Evidence Regarding the Effectiveness of Hearing Aids in Older Adults

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Do Hearing Aids Help?

- Yes, but how can this be demonstrated?---*What is the EVIDENCE that they do?*

  - "Hearing Aid Outcome Measures"

    - Used to demonstrate or document the benefits of hearing aids to consumers, clinicians, HA manufacturers, and various third-party payers

Overview of Today's Talk

- Brief review of types of hearing-aid outcome measures

- Review of research on types of outcomes to measure

- What does the evidence say re: HA outcome measures identified?

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Hearing-Aid Outcome Measures
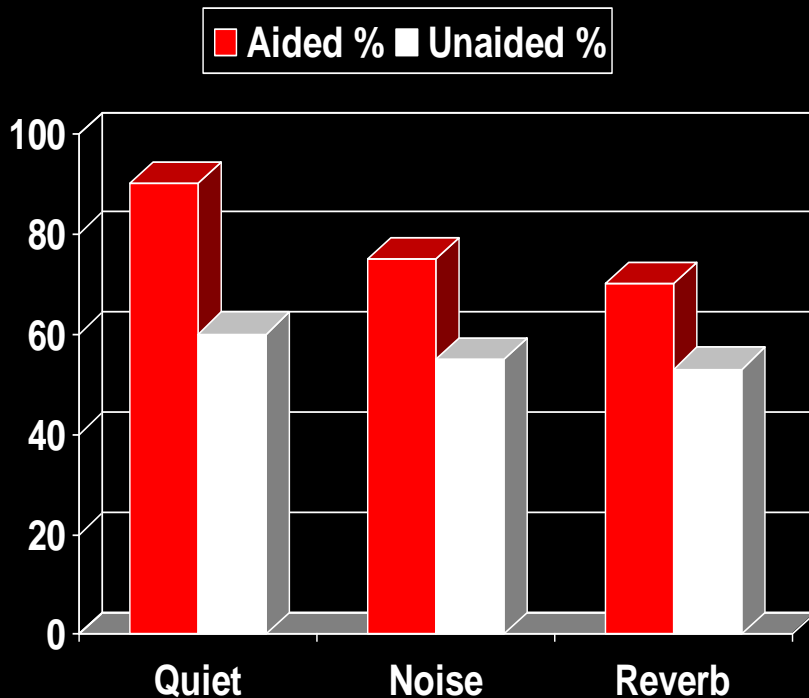
Objective Performance and Benefit

Subjective Benefit

Satisfaction

Usage

Objective Performance and Benefit
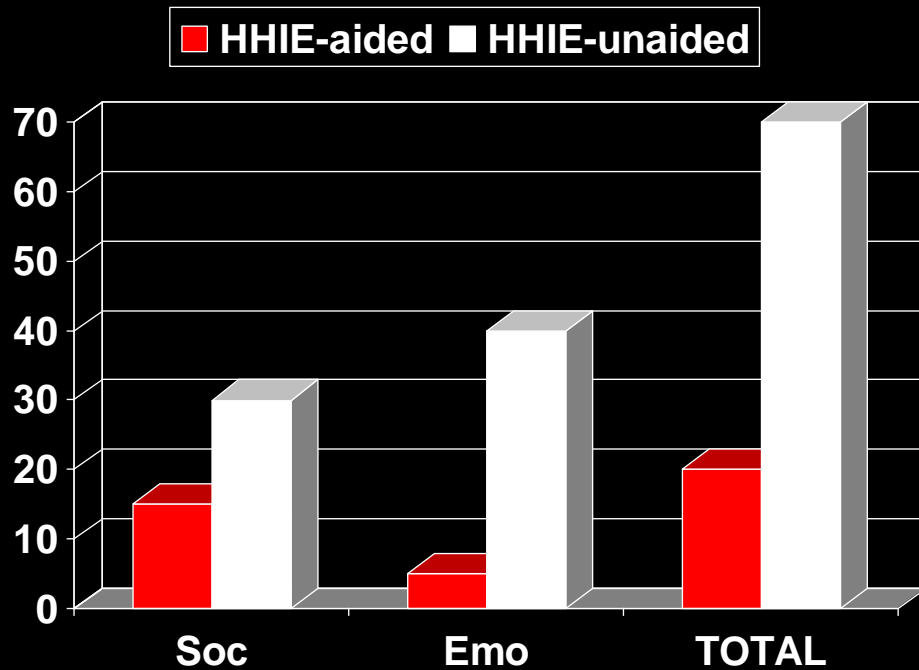

Aided and Unaided Speech Recognition

– Materials
  • Syllables, words, sentences

– Listening Conditions
  • Speech Level
  • Background
  • Azimuth

Subjective Benefit

- Subjective Scales
- Assessment of *CHANGE* from Unaided to Aided
- Examples
  - HAPI or SHAPIE
  - Benefit Profiles
    - PHAB, APHAB, COSI
  - Hearing Handicap
    - HHIE

Hearing Aid Satisfaction

Rate your satisfaction with the following ***HA features*** (VS,S,N,D,VD)

- Overall fit/comfort
- Hearing aid size
- Visibility to others
- Ease of adjusting volume
- Whistling/feedback
- Clearness of sound

Rate your satisfaction with the HA in the following ***listening situations***

- Conversation with 1 person
- In small groups
- Outdoors
- In large groups
- Watching TV
- On the telephone

MarkeTrak series, S. Kochkin

Hearing Aid Usage

- Objective Measures
  - "Datalogger"
  - Battery weight
- Subjective Measures
  - single reports of "typical usage"
  - diaries or use "logs"
  - average hours used per day vs. recommended hours

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Many Outcome Measures

Performance · **Benefit** · **Satisfaction** · *Usage*

- How are they related?
- Do they all measure the same thing?
- Do they interact in a simple or complex manner?
- Are some more important than others?
- ????

