Progressing or Regressing?
Using Neurobiological Tools to Reveal the Mechanisms Underlying Screen and Technology Use in Children

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CHAIS, Feb 2026

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Disclosures

- National Institute of Health (NICHD), USA
- Alon Foundation, Israel
- The Fulbright Foundation
- MIT International Science and Technology Initiatives (MISTI)
- The University of Cincinnati Research Grant
- The Fischer's Foundation, US
- PNC Bank, Cincinnati, US
- Cincinnati Children's Hospital Board of Trustees Award
- Promobilia Foundation (Sweden)
- Mind and Life Foundation
- Waterloo Foundation
- IDDRC, Kennedy Krieger Institute
- JOY Ventures Foundation
- Ministry of Education, Israel

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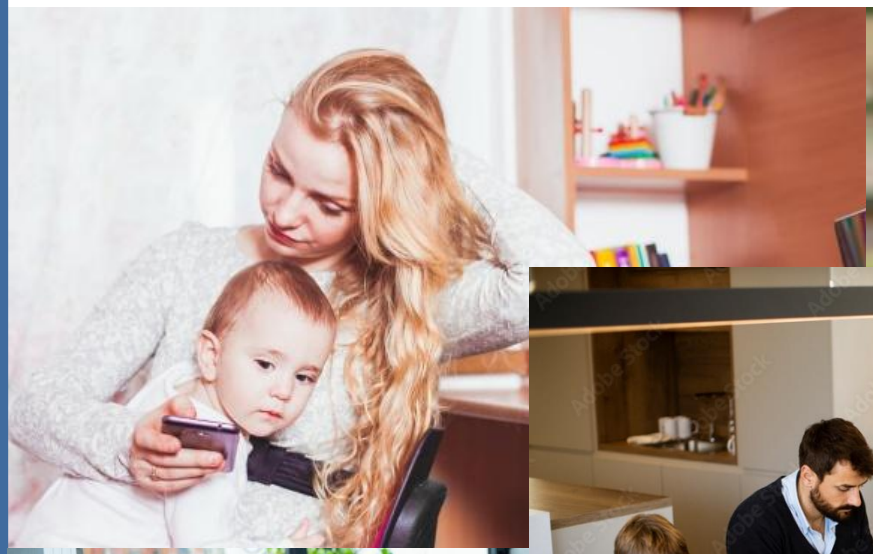
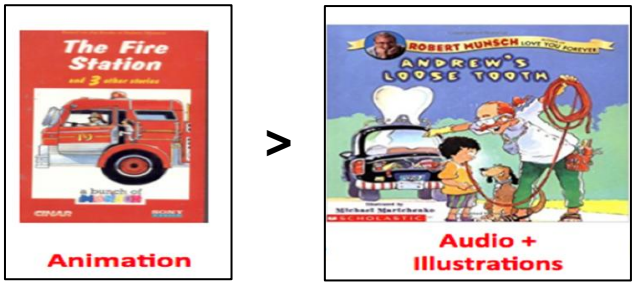
Increased interruptions? Opportunities? Both?

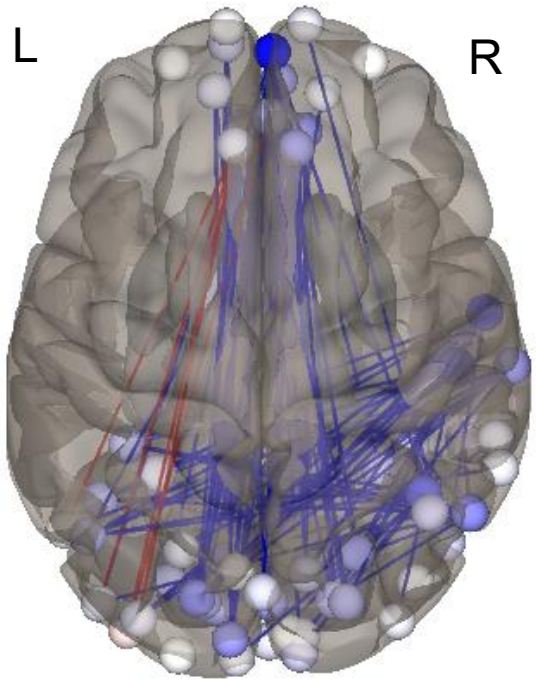


Decreased functional connectivity between attention and visualization regions when watching a movie

