The effects of computer games on increasing students' creative thinking

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Abstract

Introduction: Researchers and experts have not reached a clear conclusion about positive or negative effects of computer games on creativity. So current study aimed at examine the relationship between creativity and computer games in high school students.

Materials and Methods: This study is cross-sectional. The study sample consisted of Tehran hometown high school students who were studying in academic year of 2014-2015. For this purpose, using multi-stage cluster sampling 105 students (54 girls and 51 boys) from four schools were selected. The tools used for this study included creativity test (CT) and the test to evaluate use of computer games. For data analysis, ANOVA test (ANOVA) and Scheffe's post hoc test were used.

Results: The results showed that the four groups of no use, use under an hour, using between 1 to 2 hours and use more than two hours were significantly different in creativity ($P=0.001$, $F=5.61$). The results also showed there are significant difference in innovation among four groups of no use, using less than a year, using between one and two years and the use of more than two years ($P=0.001$, $F=16.55$).

Conclusion: Regarding the results of this study and comparison with results of other studies, it seems that use of computer games can boost creativity in children, but if the use of the games exceeds a certain level, you should expect some negative consequences to it.

Keywords: computer games, creative thinking, negative effects.
Introduction

Today Human life compared to previous centuries and millennia highly has been evolved and transformed. This kind of life because of the complexity of social, educational, economic and cultural needs requires special skills, including high level thinking. High-level thinking can be understood as a non-algorithmic and complex thinking that often produces different solutions. Various types of high-level thinking have been identified so far as it can be noted thinking. (Miri, David and Yuri, 2007).

Conceptual creativity associated with differences in individuals. This concept was developed in order to explain why some people have more ability to invent new solutions to their problems (Jacques et al., 2013). Nowadays psychologists believe that creativity is not innate but can be acquisitive. Children can be taught to have unconventional thinking and through divergent thinking consider their problems and to find appropriate solutions (Parsamanesh and Sobhy-Qaramaleky, 2014). A lot of definitions have been taken to creativity so far. Sternberg (2001, quoted by Agahi Esfahani et al., 2005) believes that creativity is the combination of the power of initiative, flexibility and sensitivity to theories that enables a person to think a productive result that its outcome is self-fulfillment and happiness of others. But now, many researchers have reached a single definition of creativity: Creativity means creating new and useful ideas or solutions (Motil and Philippi, 2014; Amabile, 1988, quoted by Chen et al., 2013; Zimmerer and Askarborok, 2008, quoted by Antonio et al., 2014).

There are some research in the field of components and elements of creativity. For example, Amabile (1988, quoted by Chen et al., 2013) divide creativity into three components: Professional knowledge, innovative thinking skills and motivation. Ama Torrance and Geff (1989, quoted by Abedi, 1994) summarizes creativity into four main factors: Fluency; means the talent to generate a lot of ideas; 2) originality; means the talent to generate innovative, unusual and fresh ideas; 3) flexibility; means the ability to produce a very different idea or methods; 4) expansion; means the talent of attention to details. Many studies have been done about factors affecting the growth and increase creativity, but some experts also believe that changes in human life in recent decades and the increasing use of new technologies can affect this dimension of personality.

By the beginning of the twentieth century, human technological advances were quicker and this progress also affected on the shape and quality of human entertainment. Video-Computer Games were began in 1972 with Pong (a PC game of table tennis) and then started to grow in hardware and software system. Improvement of the quality and variety of games caused increasingly development of the media in society, especially among adolescent (Morrison and Krugman, 2001, quoted by Abdul Khaleqi et al., 2006). However, Iran has slightly delayed the arrival of computer games, but now these games are extremely popular, especially among teenagers. For example, in a study, Amini et al (2008) conducted on high school students found that 53 percent of them use computer games.

Most research on the effects of computer games has been focused on the negative aspects of it, and few studies can be found in which emphasis is on the positive aspects of these games. Although computer games have been linked with some negative consequences, such as aggression (Sultanbayeva et al., 2013; Abdul khaleqi et al., 2006), maladaptive behaviors (eg, Cheshmi and Zamani, 2012), depression (Lemola et al., 2011), and low educational
achievement (Eow et al., 2009; Sharifi, Shagaghí & Sharifi, 2012), but also some research have emphasized on positive aspects of these games. Most attention on the positive effects of computer games has been on the cognitive effects of it. Delbari, MohammadZadeh and Delbari (2010) found that computer games have significant impact on IQ, simple reaction time, simple movement time, diagnostic reaction time and diagnostic movement time. In another study the effect of computer games on the amount of attention people with retardation was studied. The results of this study showed that the amount of attention in the intervention group that had used computer games, significantly increased but such a change was not observed in the control group (Rezaeian, 2013).

