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## Background

- Parkinson's disease (PD):** neurodegenerative movement disorder that affects approximately 3% of individuals over 60 (Nussbaum & Ellis, 2003).
- 70 – 90% of people with PD will eventually develop a speech disorder (Logemann et al., 1978).
- Hypophonia**, or *reduced vocal loudness*, is one of the most prevalent speech symptoms associated with PD (Adams & Dykstra, 2009).
- While behavioral interventions are a promising solution for many individuals with PD and hypophonia, many others have great **difficulty transferring** increased loudness in their day-to-day lives due to cognitive and sensorimotor deficits associated with PD (Adams & Dykstra, 2009; Sapir 2014).
- Voice amplification devices**, which increase the loudness of a person's natural voice, offer an alternative solution for many individuals. However, despite their availability, little research has been done on device options and efficacy (Bertrand, 2009; Andreetta et al., 2016)

**Purpose:** To compare the performance of three devices used to amplify speech loudness of people with hypophonia

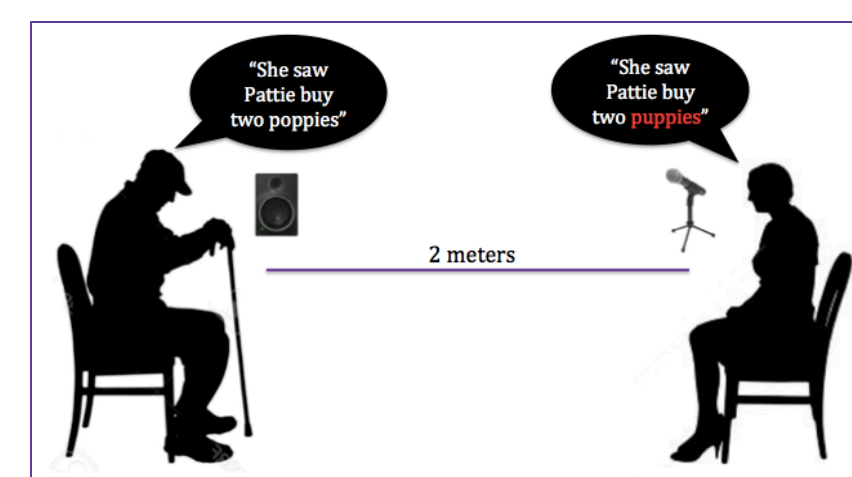
## Methods

**Participants:** 22 participant dyads; individuals with hypophonia secondary to PD (or MSA in n=2) and their primary communication partner (e.g., a spouse)

**Design:** Clinical crossover design involving two stages:

### Stage 1, Laboratory speech tasks (Visit 1)

- PD participants read aloud sentences and described pictures in four device conditions, and in two noise conditions
- Communication partner, seated 6 m away, repeated sentences back aloud
- Recordings collected via headset microphone and 2m table microphone



### Stage 2, One-week home trial periods (Visits 2-4)

- 19 participants tried out each of the three devices for a week
- Following each trial period, participants met with examiner to discuss what they did and didn't like about the devices, and to complete a series of questionnaires relating to their device impressions and the impacts on their communication.

**Final Decision (Visit 4):** Decide whether to keep using a device.

## Devices



### Wired belt-pack amplifier

Chattervox

- Headset microphone
- Amplifier worn around waist



### Wireless stationary amplifier

Nady WA120 BT

- Headset microphone
- Pocket-sized transmitter
- Large stereo amplifier to be placed in one location



### Personal communication device

Nady 351VR

- Headset microphone
- Pocket-sized transmitter
- Pocket-sized receiver connected to headphones worn by listener
- One-on-one communication

## Outcome measures

**Speech intelligibility:** What percentage of words was correctly heard by...

- The communication partner
- Naïve listeners (n = 3)