3-5 y.o children

Watching a movie vs.
Illustration+ Audio





P<0.05, FWE corrected

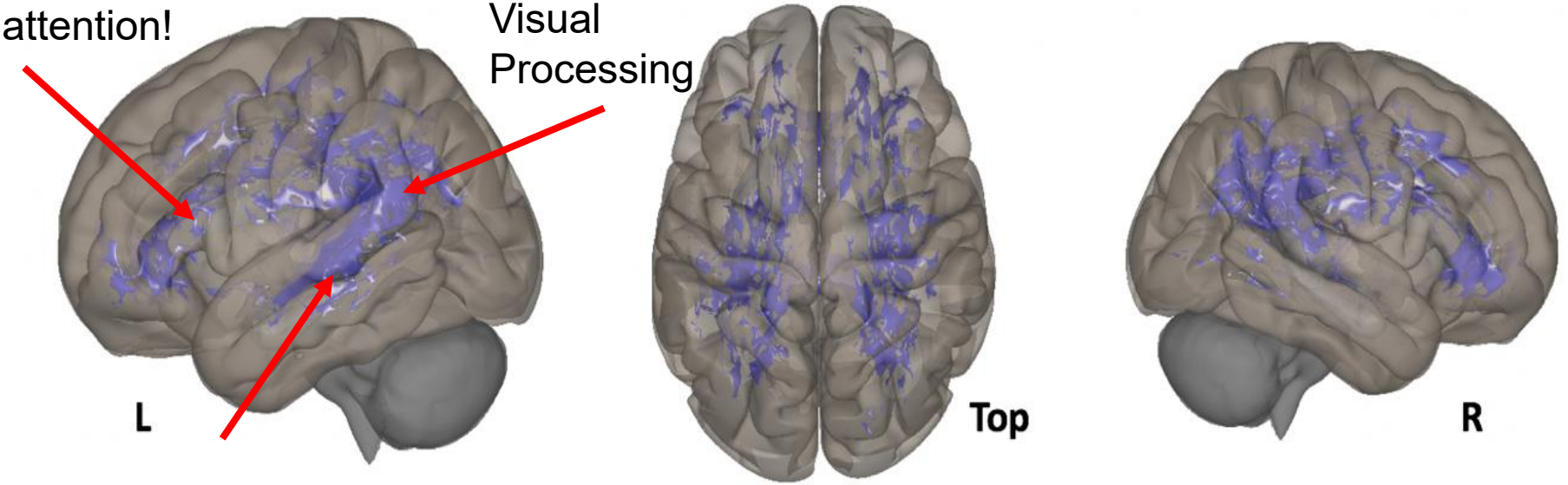
Hutton, Dudley, Horowitz-Kraus, Holland. 2018. Brain and Behavior

Less organized white-matter in related to screen exposure in cognitive control and language-related tracts

3-5 y.o children

Executive functions, attention!

