LE DIS-FUNZIONI NEUROSENSORIALI DELL'ANZIANO IN AMBITO ORL

CRONICITÀ E FRAGILITÀ IN AMBITO NEUROSENSORIALE NEL PAZIENTE ANZIANO

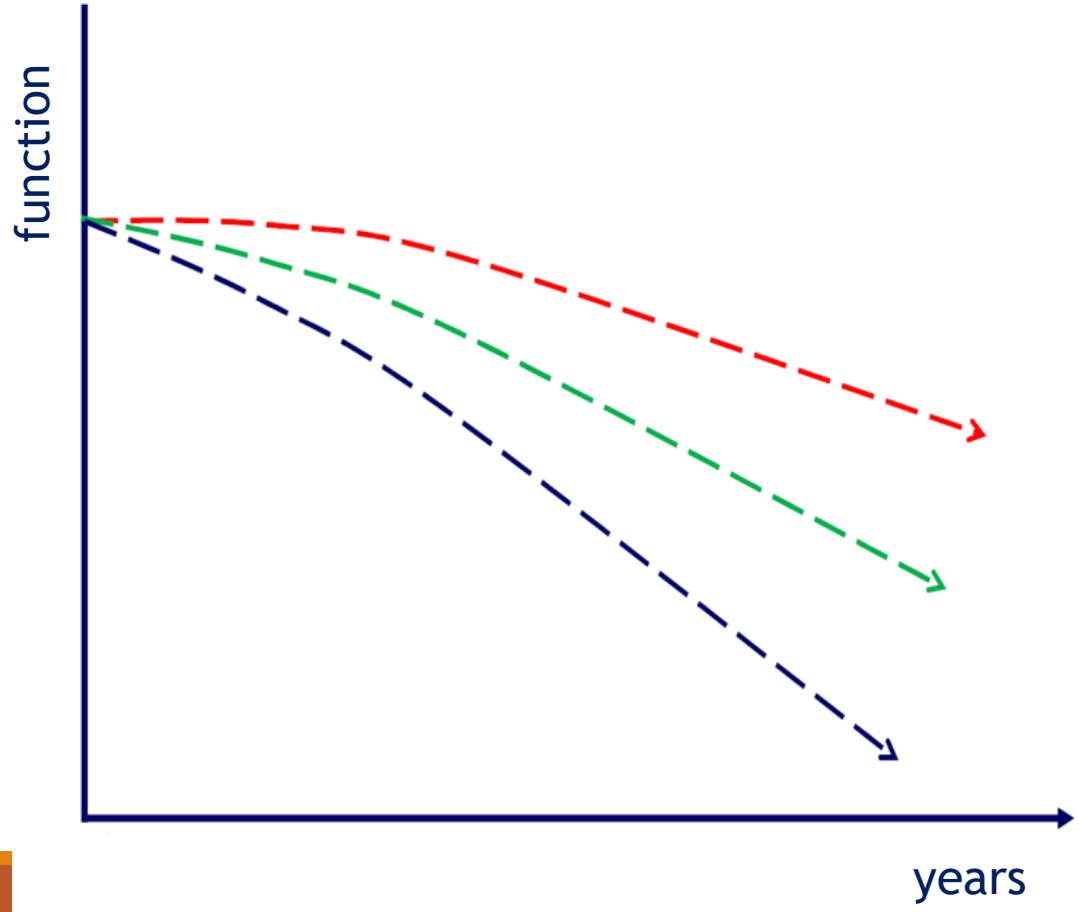
DOTT. MATTIA BRUNORI

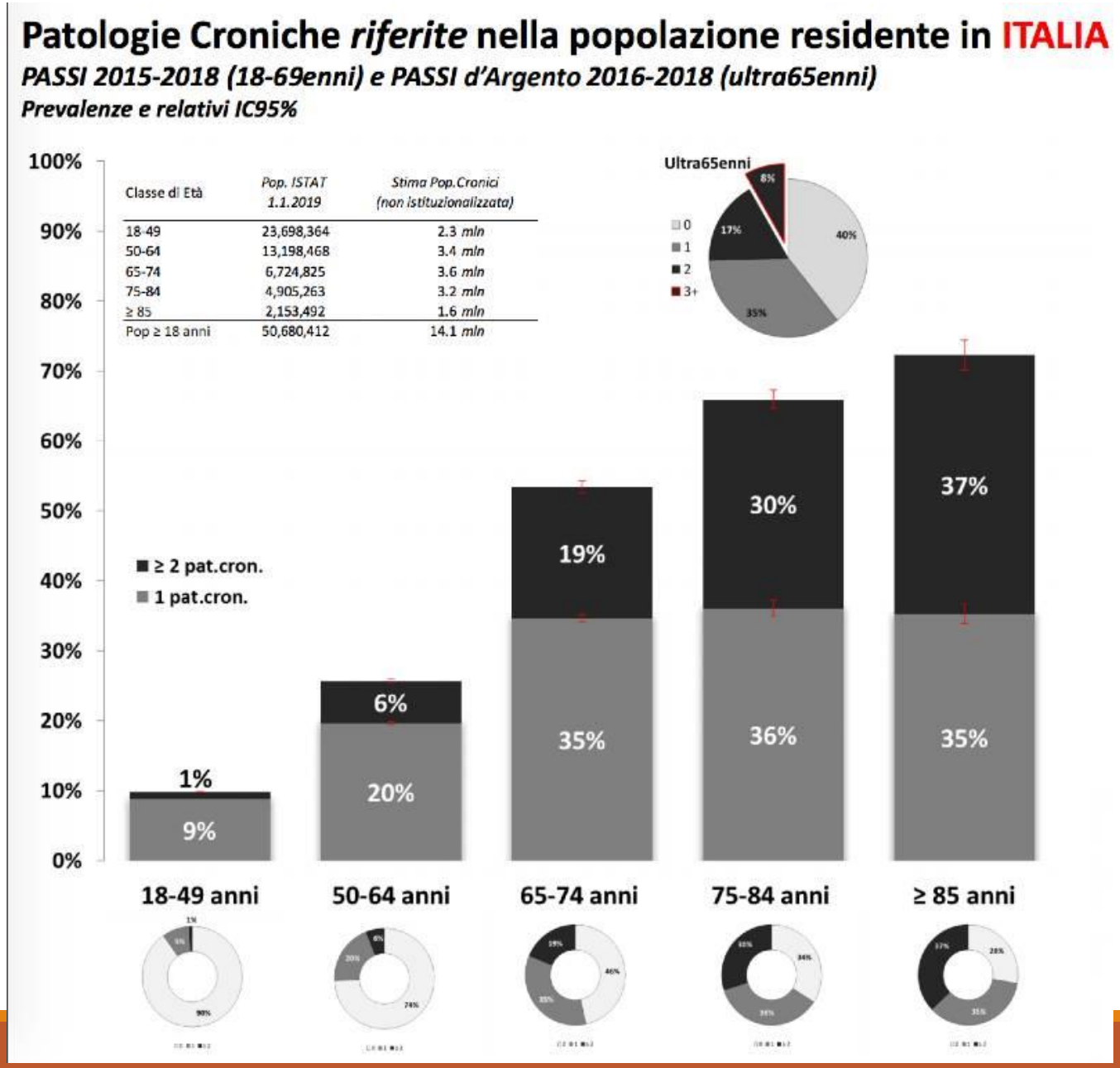
U.O.GERIATRIA E ORTOGERIATRIA


Populations are getting older
Percentage aged 60 years or older:
30% or more
10 to <30%
<10%
2025
World Health Organization

Ageing

- ✓ Molecular, cellular and tissue age-related changes
- ✓ Accumulation of chronic diseases





Hearing loss

Epidemiology

- ✓**more than 5%** of the world's population have a reduction in hearing that affects the **quality of life** and it is estimated that by 2050 1 in 10 people will have a disabling hearing loss [OMS]

- ✓In Italy there are **7 million people** with hearing problems (12% of the population)

- ✓In over65 1/3 person affected; **50% over 80 y**

Age-related hearing Impairment

- ✓ARHI (Age-related hearing Impairment) is **one of the predominant degenerative** condition in aging

- ✓Presbyacusis has been defined as hearing impairment associated with various types of auditory dysfunction, **peripheral or central**, that begins at **the high frequencies**

- ✓Bilateral, symmetrical, and slowly progressive.

- ✓Earlier in **males**

Age-related hearing Impairment

Modulating factors

- ✓**Genetics**: about 55% of ARHI in older adults can be ascribed to heritability

- ✓**Gender and Hormonal Factors**: earlier in males than in females (receptors for steroid hormones in the cochlea).
  - ✓ fluctuations in hearing thresholds observed during the menstrual cycle
  - ✓ estrogen therapy slowed the development of ARHI in postmenopausal women.

- ✓**Environmental Factors**: exercise, smoking, and diet, **excessive noise, ototoxic medications** (primarily aminoglycoside antibiotics and anticancer agents of the cisplatin class), and industrial solvents

- ✓**Diseases**: diabetes, cardiovascular disease, viral or bacterial infections

Hearing loss

Other causes

✓ **Conductive**

- Obstruction EAC: cerumen, foreign body, OE, osteomas
- Impairment of tympanic membrane function: tympanosclerosis
- Middle ear conditions: OM, otosclerosi, cholesteatoma

✓ **Sensorineural**

- Autoimmune disease
- Trauma
- Infections (meningitis, labyrinthitis)
- Neuroma
- Meniere disease

Vestibular disfunction

Epidemiology & Etiology

- ✓The overall prevalence in adults aged **over 40** in the USA is **35.4%** [Allen et al]
- ✓Peripheral vestibular dysfunction was the principal cause of **dizziness** in 56% of patients older than 50 years [Iwasaki et al]

- ✓Age-Related Vestibular Loss:
  - ✓ Neuronal and hair cell loss
  - ✓ Degeneration of the vestibular ganglion (Scarpa's ganglion) and nerve
  - ✓ Reduction in otoconia mass and changes in fragment formation

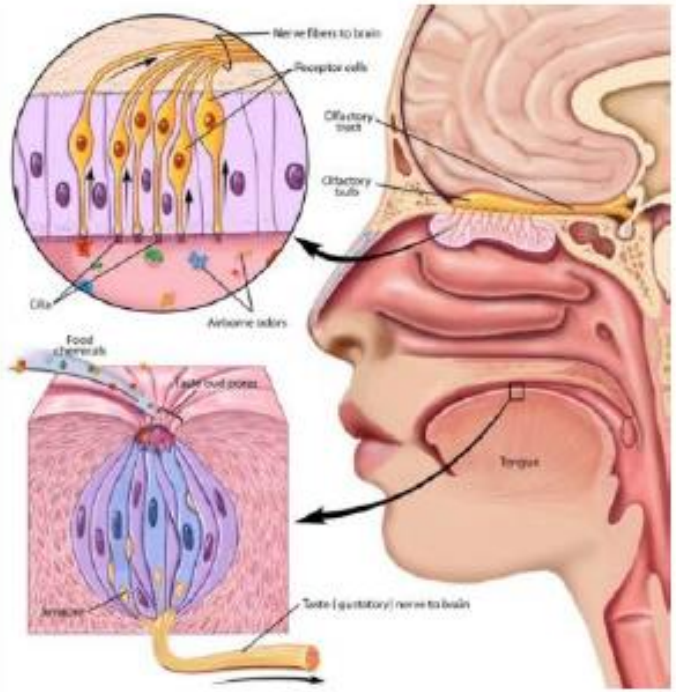
  Modulating factors: smoking, hypertension, and diabetes

- ➢Vestibular disorders:
  - **Positional vertigo**
  - **Meniere's disease**
  - **Vestibular schwannoma**
  - Head injuries
  - Infections
  - Drugs

Smell and Taste

Epidemiology & Etiology

- ✓Olfactory dysfunction is clinically relevant in about **3%-8% of the general population** [Smoliner, 2013]
- ✓**62.5% of 80 to 97 years** old had an olfactory impairment [Postgrad Med J 2006].
- ✓Survey NHANES 2013–2014: taste impairment in **17.3%** of population **> 40 y** [Liu et al]

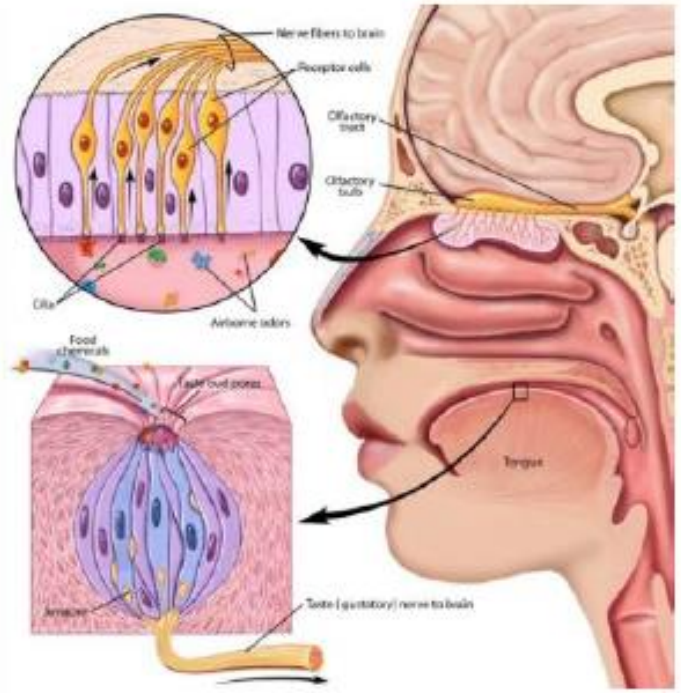


Smell and Taste

Epidemiology & Etiology

Multifactorial etiology:

- **Age-related qualitative and quantitative changes**
- **Covid-19**
- Upper respiratory infection
- Head injury
- **Polypharmacotherapy**
- Tooth loss
- Reduction in saliva production
- CKD
- Cancer
- Oral mycosis
- Hypothyroidism
- **Neurodegenerative disorders**



Visual Impairment

Epidemiology

- ✓**3.22 million** people in the United States suffer from visual impairment
- ✓The Centers for Disease Control and Prevention (CDC) and the National Centers for Health Statistics (NCHS) estimate the prevalence of **significant visual impairment** among Americans age 18 to 44 with vision loss is 5.5%; the prevalence in those age 45 to 74 is approximately 12% and is rising to **more than 15% for those 75 and over**.
- ✓After age 85, **one in four older** people are vision-impaired
- ✓2004: the total financial cost to the United States of visual impairment and blindness in US residents aged 40 and older was estimated at $35.4 billion.

