Patient Factor Predictors of Hearing Aid Service Level-Based Outcomes

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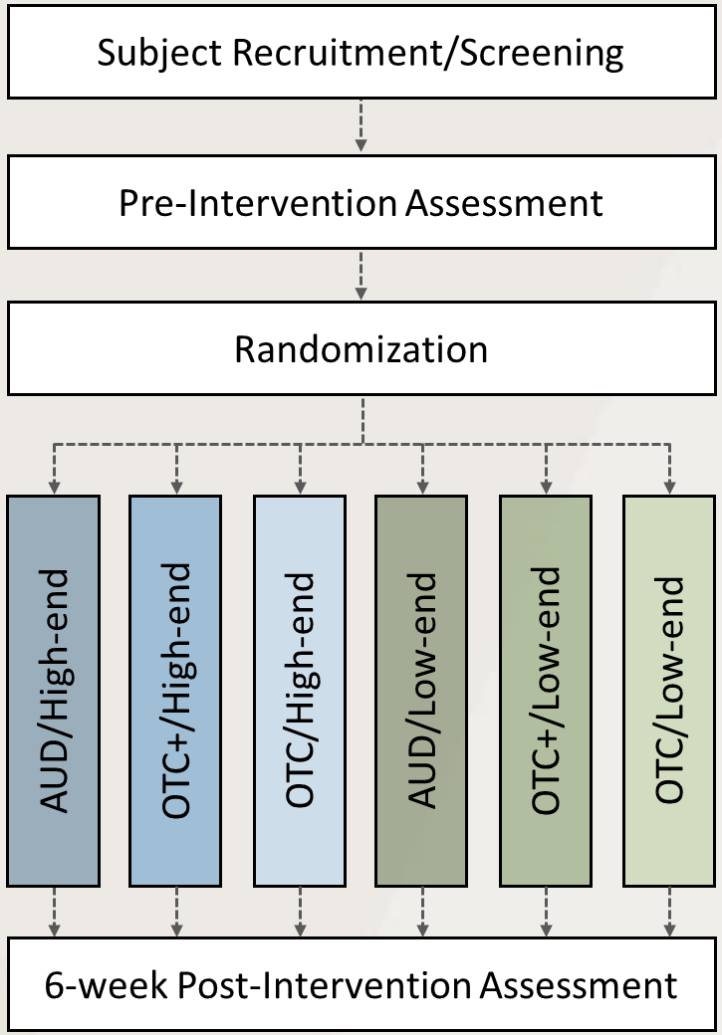
Recently completed work (Ricketts, Wu, et al.)