In relation to the effects of computer games on creativity as well as a number of studies have been done. Khalifeh and Nobandegani (2013) found that there is a relationship between creativity and involving in computer games, and those who used more computer games showed improvement in creativity. But in another study in Iran the results showed that computer games reduce some of the dimensions of creativity in students (Turan Poshti and Karim Zadeh, 2012). Naeini and Masoud (2012) also found in their study that the use of educational computer games associated with an increase in some aspects of creativity. In studies that have found a positive relationship between creativity and the use of computer games researchers have stressed on interactive environment of games and believe that this environment can have an impact on creativity. But in research that negative relationship between creativity and computer games have been obtained it is emphasized on this point that these types of games act as an obstacle to children's learning and so can impair the growth of individual creativity (Khalifeh and Nobandegani, 2013).

According to the mentioned topics and available research, it appears that researchers and experts have not reached a clear conclusion about positive or negative effects of computer games on creativity. So the current study aims to examine the relationship between creativity and computer games among high school students. Also in this study, the researchers intend examine the relationship between use of computer games and creativity to make a more realistic view to this issue.

Materials and Methods

1. Sample and process
This research is a cross-sectional one. The study sample consisted of Tehran high school students who were studying in academic year of 2014-2015. For this purpose, using multi-stage cluster sampling method a sample size of 105 students (54 girls and 51 boys) from four schools were selected.

2. Research Tools
Creativity Test (CT): Creativity Test has been made based on the Torrance theory about creativity in 1985 by Abedi in Tehran. However this questionnaire was revised several times and finally 60 items by Abedi was developed at the University of California. The test has 60 three- options questions consisting of four subscales: fluency, expansion, innovation and flexibility. Any option is scored from one to three so as 1 indicate a low creativity, 2 indicate a moderate creativity and 3 indicate a high creativity. Total obtained scores on each subscale, indicating the subjects score in that item and total scores on the four subscales indicate total
score of her/his creativity. Total creativity score range of each subject will be between 60 and 180. Questions 1 to 22 are related to fluency, 23 to 33 to expansion, 34 to 49 to initiative, and 50 to 60 to flexibility. Reliability coefficient of each subscale have been obtained: fluency (0/85), initiative (0/82), flexibility (0/84), and expansion (0/80) (Abedi, 1994). In a research that was performed on the 2270 Spanish student to determine the validity and reliability of creativity test, Cronbach's alpha for each subscales were obtained for fluency (0/75), flexibility (0/66), initiative (0/61) and expansion (0/61) (Auzmendi, Villa & Abedi, 1996).

The amount of usage of computer games questionnaire: This questionnaire was made by researchers in this study in which the amount of usage of computer games based on the hours and years was obtained.

3. Data analysis

For data analysis, descriptive and inferential statistical methods were used. In the descriptive statistics mean, standard deviation, frequency and percentage were used to describe the sample. In the inferential statistical also one-way analysis of variance (ANOVA) was used to compare different groups in terms of creativity in the use of computer games.

Findings

In this study, 51 male students (48/6 percent) and 54 female students (51/4 percent) were present. The mean age of the students was 16/77 with 2/50 standard deviation. 23 students (21/9 percent) in the first grade, 25 students (23/8 percent) at second grade, 21 students (20 percent) at third grade and 36 students (34/3 percent) in pre-university were studying. It was also found that 69 students 65/7 percent) use computer games. Among them, 35 students (33/3 percent) less than one hour daily, 18 students (17/1 percent) one to two hours daily and 16 patients more than three hours daily have using computer games. It was also found that among the 69 students, 28 students (26/7 percent) have used less than one year of computer games. Also 17 students (16/2 percent) one to two years and 24 students (22/9 percent) more than two years have used computer games.

The results of ANOVA (ANOVA) showed that in four unused groups, used under an hour, using between 1 to 2 hours and use more than two hours there are significant differences in creativity (F=5/61, P=0/001). To determine which group is different Scheffe’s post hoc test was used (Table 1).

Table 1: Comparison of creativity in four groups (in hours) using computer games

<table>
<thead>
<tr>
<th>significance</th>
<th>standard deviation</th>
<th>mean difference</th>
<th>hours</th>
<th>hours</th>
<th>variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/048</td>
<td>2/63</td>
<td>-7/54</td>
<td>less than 1 hour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0/007</td>
<td>3/20</td>
<td>-11/47</td>
<td>1 to 2 hours</td>
<td></td>
<td>without using</td>
</tr>
<tr>
<td>0/063</td>
<td>3/33</td>
<td>-9/15</td>
<td>2 hours and more</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0/685</td>
<td>3/21</td>
<td>-3/93</td>
<td>1 to 2 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0/972</td>
<td>3/35</td>
<td>-1/61</td>
<td>2 hours and more</td>
<td>less than 1 hour</td>
<td></td>
</tr>
<tr>
<td>0/946</td>
<td>3/81</td>
<td>2/31</td>
<td>2 hours and more</td>
<td>1 to 2 hours</td>
<td></td>
</tr>
</tbody>
</table>

http://www.ijhcs.com/index.php/ijhcs/index
As seen in the above table those that have no use of computer games compared with those with 1 hour and 1 to 2 hours use of computer games obtained lower scores on creativity. Also when the games increased, there was no difference in the amount of creativity. Also the results showed that the four groups of no use, using less than a year, using between one and two years and more than two years there are significant differences in creativity ($F=16/55, \ P<0/001$). To observe the mean differences in each group Scheffe's post hoc test was used (Table 2).