Visual Impairment

Etiology

"Normal" Age-Related Changes in Vision

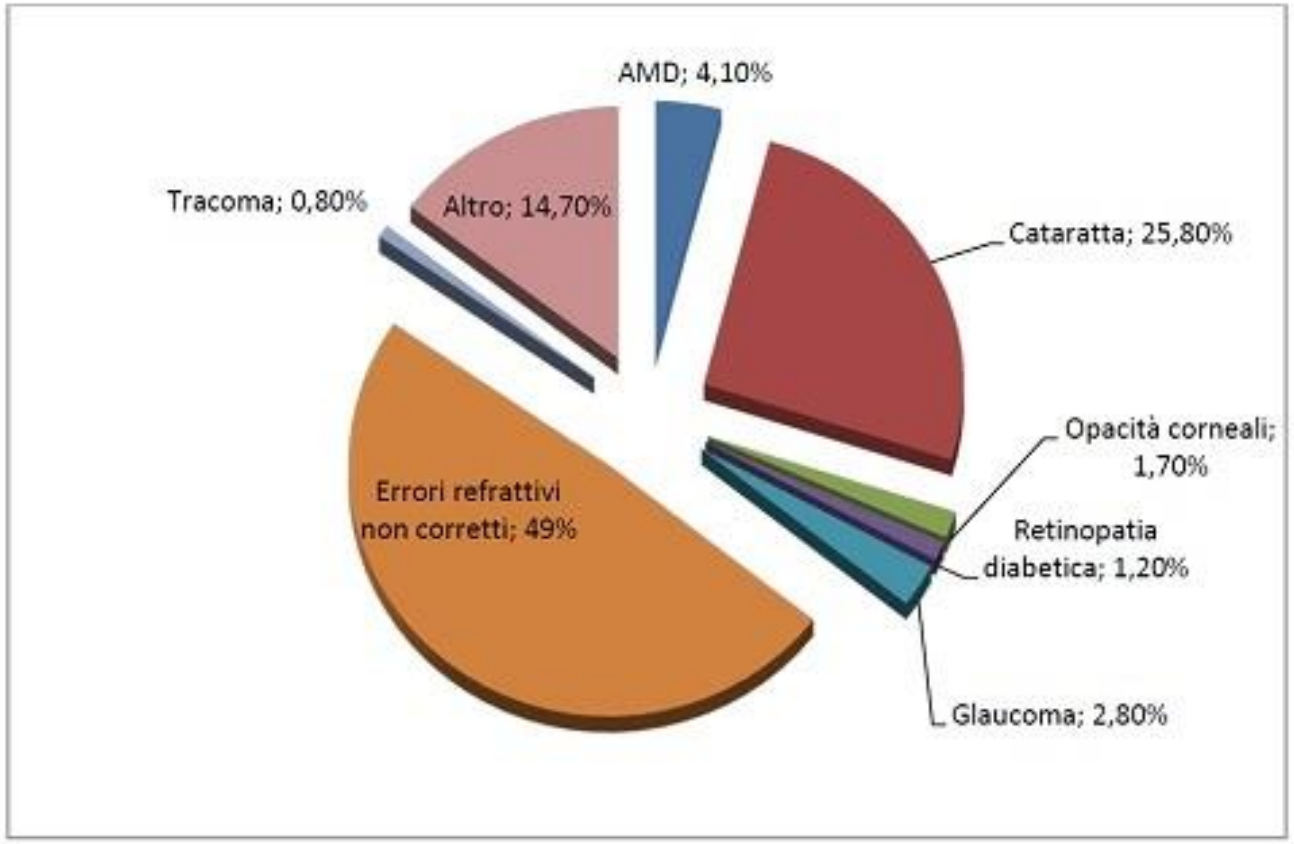
- ✓**Loss of accommodation** – crystalline lenses lose flexibility; ciliary muscles lose tone
- ✓**Loss of low-contrast acuity** – decreased transmission of ocular media; decreased pupil size
- ✓Increased sensitivity of glare – increased light scatter in cornea, lenses, retina, vitreous body
- ✓**Increased difficulty with dark adaptation** – losses in ocular transmittance and pupillary miosis
- ✓**Loss of color discrimination** – smaller pupil diameter, reduced light transmission though the lens
- ✓Loss of attentional visual field – decline of higher-order visual processes
- ✓Increased **difficulty with visual reading ability** – related to attentional visual field, low-contrast acuity and slower saccadic performance in eye movements

Visual Impairment

Etiology

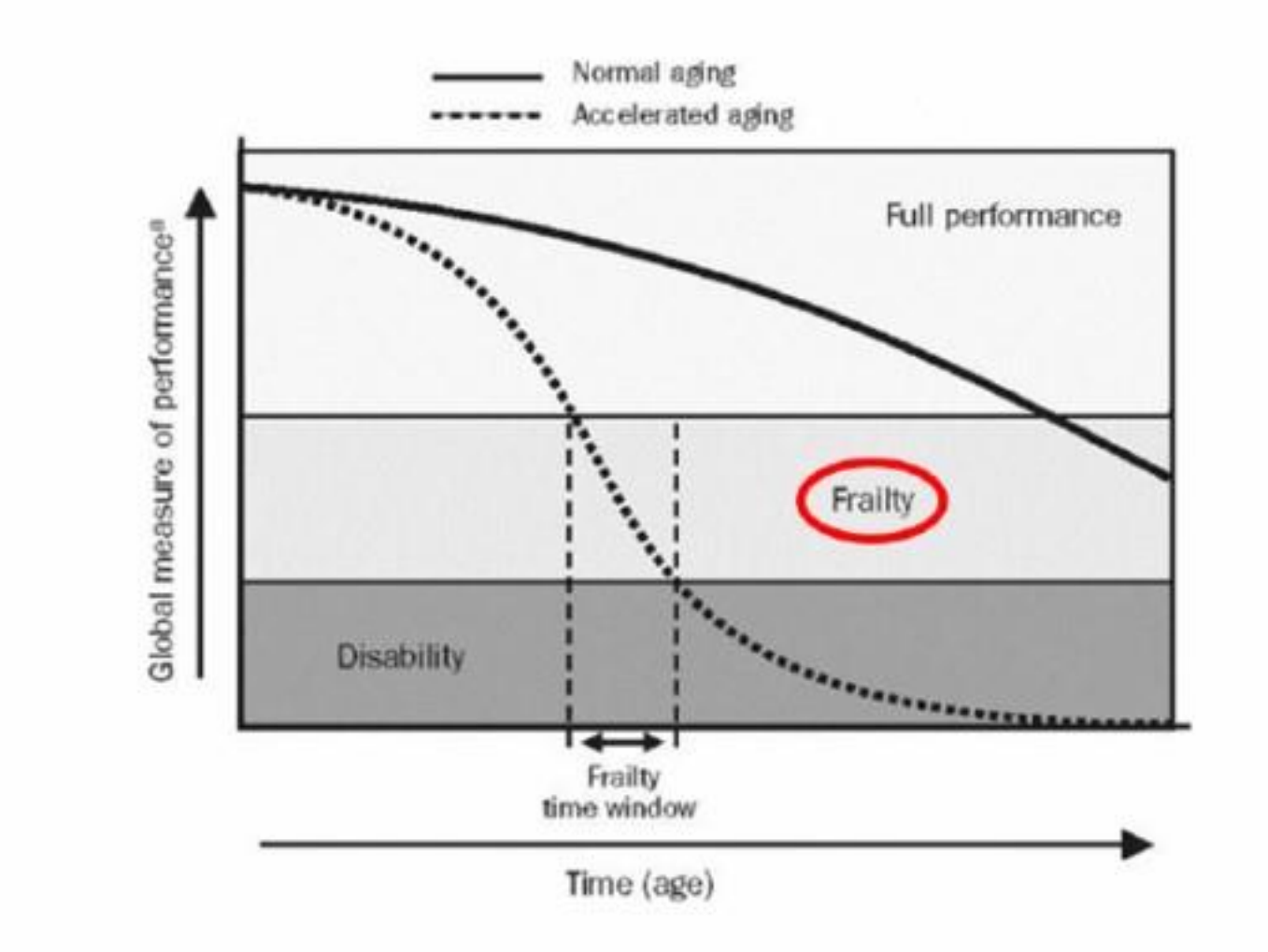
Age-Related Causes of Visual Impairment

- ✓**Macular degeneration** > reduced visual acuity, Loss of central visual field and contrast sensitivity
- ✓**Diabetic retinopathy** > Reduced visual acuity; Scattered central scotomas
- ✓**Cataract** > Reduced visual acuity; Sensitivity to glare; Altered color perception; Image distortion
- ✓**Glaucoma** > Loss of peripheral visual fields



Cause di cecità e ipovisione nel mondo su 253 milioni di disabili visivi (Fonte: *Vision Loss Expert Group*, the Lancet, 2017,elab. IAPB)

