

INTERNET USE AND EDUCATIONAL ACHIEVEMENT OF 10-YEAR OLDS IN EUROPEAN HIGH-INCOME COUNTRIES

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Abstract. Children’s online presence is increasing rapidly: both as proportion of children using the Internet and as the amount of time spent by the average child online. Yet, time spent on games or social networks does not have to translate into crucial skills of the Internet age, such as locating reliable information online. In fact, children tend to overestimate their online reading skills because they extrapolate their gaming or social media skills into online reading. The paper analyses the impact of four types of screen activity on reading achievement among four graders in six countries. For two activities – playing computer games and surfing the Internet - the relationship between screen time and reading achievement has shown consistent pattern that held across countries: a right-skewed inversed U-shape with moderate use having a mildly positive effect when compared to both no-use and heavy use. By contrast, online chatting and watching videos showed negative and more linear relationship to online reading scores. A common denominator of all online activities is that more than two hours daily of screen time had an adverse effect for school performance when compared to moderate use.

Keywords: Internet use, online gaming, watching videos, educational achievement, ePIRLS

Introduction

The amount of time spent by children online is increasing rapidly. For example, the proportion of American teens who say they are on the internet “almost constantly” has almost doubled from 24% to 45% in only three years (Pew Research, 2018) with additional 44% using the Internet several times a day. For an average teenager, this piles up to around nine hours of daily media consumption (Center for Media and Child Health, 2018). The shift in time allocation means that electronic devices have won with books also on the front of reading. For example, in the US, students aged 8-18, spend three times more time on online than offline reading (ref). Today, it is on the Internet, where the “real life” is happening for a vast number of children.

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crucial skills in the Internet age, such as locating reliable information online. In fact, children tend to overestimate their online reading skills because they extrapolate their gaming or social media skills into online reading (Mullis et al. 2017).

At the same time, online reading is not simply a transposition of traditional reading to the screen. It involves skills that are qualitatively different from those used offline: the use of search engines, hyperlinks, navigating one's way through interactive ads without losing focus or increased need for evaluation of information reliability. These differences present both opportunities and risks for student achievement.

On a positive note, online tests are believed to lead to increased student engagement (de Klerk et al., 2015), lower anxiety (Csikzentmihaly, 1991) and more focus on applied knowledge. Students enjoy them (Mullis et al., 2017). Since students learn more when they are engaged (Gromada and Shewbridge, 2016), these positive characteristics might present an opportunity to improve the achievement of groups that have traditionally fallen behind in reading, such as boys.¹

On a negative note, the interactive nature of the digital environment means that children are exposed to more distractions. In turn, the online environment with no information gatekeepers demands more critical evaluation of information reliability. Some of these worries regularly resurface in both public policy and media discourse. In July 2018, public health concerns led France to ban the use of phones in all schools at any time of the day. The general public is regularly presented with media articles that border on the moral panic, such as "A Dark Consensus About Screens and Kids Begins to Emerge in Silicon Valley" (New York Times, 2018).

Yet, the relationship between time spent on digital devices and children's educational achievement and well-being is far from clear. It shows different results depending on the medium, content, time of the week, total amount of time spent and a batch of other environmental factors. Most robust studies that focused on the impact on well-being (Przybylski and Weinstein, 2017) pointed to non-linear relationships: inversed U-shape curves showing the highest well-being for moderate use of digital technologies, lower scores for non-use and the lowest scores for excessive use.

¹For analysis of how gender differences in reading emerge in the early years see Mensah and Kiernan (2010), for analysis of how their persist see: Bradbury, B., Corak, M., Waldfogel, J. and Washbrook, E. (2015). For analysis of various reasons that have been proposed for these gaps see: or Hadjar, A., Krolak-Schwerdt, S., Priem, K. and Glock, S. (2014).

Purpose of the study

The paper seeks to fill these gaps in literature by presenting an international comparison of the impact of time spent on six types of screen activity on reading among four graders in 6 countries with controls and dependent variable which can be internationally compared. It is one of the first studies that takes online reading rather than traditional reading as the dependent variable.

It poses three research questions:

1. What is the relationship between overall computer time and online reading outcomes?
2. How does the impact on online reading differ depending on how screen time is spent? (watching videos, playing games, chatting)
3. Is the impact of screen time different for online and traditional reading outcomes?

Data

The TIMSS & PIRLS International Study Center prepared ePIRLS, an online reading test with school-like assignments in science and social studies, to see how students perform in an interactive environment. The test presents pupils with lessons on webpages with animations, graphics, tabs, ads, a guiding avatar and pop-up windows that imitate the Internet environment. It assesses pupils' understanding of the lessons.

