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# *”From cell to society - on usher syndrome: past, present and future”*

Claes Möller  Örebro

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# Do I have a patient with a problem ??

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# Does this child have a syndrome?

# Genetic screening for hearing loss disorders

- Assume 100,000 births
- 200 hearing impaired infants
- 70-80 congenital/prelingual profound deafness
- 120  moderate to severe hearing loss
- 30 cases will be Cx26
- 10 Usher type I
- 10 Usher II

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# Usher Syndrom

- Type I 10% of all congenital deaf children
- Typ II more common than type I
- Type III uncommon ( except Finland)

**>350.000**

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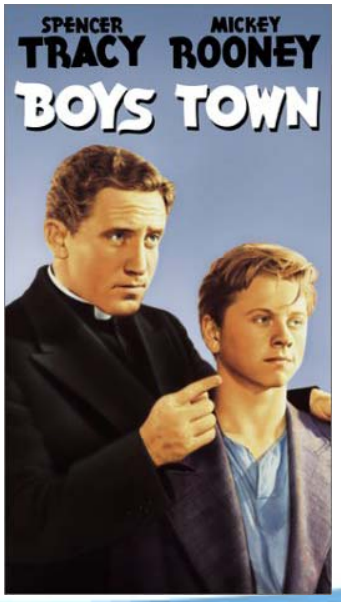
# Usher syndrome 1987

- hearing loss with RP
- no other symptoms
- autosomal recessive.
- two or more clinical types?
- hopefully only one or
- maybe two genes involved




Bill Kimberling

BOYS TOWN
Saving Children Healing Families

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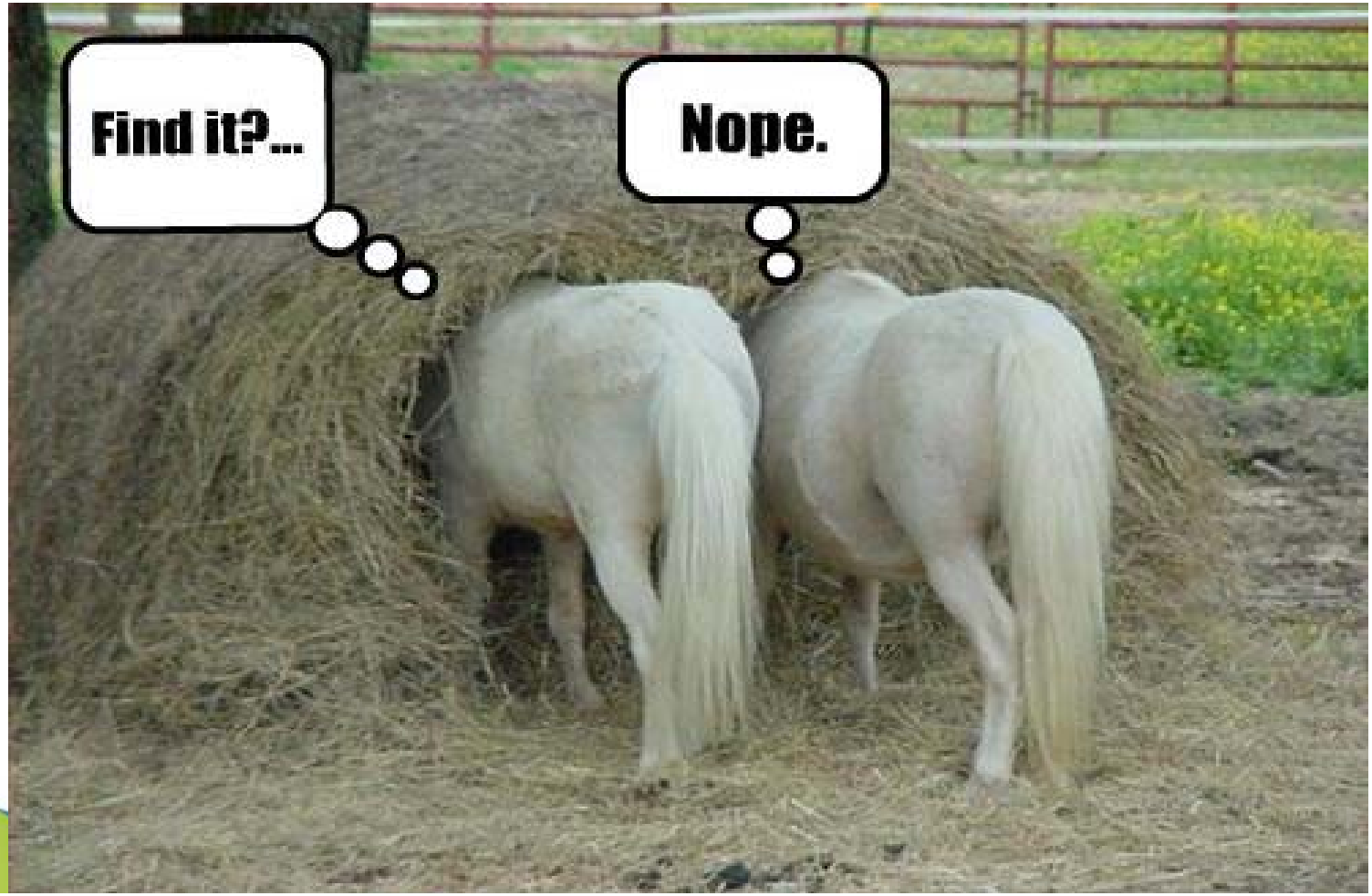
# The search for Usher genes 1987



- Type 1:
  - Profound hearing loss (deaf).
  - Early onset RP.
  - Balance problems.
- Type 2:
  - Moderate to severe hearing loss (hard of hearing)
  - RP evident in their early teens
  - No balance problems
- Type 3 ??  Finland
  - Progressive hearing loss.
  - Progressive balance problems
  - RP evident in their early teens