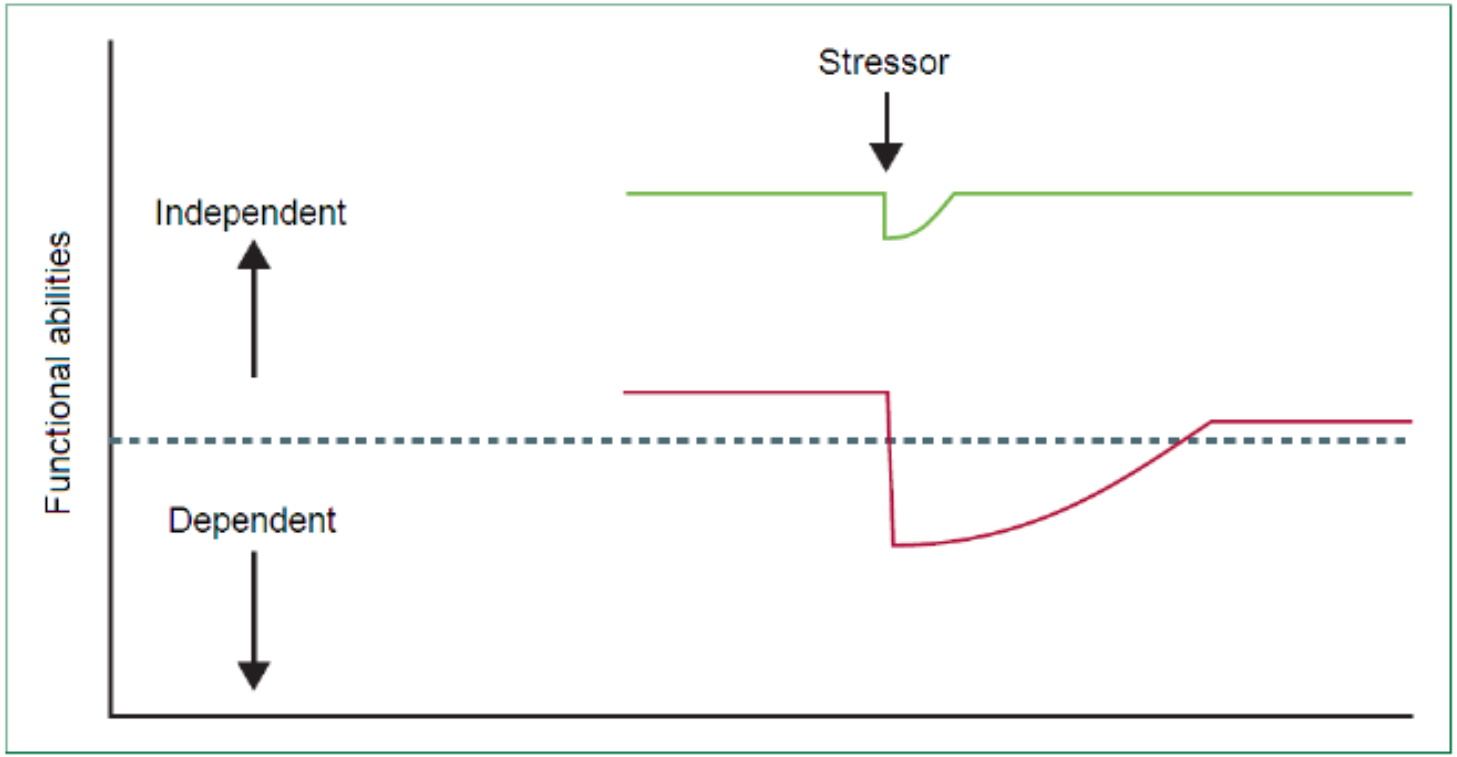
Trajectories of ageing



Ferrucci L. et al. J Endocrinol Invest 2002

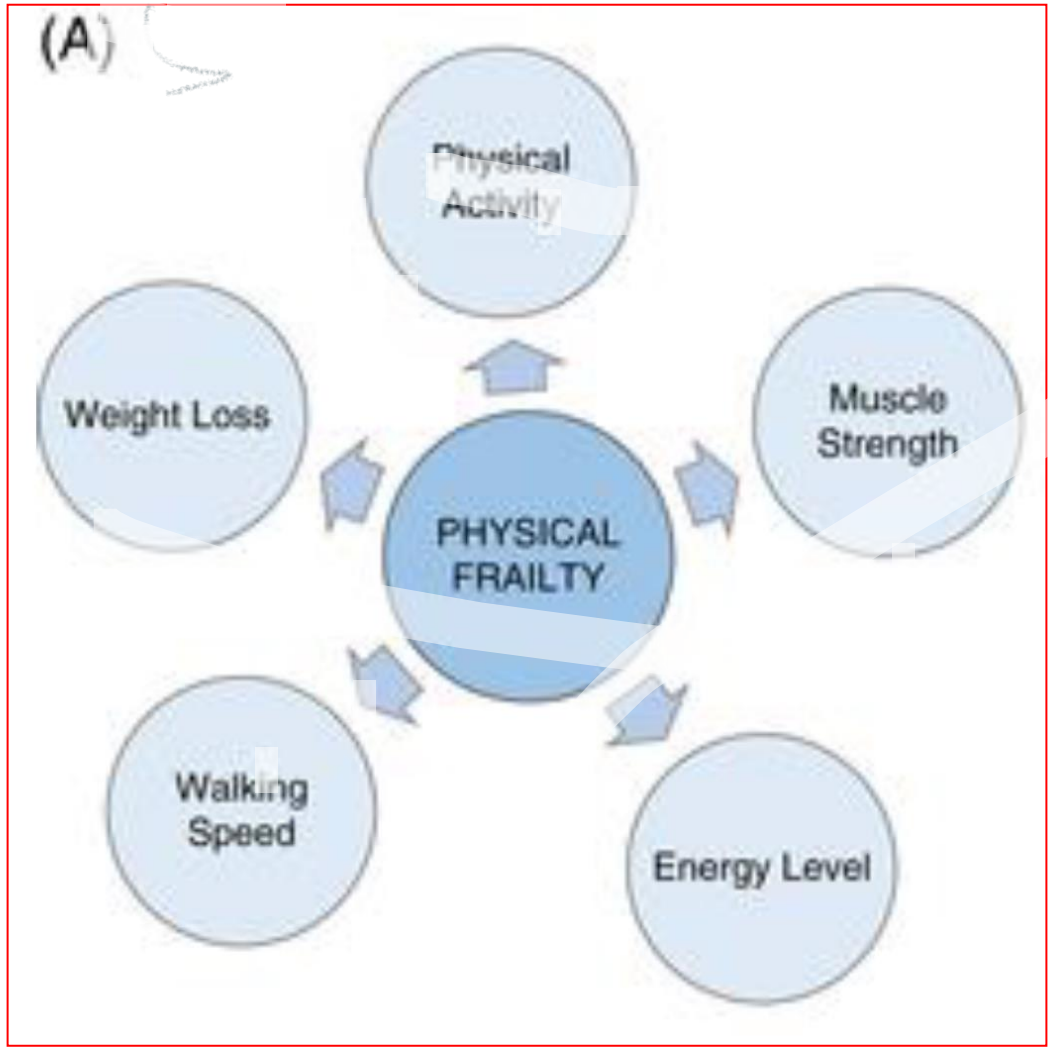
Frailty

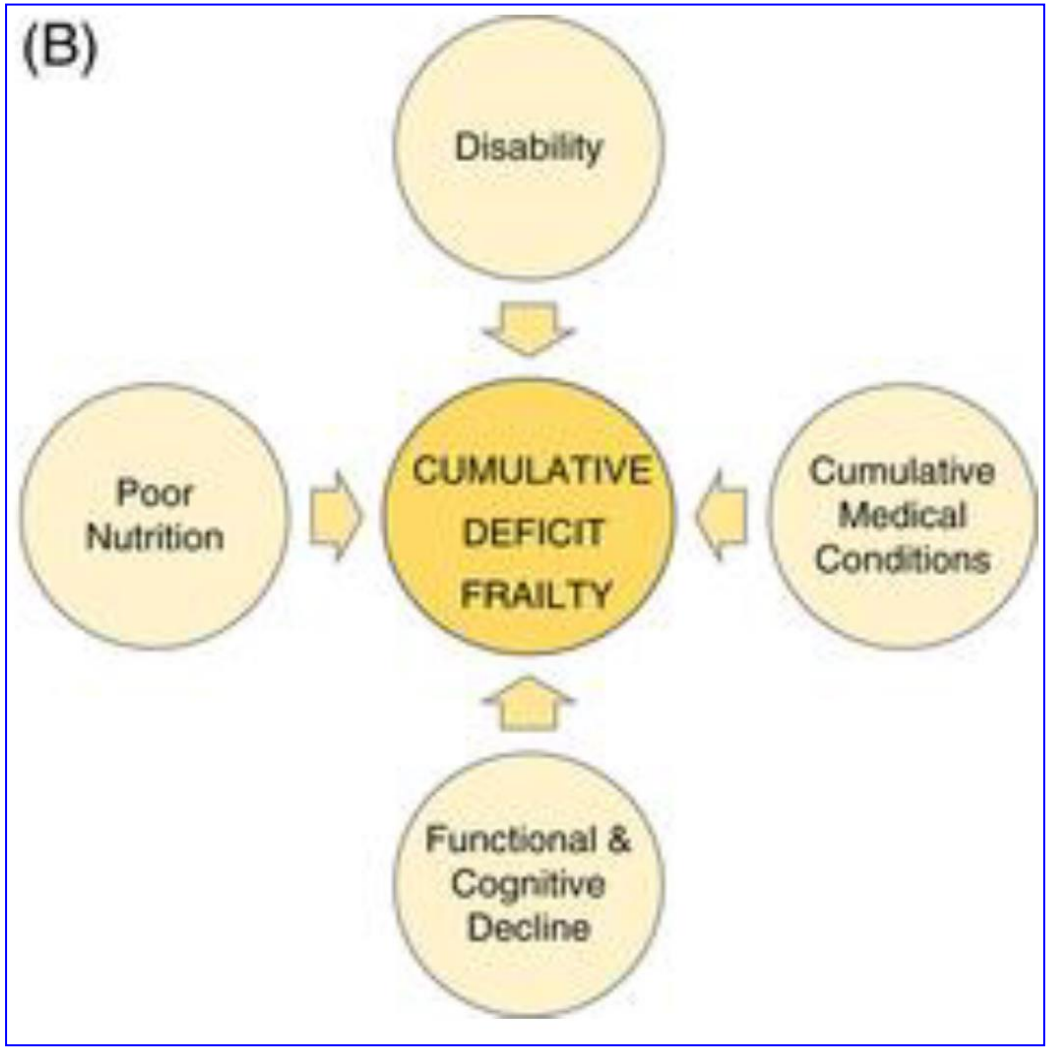
"clinical syndrome that involves multiple physiologic systems, characterized by ***decreased reserve*** *and* ***impaired ability to respond to stress****, identifies individuals at* ***high risk of developing adverse health outcomes****"*



Clegg, Andrew et al. "Frailty in elderly people." The Lancet 381 (2013): 752-762.

Frailty models





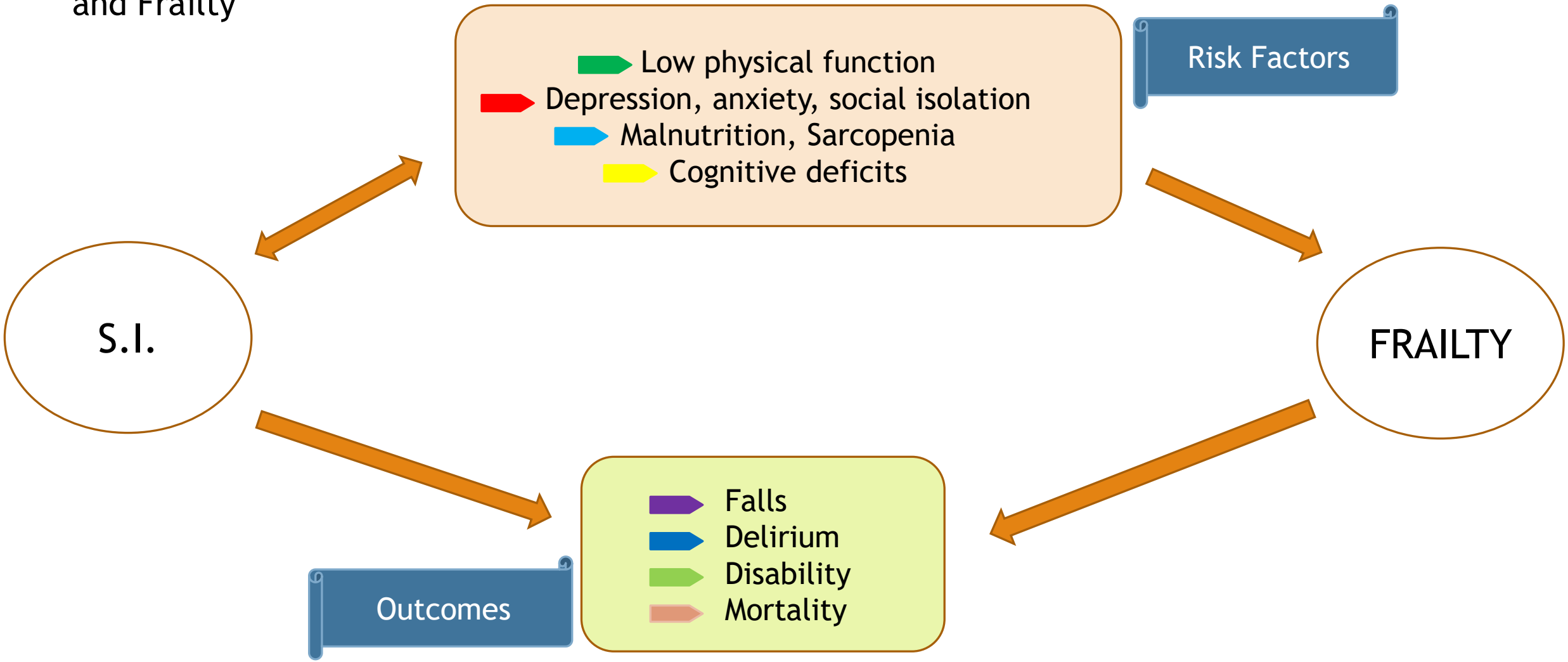
A) The frailty phenotype (proposed and validated by Fried and colleagues in the Cardiovascular Health Study). B) Accumulation of deficits approach proposed by Rockwood and colleagues.

Frailty

Epidemiology

- ✓A systematic review reported that the **overall prevalence** of frailty, in community-dwelling adults aged **65 and older** is on average **10.7%** (range 4.0%–59.1%)
- ✓The prevalence of frailty varies enormously among studies according to different definitions, countries, and setting
- ✓The prevalence of frailty in institutionalized older adults varies from 29.2% to 68.8%
- ✓In older **hospitalized** patients, the frailty prevalence varied from **27% to 80%**

Potential biological mechanisms linking Sensorial Impairment and Frailty



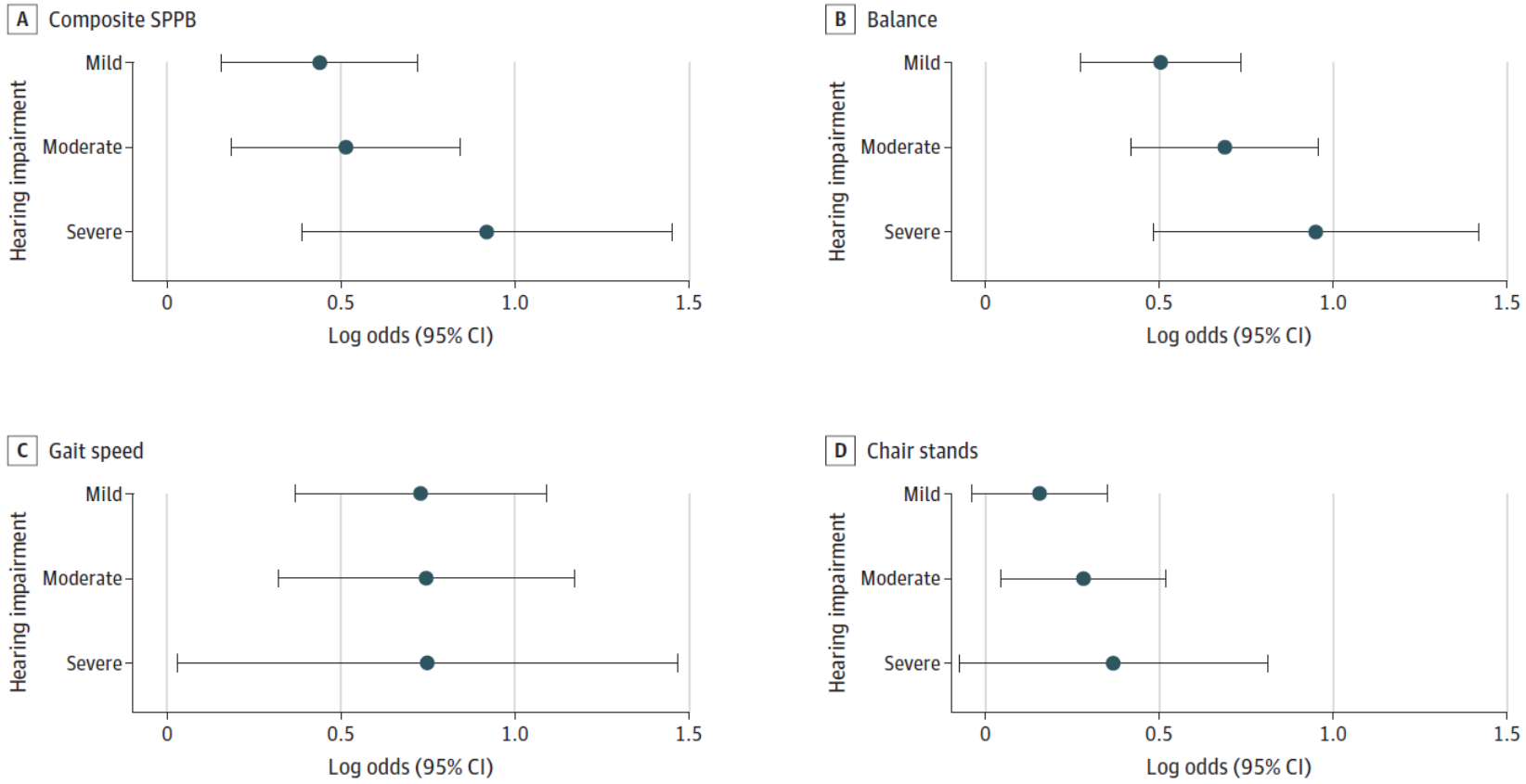
Association of Age-Related Hearing Impairment With Physical Functioning Among Community-Dwelling Older Adults in the US

