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Computer Tablet Games' Effect on Young Children's Self-Concept

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Abstract

Playing in general has a positive effect on child development; yet with the advancement of technology, the way children play has changed, and the effects of their play have changed as well. Some studies have shown an overall negative effect of electronic games, while others have reported the opposite. This study aims to investigate the effects of tablet-based electronic games on the child's self-concept. Twenty-six children between the ages of 4 and 6 years from low-income backgrounds participated. They were divided into two groups; in the experimental group, children were given a tablet device with 10 educational electronic games on it, and the mothers were instructed to let them play the games for less than three hours a day in a normal home situation. The control group was not given any electronic devices. A pre- and post-pictorial measure of self-concept was used. The overall results showed no gains in self-concept for the experimental group and no differences between the groups, except in the domain of curiosity, where the control group children experienced a pre- to post-test increase.

Keywords: computer tablet game, self-concept, young children

1. Introduction

During the past few decades, with the introduction of electronic and video games into their play world, children's play has changed dramatically. This change has been even more pronounced in the past 10 years, as electronic games have become available on smart phones and electronic touch screen tablets. Additionally, most of these games can be downloaded for free or at a low cost. Now children can enjoy playing such games (of different genres, such as action, adventure, sport, and strategy, etc.) anywhere and at any time.

Research has reported mixed results on the effects of electronic games (video games or computer touch screen tablet games) on the behavior of the players. On the one hand, some studies have reported negative consequences such as, increased aggressiveness and several medical and psychosocial effects, while on the other hand, positive benefits have also been documented, such as improved hand-eye coordination, reduced reaction time, and increases in self-esteem (Griffiths, 2002). While electronic games that are considered as passive leisure are not correlated with children's wellbeing and positive self-concept, those considered as active leisure are related to happiness and positive self-concept in children (Holder, Coleman, & Sehn, 2009). People's experience of electronic games affects their self- concept: if they experience joy and happiness, their self-concept is usually positive, especially when they are playing adventure and action games (Przybylski, Weinstein, Murayama, Lynch, & Ryan, 2012).

Studies also show that when specific tablet software is used in a controlled environment, mathematics knowledge increases in a relatively short amount of time (Schacter & Jo, 2016). Further, educational computer applications have a positive impact on learning and sense of self-worth, by giving the child an opportunity to develop mastery over technology and to be more self-directed (Wartella & Jennings, 2000). Overall, competence and mastery of electronic games show more positive outcomes than struggling to finish the game or to move from one level to the other (Ryan, Rigby, & Przybylski, 2006).

By the term "self-concept," we mean the way an individual perceives him/herself as a physical, social, and spiritual or moral being (Gecas, 1982). Positive self-concept, particularly in regard to skills related to computer technology, is facilitated through computer game play, as is evident in Durkina and Barberb's (2002) study with university students, where students who played computer games scored higher on self-concept reports than those who did not play. Moreover, individuals who use computers and social media to communicate with others

usually have a positive self-concept (Sponcil & Gitimu, 2013).

Children who play with electronic games show a stronger tendency toward academic achievement than do children who do not play such games (Yee, 2006). This is an important finding because achievement and self-concept are significantly and positively related (Marsh & Craven, 2006); therefore, to improve academic achievement, it is recommended to improve students' self-concept as a non-cognitive intervention (Parker, Marsh, Ciarrochi, Marshall, & Abduljabbar, 2014). Playing electronic games and enjoying them helps people to increase their self-concept, and it motivates them (Przybylski et al., 2012). Self-concept is also associated with self-efficiency, as people with higher self-concept are usually more efficient in what they do (Mattingly & Lewandowski, 2013), including critical thinking and problem solving (Kim & Choi, 2014). Studies also showed an association between physical play and physical self- concept (Babic et al., 2014). For children to gain any skills or benefits from what they are playing, interaction with others (Kory & Breazeal, 2014), especially parent-child interaction (Radesky, Schumacher, & Zuckerman, 2015), and interactive feedback from their parents, teachers, or siblings are required (Yannier, Koedinger, & Hudson, 2015).

