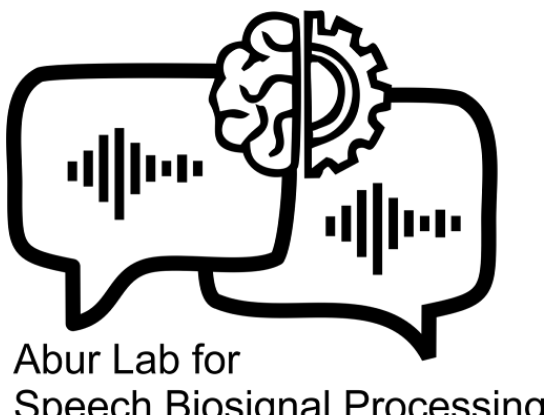
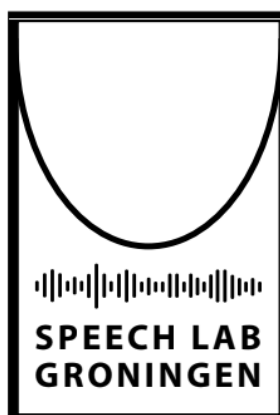
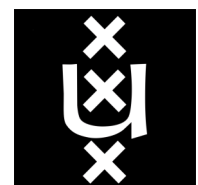


# ASSOCIATIONS BETWEEN ACOUSTIC, KINEMATIC, SELF-REPORTED, AND PERCEPTUAL BASED MEASURES OF SPEECH IN INDIVIDUALS SURGICALLY TREATED FOR ORAL CANCER



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## INTRODUCTION

- Postoperative speech is one of the top priorities of individuals treated for oral cancer [1]
- No gold standard exists to assess speech outcomes of individuals treated for oral cancer  
→ Need to understand interrelatedness between **domains** of acoustic, kinematic, perceptual, self-reported measures

### Study aims

**Aim 1:** Determine which domains differ between control speakers and individuals treated for oral cancer

**Aim 2:** Assess interrelatedness of domains for individuals treated for oral cancer

## METHODS

- Individuals treated for tongue or jaw tumours (T1-T4)
- North Wind and the Sun passage in eight sentences  
→ Acoustic and articulographic (EMA) recordings

Group	N	Age (sd)	Time post-op (sd)
Control	8 (5M; 3F)	60.9 (7.1)	-
Tongue	4 (3M; 1F)	59 (11.7)	6.33 years (4.85)
Jaw	5 (2M; 3F)	63.6 (8.0)	4.14 years (2.6)

### Measures

1. Articulatory **Acoustic** Vowel Space (AAVS [3-4])
2. Articulatory **Kinematic** Vowel Space (AKVS [4-5])
3. **Perceptual** listening effort & intelligibility (inexperienced listeners)
4. **Self-reported** outcomes (Speech Handicap Index [2])

