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Health-Related Quality of Life Benefits with Hearing Aids, in partnership with the American Academy of Audiology

Carole E Johnson, PhD, AuD

Anna Marie Jilla, PhD, AuD

Disclosures

- **Presenter Disclosure**: Financial: Anna Jilla is employed at the University of Louisiana at Lafayette; received an honorarium for presenting this course, and receives research support from the American Academy of Audiology. Non-financial: Anna Jilla serves as a volunteer with the American Academy of Audiology, Coding and Reimbursement Committee and Research Poster Subcommittee, the American Speech-Language Hearing Association, and is an Editorial Board Member - American Journal of Audiology. Financial: Carole Johnson directs the Hearing Evaluation, Rehabilitation, and Outcomes (HERO) Laboratory and receives research support from the American Academy of Audiology. She received an honorarium for presenting this course. Non-financial: Carole Johnson has no relevant non-financial relationships to disclose.
- **Content Disclosure**: This learning event does not focus exclusively on any specific product or service.
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- The interventions discussed in this course may be limited in generalizability, requiring practitioners to consider specific individual and population factors.
- The course may not cover all possible risk factors, diagnostic methods, or treatment options, and complex cases may require additional considerations.
- Healthcare providers should apply cultural competence and sensitivity to ensure effective and respectful care based on their patients' diverse needs.
- Providers should always evaluate the limitations of diagnostic and screening tools, considering their potential for false results as well as any ethical implications.
- It is the responsibility of course participants to critically evaluate the evidence from multiple sources to guide professional practice.

Learning Objectives

After this course, participants will be able to:

- Define health-related quality of life (HRQoL) and explain its relevance as an assessment domain for hearing healthcare interventions.
- Explain findings from Chisolm and colleagues' (2007) and Johnson and colleagues' (2026) systematic reviews with meta-analyses on the HRQoL outcomes of hearing aid use for adults with sensorineural hearing loss.
- Describe how to counsel patients about the benefits of hearing aid use, incorporating both statistical and clinical significance of the systematic review findings.

Outline

- Where We Began: Reviewing Chisolm et al (2007)
- Systematic Review Protocol
- Results (Meta-analyses, Risk of Bias Assessment, Graded Recommendations, and Ongoing Clinical Trials)
- Contextualizing Results & A Look Forward to Specific Aim 2
- Q&A

Where we began: Reviewing Chisolm et al (2007)

AAA Task Force on the Nonacoustic Benefits of Amplification

A Systematic Review of Health-Related Quality of Life and Hearing Aids: Final Report of the American Academy of Audiology Task Force on the Health-Related Quality of Life Benefits of Amplification in Adults

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Abstract

This is the final report of the American Academy of Audiology Task Force on the Health-Related Quality of Life (HRQoL) Benefits of Amplification in Adults. A systematic review with meta-analysis examined evidence pertaining to the use of hearing aids for improving HRQoL for adults with sensorineural hearing loss (SNHL). Relevant search strings applied to the CENTRAL, CINAHL, Cochrane Reviews, ComDisDome, EBMR, and PubMed databases identified randomized controlled trial, quasi-experimental, and nonexperimental pre-post test designed studies. Sixteen studies met a priori criteria for inclusion in this review. A random-effects meta-analysis showed differential results for generic versus disease-specific HRQoL measures for within- and between-subject designs. Although generic measures used for within-subject designs did not demonstrate HRQoL benefits from hearing aids, mean effect sizes and confidence intervals for within-subject designs and disease-specific instruments suggested that hearing aids have a small-to-medium impact on HRQoL. Further, the between-subject studies supported at least a small effect for generic measures, and when measured by disease-specific instruments, hearing aids had medium-to-large effects on adults' HRQoL. This review

Commissioned in 2003 by President Angela Loavenbruck

Members

- Teresa Chisolm, PhD, Co-chair
- Craig Newman, PhD, Co-chair
- Harvey Abrams, PhD
- Jeffrey L Danhauer, PhD
- Carole E Johnson, PhD, AuD
- Sharon Lesner, PhD
- Patricia McCarthy, PhD
- Laural J Portz, AuD

Chisolm et al (2007) https://doi.org/10.3766/jaaa.18.2.7

Levels of Evidence (Oxford Centre for Evidence-based Medicine, 2009)

- **Ia:** Systematic reviews (SRs) of randomized clinical trials (RCTs)
- **Ib:** RCTs
- **IIa:** SRs of cohort studies
- **IIb:** Cohort studies
- **IIc:** “Outcomes” research, ecological studies (e.g., pre post or observational studies)
- **IIIa:** SRs of case-control studies
- **IIIb:** Case-control studies
- **IV:** Case-series studies
- **V:** Expert opinion

Levels of Evidence (Oxford Centre for Evidence-based Medicine, 2009)

- **Ia:** Systematic reviews (SRs) of randomized clinical trials (RCTs)
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→ **Grade A**