Visual Processing



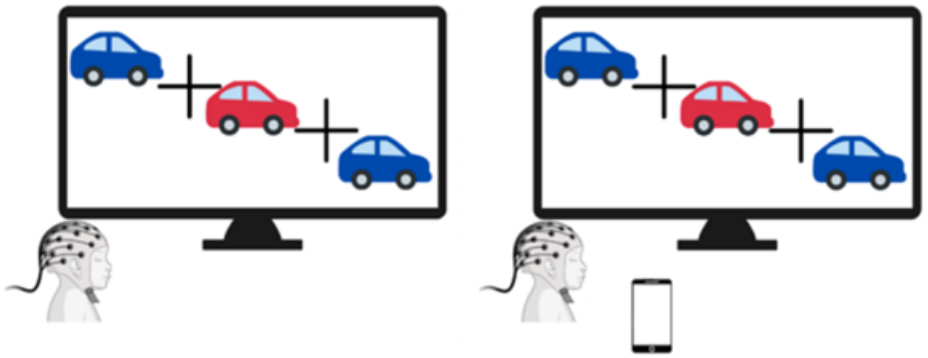
Language processing

P<0.05. FWE corrected

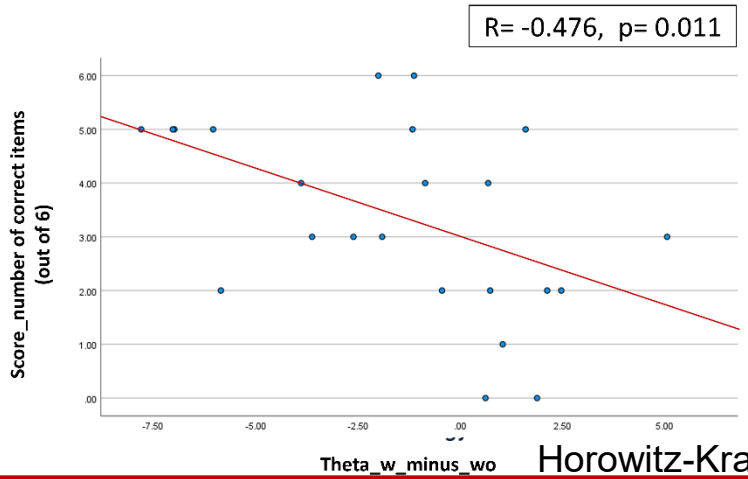
Hutton, Dudley, Horowitz-Kraus and Holland, 2020, JAMA Pediatrics

Learning next to a smartphone is related to attention-load

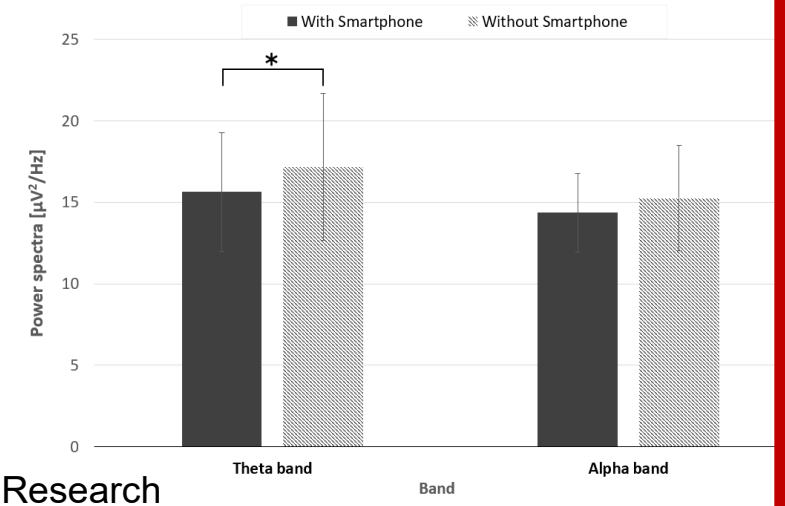
7-8 y.o children



Brain activation during smartphone presence is related to lower attention abilities



