regressions by language

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##Individual Language Models To determine the correlates of stress

```
library(lme4)
```

```
## Warning: package 'lme4' was built under R version 3.6.3
```

```
## Loading required package: Matrix
```

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.6.3
```

```
library(dotwhisker)
```

```
## Warning: package 'dotwhisker' was built under R version 3.6.3
```

```
library(data.table)
```

```
## Warning: package 'data.table' was built under R version 3.6.3
```

```
library(hqmisc)
library(lmerTest)
```

```
## Warning: package 'lmerTest' was built under R version 3.6.3
```

```
##
## Attaching package: 'lmerTest'
```

```
## The following object is masked from 'package:lme4':
##
##     lmer
```

```
## The following object is masked from 'package:stats':
##
##     step
```

```
library(phonR)
```

```
## Warning: package 'phonR' was built under R version 3.6.2
```

```
library(vowels)
library(tidyverse)
```

```
## Warning: package 'tidyverse' was built under R version 3.6.2
```

```
## -- Attaching packages --------------------------------------- tidyverse
1.3.0 --

## v tibble  3.0.4     v dplyr   1.0.2
## v tidyr   1.1.2     v stringr 1.4.0
## v readr   1.3.1     v forcats 0.4.0
## v purrr   0.3.3

## Warning: package 'tibble' was built under R version 3.6.3

## Warning: package 'tidyr' was built under R version 3.6.3

## Warning: package 'readr' was built under R version 3.6.2

## Warning: package 'dplyr' was built under R version 3.6.3

## Warning: package 'forcats' was built under R version 3.6.2

## -- Conflicts ------------------------------------------
tidyverse_conflicts() --
## x dplyr::between()   masks data.table::between()
## x tidyr::expand()    masks Matrix::expand()
## x dplyr::filter()    masks stats::filter()
## x dplyr::first()     masks data.table::first()
## x dplyr::lag()       masks stats::lag()
## x dplyr::last()      masks data.table::last()
## x tidyr::pack()      masks Matrix::pack()
## x purrr::transpose() masks data.table::transpose()
## x tidyr::unpack()    masks Matrix::unpack()

library(dplyr)
library(lsmeans)

## Warning: package 'lsmeans' was built under R version 3.6.2

## Loading required package: emmeans

## Warning: package 'emmeans' was built under R version 3.6.3

## The 'lsmeans' package is now basically a front end for 'emmeans'.
## Users are encouraged to switch the rest of the way.
## See help('transition') for more information, including how to
## convert old 'lsmeans' objects and scripts to work with 'emmeans'.

library(tidyr)
library(broom)

## Warning: package 'broom' was built under R version 3.6.3

library(broom.mixed)

## Warning: package 'broom.mixed' was built under R version 3.6.3
```

```
## Warning in checkMatrixPackageVersion(): Package version inconsistency
detected.
## TMB was built with Matrix version 1.2.18
## Current Matrix version is 1.2.17
## Please re-install 'TMB' from source using install.packages('TMB', type =
'source') or ask CRAN for a binary version of 'TMB' matching CRAN's 'Matrix'
package

## Registered S3 method overwritten by 'broom.mixed':
##   method      from
##   tidy.gamlss broom
```

#File read in

#subsets for each lang

```
compare.df2$seg = as.factor(compare.df2$seg)

bardi = subset(compare.df2, Language == "Bardi")
burarra = subset(compare.df2, Language == "Burarra")
dalabon = subset(compare.df2, Language == "Dalabon")
gija = subset(compare.df2, Language == "Gija")
gunnarpta = subset(compare.df2, Language == "Gunnarpta")
gunwinggu = subset(compare.df2, Language == "Gunwinggu")
kunbarlang = subset(compare.df2, Language == "Kunbarlang")
kayardild = subset(compare.df2, Language == "Kayardild")
malakmalak = subset(compare.df2, Language == "MalakMalak")
ngangi = subset(compare.df2, Language == "Nangikurrunggurr")
murrinh = subset(compare.df2, Language == "MurrinhPatha")
yidiny = subset(compare.df2, Language == "Yidiny")
wanyjirra = subset(compare.df2, Language == "Wanyjirra")
warnman = subset(compare.df2, Language=="Warnman")
warlpiri = subset(compare.df2, Language == "Warlpiri")
yannhangu = subset(compare.df2, Language == "Yannhangu")
```

#Bardi:

```
dur.bardi = lmer(logdur ~ (1|word) + (1|seg) + length + finality + stress,
data=bardi, REML=F)
summary(dur.bardi)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | word) + (1 | seg) + length + finality + stress
##    Data: bardi
##
##      AIC      BIC   logLik deviance df.resid
##   5573.7   5622.9  -2779.8   5559.7     8304
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
```

```
## -2.77466 -0.78630 -0.06921  0.74230  2.49594
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.008113 0.09007
##  seg      (Intercept) 0.003746 0.06120
##  Residual             0.107675 0.32814
## Number of obs: 8311, groups:  word, 2102; seg, 7
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)   -2.434e+00  4.233e-02  5.841e+00 -57.501 2.88e-09 ***
## lengthLong     7.662e-02  5.304e-02  5.782e+00   1.445      0.2
## finalityfinal  5.344e-02  9.717e-03  8.177e+03   5.500 3.92e-08 ***
## stress         1.090e-01  9.440e-03  7.809e+03  11.544  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) lngthL fnltyf
## lengthLong  -0.780
## finalityfnl -0.116  0.011
## stress      -0.127 -0.020  0.537
```

```
inten.bardi = lmer(inten_rel ~ (1|word) + (1|seg) + length + stress,
data=bardi, REML=F)
summary(inten.bardi)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | seg) + length + stress
##    Data: bardi
##
##      AIC      BIC   logLik deviance df.resid
##  52177.0  52219.1 -26082.5  52165.0     8305
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -6.1579 -0.5179 -0.0214  0.5078  6.0303
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  0.1774  0.4212
##  seg      (Intercept)  1.3996  1.1831
##  Residual             30.8972  5.5585
## Number of obs: 8311, groups:  word, 2102; seg, 7
##
## Fixed effects:
##              Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)    0.9257     0.8002    5.5499   1.157    0.295
```

```
## lengthLong     0.0685     1.0085    5.4827   0.068    0.948
## stress         0.6975     0.1303 7676.9715   5.352 8.95e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##            (Intr) lngthL
## lengthLong -0.788
## stress     -0.070 -0.024
```

```
f0.bardi = lmer(f0st ~ (1|word) + (1|seg) + finality + stress, data=bardi,
REML=F)
```

```
## Warning in checkConv(attr(opt, "derivs"), opt$par, ctrl =
control$checkConv, :
## Model failed to converge with max|grad| = 0.00965991 (tol = 0.002,
component 1)
```

```
summary(f0.bardi)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | seg) + finality + stress
##    Data: bardi
##
##      AIC      BIC   logLik deviance df.resid
##  45248.4  45290.4 -22618.2  45236.4     8072
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.5462 -0.5111 -0.0406  0.4406  4.9777
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 11.12733 3.3358
##  seg      (Intercept)  0.01879 0.1371
##  Residual             11.27268 3.3575
## Number of obs: 8078, groups:  word, 2090; seg, 7
##
## Fixed effects:
##                Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)      0.1650     0.1294   13.1211   1.275    0.224
## finalityfinal   -0.1582     0.1110 5382.1128  -1.425    0.154
## stress           0.8180     0.1067 3238.1747   7.668 2.29e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
## finalityfnl -0.412
## stress      -0.471  0.586
```

```
## optimizer (nloptwrap) convergence code: 0 (OK)
## Model failed to converge with max|grad| = 0.00965991 (tol = 0.002,
component 1)

range.bardi = lmer(rangest ~ (1|word) + (1|seg) + finality + stress,
data=bardi, REML=F)

## boundary (singular) fit: see ?isSingular

summary(range.bardi)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: rangest ~ (1 | word) + (1 | seg) + finality + stress
##    Data: bardi
##
##      AIC      BIC   logLik deviance df.resid
##  34662.6  34704.6 -17325.3  34650.6     8072
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.2148 -0.4710 -0.2419  0.1085  9.6422
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.1404   0.3747
##  seg      (Intercept) 0.0000   0.0000
##  Residual             4.1478   2.0366
## Number of obs: 8078, groups:  word, 2090; seg, 7
##
## Fixed effects:
##                Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)   1.396e+00  4.236e-02 3.009e+03  32.962  < 2e-16 ***
## finalityfinal 3.305e-01  5.983e-02 7.282e+03   5.524 3.42e-08 ***
## stress        4.391e-01  5.621e-02 6.592e+03   7.811 6.55e-15 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
## finalityfnl -0.668
## stress      -0.714  0.533
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular

euclid.bardi = lmer(euclid ~ (1|word) + (1|seg) + stress, data=bardi, REML=F)
summary(euclid.bardi)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: euclid ~ (1 | word) + (1 | seg) + stress
```

```
##    Data: bardi
##
##      AIC      BIC   logLik deviance df.resid
##  -7635.1  -7600.0   3822.6  -7645.1     8306
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.4917 -0.6578 -0.1916  0.4522  5.5630
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.004551 0.06746
##  seg      (Intercept) 0.001953 0.04419
##  Residual             0.020368 0.14272
## Number of obs: 8311, groups:  word, 2102; seg, 7
##
## Fixed effects:
##             Estimate Std. Error        df t value Pr(>|t|)
## (Intercept) 2.128e-01  1.808e-02 7.078e+00   11.78 6.62e-06 ***
## stress      1.103e-02  3.571e-03 7.842e+03    3.09  0.00201 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.112
```

#Burarra