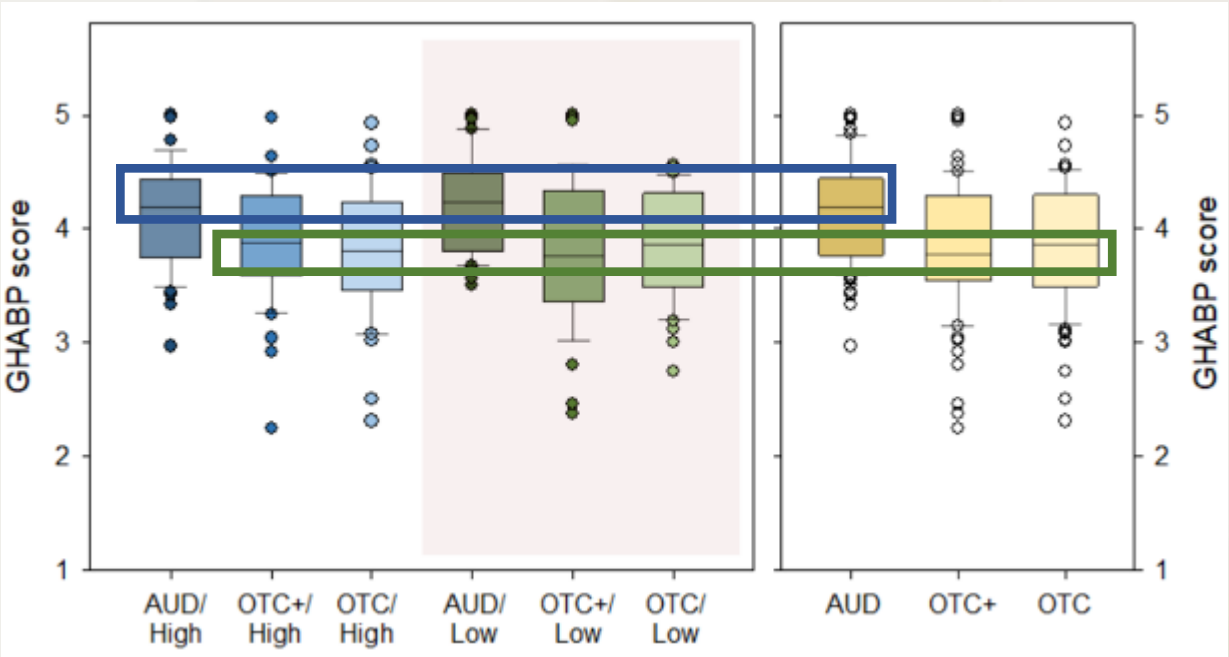
- Over-the-counter (OTC) hearing aids (HAs) have the potential to improve the affordability and accessibility of hearing healthcare.
- The over-arching purpose of this study was to characterize the outcomes of three different service-delivery models across two different hearing aid technology levels.
- Measures were administered before (unaided, including predictive) and after (6-7 week) hearing aid intervention.
- 250 adults (mild-to-moderate loss, reported no cognitive problems) evaluated at two different sites (different geographically and population density).



A few more details

- 250 adults with mild-to-moderate hearing loss were evaluated at two different sites that differed geographically and by population density.
- A low end hearing aid (features similar to current mid-level OTC devices); and, 2) A high end hearing aid from the same manufacturer were used.
  - Device names in support and fitting materials replaced with generic names.
- All participants were blinded to all other service levels.
- The hearing aids were configured to have four, fixed, frequency responses (OTC and OTC+ groups) or fitted to individualized prescriptive gain targets using probe microphone techniques (AUD Group).

Primary Outcome Results (EMA GHABP: controlling for unaided score and site; 8,631 aided surveys)



- All three service types led to positive outcomes for the majority of participants.
- Similar significant results pattern was measured for two other secondary outcome measures (SADL, Retrospective GHABP).

Exploratory Predictive Analyses

- Despite the significant differences in outcomes, there was clearly overlap in the measured outcomes across the three service types.
  - OTC and OTC+ models also benefit from improved accessibility compared to the AuD model for some individuals.
- An exploratory portion of this study aimed to assess potential predictors of success overall and within each of the service types. The aim of this presentation is to discuss this exploratory analysis.
  - Indirectly, whether patient factors could be identified that may be barriers to success for individual service model (for use in future investigations).
  - Lower average outcomes and a higher study dropout rate suggests it may be particularly important to identify barriers to success for the OTC service model.

Predictors of Hearing Aid Outcomes

- Have been explored in many past studies and reviews.
- Few studies have examined relative outcomes for newer HA delivery models.
- This study provided a unique opportunity to explore potential predictors across multiple service models and hearing aid technology levels.


Original Article

Expectations About Hearing Aids and Their Relationship to Fitting Outcome

Robyn M. Cox

J Am Acad Audiol 2004; 15(05): 342-352
DOI: 10.3766/jaaa.15.5.2

Articles

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Therese C. Walden , Brian E. Walden


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Larry E. Humes, PhD View all authors and affiliations

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SYSTEMATIC REVIEW

Predicting Hearing Aid Satisfaction in Adults: A Systematic Review of Speech-in-noise Tests and Other Behavioral Measures

Davidson, Alyssa[1,2]; Marrone, Nicole[1]; Wong, Bryan[1]; Musiek, Frank[1]