JAMA Network Open

Pablo Martinez-Amezcua, MD, PhD, MHS; Danielle Powell, AuD, PhD; Pei-Lun Kuo, MD, PhD, MPH; Nicholas S. Reed, AuD; Kevin J. Sullivan, PhD, MPH; Priya Palta, PhD, MHS; Moyses Szklo, MD, DrPH; Richey Sharrett, MD, DrPH; Jennifer A. Schrack, PhD; Frank R. Lin, MD, PhD; Jennifer A. Deal, PhD

- ✓**2956** participants (mean [SD] age, 79 [4.6] years)
- ✓A **composite score of 6** or less and a score for each component (balance, gait speed, and chair stands) of 2 or less indicated poor performance
- ✓**Pure tone audiometry**; normal hearing (BPTA25 dB HL), mild hearing impairment (BPTA of 26-40 dB HL), moderate hearing impairment (BPTA of 41-60 dB HL), or severe hearing impairment (BPTA>60 dB HL)
- ✓FU up to 8-9 y

Figure 1. Adjusted Associations Between Hearing Categories and Low Vs High Short Physical Performance Battery (SPPB) Composite and Component Scores



Markers indicate log odds compared with normal hearing; horizontal lines indicate 95% CIs. The model was adjusted for covariates in model 2: age, sex, race–center site, body mass index, educational level, occupational noise exposure, smoking status, and multimorbidity index.

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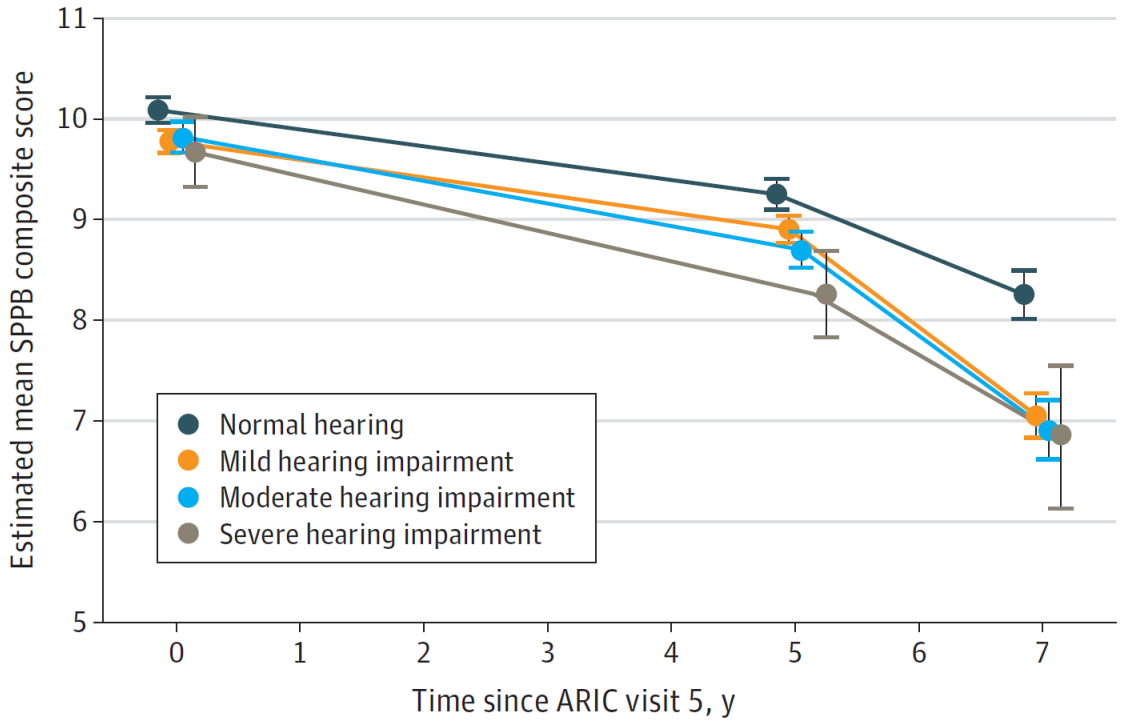
Figure 2. Estimated Mean Short Physical Performance Battery (SPPB) Composite Score Over Time Across Hearing Categories



Adjusted for covariates in model 2: age, sex, race-center site, body mass index, educational level, occupational noise exposure, smoking status, and multimorbidity index. Error bars indicate 95% CIs. ARIC indicates Atherosclerosis Risk in Communities.

The association amongst visual, hearing, and dual sensory loss with depression and anxiety over 6 years: The Tromsø Study

S. Cosh, T. von Hanno, C. Helmer, G. Bertelsen, C. Delcourt, H. Schirmer

- ✓n = 2156
- ✓F 52.9%
- ✓Mean age was 66.9 (±5.2) years
- ✓Depression and anxiety: Hopkins Symptom Checklist (HSCL)-10.
- ✓**Visual acuity** was assessed using Snellen charts at a distance of 6 meters
- ✓**Self-reported HL**

Table 2: Association between baseline sensory loss and depression symptoms

	Model 1			Model 2			Model 3			Sensitivity Analysis		
	b	**SE**	**p**	**b**	**SE**	**p**	**b**	**SE**	**p**	**b**	**SE**	**p**
Vision Loss alone												
Baseline score	-0.0055	0.066	.933	-0.0381	0.070	.587	-0.0906	0.071	.200	-0.0945	0.072	.188
Six year score	**0.0216**	**0.009**	**.017**	**0.0241**	**0.010**	**.014**	**0.0220**	**0.010**	**.034**	**0.0233**	**0.011**	**.030**
Hearing Loss alone												
Baseline score	**0.2544**	**0.070**	**<.001**	**0.2264**	**0.073**	**.002**	**0.1750**	**0.074**	**.019**	**0.2071**	**0.077**	**.007**
Six year score	0.0085	0.010	.396	0.0068	0.011	.523	0.0022	0.011	.844	0.0028	0.011	.804
Dual Loss												
Baseline score	0.0449	0.120	.708	0.0089	0.098	.928	-0.1144	0.105	.275	-0.0852	0.109	.436
Six year score	**0.0499**	**0.017**	**.004**	**0.0487**	**0.014**	**<.001**	**0.0413**	**0.015**	**.007**	**0.0478**	**0.016**	**.003**

International Journal of Geriatric Psychiatry, 2018

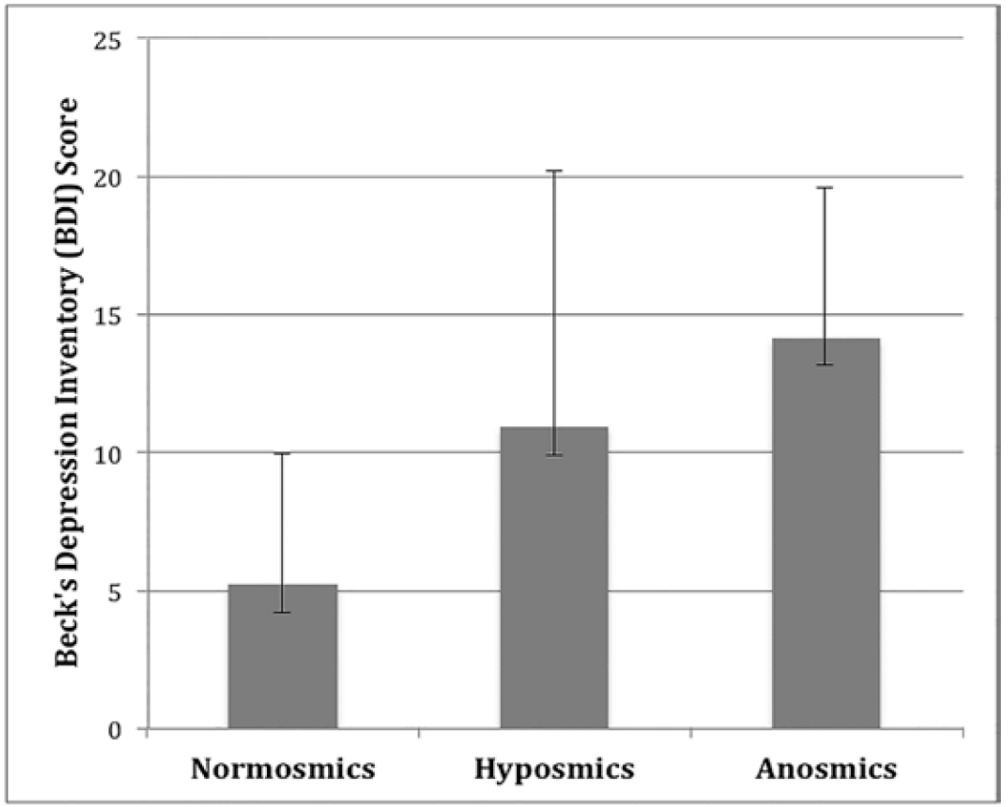
The Association Between Olfaction and Depression: A Systematic Review

Preeti Kohli[1], Zachary M. Soler[1], Shaun A. Nguyen[1], John S. Muus[1] and Rodney J. Schlosser[1,2]

Table 2. Combined measures of olfaction in depressed patients and nondepressed controls

	Patients (*n*)	Score (Mean, SD)	*P* value
Sniffin' Sticks Test			
Threshold			
Depressed	122	6.31 (1.38)	0.0005
Controls	169	6.78 (0.88)	
Discrimination			
Depressed	77	12.05 (1.44)	0.0073
Controls	79	12.66 (1.36)	
Identification			
Depressed	152	12.57 (0.74)	<0.0001
Controls	208	12.98 (0.90)	
SIT-40			
Depressed	36	35.31 (1.91)	<0.0001
Controls	94	37.41 (1.45)	

SIT-40: 40-Item Smell Identification Test.



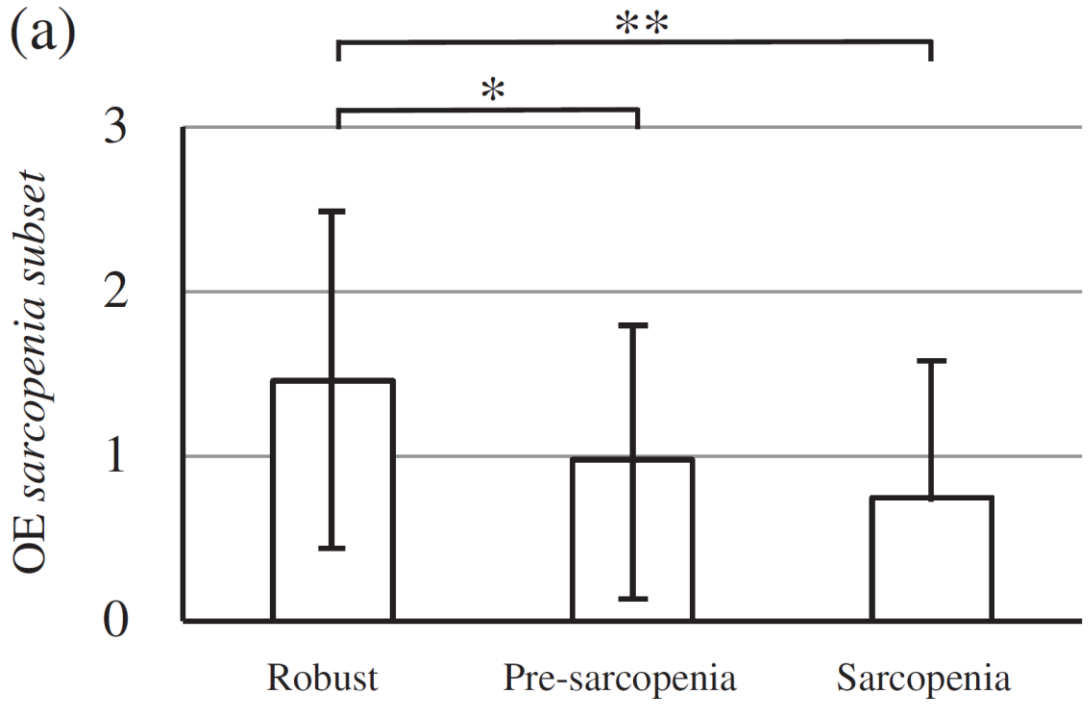
Normosmics vs hyposmics: p<0.0001
Normosmics vs anosmics: p<0.0001
Hyposmics vs anosmics: p=0.0274
BDI: Beck's Depression Inventory

Association of olfactory impairment with indexes of sarcopenia and frailty in community-dwelling older adults

- ✓A total of 141 community-dwelling older Japanese
- ✓69 men and 72 women; mean age 73.0 years

- ✓AWGS sarcopenia was observed in 12 participants (8.5%)
- ✓The prevalence of **olfactory impairment** was **67.4%** in the total population
- ✓The prevalence of gustatory impairment for salty and sweet taste was 40.4% and 9.2%

Results: …significant association of olfactory impairment and **ASMI** (less than the cut-off value and Asian Working Group for Sarcopenia sarcopenia) in **women**, after adjustment.



a) OE "sarcopenia subset" score (three odorants: Japanese cypress (hinoki), wood and roasted garlic) for each Asian Working Group for Sarcopenia sarcopenia status.