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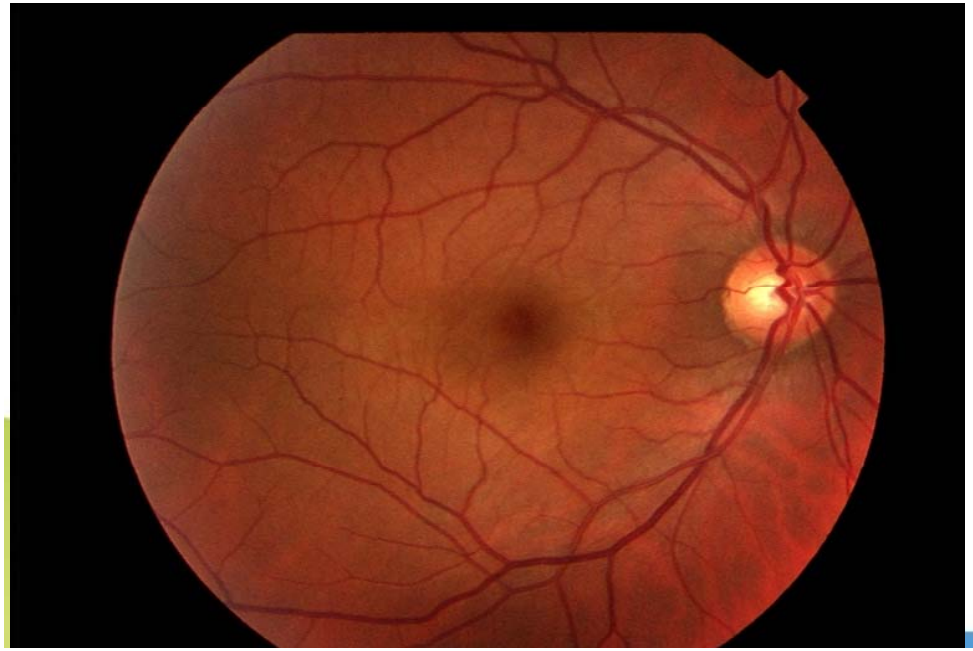
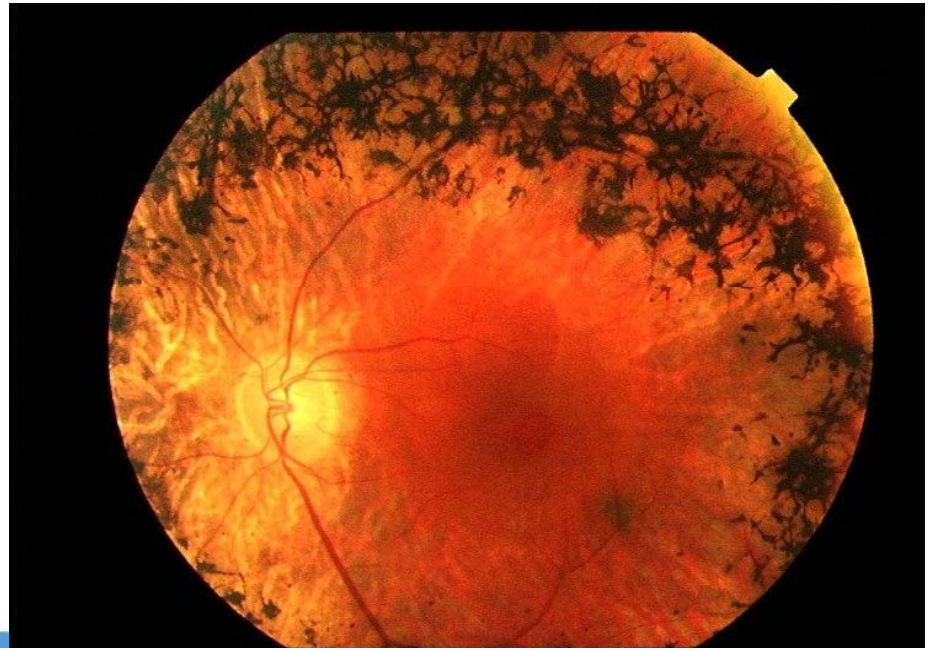
# Retinitis pigmentosa





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# Teenage

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# 20- 40 years

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# Most people will have central vision

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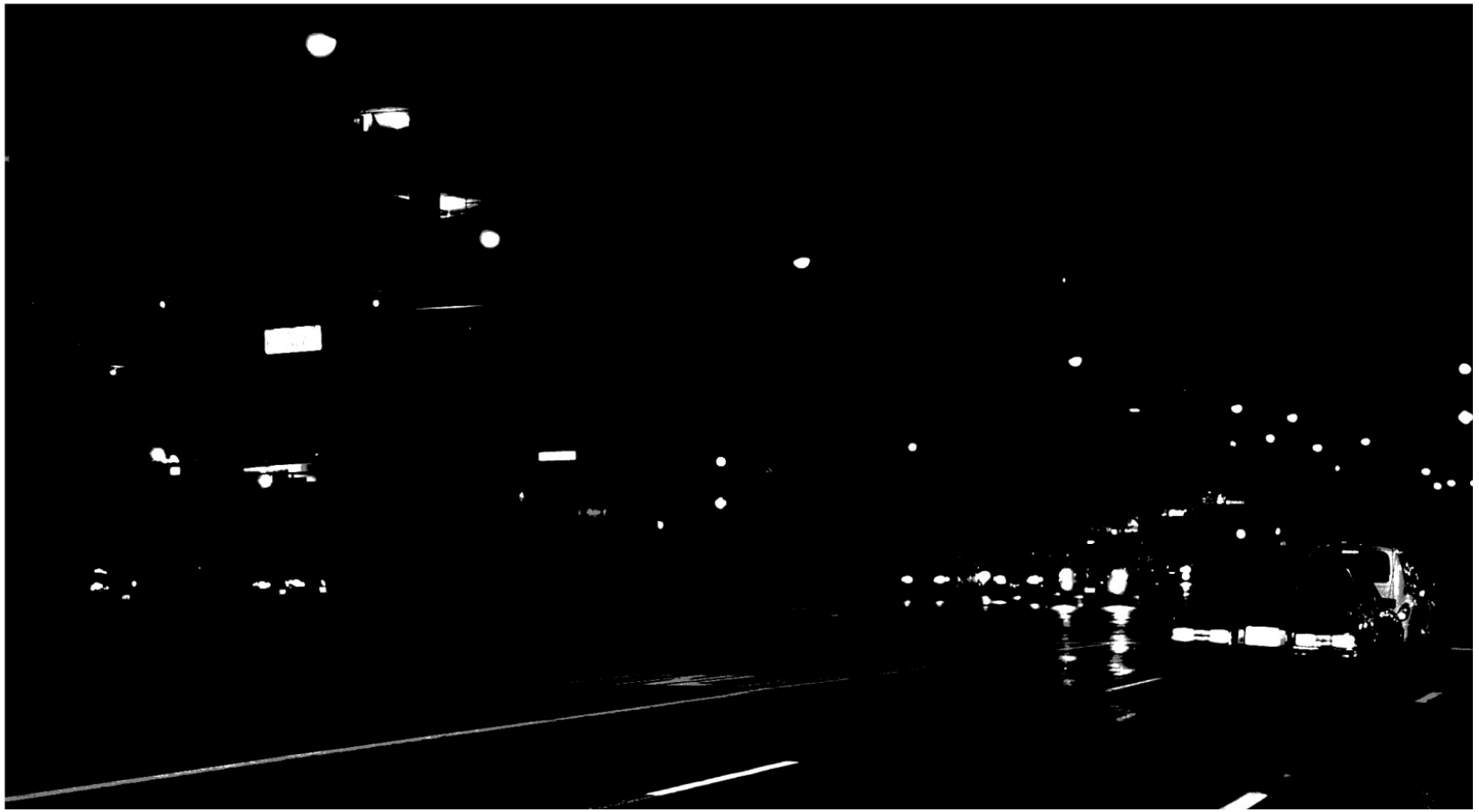
# What a person with Usher sees



