Mental Rotation Ability and Computer Game Experience

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ABSTRACT

Computer games, which are currently very popular among students, can affect different cognitive abilities. The purpose of the present study is to examine undergraduate students' experiences and preferences in playing computer games as well as their mental rotation abilities. A total of 163 undergraduate students participated. The results showed a significant difference between students' mental rotation abilities in terms of their experiences and preferences in playing computer games. Moreover, 2D or 3D computer game preference was shown to be dependent on gender. This study also explores the quantity of time spent by undergraduate students playing computer games.

Keywords: Computer Games, Game Playing Time, Gender Effect, Mental Rotation Ability

INTRODUCTION

Over the past 25 years, computer and video games have become an increasingly widespread form of entertainment across a number of different platforms (Dickey, 2005). Such games, especially computer games, are played by a variety of individuals regardless of age, and the resulting impacts can be seen in different fields. For instance, structural aspects like graphics, music, and sound effects can influence player behavior. Moreover, with the integration of computer games into curricula, the relationship between computer games and learning has become an engaging issue that is being studied by several organizations (Carlson, 2003).

According to some studies, males and females spend different amounts of time playing computer games. These results may reflect differences in terms of the cultural backgrounds and expectations of participants. In their study, Onay, Tufekci, and Cagiltay (2005) examined Turkish undergraduate students' computer game playing habits and experiences and found that males spend more time playing computer games than females. Similarly, another study (Tuzun & Ozdinc, 2010) was carried out to determine the computer game playing characteristics and preferences of teacher candidates and found that most male students and a minority of female students played computer games. According to an Entertainment Software Association report (ESA, 2013), in the US, 55% of the game playing population is male and 45% is female. Other

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studies (Greenberg, Sherry, Lachlan, Lucas, & Holmstrom, 2010; Homer, Hayward, Frye, & Plass, 2012) have had parallel findings. Moreover, the game preferences of female and male players can be affected by factors such as achievement, social interaction, immersion, violence, gender role, and enjoyment (Hartmann & Klimmt, 2006; Yee, 2006).

Computer and video games are generally accepted as entertainment tools, but they are also powerful learning environments (Prensky, 2005). According to the literature, games can present players with a meaningful framework by placing them in a problem-based learning environment (Kiili, 2005). Moreover, the nature of games challenges players, who explore and manipulate items on the screen while discovering new strategies and ideas. In this way, games provide problem-based learning that can be related to discovery learning (Kiili, 2005). Some studies (Charlier & De Fraine, 2012; Lin, Wei, & Hung, 2012; Papastergiou, 2009) have shown that playing computer games has positive effects on teaching and learning. Results in the literature suggest that games can enhance the motivation, learning, and self-confidence of players.

With respect to movement, computer and video games are divided into two platforms: two dimensional (2D) and three dimensional (3D). In 2D games, the player can only move a character left-right or up-down in a 2D plane; in a 3D game, the player can also move a character forward-back (Gagnon, 1985). Some studies have investigated how the use of 2D or 3D graphics in computer games influence male and female players, and it was reported that female players prefer 2D games with "closed areas," or limited and defined areas where a player can go (Ziemek, 2006). In addition, females tend to have trouble with camera angles and character motions in 3D games. According to the results, 68.4% of females preferred 2D games, while 66.7% of males said 3D games were their favorite.

Computer games might have an impact on developing skills such as critical and logical reasoning (De Castell & Jenson, 2004), spatial visualization (Green & Bavelier, 2003), and communication skills (Herz, 2001). They also have the potential to foster learning, especially informal science literacy (Steinkuehler & Duncan, 2008). As experiences and preferences in games might affect mental skills and such preferences may change with respect to demographic structure, some studies (Aquila, 2006; Griffiths, Davies, & Chappell, 2004) have explored associations between playing computer games and demographic characteristics such as gender or age.

Spatial ability is a "skill in representing, transforming, generating, and recalling symbolic, nonlinguistic information" (Linn & Petersen, 1985, pp. 1482). Some studies have identified relationships between playing computer games and spatial skills, such as mental rotation (De Lisi and Wolford, 2002). According to their results, positive effects were found on spatial skills when playing the game Tetris; after several gaming sessions, participants earned higher scores on a posttest. Although the pretest scores of females were lower than those of males, they performed as well as males on the posttest. In other words, the researchers suggested that even children who showed low mental rotation performance on the pretest improved after playing computer games that involved the use of spatial skills. In addition, Feng, Spence, and Pratt (2007) used a pretest/posttest to demonstrate that playing an action video game can decrease gender differences in mental rotation skills. According to their results, participants' mental rotation performance also increased, with females benefiting more than males.

The relationship between spatial abilities and computer games has also been explored. According to one study (Quaiser-Pohl, Geiser, & Lehmann, 2006), mean differences emerged in test performances between computer game players and non-players across age ranges. Moreover, males who did not play games had lower mental rotation performance than males who did. However, females' game preferences were not related to their mental rotation performances. In their study, Sims and Mayer (2002) tried to determine the effects of computer game playing on spatial skills by comparing computer game players with non-players; experienced players earned

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