M Harita et al.DOI: 10.1111/ggi.13621

Olfactory deficits predict cognitive decline and Alzheimer dementia in an urban community

- ✓n = 757 pz >65 aa
- ✓FU at 2 and 4 y
- ✓memory, language, and visual-spatial ability
- ✓UPSIT test – 40 item

Figure 2 Receiver operating characteristic curves for odor identification and episodic verbal memory in predicting cognitive decline

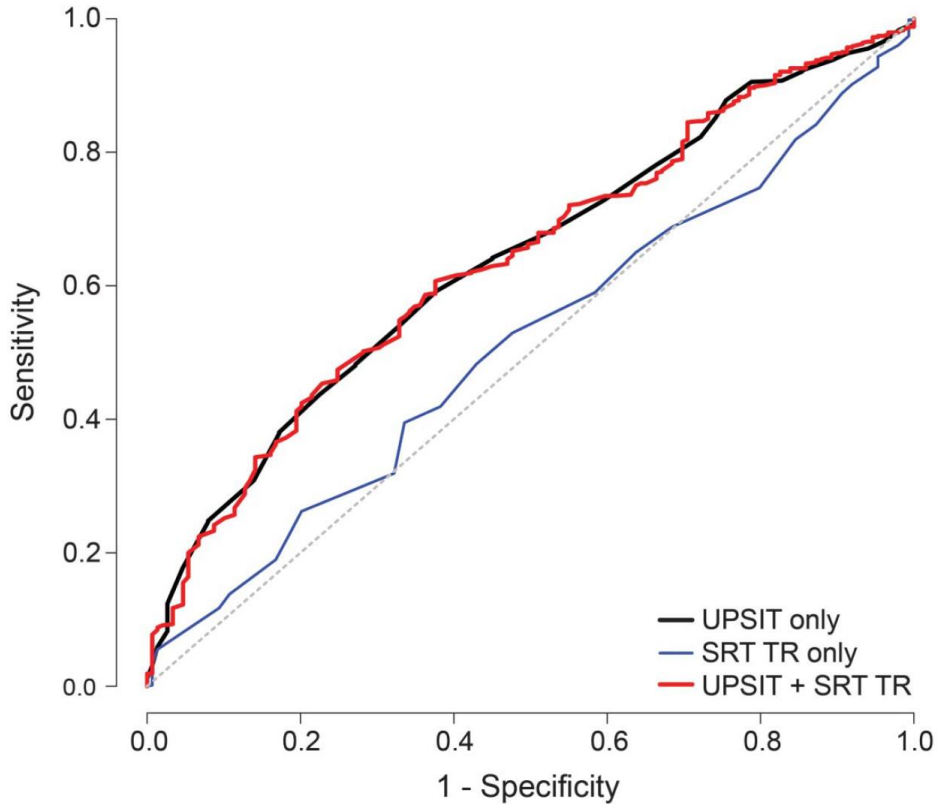
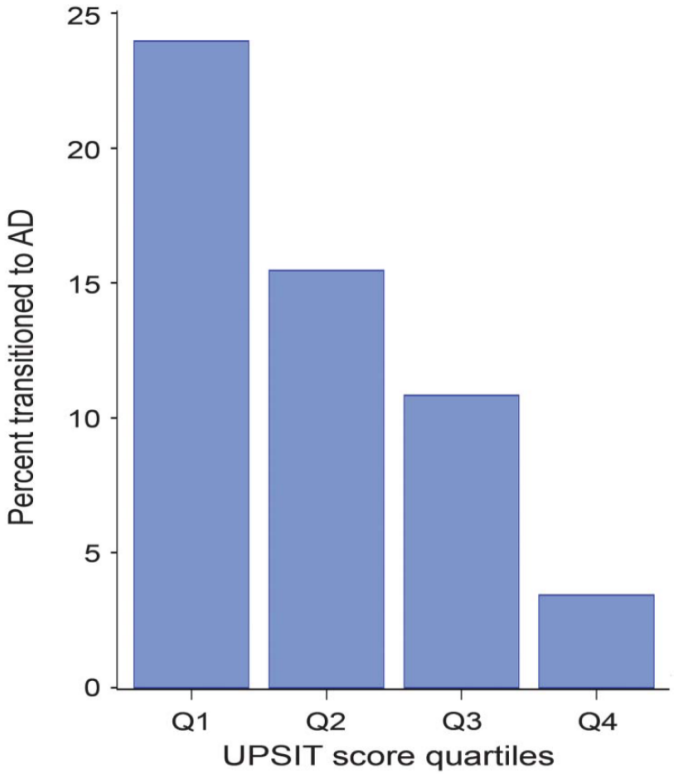


Figure 1 Baseline UPSIT quartile scores in patients who transitioned to AD dementia during follow-up



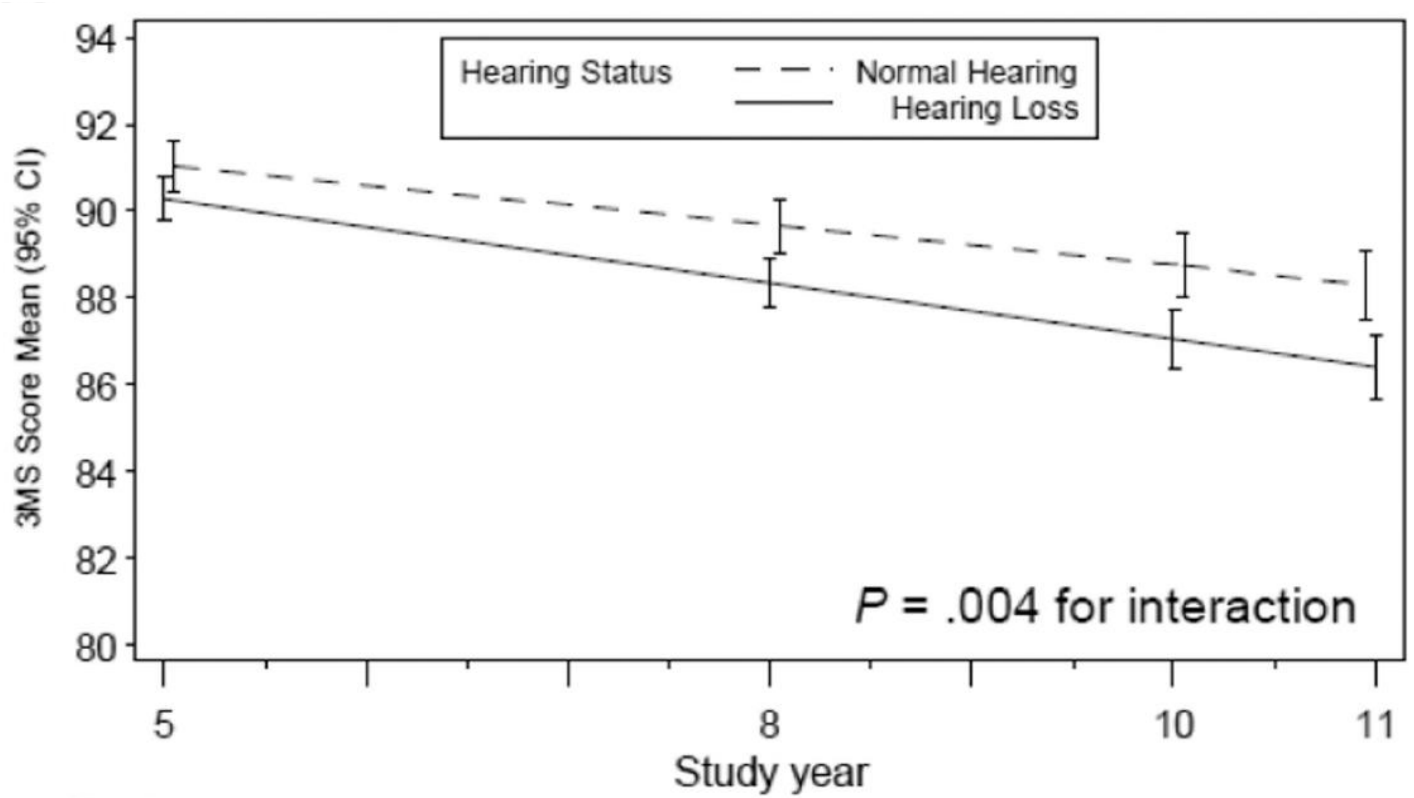
In 757 participants without dementia who were followed, percent transitioning to AD classified by baseline UPSIT quartile scores. Q1 represents the quartile with the lowest UPSIT scores (worst quartile test performance) and Q4 represents the quartile with the highest UPSIT scores (best quartile test performance) that was used as the reference group in the analyses of other quartiles. AD = Alzheimer disease; UPSIT = University of Pennsylvania Smell Identification Test.

D.P. Devanand, 2014 American Academy of Neurology

Hearing Loss and Cognitive Decline Among Older Adults

Frank R. Lin, M.D Ph.D.[1,2], Kristine Yaffe, M.D.[3,4], Jin Xia, M.S.[2], Qian-Li Xue, Ph.D.[2], Tamara B. Harris, M.D. M.S.[5], Elizabeth Purchase-Helzner, Ph.D.[6], Suzanne Satterfield, M.D. Dr.P.H.[7], Hilsa N. Ayonayon, Ph.D.[4], Luigi Ferrucci, M.D. Ph.D.[8], Eleanor M. Simonsick, Ph.D.[8], and for the Health ABC Study

- ✓1984 older adults
- ✓mean age 77.4 years
- ✓No cognitive impairment at baseline
- ✓FU 6y
- ✓Incident cognitive impairment: 3MS score < 80 or a decline in 3MS > 5
- ✓PTA



No. of Participants				
Normal Hearing	818	660	605	530
Hearing Loss	1157	876	766	639

JAMA Intern Med. 2013 February 25; 173(4): . doi:10.1001/jamainternmed.2013.1868.

Hearing Loss and Falls: A Systematic Review and Meta-analysis

Nicole Tin-Lok Jiam, BA; Carol Li, MD; Yuri Agrawal, MD, MPH

The Laryngoscope

Study Source	Sample Size	Odds Ratio (95% CI)
Assantachai	1043	1.97 (1.35-2.86)
Bumin	33	9.64 (1.63-56.9)
Girard	298	1.97 (1.001-3.88)
Kulmala	428	1.3 (0.89-1.92)
Lee	173	0.88 (0.38-2.04)
Lin	2017	1.4 (1.3-1.5)
Lopez - F	3014	1.45 (1.08-1.93)
Lopez - M	2340	1.38 (1.08-1.78)
Purchase-Helzner	9704	1 (0.88-1.15)
Sihvonen	79	17.14 (1.78-165.6)
Skalska	4920	1 (0.88-1.5)
Stam	1865	2.5 (1.49-4.19)
Tobis	47	1.42 (0.62-3.26)

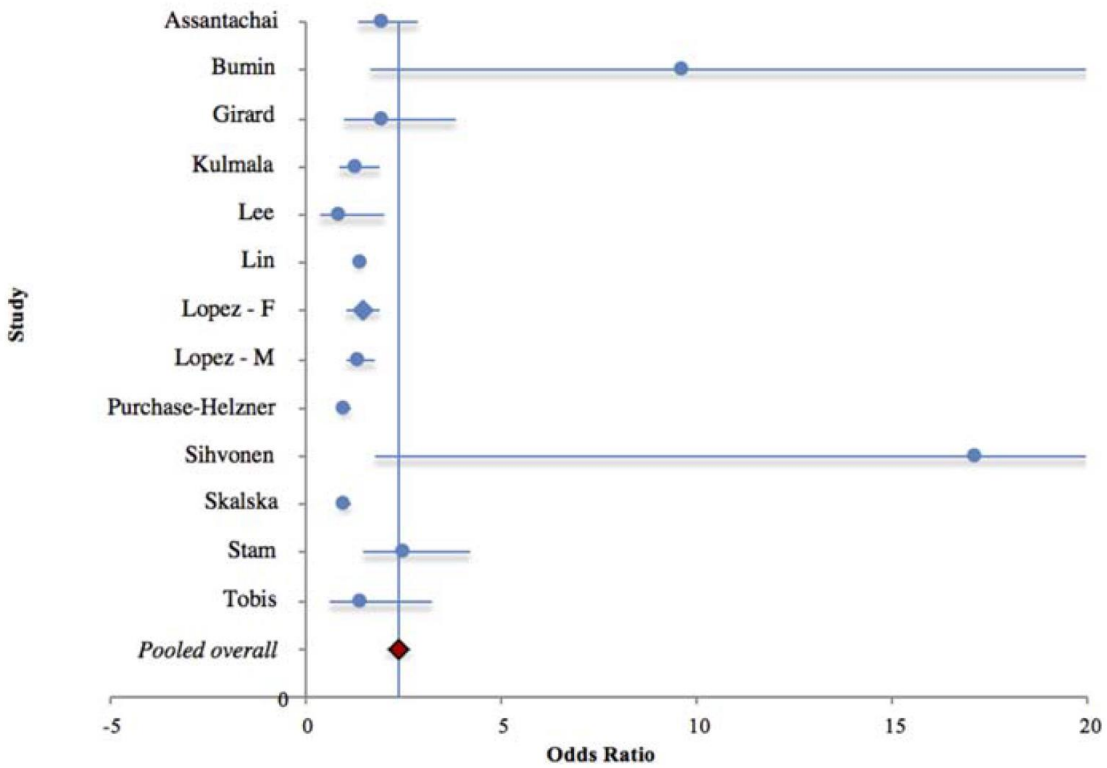


Fig. 2. Forest plot demonstrating association between hearing loss and falls in older adults. The forest plot is a graphical representation of the meta-analysis on the 13 studies included in this review. The blue circle is a measure of effect for each study, and its corresponding horizontal line represents confidence intervals. The red diamond at the bottom of the graph summarizes the average effect size of these 13 studies. F = female; M = male. [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]

Visual and Hearing Impairment Are Associated With Delirium in Hospitalized Patients: Results of a Multisite Prevalence Study

- ✓Cross-sectional study nested in the 2017 “Delirium Day” project.
- ✓Patients 65 years and older admitted to acute hospital medical wards, emergency departments, rehabilitation wards, nursing homes, and hospices in Italy
- ✓3038 patients were included; delirium prevalence was 25%.