Furthermore, a study showed that 10- to 15-year-old children who played electronic games for one hour each day displayed better prosocial behavior, greater life satisfaction, and low psychological problems compared to non-players and heavy players. On the other hand, moderate players, defined as those who played electronic games one to three hours daily, showed neither positive nor negative indicators, which suggest that moderate players do not differ from non-playing children (Przybylski, 2014).

A previous study conducted in a primary school setting investigated the cognitive, emotional, and behavioral effects of using an iPad during learning in class. The results showed that children who used iPads scored higher on overall engagement, as well as on cognitive and emotional engagement, but not on behavioral engagement, compared with children in a control group (McPhee, Marks, & Marks, 2013). Similarly, Bahatheg (2013) studied the effect of iPad electronic games on self-concept skills in a pre-post design study with deaf children; the children who played iPad games for 2 to 3 hours every day for 2 months experienced increases in their self-concept in comparison to their peers in the control group, who did not show any significant increases in their self- concept (Bahatheg, 2013).

Overall, researchers agree that electronic games have some effect on people's behavior. Yet there is a lack of research on the direct effect of playing with electronic touch screen tablet games on children's self-concept; therefore, this study aims to investigate the effect of playing with educational electronic games on the child's self-concept, in a normal home situation, where parents are not usually involved in playing or participating with their children while the children are engaged with such devices. We hypothesized that children's self-concept will be increased after playing with electronic tablet games.

2. Methods

2.1 Participants

A total of 26 children (17 girls and 9 boys) and their mothers were recruited from the Alnahda Women's Organization (Note 1) in Riyadh, Saudi Arabia. The age of children ranged from 4 to 6 year olds and had a mean IQ of 88. All of them came from low-income backgrounds (to control for previous experience), were not yet attending school, and had no access to electronic games, according to their mothers. The children were divided into an experimental and a control group, each comprising 13 children (seven girls in the experimental group and eight girls in the control group). Group assignment was based on matched pairings according to IQ to ensure that IQ differences would not be a confounding factor.

2.2 Measures

The Self Concept Test developed by Ibrahem Gashgosh was used to evaluate each child's self-concept. The test comprises 40 pictures; all characters are stylized figures. The test covers 13 domains of self–concept (general self-assessment, social acceptance, physical appearance, physical ability and skill, independence, interpersonal relationship skills, leadership ability and influence, language and communication skills, knowledge and thinking, problem solving, curiosity, physical property, and moral behavior) (Gashgosh, 1998). This test was used because 3- to 5-year-old children characterize themselves differently in different dimensions, and these self-characterizations are stable over time (Shaffer & Kipp, 2010). The Self Concept Test covers the relevant dimensions.

The Goodenough Draw-A-Person Test was used to measure the participants' IQ, to ensure that the two groups (control and experimental) had similar mean IQs. We used the Saudi standardized version (Abou Hatab, 1977).

A HUAWEI Media Pad 7 Lite was given to each child in the experimental group. Ten educational electronic

games were downloaded onto the tablet (the name of each game and its aims are presented in Table 1). These tablet games were chosen according to their popularity among mothers and children. Thirty-five mothers with children aged 4–7 years were shown the educational electronic games chosen for this research, and all of them agreed that they had downloaded at least four of the tablet games onto their devices so that their children could play with them. Children as young as 1 year up to the age of 8 years prefer animated computer games that are oriented towards problem solving, which gives them a sense of control (Wartella & Jennings, 2000). Therefore, all the games downloaded onto the tablets for this research fit this criterion.

