Sex differences in low-level multisensory integration in developmental dyslexia

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Introduction

- Learning to read requires integration of visual and auditory stimuli → suggested deficit in multisensory integration in dyslexia¹,²,³
- Males are diagnosed with dyslexia more frequently than females⁴
- In ASD, another neurodevelopmental disorder with higher prevalence in males → males more deficient than females in multisensory speech processing⁵

Aim

- Investigate possible sex-differences in low-level (non-linguistic) multisensory integration in dyslexia at the behavioral and neural levels

Hypotheses

- Greater deficit in multisensory integration in males with dyslexia at behavioral level
- Reflected in ERPs → males with dyslexia presenting atypical neural responses compared to other groups

Method

- 44 participants with dyslexia and 44 typical readers aged 15-25 years old matched for sex, age and SES performed simple reaction time task while continuous EEG was recorded
- 128 trials in each condition (auditory: 1000 Hz tone; visual: white flash; multisensory: 1000 Hz tone and white flash presented simultaneously) + 16 catch trials (no stimuli) presented in a random order
- Participants instructed to press a button as quickly as possible after stimulus presentation

Behavioral results

- Interaction between group and sex: F(1,83) = 4.55, p = .036, η²p = .052
Lower magnitude of multisensory integration in males with dyslexia (M = 0.01, SD = 0.11) than males from the control group (M = 0.13, SD = 0.22, p = .004, Bonferroni corrected); difference between females from dyslexic (M = 0.10, SD = 0.19) and control (M = 0.10, SD = 0.12) groups not significant (p = .989, Bonferroni corrected)

Conclusions

- Only males with dyslexia presented a deficit in multisensory integration of simple non-linguistic stimuli
- At the neural level both females and males with dyslexia presented different processing of multisensory stimuli than the control group
- Sex is an important factor in multisensory integration in dyslexia and studies should take into account potential sex differences

Neural results

- N1 component (98-196 ms) → greater difference in amplitudes between multisensory and SUM conditions in the control than in the dyslexic group F(1,84) = 5.99, p = .016, η²p = .067
- N2 component (196-384 ms) → greater difference in amplitudes between multisensory and SUM conditions in the control than in the dyslexic group F(1,84) = 5.80, p = .018, η²p = .065

N2 component later in the dyslexic group F(1,84) = 5.85, p = .018, η²p = .065

References


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