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# PERSPECTIVES ON READING IN A DIGITIZED WORLD

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### Agenda

- Reading and digitisation what do we know?
  - Continuous reading of linear text the role of medium for reading comprehension
  - Meta-analyses and single studies
- Contemplating reading now and in the future
  - The role of long-form reading
  - Reading redefined?



### **Reading and digitisation**

- An extremely multi-faceted area of research...
  - From "digital reading" hypertexts, hypermedia, interactivity; internet navigation and search skills, etc. in which texts may be one part
  - to the reading of single texts on the substrate of paper vs the substrate of screens (computers, laptops, tablets, e-readers, smart phones...)





#### **Continuous reading of linear text – on paper and on various screens**













#### **Comprehension of linear texts on paper** and on screens

#### Three recent meta-analyses

#### Journal of Research in Reading

UKLA The United Kingdom Li

Journal of Research in Reading, ISSN 0141-0423 Volume 42, Issue 2, 2019, pp 288-325

DOI:10.1111/1467-9817.12269

#### Reading from paper compared to screens: A systematic review and metaanalysis

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Background: Given the increasing popularity of reading from screens, it is not surprising that numerous studies have been conducted comparing reading from paper and electronic sources. The purpose of this systematic review and meta-analysis is to consolidate the findings on reading performance, reading times and calibration of performance (metacognition) between reading text from paper compared to screens. Methods: A systematic literature search of reports of studies comparing reading from paper and screens was conducted in seven databases. Additional studies were identified by contacting researchers who have published on the topic, by a backwards search of the references of found reports and by a snowball search of reports citing what was initially found. Only studies that were experiments with random assignment and with participants who had fundamental reading skills and disseminated between 2008 and 2018 were included. Twenty-nine reports with 33 identified studies met inclusion 



#### Educational Research Review 25 (2018) 23-38 Contents lists available at ScienceDirect

Educational Research Review

journal homepage: www.elsevier.com/locate/edurev

#### Review

Don't throw away your printed books: A meta-analysis on the effects of reading media on reading comprehension



#### Computers & Education 123 (2018) 138-149

Contents lists available at ScienceDirect **Computers & Education** journal homepage: www.elsevier.com/locate/compedu ELSEVIE

#### Comparison of reading performance on screen and on paper: A meta-analysis

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ABSTRACT

#### ARTICLEINFO

Keywords: Digital reading Reading performance Screen Paper Meta-analysis

This meta-analysis looked at 17 studies which focused on the comparison of reading on screen and reading on paper in terms of reading comprehension and reading speed. The robust variance estimation (RVE)- based meta-analysis models were employed, followed by four different RVE meta-regression models to examine the potential effects of some of the covariates (moderators) on the mean differences in comprehension and reading speed between reading on screen and reading on paper. The RVE meta-analysis showed that reading on paper was better than reading on screen in terms of reading comprehension, and there were no significant differences between









aper and on digital devices. We in-participants designs (n = 16)advantage of paper over digital



### Delgado et al. (2018)

- 54 experiments
- 76 comparisons between paper-based and screen-based reading comprehension (of single text reading, no hyperlinks or interactivity)
- Both between- and within-subjects designs
- > 170 000 participants
- 19 countries
- Publication year 2000 2017



### **Description of the studies**

- Text length:
  - (a) short (less than 1,000 words) (b) long (1,000 words or more)
- Reading time allowed for reading:
   (a) free (self-paced by participants)
  - (b) constrained (set by experimental instructions)
- Type of digital device:

   (a) computer (desktop or laptop)
  - (b) hand-held (tablet, e-reader or smartphone)
- Text genre:
  - (a) informational (non-fiction: textbooks, newspapers, science magazines)
  - (b) narrative (fiction stories: novels, short fiction stories)
  - (c) mix (when both genre categories were used in the same task)



### **Findings**

- Significant overall reading medium effect indicating better reading outcomes for paper-based reading (effect size Hedge's g = -.21, dc = -.21.)
- The advantage for print is larger under time constraints than under self-paced reading
- Scrolling results in a significant digital disadvantage
- The advantage of paper *increased* over the years since 2000 (as seen in the effect sizes in the studies, in light of their publication year)