**Speech-to-noise ratio:** How loud was the talker compared to the background noise during...

- Sentence reading
- Picture description

**Overall preference:** On a visual analog scale from low to high, what did each participant think of each device...

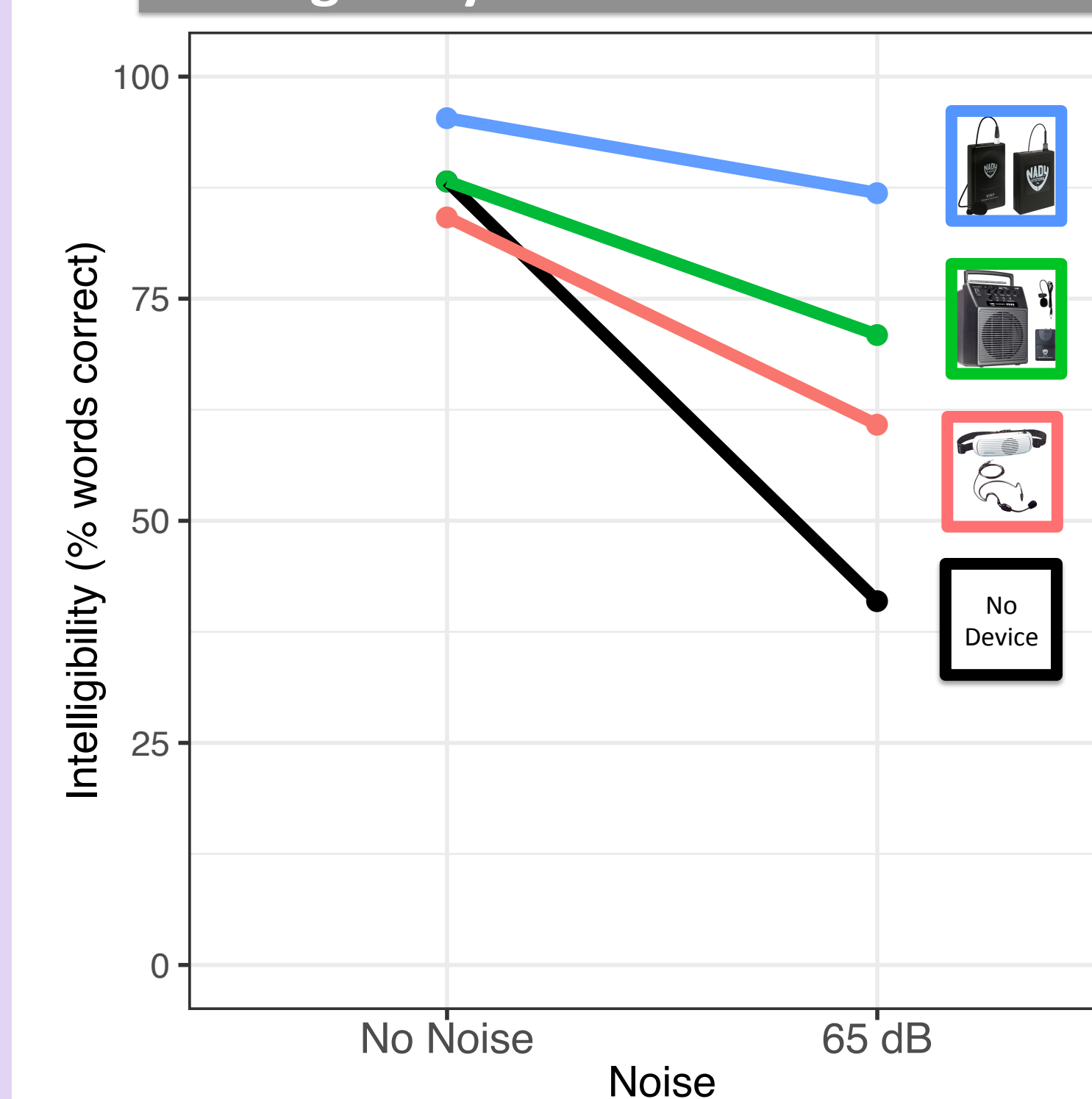
- Immediately after trying them in the lab
- Following the one-week trial periods at home

