

Processing EGG data: New methods for a multidimensional time-series assessment of vocal fold activity

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mFiL

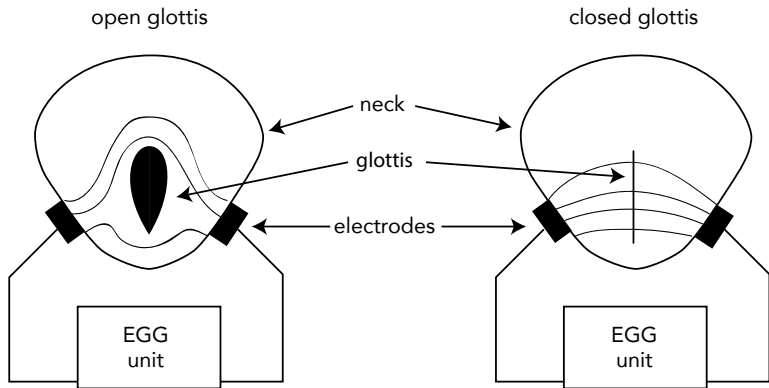
Background: Electroglottography

- EGG (Fabre, 1957; Scherer & Titze, 1987; Rothenberg & Mahshie, 1988)
 - estimation of vocal folds contact area (VFCA) based on impedance of high frequency current
- non-invasive
- relatively simple signal

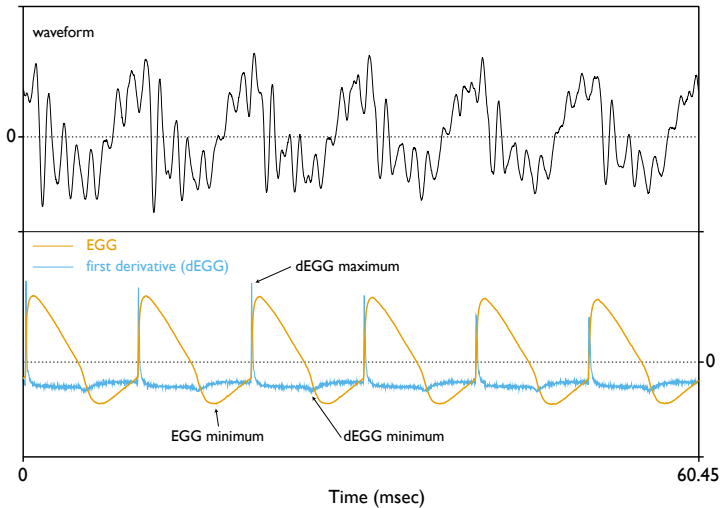
Background: Electroglottography



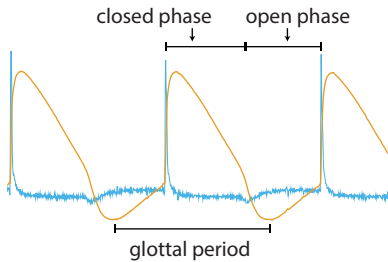
Background: Electroglottography



Background: EGG signal

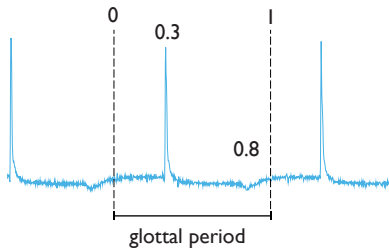


Background: EGG signal



Background: Contact quotient

$$CQ = 0.8 - 0.3 = 0.5$$

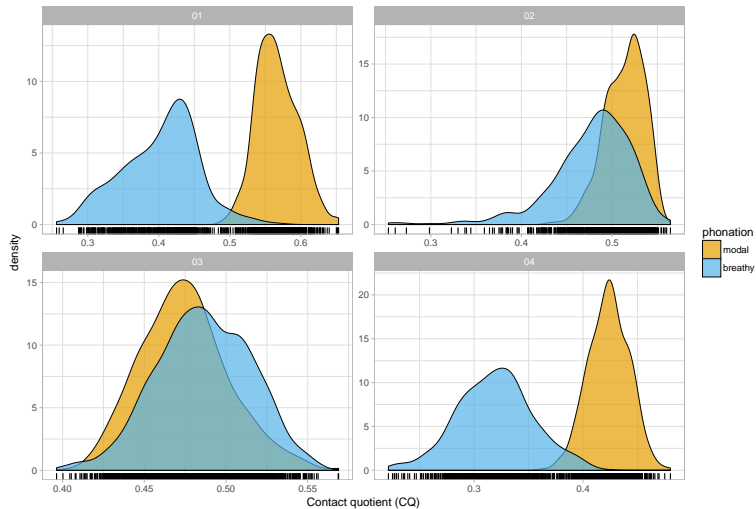


Methods

- 4 phonetically trained BE speakers
- [a] in modal and breathy voice
 - $10 \times 2 = 20$ tokens per speaker
- 80 tokens

Results: CQ

Density plots of CQ in modal and breathy phonation by speaker

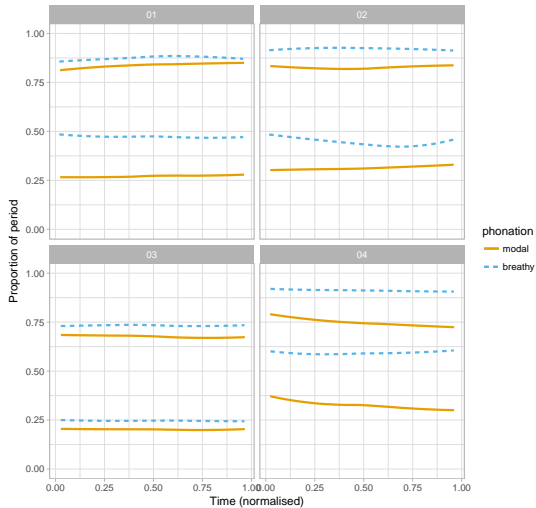


Results: CQ

```
## Linear mixed model fit by REML t-tests use Satterthwaite approximations
## to degrees of freedom [lmerMod]
## Formula: contact_quotient ~ phonation + (1 + phonation | speaker)
## Data: tracegram
##
## REML criterion at convergence: -19596.2
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -6.8237 -0.5875  0.0188  0.6320  5.0468
##
## Random effects:
## Groups   Name                Variance Std.Dev. Corr
## speaker  (Intercept)          0.003668 0.06057
##          phonationbreathy 0.005922 0.07696  -0.38
## Residual                    0.001081 0.03289
## Number of obs: 4927, groups:  speaker, 4
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)    0.49460    0.03029   3.01510   16.33 0.000486 ***
## phonationbreathy -0.07312    0.03849   3.01340    -1.90 0.153291
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##              (Intr)
## phontnbrthy -0.381
```

Results

Tracegrams of modal and breathy phonation by speaker



References

- Fabre, P. 1957. Un procede electrique percutane d'inscription de l'accolement glottique au cours de la phonation: glottographie de haute frequence. Premiers resultats. *Bulletin de l'Académie nationale de médecine* 141. 66.
- Rothenberg, Martin & James J. Mahshie. 1988. Monitoring vocal fold abduction through vocal fold contact area. *Journal of Speech, Language, and Hearing Research* 31(3). 338–351.
- Scherer, Ronald C. & Ingo R. Titze. 1987. The abduction quotient related to vocal quality. *Journal of Voice* 1(3). 246–251.