Our Approach to Sorting this Out

- Obtain multiple measures of hearing-aid outcome from large numbers of hearing aid wearers at the same time

- Examine associations (correlations) among measures

- Determine if the large set of outcome measures can be reduced to a smaller set (factor analysis)

The IU Studies
(IU-1 to IU-4)

KEY COLLABORATORS:
Nathan Amos
Amy Arthur
Nancy Barlow
Gretchen Burk
Carolyn Garner
Lisa Goerner
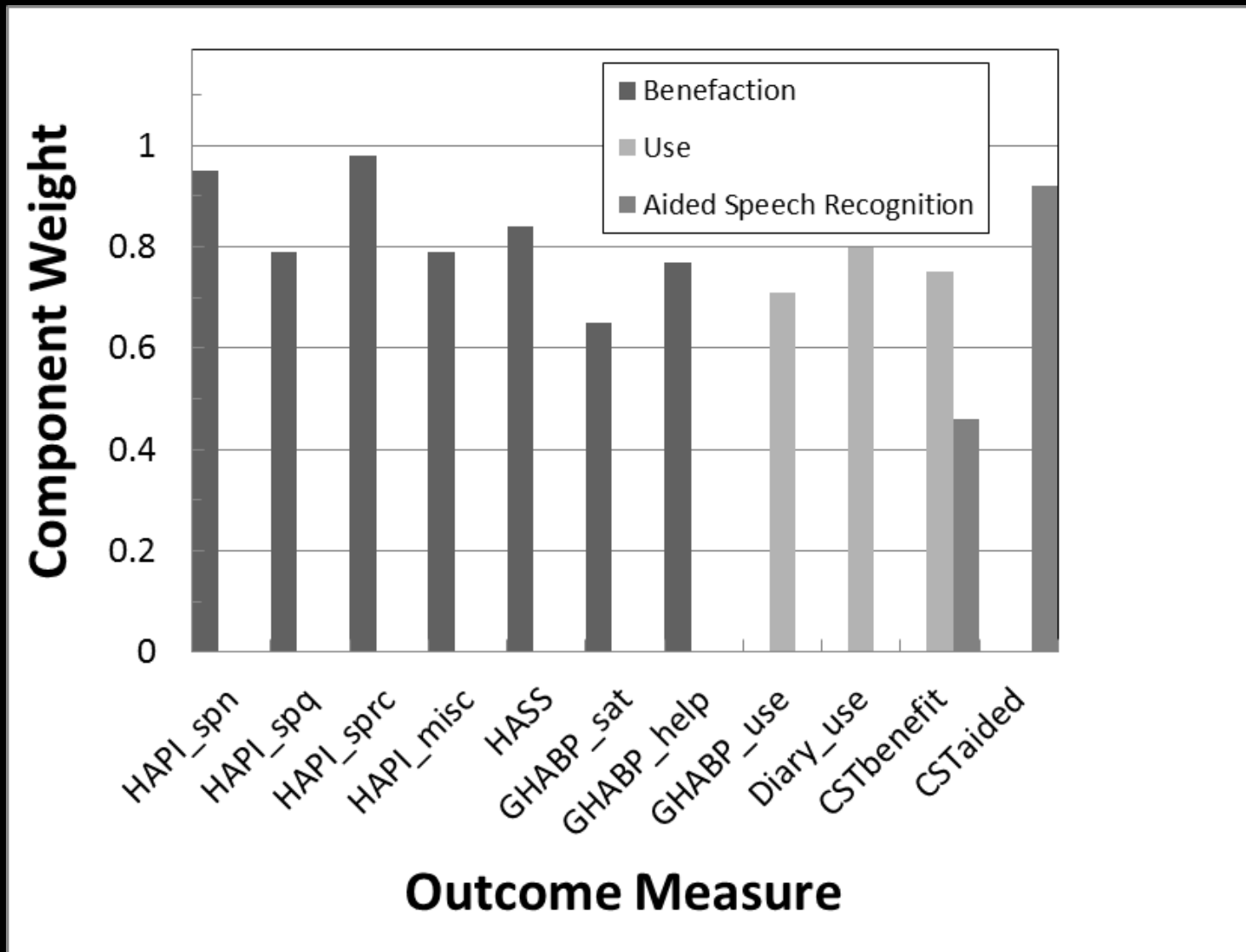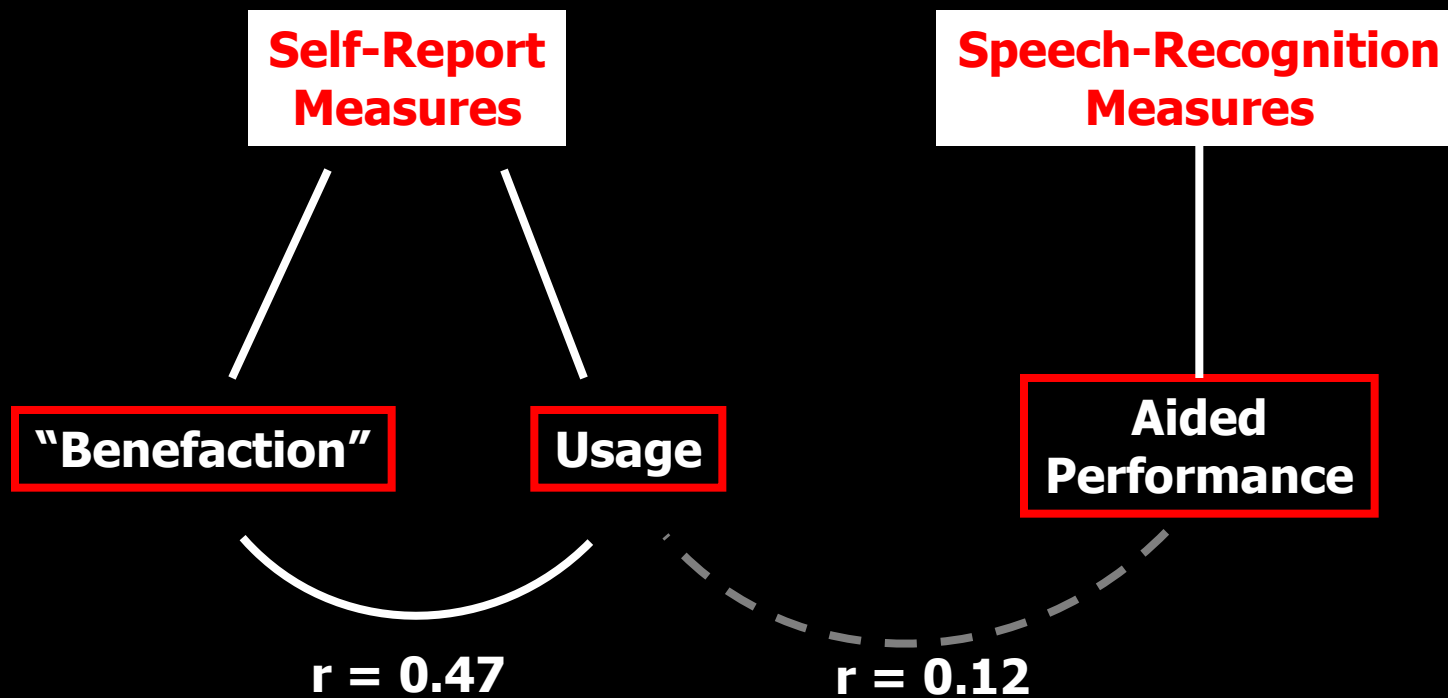Dana (Wilson) Kinney
Elizabeth Thompson
+ many students!