Author Information

Ear and Hearing 42(6):p 1485-1498, November/December 2021. | DOI: 10.1097/AUD.0000000000001051


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The Relationship Between Hearing Loss Self-Management and Hearing Aid Benefit and Satisfaction

Elizabeth Convery, Gitte Keidser, Louise Hickson and Carly Meyer


Review Article

Factors influencing hearing aid use, benefit and satisfaction in adults: a systematic review of the past decade

Bopane Mothemela, Vinaya Manchaiah, Faheema Mahomed-Asmail, Megan Kroetze & De Wet Swanepoel

Received 25 Mar 2023, Accepted 14 Oct 2023, Published online: 14 Nov 2023

Measured predictive variables in this study:
(Selected based on potential from a review of previous studies)

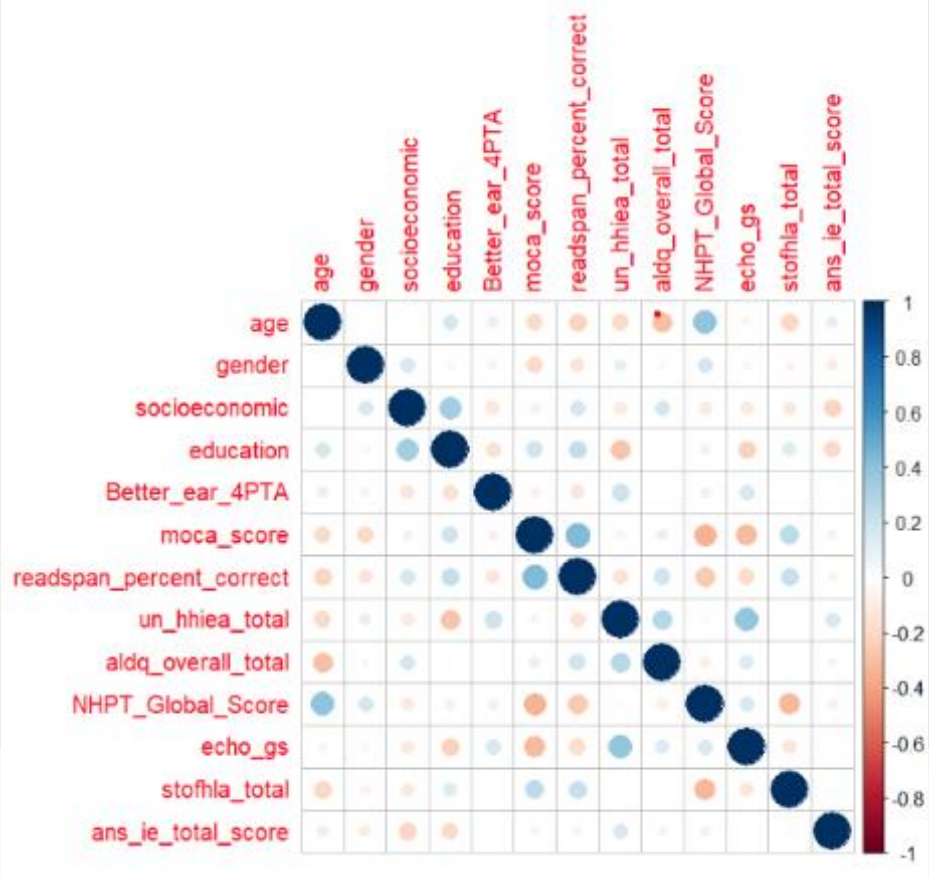
- Age, Gender, Education, Socioeconomic status
- Audiometric hearing loss (better ear 4-frequency-PTA)
- Cognitive screener results (Montreal Cognitive Assessment; MoCA)
- Working memory screening (Reading Span)
- Lifestyle (Auditory Lifestyle and Demand Questionnaire; ALDQ)
- Finger dexterity (Nine-Hole Peg Test; NHPT)
- Hearing aid expectations (Expected Consequences of Hearing Aid Ownership; ECHO)
- Hearing handicap (HHIA/E)
- Health literacy (Short Test of Functional Health Literacy in Adults; STOFHLA)
- Locus of control (Nowicki-Strickland Internal External control scale for Adults; ANSIE)

Results: Predictors of Hearing Aid Outcome Patterns

Are pre-fitting test results associated with individual or group differences in hearing aid outcomes (benefit, satisfaction, etc.)