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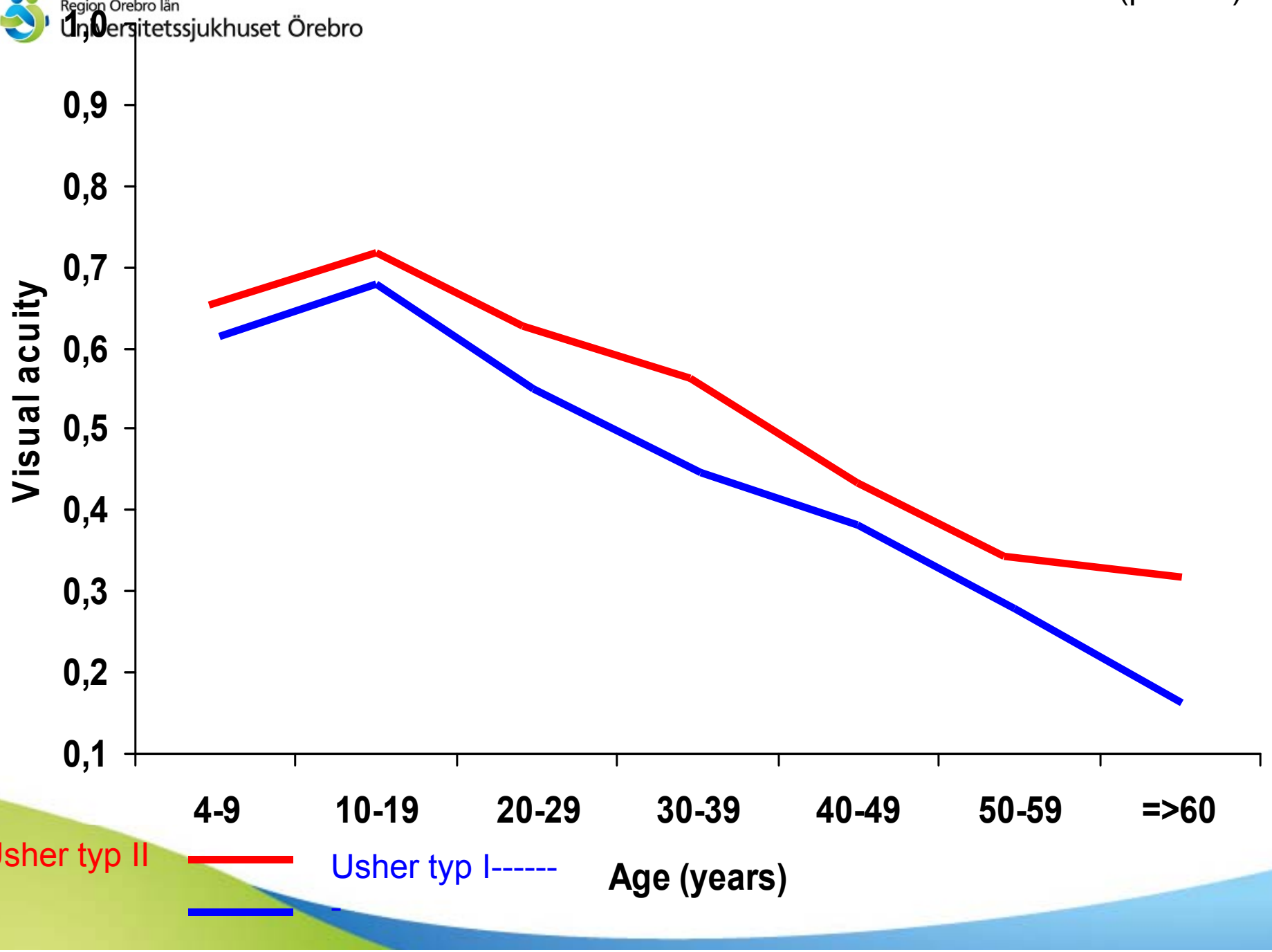
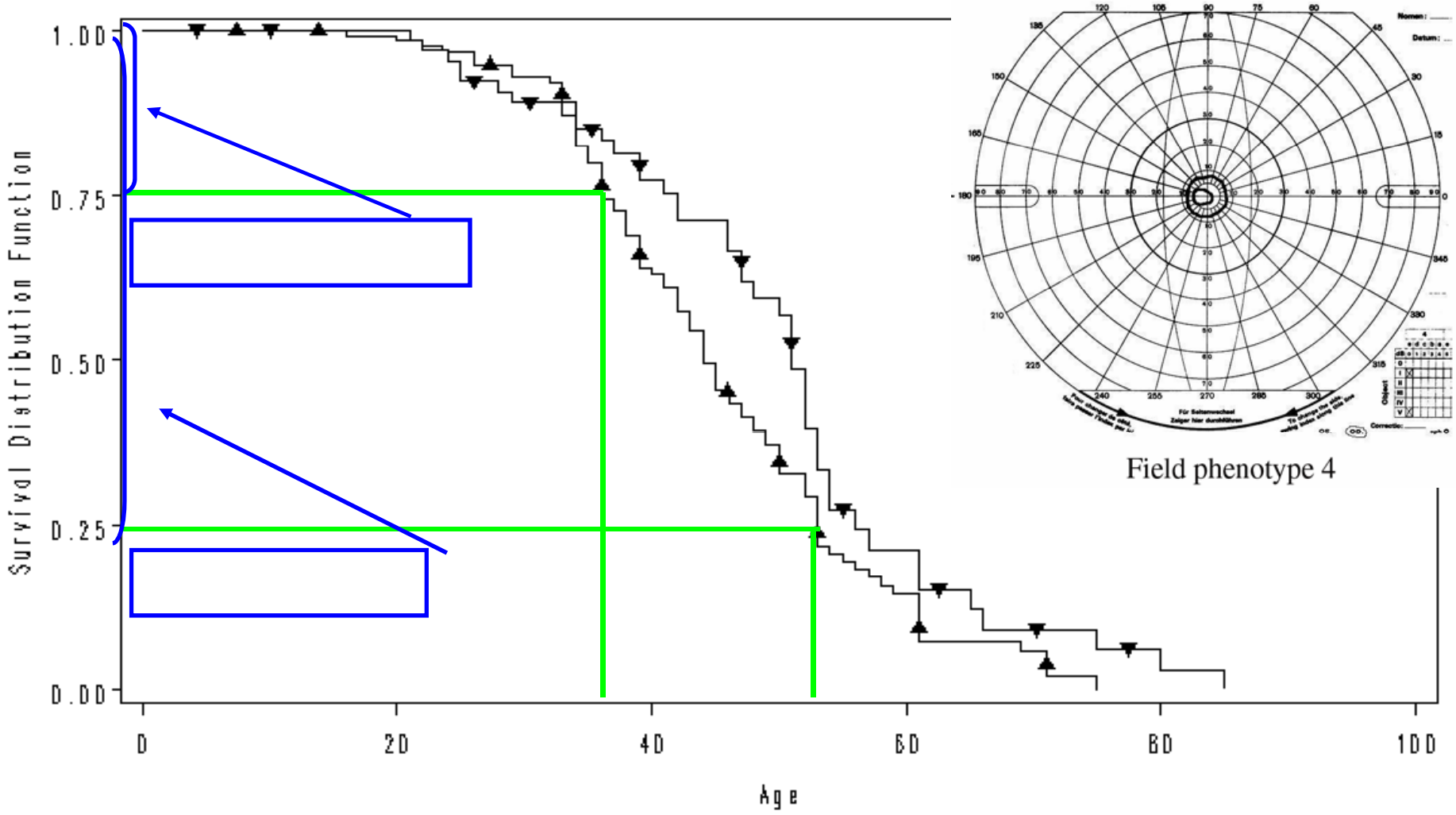
(p<0.05)



# Visual field analysis risk for <10 degress






Field phenotype 4

Usher typ I

Usher typ II

(p<0.05)