Table 1. Names and aims of electronic games downloaded onto the tablets

Name of the game	Aim of the game
Jewels Master	In this game, children learn to differentiate between colors in a fast and organized way.
Number Link	This game aims to develop logic as well as the ability to connect numbers in a short period of time.
Unblock Me	This game aims to develop logical thinking and problem solving through planning.
Rings Linking	This game aims to develop the ability to recognize colors and shapes.
Sort and Stack Toys 3D	This game depends on problem solving and creative thinking through recognizing shapes and organizing them according to shape and color, which helps develop visual perception and memory.
Write with Me in Arabic 2	This game helps children learn to recognize and write Arabic letters.
Fruit Mania	This game encourages learning through recognizing fruits.
Montezuma Puzzle	This game develops logic.
Zentomino HD	This game aims to develop logic and problem solving.
Bubble Mania	This game aims to develop mathematical skills and logical thinking.

2.3 Procedures

The Alnahda Women's Organization helped us locate low-income families with children aged 4–7 years. After talking to the mothers and explaining the aims and goals of the research, we secured their agreement to participate in the study. The mothers were invited to King Saud University's Psychology Department, where the tests were conducted individually with each child, while the mother waited in another room. The mothers and children returned home after the tests. After calculating each child's IQ, we assigned him\her to one of the two groups, using the matched pair method to control the mean IQ between groups. The mothers of children assigned to the experimental group were asked to come back to the university to take the Huawei Media tablets onto which the 10 educational electronic games had been loaded, and they were instructed to allow their children to play with the tablet for less than three hours daily. (In a previous study, children who played electronic games for more than three hours daily exhibited negative outcomes (Przybylski, 2014). Therefore, the mothers were strongly instructed not to allow their children to play for more than three hours each day, and not to download any additional games on the tablet during the 10-week research period.) The children were given the chance to play in a normal home situation, where the parents let them play on the tablet devices without sharing the game or even, in some homes, without the parents talking about it with their children or giving them feedback. Ten weeks later, both groups were invited back to the University for the post-testing; however, this time, only the self-concept test was re-administered to all the participants. After taking the self-concept posttest, the control group children were given a Huawei Media Pad 7 just like the experimental group children so they would not feel left out. All the mothers were asked about their child's play. The mothers of the control group children agreed that all the boys played with their balls and toy cars, while the girls played with their dolls and stuffed animals. Some of the children played with coloring books or wooden blocks, or watched TV. For the experimental group, 87% of the mothers agreed that their children played on their electronic tablets for more than two hours and some even more than three hours, and that they also watched TV and played with non-electronic toys less than they had before they received the touch screen tablet.

3. Results

To verify the equivalence of the two groups' self-concept scores on the pre-test, a Mann-Whitney test was used. The results showed no significant group differences, $U = 74.00$, $p < 0.61$. The sum of ranks for the experimental group was 165; for the control group, it was 186.

To test our hypothesis that children's self-concept will be increased after playing with electronic tablet games, we applied the Wilcoxon test to the pre-post total scores and to scores for each domain of the self-concept test.

The results for the experimental group are displayed in Table 2.

Table 2. Wilcoxon test for paired samples test for the difference between the pre & post-scores of the experimental group