Predictor Exploration #1: What factors predict **EMA GHABP** when controlling for group membership (Service and Hearing Aid Technology Level)?

Predictor Correlations



- Linear mixed model supported the following significant predictors:
- Trend - 4PTA (p=0.06)
- Health Literacy (t=-1.99 p =0.047*)
- Gender (t=2.23 p=0.024*)
- Hearing Handicap (t=-2.725 p=0.006 **)
- Expectations (t=5.34 p=2.38e-07 ***)

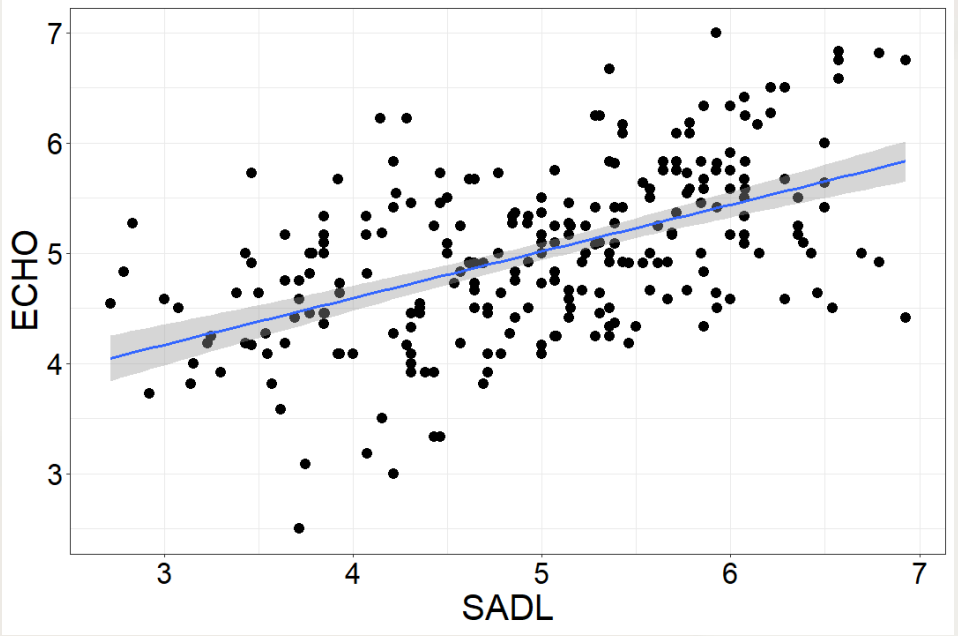
Predictor Exploration #1: Factors predicting secondary outcomes when controlling for group membership (Service and Hearing Aid Technology Level)?

