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Bidirectional association between sensory loss and frailty: a systematic review and meta-analysis

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ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - The review has not yet started.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 1 March 2025 and was last updated on 1 March 2025.

INTRODUCTION

Review question / Objective To find out if there is a bidirectional association between sensory loss and frailty.

Condition being studied A comprehensive synthesis of the bidirectional association between sensory loss (including vision impairment, hearing impairment, smell impairment, and taste impairment) and physical frailty is lack and warranted to be conducted. Therefore, this meta-analysis and systematic review were conducted to fill this gap and explore potential moderating factors.

METHODS

Search strategy

PubMed

(((((("Vision, Ocular"[Mesh]) OR (vision[Title/Abstract] OR visual[Title/Abstract] OR sight[Title/Abstract] OR eyesight[Title/Abstract] OR

seeing[Title/Abstract] OR blindness[Title/Abstract])) OR ((("Hearing"[Mesh]) OR (hearing[Title/Abstract] OR deafness[Title/Abstract] OR aural[Title/Abstract] OR audition[Title/Abstract]))) OR ((("Smell"[Mesh]) OR (smell[Title/Abstract] OR hyposmia[Title/Abstract] OR anosmia[Title/Abstract] OR dysosmia[Title/Abstract] OR cacosmia[Title/Abstract] OR microsmia[Title/Abstract] OR parosmia[Title/Abstract] OR olfaction[Title/Abstract] OR olfactory[Title/Abstract]))) OR ((("Taste"[Mesh]) OR (taste[Title/Abstract] OR hypogeusia[Title/Abstract] OR gustatory[Title/Abstract] OR gustation[Title/Abstract]))) AND ((("Frailty"[Mesh]) OR (frailty[Title/Abstract] OR frailties[Title/Abstract] OR frailness[Title/Abstract] OR frail[Title/Abstract] OR pre-frailty[Title/Abstract] OR debility[Title/Abstract] OR debilities[Title/Abstract]))) AND (impairment[Title/Abstract] OR dysfunction[Title/Abstract] OR loss[Title/Abstract] OR diminish[Title/Abstract] OR diminished[Title/Abstract] OR deterioration[Title/Abstract] OR defect[Title/Abstract] OR disease[Title/Abstract] OR

reduce[Title/Abstract] OR reduction[Title/Abstract] OR decline[Title/Abstract] OR loss[Title/Abstract] OR disorder[Title/Abstract] OR difficult[Title/Abstract] OR difficulty[Title/Abstract] OR deficit[Title/Abstract] OR insufficient[Title/Abstract] OR insufficiency[Title/Abstract] OR decrease[Title/Abstract]),Most Recent,from 1000/1/1 - 2024/10/23,("vision, ocular"[MeSH Terms] OR ("vision"[Title/Abstract] OR "visual"[Title/Abstract] OR "sight"[Title/Abstract] OR "eyesight"[Title/Abstract] OR "seeing"[Title/Abstract] OR "blindness"[Title/Abstract]) OR ("Hearing"[MeSH Terms] OR ("Hearing"[Title/Abstract] OR "deafness"[Title/Abstract] OR "aural"[Title/Abstract] OR "audition"[Title/Abstract])) OR ("Smell"[MeSH Terms] OR ("Smell"[Title/Abstract] OR "hyposmia"[Title/Abstract] OR "anosmia"[Title/Abstract] OR "dysosmia"[Title/Abstract] OR "cacosmia"[Title/Abstract] OR "microsmia"[Title/Abstract] OR "parosmia"[Title/Abstract] OR "olfaction"[Title/Abstract] OR "olfactory"[Title/Abstract])) OR ("Taste"[MeSH Terms] OR ("Taste"[Title/Abstract] OR "hypogeusia"[Title/Abstract] OR "gustatory"[Title/Abstract] OR "gustation"[Title/Abstract])) AND ("Frailty"[MeSH Terms] OR ("Frailty"[Title/Abstract] OR "frailties"[Title/Abstract] OR "frailness"[Title/Abstract] OR "frail"[Title/Abstract] OR "pre-frailty"[Title/Abstract] OR "debility"[Title/Abstract] OR "debilities"[Title/Abstract])) AND ("impairment"[Title/Abstract] OR "dysfunction"[Title/Abstract] OR "loss"[Title/Abstract] OR "diminish"[Title/Abstract] OR "diminished"[Title/Abstract] OR "deterioration"[Title/Abstract] OR "defect"[Title/Abstract] OR "disease"[Title/Abstract] OR "reduce"[Title/Abstract] OR "reduction"[Title/Abstract] OR "decline"[Title/Abstract] OR "loss"[Title/Abstract] OR "disorder"[Title/Abstract] OR "difficult"[Title/Abstract] OR "difficulty"[Title/Abstract] OR "deficit"[Title/Abstract] OR "insufficient"[Title/Abstract] OR "insufficiency"[Title/Abstract] OR "decrease"[Title/Abstract]))