Self-concept domains	Group	N	Sum of Ranks	Mean Rank	Z-value	Sig.
General self-assessment	Negative Ranks	1	2.00	2.00	0.58	0.564 (N. S.)
	Positive Ranks	2	2.00	4.00		
	Ties	10				
Social acceptance	Negative Ranks	0	0.00	0.00	2.26	0.024 (0.05)
	Positive Ranks	6	3.50	21.00		
	Ties	7				
Physical appearance	Negative Ranks	1	2.00	2.00	0.58	0.564 (N. S.)
	Positive Ranks	2	2.00	4.00		
	Ties	10				
Physical ability and skill	Negative Ranks	2	3.00	6.00	1.41	0.160 (N. S.)
	Positive Ranks	5	4.40	22.00		
	Ties	6				
Independence	Negative Ranks	2	5.25	10.50	1.46	0.144 (N. S.)
	Positive Ranks	7	4.93	34.50		
	Ties	4				
Interpersonal relationship skills	Negative Ranks	1	1.00	1.00	1.00	0.317 (N. S.)
	Positive Ranks	0	0.00	0.00		
	Ties	12				
Leadership ability and influence	Negative Ranks	2	3.00	6.00	0.97	0.330 (N. S.)
	Positive Ranks	4	3.75	15.00		
	Ties	7				
Language and communication skills	Negative Ranks	1	3.50	3.50	1.63	0.102 (N. S.)
	Positive Ranks	5	3.50	17.50		
	Ties	7				
Knowledge and thinking	Negative Ranks	2	2.50	5.00	0.00	1.000 (N. S.)
	Positive Ranks	2	2.50	5.00		
	Ties	9				
Problem Solving	Negative Ranks	2	3.00	6.00	0.45	0.655 (N. S.)
	Positive Ranks	3	3.00	9.00		
	Ties	8				
Curiosity	Negative Ranks	5	4.00	20.00	1.13	0.257 (N. S.)
	Positive Ranks	2	4.00	8.00		
	Ties	6				
Physical property	Negative Ranks	3	4.00	12.00	0.91	0.366 (N. S.)
	Positive Ranks	5	4.80	24.00		
	Ties	5				
Moral behavior	Negative Ranks	1	1.00	1.00	1.00	0.317 (N. S.)
	Positive Ranks	0	0.00	0.00		
	Ties	12				
Total score of self-concept	Negative Ranks	6	4.33	26.00	1.37	0.172 (N. S.)
	Positive Ranks	7	9.29	65.00		
	Ties	0				

The pre- to post-test difference was not significant, $Z = 1.37$, $p = 0.172$, for total scores, and all p-values were greater than 0.05 for the 13 domains scores; i.e., the experimental group's self-concept did not differ after the children played games on the tablet devices.

The results of the Wilcoxon test for the control group are shown in Table 3. The Z value for only one of the 13 domains (curiosity) was significant, $Z = 2.65$, $p < 0.01$. Seven of the 13 children in the control group demonstrated increased curiosity between the pre- and post-tests. The difference in total self-concept score was

non-significant, $Z = 0.60$, $p < 0.55$.

Table 3. Wilcoxon test for paired samples test for the difference between the pre & post-scores of the control group

Self-concept domains	Group	N	Sum of Ranks	Mean Rank	Z-value	Sig.
General self-assessment	Negative Ranks	1	1.50	1.50	0.00	1.000 (N. S.)
	Positive Ranks	1	1.50	1.50		
	Ties	11				
Social acceptance	Negative Ranks	1	2.50	2.50	1.00	0.317 (N. S.)
	Positive Ranks	3	2.50	7.50		
	Ties	9				
Physical appearance	Negative Ranks	2	2.00	4.00	0.58	0.564 (N. S.)
	Positive Ranks	1	2.00	2.00		
	Ties	10				
Physical ability and skill	Negative Ranks	1	3.00	3.00	1.34	0.180 (N. S.)
	Positive Ranks	4	3.00	12.00		
	Ties	8				
Independence	Negative Ranks	6	5.25	31.50	1.16	0.248 (N. S.)
	Positive Ranks	3	4.50	13.50		
	Ties	4				
Interpersonal relationship skills	Negative Ranks	4	4.00	16.00	1.19	0.236 (N. S.)
	Positive Ranks	2	2.50	5.00		
	Ties	7				
Leadership ability and influence	Negative Ranks	1	2.00	2.00	0.54	0.593 (N. S.)
	Positive Ranks	2	2.00	4.00		
	Ties	10				
Language and communication skills	Negative Ranks	2	3.50	7.00	0.82	0.414 (N. S.)
	Positive Ranks	4	3.50	14.00		
	Ties	7				
Knowledge and thinking	Negative Ranks	1	2.00	2.00	0.45	0.655 (N. S.)
	Positive Ranks	1	1.00	1.00		
	Ties	11				
Problem solving	Negative Ranks	2	1.50	3.00	1.41	0.157 (N. S.)
	Positive Ranks	0	0.00	0.00		
	Ties	11				
Curiosity	Negative Ranks	0	0.00	0.00	2.65	0.008 (0.01)
	Positive Ranks	7	4.00	28.00		
	Ties	6				
Physical property	Negative Ranks	2	3.25	6.50	0.28	0.783 (N. S.)
	Positive Ranks	3	2.83	8.50		
	Ties	8				
Moral behavior	Negative Ranks	0	0.00	0.00	1.41	0.157 (N. S.)
	Positive Ranks	2	1.50	3.00		
	Ties	11				
Total score of self-concept	Negative Ranks	4	9.25	37.00	0.60	0.551 (N. S.)
	Positive Ranks	9	6.00	54.00		
	Ties	0				

