

Differences between preschool children using tablets and non-tablets in visual perception and fine motor skills

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Abstract

Background: Numerous touch-screen applications designed to support visual perceptual skills and fine motor development for young children are available.

Objectives: This study aimed to investigate whether or not there were differences between children using tablets and non-tablets in visual perception and fine motor skills and to examine the association between visual perception and fine motor skills in two groups.

Methods: This study had tablet and non-tablet groups, each with 36 typically developing preschool children.

Results: Children in the non-tablet group yielded significantly higher scores in the subtests of visual discrimination, visual memory, spatial relationships, form constancy, visual figure ground, fine motor precision, fine motor integration, and manual dexterity than those in the tablet group. The association between visual perception and fine motor skills demonstrated different patterns in the two groups.

Conclusion: There are differences in visual perception and fine motor skills between children using tablets and non-using tablets. Different patterns of association relationship support the need for occupational therapists to consider the underlying mechanism.

Keywords

Tablet, visual perception, fine motor, preschooler children

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Introduction

With the rapid evolution of technology, children are very attracted by televisions, smartphones, and computer- and tablet-based games. The proportion of time spent by children on screen-based leisure activities and the frequency of using tablet in children have increased. According to the report by Taiwan's Ministry of Health and Welfare, children aged 3 to 12 years now spend more than two-thirds of their daytime hours on sedentary activities. In other words, the sedentary lifestyle has become the mainstream living pattern for children in Taiwan (Child Welfare League Foundation, 2013). This may limit the time available for physical activities that promote their growth and health.

The preschool stage is an important period for children to develop their motor, language, cognitive, and social-emotional skills. Using tablets in early

childhood may be a risk factor that affects the growth and development of infants and children (American Academy of Pediatrics (AAP), 2016), and using a touchscreen tablet or mobile device may affect the development of fine motor skills and visual perception in preschool children (AAP, 2011; Lin, Cherng, & Chen, 2017; Price, Jewitt, & Crescenzi, 2015). However, the real effects of using tablets on the development of young children remain unknown

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because there has been little dedicated research in this area. In particular, there has been limited research pertaining to the association between tablet use and visual perception and fine motor skills.

Children grow and their skills develop dramatically in early childhood, defined as three to six years of age (Copple & Bredekamp, 2009). During the preschool period, children develop multiple basic skills and functions (Zwicker & Harris, 2009). Preschool children spend much time playing and exploring their environment. Playing activities require a considerable integration and execution of visual perception and fine motor skills (Zwicker & Harris, 2009). Visual perception is the process of vision and cognition, including visual attention, visual searching, visual discrimination, visual memory, and visual cognitive function; these can help the planning and execution of activities (Case-Smith & O'Brien, 2010). Fine motor skills refer to manual dexterity skills, which include reaching, grasping, manipulating objects, and using tools (Case-Smith & O'Brien, 2010).

Tablets and application software have increased in popularity in recent years due to greater numbers of users and an extension of the range of their ages, with preschool children now becoming tablets users (Common Sense Media, 2017; Costello, 2012). In Taiwan, the Child Welfare League Foundation (2013) has conducted a survey of 1500 families with children under 12 years old to investigate conditions related the use of computers, communication technology, and consumer electronics products. The findings of this survey revealed that 97.9% of families had video games, computers, smartphones, or tablets at their homes, with 10.4% of children under six years having their own smartphones or tablets. More than 20% of the children used smartphones or tablets for at least an hour daily. Notably, 67.6% of the children had accessed smartphones or tablets before reaching the age of six years, and 92.8% had actively asked to use smartphones or tablets. Similar results have been reported by a survey conducted by the Common Sense Media organisation (2017), which showed that 46% of children aged two to four years and 66% of aged five to eight years had their own tablet and smartphone. Approximately 84% of children under the age of eight years had used a mobile device at some time. Children aged two to eight years spent approximately an hour daily with mobile devices overall (58 min among children aged 2 to 4 years and 62 min among those aged 5 to 8 years). It has also been estimated that many parents use smartphones or tablets as a form of 'babysitter' to keep their children playing quietly for a while (Child Welfare League Foundation, 2013; Common Sense Media, 2017). In short, tablets have become common objects in the daily lives of children worldwide, and paediatric

occupational therapists are concerned regarding the potential effects of frequent screen-based activities on the development of children's visual perception and fine motor skills.