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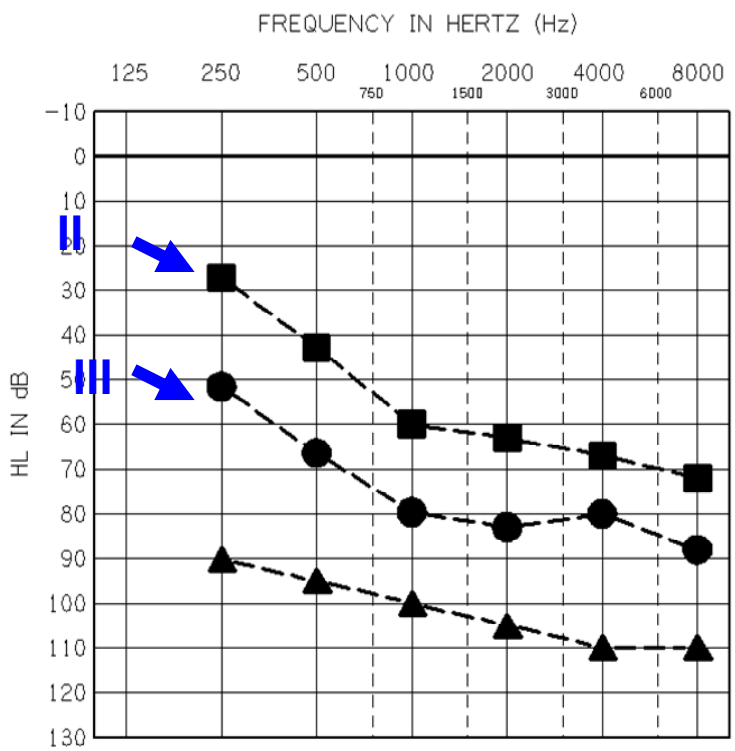
# Comparison of hearing loss between Usher type I, II and III

**4-9y**

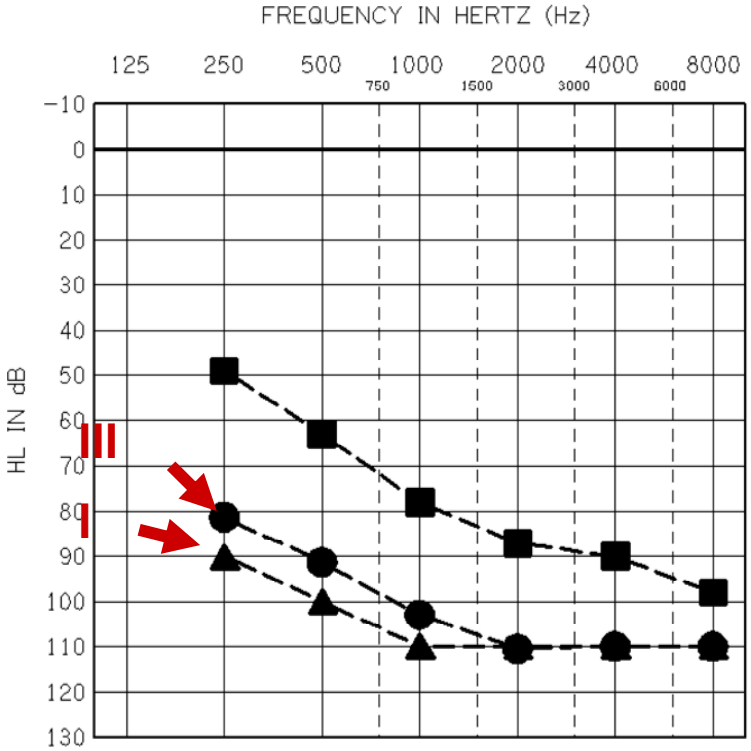



–■– Usher type II

–●– Usher type III (USH3)

–▲– Usher type I

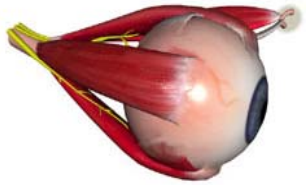
**40-49y**

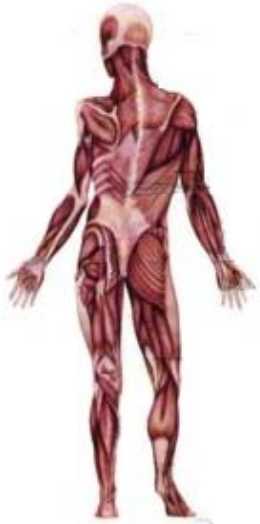



–■– Usher type II

–●– Usher type III (USH3)

