



# Reading on paper and screens: Empirical research

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# COST Action IS1404 E-READ: Evolution of REading in the Age of Digitisation

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- There is evidence that linear text reading on screen(s) is different from text reading on paper
  - Paper/screen affordances might impact cognitive and emotional aspects
- What are the effects of screen reading?
- We need to identify the best of both worlds (paper and screens)

# Reading is

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- Human-technology interaction
  - Affordances of substrates (paper; screens)
- Multidimensional
  - Substrate; text; reader; purpose
- Multisensory and embodied
  - Tactility & haptics; body and brain

# An integrative model of reading

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- **Ergonomic dimension** (reading is physical engagement with a device; haptics)
- **Attentional/perceptual dimension** (allocation of attention; audiovisual processing)
- **Cognitive dimension** (comprehension; linguistic processing)
- **Phenomenological dimension** (individually meaningful activity)
- **Sociocultural dimension** (socially meaningful activity)

# Aspects of reading to be measured

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- - ergonomics (haptic/tactile affordances)
- - visibility (visual discrimination)
- - legibility (color; typography)
- - attention
- - comprehension
- - memory
- - metacognition
- - emotion/immersion/phenomenological experience

# Interdisciplinary scope

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- Literary studies
- Media studies
- Book history
- Psychology
- Neuroscience
- LIS (Library and information science)
- Philosophy
- Biology
- Educational sciences
- HCI (Human-Computer Interaction)



# Reading comprehension on paper and computer screen

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- 72 students (10th grade) in two Norwegian schools
- Students read two 4 page long texts (one narrative, one expository) on either paper or computer screen, then answered comprehension questions on the computer
- Hypothesis: on-paper readers would perform significantly better on the comprehension assessment than on-screen readers

(Mangen, Walgermo & Brønnick, 2013)



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- Results: students who read texts on paper scored significantly better on the comprehension measure than students who read the texts on the computer
  - No difference between expository and narrative text  
(Mangen, Walgermo & Brønnick, 2013)



# Potential explanations

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- Multitasking (shifting between windows)?
- Scrolling?
- Visual fatigue?
- Lack of fixity on screen?

# Immersive reading on paper and iPad

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- Does it matter to our *emotional engagement* if we read a sad story on paper or on an iPad?
- 2 x 2 between-subjects design
  - medium (booklet; iPad)
  - genre instructions (fiction; nonfiction)
- Participants (n = 145; 73% women) read a 5-page narrative and completed a series of online questionnaires

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- All read the same short narrative text (5-6 p) titled “Murder in the mall” (adapted from Sherwin B. Nuland (1995), *How We Die*)
  - Letter-sized pages stapled in the upper left corner, and iPad w/Kindle app

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- Subjects reading the text as a *news story on paper*, reported
    - Highest level of empathy with the characters in the story
    - Highest level of transportation into the story (forgetting about the «here-and-now» of the situation)
    - Highest level of clarity and consistency in the storytelling
    - Highest level of medium/interface transparency (i.e., reporting that the medium - paper - was not interfering with their immersive experience)

(Mangen & Kuiken, submitted)



# Paper or screen? Potentially mediating factors

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- *Text*-related (e.g., length; complexity; genre; layout/structure)
- *Reader*-related (e.g., age; gender; novice vs expert; special needs)
- *Substrate* (e.g., audiovisual features; haptic/tactile feedback)
- *Purpose* of reading (e.g., study; leisure; contemplation; light entertainment; news)



*Thank you for your attention*

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