



Paper and digital learnings in school-aged children: the involvement of Executive Functions Costanza Ruffini– PhD Student – costanza.ruffini@unifi.it

INTRODUCTION

Literature supports a disadvantage of students' performances in the digital modality in comparison to the paper one for text comprehension (TC, Clinton et al., 2019; Delgado et al., 2018) whereas contrasting results have been found for text writing (TW, Feng et al., 2019; Wollscheid et al., 2016). Executive Functions (EF) are high cognitive control processes involved both in text comprehension (Cartwright & Duke, 2019) and in writing (Kellogg, 2022). As digital learning may require a higher cognitive control in comparison to traditional paper-and-pencil learning (Ackerman & Lauterman, 2012), it is important to study the involvement of EF within digital contexts.

AIMS

- investigate the effect of the paper/digital tool on text comprehension and writing
- investigate the role of basic EF components (working memory, inhibition, cognitive flexibility) in mediating learning performances in primary school aged children





METHODOLOGY

PARTICIPANTS

175 typically developmental children (MeanAge 9.75 (.89), 82F, 3,4,5 grades, 30 bilinguals, middle-high SES)

INSTRUMENTS

Text Comprehension assessments

- Prove MT-3 Cliniche (Cornoldi & Carretti, 2017)
- MT Kit Scuola (Cornoldi & Colpo, 2009) Writing assessment
- Write a story (Pinto et al., 2008)

Executive Functions assessments (selected form TeleFE platform)

- Go/No-Go Task (Inhibition)
- Flanker Task (Interference control and Cognitive Flexibility)
- N-back Task (Working Memory)

STUDY DESIGN

Within-subject design, counterbalanced order of presentation across the two sessions (digital-paper vs paper-digital)



- High Writers (HC) for paper TW complexity scores > median
- pattern (F(2, 163)=4.12, p<.05, $\eta_p^2 = .05$).
- For % of errors, no significant interactions

Classification in LW and HW significantly explained the variability in the difference between dTW and pTW:

- level of narrative complexity directly and indirectly via the mixed rule incongruent CR.
- number of words indirectly via the mixed rule incongruent CR and via the N-back CR but not directly.

DISCUSSION AND FUTURE DIRECTIONS

REFERENCES

- Confirmation that there is no difference between digital and paper for narrative text comprehension (Delgado et al., 2018)
- Confirmation of differences between digital- and paper text writing (Feng et al., 2019)
 - Importance of digital devices for children with text comprehension and writing difficulties
- Confirmation of the involvement of EF, particularly working memory, in digital and paper text comprehension (Cartwright & Duke, 2019) and writing (Kellogg, 2022)
- Evidence of the mediating role of cognitive flexibility and working memory in explaining the difference between digital and paper.
 - Larger sample size for each grade.
- Comparison between reading and writing tasks with analysis of the EF mediator role.

Ackerman, R., & Lauterman, T. (2012). Taking reading comprehension exams on screen or on paper? A metacognitive analysis of learning texts under time pressure. Computers in human behavior, 28(5), 1816-1828.

Cartwright, K. B., & Duke, N. K. (2019). The DRIVE model of reading: Making the complexity of reading accessible. The Reading Teacher, 73(1), 7-15. Clinton, V. (2019). Reading from paper compared to screens: A systematic review and meta-analysis. Journal of Research in Reading, 42(2), 288-325. https://doi.org/10.1111/1467-9817.12269

Cornoldi, C., Carretti, B. (2017). Prove MT -3 Clinica. Il test sviluppato da Cesare Cornoldi per la valutazione delle abilità di lettura, comprensione, scrittura e matematica. Giunti Psychometrics.

Cornoldi, C., Colpo, G. (2009). Prove di lettura MT per la scuola elementare -2. Giunti O.S. Organizzazioni Speciali, Firenze.

Delgado, P., Vargas, C., Ackerman, R., & Salmerón, L. (2018). Don't throw away your printed books: A meta-analysis on the effects of reading media on reading comprehension. Educational Research Review, 25, 23-38. https://doi.org/10.1016/j.edurev.2018.09.003

Feng, L., Lindner, A., Ji, X. R., & Malatesha Joshi, R. (2019). The roles of handwriting and keyboarding in writing: A meta-analytic review. Reading and Writing, 32(1), 33-63. DOI:10.1007/S11145-017-9749-X

Kellogg, R. T. (2022). Book Review: Executive function and writing-Teresa Limpo & Thierry Olive, Eds. (2021). Journal of Writing Research, 13(3), 473-479. https://doi.org/10.17239/jowr-2022.13.03.05

Pinto, G., Bigozzi, L., Accorti Gamannossi, B., & Vezzani, C. (2008). L'alfabetizzazione emergente: validazione di un modello per la lingua italiana. Giornale italiano di psicologia, 35(4), 961-978. http://hdl.handle.net/2158/219325

Wollscheid, S., Sjaastad, J., & Tømte, C. (2016). The impact of digital devices vs. Pen (cil) and paper on primary school students' writing skills-A research review. Computers & education, 95, 19-35. https://doi.org/10.1016/j.compedu.2015.12.001



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