Common Features across IU Studies

- Shared set of 12 outcome measures
- Outcome measures completed at 4-6 weeks post-fit
- Strict protocol followed in each study, with many common features across studies
  - Older adults with typical bilateral sloping hearing loss as participants
  - Similar gain targets and real-ear verification
  - Same core team of clinicians in same clinic

Three Outcome Factors Emerged

Hearing Aid Outcome Measures
Factor Analysis Results (N=368)

Self-Report Measures

Speech-Recognition Measures

"Benefaction" **Usage** **Aided Performance**

r = 0.47 **r = 0.12**

Three factors emerged; % variance = 74.6

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Evidence about Effectiveness of Hearing Aids in Older Adults
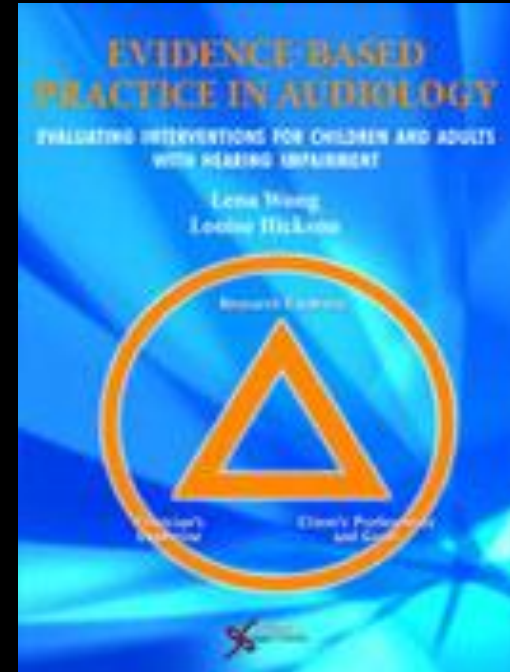## (Humes & Krull, 2012)

- Conducted Medline/PubMed search
  - Keywords: hearing aid, outcomes, adults
  - Restricted to articles published >1990 in English
- 783 articles identified on first pass
- Initial review of titles reduced pool to 165
- Review of 165 abstracts resulted in 33 articles reviewed and analysed (1 randomized controlled trial)
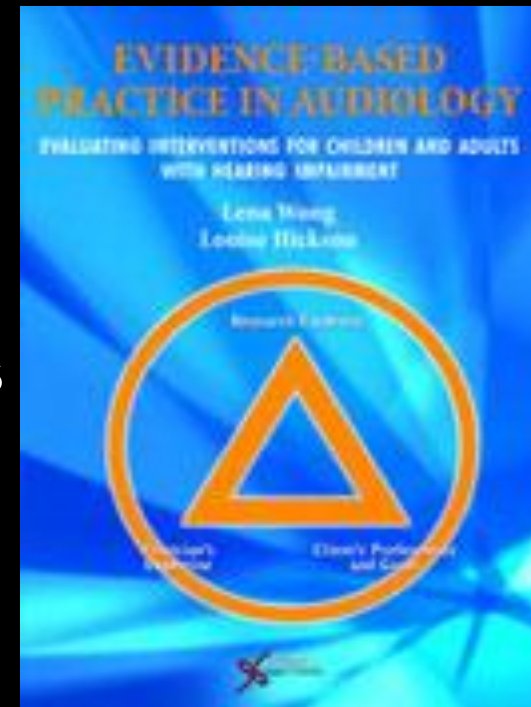
Evidence about Hearing Aids
## (Humes & Krull, 2012)