Previous studies have shown that applying technology products to education could enhance children's motivation and participation in learning (Arrowood & Overall, 2004; Chung & Walsh, 2006; Schmid, Miodrag, & DiFrancesco, 2008; Zevenbergen & Logan, 2008) and that learning with technology products improved cognition, constructive knowledge, problem solving, and language (Clements & Sarama, 2003; Swaminathan & Wright, 2003; Vernadakis, Avgerinos, & Tsitskari, 2005). However, some researchers have questioned the benefits of using technology products in children's learning (Couse & Chen, 2010). For example, learning with technology products may deprive children of the in-hand manipulation forms of traditional learning (Couse & Chen, 2010). Thus, there is an urgent need to assess the impacts of tablet use on children's health and development.

When using a tablet, the eyes focus on the dynamic screen, and visual perception and tactile senses are quickly integrated (Johnson, 2012). Studies have shown that visual stimuli provided by computer games increase visual discrimination, the speed of visual scanning, and selective attention (Green & Bavelier, 2007; Spence & Feng, 2010). Recently, two meta-analyses of the effects of computer game training on visual and spatial perception indicate that playing video games has positive effects (Powers, Brooks, Aldrich, Palladino, & Alfieri, 2013; Stanmore, Stubbs, Vancampfort, de Bruin, & Firth, 2017). Research on the computerised visual perception training programmes used for children with special needs also demonstrated promising results (Park & Park, 2015; Poon, Li-Tsang, Weiss, & Rosenblum, 2010). However, users may unconsciously prolong the time they spend using their tablets because of the convenience and entertainment provided by these applications. Rapid scene changes and numerous light stimulations can tire the ocular muscles and may result in weak visual pursuit ability (Lin & Wang, 2008). Negative effects of the overuse of these applications by children include myopia, a lack of time interacting with adults, attention deficit, and impaired construction of three-dimension visual spatial perception (AAP, 2011). According to the recommendations of the AAP (2016), preschool children should not use screen-based products for more than an hour per day.

Many daily activities involve manipulation skills of both hands. When children manipulate toys or objects with their fingers and hands, this requires a high degree of coordination of muscle physiology, joint stability,

visual perception, and haptic perception (Case-Smith & Exner, 2015). In contrast, only basic actions are needed for using a touchscreen device, such as tapping, double-tapping, pressing, sweeping, dragging and zooming (Price et al., 2015). These activities involve less muscle strength, coordination, and dexterity than grasping objects, drawing, handwriting and manipulating toys or objects (Mangen & Velay, 2010). Therefore, the frequent use of touchscreen tablets by preschool children may exert a potentially detrimental effect on the development of their fine motor skills (Lin et al., 2017; Mangen & Velay, 2010).

Many tablet applications for children are advertised as having functions that train visual perception and fine motor skills; however, their effects have rarely been supported by evidence-based studies. Indeed, there has been little published research pertaining to the effects of using a touchscreen tablet on fine motor skills in preschool and school-aged children (Coutinho, Bosisio, & Brown, 2017; Lin et al., 2017). Coutinho et al. (2017) have reported that children with poor visual motor skills showed improvements in visual motor integration skills with interventions using iPad applications or traditional occupational therapy, with similar gains over time between the two interventions. In contrast, Lin et al. (2017) have reported that children who used touchscreen tablets experienced significant decreases in fine motor precision, fine motor integration, and manual dexterity. However, factors related to the fine motor skills such as visual perception have not been further explored. Additional evidence that relationships between visual perception and fine motor skills among children using tablets and non-using tablets were worth investigating.