The Mann-Whitney test was also used to look for significant differences between the experimental and the control groups on the self-concept post-test. The results are presented in Table 4. No significant differences were found between the total scores, $U = 79.50$, $p < 0.80$. The sum of ranks for the experimental group was 180.50, and for the control group, 170.50. When the 13 self-concept domains were analyzed, curiosity was again the only domain in which a difference was observed: the experimental group sum of ranks was 130.00, while the control group sum of ranks was 221.00, $U = 39$, $p < 0.05$; this indicates that the control group had a higher level of curiosity than the experimental group did.

Table 4. Mann-Whitney test for significant differences between the degree of the experimental and control groups in the post-test

Factors	Group	N	Mean Rank	Sum of Ranks	U-value	Sig.
General self-assessment	Experimental	13	13.50	175.50	84.50	1.000
	Control	13	13.50	175.50		(N. S.)
Social acceptance	Experimental	13	14.42	187.50	72.50	0.545
	Control	13	12.58	163.50		(N. S.)
Physical appearance	Experimental	13	13.50	175.50	84.50	1.000
	Control	13	13.50	175.50		(N. S.)
Physical ability and skill	Experimental	13	14.77	192.00	68.00	0.418
	Control	13	12.23	159.00		(N. S.)
Independence	Experimental	13	14.46	188.00	72.00	0.545
	Control	13	12.54	163.00		(N. S.)
Interpersonal relationship skills	Experimental	13	14.62	190.00	70.00	0.479
	Control	13	12.38	161.00		(N. S.)
Leadership ability and influence	Experimental	13	13.00	169.00	78.00	0.762
	Control	13	14.00	182.00		(N. S.)
Language and communication skills	Experimental	13	13.50	175.50	84.50	1.000
	Control	13	13.50	175.50		(N. S.)
Knowledge and thinking	Experimental	13	14.12	183.50	76.50	0.687
	Control	13	12.88	167.50		(N. S.)
Problem solving	Experimental	13	13.50	175.50	84.50	1.000
	Control	13	13.50	175.50		(N. S.)
Curiosity	Experimental	13	10.00	130.00	39.00	0.019
	Control	13	17.00	221.00		(0.05)
Physical property	Experimental	13	13.08	170.00	79.00	0.801
	Control	13	13.92	181.00		(N. S.)
Moral behavior	Experimental	13	13.00	169.00	78.00	0.762
	Control	13	14.00	182.00		(N. S.)

4. Discussion

In this research, we hypothesized that children would increase their self-concept after exposure to educational games on an electronic tablet. Our findings did not support this hypothesis, as we failed to see differences in total self-concept between the children who were given the devices (experimental group) and the children who were not (control group). We also detected no significant pre- to post-test changes in self-concept within the experimental group. Therefore, our results do not agree with those of Przybylski et al. (2012), where self-concept was found to be higher in people who played electronic games.