**Table 2: Comparison of creativity in four groups (in years) using computer games**

<table>
<thead>
<tr>
<th>significance</th>
<th>standard deviation</th>
<th>mean difference</th>
<th>year</th>
<th>year</th>
<th>variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/111</td>
<td>2/47</td>
<td>-6/13</td>
<td>less than 1 year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$P &lt; 0/001$</td>
<td>2/88</td>
<td>-14/94</td>
<td>1 to 2 years without using</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$P &lt; 0/001$</td>
<td>2/58</td>
<td>-16/09</td>
<td>2 years and more</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0/042</td>
<td>3/01</td>
<td>-8/80</td>
<td>1 to 2 years less than 1 year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0/006</td>
<td>2/73</td>
<td>-9/95</td>
<td>2 years and more</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0/987</td>
<td>3/11</td>
<td>-1/14</td>
<td>2 years and more</td>
<td>1 to 2 years</td>
<td></td>
</tr>
</tbody>
</table>

As indicated in the above table in people without the use of computer games and people who have used computer games for a year no significant difference in the degree of creativity is seen. On the other hand people with no history of using the Internet and people with a history of 1 year of using the Internet compared with those who use the Internet 1 to 2 years, 2 years and more use of computer games significant difference was seen in the creativity.

**Discussion and Conclusion**

Given the increasing use of computer games in recent years, it is important to recognize positive and negative consequences of them. This study was done to investigate the relationship between creativity and critical thinking with computer games in students. The results of this study showed that among those who did not use computer games and those used the computer games for two hours a day there was a significant difference in the degree of creativity. But the important point is that by increasing the use of computer games for more than two hours degree of creativity remained stable and did not increase. Also another finding of the study was that people who use longer and more than one year of computer games has a higher creativity, but in this case, with increasing use of computer games to more than two years the degree of creativity remain constant.

This finding has also been achieved in several other studies. For example Gakenbakh and Dopkov (2012) found that having a history of computer games is associated with some aspects of creativity. These findings in other similar researches by Naeini and Masoud (2012), Khalifeh and Nobandegany (2012) and Lee (2005) have been repeated. So, most of the findings and the findings of current research indicate a relationship between the use of computer games and creativity. But at least in one study this finding has been challenged. Another study's results in Iran showed that computer games reduce some of the dimensions of
creativity in students (TuranPoshti and KarimZadh, 2012). If we look from a wider perspective to the findings all these findings could be true. Here the question is not whether or not creativity associated with computer games? This relationship is largely known and therefore it should be asked the how is the relationship between creativity and computer games.

Experts believe that high-level thinking is considered as complex and non-algorithmic thinking that often able person to produce several solutions. Creativity is a type of high-level thinking that can be upgraded by some measures (Miri, David and Yuri, 2007). Salinous-Pesternak (2005, quoted by the Khalifeh and Nobandegany, 2012) believe that computer games give a more variety and richness to children's games and provide a variety of methods to solve the problem that these methods help to grow high-level cognitive skills in students. But it should be noted that according to the findings of this study, it is likely use of computer games to a certain level can increase creativity and more use of this limit may be ineffective or even cause negative effects.

Reo and Myjz (2000) argue that computer games include creative problem-solving processes and by creating an environment of active engagement can help to increase students' creativity. On the other hand, some researchers believe working with computer waste children time and prevent them from cognitive, psychological and social growth (Scarlett, Nadio and Ponte, 2005). If we combine these two views we can conclude that use of computer games can boost creativity in children, but if usage exceeds a certain limit we should expect some negative consequences.

Totally it can be concluded that computer games have some positive aspects and some negative aspects. Of their positive aspects it can be noted to boost creativity. It should be noted that students who use a certain amount of computer games experience creativity increase and critical thinking but more than that, has no effect on these variables.

Like all similar studies, this study was not without limitations. The absence of a standard instrument that can measure the amount and type of use of computer games is one of the main limitations of this study and the researchers hope standard tools for this area to be built in future studies. Also expansion of this study to larger population groups and the use of research methods of intervention indicating causal relationships between creativity and computer games can be considered in future studies.
References


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