

The Ear to Brain Connection

Doug Dunker, BC-HIS, ACA
Owner of Prescott Hearing Center

Hearing Care is Healthcare

- Social Health
- Emotional
- Physical
- Cognitive

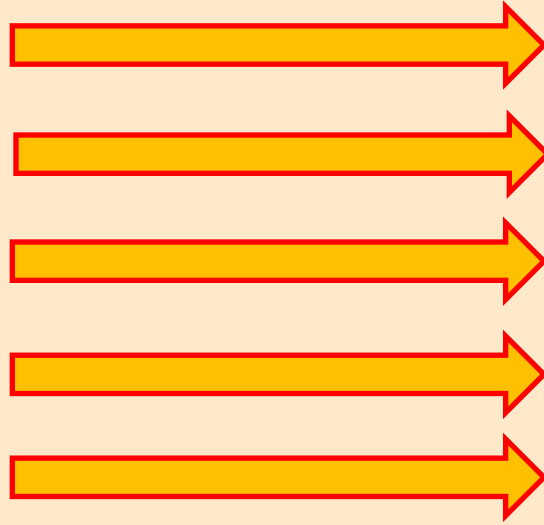
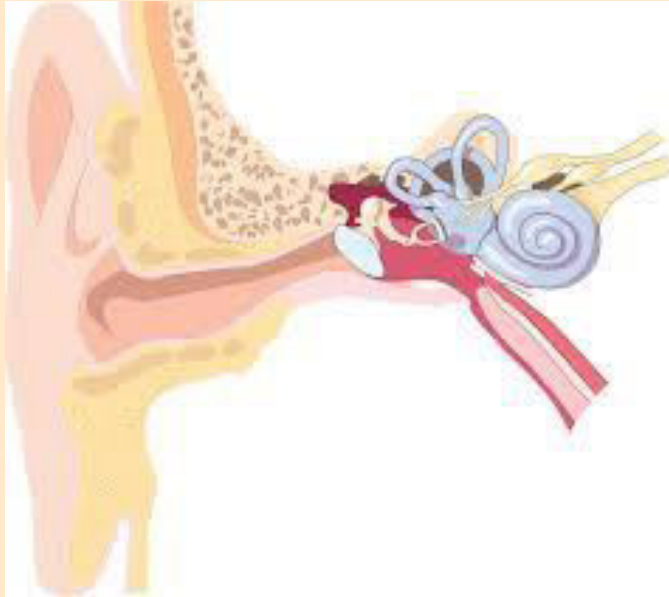