- Of the 33 articles reviewed
  - 27 studies of some aspect of benefaction
  - 12 studies of usage
  - 8 studies used the IOI-HA
  - 9 studies of aided (and unaided) speech recognition

- ALL STUDIES were performed with older adults typically having mild-to-moderate sloping sensorineural hearing loss and fitted bilaterally with real ear measurements used to verify the fitting

Evidence about Hearing Aids
(Humes & Krull, 2012)

- Overall, POSITIVE outcomes observed across studies

  - Reductions in activity limitations and participation restrictions

  - Typical ratings of 'satisfied' and 'helpful'

  - Typical aid use of 'about three quarters of the time' or '4-8 hrs/day'

  - Significantly better aided than unaided speech understanding
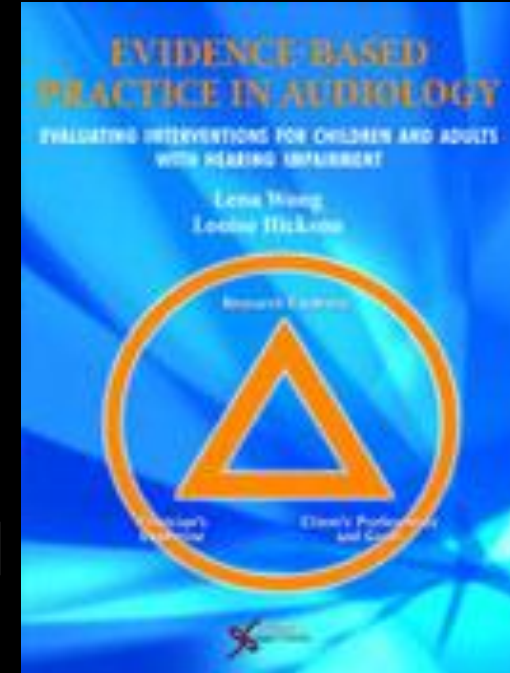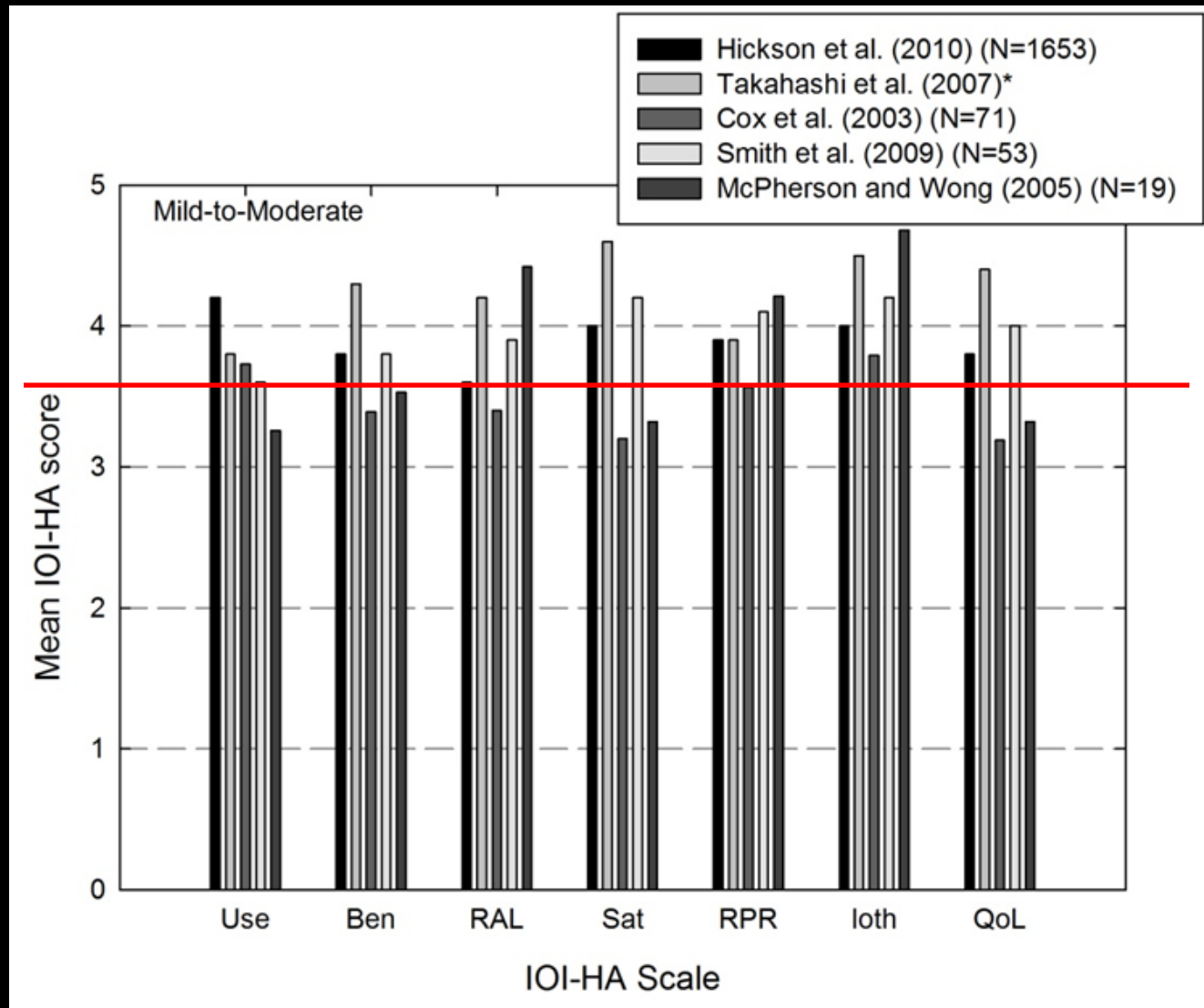
EXAMPLE: NIDCD/VA Study—Aided
and Unaided Speech-Recognition Performance
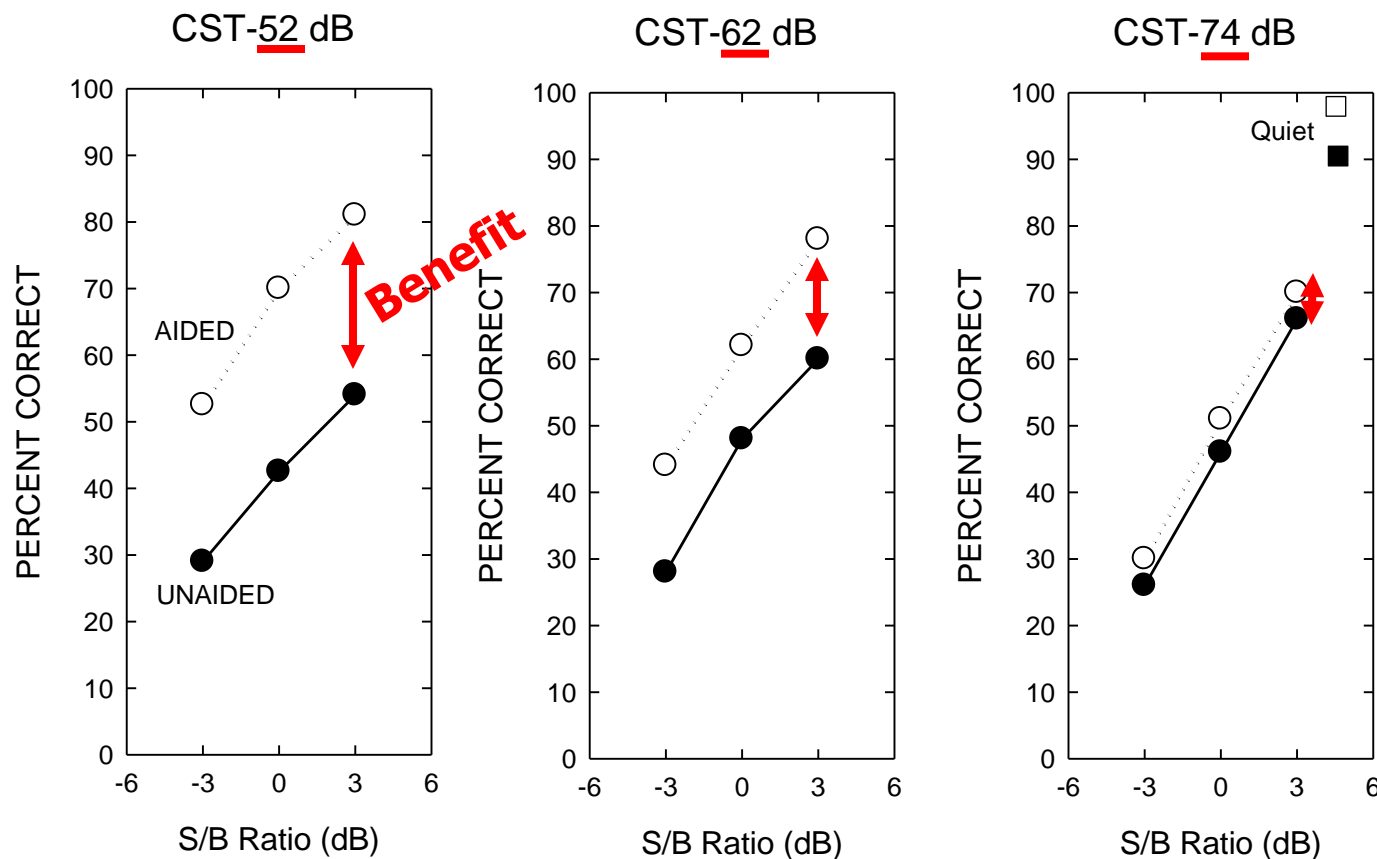
NIDCD/VA Study (Larson et al., 2000), N = 320

