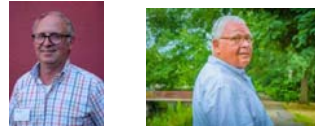


IMPACT OF CI ON THE BRAIN

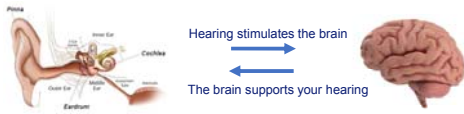
André Goedegebure,
Erasmus MC Rotterdam
11th November 2022



CI activates the brain!

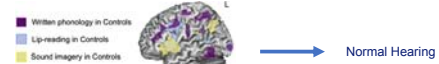


The ear and the brain are connected



Changes in the brain due to hearing loss /deafness

Lazard et al Hear Res 2014



The impact of CI in children

Plasticity of the brain: "moulded" under the influence of experiences



Sensitive period of the brain

Oral language development until 6 years of age
Bilateral development until 12 years age

→ Success of CI strongly depends on timing of intervention!



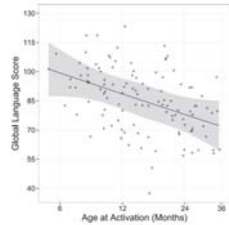
www.hearinghealthmatters.org



Age at implantation

Ching et al *Pediatrics* 2017

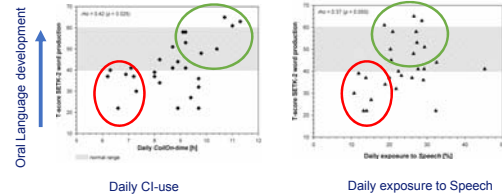
Early implantation (6-12 months) gives better oral language outcomes at 5 years of age



Erasmus MC
Erasmus

Importance of CI use

Glaubitz et al *Int JPOr* 2021



Erasmus MC
Erasmus

The impact of CI in adults

Plasticity of the brain is still present: CI rehabilitation is one of the best proofs!

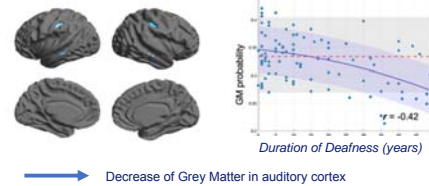
However, potential success of CI strongly depends on historical experiences:

- Duration of deafness
- Hearing aids use
- Preferred language modality

Erasmus MC
Erasmus

Duration of deafness

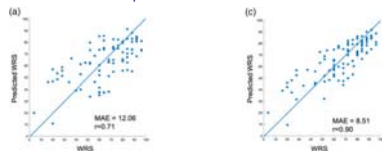
Sun et al *Hum Brain Map* 2021



Erasmus MC
Erasmus

Pre-operative Brain imaging predicts CI outcome

Sun et al *Hum Brain Map* 2021



Prediction based on clinical measures

...both imaging and clinical measures

Erasmus MC
Erasmus

Effect of CI on cognition and dementia

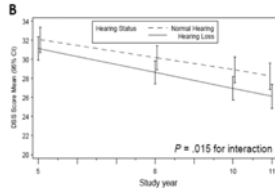
CI enables people to stay active, especially at older age

This may have a positive effect on cognitive decline



Erasmus MC
Erasmus

Cognitive decline and hearing



Lin et al 2011

Erasmus MC

Review paper Livingston Lancet 2017



Erasmus MC

The Rotterdam study

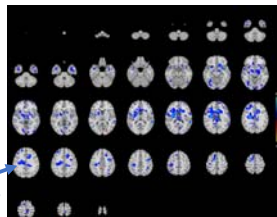
Large study cohort of older adults (N=20,000)

Hearing loss & MRI brain:

Poorer hearing is associated with lower white matter volumes and quality

Rijters et al 2017 Front Aging Neurosci. Rijters et al 2018 Neurobiology of Aging

Blue colour: negative association



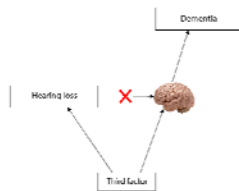
Erasmus MC

Timely use of CI or hearing aid!



Erasmus MC

Timely use of CI or hearing aid?



Erasmus MC

Take home message

The use of Cochlear implantation has important impact on the brain:

- Scientific proof
- Clinical experience

Benefit of timely intervention and auditory stimulation

Erasmus MC