Causes of Hearing Loss

- Noise
- Co-morbidity
- Ototoxic medications
- Middle Ear
- Age

AGE...
is the most
common cause
of hearing loss

The Normal Ear to Brain Connection

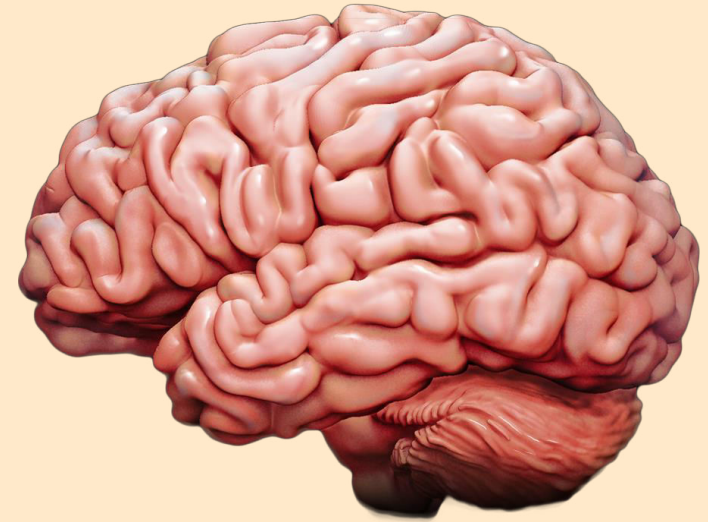
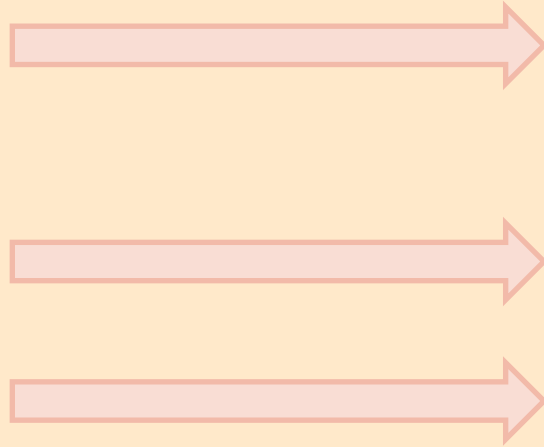
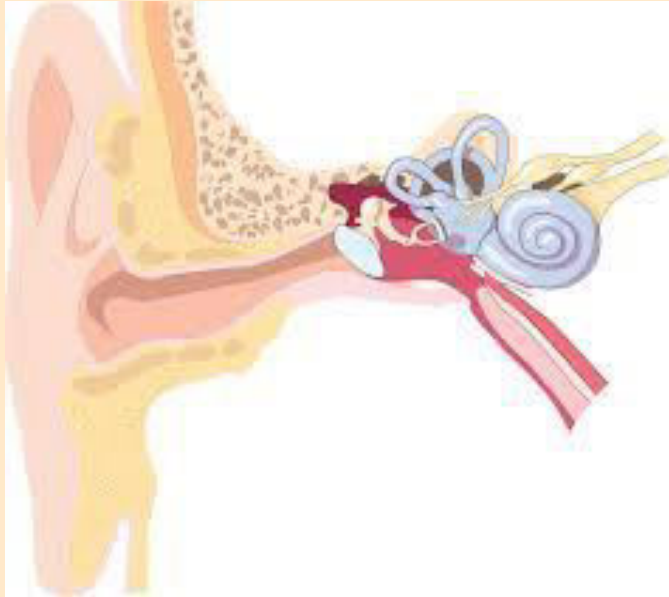


The Auditory Nerve is Responsible For:

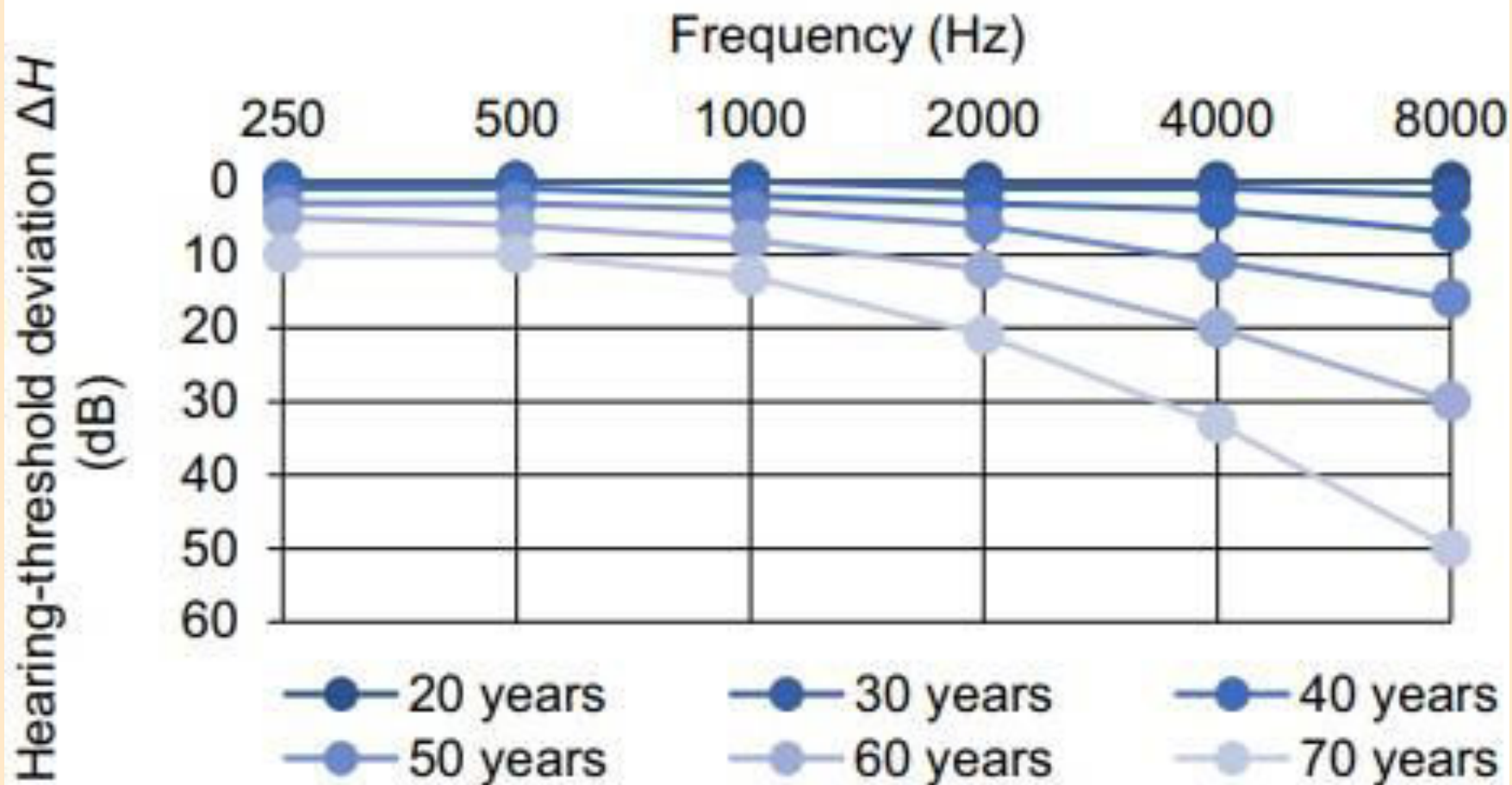
- Timing
- Frequency
- Volume
- Duration
- Location

When there are less neural connections to the brain...

The Impaired Ear to Brain Connection



Median hearing threshold deviations for males



Three Consequences of Neural Degeneration

1. Tinnitus
2. Auditory Deprivation
3. Cognitive Decline

Tinnitus or Tinnitus

- When nerves get damaged, the brain doesn't know how to react
- Like phantom limb pain
- Central gain hypothesis
- Tinnitus is a result of damage to the auditory system

Auditory Deprivation

- Like a cell phone call with poor reception
- Loss of clarity
- Even more difficult hearing in noise
- Leads to avoiding social events
- Use it or lose it
- Leads to brain atrophy

Cognitive Decline

- Brain has less data to work with
- Brain atrophy
- Cognitive overload
- Easy to isolate
- Tiring – people “check out”

Why Hearing Loss and Dementia?

Three Theories

- Social Isolation
- Brain Atrophy
- Cognitive overload

Original Contribution

February 2011

Hearing Loss and Incident Dementia

Frank R. Lin, MD, PhD; E. Jeffrey Metter, MD; Richard J. O'Brien, MD, PhD; [et al](#)

[» Author Affiliations](#) | [Article Information](#)

Arch Neurol. 2011;68(2):214-220. doi:10.1001/archneurol.2010.362

Original Investigation

Feb 25, 2013

Hearing Loss and Cognitive Decline in Older Adults

Frank R. Lin, MD, PhD; Kristine Yaffe, MD; Jin Xia, MS; [et al](#)

[» Author Affiliations](#) | [Article Information](#)

JAMA Intern Med. 2013;173(4):293-299. doi:10.1001/jamainternmed.2013.1868

[» Neuropsychology.](#) 2011 Nov;25(6):763-70. doi: 10.1037/a0024238.