EXAMPLE: Analysis of IOI-HA (Mild-Moderate Hearing Loss)

Good News, but Some Caveats

- In all studies reviewed
  - Older adults with primarily mild-to-moderate sensorineural hearing loss
  - Bilateral fits for hearing aids
  - REM used for verification
- Cannot generalize positive findings to other patients or practices (i.e., young adults, severe hearing loss, monaural fits, no verification with REM)

Another Caveat: Evidence is mostly Level 3

Hierarchies of Evidence (adapted from Cox, 2005)

| Level	Type of Evidence
1	Systematic review ... ...yses of studi... ...gh-level or ...ntrolled trials (RCT)
	Well-designed RCT
3	Treatment studies that are not randomized (e.g., nonequivalent group designs, separate sample pretest/postest design and time-series designs)
4	Non-treatment studies (e.g., cohort studies, case-control studies, cross-sectional studies, and uncontrolled experiments)
5	Case studies
6	Expert comments

More clinical research is needed!
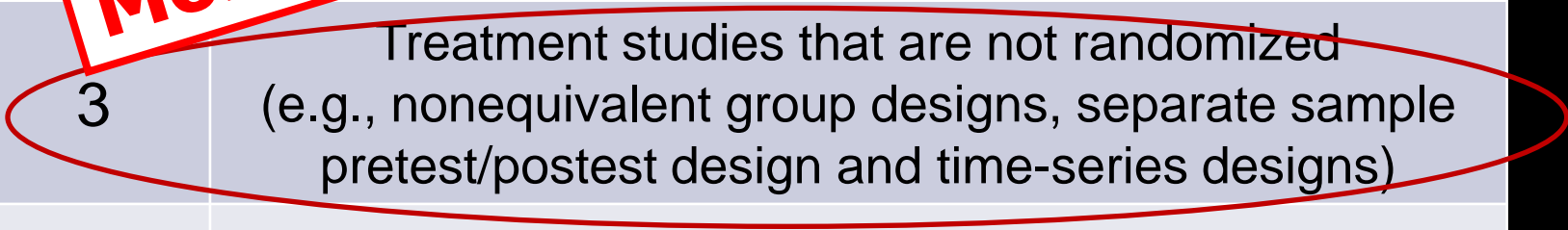
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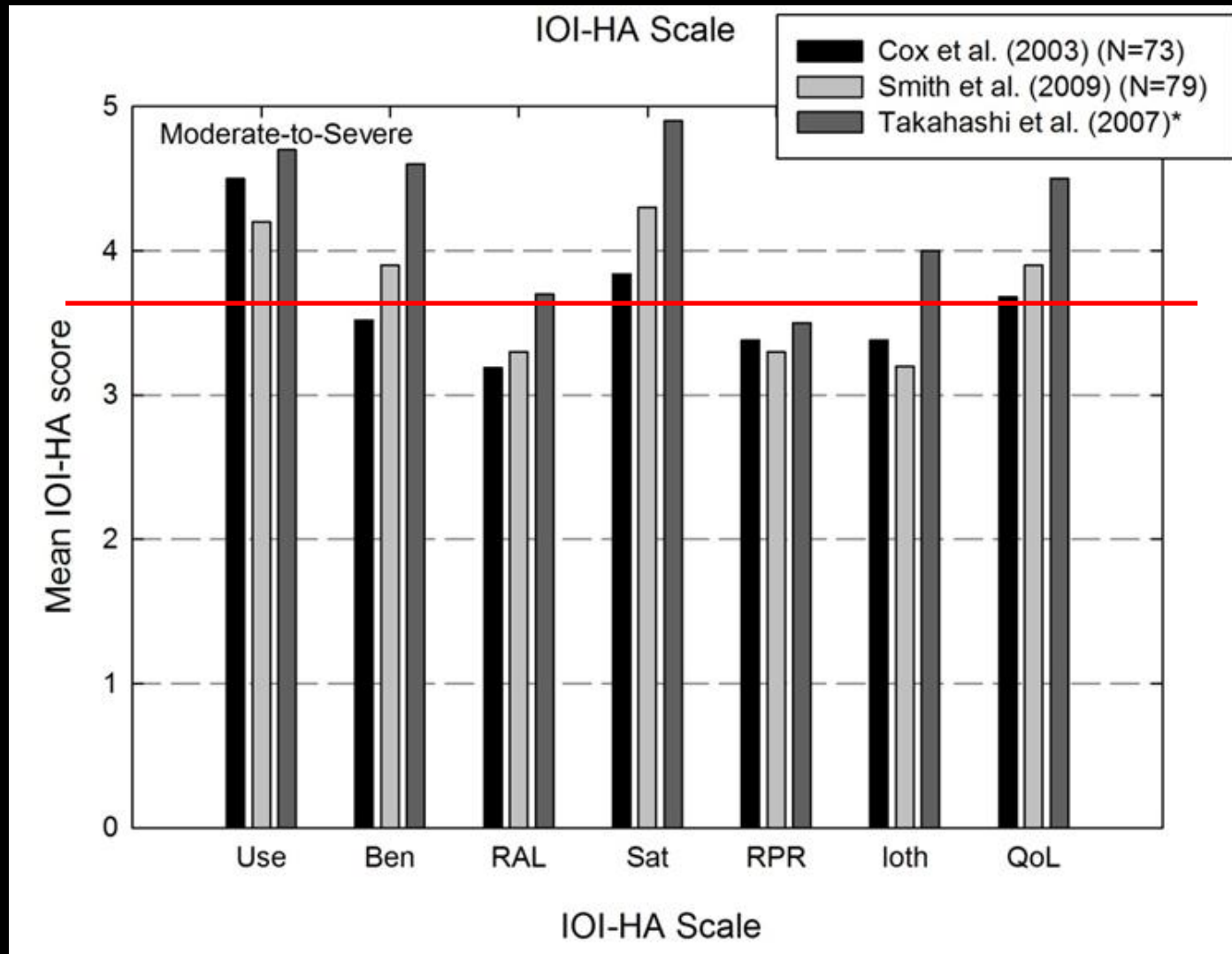
- N = 320-330 elderly adults

- Binaural fit of ITE's with 3 different circuits (crossover design)
  - Linear with PC
  - Linear with OLC
  - Single-channel WDRC

- Multiple measures of outcome obtained (especially speech recognition and subjective benefit)

