

## Introduction:

Many adults with hearing impairment are not confident in their ability to perform the skills needed to be a successful hearing aid (HA) user. In other words, these individuals have low HA self-efficacy (HA-SE). Low HA-SE has been identified as a barrier to HA uptake and success. Research suggests that audiologists may be able to positively impact HA-SE (Meyer et al., 2014). As direct-to-consumer (DTC) HAs become more accessible, it is unclear how a lack of audiologic services might impact HA-SE and success with these devices for different consumers. This research sought to better understand how different fitting models with DTC devices might impact HA-SE and first-time device experiences for adults with varying cognitive abilities. Specifically, the following questions were asked:

- Q1.** Following a 1-week trial with DTC devices, is HA-SE benefit better when devices are fitted by an audiologist or using a self-fitting model?
- Q2.** How does cognitive ability impact the relative HA-SE benefit obtained from audiologic services?
- Q3.** How does the HA fitting model and cognitive ability impact how users interact with manufacturer-provided resources?

## Methods:

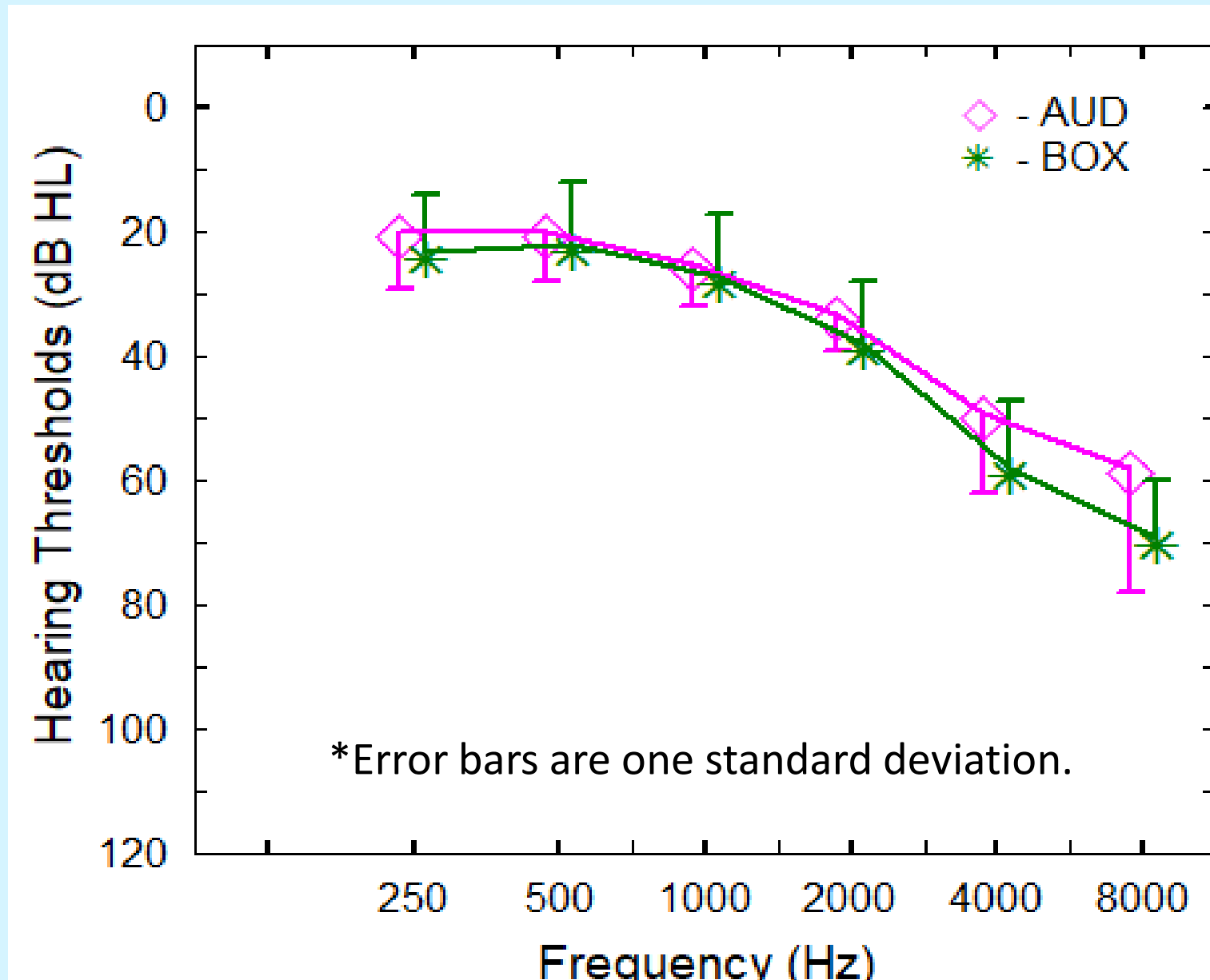
**Design:** Double-blinded randomized control trial