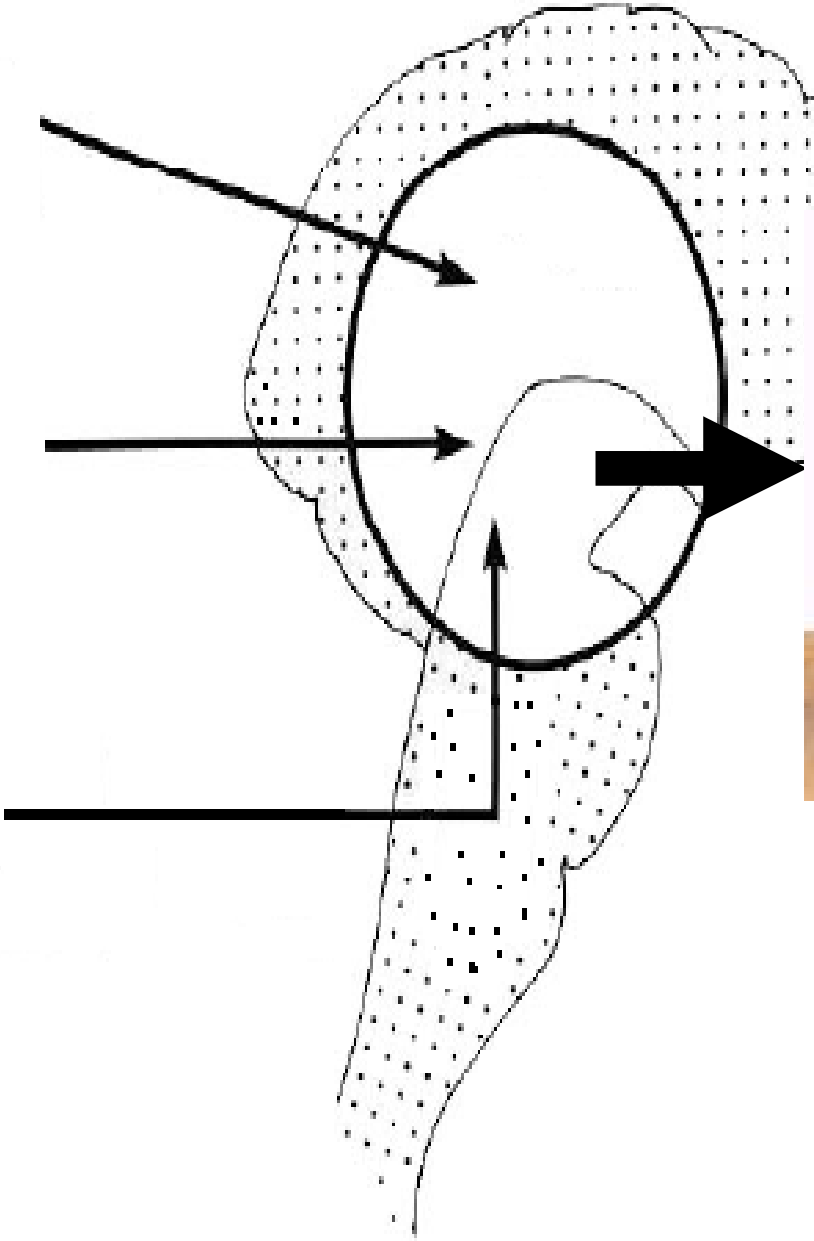
–▲– Usher type I

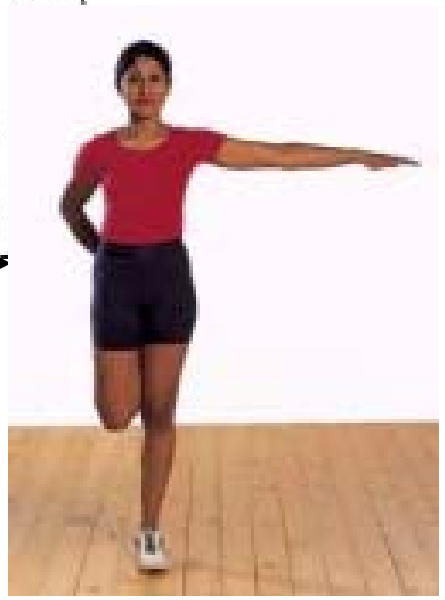




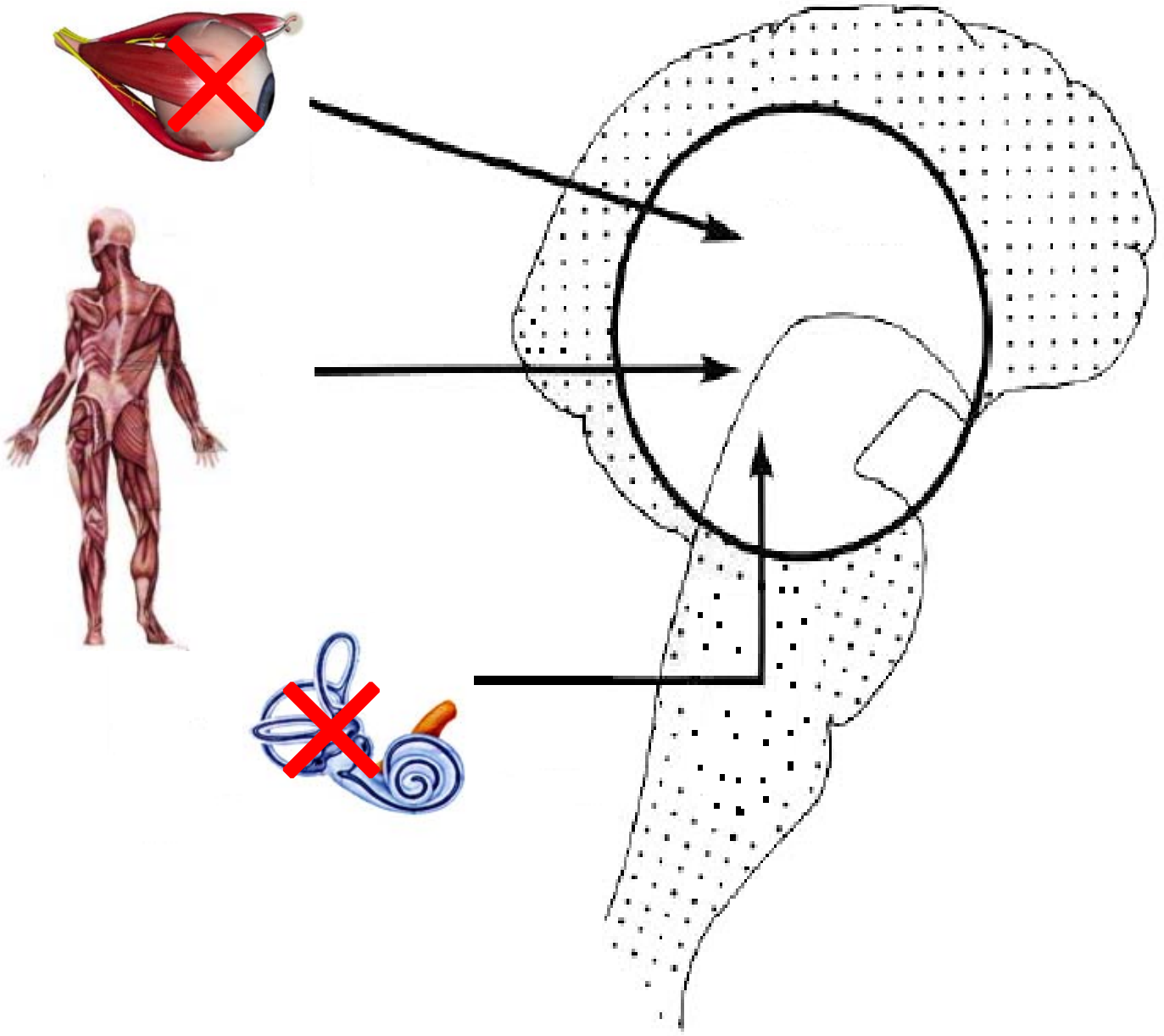
# Input

# output

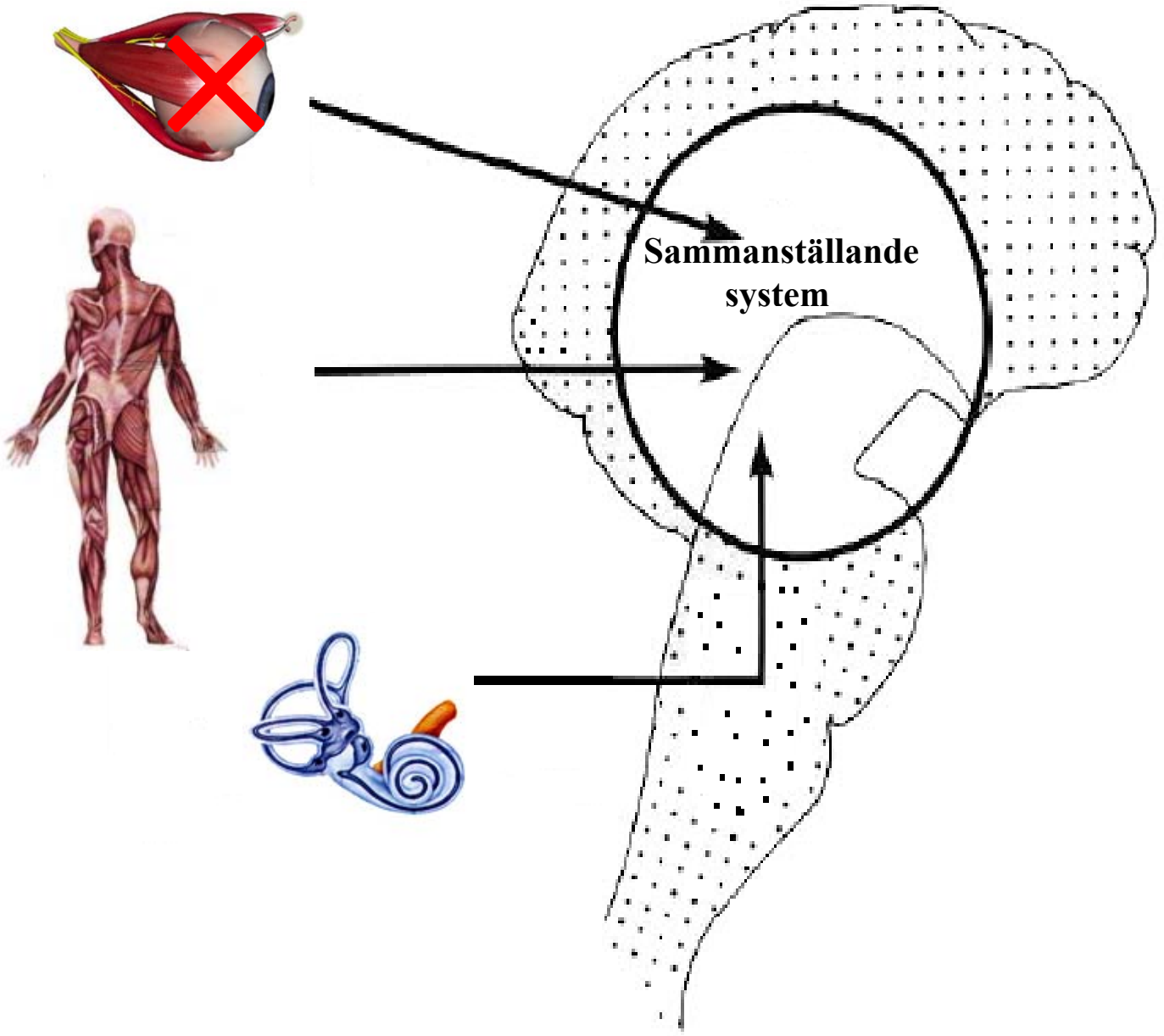




# Balance - Type I



# Balance - type II



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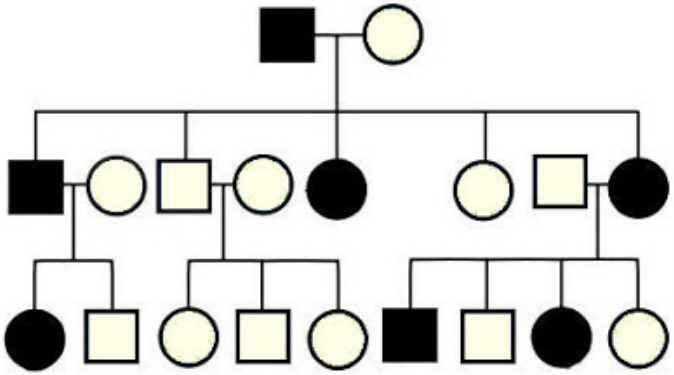
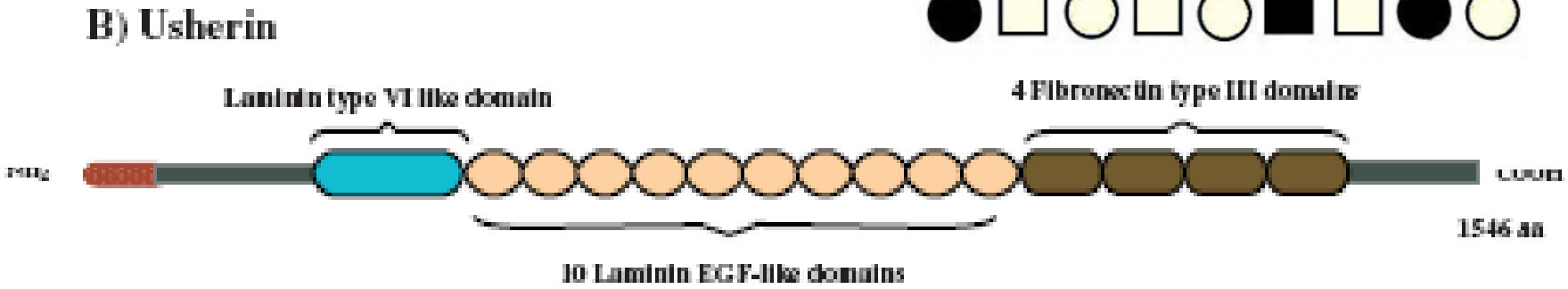
# 1990

## How we found the gene for USH 2a

Familjen Fransson i Småland





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# Swedish Usher data base

| Usher type | Number | Genetic diagnos | DNA available |
|---|---|---|---|
| Type 1 | 180 | 80 | 110 |
| Type 2 | 178 | 101 | 140 |
| Type 3 | 27 | 20 | 26 |
| | | | |

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# Mean diagnosis age depending on when you were born

| | Usher type I | Usher type II |
|---|---|---|
| 1910´s | | 42 y |
| 1920´s | 27y | |
