

Use of the SpeechVive device improves communication in people with Parkinson's disease

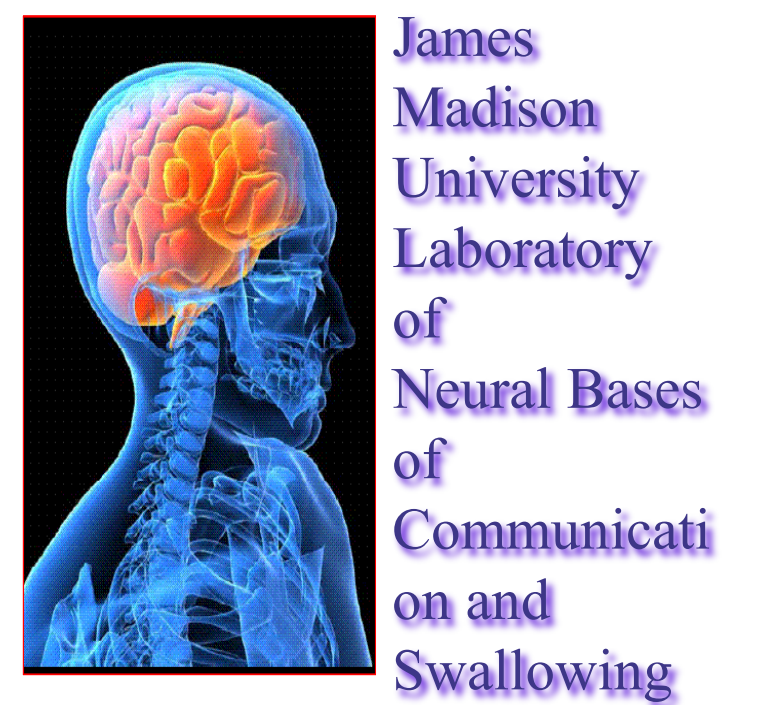


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Background

Individuals with Parkinson's disease are often affected by problems with communication including reduced vocal loudness, increased speech rate, and slurred articulation [1-3]

Speech Therapy Available [2,4,5]:

- o adduction exercises
- o vocal function exercises
- o LSVT LOUD™

Behavioral treatments may be less successful with individuals with PD because for some, carry-over into everyday life is inconsistent [5,6].

Objective: The purpose of this study was to assess the efficacy of a new treatment for speech impairments associated with PD (SpeechVive™ device) by examining changes to speech after 3 months of daily use.



Methods

Subjects

- o 18 participants were enrolled.
- o 2 dropped out when their devices were lost. Resulting n=16
- o Recruited at two sites: Purdue University and James Madison University
- o Mean age = 64.5 years (range = 56 to 78 years)
- o Mean disease duration = 8.1 years (range = 2 to 17 years)
- o 6 participants had previous speech therapy (5 had LSVT LOUD)
- o 2 participants had DBS implant

Treatment Program:

- o Asked to wear the SpeechVive 2-8 hours per day in a communicative environment and read 30 minutes per day, 5 days per week
- o Noise level from SpeechVive elicited a 3-5 dB increase in sound pressure level and the noise level was adjusted every two weeks

Testing:

- o Tested pre- and post-training (3-month treatment period)
- o Tested first without the device (OFF) and then with the device (ON)

Speech Tasks: Talk extemporaneously about topic of choice for ~2 minutes, read a passage, and read sentences

Measurements:

1. Sound pressure level (dB)
2. Utterance Length (syllables)
3. Fundamental frequency range (semitones)
4. Fundamental frequency variability (Hz)
5. Pausing patterns relative to syntax



Analysis:

Analyzed with repeated-measures ANOVA, subject modeled as a random factor Session – pre/post treatment and Device – off/on device were within factors