**Final decision:** At the end of the study, did the participants elect to continue using a device? Which one?

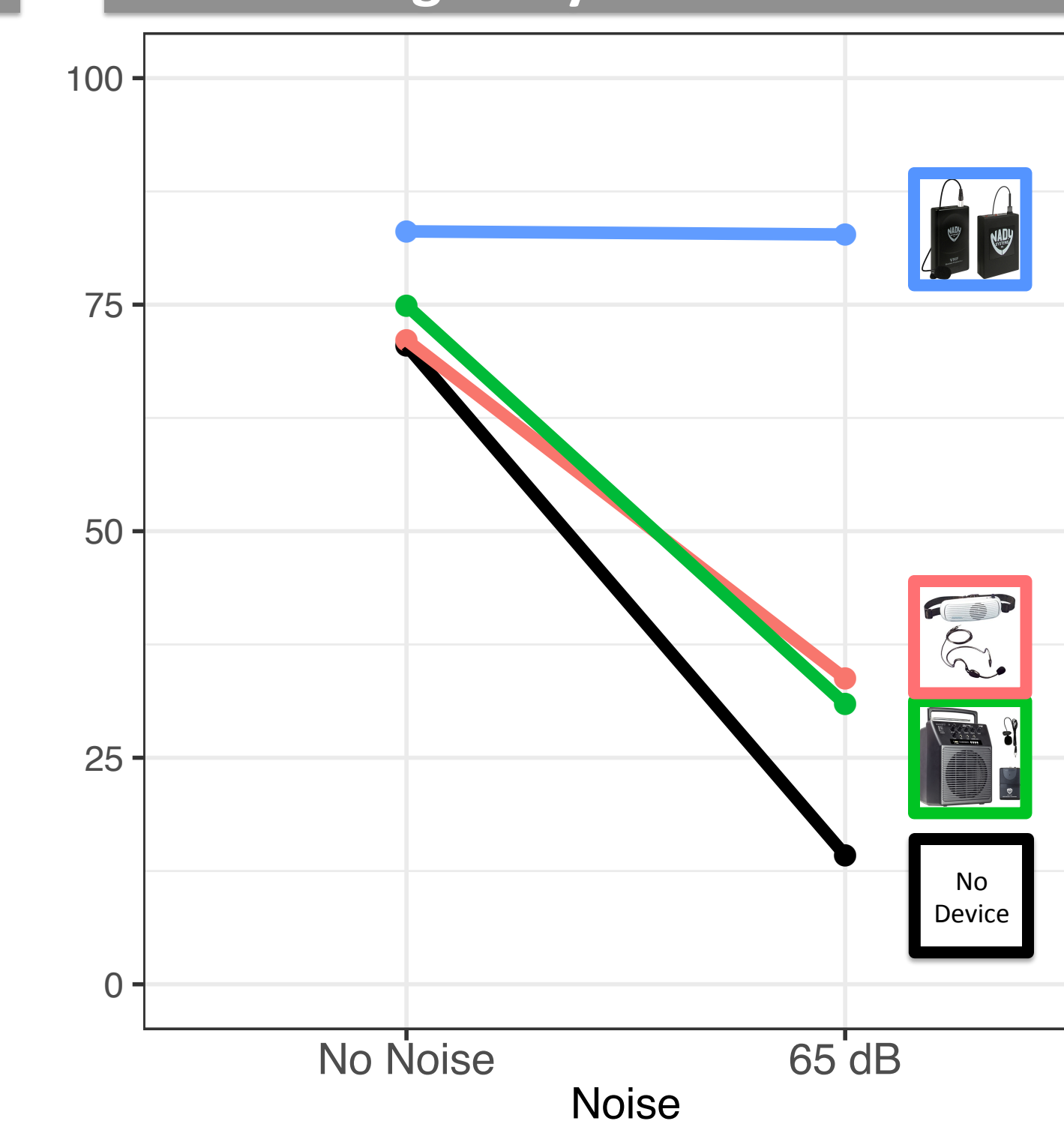
**6-month follow-ups:** Currently in progress!