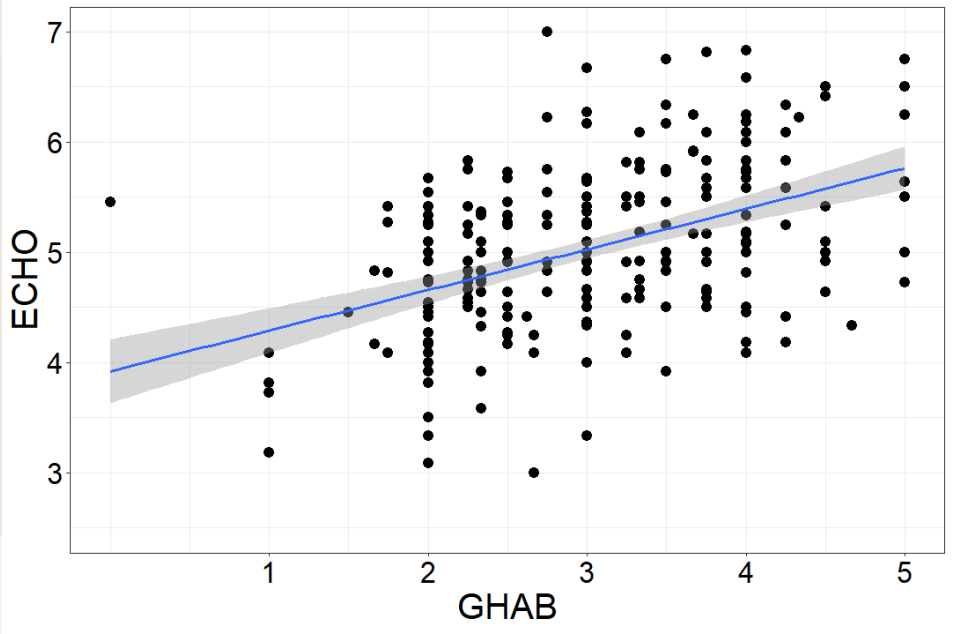
- **GHABP (Retrospective)**
- Gender (t=2.11 p=0.036*)
- Expectations (t=3.81 p=0.0001 ***)

- **SADL**
- Better ear 4PTA (t=2.34 p=0.023*)
- Expectations (t=7.61 p=7.39e-13 ***)

Summary and data direction

- Males were associated with: 1) Higher $GHABP_{EMA}$ scores, and 2) Higher $GHABP_{Retro}$ scores.
- More hearing loss (4FPTA_BE) was associated with greater satisfaction (SADL Global Score) and a trend toward higher $GHABP_{EMA}$ scores.
- More $Hearing\ Handicap_{unaided}$ was associated with higher $GHABP_{EMA}$ scores.
- Poorer health literacy was associated with higher $GHABP_{EMA}$ scores (although majority at ceiling).
- Higher expectations (ECHO Global Score) were associated with: 1) Higher $GHABP_{EMA}$ scores, 2) Higher $GHABP_{Retro}$ scores, and 3) Greater Satisfaction (SADL Global Score).





Predictor Exploration #2: Are there significant predictors within the service or technology groups?

- As expected given random assignment, the mean score for each of the individual predictor measures was similar for all 5 groups.
- That is, all 5 groups had similar average hearing loss, expectations, health literacy, etc.