#### Conclusions

- Digital natives" do not get better at reading on screens
- Digital environments seem less conducive to fostering deep comprehension
- Paper-based reading yields a larger advantage in situations demanding increased mental effort
  - Reading under time pressure
  - Reading more complex informational texts

Delgado et al., 2018



#### WHY?

- The Shallowing Hypothesis
  - The more we read on screen, the more skimming, scanning
- The Metacognitive Deficit Hypothesis
  - We are less in touch with our reading on screen
  - We tend to overestimate our comprehension on screen



# Children's metacognition on paper and screen

- A recent study (Halamish & Elbaz, 2019) assessed the comprehension and metacomprehension of fifth grade children (N = 38)
- Reading time was the same, but comprehension was better on paper than on screen
- Children's metacomprehension judgments were insensitive to the effect of medium
- Children are unaware of the detrimental effect that screen reading has on their comprehension, and they are likely to make ineffective medium choices for their reading tasks



# Long-form reading in print and on Kindle – an experiment



#### Reading a longer narrative text in print vs on a Kindle

- E-ink display technology:
  - developed for sustained (e.g., novels)
  - shown to be as good (Benedetto et al., 2013) or better (Siegenthaler et al., 2012) than paper for perceptibility, legibility and visual discrimination
- Reading a long (28 pages) text, in a real book vs as a real e-book



tran the nearest of December, it was turning of hurst, it was due winter destroyed, we had everything below us, had nothing before us, we were all g streets to Measure, we were an going d the other way- in shund, the pariod an far like the present penach, that of its neishest authorities installed being incented, for mood or for evil, auperlative degree of comparison of "There were a Sing with a late and a queen with a plain tans, throns of England, there were a kin a large jaw and a queen with a l on the throne of France in countries it was clearer than t the louds of the State preserve

Collaborators: J.-L. Velay (CNRS/Aix-Marseille Univ.) & G. Olivier (Nice-Sophia Antipolis Univ.)



#### **Research questions**

Do haptic/tactile affordances of a Kindle affect readers'

- immersion and emotional engagement
- short-term factual recall
- aspects of comprehension
- ability to place events in correct text segments/parts ("where-in-the-text")
- ability to reconstruct the plot





- Participants (n = 50) read "Jenny Mon Amour" (from *Two of the Deadliest* [2009)]) in print or on a Kindle
- The text was 28 pages long









#### Time and temporality between events



- A significant 'category of response' by 'group' interaction
- "What is the time lapse between event X and Y?"
- "For how long did [event] last?"
- "When did [event] occur?"



#### **Plot reconstruction task**

14 key events to be sorted in the correct order



Mean distance from correct order

- paper: 4.8
- Kindle: 7.9

Correlation between 'where in the text' results and plot reconstruction performance



### **Conclusions, Kindle experiment**

- On measures related to *chronology* and temporality, print readers performed better:
  - Better recall of temporal relations between events
  - More correct reconstruction of the plot
- Sensorimotor assessment of the substrate seems to be related to aspects of cognitive processing



Mangen, Olivier & Velay, 2019



## Some issues to ponder ...



#### The importance of *fiction book* reading

Jerrim & Moss, 2019

- The fiction effect":
  - Time spent reading fiction books is associated with higher PISA reading scores
  - Association only for fiction book reading, not for non-fiction books, magazines, news, or comics
  - Found across almost all OECD countries (> 295 000 teenagers)

 

 BERJ Printin Educational Recent Journal
 BERA

 British Educational Research Journal Vol. 45, No. 1, February 2019, pp. 181–200
 DOI: DOI: 10.1002/berj.3498

 The link between fiction and teenagers' reading skills: International evidence from the OECD PISA study