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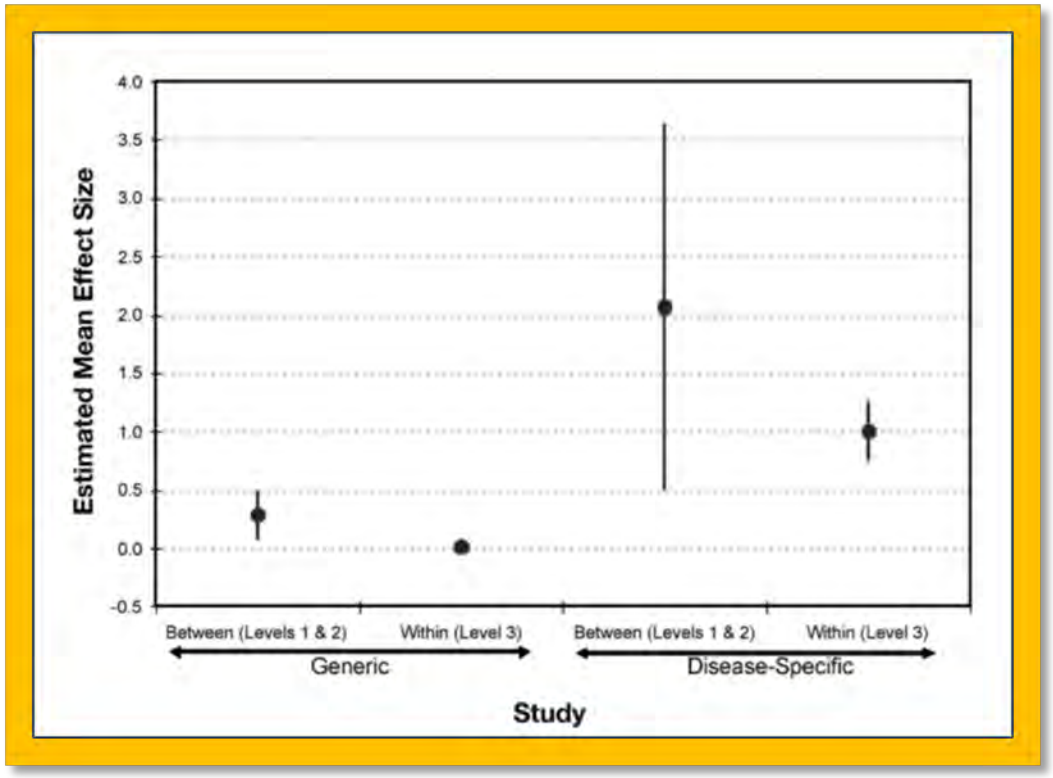
Methods (Chisolm et al, 2007)

- Applied relevant search strings to databases (e.g., CENTRAL, CINAHL, Cochrane Reviews, ComDisDome, OVID EBMR, and PubMed) to identify randomized controlled trials, quasi-experimental, and nonexperimental pre-post designed studies
- Sixteen studies met the criteria for possible inclusion in a random-effects meta-analysis of generic and disease-specific outcome measures
- Analog and digitally programmable hearing aids
- Few randomized clinical trials

Findings (Chisolm et al, 2007)



- The mean effect size and 95% confidence interval for within-subject designs and disease-specific instruments suggested that hearing aids have a **small-to-medium impact** on HRQoL
- Further, the between-subject studies supported at least **a small effect** for generic measures, and when measured by disease-specific instruments, hearing aids had **medium-to-large effects** on adults' HRQoL

Conclusions (Chisolm et al, 2007)

- The evidence supported a **recommendation grade of "B"** for the use of hearing aids, a noninvasive low-risk intervention, to improve the HRQoL of adults with SNHL
- The Task Force recommended that randomized clinical trials (RCTs) be conducted to assess the HRQoL benefits of amplification and that the systematic review be periodically updated

Where We Began

Need for an Update

- Impact of untreated SNHL on HRQoL of adults of SNHL
  - Concept of HRQoL has expanded to encompass broader aspects of health and well-being
    - Generic
    - Disease-specific (note: Chisolm et al [2007] found that most outcomes were reported for disease-specific measures only)
  - Untreated SNHL is now recognized as being associated with other chronic health conditions
  - Both the definition of and measurement of HRQoL have evolved to reflect these changes
- Growing body of evidence and evolution of hearing technology
  - 20 years have passed
  - More RCTs have been conducted (Chisolm et al [2007] has primarily within-subjects designs lacking control groups)
  - Last systematic review involved analog hearing aids only
- Improvements in systematic review study design and meta-analytic methods
  - Chisolm et al (2007) relied primarily on within-subject studies lacking a true control group
  - Skilled library scientist to conduct search
  - Meta-analytic methods were incorrect, lacked sophistication, or were incomplete (e.g., no prediction intervals, no heterogeneity assessments)
  - Covidence©, a systematic review management platform, and Comprehensive Meta-Analysis statistical software were not available

Formation of the AAA Writing Group on the Health-Related Quality of Life Benefits of Hearing Aid Use

- Carole E Johnson, PhD, AuD – Co-chair
- Anna Marie Jilla, PhD, AuD – Co-chair
- Emily Gonzales, AuD
- Lindsey Jorgensen, PhD, AuD
- Magudilu Srushyla Kumar Lakshmi, PhD
- M Samantha Lewis, PhD
- Jin Hyung Park, AuD
- Elizabeth Sanders, MILS
- James Connor Sullivan, AuD

Systematic Review Protocol

What is new?

- Expanded, holistic definition of HRQoL
- Determination of graded recommendations for:
  - **Aim 1**
    - Generic HRQoL measures (e.g., 12-item Short Form [SF-12])
    - Disease-specific HRQoL measures (e.g., Hearing Handicap Inventory for the Elderly [HHIE])
  - **Aim 2** (specific areas of functioning)
    - Balance
    - Cognition
    - Mental Health

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  - **Aim 2** (specific areas of functioning)
    - Balance
    - Cognition
    - Mental Health

Development of a PICO Rubric

- Population
- Intervention
- Comparator
- Outcomes

Population

Include

- 18 years and older with SNHL (mixed hearing loss that is primarily SNHL)
- Any severity of hearing loss (mild to profound)
- Adults:
  - Community dwelling
  - Residing in assisted living

Exclude

- Adults in:
  - Skilled nursing facilities
  - Correctional facilities
  - Acute care (inpatient)