Hearing loss and cognition in the Baltimore Longitudinal Study of Aging

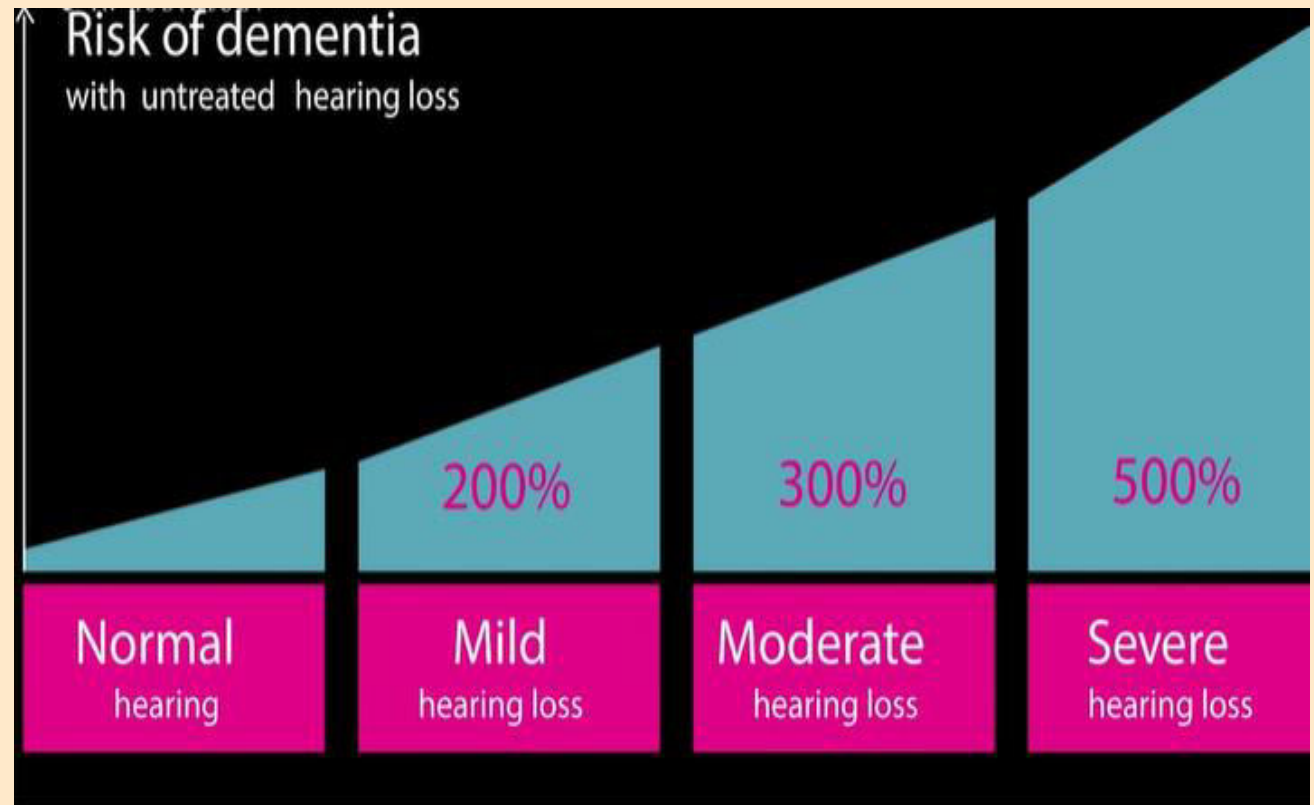
Frank R Lin ¹, Luigi Ferrucci, E Jeffrey Metter, Yang An, Alan B Zonderman, Susan M Resnick

Affiliations [+ expand](#)

PMID: 21728425 PMCID: PMC3193888 DOI: 10.1037/a0024238

Dr. Frank Lin's study states that...

