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Video gaming and gender differences in digital and printed reading performance among 15-year-olds students in 26 countries

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A R T I C L E   I N F O

A B S T R A C T

Video games are a favorite leisure-time activity among teenagers worldwide. This study examines cross-national gender differences in reading achievement and video gaming and whether video gaming explains gender differences in reading achievement and differences in performance between paper-based and computer-based reading. We use data from a representative sample of 145,953 students from 26 countries who sat the PISA 2012 assessments and provided self-reports on use of video games. Although boys tend to have poorer results in both the computer-based and the paper-based reading assessments, boys' under achievement is smaller when the assessment is delivered on computer than when it is delivered on paper. Boys underperformance compared to girls in the two reading assessments is particularly pronounced among low-achieving students. Among both boys and girls moderate use of single-player games is associated with a performance advantage. However, frequent engagement with collaborative online games is generally associated with a steep reduction in achievement, particularly in the paper-based test and particularly among low-achieving students. Excessive gaming may hinder academic achievement, but moderate gaming can promote positive student outcomes. In many countries video gaming explains the difference in the gender gap in reading between the paper-based and the computer-based assessments.

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Introduction

The ability to use computers and the internet is increasingly perceived as a key skill to take part in todays' society and economy (Organisation for Economic Cooperation and Development 2013a; OECD, 2013b; European Commission, 2007). In 2005 fewer than 60% of adults (16–74 year olds) in OECD countries used the internet and in 2013 this figure had risen to 80%. Among young cohorts (16–24 year olds) as many as 95% report using the internet (OECD, 2014a). Technological changes have modified the world in which students grow and learn and by so doing are changing the skills students need to master and the ways in which they need to be able to express their knowledge. As digital technologies and their use become pervasive, teenagers are increasingly required to apply their skills to read digital material to solve problems on computers (Coiro, Knobel, Lankshear, & Leu, 2008; Kemp, 2011; Wirth & Klieme, 2004).

More than ever, reading is a key to acquiring knowledge, and mastery of reading is a precondition for individuals' success in all domains of life (Cunningham & Stanovich, 1998; Smith, Mikulecky, Kibby, & Dreher, 2000). The pervasiveness of information technology means that reading proficiency is becoming even more crucial and that students need to master new forms of reading. In the past, students had to be able to understand, interpret and reflect upon single texts. These were the skills that were recognized as key to reading literacy proficiency by international experts who defined the frameworks for the first large scale cross-national studies of reading literacy. Although these skills remain important, the change in the medium of delivery of texts, from paper to electronic, from page to screen, is also changing the skills that students need to master (Goldman, Braasch, Wiley, Graesser, & Brodowinska, 2012; Leu et al., 2015). When accessing digital material, students are not only required to comprehend and interpret extended pieces of continuous texts − including literary texts, but also to deploy information-processing strategies such as analyzing, synthesizing, integrating and interpreting relevant information from multiple texts and information sources (Rouet, 2006; Spiro, Deschryver, Hagerman, Morsink, & Thompson, 2015). Today's reading is about searching not just for meaning but for relevant material. It encompasses students' ability to deal effectively with a potentially endless stream of available information by searching, organizing and filtering written material. As the structure and formats of texts change because of the shift to digital technologies, readers are required to develop and use new cognitive strategies.

Reading proficiency is a fundamental pre-requisite for academic success and participation in society (OECD, 2010b) and while numerous studies have indicated that boys have poorer reading performance than girls (Cole, 1997; Smith & Wilhelm, 2009), the size of the gender gap in reading appears to vary across countries and age groups (Hyde, 2004; OECD, 2010a; Pope & Sydnor, 2010). Boys tend to have better mathematics performance than girls but tend to have overall poorer academic results than girls (Arnot, David, & Weiner, 1996; Collins, Kenway, & McLeod, 2000; Legewie & DiPrete, 2012; Turner, Riddell, & Brown, 1995). Studies suggest that better reading proficiency at age 15 is associated with a higher likelihood of continuing in education after the end of compulsory schooling (OECD, 2010c) and that poor academic results, which, for many students started with failure to acquire adequate reading skills, are associated with a higher likelihood of dropping out from school (Hernandez, 2012).

Students who do not complete secondary school or do not continue with post-secondary education or training are more likely to face worse labor market conditions, with a higher likelihood of being unemployed (Sum, Khatiwada, McLaughlin, & Palma, 2009) and to command low incomes (Rumberger & Lamb, 2003). Students who drop out also experience lower levels of well-being (Oreopoulos, 2007). In addition to the negative consequences experienced by individuals, early school leaving has sizable social costs (Brunello & De Paola, 2013). Therefore understanding the causes of the lower performance of teenage boys in reading is a crucial issue in educational research, administration, and practice.

Reading difficulties among secondary school students could be due to cognitive aspects (Fletcher et al., 1994; Shankweiler et al., 1995); motivation and attitudes (McKenna, Conradi, Lawrence, Jang, & Meyer, 2012; Morgan & Fuchs, 2007; Schiefele, 2009); and patterns of behaviors in and out of school (Baker & Wigfield, 1999; Cipielewski & Stanovich, 1992). Research suggests that gender differences in reading proficiency could stem from a combination of cognitive, motivational and behavioral components (Ruble, Martin, & Berenbaum, 2006). Boys and girls differ not only in academic achievement in general and reading achievement in particular, but also in how they behave while at school (Francis, 2000; Paechter, 1998; Warrington, Younger, & Williams, 2000) and in how they spend their after-school time − both leisure and academic-related. For example, boys are more likely to play truant, to suffer from poor in-school discipline, to be less engaged in homework while at home and to play video games (OECD, 2013b). Boys are also more likely than girls to play action or combat video games and to play such games in the presence of peers (Olson et al., 2007).

New gender gaps in school and in the labor market may emerge as a result of changing requirements in the tasks that individuals need to perform using digital technologies, which require greater visual-spatial ability (Lee, 2007), as well as increasing demand for high level ICT related skills in the economy. There is evidence that women may perform less well than men in problem solving tasks on digital technologies, may have poorer navigation skills and may be less interested in ICT related skills than men (Zhou, 2014). Studies examining gender gaps in reading proficiency have in fact identified marked differences depending on the characteristics and requirements of the texts students were assessed on. Girls tend to do better when assessments require constructed responses and worse on tests that require greater visual-spatial ability while boys are more responsive to text content and do better in multiple-choice assessments (Castelli, Colazzo, & Molinari, 1998; Lafontaine & Monseur, 2009; Oakhill & Petrides, 2007; Rosen, 2001; Schwabe, McElvany, & Trendtel, 2015). Boys also generally outperform girls on tasks that require a greater amount of abstract information processing (Halpern & LaMay, 2000), in the ability to transform a visual-spatial image in working memory, and generate and manipulate the information in a mental representation.

Previous research indicated that the games children engage in can explain differences in the acquisition of specific skills and competences and that different patterns of play among boys and girls in childhood, with boys being more likely than girls to play with blocks and legos, could explain some of the observed gender differences in mathematics achievement (Casey et al., 2008; Jarrell, 1998; Levine, Ratliff, Huttenlocher, & Cannon, 2012; Levine, Whealton Suriyakham, Rowe, Huttenlocher, & Gunderson, 2010; Lowrie, 2002). Rasmusson and Aberg-Bendtsson (2014) investigate the mediating role of video gaming in explaining gender differences in digital literacy in Sweden and found that patterns of video gaming explain almost all of the observed gender gap in digital reading proficiency. However there may be important differences across countries in gender differences in print and digital reading performance, as well as the role video gaming may play in explaining such differences.