There has been an ongoing debate in the literature regarding the association between visual perceptual and fine motor skills (Schneck, 2010). For example, Henderson, Barnett, and Henderson (1994) have found no correlation between visual perceptual and motor skills, whereas Brown (2012) has reported that visual perceptual skills and visual motor integration skills were related and dependent on each another. However, these studies focused primarily on children aged 6 to 12 years. Little is known regarding the association between visual perception and fine motor performance in preschool children and their correlation with the use of touchscreen tablets. Therefore, the main aim of this study was to investigate whether or not there were differences between preschool children using tablets and non-using tablets in visual perception and fine motor skills. In addition, the study examined the association between visual perception and fine motor performance in two groups.

Methods

Research design

A cross-sectional study was conducted from July to September 2017 in Tainan City, Taiwan.

Participants

Seventy-two preschool children (mean age, 61.9 ± 7.3 months; 46 boys, 64%) from six preschools were recruited. When recruiting the participants, the primary investigator asked parents the following questions: (1) Does your child use a tablet to play any game or educational purposes more than 6 months? (2) How many times does your child use a tablet per week? (3) How much time does your child play per time? The inclusion criteria were as follows: (a) typically developing children aged four to six years; (b) the score of the Peabody Picture Vocabulary Test-Revised (PPVT-R, Mandarin Version; Lu & Liu, 2005) was more than 85; and (c) the presence of no visual or hearing impairment. Purposive sampling was used to recruit the children and assign them to two groups according to their experience of using a tablet, with 36 children who used tablets to play any game or educational purposes more than once a week (for at least 20 min per time) lasting more than six months (mean time = 230.2 ± 163.7 min per week, range from 50 to 630) assigned to the tablet group and 36 children who never used tablets assigned to the non-tablet group. The children in the two groups were matched for age and gender. Table 1 presents characteristics of sample participants. There were no significant differences between the groups in any demographic characteristics, with the exception of a greater number of children without siblings in the tablet group (25.0% vs. 5.6%).

Measures

Cognitive ability. The children's cognitive ability was assessed by the Chinese version of the PPVT-R (Lu & Liu, 2005). This is a 125-items test for children aged 3 to 12 years, with established good reliability and validity. The raw score can be translated to a standard score (100 ± 15). The test lasts for approximately 10 to 15 min.

Visual perception. *The Test of Visual Perceptual Skills, Third Edition (TVPS-3; Martin, 2006)* is a seven-subtest visual perception measure for children aged 4 years to 18 years. This test requires only a few verbal instructions and is not affected by culture, race, or education level. Subtests include visual discrimination (the ability to recognise details in visual images); visual memory (a form of memory that preserves

Table 1. Demographic characteristics of participants.

Characteristics	Tablet group M (SD) or n (%) (n = 36)	Non-tablet group M (SD) or n (%) (n = 36)	Statistic
Gender			
Boy	23 (63.9%)	23 (63.9%)	
Girl	13 (36.1%)	13 (36.1%)	
Age (months)	61.8 (7.4)	61.9 (7.2)	$t = -.08$
Birth order			$\chi^2 = 3.00$
First-born	20 (55.6%)	27 (75.0%)	
Middle-born/Last-born	16 (44.4%)	9 (25.0%)	
Only child	9 (25.0%)	2 (5.6%)	$\chi^2 = 5.20^*$
Hand preference			$\chi^2 = .31$
Right	29 (80.6%)	29 (80.6%)	
Left	3 (8.3%)	2 (5.6%)	
Mixed	4 (11.1%)	5 (13.9%)	
BMI	15.6 (1.7)	15.3 (1.3)	$t = .77$
PPVT-R	115.6 (8.6)	118.8 (10.0)	$t = -1.46$
Father's age (years)	39.0 (5.8)	37.7 (3.8)	$t = .93$
Father's educational level			$\chi^2 = 2.90$
High school and below	17 (47.2%)	10 (27.8%)	
Bachelor degree or above	19 (52.8%)	26 (72.2%)	
Mother's age (years)	36.2 (4.5)	36.0 (3.0)	$t = .21$
Mother's educational level			$\chi^2 = .91$
High school and below	17 (47.2%)	13 (36.1%)	
Bachelor degree or above	19 (52.8%)	23 (63.9%)	
Household income			$\chi^2 = 1.29$
Average	30 (83.3%)	26 (72.2%)	
Above average	6 (16.7%)	10 (27.8%)	