Left: Sound booth used for data collection

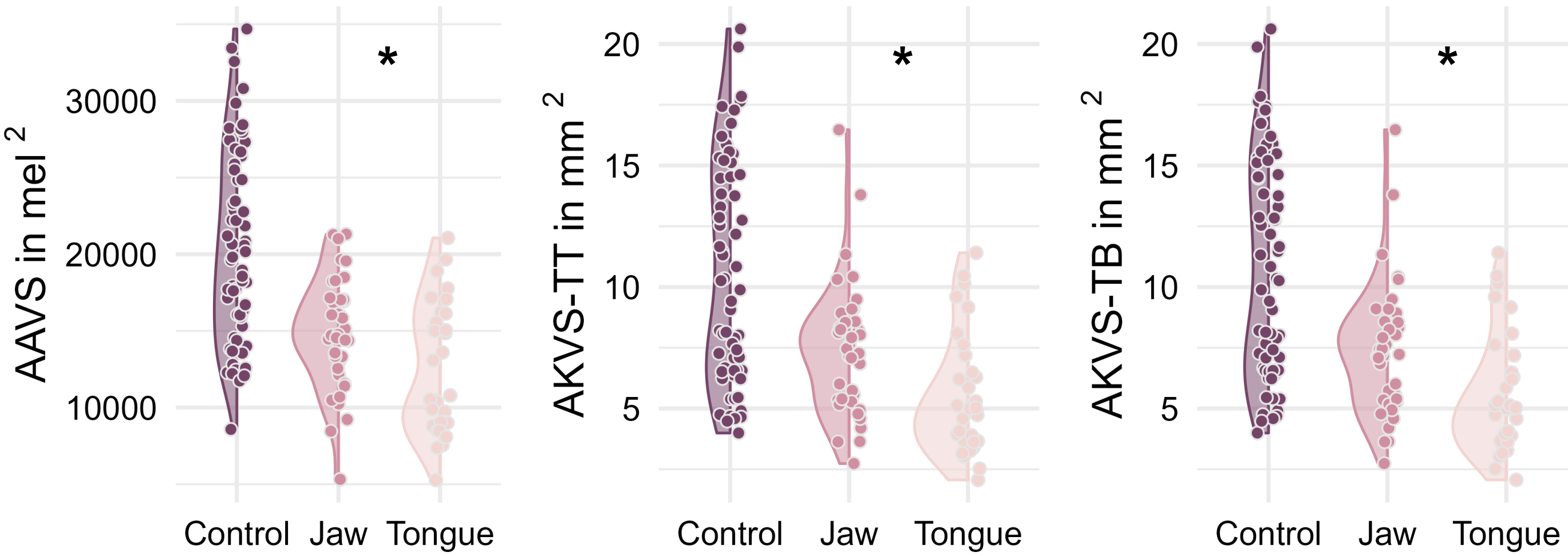
Right: experimental set-up in the van



## RESULTS AIM 1:

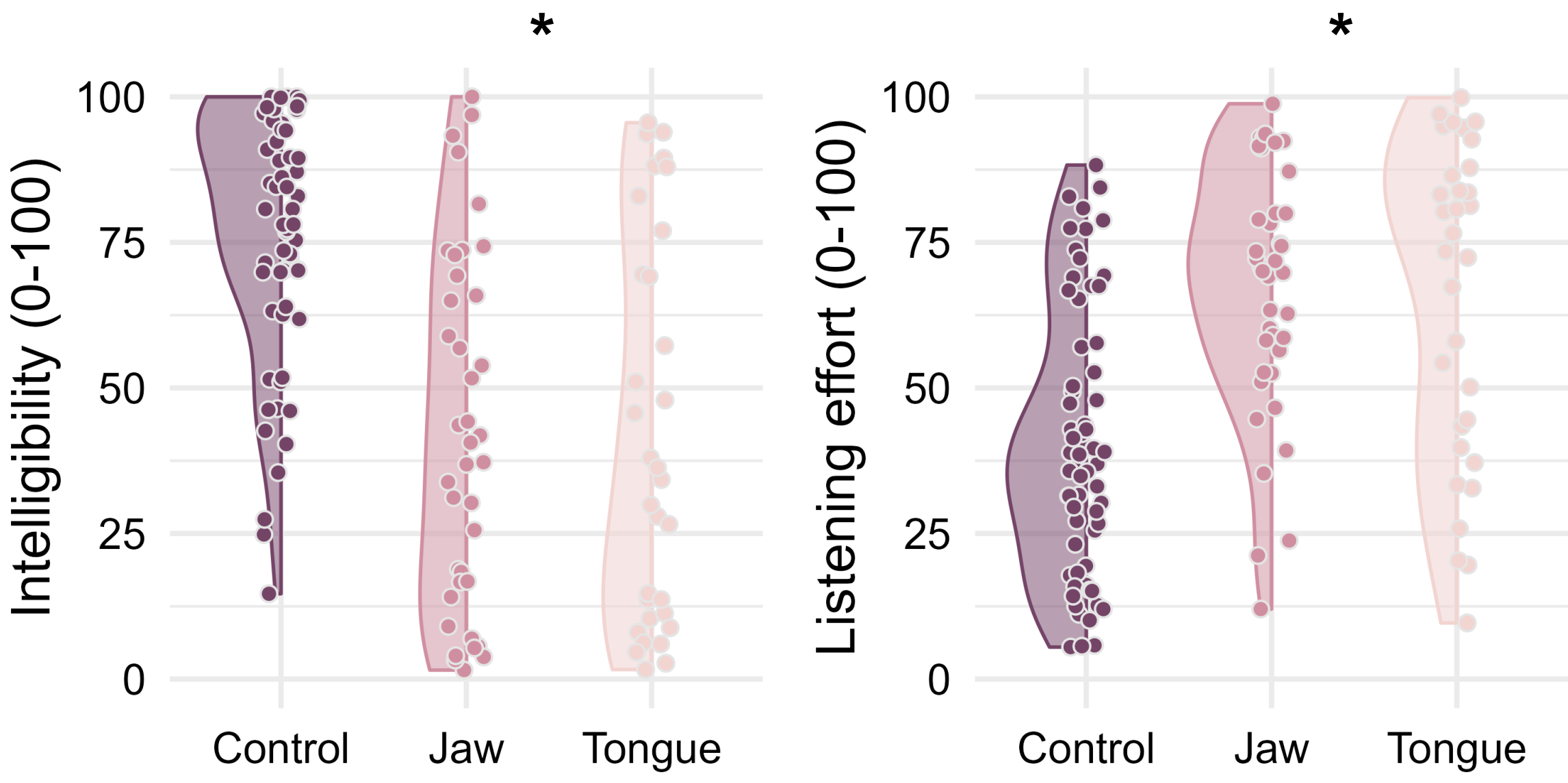
### Articulatory Acoustic and Kinematic Vowel Space