- 2-5 times more likely to develop dementia if you have a hearing loss
- Severity of hearing loss makes a difference
- Treatment of hearing loss mitigates the risk



Social Isolation

➤ [J Speech Hear Res.](#) 1982 Dec;25(4):593-9. doi: 10.1044/jshr.2504.593.

Hearing impairment and social isolation in the elderly

[B E Weinstein](#), [I M Ventry](#)

PMID: 7162161 DOI: [10.1044/jshr.2504.593](#)

Association Between Hearing Impairment and Lower Levels of Physical Activity in Older Adults

[Fiona E. Gispen MS](#) ✉ [David S. Chen BS](#), [Dane J. Genther MD](#), [Frank R. Lin MD, PhD](#)

First published: 15 July 2014

<https://doi.org/10.1111/jgs.12938>

Brain Atrophy

Association of hearing impairment with brain volume changes in older adults

F R Lin ¹, L Ferrucci ², Y An ³, J O Goh ⁴, Jimit Doshi ⁵, E J Metter ², C Davatzikos ⁵, M A Kraut ⁶, S M Resnick ³

Affiliations [+ expand](#)

PMID: 24412398 PMCID: PMC3951583 DOI: 10.1016/j.neuroimage.2013.12.059

Cognitive overload



[Front Psychol.](#) 2016; 7: 301.

PMCID: PMC4777916

Published online 2016 Mar 4. doi: [10.3389/fpsyg.2016.00301](https://doi.org/10.3389/fpsyg.2016.00301)

PMID: [26973585](https://pubmed.ncbi.nlm.nih.gov/26973585/)

Effects of Hearing Loss and Cognitive Load on Speech Recognition with Competing Talkers

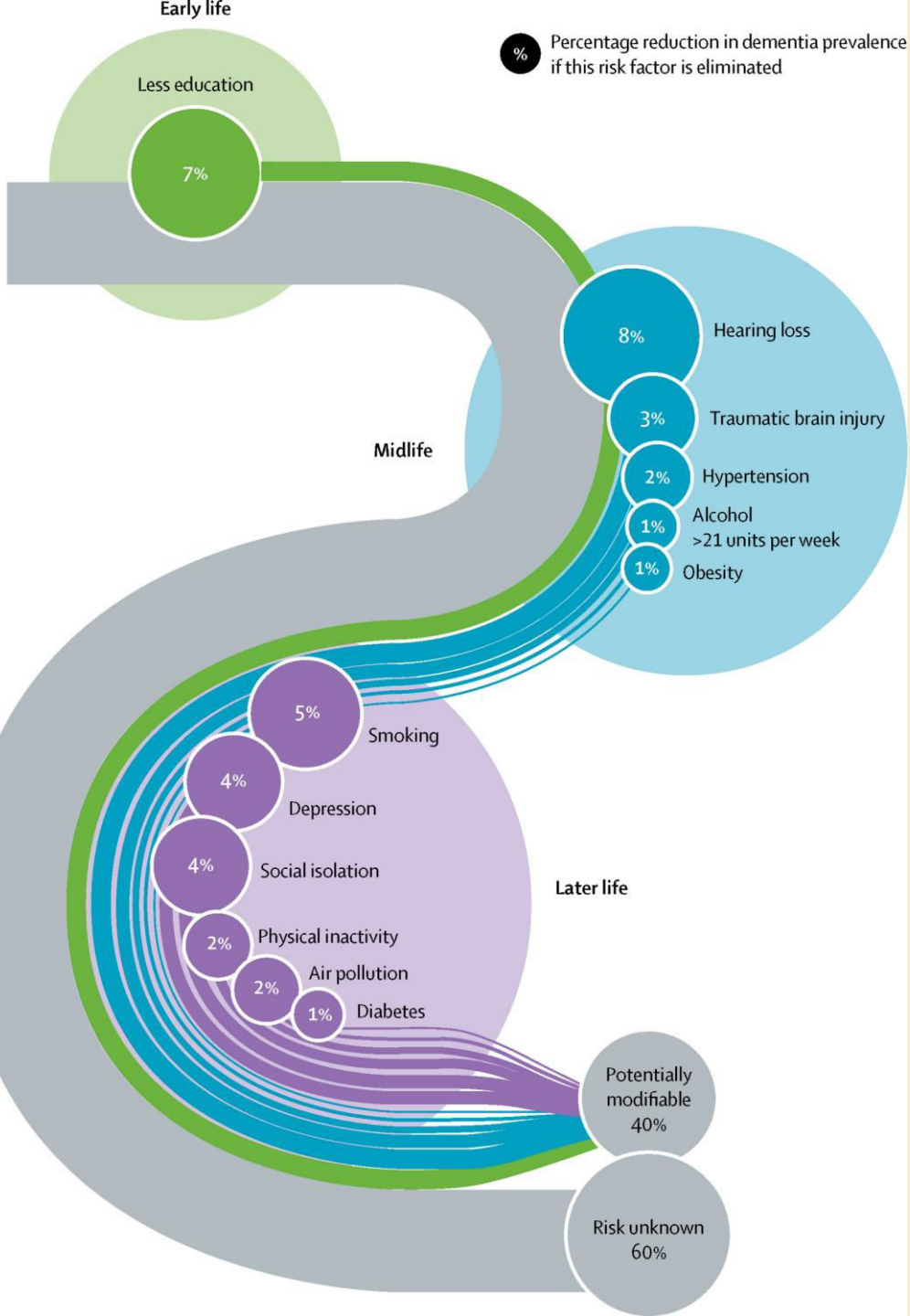
[Hartmut Meister](#),^{1,*} [Stefan Schreitmüller](#),¹ [Magdalene Ortmann](#),¹