```
dur.burarra = lmer(logdur ~ (1|word) + (1|speaker) + length + finality +
stress, data=burarra, REML=F)
summary(dur.burarra)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | word) + (1 | speaker) + length + finality + stress
##    Data: burarra
##
##      AIC      BIC   logLik deviance df.resid
##    605.6    644.2   -295.8    591.6     1831
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.3169 -0.7501 -0.1714  0.5779  3.0003
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 0.0168213 0.12970
##  speaker  (Intercept) 0.0008871 0.02978
##  Residual             0.0679611 0.26069
```

```
## Number of obs: 1838, groups:  word, 696; speaker, 5
##
## Fixed effects:
##                 Estimate Std. Error         df  t value Pr(>|t|)
## (Intercept)   -2.509e+00  2.069e-02  9.114e+00 -121.235 6.20e-16 ***
## lengthLong     4.736e-01  6.086e-02  1.827e+03    7.781 1.19e-14 ***
## finalityfinal  4.376e-02  1.712e-02  1.827e+03    2.556   0.0107 *
## stress         8.629e-03  1.670e-02  1.836e+03    0.517   0.6054
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) lngthL fnltyf
## lengthLong  -0.054
## finalityfnl -0.429  0.003
## stress      -0.468  0.041  0.550
```

```
inten.burarra = lmer(inten_rel ~ (1|word) + (1|speaker) + (1|seg) + stress +
length + finality, data=burarra, REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(inten.burarra)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | speaker) + (1 | seg) + stress +
##     length + finality
##    Data: burarra
##
##      AIC      BIC   logLik deviance df.resid
##  12000.1  12044.3  -5992.1  11984.1     1830
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.3176 -0.5289 -0.0149  0.4890  5.3247
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  3.97396 1.9935
##  speaker  (Intercept)  0.08209 0.2865
##  seg      (Intercept)  0.00000 0.0000
##  Residual             36.34292 6.0285
## Number of obs: 1838, groups:  word, 696; speaker, 5; seg, 5
##
## Fixed effects:
##                Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)      4.3388     0.3340   12.1463  12.990 1.74e-08 ***
## stress          -2.4532     0.3677 1746.8149  -6.671 3.40e-11 ***
## lengthLong      -3.1694     1.3434 1800.6424  -2.359   0.0184 *
## finalityfinal   -6.0630     0.3800 1822.4511 -15.953  < 2e-16 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) stress lngthL
## stress      -0.624
## lengthLong  -0.080  0.048
## finalityfnl -0.580  0.542  0.011
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
f0.burarra = lmer(f0st ~ (1|word) + (1|speaker) + (1|seg) + finality +
stress, data=burarra, REML=F)
summary(f0.burarra)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | speaker) + (1 | seg) + finality + stress
##    Data: burarra
##
##      AIC      BIC   logLik deviance df.resid
##   9149.8   9188.4  -4567.9   9135.8     1826
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.4347 -0.4788  0.0103  0.5139  4.1222
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 3.9506   1.9876
##  speaker  (Intercept) 0.8030   0.8961
##  seg      (Intercept) 0.1468   0.3831
##  Residual             6.0793   2.4656
## Number of obs: 1833, groups:  word, 695; speaker, 5; seg, 5
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)      0.67413    0.49150    7.83203   1.372    0.208
## finalityfinal   -1.44300    0.17562 1708.07877  -8.217 4.09e-16 ***
## stress           0.08575    0.17008 1764.77800   0.504    0.614
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
## finalityfnl -0.165
## stress      -0.199  0.553
```

```
range.burarra = lme4::lmer(rangest ~ (1|word) + (1|seg) + (1|speaker) +
stress, data=burarra, REML=F)
summary(range.burarra)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: rangest ~ (1 | word) + (1 | seg) + (1 | speaker) + stress
##    Data: burarra
##
##      AIC      BIC   logLik deviance df.resid
##   7609.6   7642.7  -3798.8   7597.6     1827
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.1244 -0.5078 -0.2406  0.1835  6.9893
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.12955  0.3599
##  seg      (Intercept) 0.01099  0.1048
##  speaker  (Intercept) 0.06032  0.2456
##  Residual             3.55660  1.8859
## Number of obs: 1833, groups:  word, 695; seg, 5; speaker, 5
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept)  2.04704    0.15486  13.219
## stress      -0.25051    0.09408  -2.663
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.271
```

```
euclid.burarra = lmer(euclid ~ (1|word) + (1|speaker) + (1|seg) + stress,
data=burarra, REML=F)
summary(euclid.burarra)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: euclid ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: burarra
##
##      AIC      BIC   logLik deviance df.resid
##  -1812.3  -1779.2    912.1  -1824.3     1832
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.2553 -0.7294 -0.1860  0.5596  4.5513
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
```

```
##  word     (Intercept) 0.0026319 0.05130
##  speaker  (Intercept) 0.0007948 0.02819
##  seg      (Intercept) 0.0003342 0.01828
##  Residual             0.0193714 0.13918
## Number of obs: 1838, groups:  word, 696; speaker, 5; seg, 5
##
## Fixed effects:
##              Estimate Std. Error        df t value Pr(>|t|)
## (Intercept) 2.255e-01  1.793e-02 6.529e+00  12.577  8.1e-06 ***
## stress      1.654e-02  7.272e-03 1.825e+03   2.275    0.023 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.185
```

#Dalabon:

```
dur.dalabon = lmer(logdur ~ (1|word) + (1|speaker) + (1|seg) + length +
finality + stress, data=dalabon, REML=F)
summary(dur.dalabon)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | word) + (1 | speaker) + (1 | seg) + length +
finality +
##     stress
##    Data: dalabon
##
##      AIC      BIC   logLik deviance df.resid
##   3162.5   3217.3  -1573.3   3146.5     6905
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.0509 -0.7737 -0.1589  0.6351  3.1366
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.006367 0.07979
##  seg      (Intercept) 0.001577 0.03971
##  speaker  (Intercept) 0.001907 0.04367
##  Residual             0.086726 0.29449
## Number of obs: 6913, groups:  word, 2116; seg, 10; speaker, 5
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)   -2.417e+00  2.831e-02  1.044e+01 -85.370 3.42e-16 ***
## lengthLong     3.657e-02  4.614e-02  3.733e+01   0.792    0.433
## finalityfinal  1.037e-01  9.753e-03  6.875e+03  10.633  < 2e-16 ***
```

```
## stress         1.270e-02  9.101e-03  6.213e+03   1.396    0.163
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) lngthL fnltyf
## lengthLong  -0.245
## finalityfnl -0.157 -0.063
## stress      -0.154  0.007  0.450
```

```
inten.dalabon = lmer(inten_rel ~ (1|word) + (1|speaker) + (1|seg) + length +
finality + stress, data=dalabon, REML=F)
summary(inten.dalabon)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | speaker) + (1 | seg) + length +
##     finality + stress
##    Data: dalabon
##
##      AIC      BIC   logLik deviance df.resid
##  43205.0  43259.7 -21594.5  43189.0     6905
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -6.6602 -0.5421 -0.0605  0.4699  7.0553
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  0.1911  0.4371
##  seg      (Intercept)  0.3032  0.5506
##  speaker  (Intercept)  1.8324  1.3537
##  Residual             29.9468  5.4724
## Number of obs: 6913, groups:  word, 2116; seg, 10; speaker, 5
##
## Fixed effects:
##                Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)      2.9716     0.6794    6.7162   4.374  0.00359 **
## lengthLong      -0.5308     0.7300   47.1506  -0.727  0.47077
## finalityfinal   -2.5648     0.1746 6215.7646 -14.689  < 2e-16 ***
## stress          -1.2083     0.1589 3661.6651  -7.602 3.68e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) lngthL fnltyf
## lengthLong  -0.125
## finalityfnl -0.120 -0.093
## stress      -0.121 -0.018  0.442
```

```
f0.dalabon = lmer(f0st ~ (1|word) + (1|speaker) + (1|seg) + finality +
stress, data=dalabon, REML=F)

## boundary (singular) fit: see ?isSingular

summary(f0.dalabon)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | speaker) + (1 | seg) + finality + stress
##    Data: dalabon
##
##      AIC      BIC   logLik deviance df.resid
##  34030.5  34078.2 -17008.2  34016.5     6742
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -6.1985 -0.4709 -0.0091  0.4897  3.8743
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 4.15185  2.0376
##  seg      (Intercept) 0.03398  0.1843
##  speaker  (Intercept) 0.00000  0.0000
##  Residual             6.78972  2.6057
## Number of obs: 6749, groups:  word, 2077; seg, 9; speaker, 5
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)      1.10671    0.11222   12.44224   9.862 3.07e-07 ***
## finalityfinal   -1.02528    0.09452 5337.99467 -10.847  < 2e-16 ***
## stress          -0.14083    0.09134 6229.45188  -1.542    0.123
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
## finalityfnl -0.378
## stress      -0.345  0.479
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular

range.dalabon = lme4::lmer(rangest ~ (1|word) + (1|seg) + (1|speaker) +
stress, data=dalabon, REML=F)
summary(range.dalabon)

## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: rangest ~ (1 | word) + (1 | seg) + (1 | speaker) + stress
##    Data: dalabon
##
##      AIC      BIC   logLik deviance df.resid
```

```
##  30590.1  30631.0 -15289.1  30578.1     6743
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.3093 -0.4580 -0.2294  0.1000  9.2863
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.227450 0.47692
##  seg      (Intercept) 0.009875 0.09937
##  speaker  (Intercept) 0.187743 0.43329
##  Residual             5.222144 2.28520
## Number of obs: 6749, groups:  word, 2077; seg, 9; speaker, 5
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept)  1.86268    0.21180   8.794
## stress       0.08412    0.06213   1.354
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.099
```

