The Egyptian Journal of Hospital Medicine (April 2023) Vol. 91, Page 4387-4392

Effect of Touch Screen Devices Use on Fine Motor Skills of Preschool Children

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ABSTRACT

Background: The development of preschoolers' hand skills may be impacted by touch screen technology.
Objective: The purpose of this study was to investigate the effect of touch screen devices use on fine motor skills of preschool children.
Subjects and Methods: The study sample included 50 children aged 4-5 years who had frequently used interactive tablet media (group A) and 50 children matched for age who hadn't used interactive tablet media (group B). Fine motor skills were evaluated using Peabody Developmental Motor Scale-2 (PDMS-2). Both groups' socioeconomic position was similar and assessed by the Socioeconomic Status Scale (SES).
Results: There was a significant decrease in raw score of grasping and visual motor integration of group A compared with that of group B ($p < 0.05$). There was a significant decrease in age equivalent of grasping and visual motor integration of group A compared with that of group B ($p < 0.01$). There was a significant decrease in standard score of grasping and visual motor integration of group A compared with that of group B ($p < 0.01$). There was a significant decrease in percentile rank of grasping and visual motor integration of group A compared with that of group B ($p < 0.01$). Fine motor skills of group B were better than those of group A.
Conclusion: The fine motor skills of preschool children who do not use touch screens are better than those of children using a touch screen.
Keywords: Fine motor skills, Tablet use, Child development, Peabody scale.

INTRODUCTION

The ability to move and coordinate one's muscles and body is referred to as having motor abilities [1]. Gross and fine motor skills are the two main categories of motor skills. For motions like sprinting, jumping, and throwing, an individual has to be able to coordinate their arms, legs, and other big body components [2].

The capacity to regulate movement through the coordinated use of the nerve system, fibres, and muscles such as those in the fingers and hands is known as fine motor skill [3]. The development of fine motor skills involves the physical manipulation of items including writing, weaving ropes, arranging beams, tying shoelaces, turning pages of books, using scissors, playing with playdough, and folding paper to create shapes [4]. Activities that require fine motor skills include cutting with scissors, colouring, and sketching with pencils and crayons [5].

Early childhood, defined as the age range from three to six years old, is a time of rapid growth and skill development for children [6]. Environmental, biochemical, and genetic variables all have an impact on a child's development [7].

Both academic and everyday tasks require fine motor abilities to be completed. Without the capacity to carry out these regular duties, a child's self-esteem may suffer, their academic performance may suffer, and they may have very few play alternatives. Also, they are unable to acquire the necessary independence in daily skills (such dressing and eating oneself), which has social and peer interaction repercussions. Fine motor abilities are crucial for carrying both daily tasks and academic tasks. Children's self-esteem will be poor and their academic performance will be impacted if they are unable to execute everyday duties. Interactive media have recently been included in the library of teaching tools. Unfortunately, little is known about how these interactive toys affect young children's development, including their fine motor skills [8].

The widespread use of electronic technology in recent years has significantly impacted people's daily lives. The incidence of device ownership among adolescents has reached very high levels and is rising among younger children as these technological usages become more essential in daily life [9].

Families now own a lot more modern technology, like tablets and smartphones, and young kids are using it more often [10].

Young children find touchscreens to be an intuitive and alluring source of sensory and cognitive stimulation [11], and the effect of such gadgets on children's development is a major issue that worries parents, researchers, and policy officials. Children are more independent in their interactions with the gadget and consequently the material thanks to the simplicity of a touch screen [12].

Despite warnings against newborns and early toddlers using touch screens independently, the majority of families said they often allow their kid to use a gadget. As toddlers improve their cognitive executive abilities and are able to comprehend what is being done on the screen, the displays become easier to operate and offer sensory sensations [13]. By using touch displays, learning is improved through haptic engagement [14].

The purpose of this study was to investigate the effect of touch screen devices use on the fine motor skills of preschool children.