Intervention

Include various

- Hearing aid styles (receiver-in-the-canal, in-the-ear, behind-the-ear)
- Power source (battery, rechargeable, or solar powered)
- Signal processing circuitry (analog and digital)
- Microphone technology (omnidirectional and directional)
- Fitting arrangement (monaural and binaural)
- Service-delivery method (audiologist fit, direct to consumer, over the counter)
- Payment type (self-pay or free)

Exclude

- Cochlear implants
- Bone conduction hearing aids
- Other implantable hearing technology

Comparator

Include

- Nonuse of hearing aids
- Controlled intervention (such as healthy aging education program) involving participants who did not use hearing aids

Exclude

- Sham or placebo hearing aids to prevent amplification-related confounding in HRQoL outcomes

Outcomes

Include

- Disease-specific HRQoL outcome measures (e.g., Hearing Handicap Inventory for the Elderly)
- Generic HRQoL Measures (e.g., EQ-5D, SE-12, and SF-36)

Exclude

- Outcome measures not meeting inclusion criteria

Search and Retrieval Process

- Met with Elizabeth Sanders, MILS, and provided her with:
  - Expanded definition of HRQoL
  - PICO rubric
- Developed unique search strategies for:
  - CINAHL
  - Cochrane Library
  - EMBASE
  - MEDLINE
  - PubMed
  - Scopus
  - Web of Science Citation Indexes
  - ISRCTN Registry
  - ClinicalTrials.gov
  - WHO International Clinical Trials Registry Platform

Study Tools

- Use of **Covidence©**: An Online Systematic Review Platform
  - Study selection
    - Title and abstract
    - Full-text review
  - Quality assessment (Revised Cochrane Risk-of-Bias Tool for Randomized Trials: RoB 2)
  - Data extraction
- Use of **Comprehensive Meta-Analysis** software
  - Standardized difference in means
  - I-squared statistic
  - Prediction Intervals
  - Publication Bias

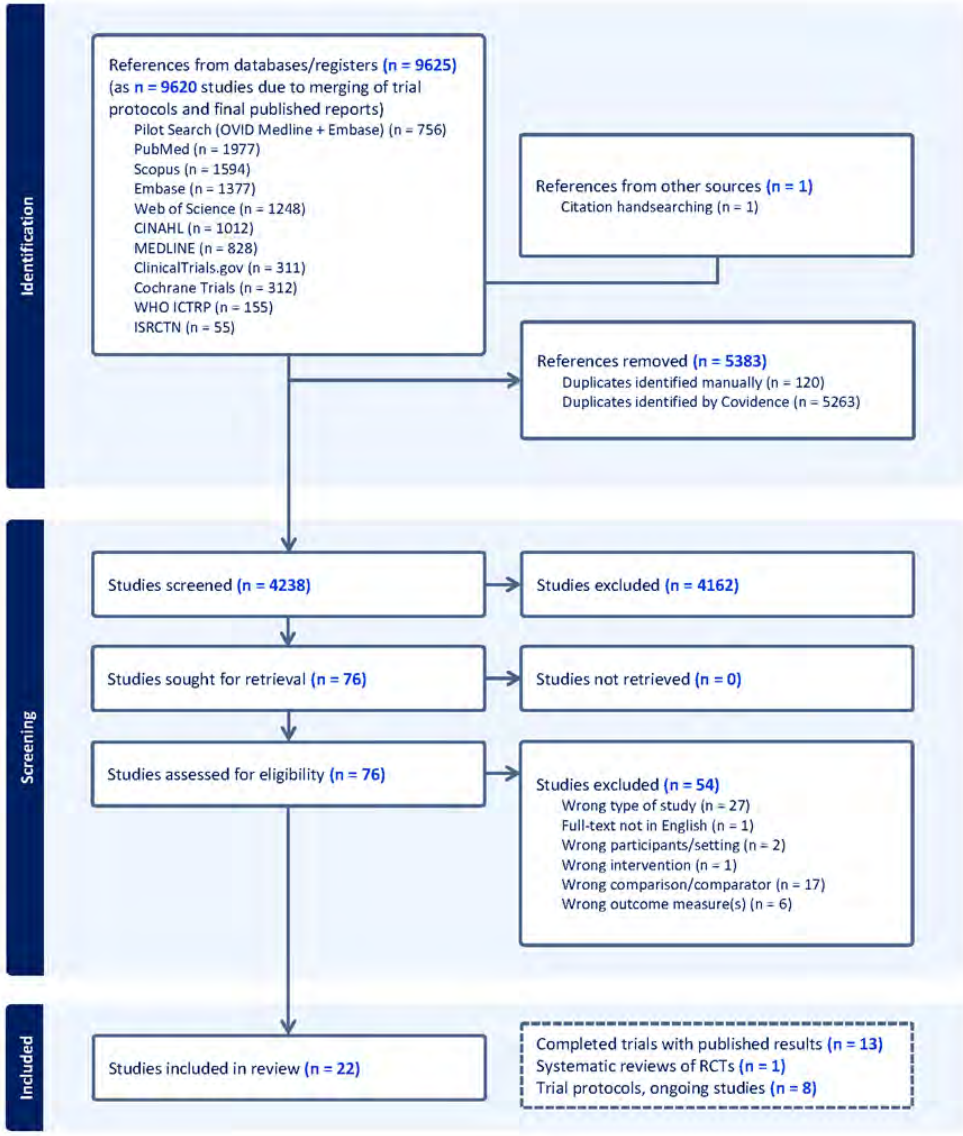
Results

Meta-analyses, Risk of Bias Assessment,
Graded Recommendations, and Ongoing Clinical Trials

Results for the Search and Retrieval Process

- The database search yielded **9,621** articles (9,620 + 1 handsearching)
- **5,383** duplicates were removed with **4,238** articles undergoing title and abstract screening, resulting in **76** articles for full-text review
- 22 articles were included
  - **13** randomized controlled trials (RCTs)
  - **One** systematic review of RCTs were selected
  - **8** study protocols