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Abstract It is well known that children who read more tend to achieve higher scores in academic reading tests. Much less is known, however, about the link between reading different types of text and young people's reading performance. We investigate this issue using the Programme for International Student Assessment (PISA) 2009 database, exploring the association between the frequency with which teenagers read five different types of text (magzines, non-fiction, fiction, newspapers and comics) and their PISA reading scores. Analysing data from more than 250,000 teenagers from across 35 industrialised countries, we find evidence of a sizeable 'fiction effect' young people who read this type of text frequently have significantly stronger reading skills than their peers who do not. In contrast, the same does not hold true for the four other text types. We therefore conclude that encouraging young people to read fiction may be particularly beneficial for their freading skills. Interventions encouraging fiction reading may be especially important for boys from disadvantaged socio-economic backgrounds, who are less likely to read this text type.

Keywords: fiction; gender; PISA; reading

#### Introduction

The ability to read is a fundamental life skill, which is critical to participating effectively within both society and the workplace. In a policy-driven environment, many educationalists and policymakers have sought to develop a better understanding of the factors that are related to higher levels of reading achievement. It has long been hypothesised that encouraging young people to read more will help them to develop stronger reading skills, and the Organisation for Economic Co-operation and Development (OECD) has been very active in exploring this area (Kirsch *et al.*, 2002;

> Norwegian Reading Centre

### A longitudinal study from Finland

- «Leisure reading (but not any kind) and reading comprehension support each other – a longitudinal study across grades 1 and 9»
- Studied >2500 children from age 7 to 16, focusing on their development of reading skills (fluency and comprehension) and frequency of reading various types of texts (magazines, news, fiction books and digital reading)
- Digital reading" = social media, blogs, web pages, wikis etc. (i.e., typically *shorter* texts, read for socializing)

Torppa et al., 2019



### Torppa et al. (2019) findings

- Those who were most frequent readers of *fiction books*, had better reading comprehension
- There was a negative association between reading digital texts, and reading skills

CHILD DEVELOPMENT Child Development, xxxx 2019, Volume 00, Number 0, Pages 1-25 Leisure Reading (But Not Any Kind) and Reading Comprehension Support Each Other-A Longitudinal Study Across Grades 1 and 9 Minna Torppa 🕞 Pekka Niemi University of Turku University of Jyväskylä Kati Vasalampi Marja-Kristiina Lerkkanen University of Ivväskulä University of Jyväskylä and University of Stavanger Asko Tolvanen and Anna-Maija Poikkeus University of Jyväskylä This study examines associations between leisure reading and reading skills in data of 2,525 students followed from age 7 to 16. As a step further from traditional cross-lagged analysis, a random intercept crosslagged panel model was used to identify within-person associations of leisure reading (books, magazines, pers, and digital reading), reading fluency, and reading comprehension. In Grades 1-3 poorer comprehension and fluency predicted less leisure reading. In later grades more frequent leisure reading, particularly of books, predicted better reading comprehension. Negative associations were found between digital reading and reading skills. The findings specify earlier findings of correlations between individuals by showing that reading comprehension improvement, in particular, is predicted by within-individual increases in book reading. A common belief is that in addition to school- teachers would be well advised to encourage chilrelated reading activities, reading for pleasure pro- dren to become habitual readers. motes reading development. The assertion seems Although the practical significance of leisure plausible as avid readers devote considerable time reading appears self-evident, the direction of influand effort to reading, and they can receive massive ence in reported research on the topic is anything practice for automatization and accumulating lexi- but undisputable. This means that the pedagogical con (e.g., a Harry Potter book has as many as measures taken regarding reading also lack true 250,000 words). Leisure reading may thus result in underpinning. Instead of keen reading, the driving practice that easily surpasses the amount of text force can as well be reading competence itself or students read for school (e.g., Anderson, Wilson, & this can act in concert with leisure reading. Is the Fielding, 1988). In line with this, consistent evidence stage set already during the early elementary points to significant positive correlations between grades, so that students with a head start in readthe amount of leisure reading and reading skills ing skills also develop an interest in voluntary read-(e.g., Mol & Bus, 2011; Schiefele, Schaffner, Möller, ing? If so, then habitual reading would be & Wigfield, 2012; Stanovich, 1986), suggesting that established together with good decoding skills those who read a lot are better readers than those which feed into vocabulary and comprehension who are reading less. Evidence further suggests that (e.g., Perfetti & Stafura, 2014). Alternatively, it may leisure reading is intrinsically more motivating than be possible to encourage older students to read reading for school (Cox & Guthrie, 2001; Durik, more than they did before, thereby inducing a vir-