Received: 14/11/2022
Accepted: 16/01/2023

SUBJECTS AND METHODS

This study included a total of 50 children aged 4-5 years who had frequently used interactive tablet media; **Group (A)** and 50 age matched children who hadn't used interactive tablet media; **Group (B)** selected from young children attending at public and private day care centers in Alshrqia Governorate.

All children were subjected to:

1- **Assessment of fine motor skills by Peabody Developmental Motor Scale-2:**
The Peabody Developmental Motor Scales, Second Edition, were used to assess fine motor development (PDMS-2). It was created to evaluate children's gross and fine motor skills from birth to age five. The gold standard for evaluating the nature of motor development in diverse kid groups, the PMDS-2 is often utilized in research and literature. The exam was created to determine a child's motor development's strengths and limitations [15].

2- **Important Tips:**
a. All assessment items were given precisely, with clear verbal instructions and examples.
b. The exam was performed in a setting with few distractions. The testing location was prepared beforehand, with sections marked out, measurements taken, and equipment prepared. This kept the test from being interrupted and kept it moving.

3- **Tasks**:
The PDMS-2's fine motor skills subtest has the following items per subtest [15]:

- **Grasping:**
  a. Grasping cubes.
  b. Grasping marker.
  c. Buttoning/unbuttoning buttons.
  d. Touching fingers.
- **Visual-motor integration:**
  a. Building tower/train/bridge/wall/steps/pyramid.
  b. Snipping with scissors imitating horizontal stroke.
  c. Stringing beads.
  d. Folding paper.
  e. Copying circle/cross/square.
  f. Cutting paper/line/circle/square.
  g. Lacing string.
  h. Dropping pellets.
  i. Tracing line.
  j. Connecting dots.
  k. Coloring between lines.
- **Grading and Scoring of the PDMS-2:**
  a. The child was asked to do a task, and the therapist watched the child to see how they handle it. Products received a 2, 1, or 0 ratings.
  b. 0= If a youngster couldn't or won't try something, or if the try didn't show that a certain talent was developing. 1= The child's performance clearly resembled the item mastery criterion, but it fell short of meeting the criteria or demonstrated a nascent competence. 2= The kid completed the task in accordance with the standards established for skill mastery.

4- **The terms socioeconomic status (SES):**
In health research, socioeconomic status and social class are frequently employed [16]. SES assessment is a crucial component of community-based health research since it is a significant predictor of mortality and morbidity, as well as health and nutritional status [17]. Three factors are often used to determine SES: income, employment, and education [18]. In western European nations, the fundamental foundation for SES categorization has been occupational groups based on prestige, abilities, social influence, and/or power [16]. Although SES has traditionally been thought of as an innate trait, in contemporary culture it may vary based on things like occupation, education, income, kind of housing, material belongings, etc. [19]. Seven areas make up the new socioeconomic status scale, which has an overall score of 84.

Ethical approval:

The study was authorised by the faculty's ethical committee at Cairo University's College of Medicine. The research's objectives were explained to all prospective participants' parents, who were then asked to sign a consent form before any children were enrolled. The study was conducted out in line with the Helsinki Declaration.

Statistical analysis

Every statistical test was run using SPSS version 25 for Windows (IBM SPSS, Chicago, IL, USA). Using the Shapiro Walk test, the distribution of the data was examined for normality. Frequencies and relative percentages were used to depict qualitative data. Quantitative information was presented as mean SD (Standard deviation). An unpaired t test was used to compare the demographics of the participants between groups. Chi squared analysis was done to compare the distribution of sexes between groups. To compare grasping and visual motor integration between groups, an unpaired t-test was used. All statistical tests have a significance threshold of p 0.05.

RESULTS

Table 1 shows subjects' characteristics. There was no significant difference between groups regarding age, SES, and sex distribution ($p > 0.05$).

Table (1): Basic characteristics of participants.