[Sebastian Rähmann](#),¹ and [Martin Walger](#)²

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Benefits of getting treatment

1. Increased quality of life (NCOA report that individuals reported O/A QOL improvement, improved relationships at home, and higher self esteem)
2. Increased cognitive function (after only 2 weeks of Tx for hearing loss, showed improvement in selective attention, memory recall, and processing speed)
3. Reduced risk of falling
4. Provide proper stimulus to the brain to reduce tinnitus
5. Reduce the risk of dementia



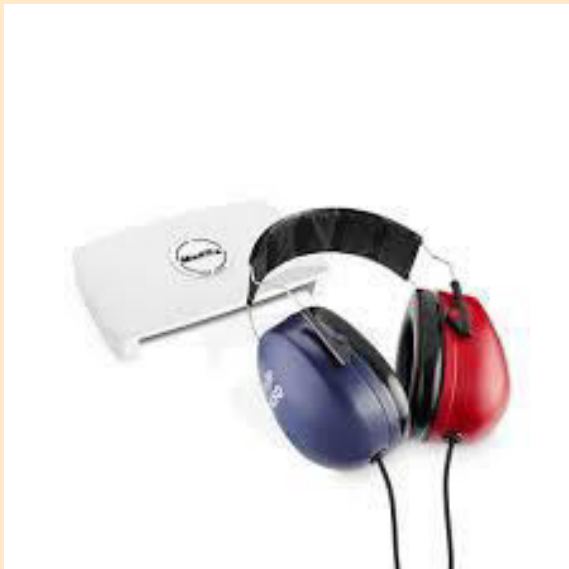
The Lancet Report

- Study of Studies relating to causes of dementia
- 40% of Dementia cases are likely preventable
- Treating hearing loss is #1 most modifiable risk factor

How Can We Help?



- Cognivue Thrive Screenings
- Speech-in Noise Testing
- Cerumen Management
- Tinnitus Management
- Hearing Healthcare



Prescott Hearing Center Staff



Doug, Paula and Max



Kim



Erin



Denice

Thank you

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