Embase

((('vision'/exp OR vision:ab,ti OR visual:ab,ti OR sight,:ab,ti OR eyesight:ab,ti OR seeing:ab,ti OR blindness:ab,ti) OR ('hearing'/exp OR 'hearing':ab,ti OR deafness:ab,ti OR aural:ab,ti OR audition:ab,ti) OR ('smelling':ab,ti OR olfactory:ab,ti OR olfaction:ab,ti OR smell:ab,ti OR 'parosmia':ab,ti OR microsmia:ab,ti OR cacosmia:ab,ti OR dysosmia:ab,ti OR anosmia:ab,ti OR hyposmia:ab,ti) OR ('taste'/exp OR taste:ab,ti OR hypogeusia:ab,ti OR

gustatory:ab,ti OR gustation:ab,ti) OR ('smelling'/exp OR 'smelling':ab,ti OR olfactory:ab,ti OR olfaction:ab,ti OR smell:ab,ti OR 'parosmia':ab,ti OR microsmia:ab,ti OR cacosmia:ab,ti OR dysosmia:ab,ti OR anosmia:ab,ti OR hyposmia:ab,ti)) AND ('disability'/exp OR 'disability':ab,ti OR impairment:ab,ti OR deficit:ab,ti OR dysfunction:ab,ti OR diminish:ab,ti OR diminished:ab,ti OR deterioration:ab,ti OR defect:ab,ti OR disease:ab,ti OR reduce:ab,ti OR reduction:ab,ti OR decline:ab,ti OR loss:ab,ti OR disorder:ab,ti OR difficult:ab,ti OR difficulty:ab,ti OR insufficient:ab,ti OR insufficiency:ab,ti OR decrease:ab,ti) AND ('frailty'/exp OR 'frailty':ab,ti OR frailties:ab,ti OR frailness:ab,ti OR frail:ab,ti OR 'pre frailty':ab,ti OR debility:ab,ti OR debilities:ab,ti)

Web of Science Core Collection

TS= ((taste OR hypogeusia OR gustatory OR gustation) OR (smell OR hyposmia OR anosmia OR dysosmia OR cacosmia OR microsmia OR parosmia OR olfaction OR olfactory) OR (hearing OR deafness OR aural OR audition) OR (vision OR visual OR sight OR eyesight OR seeing OR blindness)) AND (frailty OR frailties OR frailness OR frail OR pre-frailty OR debility OR debilities) AND (impairment OR dysfunction OR loss OR diminish OR diminished OR deterioration OR defect OR disease OR reduce OR reduction OR decline OR loss OR disorder OR difficult OR difficulty OR deficit OR insufficient OR insufficiency OR decrease)

The Cochrane Library

((MeSH descriptor: [Vision, Ocular] explode all trees OR (vision):ti,ab,kw OR (visual):ti,ab,kw OR (sight):ti,ab,kw OR (eyesight):ti,ab,kw OR (seeing):ti,ab,kw OR (blindness):ti,ab,kw) OR (MeSH descriptor: [Hearing] explode all trees OR (hearing):ti,ab,kw OR (deafness):ti,ab,kw OR (aural):ti,ab,kw OR (audition):ti,ab,kw) OR (MeSH descriptor: [Smell] explode all trees OR (smell):ti,ab,kw OR (olfactory):ti,ab,kw OR (olfaction):ti,ab,kw OR (parosmia):ti,ab,kw OR (microsmia):ti,ab,kw OR (cacosmia):ti,ab,kw OR (dysosmia):ti,ab,kw OR (anosmia):ti,ab,kw OR (hyposmia):ti,ab,kw) OR (MeSH descriptor: [Taste] explode all trees OR (taste):ti,ab,kw OR (gustation):ti,ab,kw OR (gustatory):ti,ab,kw OR (hypogeusia):ti,ab,kw)) AND (impairment):ti,ab,kw OR (deficit):ti,ab,kw OR (dysfunction):ti,ab,kw OR (loss):ti,ab,kw OR (diminish):ti,ab,kw OR (diminished):ti,ab,kw OR (deterioration):ti,ab,kw OR (defect):ti,ab,kw OR (disease):ti,ab,kw OR (reduce):ti,ab,kw OR (reduction):ti,ab,kw OR (decline):ti,ab,kw OR (loss):ti,ab,kw OR (disorder):ti,ab,kw OR (difficult):ti,ab,kw OR (difficulty):ti,ab,kw OR (deficit):ti,ab,kw OR

