Overall analysis

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1. Overall kinematic analysis

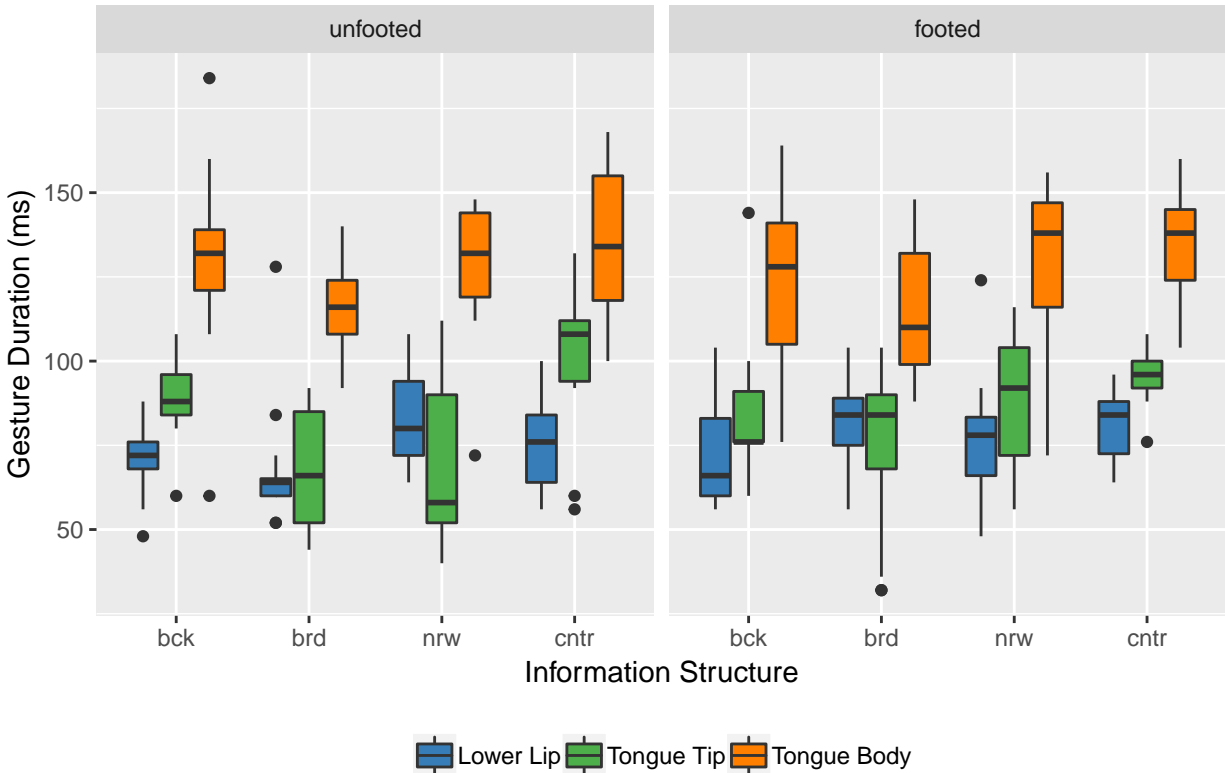### 1.1. Gesture Duration

Fig 1. Overall Gesture Duration

Fig 1. displays the distribution of gesture duration data across 2 speakers in different conditions. I found a main effect of Information Structure on *gesture duration*: $F(3, 286) = 8.60$ (p < .001). *Across-accentuation*, longer movements were confirmed when comparing the maximally diverging focus structures, i.e., *background* and *contrastive focus*. The duration of opening gesture across the three different articulators increased on average 9.40ms. *Within-accentuation*, opening gestures were averagely 15.7ms longer in *contrastive focus* condition than *background focus* condition.

The main factor *Place of Articulation* also has an effect on *gesture duration* ($F(2, 286) = 204.50$ (p < .001), post-hoc: /k/ > /t/ > /p/).

The interaction between *place of articulation* and *information_structure* was confirmed significant. While the greatest increase for *lower lip* is between *contrastive focus* and *background* (6.4ms longer), the largest differences for *tongue tip* and *tongue body* come from comparing *contrastive focus* and *broad focus* (26.2ms and 18ms longer, respectively).

```
## # A tibble: 3 x 5
## # Groups:   Place [3]
```

```
##   Place         bck   brd   nrw  cntr
##   <fct>        <dbl> <dbl> <dbl> <dbl>
## 1 lower_lip     71.4  75.1  79.5  77.8
## 2 tongue_tip    86.7  72    78.9  98.2
## 3 tongue_body  127   116   129.  134.
```

Effects of *Footedness* on *gesture duration* failed to reach the level of significance.