Table 3
Association Among Visual Impairment, Hearing Impairment, and Delirium*

Variables	Model 1		Model 2	
	Odds Ratio (Confidence Interval)	*P* Value	Odds Ratio (Confidence Interval)	*P* Value
No visual or hearing impairment	Ref		Ref	
Visual impairment	0.8 (0.6–1.2)	.36	0.8 (0.6–1.2)	.27
Hearing impairment	1.1 (0.8–1.4)	.42	1.1 (0.8–1.4)	.63
Visual and hearing impairment	1.5 (1.2–2.1)	.00	1.4 (1.1–1.9)	.02
Dementia	5.9 (4.8–7.2)	.00	6.1 (4.9–7.4)	.00
Autonomy score†	2.9 (2.2–3.8)	.00	2.6 (1.9–3.4)	.00
Weight loss in the past 12 months (>5%)	1.7 (1.4–2.1)	.00	1.7 (1.3–2.1)	.00
Psychoactive drugs‡	—	—	1.4 (1.1–1.7)	.00
Urinary catheters	—	—	2.1 (1.7–2.6)	.00

Age and Ageing 2012; **41:** 195–200
doi: 10.1093/ageing/afr155
Published electronically 29 November 2011

Severity of age-related hearing loss is associated with impaired activities of daily living

- ✓1952 pts ≥60y
- ✓PTA

Table 3. Association between Measured Hearing Loss, Hearing Handicap Inventory for Elderly (HHIE) Scores and Activities of Daily Living (ADL)

	Mean ADL score (SD)	Impaired ADL, OR (95% CI)	
		Age-sex adjusted	Multivariate-adjusted[a]
Presence of hearing loss			
No hearing loss (≤25 dB HL), $n = 886$	27.14 (2.10)	1.0 (reference)	1.0 (reference)
Any hearing loss (>25 dB HL), $n = 686$	26.34 (2.94)	1.46 (0.95–2.25)	1.53 (0.95–2.48)
Severity of hearing loss			
No hearing loss (≤25 dB HL), $n = 886$	27.14 (2.10)	1.0 (reference)	1.0 (reference)
Mild hearing loss (26–40 dB HL), $n = 476$	26.67 (2.55)	1.12 (0.69–1.81)	1.12 (0.65–1.91)
Moderate to severe hearing loss (>40 dB HL), $n = 212$	25.59 (3.59)	2.39 (1.41–4.05)	2.87 (1.59–5.19)
P_{trend}		0.003	0.001
Severity of hearing handicap			
No handicap (HHIE <8), $n = 350$	26.83 (2.41)	1.0 (reference)	1.0 (reference)
Moderate handicap (HHIE 8–24), $n = 319$	26.54 (2.45)	0.83 (0.50–1.40)	0.94 (0.52–1.69)
Severe handicap (HHIE ≥26), $n = 88$	25.20 (3.79)	2.17 (1.14–4.10)	2.11 (1.00–4.43)
P_{trend}		0.05	0.10

OR, odds ratio; CI, confidence interval; SD, standard deviation.
[a]Further adjusting for cognitive impairment, probable depression and admission to a hospital in the past 12 months.

Smell Loss Predicts Mortality Risk Regardless of Dementia Conversion

- ✓1774 participants aged 40 to 90 at baseline.
- ✓Scandinavian Odor-Identification Test (SOIT), Subjective olfactory impairment
- ✓Assessment of Dementia at Baseline and 5- and 10-year Follow-up
- ✓Mean age at baseline was 63.5 +- 12.7; F 54%

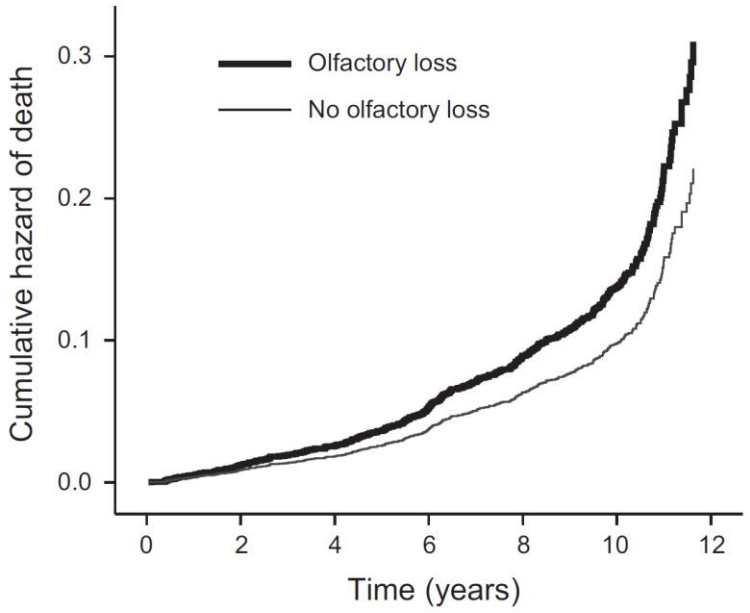


Figure 2. Cumulative hazard of death associated with olfactory loss (Scandinavian Odor-Identification Test (SOIT) score ≤ 4) compared with no olfactory loss (SOIT score >4). The data are adjusted for differences in age, sex, years of education, history of heart disease, stroke, high blood pressure, diabetes mellitus, depression, cognitive performance assessed using Mini-Mental State Examination and SRB, apolipoprotein E ε4, and dementia conversion.

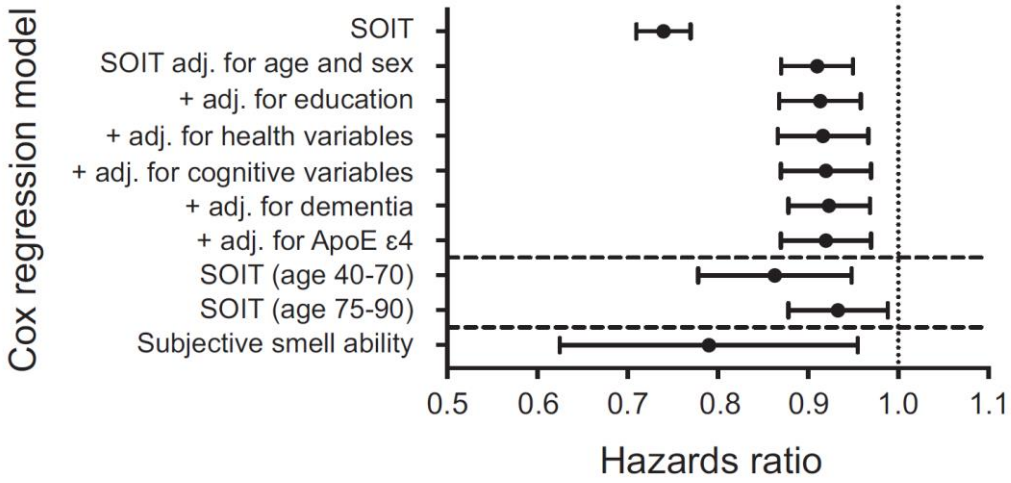


Figure 3. Hazards ratios (HRs) and 95% confidence intervals (CIs) of Cox regression models predicting mortality from the Scandinavian Odor-Identification Test (SOIT). Data were adjusted stepwise for demographic, health, and cognitive variables; incident dementia; and apolipoprotein E ε4. Results are presented separately for SOIT in adults aged 40 to 70 and 75 to 90, and from subjective smell ability, all adjusted for the full list of control variables.

EKSTROM ET AL. 2017 JAGS

Association of Hearing Impairment and Mortality in Older Adults

Dane J. Genther,[1,2] Joshua Betz,[2,3] Sheila Pratt,[4,5] Steven B. Kritchevsky,[6,7] Kathryn R. Martin,[8] Tamara B. Harris,[9] Elizabeth Helzner,[10] Suzanne Satterfield,[11] Qian-Li Xue,[2,12] Kristine Yaffe,[13,14,15] Eleanor M. Simonsick,[12,16] and Frank R. Lin,[1,2,12,17,18]; for the Health ABC Study

- ✓ 1146 participants with HI > 70 y,
- ✓ FU 8 y
- ✓ HI was associated with a 20% increased mortality risk compared with normal hearing (hazard ratio = 1.20, 95% CI: 1.03–1.41).

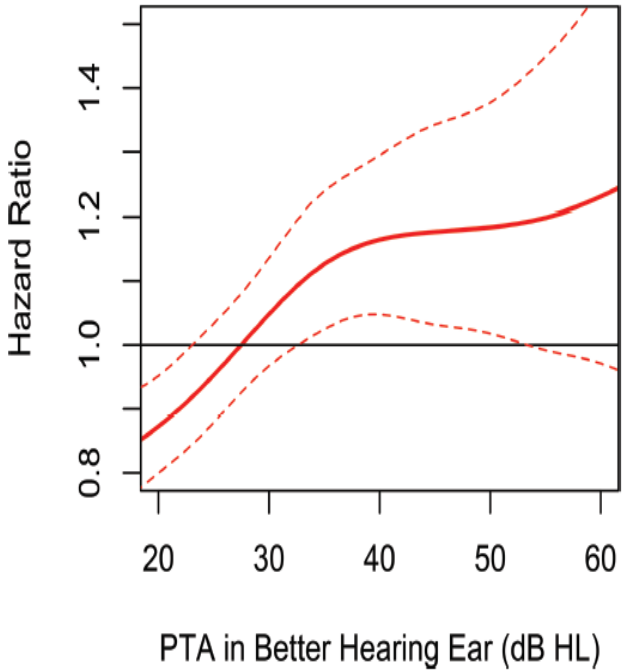


Figure 1. Risk of mortality by baseline hearing loss in fully adjusted model. Hearing impairment is defined as pure-tone average >25 dB HL at 0.5–4 kHz in the better ear. The solid line indicates the hazard ratio of mortality by degree of hearing loss, and the dotted lines represent the 95% CI for the hazard ratio. dB = decibels; HL = hearing level; PTA = pure-tone average.

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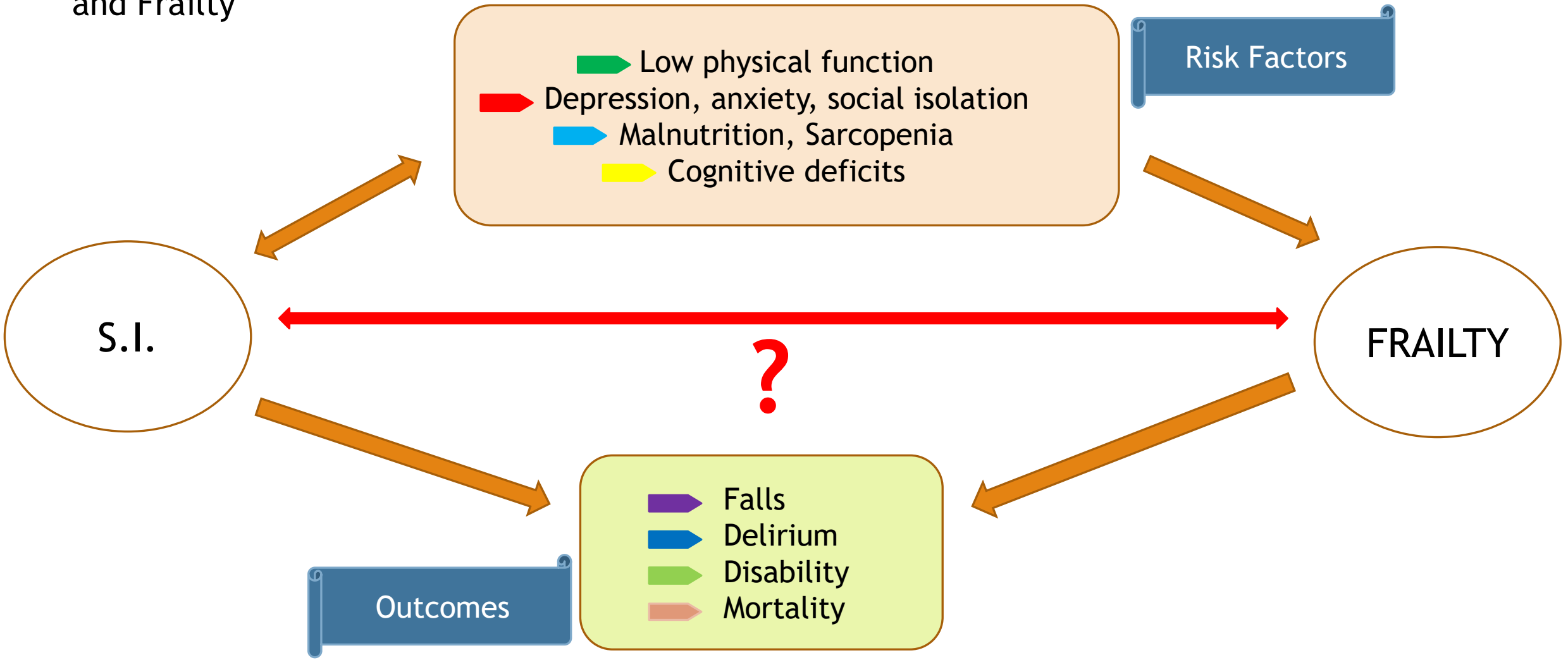
doi:10.1093/gerona/glu094