- Acoustic (AAVS):  $F_1$ - $F_2$  trajectories of voiced segments [3-4]
- Kinematic (AKVS): X and Y coordinates of all segments [4-5]  
→ Tongue tip (TT) and Tongue Back (TB)



### Perceptual intelligibility and listening effort

- 35 inexperienced listeners (13M, 22F, mean age: 36.1 years)
- Visual Analogue Scale rating procedure
- Multi speaker babble added (SNR of +2dB)

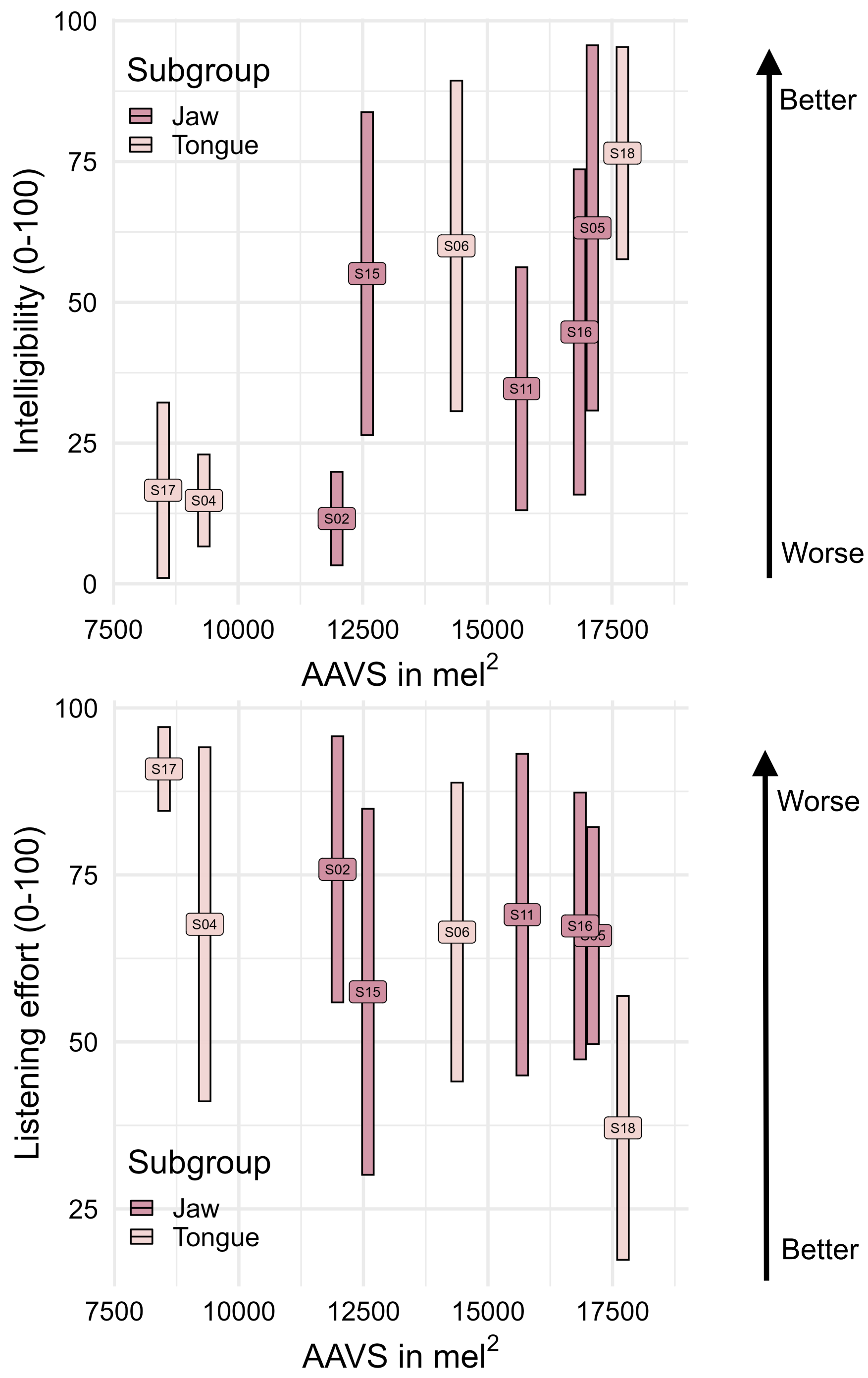
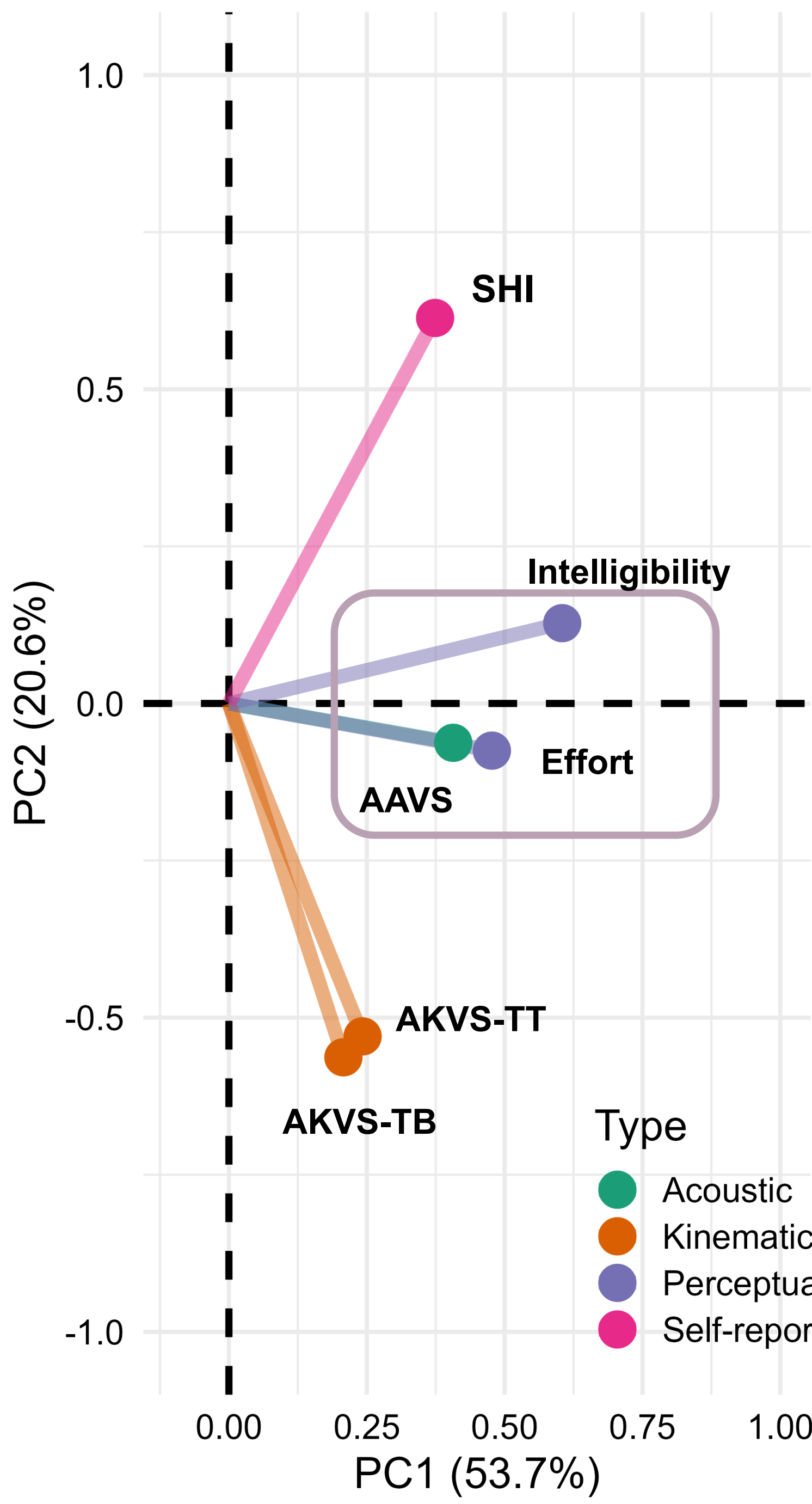


### Group differences

- Individuals treated for oral cancer score lower across domains (acoustic, kinematic, perceptual) compared to control speakers:  
→ Mean Z-score difference:  $\beta = -0.96$  SD,  $p < 0.001$

## RESULTS AIM 2:

- Principal Component Analysis (PCA)  
→ PC1 and PC2 explain  $\pm 75\%$  of the data



## DISCUSSION & CONCLUSION

### Aim 1: group differences

- All measures showed differences between control speakers and individuals treated for oral cancer  
→ Highlights the multifaceted nature of the speech problems of individuals treated for oral cancer

### Aim 2: interrelatedness of domains

- Findings highlight interrelatedness of acoustic and perceptual measures  
→ No clear association between acoustics and kinematics

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