```
euclid.dalabon = lme4::lmer(euclid ~ (1|word) + (1|speaker) + (1|seg) +
stress, data=dalabon, REML=F)
summary(euclid.dalabon)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: euclid ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: dalabon
##
##      AIC      BIC   logLik deviance df.resid
##  -7697.6  -7656.6   3854.8  -7709.6     6907
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.4935 -0.6897 -0.1274  0.5521  5.6449
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.001877 0.04333
##  seg      (Intercept) 0.001392 0.03731
##  speaker  (Intercept) 0.001087 0.03297
##  Residual             0.017620 0.13274
## Number of obs: 6913, groups:  word, 2116; seg, 10; speaker, 5
##
## Fixed effects:
##              Estimate Std. Error t value
## (Intercept)  0.220846   0.020734  10.651
## stress      -0.006981   0.003728  -1.873
```

```
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.048
```

#Gija:

```
dur.gija = lmer(logdur ~ (1|word) + (1|speaker) + (1|seg) + length + finality
+ stress, data=gija, REML=F)
summary(dur.gija)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | word) + (1 | speaker) + (1 | seg) + length +
finality +
##     stress
##    Data: gija
##
##      AIC      BIC   logLik deviance df.resid
##   3295.5   3353.0  -1639.8   3279.5     9812
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.5842 -0.7485 -0.1001  0.6250  3.3086
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.009690 0.09844
##  seg      (Intercept) 0.016272 0.12756
##  speaker  (Intercept) 0.007141 0.08450
##  Residual             0.074074 0.27216
## Number of obs: 9820, groups:  word, 2707; seg, 9; speaker, 5
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)   -2.463e+00  6.907e-02  9.678e+00 -35.663 1.35e-11 ***
## lengthLong     1.998e-01  1.047e-01  1.020e+01   1.909   0.0848 .
## finalityfinal  7.565e-02  7.360e-03  9.808e+03  10.279  < 2e-16 ***
## stress         4.427e-02  7.216e-03  9.779e+03   6.135 8.84e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) lngthL fnltyf
## lengthLong  -0.457
## finalityfnl -0.046  0.010
## stress      -0.059 -0.010  0.456
```

```
inten.gija = lmer(inten_rel ~ (1|word) + (1|speaker) + (1|seg) + stress,
data=gija, REML=F)
summary(inten.gija)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: gija
##
##      AIC      BIC   logLik deviance df.resid
##  59885.7  59928.8 -29936.8  59873.7     9814
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.7847 -0.5737  0.0022  0.5775  5.7585
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  0.8335  0.9130
##  seg      (Intercept)  2.1348  1.4611
##  speaker  (Intercept)  0.3382  0.5815
##  Residual             25.1910  5.0191
## Number of obs: 9820, groups:  word, 2707; seg, 9; speaker, 5
##
## Fixed effects:
##             Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)    2.3587     0.6400    8.3302   3.685  0.00575 **
## stress        -0.7931     0.1140 9357.7603  -6.960 3.64e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.094
```

```
f0.gija = lmer(f0st ~ (1|word) + (1|speaker) + (1|seg) + stress, data=gija,
REML=F)
summary(f0.gija)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: gija
##
##      AIC      BIC   logLik deviance df.resid
##  51923.5  51966.4 -25955.7  51911.5     9526
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.7688 -0.4354  0.0298  0.5222  4.0349
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  2.78973 1.6702
```

```
##  seg      (Intercept)  0.03575 0.1891
##  speaker  (Intercept)  0.10140 0.3184
##  Residual             11.67271 3.4165
## Number of obs: 9532, groups:  word, 2687; seg, 9; speaker, 5
##
## Fixed effects:
##              Estimate Std. Error        df t value Pr(>|t|)
## (Intercept) 7.433e-01  1.859e-01 7.114e+00   3.998  0.00504 **
## stress      8.175e-01  8.244e-02 7.694e+03   9.916  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.174
```

```
range.gija = lmer(rangest ~ (1|word) + (1|speaker) + (1|seg) + stress,
data=gija, REML=F)
summary(range.gija)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: rangest ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: gija
##
##      AIC      BIC   logLik deviance df.resid
##  51069.7  51112.7 -25528.8  51057.7     9526
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.0105 -0.4984 -0.3122 -0.0326  5.8158
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  0.22494 0.4743
##  seg      (Intercept)  0.02097 0.1448
##  speaker  (Intercept)  0.17596 0.4195
##  Residual             12.17650 3.4895
## Number of obs: 9532, groups:  word, 2687; seg, 9; speaker, 5
##
## Fixed effects:
##              Estimate Std. Error        df t value Pr(>|t|)
## (Intercept) 1.928e+00  2.105e-01 6.667e+00   9.161 5.12e-05 ***
## stress      2.515e-01  7.834e-02 6.589e+03   3.210  0.00133 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.143
```

```
euclid.gija = lme4::lmer(euclid ~ (1|word) + (1|speaker) + (1|seg) + stress,
data=gija, REML=F)
summary(euclid.gija)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: euclid ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: gija
##
##      AIC      BIC   logLik deviance df.resid
## -13983.6 -13940.5   6997.8 -13995.6     9814
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.1433 -0.7247 -0.1416  0.5995  7.7439
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 1.603e-03 0.040033
##  seg      (Intercept) 5.955e-04 0.024404
##  speaker  (Intercept) 2.844e-05 0.005333
##  Residual             1.283e-02 0.113261
## Number of obs: 9820, groups:  word, 2707; seg, 9; speaker, 5
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept) 0.189321   0.010619  17.828
## stress      0.006643   0.002664   2.494
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.127
```

#Gunnartpa

```
dur.gunnarpta = lmer(logdur ~ (1|word) + (1|speaker) + (1|seg) + finality +
stress, data=gunnarpta, REML=F)
summary(dur.gunnarpta)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | word) + (1 | speaker) + (1 | seg) + finality +
##     stress
##    Data: gunnarpta
##
##      AIC      BIC   logLik deviance df.resid
##    350.1    380.5   -168.0    336.1      559
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.24525 -0.76068 -0.06717  0.68819  2.22422
##
```

```
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.018903 0.13749
##  seg      (Intercept) 0.002163 0.04651
##  speaker  (Intercept) 0.004256 0.06523
##  Residual             0.088793 0.29798
## Number of obs: 566, groups:  word, 256; seg, 5; speaker, 3
##
## Fixed effects:
##                Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)    -2.51879    0.05282   6.73880 -47.689 8.89e-10 ***
## finalityfinal   0.18125    0.03684 549.85922   4.920 1.15e-06 ***
## stress          0.09904    0.03378 562.00830   2.932  0.00351 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
## finalityfnl -0.322
## stress      -0.407  0.577
```

```
inten.gunnarpta = lmer(inten_rel ~ (1|word) + (1|speaker) + (1|seg) +
finality + stress, data=gunnarpta, REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(inten.gunnarpta)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | speaker) + (1 | seg) + finality +
##     stress
##    Data: gunnarpta
##
##      AIC      BIC   logLik deviance df.resid
##   3592.8   3623.2  -1789.4   3578.8      559
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.6807 -0.5628 -0.0431  0.5700  3.8244
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 2.893e-13 5.379e-07
##  seg      (Intercept) 2.431e+00 1.559e+00
##  speaker  (Intercept) 0.000e+00 0.000e+00
##  Residual             3.209e+01 5.664e+00
## Number of obs: 566, groups:  word, 256; seg, 5; speaker, 3
##
## Fixed effects:
##               Estimate Std. Error       df t value Pr(>|t|)
```

```
## (Intercept)     3.7221     0.8612   5.6128   4.322  0.00580 **
## finalityfinal  -3.7086     0.6486 564.6205  -5.718 1.75e-08 ***
## stress         -1.8559     0.5835 560.4222  -3.181  0.00155 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
## finalityfnl -0.329
## stress      -0.420  0.553
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
f0.gunnarpta = lmer(f0st ~ (1|word) + (1|speaker) + (1|seg) + finality +
stress, data=gunnarpta, REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(f0.gunnarpta)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | speaker) + (1 | seg) + finality + stress
##    Data: gunnarpta
##
##      AIC      BIC   logLik deviance df.resid
##   2899.6   2929.6  -1442.8   2885.6      531
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.7756 -0.3994  0.0598  0.4561  4.3011
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 3.733    1.932
##  seg      (Intercept) 0.000    0.000
##  speaker  (Intercept) 0.000    0.000
##  Residual             9.695    3.114
## Number of obs: 538, groups:  word, 246; seg, 5; speaker, 3
##
## Fixed effects:
##               Estimate Std. Error       df t value Pr(>|t|)
## (Intercept)     1.1438     0.3132 441.1393   3.652 0.000292 ***
## finalityfinal  -0.8993     0.4060 505.9647  -2.215 0.027188 *
## stress         -0.3227     0.3741 534.7646  -0.863 0.388731
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
## finalityfnl -0.649
```

```
## stress      -0.740  0.593
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
range.gunnartpa = lme4::lmer(rangest ~ (1|word) + (1|seg) + (1|speaker) +
stress, data=gunnarpta, REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(range.gunnartpa)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: rangest ~ (1 | word) + (1 | seg) + (1 | speaker) + stress
##    Data: gunnarpta
##
##      AIC      BIC   logLik deviance df.resid
##   2758.7   2784.5  -1373.4   2746.7      532
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -0.9036 -0.4799 -0.2836  0.0640  7.1692
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.0000   0.000
##  seg      (Intercept) 0.0000   0.000
##  speaker  (Intercept) 0.1832   0.428
##  Residual             9.5804   3.095
## Number of obs: 538, groups:  word, 246; seg, 5; speaker, 3
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept)   2.2794     0.3112   7.324
## stress       -0.3519     0.2686  -1.310
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.385
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
euclid.gunnarpta = lme4::lmer(euclid ~ (1|word) + (1|speaker) + (1|seg) +
stress, data=gunnarpta, REML=F)
summary(euclid.gunnarpta)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: euclid ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: gunnarpta
##
##      AIC      BIC   logLik deviance df.resid
##   -542.3   -516.3    277.2   -554.3      560
```