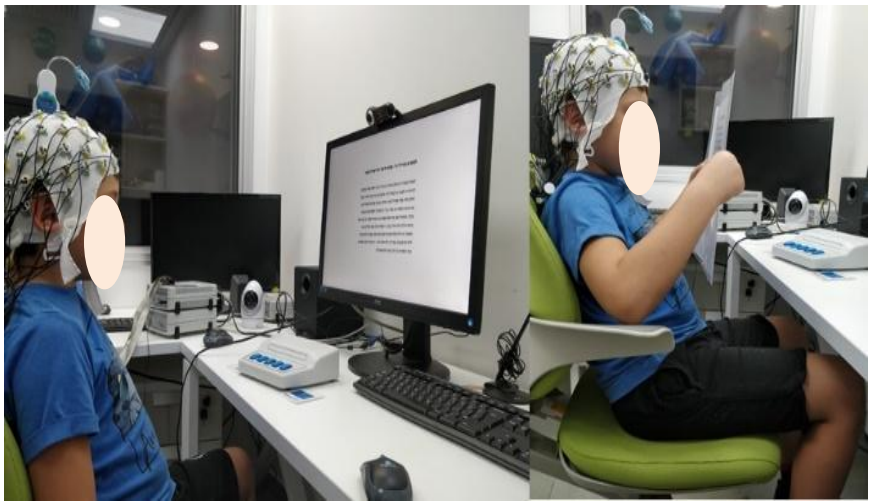
Increased theta band (attention load) while learning with a smartphone

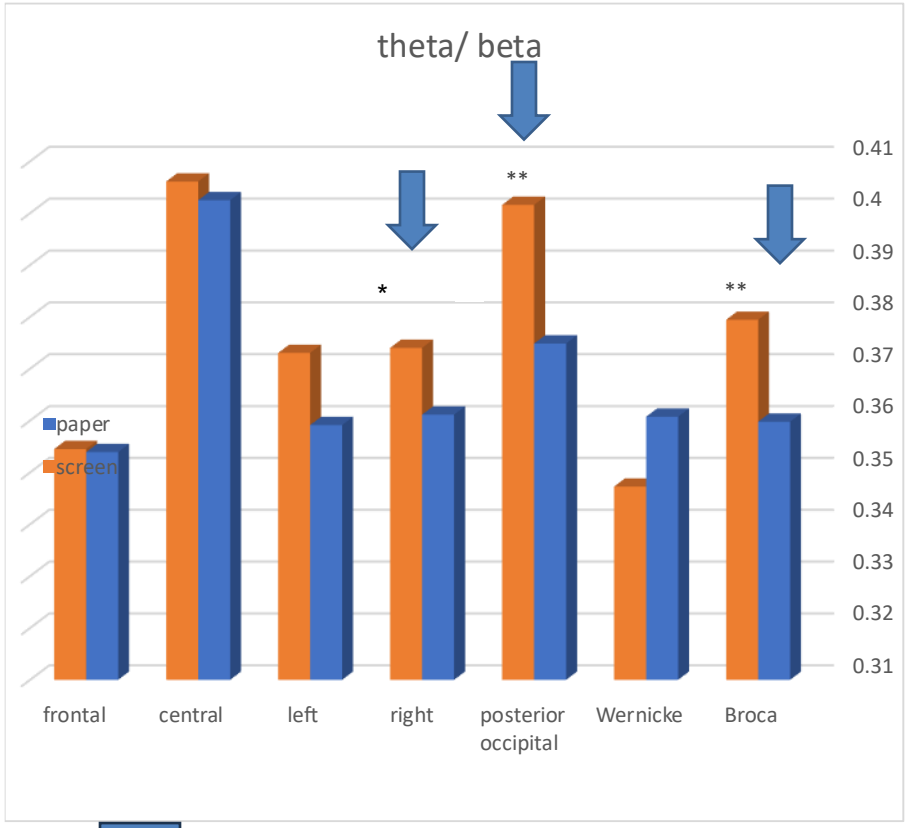


Horowitz-Kraus et al., 2024. Ped Research

Brain activation related to attention load when reading from a screen vs printed paper