Vida, & Eccles, 2006; Wang & Guthrie, 2004). Thus, tuous circle that promotes reading competence (e.g.,

Snowling & Hulme, 2011). Finally, a reciprocal influence is also possible from the very beginning

it appears justifiable to conclude that parents and



### Reading is increasingly diverse





### **Consider medium (incl paper) in light of**

- The *content* 
  - Short or lengthy? Simple or complex? Verbal text or multimodal?
- The purpose
  - Gist or deep comprehension? Skim for main points or scrutinize for analysis/critical reflection? Study or leisure?
- The context
  - Intermittent or sustained reading? Time constraints?
- The *reader* 
  - Novice or expert? Reluctant or motivated?



#### **Important questions concerning the future of reading**

- What are the perceptual and cognitive mechanisms behind the screen disadvantage when reading linear texts?
- To what extent are current findings of screen inferiority related to experience & expertise (with medium, and with reading)?
- How to facilitate deep engagement with (complex; long) texts on screens?
- How to motivate children and adolescents to (continue to) read long(er), fictional texts – in whatever medium?





We live in an era of ever more swift and pervasive digitisation. Digital technologies offer tremendous opportunities with respect to the production, access, storage and transmission of information, at the same time as they challenge a number of long-established reading practices. Over the last four years a group of almost 200 scholars and scientists of reading, publishing, and literacy from across Europe, have been researching the impact of digitisation on reading practices.

Paper and screens each afford their own types of processing. In today's hybrid reading environment of paper and screens, we will need to find the best ways to utilize the advantages of both paper and digital technologies across age groups and purposes.

Research shows that paper remains the preferred reading medium for longer single texts, especially when reading for deeper comprehension and retention, and that paper best supports long-form reading of informational texts. Reading long-form texts is invaluable for a number of cognitive achievements, such as concentration, vocabulary building and memory. Thus, it is important that we preserve and foster long-form reading as one of a number of reading modes. In addition, as screen use continues to grow, it will be one of the urgent challenges to discover ways in which to facilitate deep reading of long-form texts in a screen environment.

Key findings:

 Individual differences in skills, abilities, and predispositions form distinct learning profiles that affect children's ability to use and learn from digital versus print sources;

 Digital text offers excellent opportunities to tailor text presentation to an individual's preferences and needs. Benefits for comprehension and motivation have been demonstrated where the digital reading environment was carefully designed with the reader in mind;

http://ereadcost.eu/stavanger-declaration/





#### E-READ Stavanger Declaration on the Future of Reading



#### **KEY FINDINGS**

- Individual differences in skills, abilities, and predispositions form distinct learning profiles that affect children's ability to use and learn from digital vs print sources;
- Readers are more likely to be *overconfident* about their comprehension when reading digitally than when reading print;
- Screen inferiority effects have *increased* rather than decreased over time, regardless of age group and of prior experience with digital environments;
- Our *embodied cognition* may contribute to differences between reading on paper and on screens;





#### E-READ Stavanger Declaration on the Future of Reading



#### RECOMMENDATIONS

- Students should be taught strategies to master *deep reading* on digital devices.
   Schools and school libraries must continue to motivate students to read paper books, and to set time apart for it in the curriculum;
- Replacing paper with digital technologies in primary education is *not neutral*. Unless accompanied by carefully developed digital learning tools and strategies, they may cause a *setback* in the development of children's reading comprehension and emerging critical thinking skills;
- Educators, reading experts, psychologists, and technologists should partner to develop digital tools that incorporate insights from research about the processing of digital and printed formats for reading practices



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#### Thank you for your attention

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