BMI: body mass index; PPVT-R: Peabody Picture Vocabulary Test-Revised.

* $p < 0.05$.

characteristics pertaining to visual experience); spatial relationships (the ability to specify how an object is located in space in relation to a reference object); form constancy (the ability to recognise that a shape remains the same despite changes in size, direction, orientation, and distance); sequential memory (the ability to remember a series of shapes, numbers, letters, or objects in order); visual figure ground (the ability to separate the elements of a visual image on the basis of contrast to perceive an object against a background); and visual closure (the ability to visualise a complete whole when given incomplete information or a partial picture). Reportedly, test's validity is 0.96 and the test-retest reliability at three weeks is 0.97. The test lasts for approximately 30 min to complete all the subtests. In this study, the standard scores were used.

Fine motor performance. *The Bruininks–Oseretsky Test of Motor Proficiency, Second Edition* (BOT-2; Bruininks & Bruininks, 2005) was used to examine the children's fine motor performance. This is a norm-referenced, standardised motor assessment and is suitable for people aged 4 to 21 years. Two fine motor domains

(fine manual control and manual coordination) are assessed by four motor subtests, including fine motor precision (e.g., cutting out a circle and connecting dots), fine motor integration (e.g., copying a star and copying a square), manual dexterity (e.g., transferring pennies, sorting cards, and stringing blocks), and upper-limb coordination (e.g., throwing a ball at a target and catching a tossed ball). The subtest measures are available as a raw score, standard score, and percentile rank. BOT-2 has shown good reliability and validity responsiveness for assessing motor competence in Taiwanese children (Wuang & Su, 2009). In this study, the standard scores of the fine motor precision, fine motor integration, and manual dexterity subtests were applied.

Demographic information. Questionnaires included the following demographic information: age, sex, height, weight, birth order, the number of siblings, hand preference, and medical history. In addition, the questionnaire included questions regarding the parent's age, education level, employment status, and marital status as well as the household income.

Table 2. Scores on Visual Perception and Fine Motor Assessments.

Assessments	Tablet group M (SD)	Non-tablet group M (SD)	t	p
TVPS-3 subtests				
Visual discrimination	11.03 (3.41)	12.67 (3.36)	-2.056	0.044
Visual memory	12.08 (3.36)	14.83 (2.85)	-3.744	<0.001
Spatial relations	13.58 (4.29)	16.03 (2.70)	-2.896	0.005
Form constancy	9.83 (3.43)	12.58 (2.55)	-3.865	<0.001
Sequential memory	10.97 (4.40)	12.36 (3.50)	-1.482	0.143
Figure ground	11.67 (3.79)	13.83 (3.61)	-2.486	0.015
Visual closure	9.36 (4.73)	10.64 (3.73)	-1.273	0.207
BOT-2 subtests				
Fine motor precision	18.67 (4.08)	21.78 (3.83)	-3.335	0.001
Fine motor integration	18.42 (3.57)	20.75 (4.92)	-2.301	0.024
Manual dexterity	17.22 (3.91)	18.92 (3.21)	-2.011	0.048

BOT-2: Bruininks-Oseretsky Test of Motor Proficiency, Second Edition; TVPS-3: Test of Visual Perceptual Skills, Third Edition.