In 14 countries, the same Grade 4 students sat the paper test one day and took the computer-based test the next day. The two tests are designed to be directly comparable, so we can see how the testing method affected the scores of the same children in different countries. To compare countries with similar resources, the paper starts with ten countries that are members of the OECD: Denmark, Israel, Norway, Sweden, Italy, Portugal, Canada, Slovenia, Ireland, and the US. Subsequently, all countries are screened for missing data. Countries where the dependent variable (reading score) shows statistically significant difference between children with and without missing parental data are dropped from further analysis. The final sample comprises Denmark, Norway, Italy, Portugal, Slovenia and Ireland.

The latest round of PIRLS 2016 produced nationally representative and cross-nationally comparable data on schoolchildren's skills and knowledge in reading. Most data use the resulting 'plausible values' rather than the actual test answers. Scores are rescaled so that they had normal distribution with an international mean of 500 and a standard deviation of 100 during the first data collection in 2001.

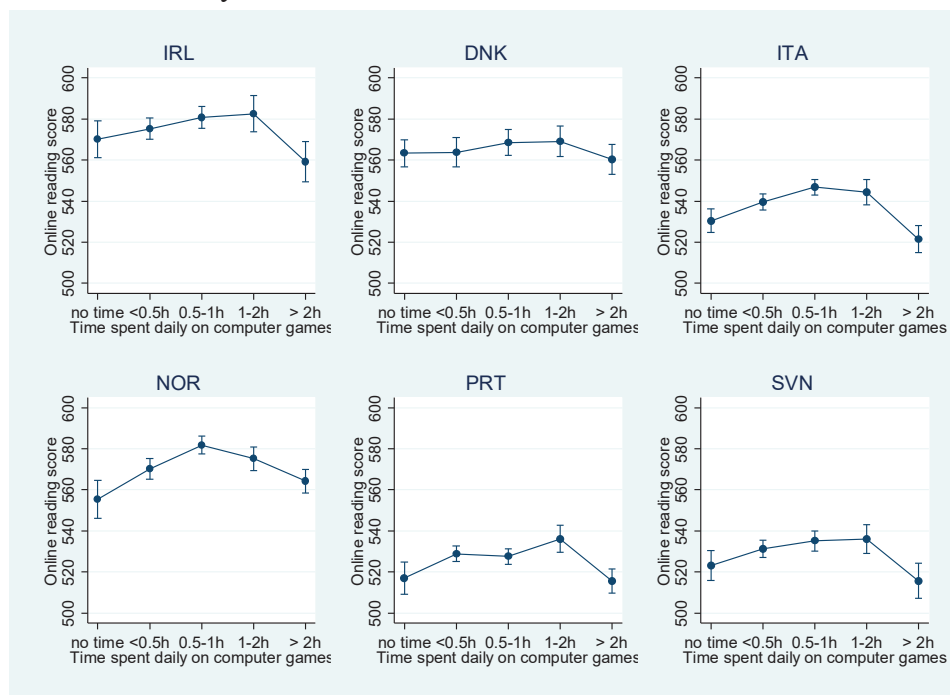
The random samples have two-stages of sampling units: schools and classes. Schools are sampled with probability proportional to their size from the list of all schools in the country that contain eligible students. Schools on the

list are stratified according to demographic variables that are known to influence the educational outcomes in a given country, such as geographic region in Italy, language in Norway or school type in Ireland. As the second-stage sampling units, classes are sampled with probability inversely proportional to school size.

Results

Computer games

Playing computer games shows an inversed U-shaped relationship with online reading scores in 5 out of 6 analysed countries. Moderate use is better than no use in Norway, Portugal and Italy (where moderate users are 16 points ahead of non-users). However, heavy use (more than two hours on an average day) translates into statistically significantly worse effect than moderate use in all countries apart from Denmark. In Italy, gaps go up to 25 points – a quarter of standard deviation - between children who spend 30-60 minutes daily on computer games and their counterparts who spend more than 2 hours a day.