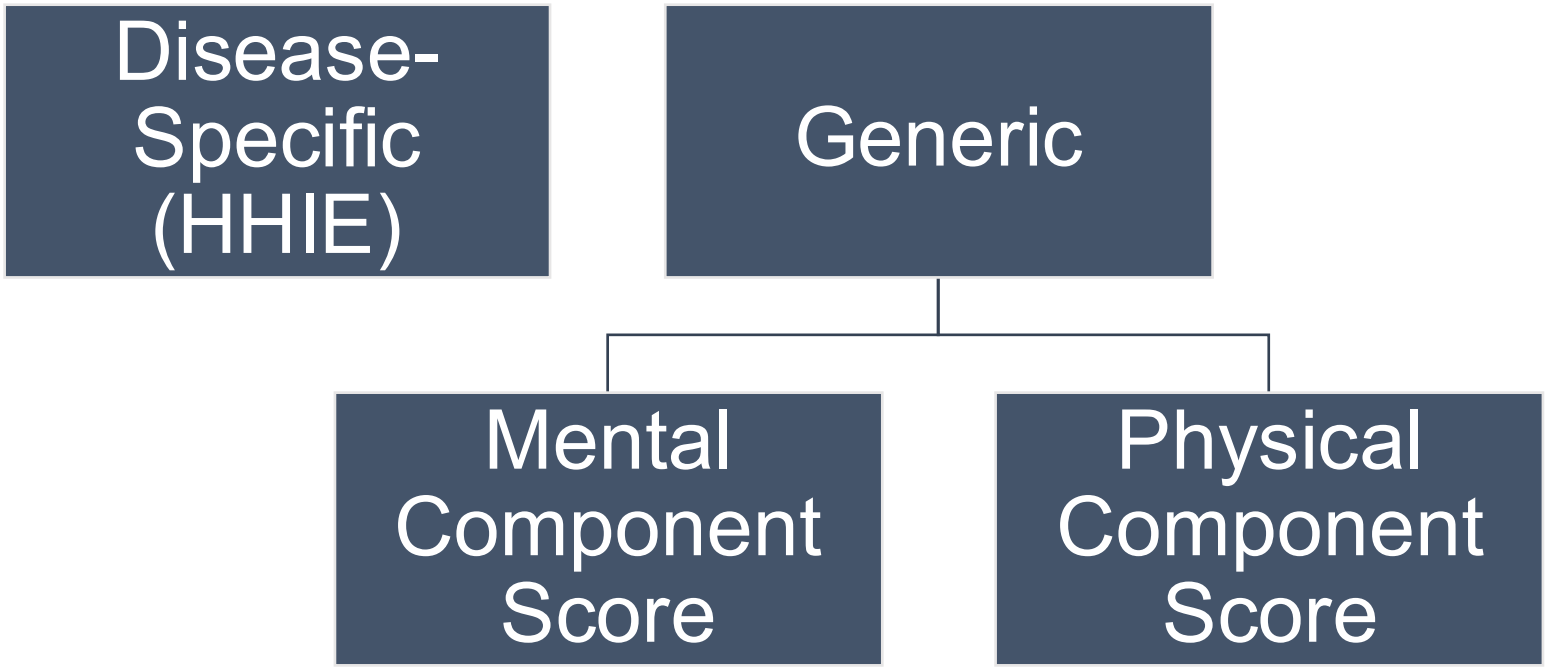
PRISMA Chart



Evidence Profile of Included RCTs (N = 13)

Number of RCTs	13 included; 10 suitable for meta-analysis
Publication date range of included RCTs	1990-2025
Number of participants in meta-analyses	(1) disease-specific, N = 1965; (2) generic with mental and physical component scores of SF-12, N = 2054 for both
Participant Age	Average age > 65 years across N = 13 included clinical trials
Study Settings	Outpatient university medical center (N = 4), Veterans health clinic (N = 2), local health center (N = 2), various non-health-related community sites (N = 2), community-based mobile hearing clinic (N = 1), home-based (N = 1), combination home and outpatient clinic (N = 1)
Location of Studies	USA (N = 8), Western Europe (N = 2), Singapore (N = 1), China (N = 2)
Disease-specific HRQoL outcomes	Hearing Handicap Inventory for the Elderly (HHIE) and Hearing Handicap Inventory for the Elderly – Screening Version (HHIE-S)
Generic HRQoL outcomes	Health Utilities Index 3 (HUI-3), Self-Evaluation of Life Function (SELF), Medical Outcomes Study 36-item Short Form Health Survey (MOS SF-36), 12-item Short Form (SF-12), and World Health Organization Disability Assessment Schedule II (WHO-DAS II)

HRQoL Measures



Generic HRQoL Measures

- Health Utilities Index 3 (HUI-3)
- *12-item Short Form (SF-12)
- *Medical Outcome Study 36-item Short-Form Health Survey (SF-36)
- Self-Evaluation of Life Function (SELF)
- World Health Organization Disability Assessment Schedule II (WHO-DAS II)

* = measures with mental and physical component scores

Results

Disease-Specific Outcome Measures

Effect Size

- Random-effects meta-analysis produced a mean effect size of 1.372 (95% confidence interval: 1.104 – 1.640; Z = 10.040; p < 0.001), based on 7 RCTs with a total of **1,965** participants