Procedures

The study protocol has been approved by the Institutional Review Board of National Cheng Kung University Hospital (A-ER-102-347). Fliers were used to recruit the children and their parents from six pre-schools. The principal investigator explained the complete procedures to all the parents from whom written informed consent was obtained before the children were enrolled in the study. After recruitment, a registered occupational therapist administered the PPVT-R, the TVPS-3, and the three fine motor subtests of the BOT-2. The occupational therapist was blinded to group membership when assessing the children. The analyses were performed after all the data were collected.

Data analysis

The data were analysed with the Chinese version of IBM SPSS 22.0. The demographic information for the children and their families were summarised by descriptive statistics. The data were analysed by independent sample *t* tests. A one-way analysis of covariance (ANCOVA) was conducted to examine whether differences in demographic characteristics accounted for differences in visual perception and fine motor skills between the two groups. Bivariate correlations were computed to identify significant correlations among all variables. Statistical significance was set at $p < 0.05$.

Results

All 72 children showed typical visual perception and fine motor performance. As shown in Table 2, the children in the tablet group showed significantly lower scores for visual discrimination, visual memory, spatial

relationships, form constancy, and visual figure ground than those in the non-tablet group. There were no significant group differences in the sequential memory or visual closure subtests. In the assessment of fine motor skills, the children in the non-tablet group showed significantly higher scores in fine motor precision, fine motor integration, and manual dexterity than those in the tablet group (Table 2). When 'being an only child' was entered as a covariate in ANCOVA analysis, the observed differences between the groups in visual discrimination ($F = 4.24$, $p = 0.043$), visual memory ($F = 16.65$, $p < 0.001$), spatial relationships ($F = 9.57$, $p = 0.003$), form constancy ($F = 13.96$, $p < 0.001$), visual figure ground ($F = 5.23$, $p = 0.025$), fine motor precision ($F = 10.69$, $p = 0.002$), fine motor integration ($F = 5.20$, $p = 0.026$), and manual dexterity ($F = 4.23$, $p = 0.043$) remained significant.

A correlation matrix was used to illustrate the associations between visual perception and fine motor skills for the two groups. Table 3 presents the correlations among the variables. In the tablet group, the following significant correlations were observed: fine motor precision and fine motor integration with visual discrimination, spatial relationships, and sequential memory; and manual dexterity with visual memory and form constancy. In the non-tablet group, the following significant correlations were observed: fine motor precision with visual discrimination and spatial relationships; fine motor integration with visual discrimination, spatial relationships, and visual closure; and manual dexterity with visual discrimination. Thus, different patterns of correlations between visual perception and fine motor skills were observed in two groups.

Furthermore, the correlation analysis between the time (minutes) of using tablet and the performance of the visual perception and fine motor skills in the tablet

Table 3. Intercorrelations of the TVPS-3 and BOT-2 in the tablet and non-tablet groups.

Tests	Tablet group			Non-tablet group		
	Fine motor precision	Fine motor integration	Manual dexterity	Fine motor precision	Fine motor integration	Manual dexterity
Visual discrimination	.352*	.432**	.276	.434**	.334*	.434**
Visual memory	.209	.137	.343*	.007	.131	.103
Spatial relations	.417*	.369*	.268	.370*	.333*	.263
Form constancy	.018	.043	.404*	.074	.197	.219
Sequential memory	.450**	.577***	.273	.064	.022	-.175
Figure ground	.124	.186	.050	.282	.206	.170
Visual closure	.266	.171	.099	.288	.402*	.226

BOT-2: Bruininks–Oseretsky Test of Motor Proficiency, Second Edition; TVPS-3: Test of Visual Perceptual Skills, Third Edition.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

group was conducted. The time of using tablets were negatively correlated with fine motor precision ($r = -.382$, $p = 0.022$), visual discrimination ($r = -.357$, $p = 0.033$), and spatial relationships ($r = -.362$, $p = 0.030$), indicating that children who spent more time using tablets had lower scores on fine motor precision, visual discrimination, and spatial relationships. No other significant correlations were found.