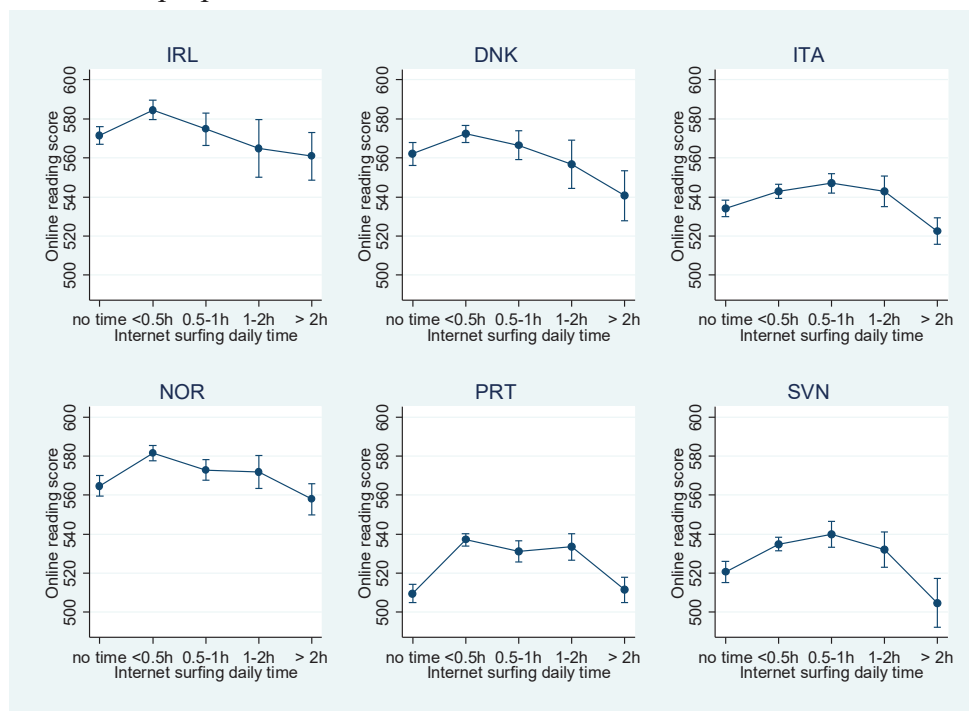


Source: prepared using ePIRLS database.

Note: Predictive margins of overall computer use with 95% confidence intervals, after controlling for gender, parental education, parental occupation, child's age in months and home use of the language of test.

Surfing the Internet

Surfing the Internet shows an inversed U-shaped relationship with online reading scores in 5 out of 6 countries. Moderate use is better than no use everywhere apart from Denmark. In Norway, differences go up to 17 points between kids with zero internet time and those who use it for less than 30 minutes per day. By contrast, heavy use (more than two hours on an average day) translates into statistically significantly worse effect than moderate use in all six countries. To acknowledge that surfing the Internet is a broad category, all models are additionally controlled for surfing the internet for schoolwork purposes.



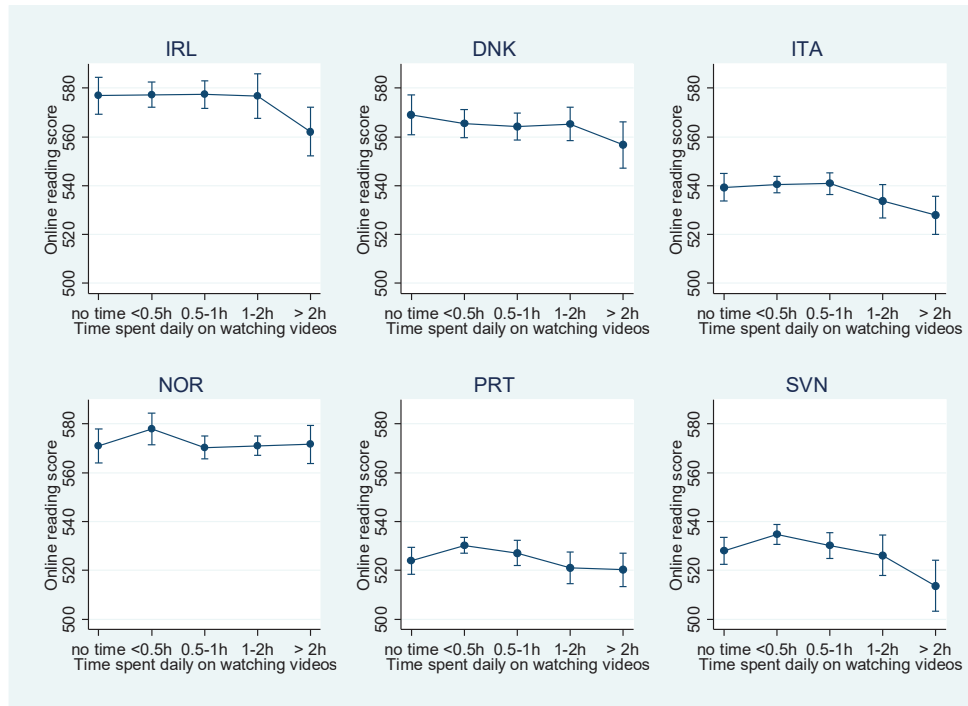
Source: prepared using ePIRLS database.