```
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.8476 -0.6760 -0.0200  0.5863  3.9602
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.003069 0.05540
##  seg      (Intercept) 0.005953 0.07715
##  speaker  (Intercept) 0.001516 0.03893
##  Residual             0.018629 0.13649
## Number of obs: 566, groups:  word, 256; seg, 5; speaker, 3
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept)  0.30376    0.04292   7.077
## stress      -0.01595    0.01253  -1.273
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.157
```

#Gunwinggu:

```
dur.gunwinggu = lmer(logdur ~ (1|word) + (1|speaker) + (1|seg) + finality +
length + stress, data=gunwinggu, REML=F)
summary(dur.gunwinggu)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | word) + (1 | speaker) + (1 | seg) + finality +
##     length + stress
##    Data: gunwinggu
##
##      AIC      BIC   logLik deviance df.resid
##    319.9    356.1   -152.0    303.9      672
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.46756 -0.70622 -0.03147  0.70586  2.59524
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.022770 0.15090
##  seg      (Intercept) 0.006562 0.08101
##  speaker  (Intercept) 0.016998 0.13038
##  Residual             0.076862 0.27724
## Number of obs: 680, groups:  word, 175; seg, 5; speaker, 3
##
## Fixed effects:
```

```
##                Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)    -2.29309    0.09600   5.17987 -23.886 1.69e-06 ***
## finalityfinal  -0.04894    0.03867 671.70587  -1.266   0.2061
## lengthLong      0.34325    0.19773  79.34549   1.736   0.0865 .
## stress         -0.05279    0.03661 675.44537  -1.442   0.1498
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf lngthL
## finalityfnl -0.288
## lengthLong  -0.133 -0.019
## stress      -0.312  0.755 -0.017
```

```
inten.gunwinggu = lmer(inten_rel ~ (1|word) + (1|speaker) + (1|seg) + stress,
data=gunwinggu, REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(inten.gunwinggu)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: gunwinggu
##
##      AIC      BIC   logLik deviance df.resid
##   3836.8   3863.9  -1912.4   3824.8      674
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.4243 -0.5206 -0.0100  0.5176  4.3538
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  0.4188  0.6471
##  seg      (Intercept)  0.2070  0.4549
##  speaker  (Intercept)  0.0000  0.0000
##  Residual             15.7840  3.9729
## Number of obs: 680, groups:  word, 175; seg, 5; speaker, 3
##
## Fixed effects:
##              Estimate Std. Error        df t value Pr(>|t|)
## (Intercept) 6.323e-03  3.640e-01 5.731e+00   0.017    0.987
## stress      6.947e-01  3.175e-01 6.416e+02   2.188    0.029 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.493
```

```
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular

f0.gunwinggu = lmer(f0st ~ (1|word) + (1|speaker) + (1|seg) + stress,
data=gunwinggu,REML=F)

## boundary (singular) fit: see ?isSingular

summary(f0.gunwinggu)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: gunwinggu
##
##      AIC      BIC   logLik deviance df.resid
##   3001.3   3028.4  -1494.7   2989.3      672
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.1229 -0.5156  0.0185  0.5113  7.8614
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 1.3056   1.1426
##  seg      (Intercept) 0.0247   0.1571
##  speaker  (Intercept) 0.0000   0.0000
##  Residual             4.0858   2.0213
## Number of obs: 678, groups:  word, 175; seg, 5; speaker, 3
##
## Fixed effects:
##             Estimate Std. Error       df t value Pr(>|t|)
## (Intercept)  -0.1117     0.1920  11.7282  -0.582    0.572
## stress        0.8169     0.1749 656.0010   4.670 3.65e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.528
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular

range.gunwinggu = lme4::lmer(rangest ~ (1|word) + (1|speaker) + (1|seg) +
stress, data=gunwinggu,REML=F)

## boundary (singular) fit: see ?isSingular

summary(range.gunwinggu)

## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: rangest ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
```

```
##    Data: gunwinggu
##
##      AIC      BIC   logLik deviance df.resid
##   2619.1   2646.2  -1303.5   2607.1      672
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.8688 -0.4275 -0.1592  0.2627 11.9159
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.7955   0.8919
##  seg      (Intercept) 0.0000   0.0000
##  speaker  (Intercept) 0.3057   0.5529
##  Residual             2.2812   1.5104
## Number of obs: 678, groups:  word, 175; seg, 5; speaker, 3
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept)   1.9344     0.3461   5.589
## stress       -0.1223     0.1307  -0.935
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.230
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
euclid.gunwinggu = lme4::lmer(euclid ~ (1|word) + (1|speaker) + (1|seg) +
stress, data=gunwinggu, REML=F)
summary(euclid.gunwinggu)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: euclid ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: gunwinggu
##
##      AIC      BIC   logLik deviance df.resid
##   -607.0   -579.9    309.5   -619.0      674
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.6261 -0.6286 -0.1304  0.4193  6.7569
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 0.0016021 0.04003
##  seg      (Intercept) 0.0030987 0.05567
##  speaker  (Intercept) 0.0002745 0.01657
##  Residual             0.0219547 0.14817
## Number of obs: 680, groups:  word, 175; seg, 5; speaker, 3
```

```
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept) 0.196692   0.033599   5.854
## stress      0.003614   0.012179   0.297
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.210
```

#Kayardild:

```
kayardild$speaker = as.factor(kayardild$speaker)
kayardild = na.omit(kayardild)

dur.kayardild = lmer(logdur ~ (1|word) + (1|speaker) + (1|seg) + finality +
stress, data=kayardild, REML=F)
summary(dur.kayardild)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | word) + (1 | speaker) + (1 | seg) + finality +
##     stress
##    Data: kayardild
##
##      AIC      BIC   logLik deviance df.resid
##   8232.1   8286.1  -4109.1   8218.1    16535
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.8575 -0.7391 -0.0306  0.7155  2.7456
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 0.0092019 0.09593
##  seg      (Intercept) 0.0208613 0.14443
##  speaker  (Intercept) 0.0001231 0.01110
##  Residual             0.0900134 0.30002
## Number of obs: 16542, groups:  word, 2670; seg, 10; speaker, 5
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)   -2.263e+00  4.872e-02  1.093e+01  -46.46 6.56e-14 ***
## finalityfinal  9.734e-02  6.229e-03  1.651e+04   15.63  < 2e-16 ***
## stress         7.840e-02  5.921e-03  1.652e+04   13.24  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
```

```
## finalityfnl -0.053
## stress      -0.070  0.496
```

```
inten.kayardild = lmer(inten_rel ~ (1|word) + (1|speaker) + (1|seg) + stress,
data=kayardild, REML=F)
summary(inten.kayardild)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: kayardild
##
##      AIC      BIC   logLik deviance df.resid
##  95610.7  95657.0 -47799.4  95598.7    16536
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.8311 -0.5608  0.0502  0.6241  6.0704
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  0.23614 0.4859
##  seg      (Intercept)  0.74595 0.8637
##  speaker  (Intercept)  0.03676 0.1917
##  Residual             18.69680 4.3240
## Number of obs: 16542, groups:  word, 2670; seg, 10; speaker, 5
##
## Fixed effects:
##              Estimate Std. Error        df t value Pr(>|t|)
## (Intercept) 3.288e-01  3.351e-01 1.081e+01   0.981    0.348
## stress      5.442e-01  7.210e-02 1.597e+04   7.547 4.69e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.100
```

```
f0.kayardild = lmer(f0st ~ (1|word) + (1|speaker) + (1|seg) + stress,
data=kayardild,REML=F)
summary(f0.kayardild)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: kayardild
##
##      AIC      BIC   logLik deviance df.resid
##  99957.6 100003.9 -49972.8  99945.6    16536
##
## Scaled residuals:
```

```
##     Min      1Q  Median      3Q     Max
## -3.6393 -0.3897  0.1480  0.6035  3.0755
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept)  6.755234 2.59908
##  seg      (Intercept)  0.028467 0.16872
##  speaker  (Intercept)  0.006072 0.07793
##  Residual             21.443945 4.63076
## Number of obs: 16542, groups:  word, 2670; seg, 10; speaker, 5
##
## Fixed effects:
##              Estimate Std. Error        df t value Pr(>|t|)
## (Intercept) 7.843e-01  1.294e-01 8.620e-01    6.06    0.131
## stress      1.064e+00  8.021e-02 1.279e+04   13.27   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.214
```

```
range.kayardild = lmer(rangest ~ (1|word) + (1|seg) + (1|speaker) + stress,
data=kayardild, REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(range.kayardild)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: rangest ~ (1 | word) + (1 | seg) + (1 | speaker) + stress
##    Data: kayardild
##
##      AIC      BIC   logLik deviance df.resid
##  95589.6  95635.9 -47788.8  95577.6    16536
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.1173 -0.5532 -0.3797 -0.0169  5.1456
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 6.339e-01 7.962e-01
##  seg      (Intercept) 3.038e-02 1.743e-01
##  speaker  (Intercept) 4.754e-09 6.895e-05
##  Residual             1.840e+01 4.290e+00
## Number of obs: 16542, groups:  word, 2670; seg, 10; speaker, 5
##
## Fixed effects:
##              Estimate Std. Error        df t value Pr(>|t|)
```

```
## (Intercept) 3.447e+00  9.494e-02 3.090e+00  36.309 3.61e-05 ***
## stress      1.715e-01  7.172e-02 1.300e+04   2.392   0.0168 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.264
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
euclid.kayardild = lme4::lmer(euclid ~ (1|word) + (1|speaker) + (1|seg) +
stress, data=kayardild, REML=F)
summary(euclid.kayardild)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: euclid ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: kayardild
##
##      AIC      BIC   logLik deviance df.resid
## -19619.2 -19572.9   9815.6 -19631.2    16536
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.7050 -0.7246 -0.1711  0.5704  4.9207
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 0.0018487 0.04300
##  seg      (Intercept) 0.0006692 0.02587
##  speaker  (Intercept) 0.0002858 0.01690
##  Residual             0.0166602 0.12907
## Number of obs: 16542, groups:  word, 2670; seg, 10; speaker, 5
##
## Fixed effects:
##              Estimate Std. Error t value
## (Intercept)  0.214490   0.013767  15.580
## stress      -0.005518   0.002212  -2.494
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.072
```

#Kunbarlang:

