Relations Between Videogame Play and 8th-Graders’ Mathematics Achievement

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ABSTRACT

This study explores whether any relationships exist between math performance scores on the Missouri Assessment Plan (MAP), its subscales and time spent playing the child’s favorite videogame given the game’s spatial content and cognitive complexity. Relationships between gender and math scores were also examined. Findings indicate no main effect of time spent playing, spatial content, or level of complexity of games on math performance. However, several math scores interacted with time spent playing one’s favorite video game, such that higher levels of math performance occurred when participants played games high in spatial content at low amounts of time. A similar interaction occurred when examining complexity of the game and time spent playing. The study provides preliminary evidence that it may be important to consider the spatial or complexity content of videogames in addition to time spent playing when addressing the relationship between videogame play and adolescent math performance.

Keywords: Academic Achievement, Adolescent, Computer Games, Math, Mental Rotation, Spatial Skills, Videogames

Videogames today enjoy unprecedented popularity, and the influence of videogames is enormous: websites, blogs, apparel, toys, and stores are dedicated to them (Kietzmann, 2007). Games are available in nearly every facet of everyday life from cell phones to computers to portable gaming units (Zackheim, 2005), commercials for videogames can be seen on every major network (Grant, 2009), and some videogame titles are now in their second decade of iteration (Sliwinski, 2008).

Previous research on videogames has explored the associations between children’s game play and their developmental outcomes, most notably in the area of aggression (Anderson & Dill, 2000; Gentile & Gentile, 2008; Kirsch & Mounts, 2007; Uhlmann & Swanson, 2004). Research has also explored the relationship between video game play and academic performance, or skills related to academic performance (Din & Calao, 2001; Gentile,
Spatial-Temporal Content, Mathematics, and Videogames

It has been argued that the use of videogames may contribute to spatial-temporal skills (Subrahmanyam et al., 2001) which involves mental processing of items presented visually, specifically noting the shape, color, and movement of items as they move (Vandierendonck & De Vooght, 1997). This type of processing is common to videogames where individuals must focus on the visual stimuli presented to them and act on what they see. Tetris, a videogame that asks the player to rotate variously shaped pieces in space in order to complete horizontal lines, has been utilized in studies exploring spatial-temporal reasoning (De Lisi & Wolford, 2002; Okagaki & French, 1994; Sims & Mayer, 2002). Other studies have used videogames such as Blockout (a game in which 3D blocks must be rotated and arranged into patterns) and STAR (a puzzle game in which participants are asked to think spatially several steps in advance) because they also utilize spatial-temporal reasoning (De Lisi & Cammarano, 1996; Peterson et al., 2004). By asking the videogame player to process information presented visually and then strategize and take action based on visual input, many popular videogames may support spatial-temporal reasoning.

Lachance and Mazzocco (2006) note that spatial based problem solving has been correlated with math skills in children’s early grade levels. Pani, Chariker, Dawson, and Johnson (2005) state that spatial-temporal reasoning (in this case mental rotation) is fundamental for problem solving in fields such as mathematics and engineering. They argue that the ability to undertake a spatial task such as mental rotation and predict its outcome demonstrates one of the earliest instances of physical reasoning and perceptual organization. Pani et al. (2005) also argue that this basic reasoning allows the individual to discover the limits of the physical world and allow the reorganization of thought in order to more efficiently process future spatial problems.

Assel, Landry, Swank, Smith, and Steelman (2003) speculated that children who show greater spatial skills as measured by two subtests of the Stanford-Binet IV (pattern recognition and copying of shapes) at age 6 would exhibit greater mathematical skills at age 8. These tasks require the use of fine motor skills, visual discrimination of presented stimuli, and the integration of visual and motor processes. The tasks undertaken included word problems as well as tasks that drew on geometry concepts such as length and area. Findings from the study supported the hypothesis that those with greater spatial skills at age 6 would exhibit greater math skill at age 8 (Assel et al., 2003). This finding is also supported by De Lisi and Wolford (2002), who confirm that while spatial abilities are not taught as a specific part of educational curricula, the impact of spatial-temporal reasoning is quite profound in some areas of mathematical and scientific problem solving. They demonstrate that students who display higher levels of spatial-temporal reasoning are also able to show a greater variety of problem solving strategies, specifically in math (De Lisi & Wolford, 2002).

Mathematics Complexity

In addition to spatial content, another facet of videogames that may relate to academic achievement involves the complexity of the game being played. The information-processing model posits that individuals manipulate and
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