(insufficient):ti,ab,kw OR (insufficiency):ti,ab,kw OR (decrease):ti,ab,kw AND (MeSH descriptor: [Frailty] explode all trees OR (frailty):ti,ab,kw OR (frailties):ti,ab,kw OR (frailness):ti,ab,kw OR (frail):ti,ab,kw OR MeSH descriptor: [Frailty] explode all trees OR (debility):ti,ab,kw OR (debilities):ti,ab,kw).

Participant or population Adults at least age 18 years.

Intervention To evaluate the impact of sensory impairment on frailty, the inclusion criteria was: Exposure (E): impairments of vision, hearing, smell, or taste; measured using objective (example: Snellen chart, pure-tone audiometry, Sniffin' sticks identification test) or subjective assessments (example: whisper test, self-report); To evaluate the impact of frailty on sensory impairment, the inclusion criteria was: Exposure (E): frailty that were operationalized using validated criteria (e.g., Fried Frailty Criteria, Frailty Index).

Comparator To evaluate the impact of sensory impairment on frailty, the inclusion criteria was: Comparator (C): participants without sensory impairment as defined above; To evaluate the impact of frailty on sensory impairment, the inclusion criteria was: Comparator (C): participants without frailty as defined above.

Study designs to be included Observational studies (cross-sectional, longitudinal, and case-control).

Eligibility criteria According to the acronym PECOS, the inclusion criteria for the articles included in the meta-analysis were as follows: To evaluate the impact of sensory impairment on frailty, the inclusion criteria was: Population (P): adults at least age 18 years; Exposure (E): impairments of vision, hearing, smell, or taste; measured using objective (example: Snellen chart, pure-tone audiometry, Sniffin' sticks identification test) or subjective assessments (example: whisper test, self-report); Comparator (C): participants without sensory impairment as defined above; Outcome (O): studies presenting data or reporting the association between sensory impairment and frailty risk; Study design (S): observational studies (cross-sectional, longitudinal, and case-control). There were no restrictions on language. To evaluate the impact of frailty on sensory impairment, the inclusion criteria was: Population (P): adults at least age 18 years; Exposure (E): frailty that were operationalized using validated criteria (e.g., Fried Frailty Criteria, Frailty Index); Comparator (C): participants without frailty as

defined above; Outcome (O): studies presenting data or reporting the association between sensory impairment and frailty risk; Study design (S): observational studies (cross-sectional, longitudinal, and case-control). There were no restrictions on language.

Information sources Four databases (PubMed, Embase, the Web of Science Core Collection database and the Cochrane Library) were searched for relevant literature from their inception to October 23, 2024.

Main outcome(s) The meta-analysis identifies significant bidirectional associations between sensory impairments (i.e., VI, HI, SI and TI) and frailty.

Quality assessment / Risk of bias analysis The Newcastle-Ottawa Scale (NOS) was used to assess the risk of included studies.

Strategy of data synthesis The odds ratios (ORs) were extracted, and following previous studies, relative risks (RRs) and hazard ratios (HRs) were directly considered as ORs. For those ORs calculated between two groups (example: exposure to impairments of vision and hearing), ORs and corresponding 95% confidence intervals (CIs) were extracted directly. Fixed-effects model (when the I² value was less than 50%, indicating low heterogeneity) or random-effects model (when the I² value was greater than 50%, indicating high heterogeneity) was used to pool ORs and 95% CIs of frailty and sensory impairment as appropriately. If there were two and more studies reporting the association between the same sensory impairment and frailty, meta-analysis was conducted. The study with the most comprehensive information was included when two studies used data from the same population.

Subgroup analysis Subgroup analysis was performed based on the type of outcomes (prefrailty, frailty), the method of measuring sensory impairment (objective or subjective), covariate adjustment (yes or no), study design (cross-sectional or longitudinal).

Sensitivity analysis Sensitivity analysis was performed by examining the reliability of results after excluding each study one by one, if applicable.

Country(ies) involved China.

Keywords Frailty, Vision impairment, Hearing impairment, Smell impairment, Taste impairment.

Contributions of each author

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