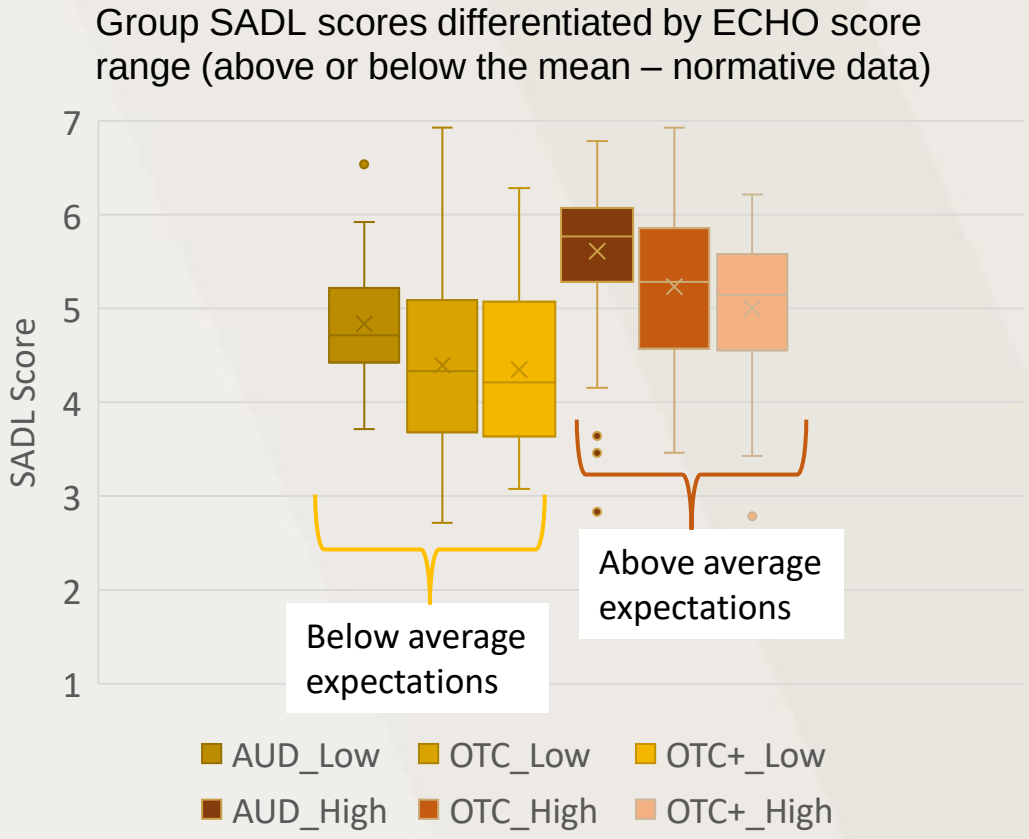
- **Collapsed across technology or service $GHABP_{EMA}$ outcome:**
- AuD: Expectations (ECHO)
- OTC: No significant predictors
- OTC+: Expectations (ECHO)
- Low End HA: Expectations (ECHO)
- High End HA: Expectations (ECHO), *Hearing Handicap, 4PTA*

Predictor Exploration #2: Were there significant within group predictors (SADL, $GHABP_{Retro}$ outcomes)?

- **Collapsed across technology or service SADL :**
- AuD: Expectations (ECHO)
- OTC: Expectations (ECHO)
- OTC+: Expectations (ECHO), *4PTA*
- Low-end HA: Expectations (ECHO), *lifestyle, gender*
- High-end HA: Expectations (ECHO), *socioeconomic*

- **Collapsed across technology or service $GHABP_{Retro}$:**
- AuD: Expectations (ECHO), *gender*
- OTC: No significant predictors
- OTC+: 4FPTA
- Low-end HA : Expectations (ECHO)
- High-end HA: Expectations (ECHO), *Hearing Handicap, 4PTA*

Expectations were associated with general and within group Satisfaction outcomes – Across group interactions?

