

The Use of Technology in Early Childhood Education: A Systematic Review

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ABSTRACT

The use of technology in digital era has influenced many factors including education. All stages of education including for the early childhood are now starting to implement digital based education. Therefore, it is important to investigate the influence of technology for the preschoolers. This study aims to provide information and review of the literatures on early childhood education related to digital platform and technology. This literature study was done using three databases, PubMed, Google scholar and SpringerLink. We evaluated paper published between 2010-2020 that used preschool children as subject and using English language. In total we found 13 papers that met the eligibility criteria. The use of technology to support education are mostly done via tablet and personal computer. Tablets more popular than computers because for young children it is easier to operate. Tablets equipped with appropriate software and supporting environment will be beneficial for children. On the other side, the use of technology has consequences for health and the development of the children especially because the declines in physical activity. In conclusion, the use of technology to support early childhood education is beneficial in one side but also detrimental on the other side. Children need support from both parents and teacher.

Keywords: Digital, Early childhood education, Technology

1. INTRODUCTION

Preschoolers have a developmental stage that is very important for their future life. The desire to explore the world around them is the most prominent thing in this phase, so the role of the caregiver is very important to help stimulate development by creating two-way interactions. Since the interaction process also involves how caregivers communicate affections, values, interests, behaviors and beliefs to their children. However, the problems that often arise in this technological era, caregivers often rely on digital media as playmates for children as non-human "actors" [1].

The very rapid development of technology today is considered to be able to help humans to complete their work efficiently in a relatively short time. But on the other hand, technology is able to change human behavior and habits at all age groups, including children. The number of children that using gadget is increasing globally. A study

in USA found that 1 of 3 children can use smartphone even before they can talk [2]. Preschoolers (2 years old children) in New Zealand have average time of using screens is about 1.5 hours each day, which increase to two hours per day when children when children 3.75 years of age [3]. The same situation happens in the other places, especially in developing countries. By facing this issue, researchers evaluated the effects of technology used to preschooler development.

Previous research has found that the use of technology can help children develop creativity, get to know foreign languages (by listening to music and video), better motor skills, improved cognitive skills, cause of distraction in children, more fun for kids, educating young ones, and competition skills [2], [4], [5].

On the other hand, technology used also has negative effects, they are speech or language delay, attention deficits, learning problems, anxiety, and childhood depression [2], [6]. A recent study also found the technology can increase the risk of obesity, physical

damage, and sleep disorder among preschooler [5]. Study from Canadian has identified the screen-time above the two-hours threshold was associated with an increased risk of clinically significant externalizing morbidity and specifically inattention problems. Furthermore, children who participated in more than two-hours/week of organized physical activity were less likely to experience mental health morbidity [7]. Came up with positive and negative effects, integrating technology in early childhood education is still considered as necessary and rapidly implemented in many countries.

Therefore, the literature review of early childhood education related to digital platform and technology is needed.

2. METHODS

This study used three databases as source of the articles. The databases used are PubMed, Google scholar and SpringerLink. Keywords used are “early childhood education” AND “digital” OR “technology”. Article should be published between 2010 to 2020 and delivered in English. The authors exclude physiological-related papers, book chapter, patent, and study that used subject other than preschool children aged 2-6 years old. In addition, the authors adapted PRISMA (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) diagram to obtain the eligible articles as follows:

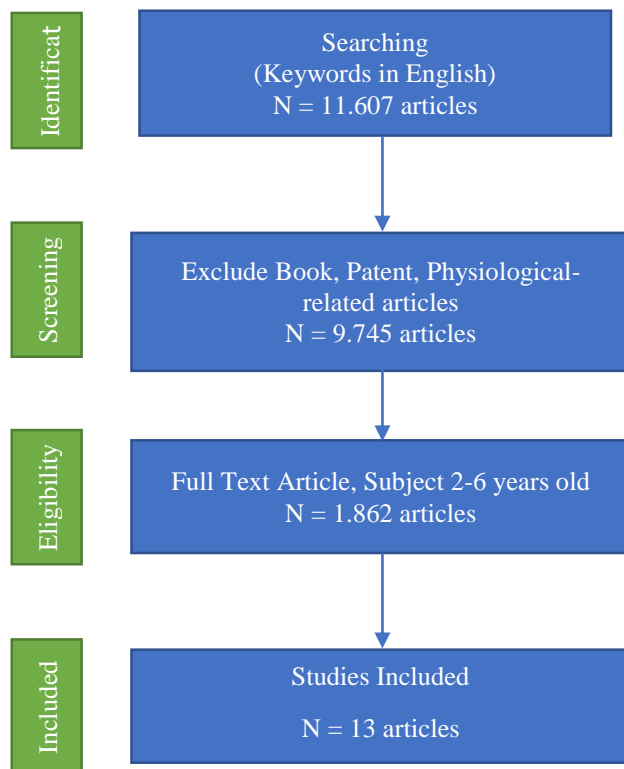


Figure 1. PRISMA (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) diagram

3. RESULTS

Based on the inclusion and exclusion criteria, the authors found 14 articles that were eligible. The brief of the selected articles is described on the Table 1.