Potential biological mechanisms linking Sensorial Impairment and Frailty



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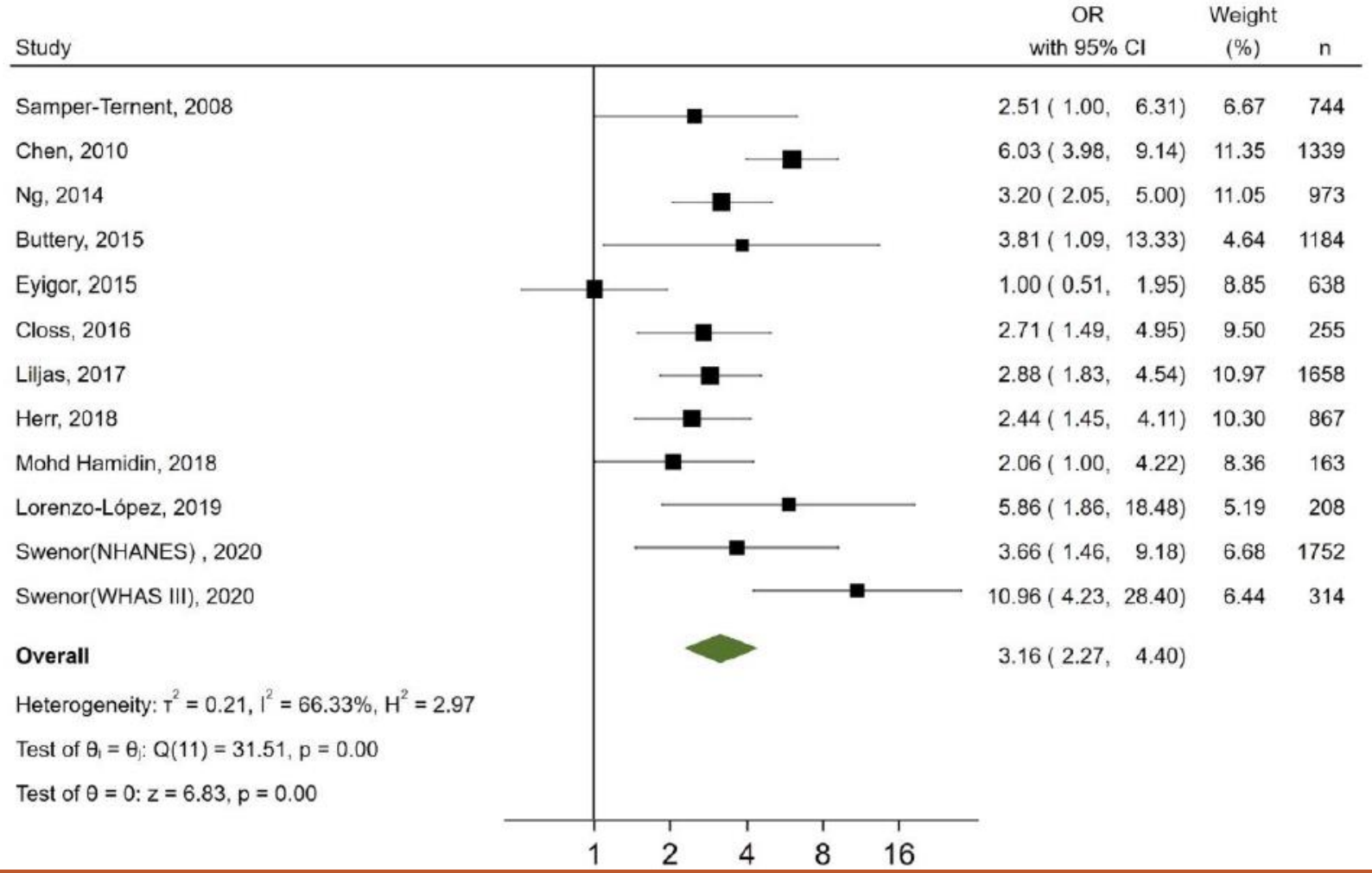
doi:10.1093/gerona/glaa171
Advance Access publication July 6, 2020

Is Sensory Loss an Understudied Risk Factor for Frailty? A Systematic Review and Meta-analysis



*Random-effects meta-analyses of the cross-sectional association between **vision impairment** and frailty. Green diamonds are the estimated pooled odds ratio (OR) for each meta-analysis; box sizes reflect the relative weight apportioned to studies in the meta-analysis. N=10,095*

Bidirectional association between visual impairment and frailty among community-dwelling older adults: a longitudinal study

Tianxue Hou[1,2], Minhui Liu[2,3] and Jinghui Zhang[1,2,4*]

Hou *et al. BMC Geriatrics* (2022) 22:672
https://doi.org/10.1186/s12877-022-03365-0

- ✓ non-visual impairment/non frail
- ✓ Physical frailty phenotype
- ✓ Subjective – self reported VI
- ✓ 5 y FU

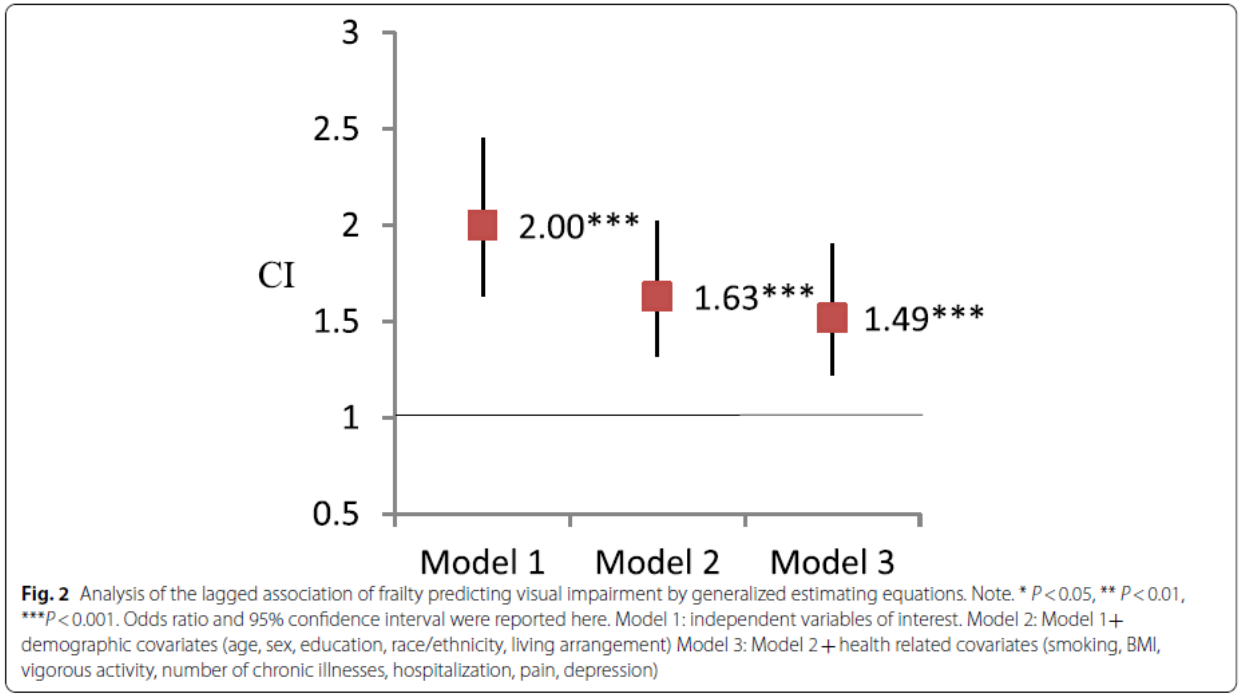


Fig. 2 Analysis of the lagged association of frailty predicting visual impairment by generalized estimating equations. Note. * $P<0.05$, ** $P<0.01$, *** $P<0.001$. Odds ratio and 95% confidence interval were reported here. Model 1: independent variables of interest. Model 2: Model 1+ demographic covariates (age, sex, education, race/ethnicity, living arrangement) Model 3: Model 2 + health related covariates (smoking, BMI, vigorous activity, number of chronic illnesses, hospitalization, pain, depression)

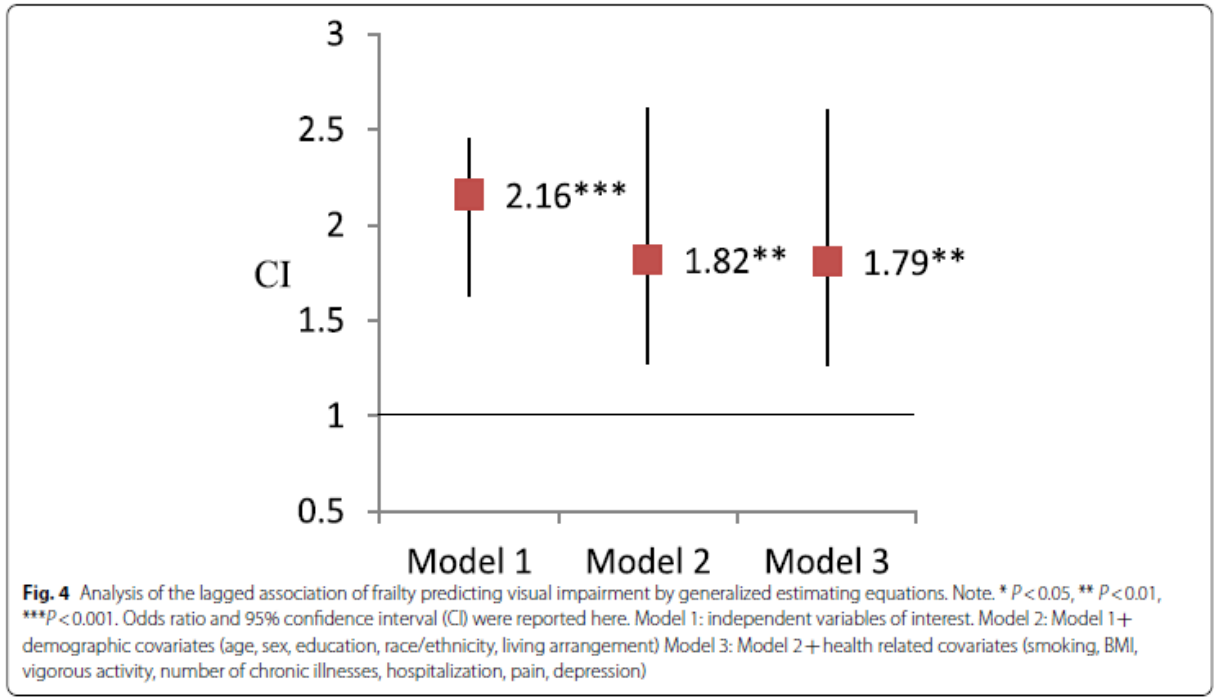


Fig. 4 Analysis of the lagged association of frailty predicting visual impairment by generalized estimating equations. Note. * $P<0.05$, ** $P<0.01$, *** $P<0.001$. Odds ratio and 95% confidence interval (CI) were reported here. Model 1: independent variables of interest. Model 2: Model 1+ demographic covariates (age, sex, education, race/ethnicity, living arrangement) Model 3: Model 2 + health related covariates (smoking, BMI, vigorous activity, number of chronic illnesses, hospitalization, pain, depression)

Visual impairment as predictors of pre-frailty or frailty

Pre-frailty or frailty as predictors of visual impairment

Association between hearing loss and frailty: a systematic review and meta-analysis

Tian *et al. BMC Geriatrics* (2021) 21:333
https://doi.org/10.1186/s12877-021-02274-y

Rong Tian[1*], Osvaldo P. Almeida[1,2], Dona M. P. Jayakody[1,3,4] and Andrew H. Ford[1,2]

Sixteen articles reported acceptable measurements of both hearing loss and frailty