Interactions analyzed with planned comparison matched pairs t-tests

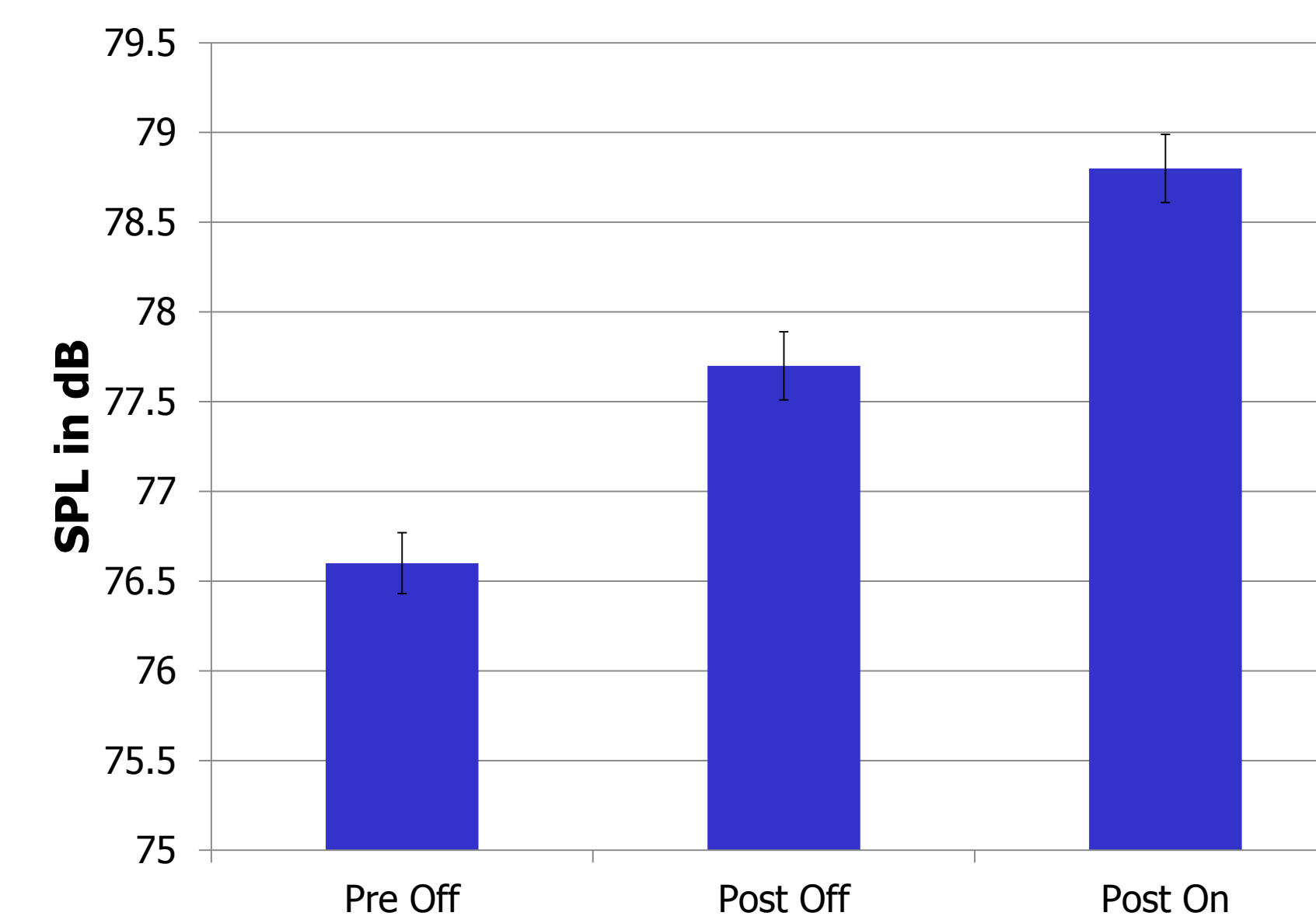
- PreOff to PostOff reflect training/learning across the 3 months of use
- PostOff to PostOn reflect device effects present after 3 months of use