	Group A	Group B			
	Mean ± SD	Mean ± SD	MD	t- value	p-value
Age (years)	4.44 ± 0.50	4.60 ± 0.49	-0.16	-1.61	0.11
SES	65.72 ± 4.12	65.1 ± 4.31	0.62	0.73	0.46
Sex, n (%)					
Boys	31 (62%)	25 (50%)		(χ^2= 1.46)	0.22
Girls	19 (30%)	25 (50%)			

SD, standard deviation; MD, mean difference; $\chi^{2,}$ chi-squared value; p-value, probability value.

Table 2 shows Comparison of fine motor skills between group A and B:

There was a significant decrease in raw score of grasping and visual motor integration of group A compared with that of group B ($p < 0.05$).

There was a significant decrease in age equivalent of grasping and visual motor integration of group A compared with that of group B ($p < 0.01$).

There was a significant decrease in standard score of grasping and visual motor integration of group A compared with that of group B ($p < 0.01$).

There was a significant decrease in percentile rank of grasping and visual motor integration of group A compared with that of group B ($p < 0.01$).

Table (2): Comparison of fine motor skills between group A and B.

Fine motor skills	Group A	Group B			
	Mean ± SD	Mean ± SD	MD	t- value	p value
Raw score					
Grasping	49.14 ± 2.72	50.24 ± 2.33	-1.1	-2.17	0.03
Visual-motor integration	131.06 ± 6.88	135.34 ± 4.61	-4.28	-3.65	0.001
Age equivalent (months)					
Grasping	54.54 ± 13.03	61.52 ± 11.03	-6.98	-2.89	0.005
Visual-motor integration	53.02 ± 8.27	60.24 ± 8.86	-7.22	-4.21	0.001
Standard score					
Grasping	8.86 ± 2.23	9.86 ± 1.82	-1	-2.45	0.01
Visual-motor integration	9.26 ± 1.67	10.36 ± 1.68	-1.1	-3.27	0.001
Percentile rank (%)					
Grasping	38.62 ± 22.70	51.50 ± 17.72	-12.88	-3.16	0.002
Visual-motor integration	41.92 ± 18.70	54.44 ± 19.98	-12.52	-3.23	0.002

SD, standard deviation; MD, mean difference; p-value, probability value.

DISCUSSION

This study looked at the impact of touch screen use on young children's fine motor abilities. In this study, 100 kids of both sexes, aged from 4 to 5 years, were evaluated using the following tools: The new socioeconomic status scale (SES), which measures socioeconomic status, and the Peabody Developmental Motor Scale 2 (PDMS-2) to evaluate fine motor abilities.

The results revealed the followings: There was no significant difference between groups regarding age, SES and sex distribution ($p > 0.05$). There was a significant decrease in raw score of grasping and visual motor integration of group A compared with that of group B ($p < 0.05$). There was a significant decrease in age equivalent of grasping and visual motor integration of group A compared with that of group B ($p < 0.01$). There was a significant decrease in standard score of grasping and visual motor integration of group A compared with that of group B ($p < 0.01$). There was a significant decrease in percentile rank of grasping and visual motor integration of group A compared with that of group B ($p < 0.01$).

According to these results, it could be concluded that there is a relation between using touch screen and fine motor skill in children.

Our findings were consistent with those of **Bedford *et al.* [13],** who used an online poll of parents of young children to gather data on tablet use and development. A younger age at the start of tablet touchscreen use was linked to stronger fine motor abilities, such as the capacity to stack blocks, in the 366 children between the ages of 19 and 36 months.

This was supported by the research of **Price and colleagues [20],** who examined the differences between free finger painting and colouring activities carried out (a) on a tablet and (b) with paper and ink in 2- to 3-year-olds. They stated that using a tablet was linked to a decrease in the number of fingers used and more homogeneous final compositions, as well as an improvement in the speed and consistency of sketching motions, which led to more drawings. The authors hypothesised that the latter would be explained by the absence of sensory exposure to paint in the tablet environment. Despite their conflicting results, the authors suggested that the tablet may be employed as an additional teaching tool for preschoolers [20].