Discussion

The purpose of this study was to extend the current knowledge regarding the differences between children using tablets and non-using tablets in visual perception and fine motor skills. The children in the non-tablet group showed significantly higher scores than those in the tablet group for visual discrimination, visual memory, spatial relationships, form constancy, visual figure ground, fine motor precision, fine motor integration, and manual dexterity. In addition, the different patterns of associations between visual perception and fine motor skills were observed in the two groups.

Interestingly, children in the tablet group did not have better visual perceptual skills even though these devices and applications could enhance the children's motivation. In particular, it should be remembered that there may be disadvantages for children in developing their visual perception ability. Previous studies have reported that screen-based computer games provide sufficient stimuli to enhance visual discrimination, visual scanning speed, and selective attention (Green & Bavelier, 2007; Spence & Feng, 2010). The current study does not support previous research, with children in the tablet group showing lower scores in their visual perception performance than those in the non-tablet group. In addition, the relationships between minutes of using tablet and the performance of the visual discrimination and spatial relationships in the tablet

group were found. Many visual perception skills mature at the age of five to six years old (Schneck, 2010). These skills allow children to recognise forms or objects when shown in different environments, positions, and sizes. Most of the tablet applications for enhancing children's visual perception skills involved animation or cartoon pictures. This reduced the children's time for involvement in realistic environments and their opportunities to gain experience of observing objects in different circumstances. Notably, the composition of applications may be a crucial ingredient. Previous studies have indicated that screen-based activities may influence the development of stereo vision (AAP, 2011). Most tablet applications involve two-dimensional, flat cartoon images, and the children just use their fingers to move the image or touch the screen. Many visual perception skills depend on the properties of the object and the multidimensional information perceived by the individual, and it involves the perception of three-dimensional aspects. Tablet applications differ from traditional pencil–paper or hand manipulation activities. In traditional play activities, the children actively rotate and touch the objects, obtaining sufficient information about them; playing tablet applications cannot provide these same opportunities to explore an object. Thus, the children in the tablet group may not have received sufficient stimuli to develop their visual perception ability. This finding may imply that traditional play activities in a natural environment remain necessary and important for preschool children to develop visual perception skills.

Our results were consistent with previous studies that highlighted disadvantages in fine motor performance with the frequent use of mobile devices (Lin et al., 2017; Mangen & Velay, 2010). The finding of this study supports that children who spent more time using tablets had lower scores on fine motor precision. Children are now frequently performing screen-based activities, such as using a touchscreen tablet or

device, instead of traditional activities, such as playing with blocks, board games, construction toys, or puzzles, etc. (Flewitt et al., 2015; Lauricella et al., 2015). Because they spend so much time on screen-based activities, they may not have sufficient time and opportunities to develop their motor skills and abilities through traditional activities. It is reasonable to assume that excessive use of a touchscreen tablet or any other touchscreen device may limit the time available to preschool children for fine motor development.

Notably, children in the non-tablet group showed significantly higher scores in many visual perception and fine motor skills. These results were consistent with the findings of Dankert, Davies, and Gavin (2003), who have demonstrated that traditional fine motor and visual perception activities could improve visual motor skills in preschool children. Given that the three motor subtests of the BOT-2 included the use of scissors, paper, and pencils, it is possible that the focus of the non-tablet group on these items may account for their greater proficiency on BOT-2 compared to the tablet group. Children in the non-tablet group may practice activities that were related to improve specific visual perception and fine motor skills. However, the transferability of fine motor skills acquired through tablet applications remains unknown. Unlike with the tablet applications, the parents of the non-tablet group children were able to modify the difficulty level of the activities in accordance with their child's current ability level. Although most of the tablet applications had settings for choosing the difficulty level, the grading of levels was too coarse to allow adjustment suitable to each child's needs. It is possible that individualised activities monitored by parents were more efficient for enhancing abilities than tablet-based applications with fixed modes.