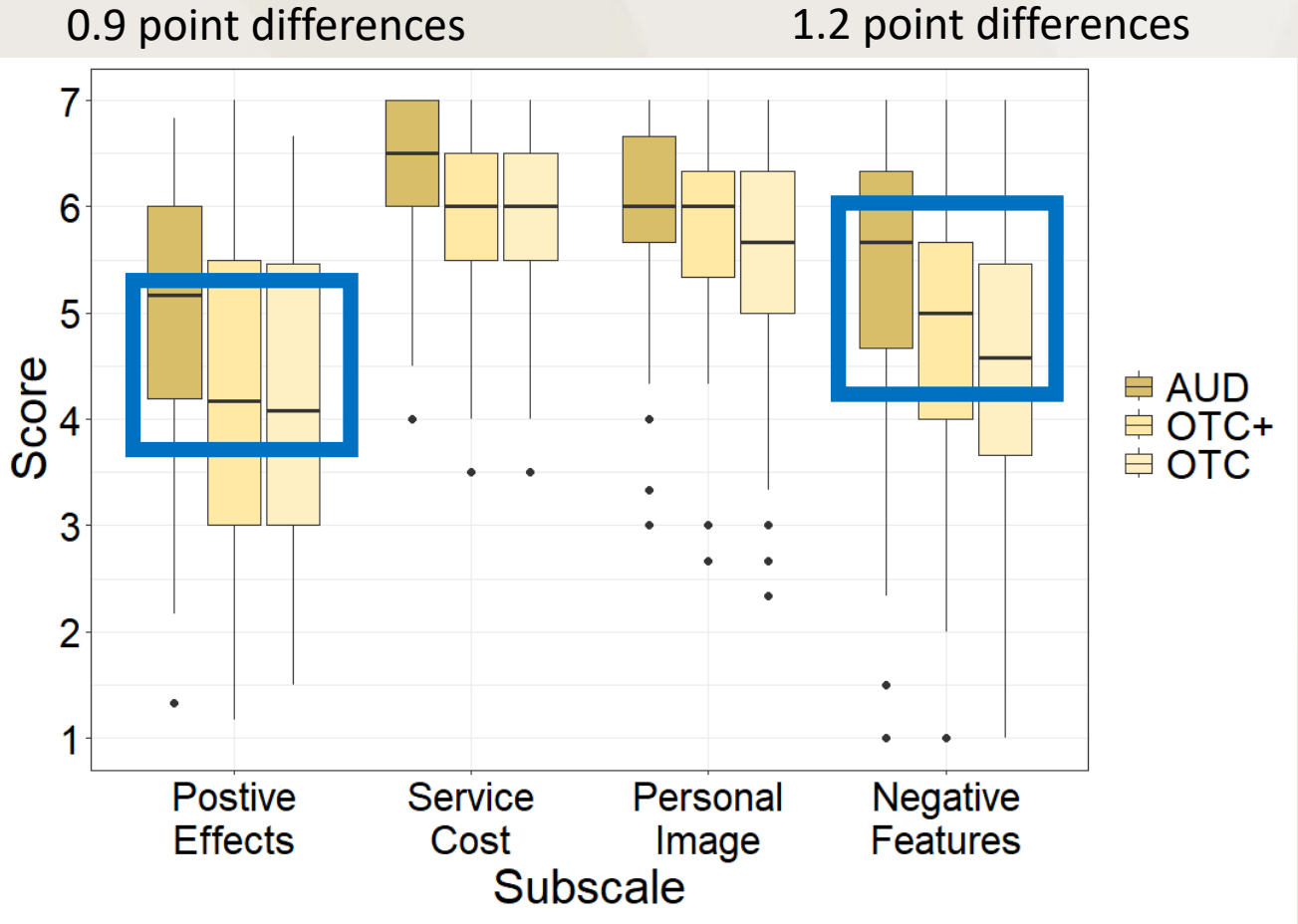


- Those with above 50th percentile ECHO scores have higher average SADL scores; but no significant interaction with service group (similar differences between outcomes for those with low and high expectations across all 3 groups - not predictive).
  - Similar for all significant predictive factors.

Other insights into outcomes that may have implications for predictive factors?

Further exploratory analysis and speculation (only time for one example)

A deeper dive examining the differences in SADL outcomes across service models (subscales)



Positive Effects and Negative Features the primary difference drivers for satisfaction?

Potential Service and Cost outcome differences handicapped by no cost in our study?

More exploration needed (outside of the design of this study).