Graphs: means with standard error bars

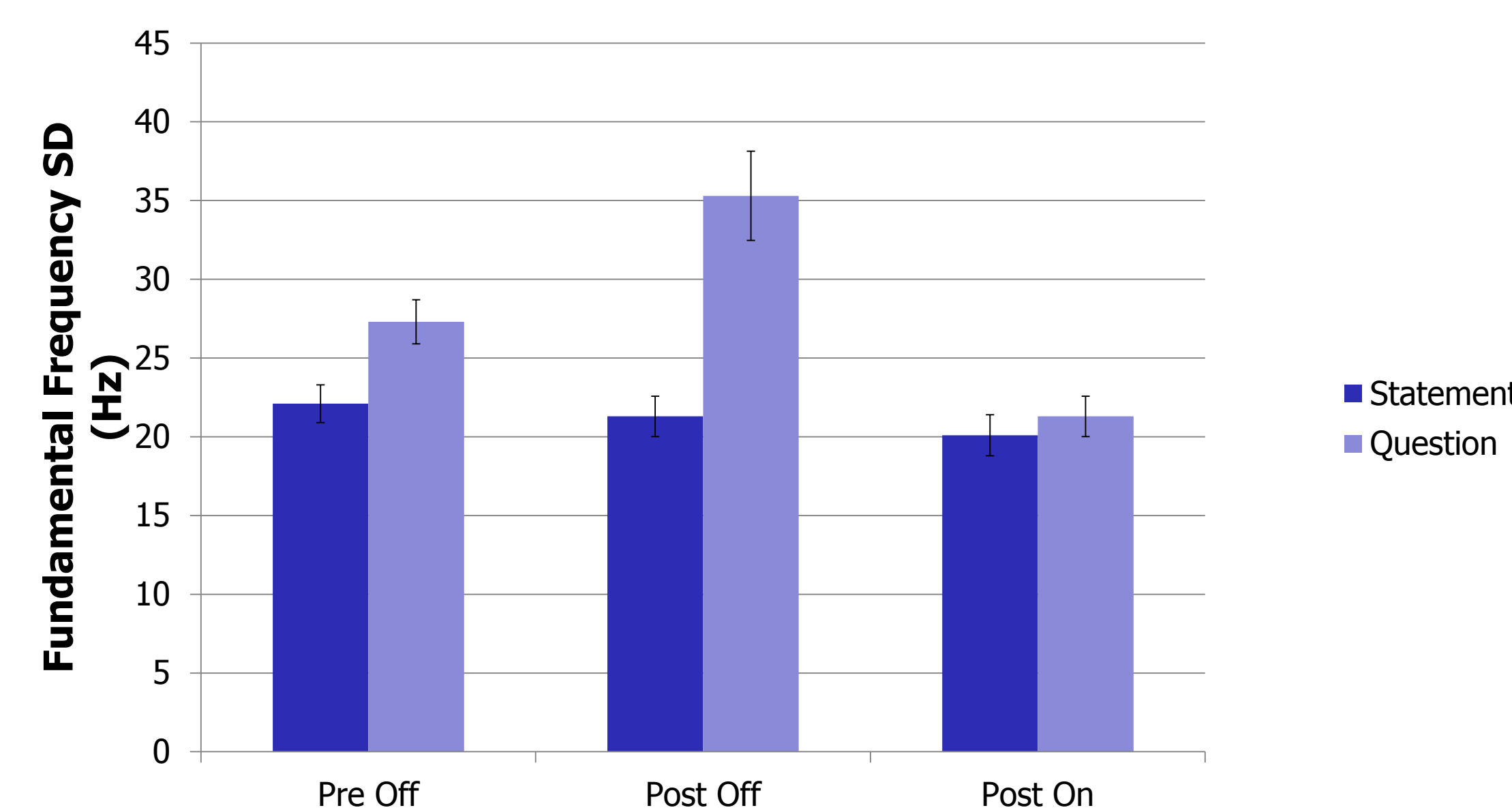
Since treatment effects are variable across participants, for each measurement, the percent of participants following the group result is provided.