| 1930´s | 28y | 35y |
| 1940´s | 24y | 29y |
| 1950´s | 18y | 23y |
| 1960´s | 12y | 23y |
| 1970´s | 9y | 19y |
| 1980´s | 9y | 14y |
| 1990´s | 4y | 14y |
| 2000´s | 2y | 12y |
| 2010`s | 1y | 10y |

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# To make a very long story short

| Genetic subtype | Locus | Gene | Protein |
|---|---|---|---|
| USH 1B | 11q13.5 | MYO7A | myosin VIIA |
| USH 1C | 11p15 | USH 1C | harmonin |
| USH 1D | 10q21-22 | CDH23 | cadherin |
| USH 1E | 21q21 | | |
| USH 1F | 10q21-22 | PCDH15 | protocadherin 15 |
| USH 1G | 17q24-25 | SANS | |
| USH1H | 15q22-23 | | |
| USH1J | 15q23-25 | CIB2 | |
| USH1K | 10p11-q21 | | |
| USH 2A | 1q32-42 | USH 2A | usherin |
| USH 2B | 3p23-24 | | |
| USH 2C | 5q14.3-q21 | VLGR1 | g-protein |
| USH 3 | 3q21-q25 | Clarin | |

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http://www.diva-portal.org/smash/record.jsf?pid=diva2:860267