**Participants:** 22 adult novice HA users with symmetrical mild to severe SNHL, bilaterally, were randomized to one of two groups (AUD and BOX, described below). Demographics and mean composite audiograms are displayed for all participations.

**Procedures:** HA-SE was obtained by a blinded assessor before and after completing a 1-week trial.

**Devices:** DTC hearing devices were used. These DTC devices had a volume wheel, 3 manual programs, and multiple coupling options.

	AUD	BOX
Subjects	10	12
Low Cog	4	6
High Cog	6	6
Age	64 (44-81)	68 (55-79)
PTA	30	34
SRT	28	31
WRS	93	89



## Service Delivery Model:

**Experimental group (AUD):** Received bilateral DTC devices that were verified, fitted, and adjusted using real-ear measures. Participants received device orientation and audiologic counseling, including individualized recommendations for coupling, volume control settings, and program use based on real-ear measurements.

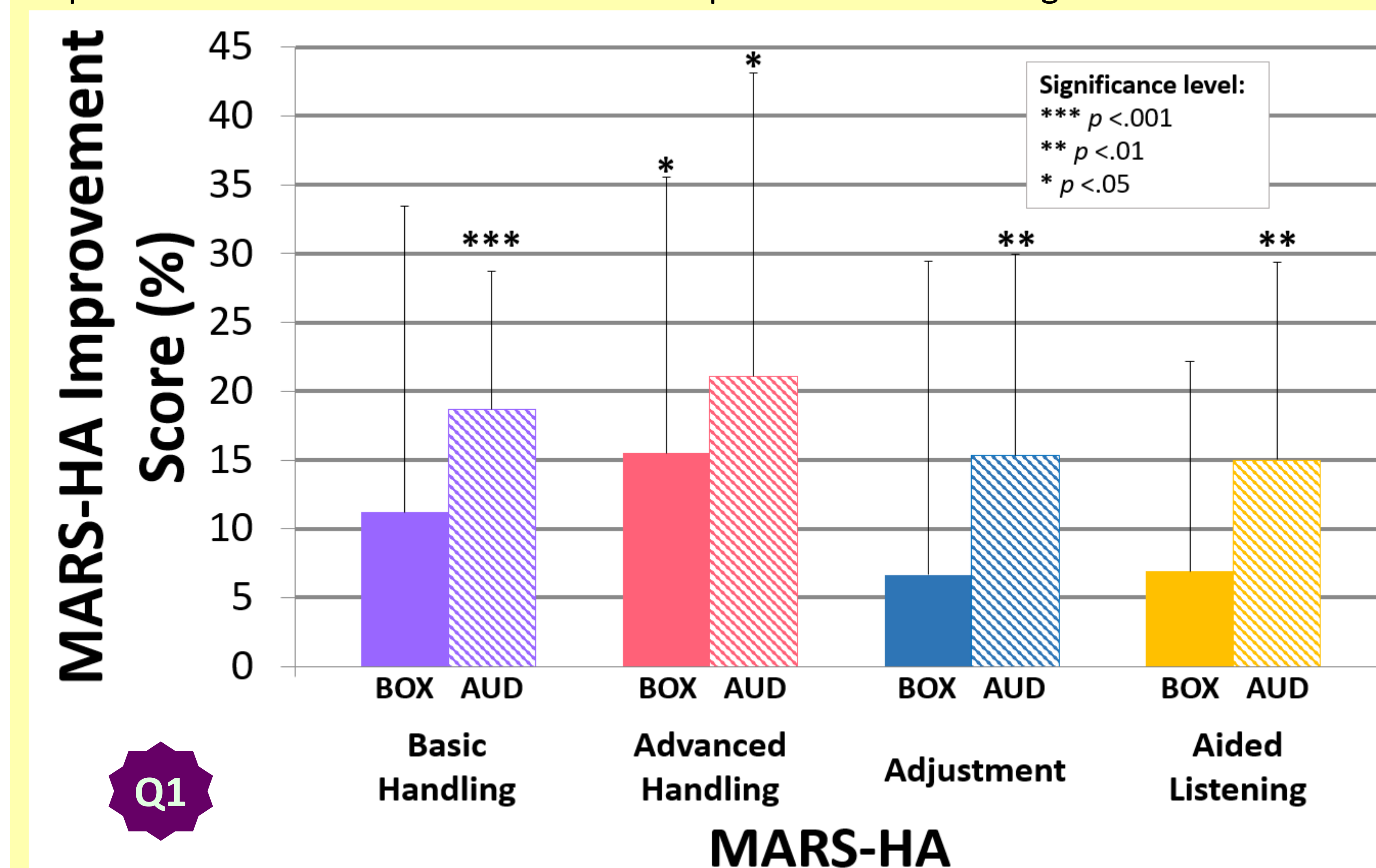
**Control group (BOX):** Received the manufacturer's box containing two DTC devices, a variety of coupling options, and manufacturer's instruction manual. No additional services were provided.