7-8 yo children





Paper

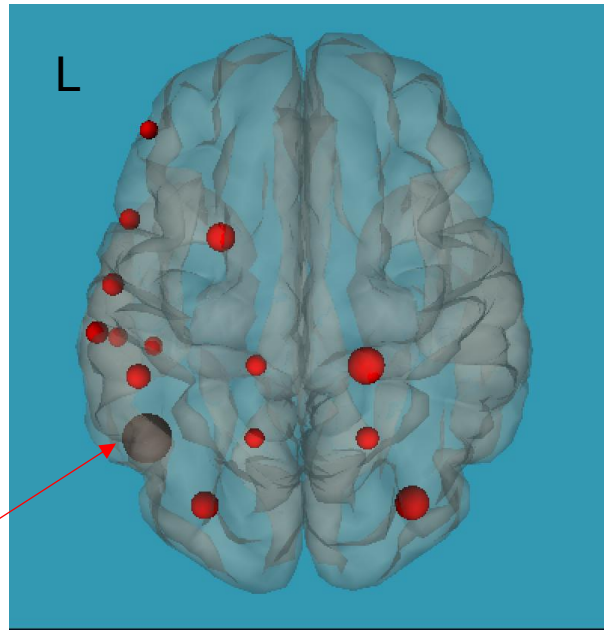
Screen

Horowitz-Kraus et al. 2023. PlosOne

Longer screen time is related to decreased connections between visualization and executive-functions regions

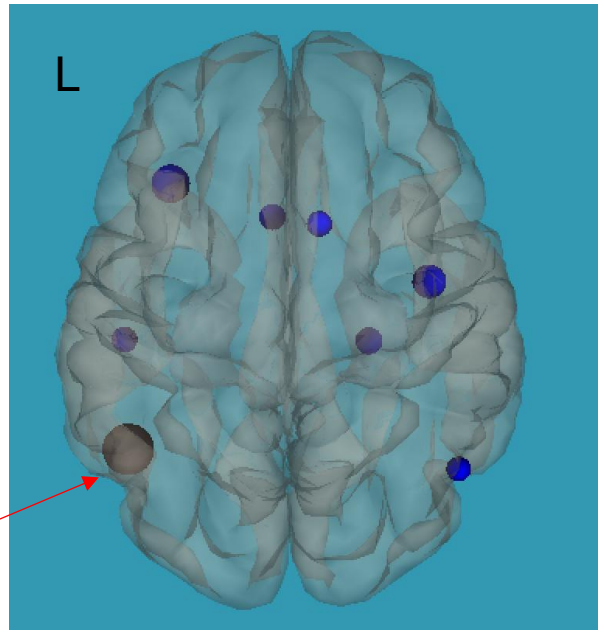
8-12 yo children

Longer Reading Time



Word Form Area

Longer Screen Time



Word Form Area

Horowitz-Kraus & Hutton. 2018. Acta Paediatrica

Support from a large-scale study:
Screen time is related to decreased gray matter volume in executive functions and visual processing regions

9-10 y.o. children

NeuroImage 185 (2019) 140–153

Contents lists available at ScienceDirect

NeuroImage

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

Screen media activity and brain structure in youth: Evidence for diverse structural correlation networks from the ABCD study

Martin P. Paulus [a,b,*], Lindsay M. Squeglia [c], Kara Bagot [b], Joanna Jacobus [b], Rayus Kuplicki [a], Florence J. Breslin [a], Jerzy Bodurka [a], Amanda Sheffield Morris [a,e], Wesley K. Thompson [d], Hauke Bartsch [f], Susan F. Tapert [b]

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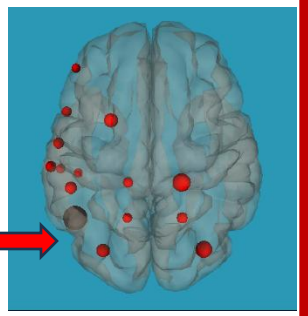