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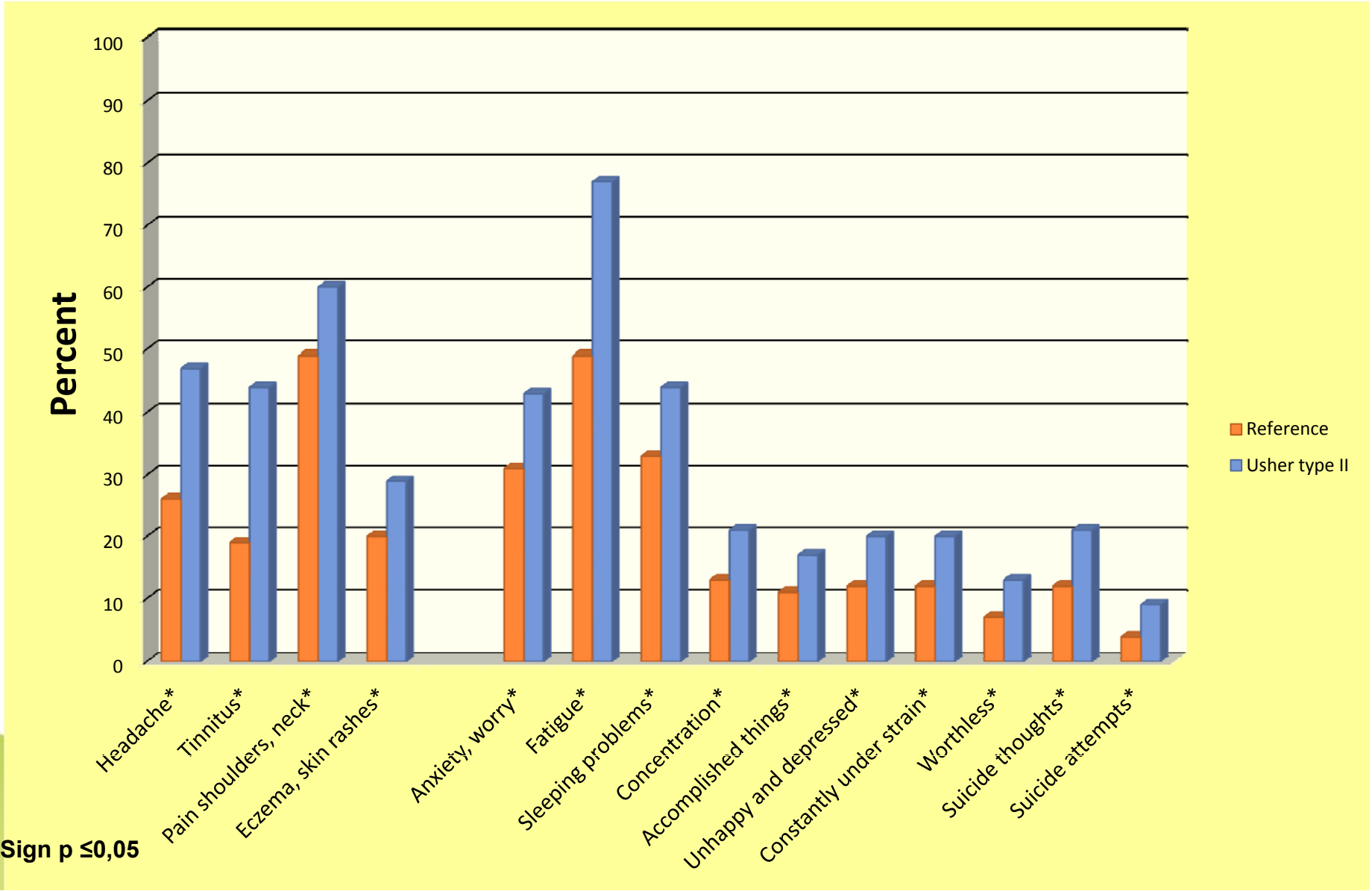


*Sign p ≤0,05

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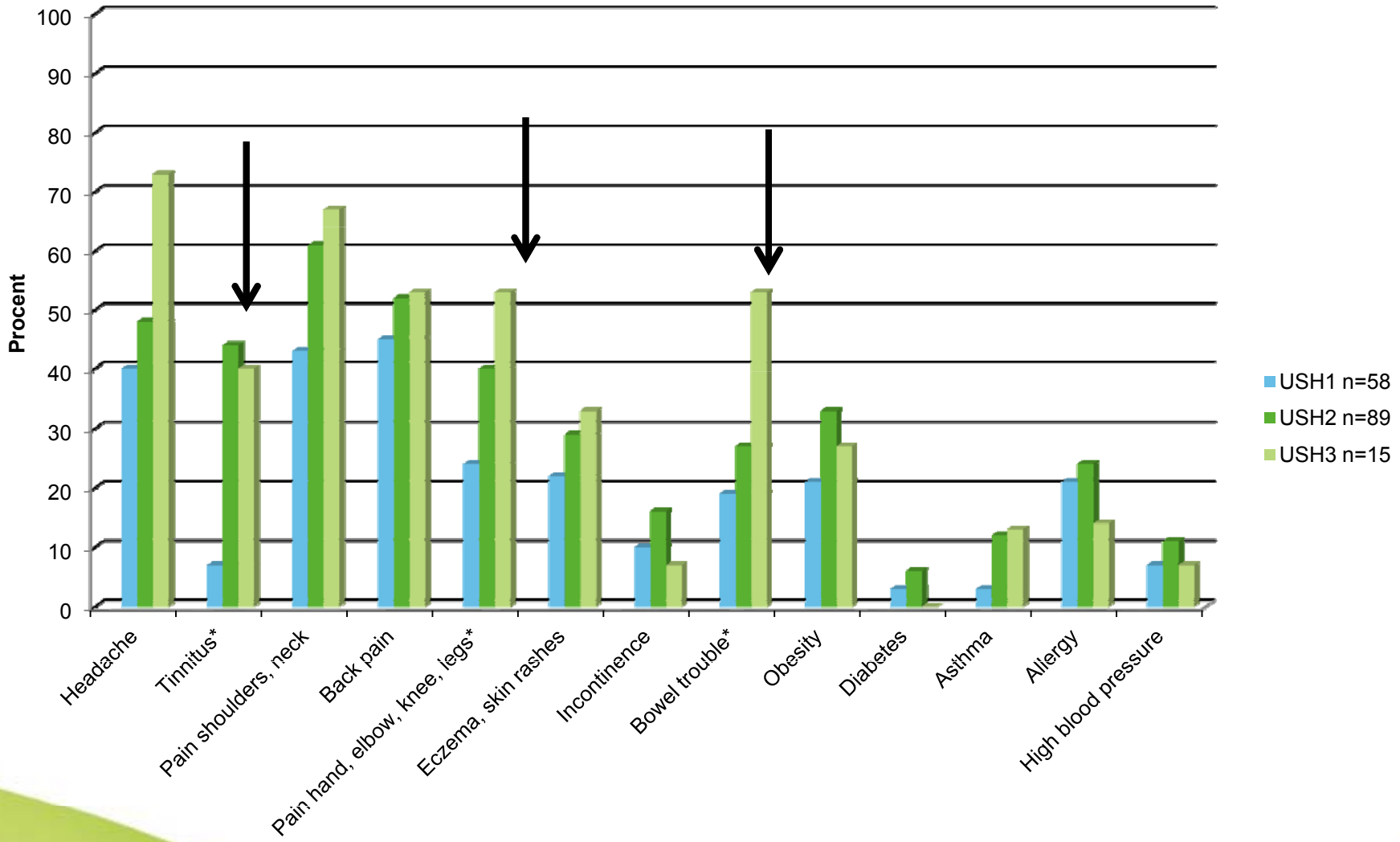
# Physical health