## Results

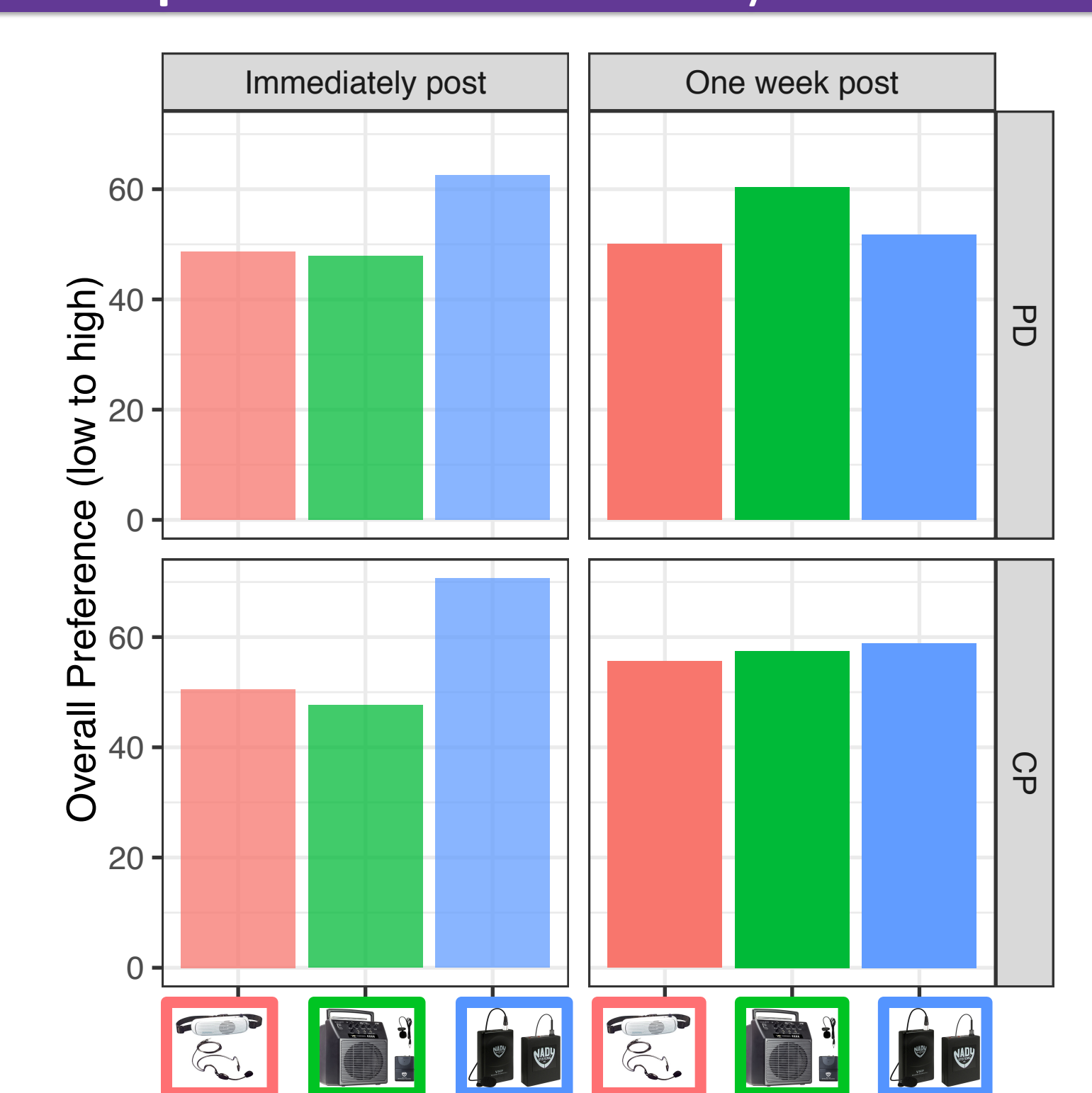
Intelligibility: Communication Partners