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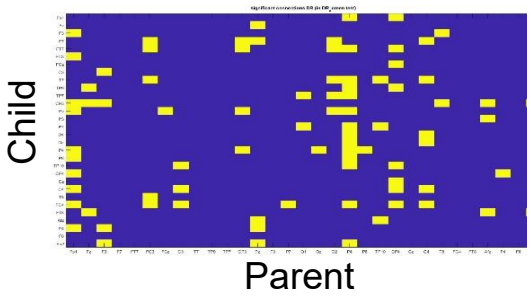
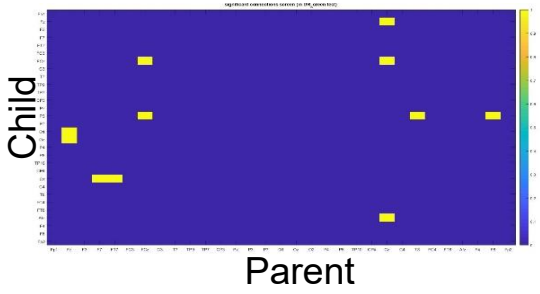
Interruptions during interaction are related to decreased joint attention/synchronization

Dr Michal Zivan

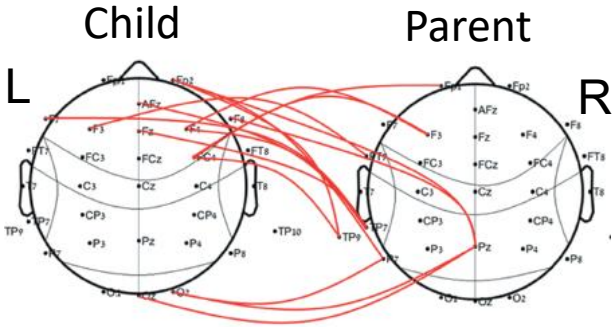
Interaction

Interruption





Participants:
N=24 couples
Age=24–42 month old toddlers (mean age = 33.5 months ± 5.8 months; 8 girls), native Hebrew-speakers



P<.05, FDR corrected

Greater synchronization during interactive reading was related to 1)joint attention (percentage) (r = .518, p < .05); 2) mother's fluency skills (r = 0.536, p = 0.008).

Zivan, Habuba, Gashri and Horowitz-Kraus, 2022.
Child Neurophysiology

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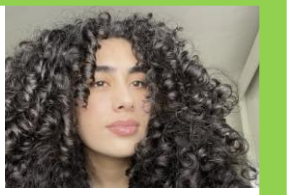
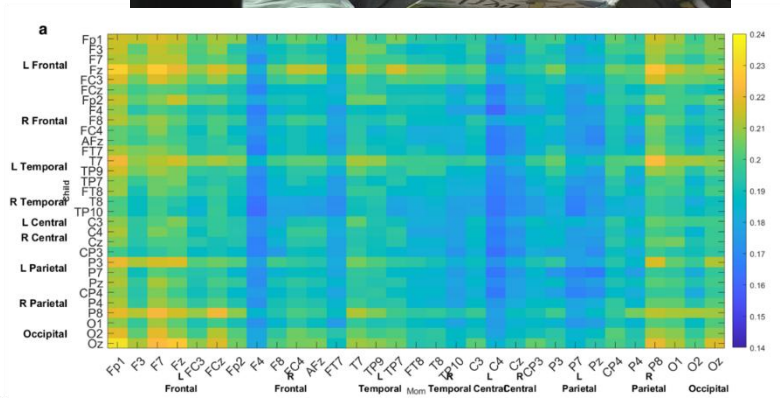
Lower brain-to-brain synchronization during a tablet-based reading