Results

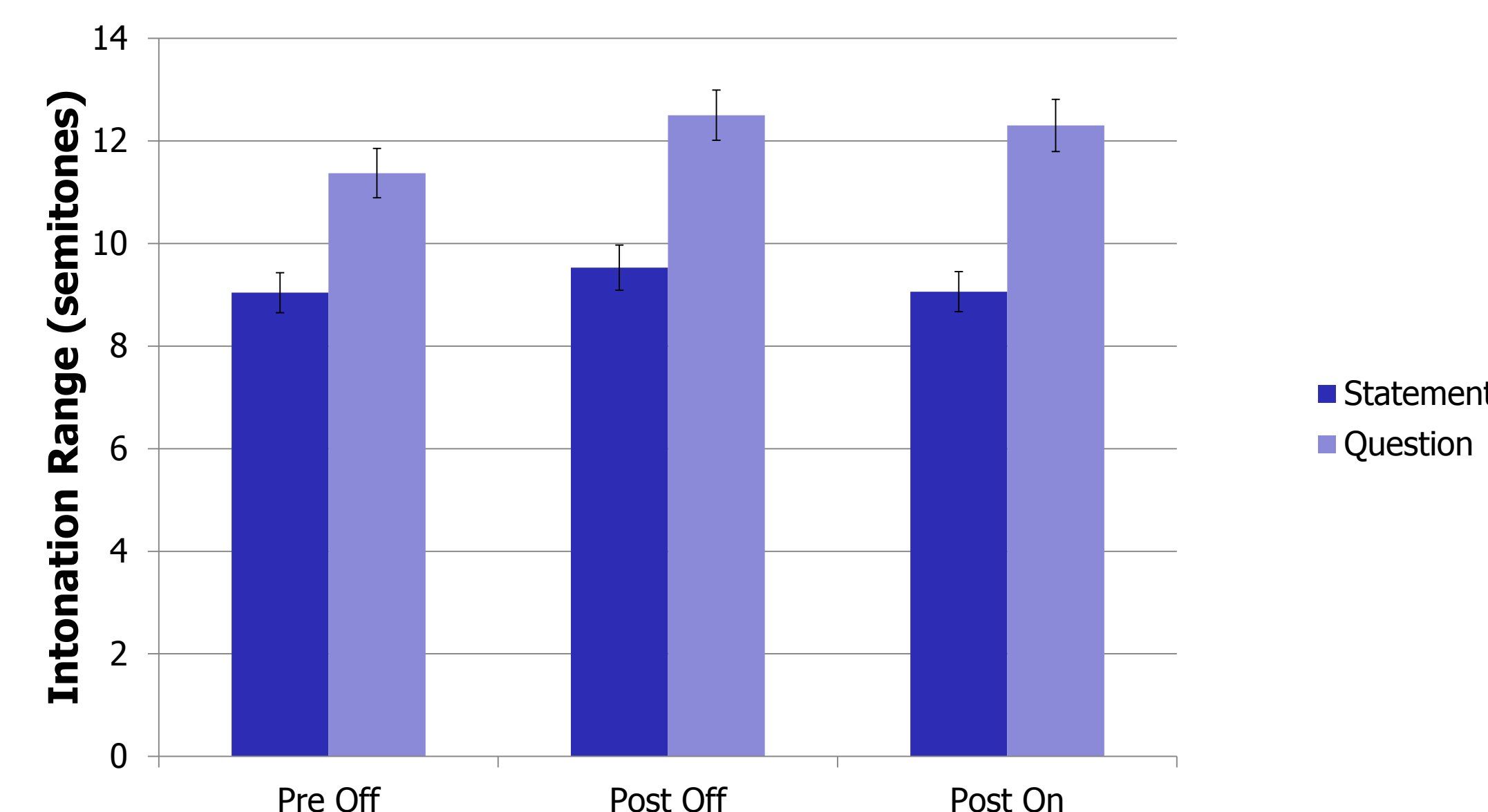
Sound Pressure Level (SPL): Significant main effects of Session ($p < 0.0001$) and Device ($p < 0.0001$), 81% of participants. Use of the SpeechVive device results in higher vocal intensity after treatment.