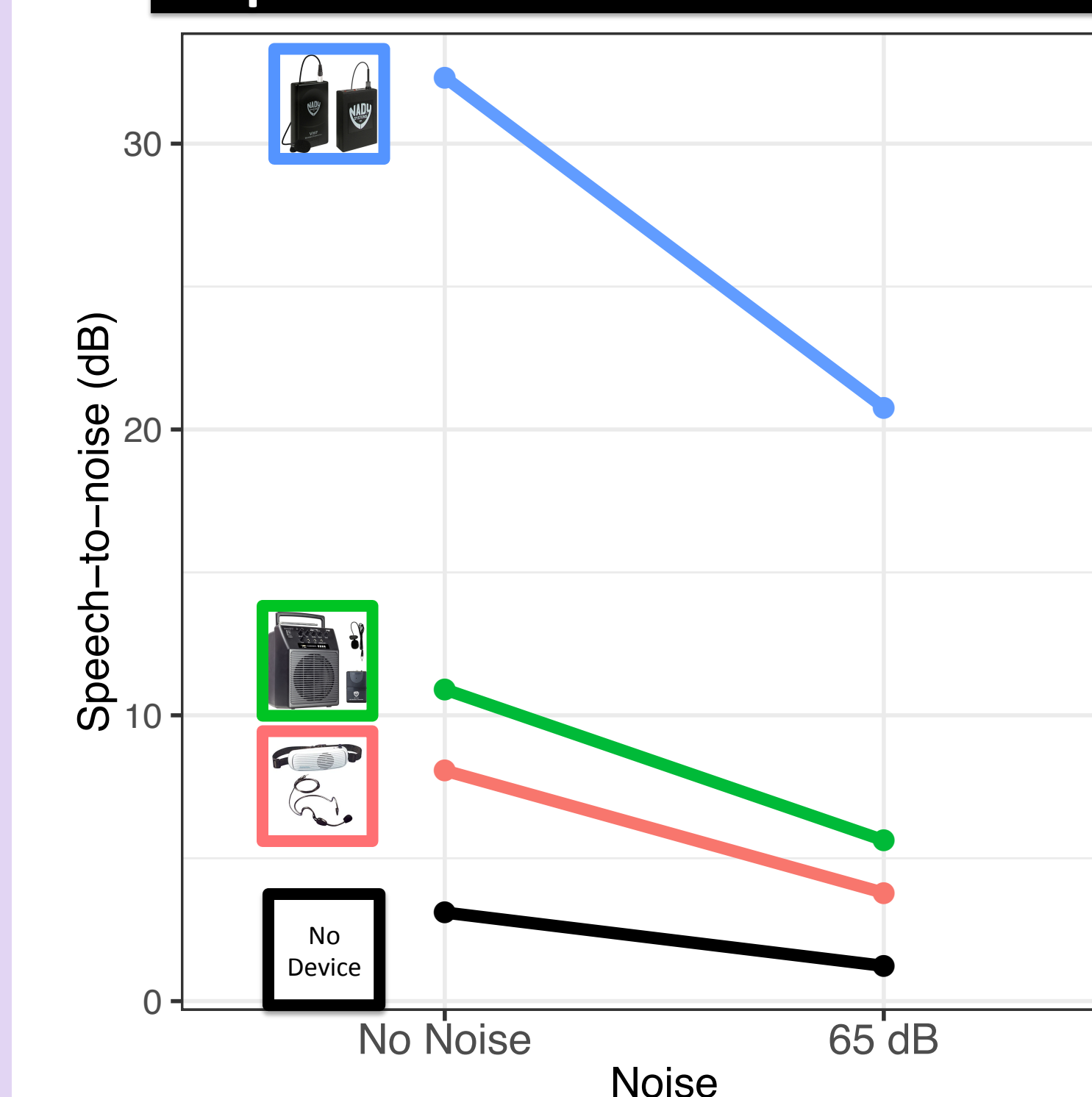
Intelligibility: Naïve listeners