Note: Predictive margins of time spent daily playing computer games use with 95% confidence intervals, after controlling for gender, parental education, parental occupation, child's age in months and language as well as computer time spent on schoolwork. Since surfing the internet can also be used for school purposes, the model is additionally controlled for use of the Internet for schoolwork.

Watching videos

By contrast to computer games and surfing the Internet, watching videos shows more linear-negative relationship with educational achievement. In no case was moderate use better than no use. In turn, excessive use was significantly worse than no use in Ireland, Italy, Portugal and Slovenia. In

Slovenia, gaps between modest use (less than 30 minutes on an average day) and heavy use (more than 2 hours daily) reached 21 points.

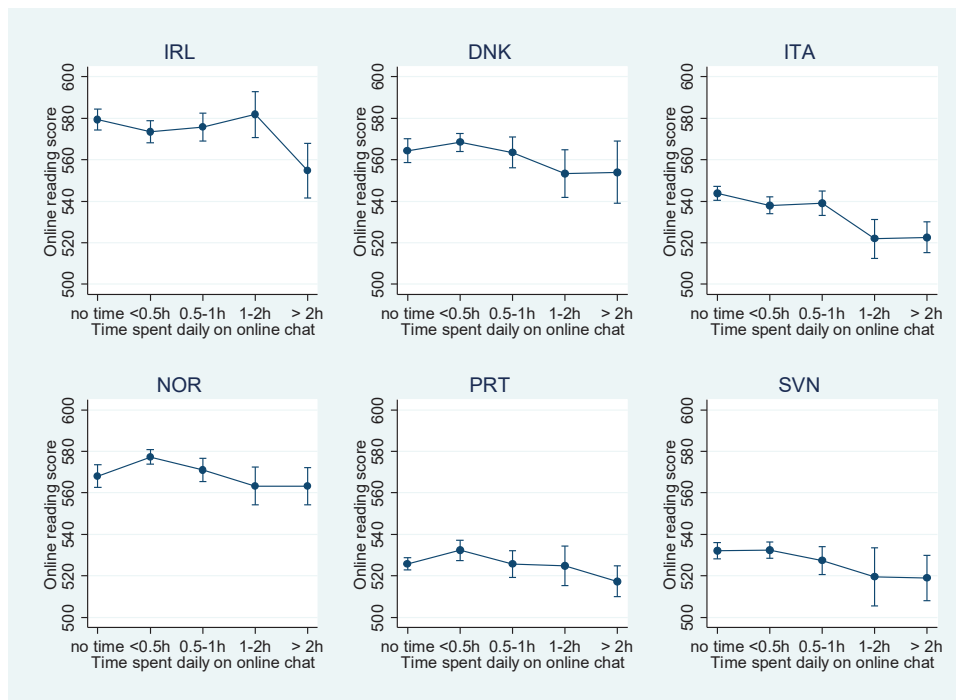


Source: prepared using ePIRLS database.

Note: Predictive margins of time spent daily playing computer games use with 95% confidence intervals, after controlling for gender, parental education, parental occupation, child's age in months and language as well as computer time spent on schoolwork.

Chatting online

Similarly to video watching, the social use of internet for chatting did not lend itself to an inverted U-shape: not in a single case was moderate use better than no use. Rather than that, it has shown a linear-negative relationship with educational achievement. Excessive use was significantly worse than no use in Ireland, Italy, Portugal and Norway. In Ireland, gaps going up to 25 points, or a quarter of a standard deviation, between children who spend more than 2 hours chatting online when compared to those who did not practice this form of Internet use.



Source: prepared using ePIRLS database.

Note: Predictive margins of time spent daily playing computer games use with 95% confidence intervals, after controlling for gender, parental education, parental occupation, child’s age in months and language as well as computer time spent on schoolwork.

Discussion

In two cases – playing computer games and surfing the Internet - the relationship between screen time and reading achievement was significant it has shown consistent pattern that held across countries: a right-skewed inversed U-shape. In most countries, moderate use tended to have a mildly positive effect when compared to no-use in the case of playing games and surfing the Internet but not in the case of chatting, watching videos and looking for information online – which all tended to bear negative and more linear relationship to online reading scores. However, for all activities, more than two hours daily had an adverse effect for school performance when compared to moderate use.

The inversed U-shape might reflect at least three different dynamics. First, online reading requires basic technological competence that children who do not spend any time online are unlikely to acquire. Second, given the engaging nature of online leisure (eg. computer games) that makes it hard to limit the entertainment to less than 30 minutes, the moderate screen use might reflect latent character features, such self-discipline that are conducive to high

reading scores and, as such, make the relationship between online time and reading epiphenomenal. Third, rather than pure character feature, moderate screen time can reflect parenting style that was not captured in controls of parental education and occupation.

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