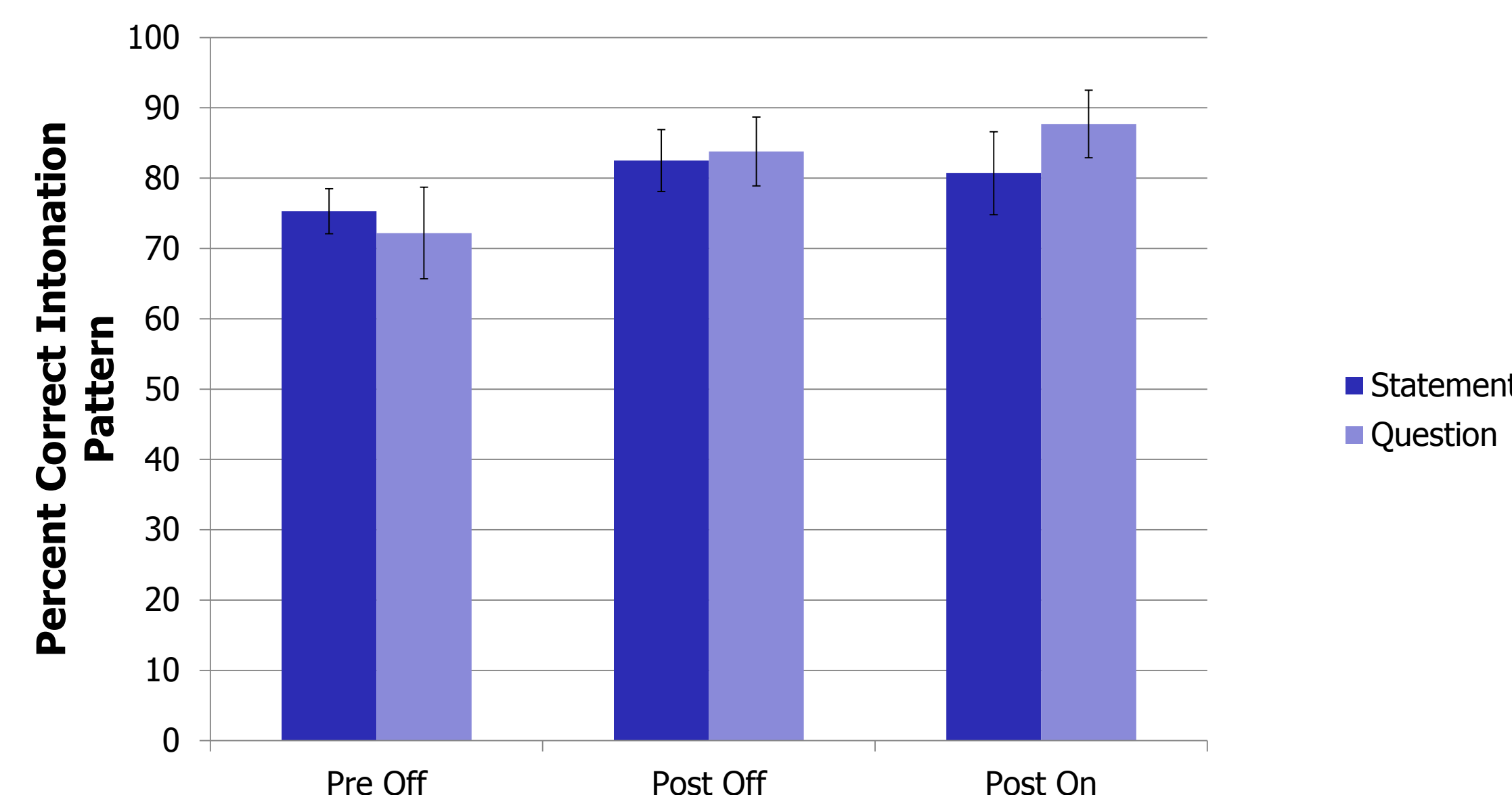
Intonation Variability: Significant effect session ($p = 0.01$), sentence type ($p < 0.0001$), and interaction ($p = 0.0007$): Question: Pre < Post, 81% of participants.