## Acknowledgements:

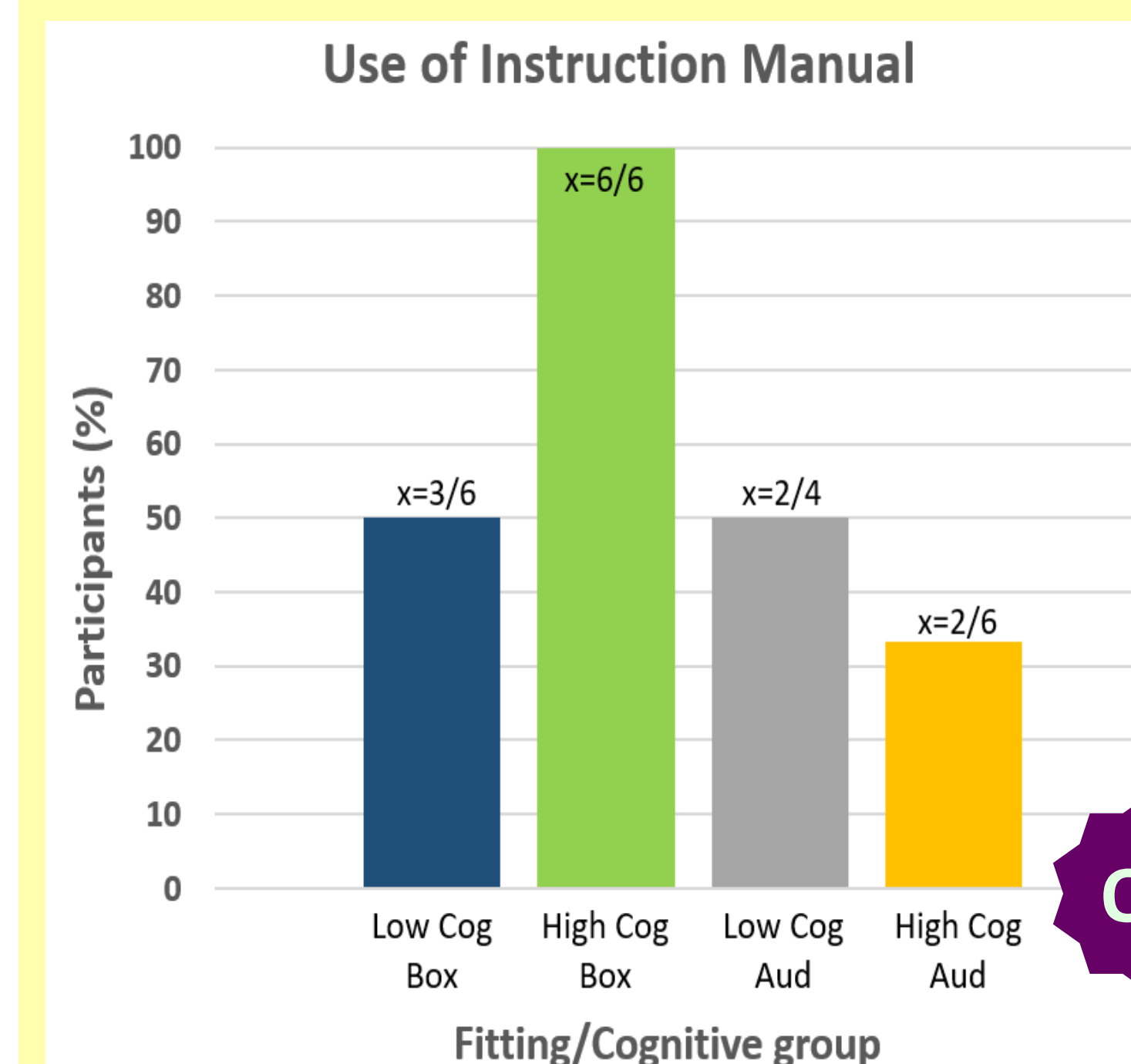
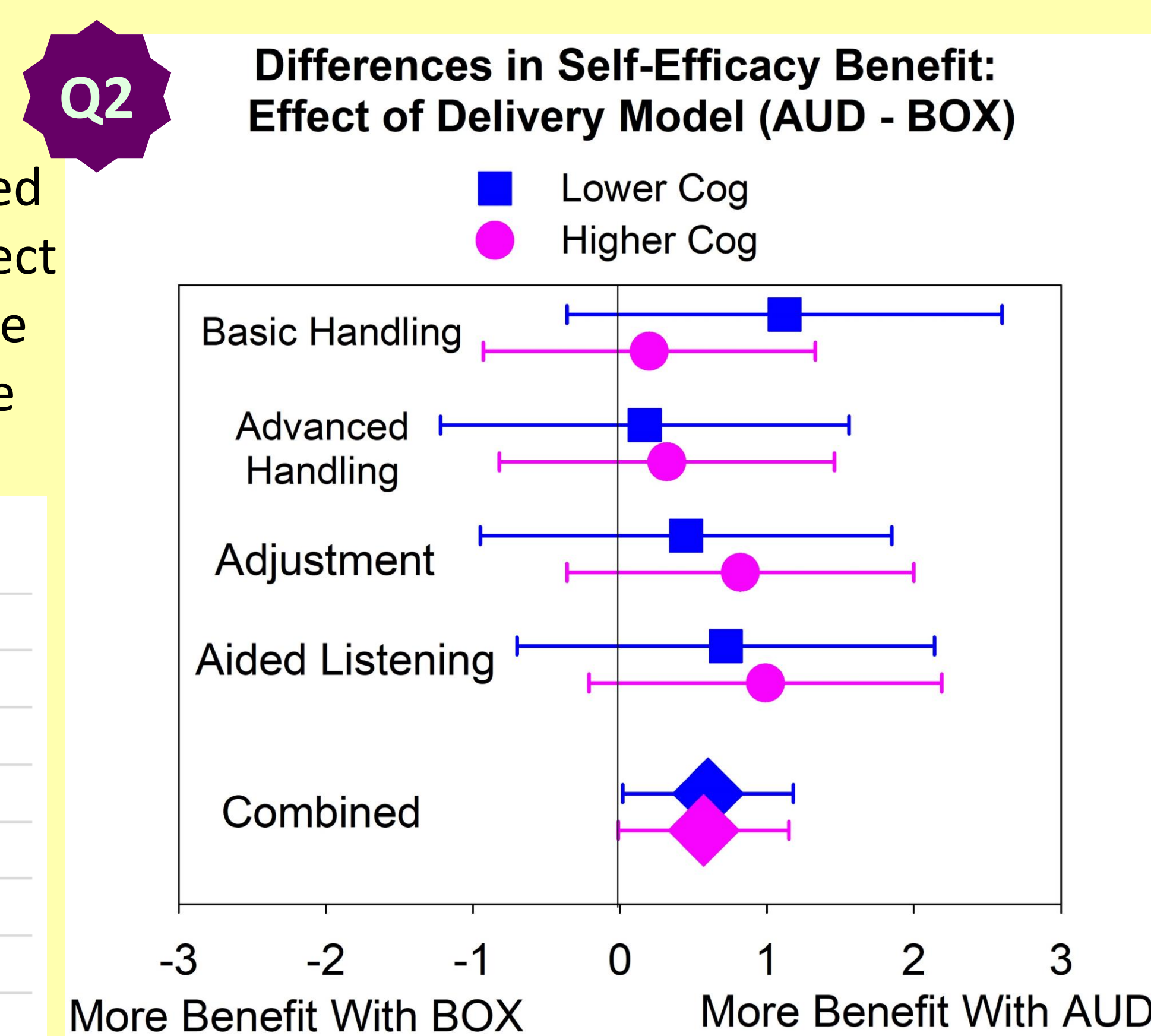
Emma Brothers contributed to data collection and Rachel Huber, Au.D., contributed to statistical analyses for this study. The first author received the Dean's Research Travel Award from the School of Communication Sciences and Disorders at the University of Memphis.