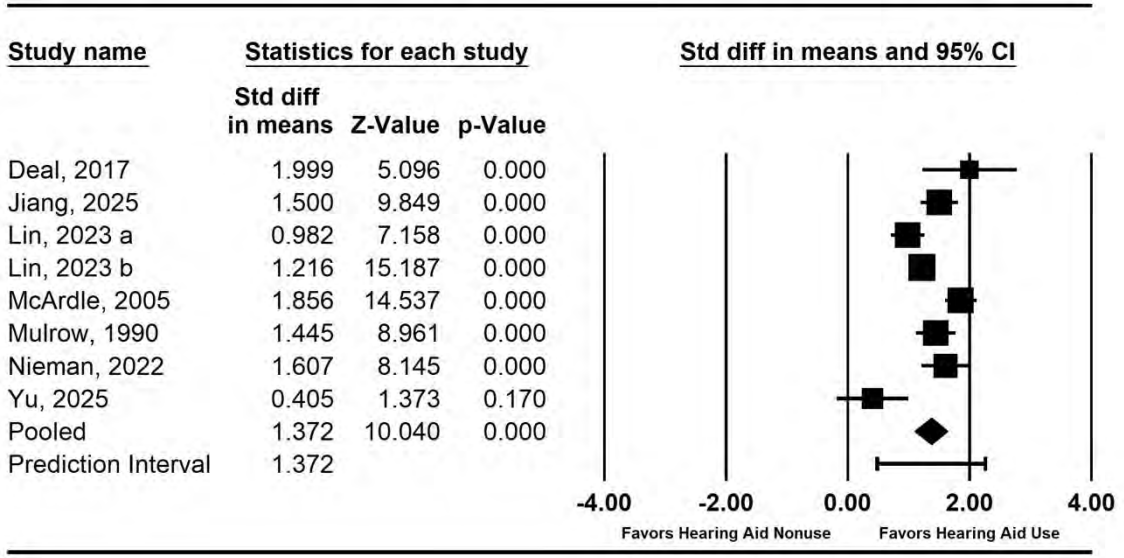
I^2 Statistic

- **83%** of variance was attributable to true effects rather than sampling error.

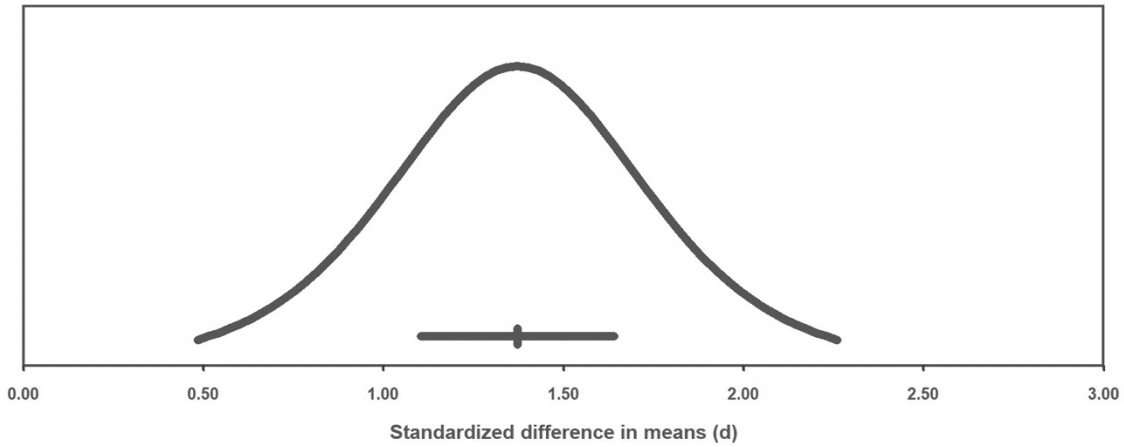
Prediction Interval (PI)

- PI was **0.484 to 2.260**, indicating that the true effect size in 95% of all comparable populations fell in this interval.

Forest Plot



Prediction Interval



The mean effect size is 1.37 with a 95% confidence interval of 1.10 to 1.64
The true effect size in 95% of all comparable populations falls in the interval 0.48 to 2.26

Results

Generic Outcome Measures

Mental Component Scores

Effect Size

- Random-effects meta-analysis produced a mean effect size of **0.288** (95% confidence interval: 0.089 – 0.487; Z = 2.832; p = 0.005), based on 7 RCTs with a total of **2,054** participants

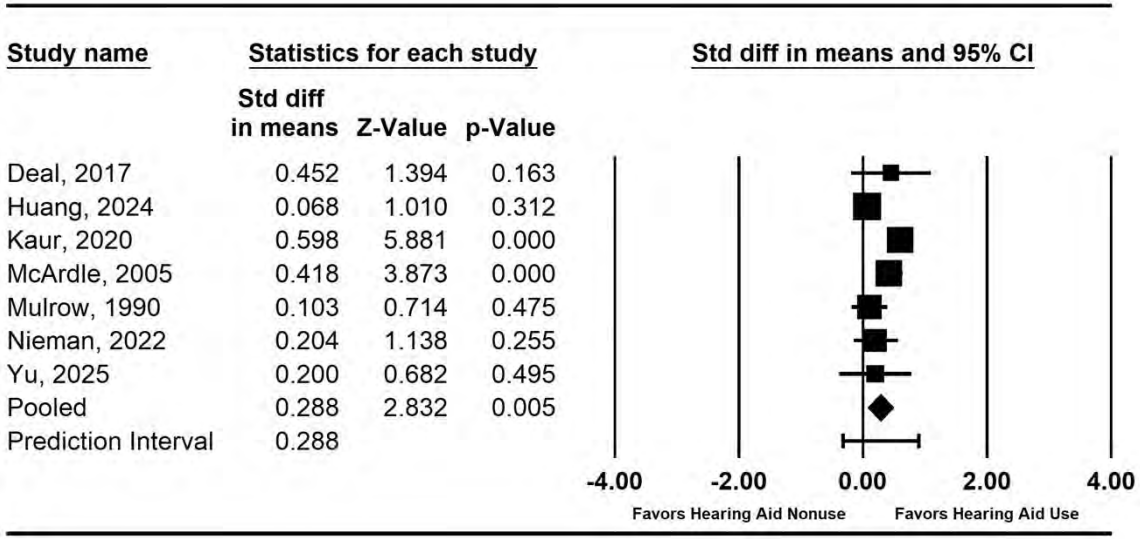
I^2 Statistic

- **74%** of variance was attributable to true effects rather than sampling error.