```
dur.kunbarlang = lmer(logdur ~ (1|word) + (1|seg) + (1|speaker) + finality +
length + stress, data=kunbarlang, REML=F)
summary(dur.kunbarlang)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
```

```
## Formula: logdur ~ (1 | word) + (1 | seg) + (1 | speaker) + finality +
##     length + stress
##    Data: kunbarlang
##
##      AIC      BIC   logLik deviance df.resid
##    994.4   1036.9   -489.2    978.4     1495
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -1.75359 -0.84411 -0.05322  0.72447  2.65753
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 0.0087910 0.09376
##  seg      (Intercept) 0.0007584 0.02754
##  speaker  (Intercept) 0.0017156 0.04142
##  Residual             0.1042656 0.32290
## Number of obs: 1503, groups:  word, 481; seg, 8; speaker, 2
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)   -2.349e+00  3.734e-02  3.300e+00 -62.898 3.38e-06 ***
## finalityfinal -3.821e-02  2.280e-02  1.486e+03  -1.676   0.0939 .
## lengthLong     2.457e-01  1.352e-01  5.080e+02   1.818   0.0697 .
## stress         6.292e-04  2.112e-02  1.379e+03   0.030   0.9762
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf lngthL
## finalityfnl -0.310
## lengthLong  -0.049 -0.011
## stress      -0.313  0.527 -0.058
```

```
inten.kunbarlang = lmer(inten_rel ~ (1|word) + (1|seg) + (1|speaker) +
stress, data=kunbarlang, REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(inten.kunbarlang)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | seg) + (1 | speaker) + stress
##    Data: kunbarlang
##
##      AIC      BIC   logLik deviance df.resid
##  10099.2  10131.1  -5043.6  10087.2     1497
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
```

```
## -4.1544 -0.5586 -0.0403  0.5448  5.2663
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  0.228   0.4775
##  seg      (Intercept)  1.151   1.0728
##  speaker  (Intercept)  0.000   0.0000
##  Residual             47.586   6.8983
## Number of obs: 1503, groups:  word, 481; seg, 8; speaker, 2
##
## Fixed effects:
##             Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)    1.0517     0.5409    7.1571   1.944    0.092 .
## stress        -0.7218     0.3743 1460.9724  -1.928    0.054 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.261
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
f0.kunbarlang = lmer(f0st ~ (1|word) + (1|seg) + (1|speaker) + stress,
data=kunbarlang,REML=F)
summary(f0.kunbarlang)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | seg) + (1 | speaker) + stress
##    Data: kunbarlang
##
##      AIC      BIC   logLik deviance df.resid
##   7616.4   7648.1  -3802.2   7604.4     1462
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.8050 -0.5771 -0.0003  0.5434  4.0596
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 2.71625  1.648
##  seg      (Intercept) 0.02221  0.149
##  speaker  (Intercept) 1.24429  1.115
##  Residual             8.50368  2.916
## Number of obs: 1468, groups:  word, 478; seg, 8; speaker, 2
##
## Fixed effects:
##             Estimate Std. Error       df t value Pr(>|t|)
## (Intercept)  -0.1444     0.8099   2.0859  -0.178  0.87433
```

```
## stress        0.4598     0.1695 623.4752   2.712  0.00687 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.083
```

```
range.kunbarlang = lmer(rangest ~ (1|word) + (1|seg) + (1|speaker) + stress,
data=kunbarlang, REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(range.kunbarlang)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: rangest ~ (1 | word) + (1 | seg) + (1 | speaker) + stress
##    Data: kunbarlang
##
##      AIC      BIC   logLik deviance df.resid
##   6837.2   6869.0  -3412.6   6825.2     1462
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.0732 -0.4696 -0.2454  0.0916  5.6779
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 2.632e-01 5.131e-01
##  seg      (Intercept) 0.000e+00 0.000e+00
##  speaker  (Intercept) 3.240e-09 5.692e-05
##  Residual             5.882e+00 2.425e+00
## Number of obs: 1468, groups:  word, 478; seg, 8; speaker, 2
##
## Fixed effects:
##             Estimate Std. Error        df t value Pr(>|t|)
## (Intercept) 1.748e+00  8.963e-02 4.454e+02  19.501  < 2e-16 ***
## stress      4.346e-01  1.316e-01 1.467e+03   3.303 0.000978 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.612
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
euclid.kunbarlang = lme4::lmer(euclid ~ (1|word) + (1|seg) + stress,
data=kunbarlang, REML=F)
summary(euclid.kunbarlang)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: euclid ~ (1 | word) + (1 | seg) + stress
##    Data: kunbarlang
##
##      AIC      BIC   logLik deviance df.resid
##  -2413.8  -2387.2   1211.9  -2423.8     1498
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.8731 -0.6881 -0.2143  0.5520  5.1126
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 1.432e-03 0.037839
##  seg      (Intercept) 7.229e-05 0.008502
##  Residual             1.051e-02 0.102514
## Number of obs: 1503, groups:  word, 481; seg, 8
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept) 0.183011   0.005877  31.142
## stress      0.005750   0.005759   0.998
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.373
```

#MalakMalak:

```
dur.malakmalak = lmer(logdur ~ (1|word) + (1|seg) + (1|speaker) + finality +
length + stress, data=malakmalak, REML=F)
summary(dur.malakmalak)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | word) + (1 | seg) + (1 | speaker) + finality +
##     length + stress
##    Data: malakmalak
##
##      AIC      BIC   logLik deviance df.resid
##    941.4    986.0   -462.7    925.4     1951
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.1969 -0.7434 -0.1335  0.5894  3.2559
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 0.0203153 0.14253
##  seg      (Intercept) 0.0014517 0.03810
```

```
##  speaker  (Intercept) 0.0001368 0.01169
##  Residual             0.0800418 0.28292
## Number of obs: 1959, groups:  word, 623; seg, 6; speaker, 2
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)     -2.55418    0.02747   10.84733 -92.981  < 2e-16 ***
## finalityfinal    0.14515    0.02179 1952.85073   6.663 3.49e-11 ***
## lengthLong       0.24474    0.18306  481.70406   1.337    0.182
## stress           0.13118    0.02039 1954.83506   6.435 1.55e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf lngthL
## finalityfnl -0.510
## lengthLong  -0.075  0.000
## stress      -0.550  0.708 -0.029
```

```
inten.malakmalak = lmer(inten_rel ~ (1|word) + (1|seg) + (1|speaker) +
stress, data=malakmalak, REML=F)
summary(inten.malakmalak)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | seg) + (1 | speaker) + stress
##    Data: malakmalak
##
##      AIC      BIC   logLik deviance df.resid
##  12200.4  12233.9  -6094.2  12188.4     1953
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.0312 -0.5062  0.0027  0.5168  5.3518
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  1.62512 1.2748
##  seg      (Intercept)  0.01229 0.1108
##  speaker  (Intercept)  0.14356 0.3789
##  Residual             28.06473 5.2976
## Number of obs: 1959, groups:  word, 623; seg, 6; speaker, 2
##
## Fixed effects:
##              Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)    0.1106     0.3353    2.7812   0.330    0.765
## stress         1.5234     0.2526 1863.1227   6.031 1.97e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.383
```

```
f0.malakmalak = lmer(f0st ~ (1|word) + (1|seg) + (1|speaker) + stress,
data=malakmalak,REML=F)
summary(f0.malakmalak)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | seg) + (1 | speaker) + stress
##    Data: malakmalak
##
##      AIC      BIC   logLik deviance df.resid
##   9169.6   9203.0  -4578.8   9157.6     1932
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.6417 -0.5428  0.0611  0.5641  3.7373
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 1.3421   1.1585
##  seg      (Intercept) 0.1893   0.4351
##  speaker  (Intercept) 3.2083   1.7912
##  Residual             5.6329   2.3734
## Number of obs: 1938, groups:  word, 619; seg, 6; speaker, 2
##
## Fixed effects:
##             Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)    0.5863     1.2873    2.1185   0.455    0.691
## stress         1.5918     0.1210 1923.5840  13.160   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.050
```

```
range.malak = lme4::lmer(rangest ~ (1|word) + (1|seg) + stress,
data=malakmalak, REML=F)
summary(range.malak)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: rangest ~ (1 | word) + (1 | seg) + stress
##    Data: malakmalak
##
##      AIC      BIC   logLik deviance df.resid
##   7941.5   7969.3  -3965.8   7931.5     1933
##
## Scaled residuals:
```

```
##     Min      1Q  Median      3Q     Max
## -1.3758 -0.5612 -0.2500  0.2381  8.5006
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.186773 0.43217
##  seg      (Intercept) 0.006462 0.08039
##  Residual             3.345140 1.82897
## Number of obs: 1938, groups:  word, 619; seg, 6
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept)  1.95731    0.07801  25.090
## stress      -0.11153    0.08765  -1.273
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.573
```

```
euclid.malakmalak = lme4::lmer(euclid ~ (1|word) + (1|seg) + (1|speaker) +
stress, data=malakmalak, REML=F)
summary(euclid.malakmalak)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: euclid ~ (1 | word) + (1 | seg) + (1 | speaker) + stress
##    Data: malakmalak
##
##      AIC      BIC   logLik deviance df.resid
##  -3230.0  -3196.6   1621.0  -3242.0     1953
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.2684 -0.6397 -0.1530  0.4837  4.9202
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 3.067e-03 0.05538
##  seg      (Intercept) 3.736e-04 0.01933
##  speaker  (Intercept) 3.697e-05 0.00608
##  Residual             9.210e-03 0.09597
## Number of obs: 1959, groups:  word, 623; seg, 6; speaker, 2
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept) 0.176121   0.010968  16.058
## stress      0.005803   0.004949   1.172
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.241
```

#MurrinhPatha:

```
dur.murrinh = lmer(logdur ~ (1|word) + (1|seg) + finality + length + stress,
data=murrinh, REML=F)
summary(dur.murrinh)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | word) + (1 | seg) + finality + length + stress
##    Data: murrinh
##
##      AIC      BIC   logLik deviance df.resid
##    435.7    468.5   -210.8    421.7      802
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.7519 -0.7622 -0.1658  0.6748  2.8321
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.01388  0.11783
##  seg      (Intercept) 0.00390  0.06245
##  Residual             0.08986  0.29976
## Number of obs: 809, groups:  word, 176; seg, 4
##
## Fixed effects:
##                Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)    -2.44191    0.04915   8.38386 -49.681 1.18e-11 ***
## finalityfinal   0.08021    0.03720 761.22602   2.156   0.0314 *
## lengthLong     -0.39811    0.33077 406.62857  -1.204   0.2295
## stress          0.02660    0.03620 750.51166   0.735   0.4626
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf lngthL
## finalityfnl -0.532
## lengthLong  -0.088 -0.002
## stress      -0.550  0.741 -0.028
```

```
inten.murrinh = lmer(inten_rel ~ (1|word) + (1|seg) + finality + length +
stress, data=murrinh, REML=F)
summary(inten.murrinh)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | seg) + finality + length + stress
##    Data: murrinh
##
##      AIC      BIC   logLik deviance df.resid
##   5172.9   5205.7  -2579.4   5158.9      802
```

```
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.5284 -0.6509 -0.0306  0.5920  3.4609
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  1.818   1.3483
##  seg      (Intercept)  0.884   0.9402
##  Residual             32.911   5.7368
## Number of obs: 809, groups:  word, 176; seg, 4
##
## Fixed effects:
##               Estimate Std. Error       df t value Pr(>|t|)
## (Intercept)     2.8422     0.8065  10.2893   3.524  0.00527 **
## finalityfinal  -1.6347     0.6829 699.1054  -2.394  0.01694 *
## lengthLong     10.9987     6.0035 574.0930   1.832  0.06746 .
## stress         -1.6737     0.6634 694.2200  -2.523  0.01186 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf lngthL
## finalityfnl -0.597
## lengthLong  -0.066 -0.002
## stress      -0.618  0.744 -0.027
```

```
f0.murrinh = lmer(f0st ~ (1|word) + (1|seg) + finality + stress,
data=murrinh,REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(f0.murrinh)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | seg) + finality + stress
##    Data: murrinh
##
##      AIC      BIC   logLik deviance df.resid
##   3813.1   3841.2  -1900.5   3801.1      795
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.0306 -0.6329 -0.1436  0.4866  4.1336
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 1.637e+00 1.280e+00
##  seg      (Intercept) 5.924e-16 2.434e-08
##  Residual             5.920e+00 2.433e+00
```

```
## Number of obs: 801, groups:  word, 176; seg, 4
##
## Fixed effects:
##               Estimate Std. Error       df t value Pr(>|t|)
## (Intercept)     1.7420     0.2866 489.0518   6.078 2.46e-09 ***
## finalityfinal  -1.1946     0.3111 799.0444  -3.839 0.000133 ***
## stress         -0.6789     0.2995 788.4887  -2.266 0.023698 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
## finalityfnl -0.766
## stress      -0.816  0.768
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
range.murrinh = lme4::lmer(rangest ~ (1|word) + (1|seg) + stress,
data=murrinh, REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(range.murrinh)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: rangest ~ (1 | word) + (1 | seg) + stress
##    Data: murrinh
##
##      AIC      BIC   logLik deviance df.resid
##   3186.5   3209.9  -1588.3   3176.5      796
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.0742 -0.5180 -0.2249  0.1598  7.9692
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.1288   0.3589
##  seg      (Intercept) 0.0000   0.0000
##  Residual             2.9927   1.7299
## Number of obs: 801, groups:  word, 176; seg, 4
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept)   1.7514     0.1030  16.998
## stress       -0.1272     0.1277  -0.996
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.651
```

```
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
euclid.murrinh = lme4::lmer(euclid ~ (1|word) + (1|seg) + stress,
data=murrinh, REML=F)
summary(euclid.murrinh)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: euclid ~ (1 | word) + (1 | seg) + stress
##    Data: murrinh
##
##      AIC      BIC   logLik deviance df.resid
##  -1343.9  -1320.4    677.0  -1353.9      804
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.7058 -0.6535 -0.1730  0.4905  6.2727
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 1.168e-03 0.03418
##  seg      (Intercept) 3.994e-05 0.00632
##  Residual             1.024e-02 0.10118
## Number of obs: 809, groups:  word, 176; seg, 4
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept) 0.147918   0.007614  19.426
## stress      0.018403   0.007877   2.336
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.518
```

#Ngan'gi:

```
dur.ngangi = lmer(logdur ~ (1|word) + (1|speaker) + (1|seg) + finality +
stress, data=ngangi, REML=F)
summary(dur.ngangi)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | word) + (1 | speaker) + (1 | seg) + finality +
##     stress
##    Data: ngangi
##
##      AIC      BIC   logLik deviance df.resid
##   3248.1   3296.1  -1617.0   3234.1     6993
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
```

```
## -2.2485 -0.7692 -0.1439  0.6435  3.0673
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.009701 0.09849
##  speaker  (Intercept) 0.003185 0.05644
##  seg      (Intercept) 0.002215 0.04706
##  Residual             0.086500 0.29411
## Number of obs: 7000, groups:  word, 1397; speaker, 9; seg, 3
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)     -2.49241    0.03510    6.88995 -71.008 3.96e-11 ***
## finalityfinal    0.11717    0.01294 6730.90361   9.057  < 2e-16 ***
## stress           0.05275    0.01211 6375.39619   4.356 1.34e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
## finalityfnl -0.256
## stress      -0.274  0.763
```

```
inten.ngangi = lmer(inten_rel ~ (1|word) + (1|speaker) + (1|seg) + stress,
data=ngangi, REML=F)
summary(inten.ngangi)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: ngangi
##
##      AIC      BIC   logLik deviance df.resid
##  36783.1  36824.2 -18385.6  36771.1     6994
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.9271 -0.5477  0.0006  0.5377 11.0606
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept)  0.925805 0.96219
##  speaker  (Intercept)  0.001375 0.03709
##  seg      (Intercept)  0.340492 0.58352
##  Residual             10.570261 3.25119
## Number of obs: 7000, groups:  word, 1397; speaker, 9; seg, 3
##
## Fixed effects:
##              Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)   -0.2887     0.3454    3.1963  -0.836    0.461
```

```
## stress         1.4760     0.0856 6558.7156  17.243   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.134
```

```
f0.ngangi = lmer(f0st ~ (1|word) + (1|speaker) + (1|seg) + stress,
data=ngangi,REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(f0.ngangi)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: ngangi
##
##      AIC      BIC   logLik deviance df.resid
##  36053.8  36094.8 -18020.9  36041.8     6889
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.8003 -0.4720  0.0323  0.5531  4.1779
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 2.320660 1.52337
##  speaker  (Intercept) 0.004046 0.06361
##  seg      (Intercept) 0.000000 0.00000
##  Residual             9.721473 3.11793
## Number of obs: 6895, groups:  word, 1391; speaker, 9; seg, 3
##
## Fixed effects:
##              Estimate Std. Error        df t value Pr(>|t|)
## (Intercept) 6.482e-01  8.433e-02 4.567e+01   7.686 9.02e-10 ***
## stress      5.768e-01  8.220e-02 6.837e+03   7.017 2.49e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.547
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
range.ngangi = lme4::lmer(rangest ~ (1|word) + (1|seg) + (1|speaker) +
stress, data=ngangi, REML=F)
summary(range.ngangi)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: rangest ~ (1 | word) + (1 | seg) + (1 | speaker) + stress
##    Data: ngangi
##
##      AIC      BIC   logLik deviance df.resid
##  34440.9  34481.9 -17214.5  34428.9     6889
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.1469 -0.4855 -0.2747  0.0656  6.7835
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.344786 0.58718
##  speaker  (Intercept) 0.091777 0.30295
##  seg      (Intercept) 0.006459 0.08037
##  Residual             8.348924 2.88945
## Number of obs: 6895, groups:  word, 1391; speaker, 9; seg, 3
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept)  2.54950    0.12983  19.637
## stress      -0.20860    0.07412  -2.814
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.313
```

```
euclid.ngangi = lme4::lmer(euclid ~ (1|word) + (1|speaker) + (1|seg) +
stress, data=ngangi, REML=F)
summary(euclid.ngangi)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: euclid ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: ngangi
##
##      AIC      BIC   logLik deviance df.resid
##  -9294.0  -9252.9   4653.0  -9306.0     6994
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.6191 -0.6514 -0.1268  0.4768  7.6765
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 0.0024438 0.04943
##  speaker  (Intercept) 0.0005983 0.02446
##  seg      (Intercept) 0.0007805 0.02794
##  Residual             0.0140602 0.11858
## Number of obs: 7000, groups:  word, 1397; speaker, 9; seg, 3
```

```
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept)  0.19823    0.01837  10.792
## stress       0.00455    0.00321   1.418
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.095
```

#Wanyjirra:

