Abnormal eye movements after auditory deprivation
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Introduction

- The inferior colliculus is a key relay station in the primary auditory pathway that is disrupted by early auditory deprivation.¹,²
- The cells of the inferior colliculus project to the deep layers of the superior colliculus.¹,³,⁴
- Multisensory cells of the deep layers of the superior colliculus project to the motor areas involved in the control of eye movements.²,³,⁴

Hypothesis

Given that sensory deprivation during early infancy alters the auditory input to the superior colliculus and leads to cerebral reorganization⁵-¹⁰, we hypothesis that:
- individuals with early auditory deprivation will have abnormal patterns of eye movements.

Methods

Participants

12 profound deaf adults (mean age = 29 years old):
- from birth (n = 10)
- < 3 months (n = 2)
Communication:
- each participant used sign and oral language
12 adults with normal hearing and without otologic problems (mean age = 26 years old)

Paradigm

EyeLink 2000, SR Research, Canada

Fixation task

For each trial, the participant fixated a circle of 0.5° in the middle of the screen, and then, with one saccade, had to direct his gaze to:
- 16 targets randomly presented 3 times each
  - 8 positions (0°, 45°, 90°, 135°, 225°, 180°, 270°, 315°)
  - 2 distances from central fixation (5° and 10°)

Pursuit task

The eyes followed a 0.5° circular target that made 8 trajectories randomly presented 3 times each:
- trajectories: horizontal, vertical and elliptic (clockwise & counter-clockwise)
- speeds: 2 and 4 deg/s¹

Results

Conclusions

Eyes movements are disrupted in profound deaf individuals when they have to do a fixation task and follow a target:
- they make more saccades and take longer pause during the fixation task.
- they make more saccades (less fluidity) and are not able to keep up with the trajectory of the target.

The presence of deficits for both the fixation task and the pursuit task suggests that these two measures tap cerebral mechanisms that seem to be equally affected by auditory deprivation.

Clinical Implication and future considerations

Measuring eyes movements during reading:
Could the deficits found in pursuit eye movements have an impact on the reading abilities of the deaf?
- deaf individuals rarely reach a normal reading level.¹¹

References


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