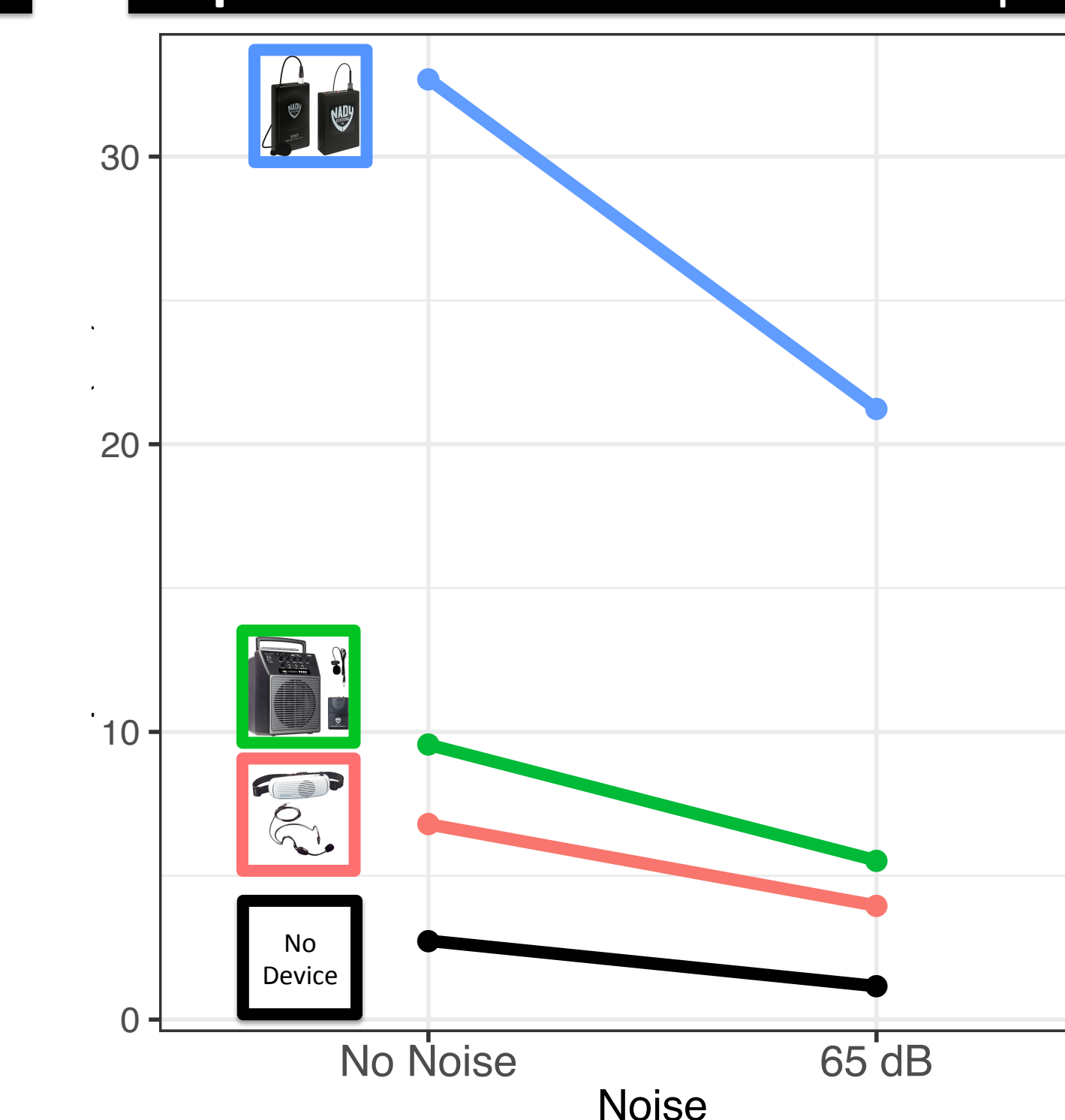
Overall preference: Immediately and after trials