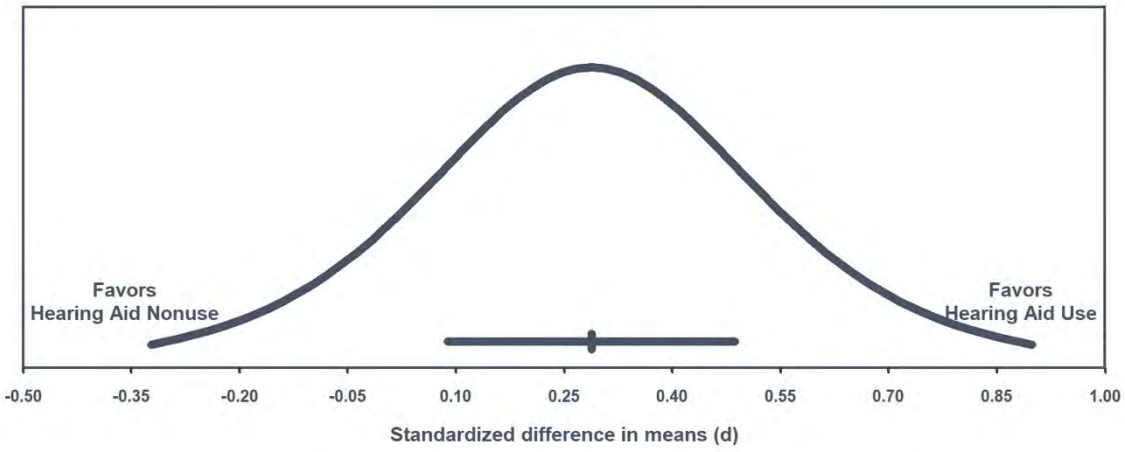
Prediction Interval (PI)

- PI was **-0.322 to 0.898**, indicating that the true effect size in 95% of all comparable populations fell in this interval.

Forest Plot



Prediction Interval



The mean effect size is 0.29 with a 95% confidence interval of 0.09 to 0.49
The true effect size in 95% of all comparable populations falls in the interval -0.32 to 0.90

Generic Outcome Measures

Physical Component Scores

Effect Size

- Random-effects meta-analysis produced a mean effect size of **0.306** (95% confidence interval: 0.107 – 0.506; Z = 3.010; p = 0.003), based on 7 RCTs with a total of **2,054** participants

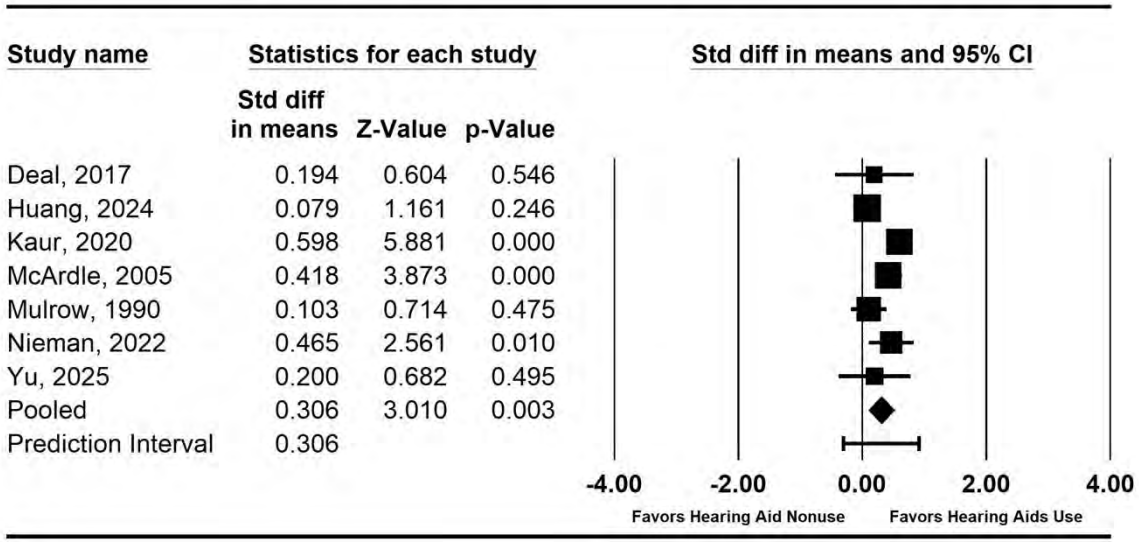
I^2 Statistic

- **74%** of variance was attributable to true effects rather than sampling error.