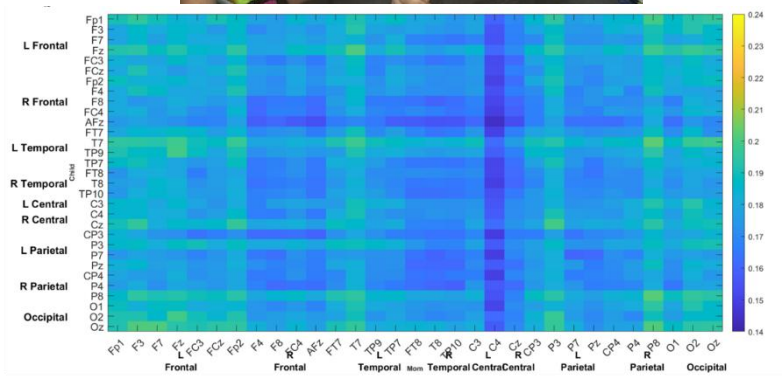


Fatma Ibrahim

Book-based dialogue

Tablet-based dialogue





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Fauzi, Ibrahim et al. 2025. *Acta Pediatrica*

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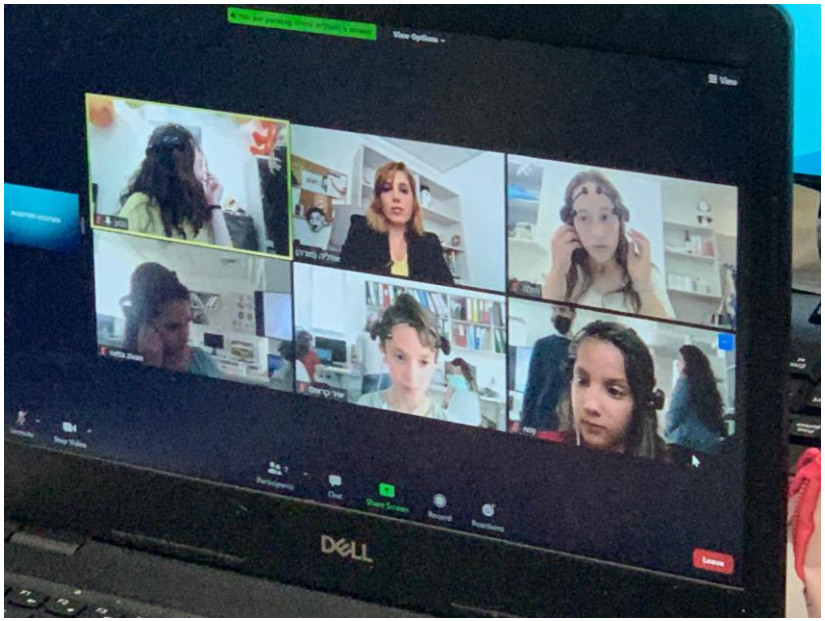
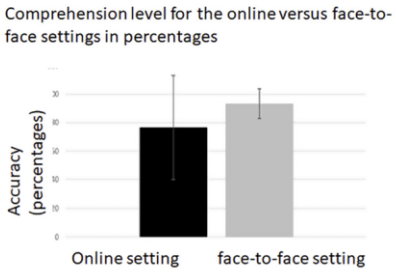
Synchronization as a group is interrupted when learning from screens





Horowitz-Kraus, Metzuyanim, et al., Acta Pediatrica. 2023

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Conclusions

- The first years of life are critical for the facilitation of the child's sensory, motor and cognitive foundations and future academic skills (reading).
- For children, reading from the screen and the existence of screens may be interrupting (attention-draggers!), creating a cognitive load.
- Interruptions during interaction- may also create a distraction/cognitive load.
- AI doesn't always trigger creativity! Note the age of use.
- War-related events: reduced cognitive and academic abilities as well as parent-child attachment- children at risk for unsupervised use of technology.
- Technology is an important tool for learning, depending on age.
- The use of Technology and advanced AI tools in children should be timed and explicitly guided.
- Special populations (Dyslexia, ADHD etc) may especially benefit from technology.

Modeling

“Togetherness”, communication and eye-contact

Adults’ monitoring of the use of technology

Thank you, team!

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