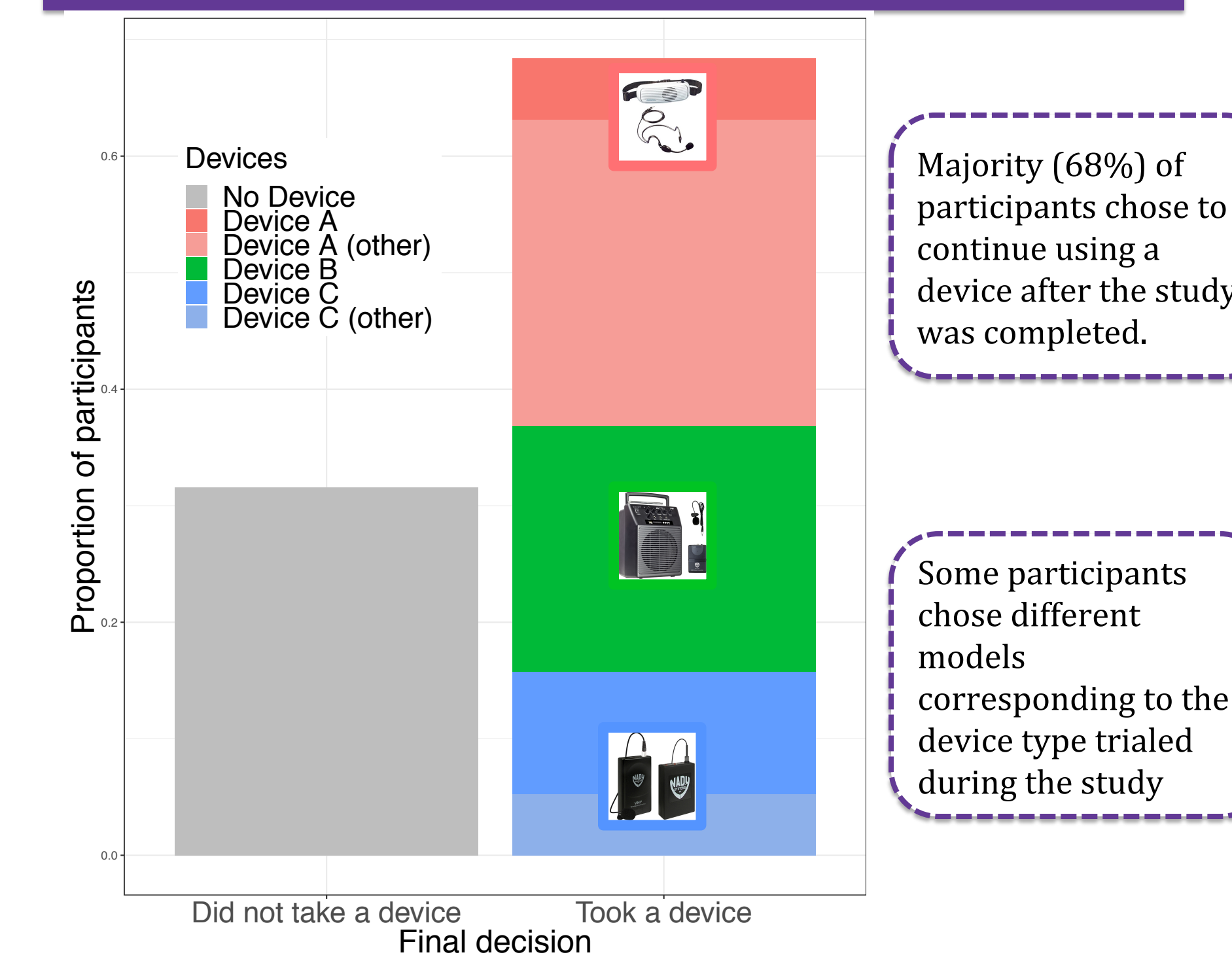
Speech-to-noise: Sentence Reading



Speech-to-noise: Picture description



Final device decisions



Majority (68%) of participants chose to continue using a device after the study was completed.

Some participants chose different models corresponding to the device type trialed during the study

## Discussion



- Clear device hierarchy through objective measures, but discrepancy between device performance measures and final preferences
- Majority of individuals elected to continue using a device following study completion; *however...*
- Device decisions did not align with device hierarchy observed in lab. Individual preferences emerged.
- Results indicate the promise of speech amplification and communication device use for hypophonia, but highlight a need to explore factors that influence preference and long-term use

## References

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