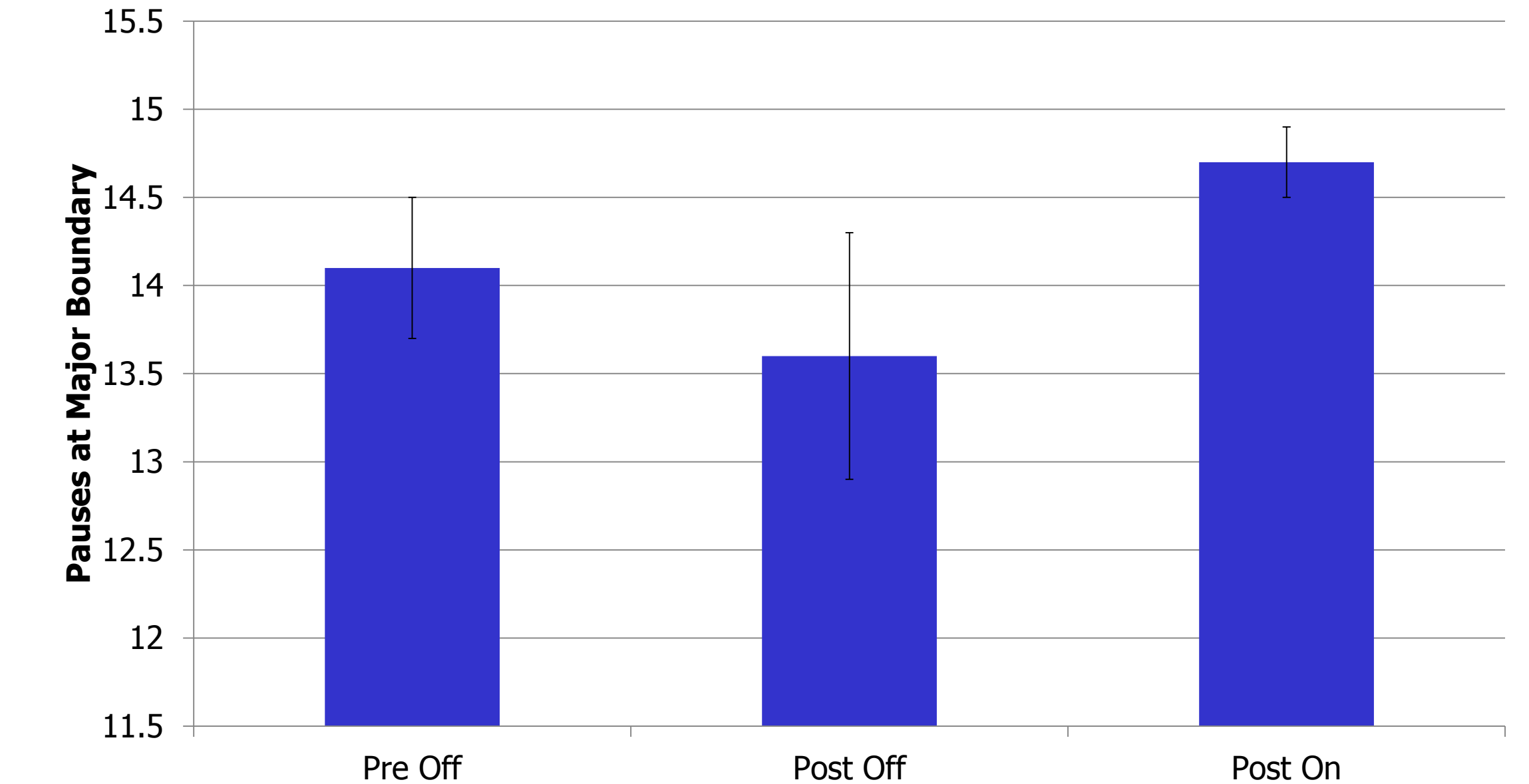
Intonation Range: Significant effect session ($p = 0.01$) and sentence type ($p < 0.0001$) – Pre < Post and Statement < Question, 62% of participants for both question and statement.