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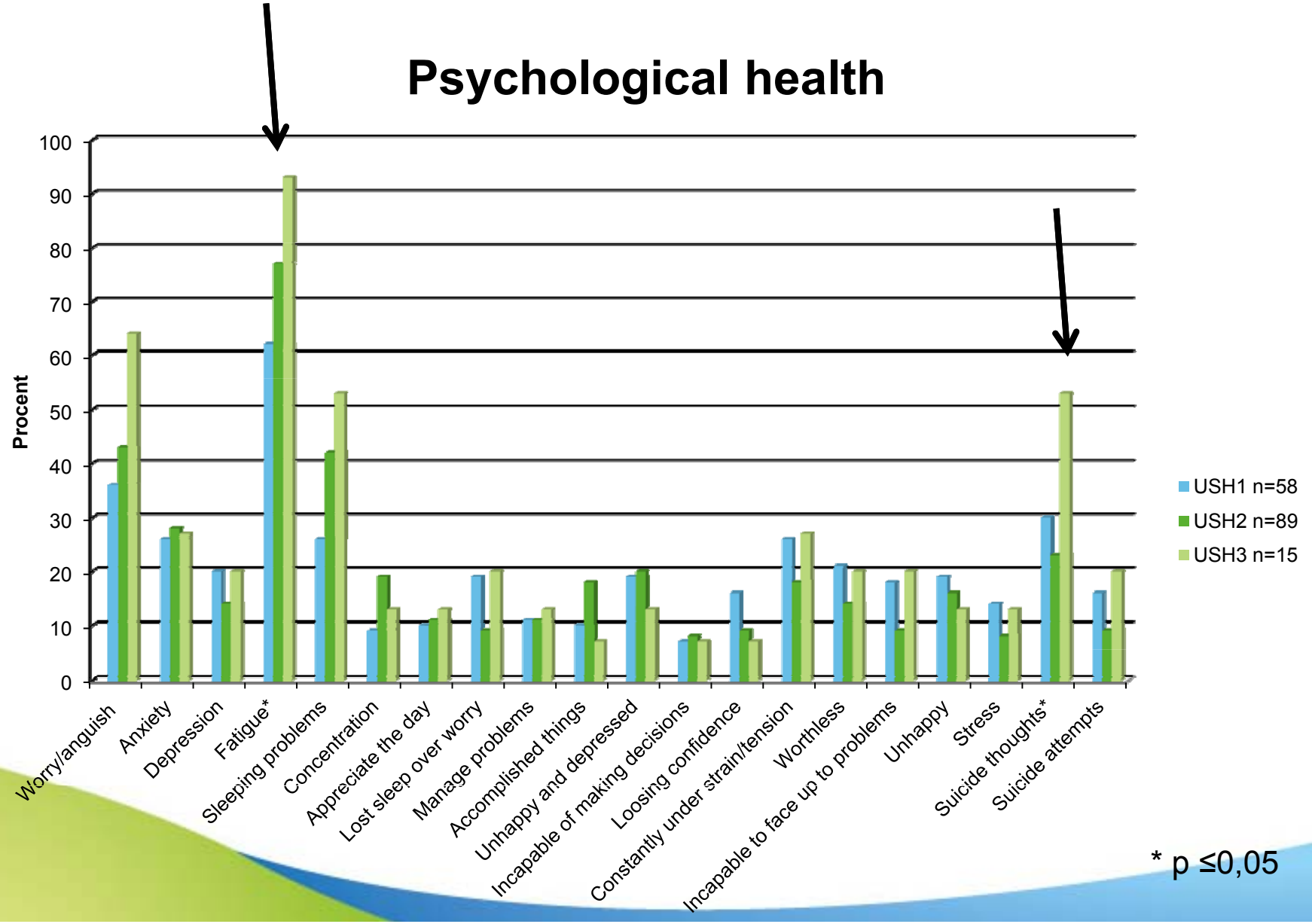
# Psychological health




* p ≤0,05

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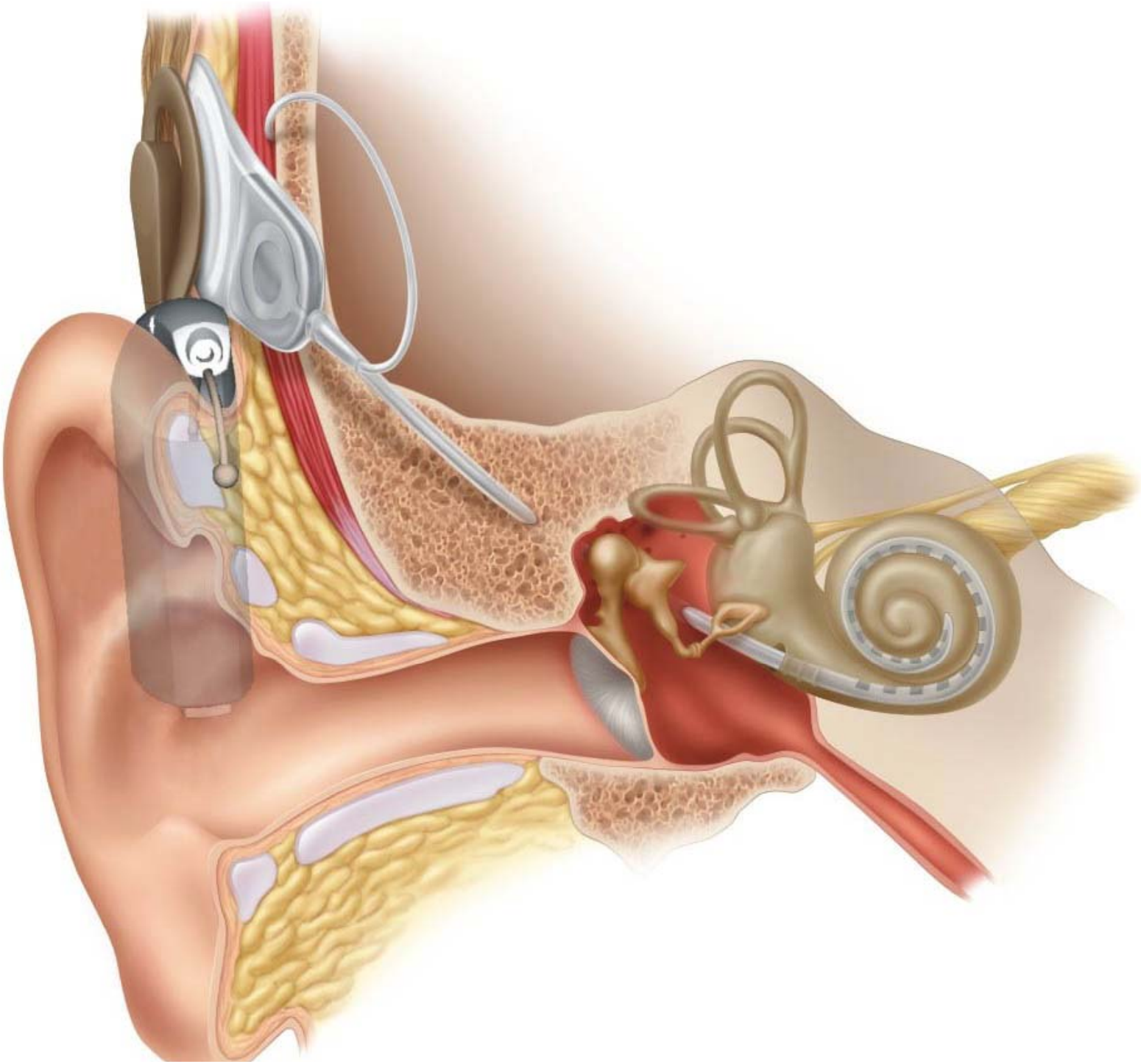
# Usher New possibilities

- Information technology
- Inner ear metabolism
- Treatment
- Genetics
- CI
- Cooperation
- Communication
- Knowledge !!!



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# CI and Usher type 1

- 95% of all deaf children ( Sweden) gets bilateral CI
- 10% of all deaf children USH 1( Iowa, Sweden)
- Early diagnose because of medical examinations
- Important if blindness occurs later
- Visual sign language- later tactile
- Some persons USH 1 implanted later
- sound awareness

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# CI and Usher type 3

- In childhood moderate -HL
- Oral communication
- Rapid progression- aquired deafness
- Visual progression variable
- Many have not learned sign language
- Finland-Sweden- USA
- Excellent results

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Thank you!!!!