Our results also do not agree with the findings of McPhee et al. (2013) and Bahatheg (2013), where self-concept increased after a person played electronic games. The reason for the discrepancy could be that our participants came from low economic backgrounds, and this situation may have affected the children's self-concept (Gecas, 1982), because the home environment helps children develop their skills and stimulates their abilities (Shaffer & Kipp. 2010). In addition, the children's mean IQ places them in the borderline group, which means they might react differently to electronic games than do children with normal IQ. Furthermore, the majority of children in our experimental group played for 2–3 hours daily, and previous research results indicated that children who play electronic games for a duration of 2–3 hours are similar in their behavior to those who do not play (Przybylski, 2014). Thus, the duration of play could have affected self-concept and did not help it to increase further as was expected.

The only difference detected between or within groups was in favor of the control group, where their curiosity behavior showed some improvement. On the one hand, according to their mothers, the children in the control group spent more time playing with their siblings and engaging in different activities and non-electronic play and games, as well as watching TV. Such activities are associated with children's physical growth, biological maturation, and behavioral development (Strong et al., 2005). They help children to build curiosity, which helps them to explore their environments, which, in turn, enables them to learn about new things in those environments and promotes survival and the use of tools (Arnone, Small, Chauncey, & McKenna. 2011). Hence, children are

left to explore freely, which is an important aspect of curiosity because it is an independent activity for pursuing information (Gordon, Breazeal, & Engel, 2015).

Another potential reason for the difference is that children's imaginations are developing rapidly at this stage of their lives; hence, playing, exploring their surroundings, and engaging in different activities help build curiosity and the imagination (Vygotsky, 1967). Therefore; children with higher degrees of curiosity exhibit higher self-concept than do children with lower degrees of curiosity (Maw & Maw, 1970). In contrast, when children play computer games on tablet devices, they do not usually move around or engage with different objects; therefore, their curiosity may not develop as much as that of children who engage in different types of play and games. In addition, the mothers of children in the experimental group told the researcher that their children did not share their electronic play time with their siblings. The reason for this could be that in many educational electronic games, competitiveness is not required, while in sport and action fighting electronic games, competition between players is practiced (Sherry, Lucas, Greenberg, & Lachlan, 2006). As a result, in our study, it is likely that no competition behavior occurred, and when people play competitive electronic games and win, they enjoy themselves more (Liu, Li, & Santhanam, 2013). Furthermore, enjoyment increases self-concept (Przybylski et al., 2012). It seems that with educational electronic games, no competition occurs because children play alone, and so the amount of enjoyment may not be high for them, therefore not helping their self-concept to increase.

In conclusion, educational electronic games do not affect children's self-concept directly; there are many factors involved, such as the duration of play, enjoyment, and competition, etc. For electronic games to gain the potential for positive effect, they should not only have entertainment value, but should be designed to address a specific problem or to teach and enhance a certain skill (Griffiths, 2002). Further, it is important for parents to be involved when their children play these electronic games, such as by giving them feedback and interacting with them, in order for the children to gain positive skills and behavior (Kory & Breazeal, 2014; Yannier et al., 2015), because in most studies that reported positive effects of computer and electronic games, parent or teachers were involved and supervising the children as they played. Thus, we recommend that parents and caregivers become involved and participate with children as the children play electronic games. Electronic and tablet games are neither fundamentally good nor fundamentally bad; in reality, the nature of their effects depends upon how they are used (Eichenbaum, Bavelier, & Green, 2014). We also suggest that more research studies be conducted on the effect of electronic tablet games on child development (using games of different genres, as well as children of different age groups, economic, and social backgrounds, and intellectual capabilities), with a larger number of participants, particularly now that such devices are used extensively by children everywhere.

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Note

Note 1. Alnahda Women's Organization is a non-profit organization that aims to help improve the lives of families in need by supporting women to learn, work, and achieve their goals.

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