 1, p. 1170, Jun. 2022, doi: 10.1186/s12889-022-13268-9.
[13] M. Kahn, N. Barnett, A. Glazer, and M. Gradisar, "COVID-19 babies: auto-videosomnography and parent reports of infant sleep, screen time, and parent well-being in 2019 vs 2020.," Sleep Med., vol. 85, pp. 259–267, Sep. 2021, doi: 10.1016/j.sleep.2021.07.033.
[14] C. Delisle Nyström et al., "International Study of Movement Behaviors in the Early Years (SUNRISE): Results from SUNRISE Sweden's Pilot and COVID-19 Study.," Int. J. Environ. Res. Public Health, vol. 17, no. 22, Nov. 2020, doi: 10.3390/ijerph17228491.
[15] J. McNicholas, M. L. Hammersley, S. Hopkins, S. McDermott, and J. Plaskett, "The Impact of COVID-19 Restrictions on the Healthy Eating and Movement Behaviors of 0-12-Year-Old Children in Western Sydney, Australia.," Front. public Heal., vol. 10, p. 841178, 2022, doi: 10.3389/fpubh.2022.841178.
[16] M. T. C. Lim et al., "School closure during the coronavirus disease 2019 (COVID-19) pandemic - Impact on children's sleep.," Sleep Med., vol. 78, pp. 108–114, Feb. 2021, doi: 10.1016/j.sleep.2020.12.025.
[17] A. D. Okely et al., "Global effect of COVID-19 pandemic on physical activity, sedentary behaviour and sleep among 3- to 5-year-old children: a longitudinal study of 14 countries.," BMC Public Health, vol. 21, no. 1, p. 940, May 2021, doi: 10.1186/s12889-021-10852-3.
[18] K. Hyunshik, M. Jiameng, L. Sunkyoung, and G. Ying, "Change in Japanese children's 24-hour movement guidelines and mental health during the COVID-19

pandemic.," Sci. Rep., vol. 11, no. 1, p. 22972, Nov. 2021, doi: 10.1038/s41598-021-01803-4.
[19] S. C. E. Schmidt et al., "Physical activity and screen time of children and adolescents before and during the COVID-19 lockdown in Germany: a natural experiment.," Sci. Rep., vol. 10, no. 1, p. 21780, Dec. 2020, doi: 10.1038/s41598-020-78438-4.
[20] J. Y. Y. Ng, Q. He, K. H. Chong, A. D. Okely, C. H. S. Chan, and A. S. Ha, "The Impact of COVID-19 on Preschool-Aged Children's Movement Behaviors in Hong Kong: A Longitudinal Analysis of Accelerometer-Measured Data.," Int. J. Environ. Res. Public Health, vol. 18, no. 22, Nov. 2021, doi: 10.3390/ijerph182211907.
[21] M. Trott, R. Driscoll, E. Irlado, and S. Pardhan, "Changes and correlates of screen time in adults and children during the COVID-19 pandemic: A systematic review and meta-analysis.," EClinicalMedicine, vol. 48, p. 101452, Jun. 2022, doi: 10.1016/j.eclinm.2022.101452.
[22] K. Proulx et al., "Nurturing care during COVID-19: a rapid review of early evidence.," BMJ Open, vol. 12, no. 6, p. e050417, Jun. 2022, doi: 10.1136/bmjopen-2021-050417.
[23] C. Bergmann et al., "Young children's screen time during the first COVID-19 lockdown in 12 countries.," Sci. Rep., vol. 12, no. 1, p. 2015, Feb. 2022, doi: 10.1038/s41598-022-05840-5.
[24] R. Hood, J. Zabatiero, D. Silva, S. R. Zubrick, and L. Straker, "'Coronavirus Changed the Rules on Everything': Parent Perspectives on How the COVID-19 Pandemic Influenced Family Routines, Relationships and Technology Use in Families with Infants.," Int. J. Environ. Res. Public Health, vol. 18, no. 23, Dec. 2021, doi: 10.3390/ijerph182312865.
[25] J. Clarke et al., "Impact of COVID-19 restrictions on preschool children's eating, activity and sleep behaviours: a qualitative study.," BMJ Open, vol. 11, no. 10, p. e051497, Oct. 2021, doi: 10.1136/bmjopen-2021-051497.
[26] M. Asikainen, A. Kylliäinen, T. E. Mäkelä, O. Saarenpää-Heikkilä, and E. J. Paavonen, "Exposure to electronic media was negatively associated with speech and language development at 18 and 24 months.," Acta Paediatr., vol. 110, no. 11, pp. 3046–3053, Nov. 2021, doi: 10.1111/apa.16021.
[27] S. Varadarajan, A. Govindarajan Venguidesvarane, K. N. Ramaswamy, M. Rajamohan, M. Krupa, and S. B. Winfred Christadoss, "Prevalence of excessive screen time and its association with developmental delay in children aged <5 years: A population-based cross-sectional study in India.," PLoS One, vol. 16, no. 7, p. e0254102, 2021, doi: 10.1371/journal.pone.0254102.
[28] A. D. Ribner and G. McHarg, "Screens across the pond: Findings from longitudinal screen time research in the US and UK.," Infant Behav. Dev., vol. 63, p. 101551, May 2021, doi: 10.1016/j.infbeh.2021.101551.
[29] B. A. McArthur, S. Tough, and S. Madigan, "Screen time and developmental and behavioral outcomes for preschool children.," Pediatr. Res., vol. 91, no. 6, pp. 1616–1621, May 2022, doi: 10.1038/s41390-021-01572-w.