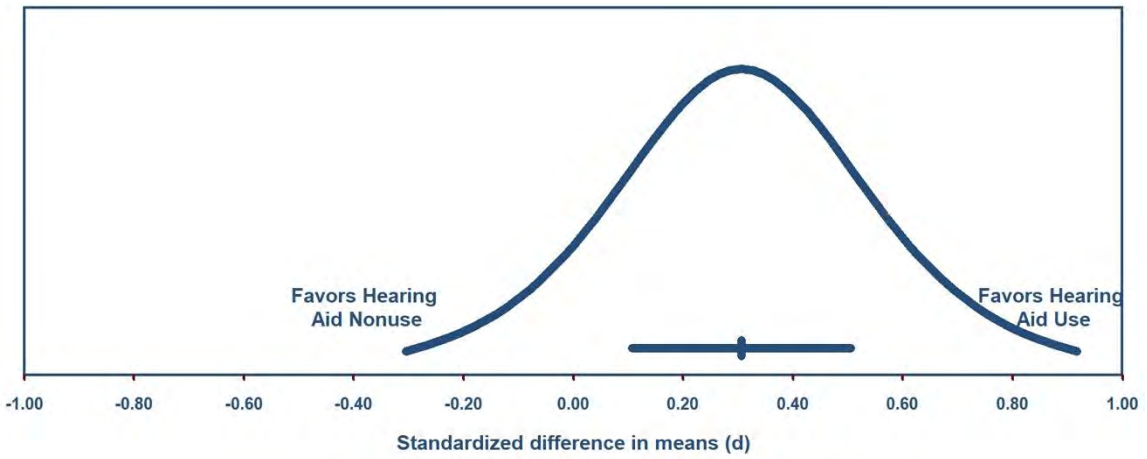
Prediction Interval (PI)

- PI was **-0.305 to 0.918**, indicating that the true effect size in 95% of all comparable populations fell in this interval.

Forest Plot



Prediction Interval

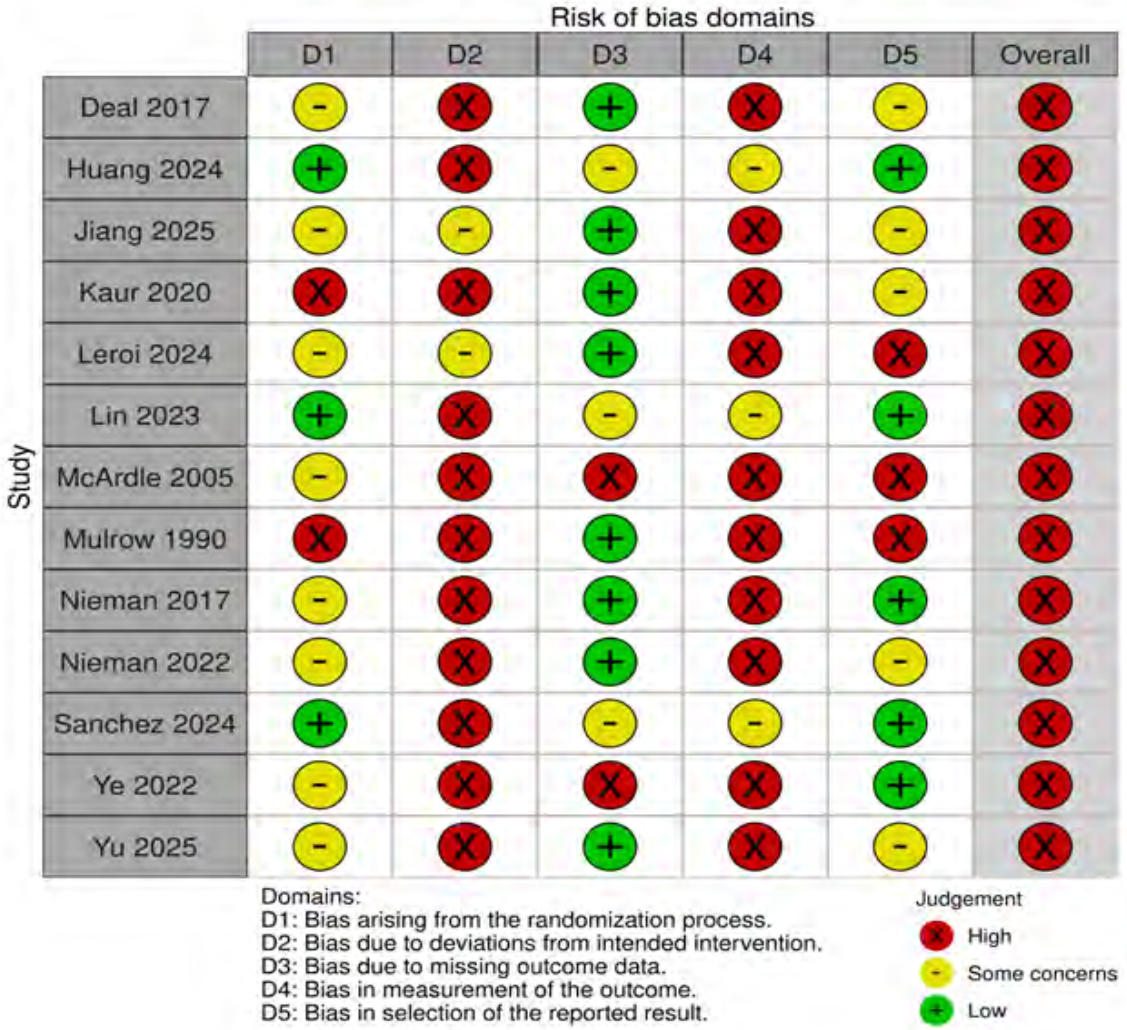


The mean effect size is 0.31 with a 95% confidence interval of 0.11 to 0.51
The true effect size in 95% of all comparable populations falls in the interval -0.30 to 0.92

Risk of Bias by Domain

- What we are doing well
  - Randomization
  - Missing outcome data
  - Selection of reported results
- Areas for improvement
  - Deviations from intended interventions
  - Outcomes measurement – blinding of assessors