```
dur.wanyjirra = lmer(logdur ~ (1|word) + (1|seg) + finality + length +
stress, data=wanyjirra, REML=F)
summary(dur.wanyjirra)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | word) + (1 | seg) + finality + length + stress
##    Data: wanyjirra
##
##      AIC      BIC   logLik deviance df.resid
##   1017.8   1056.8   -501.9   1003.8     1928
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.0905 -0.7230 -0.1189  0.5985  2.6233
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 0.0152338 0.12343
##  seg      (Intercept) 0.0005609 0.02368
##  Residual             0.0866985 0.29445
## Number of obs: 1935, groups:  word, 584; seg, 8
##
## Fixed effects:
##                 Estimate Std. Error         df  t value Pr(>|t|)
## (Intercept)     -2.44819    0.01976    8.73026 -123.881 1.79e-15 ***
## finalityfinal    0.10390    0.01876 1898.54704    5.539 3.47e-08 ***
## lengthLong       0.23734    0.12303 1125.80302    1.929    0.054 .
## stress           0.02406    0.01814 1854.61436    1.326    0.185
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf lngthL
## finalityfnl -0.526
## lengthLong  -0.099  0.029
## stress      -0.558  0.574 -0.006
```

```r
inten.wanyjirra = lmer(inten_rel ~ (1|word) + (1|seg) + finality + length +
stress, data=wanyjirra, REML=F)
summary(inten.wanyjirra)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | seg) + finality + length + stress
##    Data: wanyjirra
##
##      AIC      BIC   logLik deviance df.resid
##  11342.7  11381.7  -5664.4  11328.7     1928
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.8874 -0.5790 -0.0520  0.5104  4.9521
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  0.0482  0.2195
##  seg      (Intercept)  0.2390  0.4889
##  Residual             20.3052  4.5061
## Number of obs: 1935, groups:  word, 584; seg, 8
##
## Fixed effects:
##                Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)      2.5746     0.3226    6.3058   7.981  0.00016 ***
## finalityfinal   -3.0275     0.2671 1721.7350 -11.336  < 2e-16 ***
## lengthLong       0.4390     1.7531  643.6594   0.250  0.80237
## stress          -1.7114     0.2544 1390.5820  -6.727 2.52e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf lngthL
## finalityfnl -0.455
## lengthLong  -0.143  0.037
## stress      -0.490  0.553  0.007
```

```r
f0.wanyjirra = lmer(f0st ~ (1|word) + (1|seg) + finality + stress,
data=wanyjirra,REML=F)
summary(f0.wanyjirra)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | seg) + finality + stress
##    Data: wanyjirra
##
##      AIC      BIC   logLik deviance df.resid
##  10940.2  10973.3  -5464.1  10928.2     1830
##
```

```
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.0521 -0.3221  0.1229  0.5714  2.7279
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  6.65454 2.5796
##  seg      (Intercept)  0.06215 0.2493
##  Residual             18.16730 4.2623
## Number of obs: 1836, groups:  word, 577; seg, 8
##
## Fixed effects:
##               Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)      0.4237     0.2772    9.7402   1.529   0.1582
## finalityfinal   -0.5862     0.2910 1718.7738  -2.015   0.0441 *
## stress           0.4268     0.2766 1701.5916   1.543   0.1230
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
## finalityfnl -0.556
## stress      -0.596  0.572
```

```
range.wanyjirra = lme4::lmer(rangest ~ (1|word) + (1|seg) + stress,
data=wanyjirra, REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(range.wanyjirra)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: rangest ~ (1 | word) + (1 | seg) + stress
##    Data: wanyjirra
##
##      AIC      BIC   logLik deviance df.resid
##   9937.1   9964.6  -4963.5   9927.1     1831
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.0456 -0.4937 -0.3390 -0.0861  5.4252
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 5.145e-01 7.173e-01
##  seg      (Intercept) 4.733e-09 6.879e-05
##  Residual             1.258e+01 3.548e+00
## Number of obs: 1836, groups:  word, 577; seg, 8
##
## Fixed effects:
##             Estimate Std. Error t value
```

```
## (Intercept)   2.3969     0.1156  20.743
## stress        0.1209     0.1738   0.695
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.605
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
euclid.wanyjirra = lme4::lmer(euclid ~ (1|word) + seg + stress,
data=wanyjirra, REML=F)
summary(euclid.wanyjirra)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: euclid ~ (1 | word) + seg + stress
##    Data: wanyjirra
##
##      AIC      BIC   logLik deviance df.resid
##  -2328.4  -2267.2   1175.2  -2350.4     1924
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.3385 -0.6747 -0.1406  0.4525  4.5832
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.001537 0.03921
##  Residual             0.016104 0.12690
## Number of obs: 1935, groups:  word, 584
##
## Fixed effects:
##              Estimate Std. Error t value
## (Intercept)  0.198835   0.005142  38.670
## sega:       -0.121818   0.077371  -1.574
## sege         0.078391   0.019296   4.063
## segi         0.055144   0.008145   6.771
## segi:       -0.040744   0.094097  -0.433
## sego        -0.017427   0.021846  -0.798
## segu        -0.035042   0.008970  -3.907
## segu:       -0.154968   0.096357  -1.608
## stress       0.006755   0.006345   1.065
##
## Correlation of Fixed Effects:
##        (Intr) sega:  sege   segi   segi:  sego   segu   segu:
## sega:  -0.050
## sege   -0.157  0.007
## segi   -0.441  0.022  0.098
## segi:  -0.021  0.001  0.013  0.017
## sego   -0.112  0.005  0.061  0.076  0.014
## segu   -0.382  0.019  0.096  0.204  0.019  0.083
```

```
## segu:  -0.016  0.001  0.013  0.030  0.004  0.014  0.018
## stress -0.506  0.027 -0.073  0.110 -0.040 -0.122  0.028 -0.043
```

#Warnman:

```
warnman$seg = as.factor(warnman$seg)
warnman$word = as.factor(warnman$word)
warnman = subset(warnman, seg %in% c("a","i","u"))

dur.warnman = lmer(logdur ~ (1|seg) + finality + stress, data=warnman,
REML=F)
summary(dur.warnman)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | seg) + finality + stress
##    Data: warnman
##
##      AIC      BIC   logLik deviance df.resid
##     94.9    109.7    -42.5     84.9      136
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.5515 -0.8087 -0.2519  0.6180  2.2600
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  seg      (Intercept) 0.004934 0.07025
##  Residual             0.104435 0.32316
## Number of obs: 141, groups:  seg, 3
##
## Fixed effects:
##                Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)    -2.55644    0.06207   4.81917 -41.187 2.51e-07 ***
## finalityfinal   0.10440    0.07200 127.90924   1.450  0.14950
## stress          0.19028    0.06441 138.45428   2.954  0.00369 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
## finalityfnl -0.506
## stress      -0.475  0.408

inten.warnman = lmer(inten_rel ~ (1|seg) + finality + stress, data=warnman,
REML=F)

## boundary (singular) fit: see ?isSingular

summary(inten.warnman)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | seg) + finality + stress
##    Data: warnman
##
##      AIC      BIC   logLik deviance df.resid
##    838.1    852.9   -414.1    828.1      136
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.2893 -0.4790  0.0118  0.5515  2.4496
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  seg      (Intercept)  0.00    0.000
##  Residual             20.81    4.561
## Number of obs: 141, groups:  seg, 3
##
## Fixed effects:
##                Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)    -0.03628    0.59895 141.00000  -0.061    0.952
## finalityfinal   0.59217    0.95200 141.00000   0.622    0.535
## stress          0.72299    0.90616 141.00000   0.798    0.426
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
## finalityfnl -0.629
## stress      -0.661  0.416
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular

euclid.warnman = lme4::lmer(euclid ~ (1|seg) + stress, data=warnman, REML=F)

## boundary (singular) fit: see ?isSingular

summary(euclid.warnman)

## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: euclid ~ (1 | seg) + stress
##    Data: warnman
##
##      AIC      BIC   logLik deviance df.resid
##   -163.3   -151.5     85.6   -171.3      137
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.6962 -0.7489 -0.1321  0.8484  2.5166
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  seg      (Intercept) 0.00000  0.0000
```

```
##  Residual             0.01738  0.1318
## Number of obs: 141, groups:  seg, 3
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept)  0.22673    0.01345  16.852
## stress       0.01125    0.02382   0.472
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.565
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