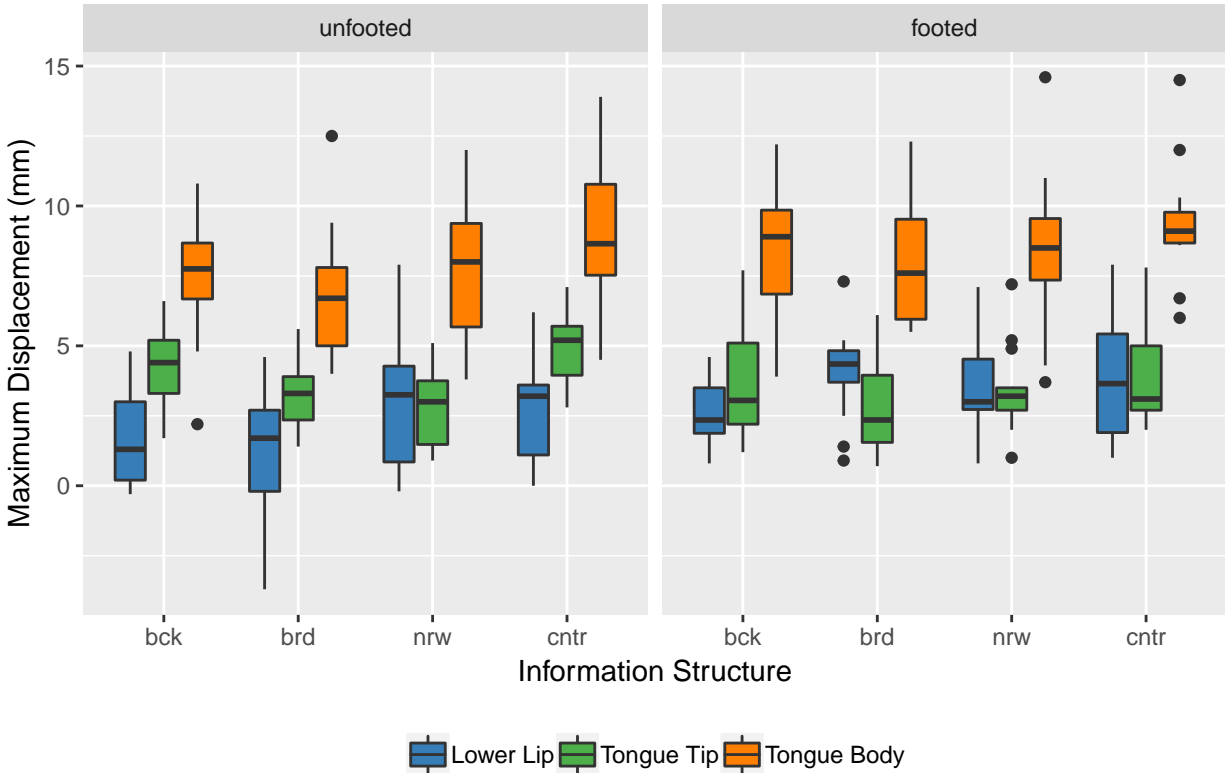## 1.2. Maximum Displacement

Fig 2. Overall Maximum Displacement

Fig 2. shows the distribution of maximum displacement of the opening gesture in different conditions. I observed larger movements across different *Information structures*: $F(3, 286) = 6.82$ (p < .001). *Across-accentuation*, the opening gestures are averagely 1.14mm larger in *contrastive focus* than in *background*. *Within-accentuation*, the displacement of gestures increased from *broad focus* to *contrastive focus* for an average of 1.37mm, from *narrow focus* to *contrastive focus* for an average of 0.85mm.

Place of articulation again has an effect on displacement ($F(2, 286) = 208.58$ (p < .001), post-hoc: /k/ > /t/ > /p/).

Comparing the two *footedness* condition, the movement under footed conditions overall is 0.48mm larger than unfooted conditions ($F(1, 286) = 4.36$ (p < .05)).

The interaction of *place* and *footedness* reached the level of significance ($F(2, 286) = 5.075$ (p < .01)).

```
## # A tibble: 2 x 4
## # Groups:   Footedness [2]
##   Footedness lower_lip tongue_tip tongue_body
##   <fct>          <dbl>      <dbl>       <dbl>
## 1 unfooted        2.15       3.81        7.84
```

```
## 2 footed            3.53       3.44       8.46
```

As can be seen from the table, whereas for *lower lip* and *tongue body*, the articulators moved larger from unfooted condition to footed condition, *tongue tip* moved smaller.

1.3. Peak Velocity

and *time-to-peak velocity* (stiffness): $F(3, 286) = 6.12$ ($p < .05$) but not for *peak velocity* ($p > .05$).

Across-accentuation, and 6.34ms in *peak velocity*, while *peak velocity* remained the same.

Within-accentuation, 9,84ms longer time-to-peak velocity).

1.4. Time-to-Peak Velocity

1.2. Main effect of place of articulation

The main factor *Place of Articulation* affects all the kinematic measures: *peak velocity*: $F(2, 286) = 25.1498$ ($p < .05$); post-hoc: /k/ > /t/ > /p/, *time-to-peak velocity (stiffness)*: $F(2, 286) = 59.41$ ($p < .05$); post-hoc: /k/ > /t/ > /p/.

1.3. Main effect of footedness

The main effect of *Footedness* reached the level of significance in *displacement* ($F(1, 286) = 4.36$ ($p < .05$); post-hoc: footed 0.48mm larger than unfooted), *peak velocity* ($F(1, 286) = 4.09$ ($p < .05$); post-hoc: footed 8.23mm/s faster than unfooted).

1.4. Interactions

Furthermore, the analysis revealed an interaction between the main factors *Information Structure* and *Place of articulations* in *gesture durations* ($F(6, 286) = 2.56$ ($p <. 05$)), and *time-to-peak velocity* ($F(6, 286) = 3.34$ ($p < .05$)). The Tukey HSD post-hoc test revealed that the greatest modification of duration for *lower lip* comes from c-0 comparison with an average increase of 6.4ms, while for *tongue tip* and *tongue body*, the greatest modification comes from c-b comparisons with an average increase of 26.2ms and 18ms, respectively. With respect to *time-to-peak velocity*, the greatest differeces for lower lip comes from comparing narrow and background context (2.3ms later in narrow focus), while for tongue tip and tongue body, the greatest increase was found in comparing contrastive and broad focus (23.9ms and 12.9ms respectively).

The intercation between *place* and *footedness* was also found significant in displacement ($F(2, 286) = 5.08$ ($p < .05$)). When put in footed context, lowe lip and tongue body moved 1.38mm and 0.52mm larger, whereas tongue tip moved 0.37mm smaller.

2. By-speaker analysis