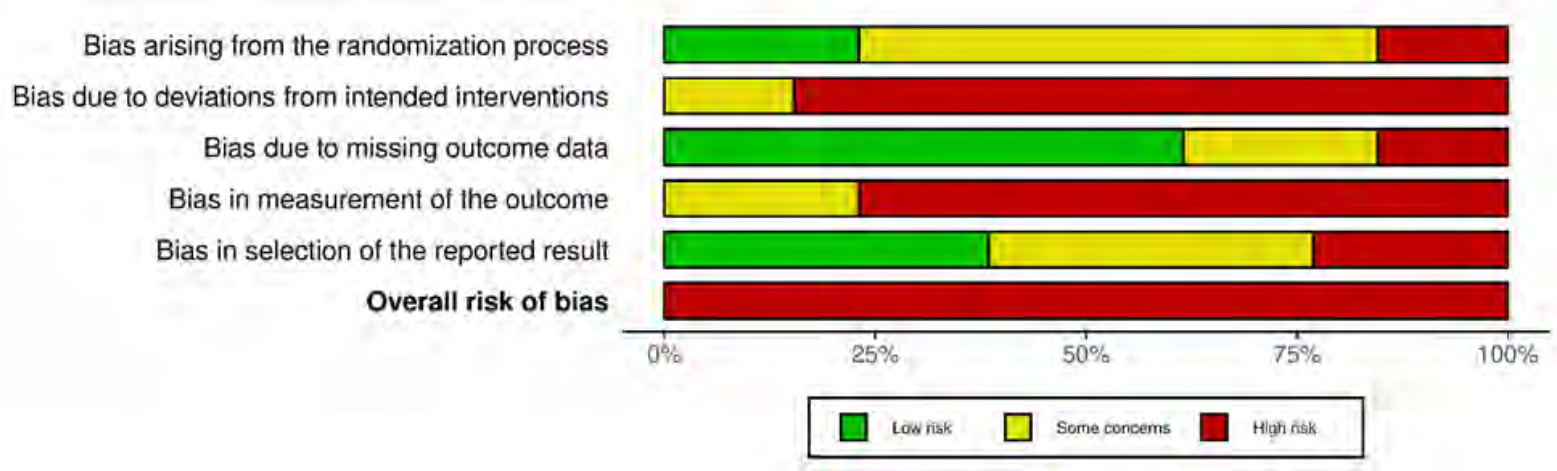
Risk of Bias by Domain for Individual Studies



Risk of Bias: Summary

- Single rating of “high risk” in any domain results in a “high risk” score for a given study
- RCTs were generally well-designed, and risks did not represent “material” bias impacting conclusions

Proportion of Type of Risk of Bias (N = 13)



Graded Recommendations

- **Size of effects:**
  - Disease-specific: **Large**
  - Generic: **Small**
- According to the Oxford Centre for Evidence-Based Medicine (2009), these findings support a **Grade A recommendation**, reflecting consistent, robust evidence that hearing aid use in adults with SNHL improves HRQoL

- **Ia:** Systematic reviews (SRs) of randomized clinical trials (RCTs)
- **Ib:** RCTs
- **IIa:** SRs of cohort studies
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- **IIIa:** SRs of case-control studies
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Ongoing Clinical Trials (N = 8)

- Registered trials with results forthcoming that otherwise met inclusion and exclusion criteria
- Characteristics
  - Locations: China (N = 4), USA (N = 2), UK (N = 1), Australia (N = 1)
  - Settings: outpatient medical centers (N = 5), community health (N = 1), home-based (N = 1)
  - Populations: primarily older adults ≥ 55 years of age; with and without related disorders (mental health, dementia, mild cognitive impairment)
  - Intervention: hearing aids
  - Comparators: active control, wait-list/delayed treatment, no intervention
  - Outcomes: HHIE, SF-12, MOS SF-36, WHOQOL-BREF

Contextualizing Results & A Look Forward to Specific Aim 2

Summary of Results

- Large effects for disease-specific and small for generic HRQoL outcome measures
- The clinical recommendation that hearing aid use versus non-use for adults with SNHL enhances HRQoL merits a **grade of A**

Possible Caveats

Mean effects were positive, while some PIs crossed the 0 line

- PIs crossing 0 is not a sign of non-significance
- These results indicate that within the universe of all possible studies there are some select cases where positive outcomes may not occur

Clinical Implications

- Preponderance of fittings were bilateral
- Majority of RCTs used evidence-based fitting procedures (Valente et al, 2007), representing outcomes that occur in conjunction with related hearing aid and rehabilitative services
- Counseling patients that hearing aids
  - Improve quality of life, but some gains may be modest and can vary by individual
  - Benefit individuals' well-being beyond audibility

Advocacy

- New evidence for USPSTF (2012, 2021) future consideration for universal hearing screening for adults 50 years and older
  - Screening
  - Efficacious treatment with diagnosis of SNHL
- Insurance and hearing aid coverage determinations
  - Robust evidence that hearing aids significantly improve HRQoL
  - Regular review of health insurance policies provide opportunities to advocate for payment or increased levels of coverage

Future Research

- Follow NASEM (2025) recommendations for core outcome measures set: Revised Hearing Handicap Inventory (RHHI: Cassarly et al, 2020)
- Address the blinding conundrum without sham devices that may confound outcomes
- Include young to middle-aged adults in samples
- Investigate impact of professional versus consumer-driven fittings
- Conduct long-term follow-up studies (>2 years)

Next Steps: Specific Aim 2

- Impact of hearing aid use on specific HRQoL domains
  - Mental health
  - Cognition
  - Balance
- Implications
  - Can better position hearing aids as medical necessities, not just optional or luxury "quality of life" widgets → insurance coverage policies
  - Supports screenings by audiologists for cognition, falls risk, and mental health
  - Demonstrates audiologists' expertise in interprofessional practice and complex care management (e.g., primary care, geriatrics, psychiatry, neurology)

Questions?
Thank you!

Carole E Johnson, PhD, AuD
Anna Marie Jilla, PhD, AuD

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