Different patterns of relationships between visual perception and fine motor skills were observed in two groups. For both groups, fine motor precision and fine motor integration were correlated with visual discrimination and spatial relationships. In the tablet group, sequential memory was additionally correlated with fine motor precision and fine motor integration. This suggests that children in the tablet group relied more heavily on sequential memory than those in the non-tablet group. Previous research has indicated that visual perception skills and visual motor skills are linked especially for children presenting with reduced motor functions (Parush, Yochman, Cohen, & Gershon, 1998; Tsai & Wu, 2008). Tseng and Chow (2000) also reported that sequential memory was the significant predictor of children with slow handwriting speed but not for the normal handwriting speed. It is plausible to assume that children in the tablet group required more visual perceptual skills to perform fine

motor skills. Moreover, the actions involved when using a touchscreen tablet are different from those required for common activities of daily living. The use of a touchscreen tablet does not provide abundant kinesthetic and haptic feedback of movements (Price et al., 2015). A plausible explanation for the different relationship patterns is that the experience of developing visual perception and fine motor skills while using a touchscreen tablet may result in changes in neurophysiological functions (Venetsanou & Kambas, 2010). However, it remains unknown how the development of visual perception and fine motor skills through tablet use changes over time. These findings warrant further research on the neurophysiological mechanisms involved in visual perception and muscle activity.

The number of children without siblings in the tablet group was considerably higher than that in the non-tablet group. As shown in previous surveys, parents sometimes use electronic or handheld devices as 'baby-sitters' to keep the child occupied (Child Welfare League Foundation, 2013; Common Sense Media, 2017). Children without siblings had a higher probability of being fed or accompanied by electronic or mobile devices. These findings have implications for paediatric practitioners who promote the health and development of preschool children through providing empirical knowledge pertaining to health education, appropriate play, entertainment and learning activities at home.

There are some limitations in this study, and the findings should be interpreted with cautions. First, the sample size was small, and the findings may not be generalisable to a larger population. Second, the study only assessed visual perception and fine motor skills; future studies may extend the outcome measures to other aspects such as children's cognitive and social performance. The effects of touchscreen tablet use on language, cognition, and psychosocial development remain unknown, and future research using more comprehensive assessments of these factors is imperative. In addition, preschool children use their mobile devices primarily for playing games and watching videos nowadays (Common Sense Media, 2017). In this study, the experience of using a tablet was defined as children using a tablet to play any game or educational purposes more than once a week (for at least 20 min per time) lasting more than six months. However, the primary investigator did not obtain the frequency and duration of use the tablets to watch videos in addition to playing games or educational purposes. It may be assumed that, in addition to played games, the children in the tablet group spent time on watching videos in the tablets, so that their visual perception and fine motor performance were lower than those in the non-tablet group. Therefore, the physical context and type of use should be considered in future studies.

Conclusion

This study assessed the differences between children using tablets and non-using tablets in visual perception and fine motor skills, and identified the patterns of correlation between visual perception and fine motor skills in two groups. Children in the tablet group showed significantly lower scores than those in the non-tablet group for visual discrimination, visual memory, spatial relationships, form constancy, visual figure ground, fine motor precision, fine motor integration, and manual dexterity. Different patterns of correlation were identified. Visual sequential memory may play a critical role in fine motor skills among children using tablets. These findings can help occupational therapists target suitable factors and focus on strengthening visual perception and fine motor skills. The use of technology in practice requires a thorough analysis of the applications to be used prior to their therapeutic implementation. Additional studies with larger sample size are warranted to examine the effects of using a tablet on the development of preschool children over time.

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