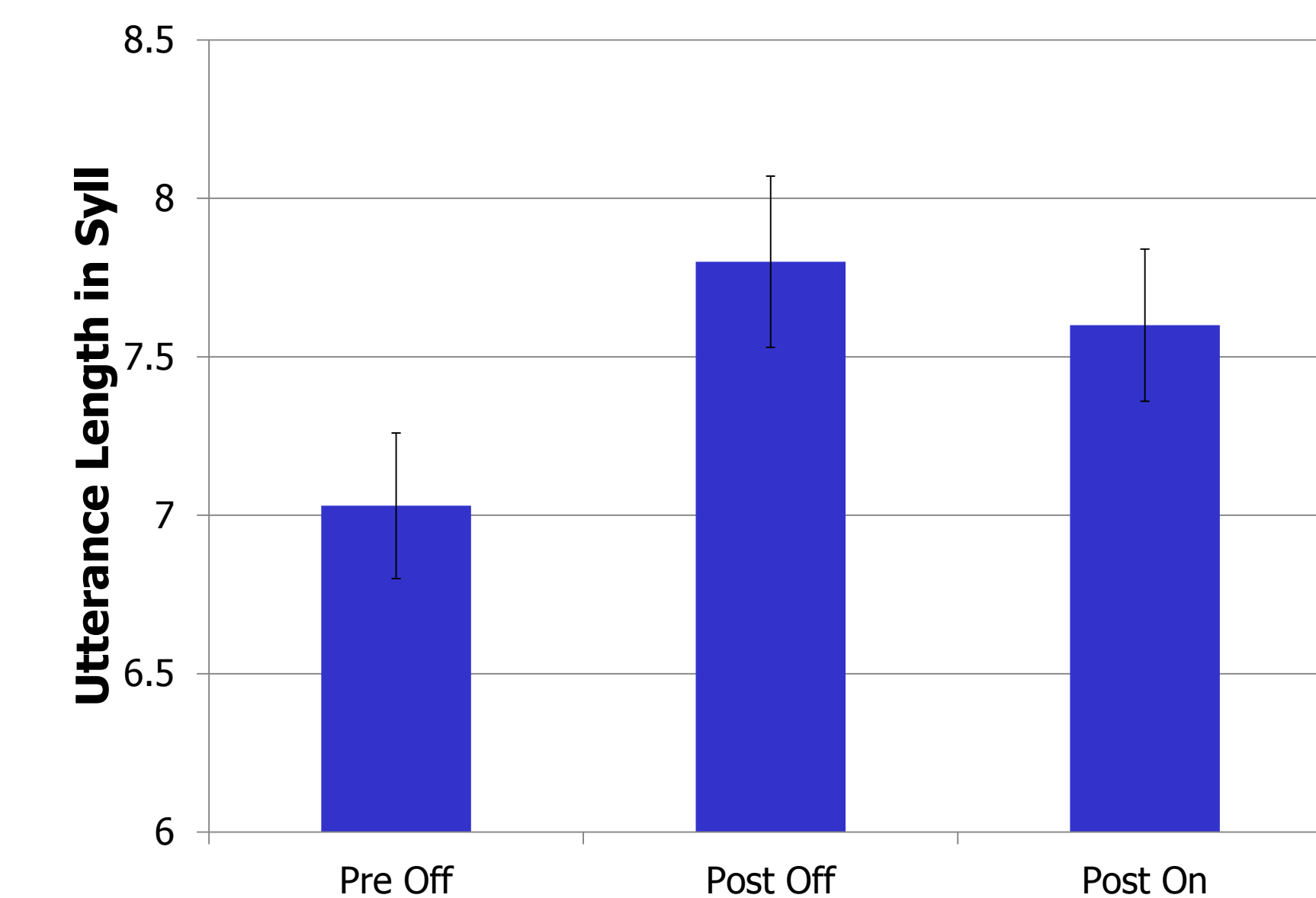
Correct Target (statement/question) Produced: Significant effect of session ($p = 0.003$) – Pre < Post, 50-63% of participants for question and statement. F0SD, Range and Correct Production data support that participants more clearly distinguished questions and statements after treatment.



Pausing Patterns: Significant effect of Device for Major Boundaries ($p = 0.03$), 43% of participants. Participants took more pauses at major boundaries after treatment, potentially making them sound more natural.



Utterance Length: Significant interaction ($p = 0.03$): Pre Off < Post Off ($p = 0.02$), 63% of participants. Participants could say more without pausing after treatment than before.



Conclusions

Improvements in vocal intensity, pauses, utterance length, and intonational contrast indicate that communication improved with device use. However, not all participants experienced the same level of improvement.

This study replicates results of earlier study ($n = 39$) with respect to sound pressure level with a smaller, more patient-friendly device and adds information related to intonation and breath patterns. No adverse events occurred.

Strengths of using the SpeechVive in treatment include 1) no cognitive load since it is based on an automatic reflex, 2) little behavioral training necessary – many of the benefits are present as soon as the patient puts the device on and it is easy to teach the patient how to wear the device, 3) clinician can track patient compliance using data on use kept by the device itself.

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Disclosure: The first author has a financial interest in the SpeechVive company and sits on the Board of Directors for the company.

References:

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