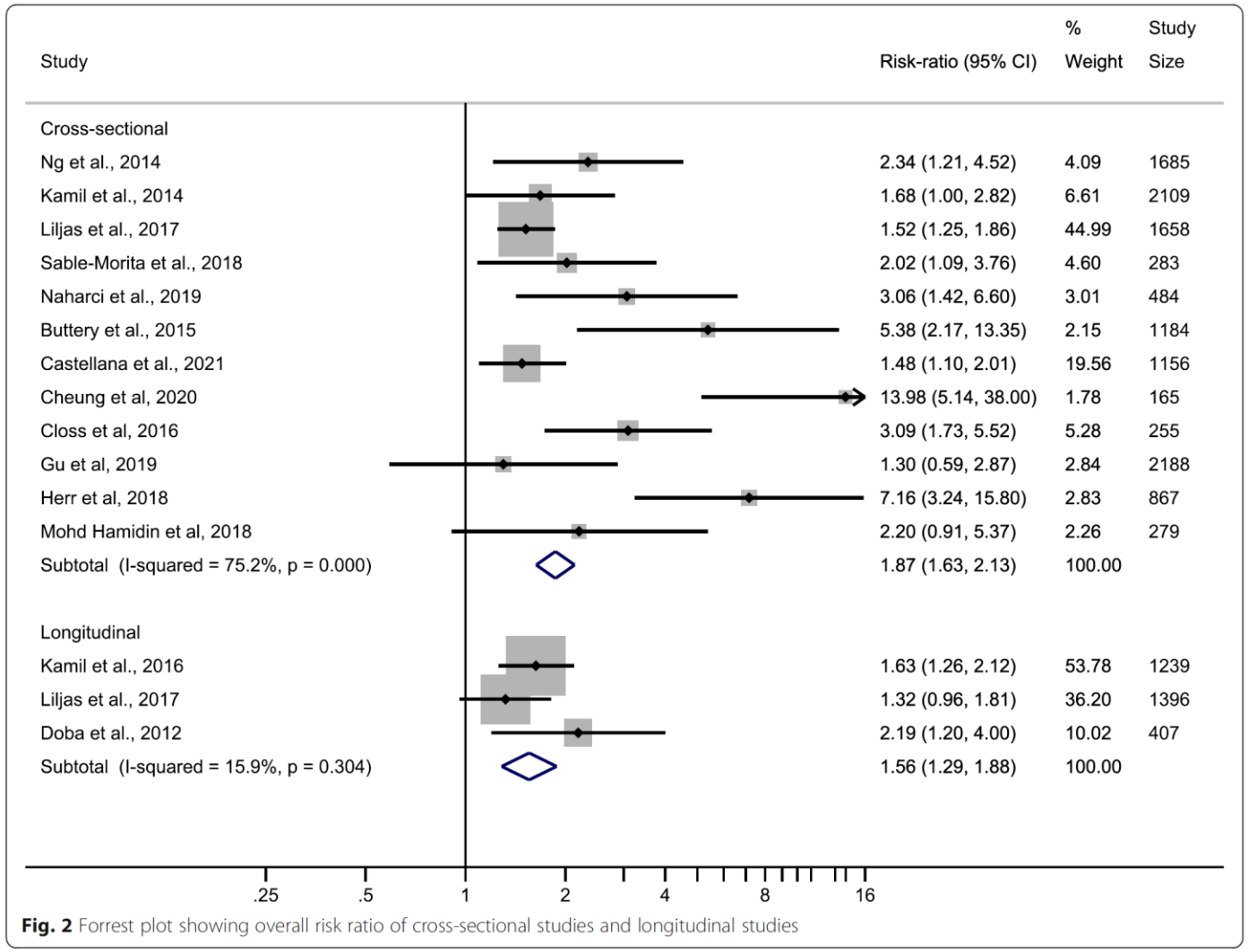


Fig. 2 Forrest plot showing overall risk ratio of cross-sectional studies and longitudinal studies

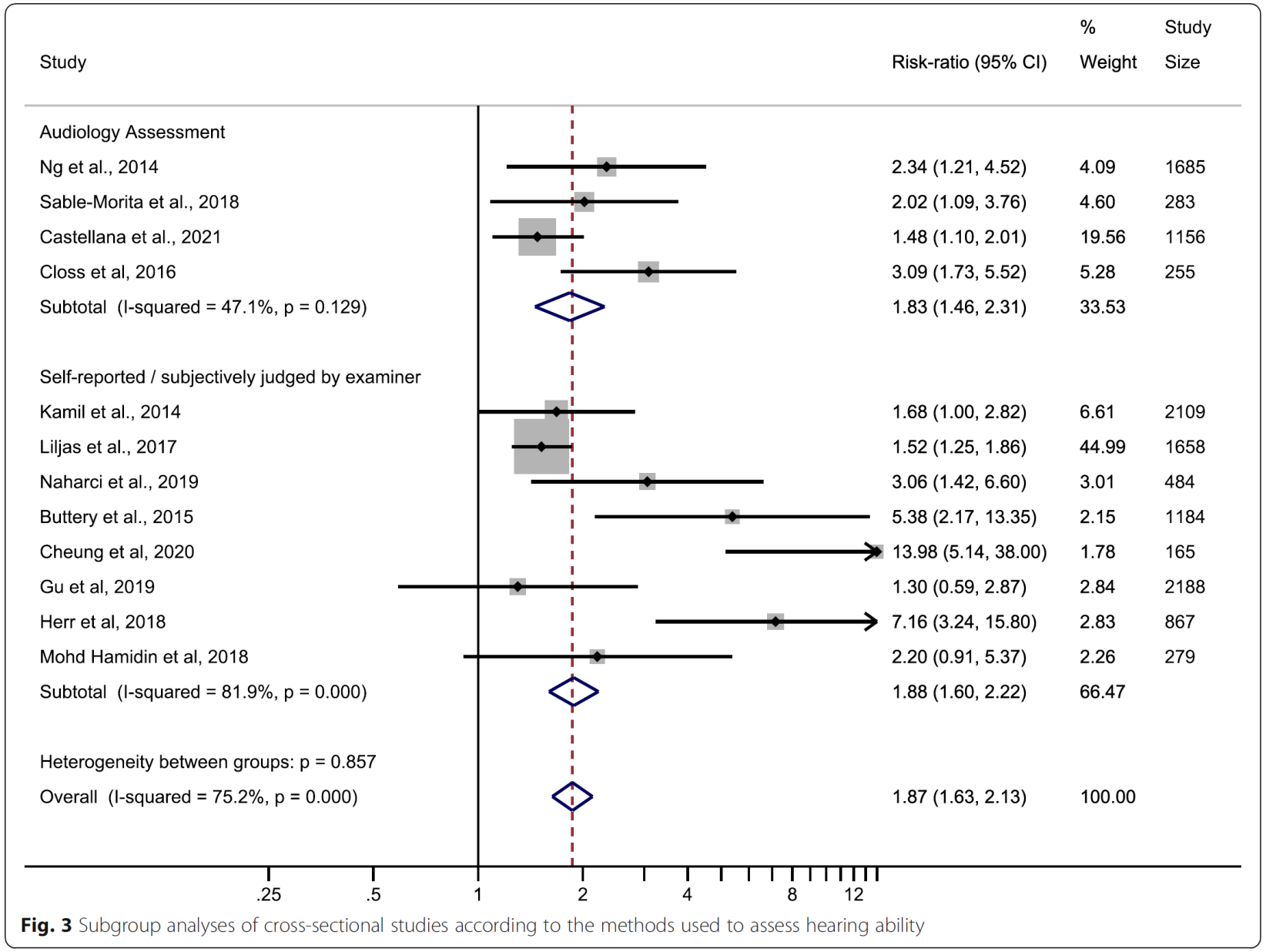


Fig. 3 Subgroup analyses of cross-sectional studies according to the methods used to assess hearing ability

Tian *et al. BMC Geriatrics* (2021) 21:333
https://doi.org/10.1186/s12877-021-02274-y

Conclusions: The findings of this systematic review and meta-analysis of observational studies suggest that hearing loss increases the risk of frailty in later life. Whether this relationship is causal remains to be determined.

Open Access Full Text Article

ORIGINAL RESEARCH

Combined Vision and Hearing Impairment is Associated with Frailty in Older Adults: Results from the West China Health and Aging Trend Study

Yanli Zhao, Qunfang Ding, Taiping Lin, Xiaoyu Shu, Dongmei Xie, Langli Gao, Jirong Yue

Clinical Interventions in Aging 2022:17 675-683

Community-dwelling individuals aged 60 years and older

FRAIL scale and categorized as robust, prefrail and frail

Self reported SI

3985 participants, 41.5% male

Median age was 66 y

Table 3 Association Between Sensory Impairment and Frailty According to Multinomial Logistic Regression Analyses

		Prefrail vs Robust		Frail vs Robust	
		OR (95% CI)	*P*-value	OR (95% CI)	*P*-value
Model 1	No sensory impairment	Reference		Reference	
	Hearing impairment only	1.26 (0.97–1.64)	0.09	1.19 (0.63–2.27)	0.59
	Visual impairment only	1.43 (1.22–1.69)	<0.001	1.79 (1.23–2.61)	0.003
	Dual sensory impairment	2.19 (1.83–2.62)	<0.001	3.94 (2.74–5.68)	<0.001
Model 2	No sensory impairment	Reference		Reference	
	Hearing impairment only	1.16 (0.88–1.52)	0.309	1.03 (0.53–2.03)	0.924
	Visual impairment only	1.38 (1.16–1.64)	<0.001	1.42 (0.96–2.11)	0.082
	Dual sensory impairment	1.94 (1.59–2.36)	<0.001	2.74 (1.83–4.10)	<0.001
Model 3	No sensory impairment	Reference		Reference	
	Hearing impairment only	1.13 (0.86–1.50)	0.376	0.99 (0.50–1.97)	0.981
	Visual impairment only	1.39 (1.17–1.65)	<0.001	1.51 (1.01–2.25)	0.046
	Dual sensory impairment	1.89 (1.55–2.31)	<0.001	2.45 (1.62–3.69)	<0.001
Model 4	No sensory impairment	Reference		Reference	
	Hearing impairment only	1.07 (0.80–1.42)	0.664	0.82 (0.40–1.68)	0.583
	Visual impairment only	1.41 (1.18–1.68)	<0.001	1.54 (1.00–2.36)	0.048
	Dual sensory impairment	1.81 (1.47–2.21)	<0.001	2.17 (1.40–3.38)	0.001

Notes: Model 1 unadjusted; Model 2 adjusted for age, sex, education, ethnicity and marital status; Model 3 adjusted for age, sex, education, ethnicity, marital status, smoker, alcohol abuse, number of chronic diseases, and cognitive impairment; Model 4 adjusted for age, sex, education, ethnicity, marital status, smoker, alcohol abuse, number of chronic diseases, cognitive impairment, depression, ADL impairment, sleep condition and malnutrition status.

The association of frailty with olfactory and gustatory dysfunction in older adults: a nationally representative sample

Isaac A. Bernstein, BA, BS[1], Christopher R. Roxbury, MD[2], Sandra Y. Lin, MD[1] and Nicholas R. Rowan, MD[1]

- ✓**3547** participants aged >= 40 years
- ✓**Self reported** olfactory dysfunction sOD and gustatory dysfunction sGD and **measured** olfactory dysfunction mOD and gustatory dysfunction mGD
- ✓Frailty was operationalized using a 39-item frailty index FI

Variable	Non-frail (FI ≤ 0.10)[a]	Vulnerable (0.10 < FI ≤ 0.21)	Frail (0.21 < FI ≤ 0.45)
Measured olfactory dysfunction	1	1.29 (0.98–1.70)	1.55 (1.22–1.98)[b]
Self-reported olfactory dysfunction	1	1.37 (1.07–1.75)[a]	1.71 (1.39–2.09)[b]
Problem with smell in past 12 months	1	1.30 (0.89–1.90)	1.46 (0.94–2.26)
Had change in ability to smell since age 25 years	1	1.14 (0.84–1.54)	1.26 (0.92–1.71)
Phantom smells	1	2.06 (1.38–3.07)[a]	2.92 (2.03–4.20)[b]
Measured gustatory dysfunction—1mM quinine	1	1.13 (0.95–1.35)	1.21 (0.93–1.58)
Measured gustatory dysfunction—0.32M NaCl	1	1.26 (0.87–1.84)	1.17 (0.72–1.92)
Measured gustatory dysfunction—1M NaCl	1	1.90 (1.00–3.62)	1.12 (0.57–2.18)
Self-reported gustatory dysfunction	1	1.54 (1.17–2.02)[a]	2.78 (2.41–3.22)[b]
Had problem with taste past 12 months	1	1.44 (0.81–2.56)	2.13 (1.18–3.86)[b]
Change in ability to taste food flavors since age 25 years	1	1.76 (1.15–2.69)[a]	2.81 (2.17–3.65)[b]
Persistent taste in mouth past 12 months	1	1.91 (1.09–3.33)[a]	3.78 (2.20–6.48)[b]

[*]Values are OR (95% CI). Multivariate logistic regression model adjusted for age, body mass index, gender, race, education, income/poverty ratio, ever had ≥2 sinus infections, eve ever broke nose/serious injury to face/skull, frequent nasal congestion in past 12 months, persistent cold/flu in past 12 months, and persistent dry mouth in past 12 months.
[a]Reference value.
[b]$p \leq 0.05$.
CI = confidence interval; FI = frailty index; OR = odds ratio.

Conclusion: Self-reported chemosensory dysfunction and mOD are independently associated with measures of frailty

Potential biological mechanisms linking Sensorial Impairment and Frailty

S.I. ⟷ *«Sensorial Frailty»* ⟷ FRAILTY

Therapeutic Advances in Chronic Disease *Review*

Sensorial frailty: age-related hearing loss and the risk of cognitive impairment and dementia in later life

Francesco Panza, Madia Lozupone, Rodolfo Sardone, Petronilla Battista, Marco Piccininni, Vittorio Dibello, Maddalena La Montagna, Roberta Stallone, Pietro Venezia, Angelo Liguori, Gianluigi Giannelli, Antonello Bellomo, Antonio Greco, Antonio Daniele, Davide Seripa, Nicola Quaranta and Giancarlo Logroscino

Ther Adv Chronic Dis
1–17
DOI: 10.1177/2040622318811000

Agenda

- ✓SI are highly prevalent among older people…but too many times overlooked -> **screening** of SI
- ✓**Multidisciplinary pharmacological and non pharmacological** (devices, rehabilitation programs, strategies to improve abilities, environment changes) **treatment** of S.I. and risk factors
- ✓**Holistic, patient-centered approach**

Grazie per l’attenzione!