EXAMPLE: Humes et al. (2001)-Aided and Unaided Speech Recognition
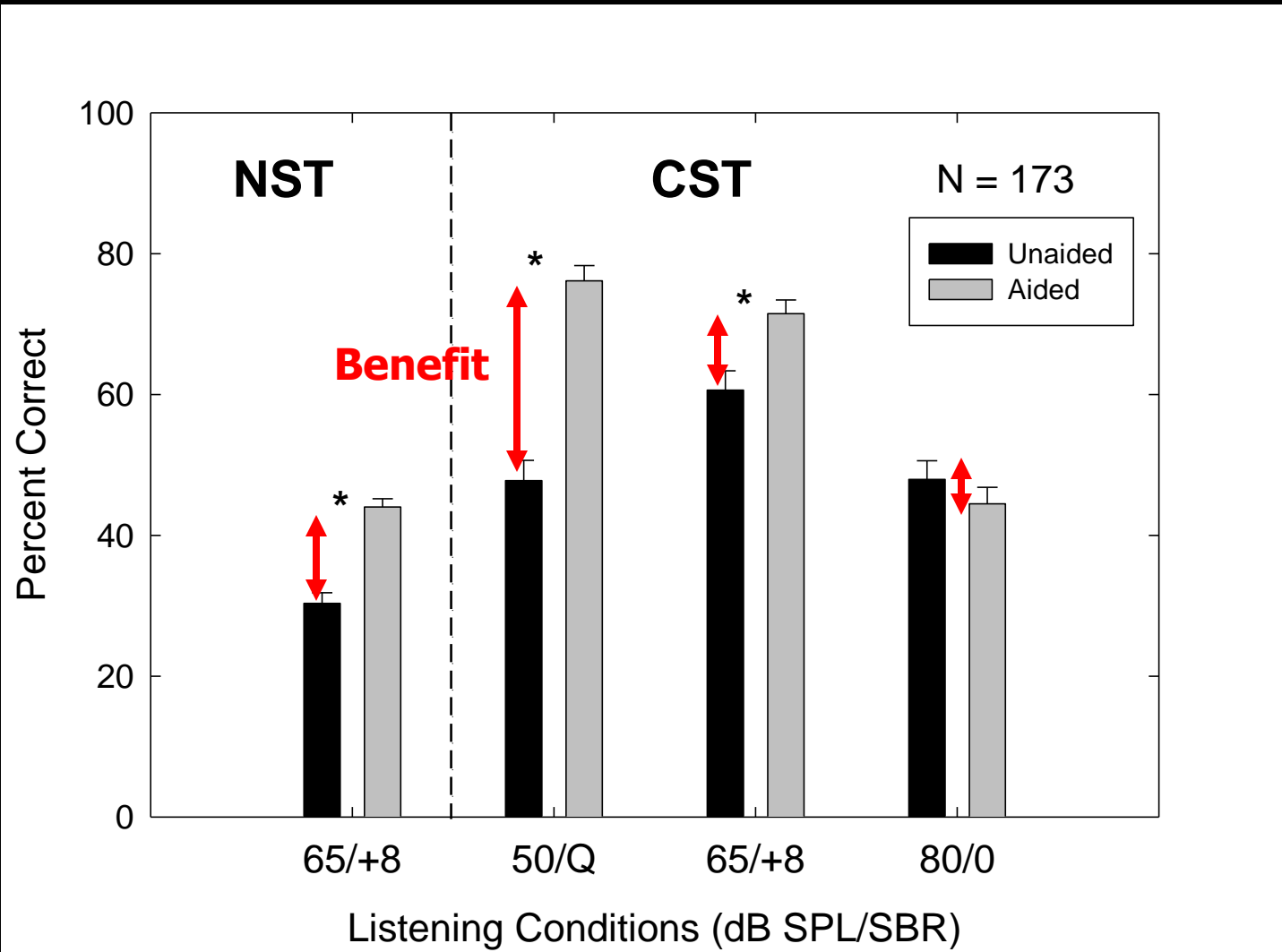
EXAMPLE: Analysis of IOI-HA (Moderate-Severe Hearing Loss)
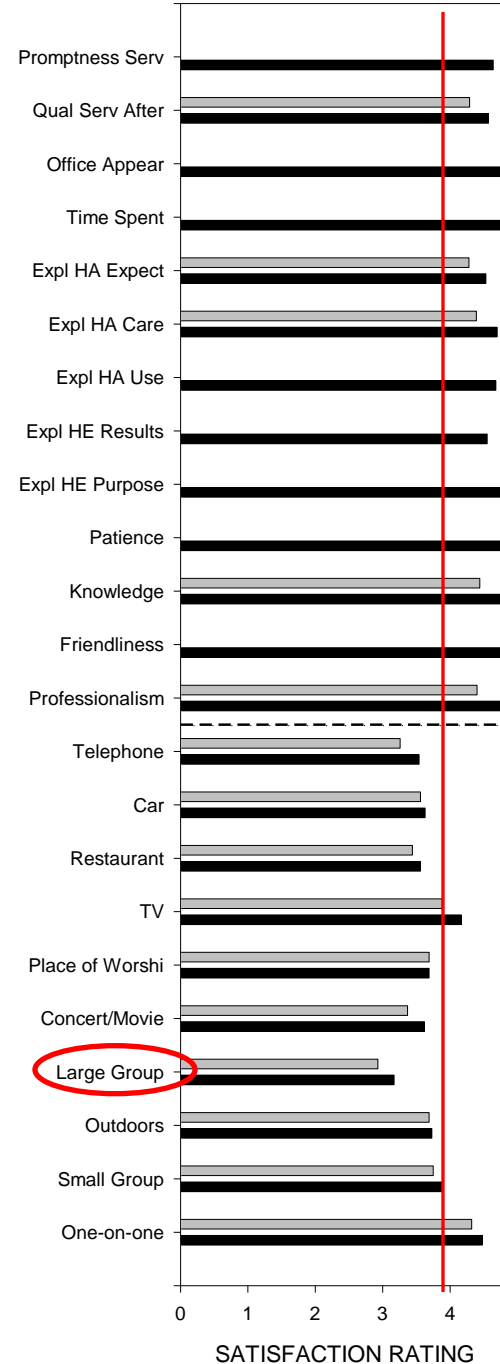
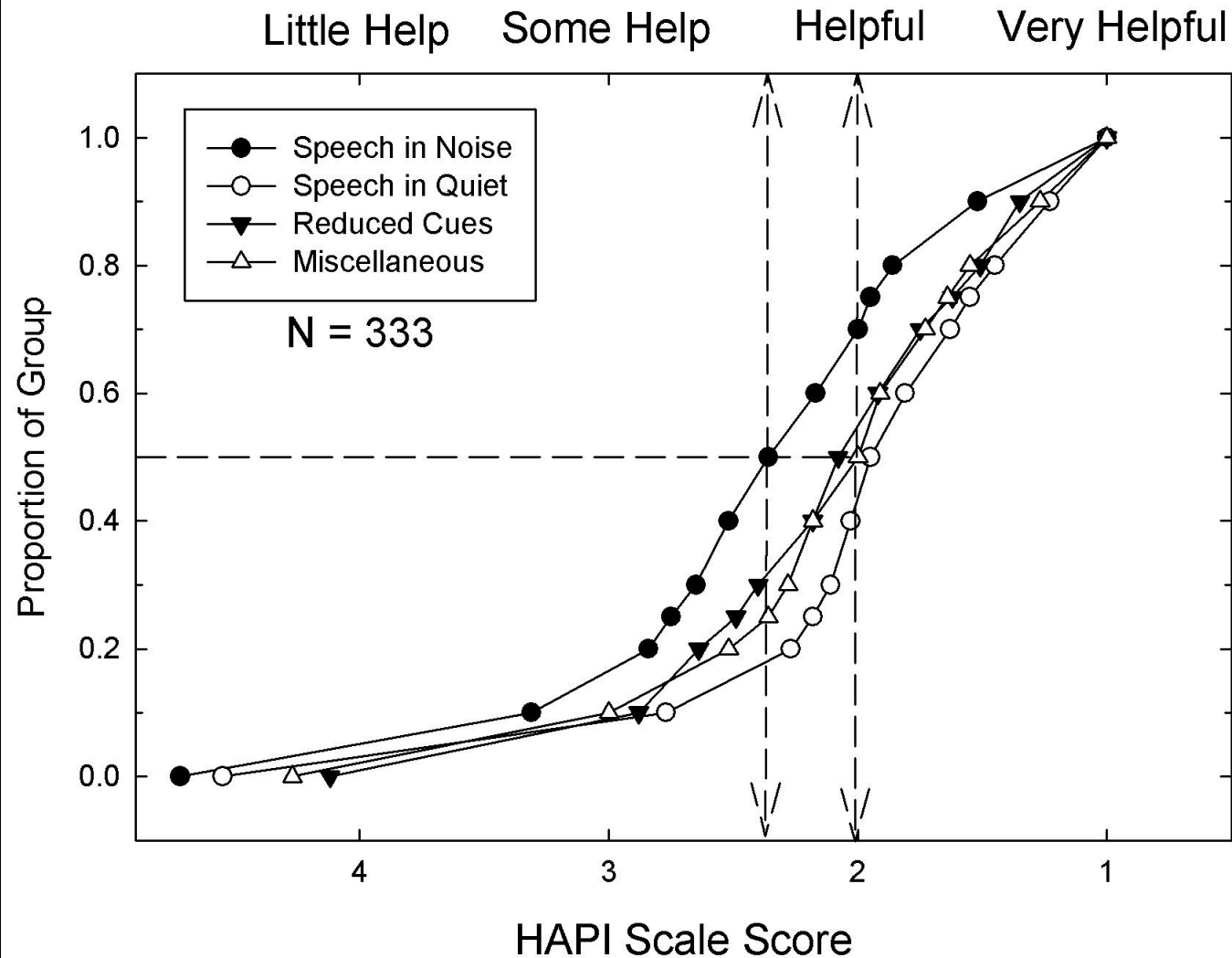EXAMPLE: Humes et al. (2001) –HA Satisfaction

"Satisfied"   "Satisfied"

Humes et al. (2001) (N = 172)
MarkeTrak V Norms (N = 524)

Hearing Aid Features

Dispenser Factors

Listening Situations

Hearing Aid Features (left axis labels, top to bottom): Packaging, Warranty, Freq Cleaning, Localization, Natural Sound, Value, On-going Expens, Use in Noise, Improves Hearin, Appearance, Reliability, Ease-Volume, Whistle/Feedbac, Clarity/Tone, Battery Life, Ease-Battery, Size, Visibility, Fit/Comfort

Dispenser/Listening (right axis labels, top to bottom): Promptness Serv, Qual Serv After, Office Appear, Time Spent, Expl HA Expect, Expl HA Care, Expl HA Use, Expl HE Results, Expl HE Purpose, Patience, Knowledge, Friendliness, Professionalism, Telephone, Car, Restaurant, TV, Place of Worshi, Concert/Movie, Large Group, Outdoors, Small Group, One-on-one

SATISFACTION RATING   SATISFACTION RATING

Norms (Humes et al., 2009)

Norms (Humes et al., 2009)