The previous findings of this study were consistent with **Lin *et al.* [21]** assessment of fine motor development in two groups of 4- to 6-year-old children using the Bruininks-Oseretsky Motor Proficiency Test. 40 kids who had used tablets for at least more than 60 minutes a week for at least more than a month made up the research group. Is For 24 weeks, they underwent a fine motor skills training programme that included 20 minutes per day of fine motor tablet exercises. At the beginning of the trial, the control group (n ¼ 40) had less tablet experience than the study group. Also, they participated in a 20-minute per day for 24 weeks fine motor skills training programme that included non-screen activities including utilising scissors, sketching, play dough, threading and lacing. Both groups' fine motor abilities were comparable at the beginning of the study, but after 24 weeks of fine motor training, the control group's fine motor abilities, particularly their fine motor precision and integration and their manual dexterity, were superior to those of the study group's children. It's probable that the control group's advantage was due to this group's greater experience with the activities that made up the test [21].

According to **Souto *et al.* [22]**, regular tablet usage in young children was linked to marginally superior fine motor abilities, or an improvement on the order of a third of a standard deviation. This study supports their findings. This also suggests that, contrary to what was previously believed, tablet usage by young children at the frequency of the current research (about one hour per day) does not negatively affect the development of their fine motor skills. However, they noted that majority of the study's participants engaged in both passive and active activities on the tablet, were frequently accompanied by their parents, and only used the device for limited periods of time that did not exceed the guidelines for children.

According to **Souto *et al.* [22]** findings, children's fine motor proficiency was declining below predicted levels, which was consistent with the findings of the current study. They believed that environmental influences had an impact on fine motor abilities. Traditional hobbies like playing with blocks, board games, building toys, or puzzles have been replaced by screen-based activities like utilizing a touch-screen tablet or gadget [23]. These kids could spend less time doing conventional activities and more time doing screen-based ones, which could have a negative impact on how well their fine motor skills develop. The digital applications used in this study may be recommended by some occupational therapists to support the development of fine motor skills, but their educational and therapeutic effects might not entirely replicate the effects of age-appropriate traditional non-digital fine motor activities, such as using scissors, drawing, and constructive play, which offer significant opportunities and experience for developing fine motor skills [23].

Yet, just because a youngster can operate a screen doesn't guarantee they can also learn from it [24]. The involvement of parents is crucial when it comes to young children's screen time. When parents actively engage in media usage and support their children in developing symbolic thinking, learning from screens and its application to the real world both increase dramatically [25].

In older children and adults, there was evidence of a link between active screen-based media consumption and fine motor skill [26]. Adults who use touchscreen phones have enhanced fingertip somatosensation and related brain activity [27], and videogames can educate manual dexterity and visual motor skills, including specialised abilities like laparoscopic surgery [28].

The ability to transfer a manual skill learned through screen-based media to the real world frequently depends on the intricacy of the virtual skill being learned and how closely it resembles actual abilities [29]. For instance, despite benefits in school preparation and cognitive development, a research examining the association between general computer usage and development in 38- to 61-month-olds revealed no relationship with visuomotor or gross motor development [27].

On the other hand, earlier research has shown that playing screen-based video games can improve visual discrimination, visual scanning speed, and selective attention [30]. The results of the current study contradict earlier findings since children in the tablet group performed worse on tests of visual perception than children in the non-tablet group. Also, the tablet group's performance in visual discrimination and spatial connections was shown to be correlated with the number of minutes spent using the device. Around the age of five to six, several visual perception abilities were fully developed [27].

Moreover, **Schneck *et al.*** [31] study was in line with other research that showed impairments in fine motor function with regular mobile device usage [32]. The results of this study confirm that kids who used tablets more often scored worse on fine motor accuracy tests. Instead of engaging in more conventional activities like playing with blocks, board games, construction toys, or puzzles, children were increasingly engaging in screen-based activities, such as using a touchscreen tablet or gadget [33].

CONCLUSION

The fine motor skills of preschool children who do not use touch screens are better than those of children using a touch screen.

Supporting and sponsoring financially: Nil.
Competing interests: Nil.

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