## Results:

The 24-item MARS-HA (Measure of Audiologic Rehabilitation Self-Efficacy for Hearing Aids) questionnaire measures HA-SE and comprises 4 subscales: Basic Handling, Advanced Handling, Adjustment, and Aided Listening (West & Smith, 2007). The mean HA-SE benefit scores (post-pre) are shown for both fitting groups for each subscale. Repeated *t*-tests were used to evaluate improvements following the 1-week trial.



Between group differences in HA-SE benefit were calculated for both cognitive groups (AUD-BOX, displayed at right). This plot demonstrates effect sizes (Cohen's *d*) and 95% confidence intervals for each MARS-HA subscale and the combined effects.



Participants reported their use of the manufacturer's instruction manual during the trial (displayed at left by fitting and cognitive group).

## Q&A:

**Q1.** Following a 1-week trial with DTC devices, was HA-SE benefit better when devices were fit with accompanying audiologic services?

- Yes. The AUD group demonstrated notable and statistically significant improvements in HA-SE for all 4 MARS-HA subscales, while the BOX group only demonstrated significant HA-SE improvement for the Advanced Handling subscale.

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## Q&A (cont.):

**Q2.** How did cognitive ability impact the relative HA-SE benefit obtained from audiologic services?

- Although there was an overall positive effect of audiologic services on HA-SE for all participants, individuals with lower working memory abilities (LoCog) received more HA-SE benefits from audiologic services for basic HA operations (e.g., insertion and removal of the HA and batteries). Those with higher working memory abilities (HiCog) showed greater HA-SE benefits from audiologic services for complex, real-world listening (e.g., adjustment to HA sound quality and their own voice, speech understanding in a small group in a noisy place with HAs).

**Q3.** How did the HA fitting model and participants' cognitive abilities impact how users interacted with manufacturer-provided resources?

- 100% of HiCog participants who did not receive audiologic services reported that they consulted the user manual. However, when they received audiologic orientation to the devices, far fewer needed to use this resource during the 1-week trial. For those with lower measured cognitive (LoCog) ability, about 1/2 of participants consulted this resource, regardless of fitting method.

## Discussion:

DTC amplification devices are intended to be self-fitted by hearing impaired consumers. They are typically accompanied by written and online resources to facilitate the fitting process and support device use and maintenance. DTC devices are limited in the adjustments that can be made to individualize outputs for different patients. As a result, some audiologists might choose to avoid fitting low-cost DTC devices for their patients, assuming that professional services with these devices might be of limited benefit. This research provides evidence that novice users who receive audiologic services with DTCs have significantly greater improvements in their HA-SE compared to those who do not receive professional support. In addition, these results support the provision of individualized services dependent on patient traits such as cognitive ability. Our findings suggest that those with lower cognitive processing abilities might receive the most HA-SE benefit from audiologic orientation to basic aspects of devices and handling, while those with higher cognitive processing might receive the most benefit from audiologic counseling related to adjustment to device use and aspects of aided listening. It is of interest that cognitive processing abilities might impact how participants choose to interact with manufacturer-provided resources to optimize the fitting process with DTCs. Perhaps most noteworthy is that only 50% of the LoCog participants in this study consulted their manual, even when they had no alternate professional instruction about fitting or using the device. Hearing health care professionals should explore strategies for optimizing outcomes for various individuals who choose lower-cost DTCs and ensuring that they are used safely and effectively.

**Limitations:** It's worth noting the BOX fitting group did not resemble a true DTC-only fitting model, as all participants received a hearing evaluation, medical referral when necessary, and electroacoustic performance was verified and deemed "acceptable" for all devices used in this research. Between groups analyses are limited in power due to small sample sizes.

## References:

- Meyer, C., Hickson, L., & Fletcher, A. (2014). Identifying the barriers and facilitators to optimal hearing aid self-efficacy. *International Journal of Audiology*, 53(sup1), S28-S37.
- West, R.L. & Smith, S.L. (2007). Development of a hearing aid self-efficacy questionnaire. *International Journal of Audiology*, 46(12), 759-771.