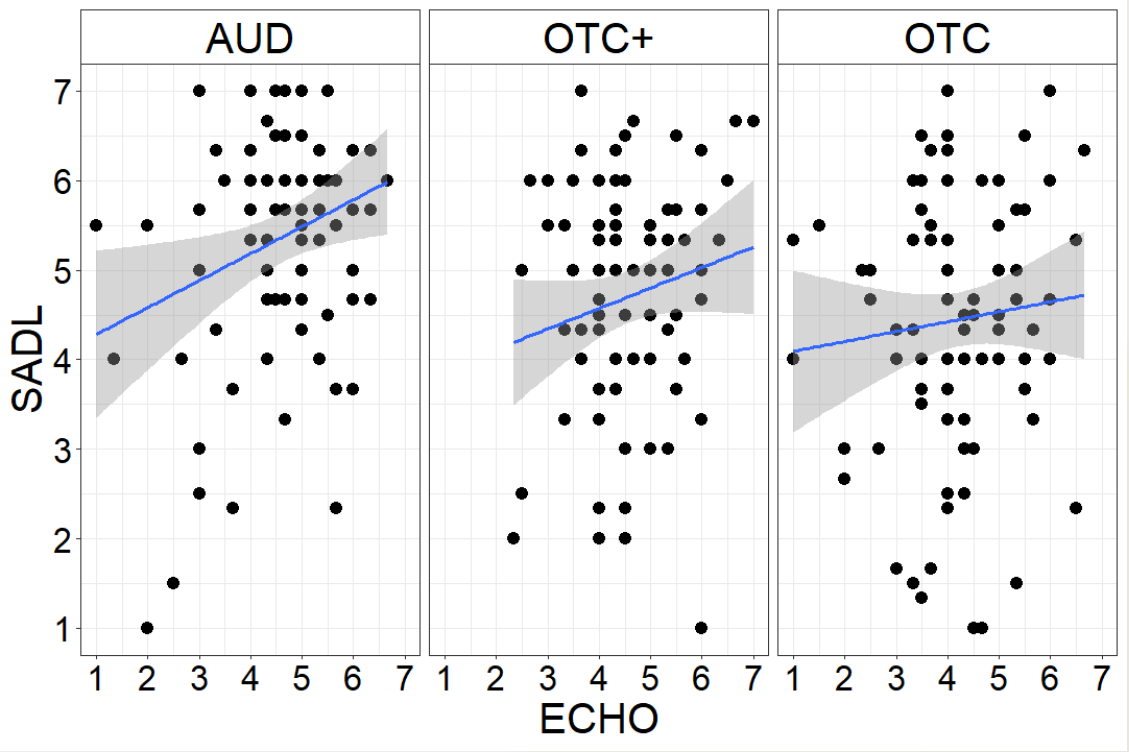
Negative Features subscale: Largest group differences, which areas are probed?

- ECHO questions (With SADL follow up):
- “Sometimes I will be bothered by an inability to get enough loudness from my hearing aids without feedback (whistling).”
- “I will be frustrated when my hearing aids pick up sounds that keep me from hearing what I want to hear.”
- “My hearing aids will be helpful on most telephones without amplifiers or loudspeakers.”

- **<u>Topics:</u>**
- Audibility/Feedback
- Noise Interference
- Usage with phone (may include streaming)

- All areas we commonly need to manage expectations and/or provide additional solutions/direction clinically.

ECHO vs SADL: Negative Features subscale: (Possible future investigations based on cherry picked data).



- Interesting trend in that it appears that the relationship between higher expectations and higher satisfaction is strengthened as a function of increased professional intervention level.
- Speculation: More professional help may improve satisfaction for those that experience negative features.
- Conversely, those that don't face these issues may be more (equally) satisfied with hearing aid self-management models.

Conclusions

- Overall (collapsed across hearing aid service and device technology levels), significant predictors of the primary and some secondary outcomes (Hearing aid Benefit and Satisfaction) were identified in this study.
  - The most consistent pattern revealed higher expectations were associated with better outcomes.
- Persisted within groups (i.e. similar association between expectations and satisfaction for participants within groups).
- However, none of our *a priori* predictor variables demonstrated utility for identifying who might be more successful with one service model compared to others.
- Preliminary analyses suggests subscale and exit interview data may provide additional insights related to specific barriers to success within service groups.

Study Limitations and Considerations for Future Design

- Our study focused on one OTC delivery model: It will likely be important for future studies to examine the most successful OTC/hybrid fitting models in the marketplace.
  - OTCs did not exist at the time of our study design and our "best of 4 appropriate frequency responses" model based may not be optimal (and general outcomes were not improved by the addition of limited services; OTC+).

- While the RCT design is extremely useful and powerful for answering questions regarding relative treatment effectiveness, not all things are equal related to different HA service delivery types.
  - Considering **individual choice** with all of the potential implications (e.g. cost, service, accessibility, etc.) may be critical if we wish to account for/consider potential individual differences/biases related to optimal device delivery.

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