4. DISCUSSIONS

It is found that there is some research found the positive impact of digital use to support education on the preschooler while for the other research exposing the negative impacts. This condition is possible due to the different living circumstances of the subject. The housing condition is also influence well-being of the children in cognitive and affective aspects [8].

The average time on tablet or computer is also important since it is related to the physical activity of the children. Physical activity in children is really beneficial since it gives the children improvement on their motoric and cognitive development, fitness bone and skeletal health also has a positive impact for their cardiometabolic [9]. For the children under 5, WHO recommends doing at least 180 minutes of physical activity, no more than 60 minutes sedentary screen time and good quality of sleep ranging from 10 to 14 hours per day [9]. From the articles found, it is known that the time children are exposed with television and tablet computer are vary, in one research found it meets the WHO criteria while the others are not. The time a child’s spent in digital platform either tablets or computers should be a concern for the parents and the teacher. If digital education method was chosen, the teacher should arrange the session no longer than the allowed screen time.

Besides the length of digital exposure, we have to pay attention to the influence of parental and guide. Children that were accompanied and communicate better with their parents has more control on home use information communication technology (ICT), the children also tend to spend more time in learning activities [10].

Concerning of the appropriate software used for education of preschooler by the content, the language used and the duration of each learning session. The children may be exposed of ICT lessons when they are drawing pictures, playing video, and also word processing when the software is intended to tell stories. On the above articles, it is also mentioned that the ICT supports child’s mathematical competence [11].

Table 1. Selected Articles

Number	Authors	Article title	Research design	Sample size	Result
1	Neuman, M. Michelle	Young children and screen time: Creating a mindful approach to digital technology	Cross sectional	69 (children aged 2 to 4)	This research revealed among Australian preschoolers and their parents found that tablets are the easiest device to use by children with an average use of 20 minutes per day. TV was also a digital media which is quite popular in use with up to 80 minutes of use per day. This study showed that the tendency of parents to use gadgets in educating their children is to increase children's creativity, however, it is stated that positive interactions between children and gadgets are things that need to be discussed.
2	Palaiologou, Ionna	Children under five and digital technologies: implications for early years pedagogy	Cross sectional	540 families	Children under 5 years have the highest rates of using digital technology at home. This study confirms that the use of digital technology among children is very common. Even as if there has been a change in the meaning of illiterate person, which was the definition of a person who can't read and write, changed to new definition of illiterate person: considered as a person who cannot learn, unlearn, relearn and use digital technologies as part of their everyday lives.
3	Zaranis, Nicholas	Comparing tablets and PCs in teaching mathematics: An attempt to improve mathematics competence in early childhood education	Experimental study	256 children (122 boys, 134 girls)	This experimental research found that the use of computers and tablets has a positive effect on the mathematical abilities at the age of preschoolers.
4	Rabia M., Yilmaz	Educational magic toys (EMT) developed with augmented reality technology for early childhood education	Cross sectional (mix method: observation, survey, and interview)	30 teachers and 33 children 5 to 6	The use of EMT in learning methods can increase preschooler's interest, however there is no significant effect on cognitive attainment.

5	Irena Y. Maureen, Hans van der Meij & Ton de Jong	Enhancing Storytelling Activities to Support Early (Digital) Literacy Development in Early Childhood Education	Experimental study: 1. control, 2. storytelling, 3. digital story telling	3 classes. 62 children, aged 5–6 years	The implementing of digital storytelling method found significantly enhanced children's literacy and digital literacy skills.
6	Papadakis, S., Kalogiannakis, M., and Zaranis, N.	The effectiveness of computer and tablet assisted intervention in early childhood students' understanding of numbers. An empirical study conducted in Greece	RCT (control and intervention group). 24 half-hour lessons intervention	265 (Mean age= 62M) from 21 kindergartens	The intervention in early childhood students' understanding of numbers revealed that both experimental groups: computers and tablets significantly outperformed the control group on the posttest. This study also found that the use of tablets as a learning tool of numbers, combined with the use of developmentally appropriate software into the children's daily routines, gave a greater impact than computers.

5. CONCLUSION

The education of preschooler using digital platform is a two-edged sword. It could be the easiest and efficient method yet really helpful to support learning environment and child's competencies as long as there are supporting software complemented by sufficient guidance from the teacher and the parents. On the other hand, it could decline child's physical activity and affecting their health.

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