#Warlpiri:

```
dur.warlpiri = lmer(logdur ~ (1|word) + (1|seg) + finality + length + stress,
data=warlpiri, REML=F)
summary(dur.warlpiri)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | word) + (1 | seg) + finality + length + stress
##    Data: warlpiri
##
##      AIC      BIC   logLik deviance df.resid
##    385.7    424.1   -185.8    371.7     1765
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.9502 -0.7534 -0.0646  0.5752  3.2816
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 0.0066888 0.08179
##  seg      (Intercept) 0.0007768 0.02787
##  Residual             0.0665742 0.25802
## Number of obs: 1772, groups:  word, 489; seg, 7
##
## Fixed effects:
##                 Estimate Std. Error         df  t value Pr(>|t|)
## (Intercept)     -2.50163    0.01923    5.02658 -130.119 4.61e-10 ***
## finalityfinal    0.04783    0.01775 1742.74559    2.694  0.00712 **
## lengthLong       0.42212    0.19346 1425.50043    2.182  0.02927 *
## stress           0.05958    0.01469 1769.44528    4.055 5.23e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf lngthL
```

```
## finalityfnl -0.293
## lengthLong  -0.075  0.000
## stress      -0.318  0.383 -0.044
```

```
inten.warlpiri = lmer(inten_rel ~ (1|word) + (1|seg) + finality + length +
stress, data=warlpiri, REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(inten.warlpiri)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | seg) + finality + length + stress
##    Data: warlpiri
##
##      AIC      BIC   logLik deviance df.resid
##  11668.0  11706.4  -5827.0  11654.0     1765
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.2826 -0.4542 -0.1648  0.4621  5.1003
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  0.3454  0.5877
##  seg      (Intercept)  0.0000  0.0000
##  Residual             41.7156  6.4588
## Number of obs: 1772, groups:  word, 489; seg, 7
##
## Fixed effects:
##                Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)      3.8275     0.2268 1018.3883  16.877  < 2e-16 ***
## finalityfinal  -10.6228     0.4175 1675.7658 -25.442  < 2e-16 ***
## lengthLong      -0.5778     4.5939 1771.5084  -0.126      0.9
## stress          -1.4815     0.3500 1701.4626  -4.233 2.42e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf lngthL
## finalityfnl -0.534
## lengthLong  -0.001  0.000
## stress      -0.634  0.351 -0.045
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
f0.warlpiri = lmer(f0st ~ (1|word) + (1|seg) + finality + stress,
data=warlpiri, REML=F)
summary(f0.warlpiri)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | seg) + finality + stress
##    Data: warlpiri
##
##      AIC      BIC   logLik deviance df.resid
##   6239.0   6271.7  -3113.5   6227.0     1713
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.6183 -0.5174  0.0840  0.5756  3.9483
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 0.6055919 0.77820
##  seg      (Intercept) 0.0009289 0.03048
##  Residual             1.8006647 1.34189
## Number of obs: 1719, groups:  word, 483; seg, 7
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)      0.33575    0.06689   12.87037   5.019 0.000242 ***
## finalityfinal   -0.31090    0.10164 1270.92183  -3.059 0.002269 **
## stress           0.85213    0.08041 1660.97269  10.597  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
## finalityfnl -0.428
## stress      -0.515  0.406
```

```
range.warlpiri = lme4::lmer(rangest ~ (1|word) + (1|seg) + stress,
data=warlpiri, REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(range.warlpiri)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: rangest ~ (1 | word) + (1 | seg) + stress
##    Data: warlpiri
##
##      AIC      BIC   logLik deviance df.resid
##   4609.9   4637.2  -2300.0   4599.9     1714
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.2340 -0.6348 -0.1808  0.4132  8.6688
##
## Random effects:
```

```
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.1585   0.3981
##  seg      (Intercept) 0.0000   0.0000
##  Residual             0.7372   0.8586
## Number of obs: 1719, groups:  word, 483; seg, 7
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept)  1.39458    0.03355  41.563
## stress      -0.24542    0.04631  -5.299
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.471
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
euclid.warlpiri = lme4::lmer(euclid ~ (1|word) + (1|seg) + stress,
data=warlpiri, REML=F)
summary(euclid.warlpiri)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: euclid ~ (1 | word) + (1 | seg) + stress
##    Data: warlpiri
##
##      AIC      BIC   logLik deviance df.resid
##   -893.9   -866.5    452.0   -903.9     1767
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.4414 -0.7070 -0.1395  0.5722  4.0528
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.003955 0.06289
##  seg      (Intercept) 0.003239 0.05691
##  Residual             0.031819 0.17838
## Number of obs: 1772, groups:  word, 489; seg, 7
##
## Fixed effects:
##              Estimate Std. Error t value
## (Intercept)  0.322481   0.030527  10.564
## stress      -0.034128   0.009432  -3.619
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.120
```

#Yannhangu:

```r
dur.yannhangu = lmer(logdur ~ (1|word) + (1|seg) + finality + length +
stress, data=yannhangu, REML=F)
summary(dur.yannhangu)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | word) + (1 | seg) + finality + length + stress
##    Data: yannhangu
##
##      AIC      BIC   logLik deviance df.resid
##   7161.8   7215.5  -3573.9   7147.8    15655
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.7409 -0.7456 -0.0843  0.6542  3.2555
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.012793 0.11311
##  seg      (Intercept) 0.003281 0.05728
##  Residual             0.086396 0.29393
## Number of obs: 15662, groups:  word, 2022; seg, 6
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)   -2.441e+00  2.738e-02  4.661e+00 -89.155 1.03e-08 ***
## finalityfinal  1.854e-01  6.988e-03  1.553e+04  26.527  < 2e-16 ***
## lengthLong    -4.118e-01  3.187e-01  2.095e+03  -1.292    0.196
## stress         5.940e-02  6.831e-03  1.515e+04   8.697  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf lngthL
## finalityfnl -0.141
## lengthLong  -0.082 -0.003
## stress      -0.165  0.645 -0.009
```

```r
inten.yannhangu = lmer(inten_rel ~ (1|word) + (1|seg) + finality + length +
stress, data=yannhangu, REML=F)
summary(inten.yannhangu)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | seg) + finality + length + stress
##    Data: yannhangu
##
##      AIC      BIC   logLik deviance df.resid
##  91213.9  91267.5 -45600.0  91199.9    15655
##
```

```
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.7628 -0.5485 -0.0214  0.5467  7.6409
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  1.0239  1.0119
##  seg      (Intercept)  0.8812  0.9387
##  Residual             19.1487  4.3759
## Number of obs: 15662, groups:  word, 2022; seg, 6
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)    2.650e+00  4.410e-01  4.803e+00   6.009  0.00211 **
## finalityfinal -4.651e+00  1.011e-01  1.440e+04 -46.002  < 2e-16 ***
## lengthLong    -5.252e-01  4.604e+00  1.462e+03  -0.114  0.90918
## stress        -1.255e+00  9.853e-02  1.386e+04 -12.741  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf lngthL
## finalityfnl -0.128
## lengthLong  -0.092 -0.002
## stress      -0.150  0.632 -0.008
```

```
f0.yannhangu = lmer(f0st ~ (1|word) + (1|seg) + finality + stress,
data=yannhangu, REML=F)
summary(f0.yannhangu)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | seg) + finality + stress
##    Data: yannhangu
##
##      AIC      BIC   logLik deviance df.resid
##  81485.7  81531.6 -40736.8  81473.7    15462
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.5139 -0.6189 -0.0528  0.5886  3.8997
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  3.66443 1.9143
##  seg      (Intercept)  0.06131 0.2476
##  Residual             10.08768 3.1761
## Number of obs: 15468, groups:  word, 2015; seg, 6
##
## Fixed effects:
```

```
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)    7.800e-01  1.485e-01  8.014e+00   5.252 0.000768 ***
## finalityfinal -8.322e-01  7.815e-02  1.536e+04 -10.649  < 2e-16 ***
## stress         1.342e+00  7.596e-02  1.430e+04  17.674  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf
## finalityfnl -0.285
## stress      -0.310  0.656
```

```
range.yannhangu = lme4::lmer(rangest ~ (1|word) + (1|seg) + stress,
data=yannhangu, REML=F)
summary(range.yannhangu)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: rangest ~ (1 | word) + (1 | seg) + stress
##    Data: yannhangu
##
##      AIC      BIC   logLik deviance df.resid
##  66260.1  66298.4 -33125.1  66250.1    15463
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.5992 -0.5050 -0.2404  0.1655  9.1095
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.29172  0.5401
##  seg      (Intercept) 0.04565  0.2137
##  Residual             4.07438  2.0185
## Number of obs: 15468, groups:  word, 2015; seg, 6
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept)  2.17913    0.10881  20.027
## stress       0.01092    0.03546   0.308
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.153
```

```
euclid.yannhangu = lme4::lmer(euclid ~ (1|word) + (1|seg) + stress,
data=yannhangu, REML=F)
summary(euclid.yannhangu)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: euclid ~ (1 | word) + (1 | seg) + stress
##    Data: yannhangu
##
```

```
##      AIC      BIC   logLik deviance df.resid
## -17658.0 -17619.7   8834.0 -17668.0    15657
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.8016 -0.6510 -0.1653  0.4616  6.9334
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.002650 0.05148
##  seg      (Intercept) 0.003072 0.05543
##  Residual             0.017699 0.13304
## Number of obs: 15662, groups:  word, 2022; seg, 6
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept) 0.235988   0.024804   9.514
## stress      0.008209   0.002368   3.467
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.052
```

#Yidiny:

```
dur.yidiny = lmer(logdur ~ (1|word) + (1|speaker) + (1|seg) + finality +
length + stress, data=yidiny, REML=F)

## boundary (singular) fit: see ?isSingular

summary(dur.yidiny)

## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: logdur ~ (1 | word) + (1 | speaker) + (1 | seg) + finality +
##     length + stress
##    Data: yidiny
##
##      AIC      BIC   logLik deviance df.resid
##   1903.3   1955.8   -943.6   1887.3     5229
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -3.0380 -0.7346 -0.0380  0.6670  3.2703
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 9.236e-03 9.610e-02
##  seg      (Intercept) 2.695e-03 5.192e-02
##  speaker  (Intercept) 7.020e-11 8.379e-06
##  Residual             7.764e-02 2.786e-01
```

```
## Number of obs: 5237, groups:  word, 959; seg, 6; speaker, 2
##
## Fixed effects:
##                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)     -2.59058    0.03226    6.87292 -80.293 1.79e-11 ***
## finalityfinal    0.18217    0.01231 5014.30777  14.803  < 2e-16 ***
## lengthLong       0.33048    0.04464    6.26430   7.404 0.000255 ***
## stress           0.10352    0.01337 4765.02236   7.746 1.15e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) fnltyf lngthL
## finalityfnl -0.286
## lengthLong  -0.680  0.080
## stress      -0.301  0.750  0.129
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
inten.yidiny = lmer(inten_rel ~ (1|word) + (1|speaker) + (1|seg) + stress,
data=yidiny, REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(inten.yidiny)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: inten_rel ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: yidiny
##
##      AIC      BIC   logLik deviance df.resid
##  29689.9  29729.3 -14839.0  29677.9     5231
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -6.3758 -0.5382  0.0358  0.5833  5.7185
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept)  0.3216  0.5671
##  seg      (Intercept)  1.8141  1.3469
##  speaker  (Intercept)  0.0000  0.0000
##  Residual             16.5725  4.0709
## Number of obs: 5237, groups:  word, 959; seg, 6; speaker, 2
##
## Fixed effects:
##              Estimate Std. Error        df t value Pr(>|t|)
## (Intercept)    0.5231     0.5581    6.0686   0.937    0.384
## stress         1.9616     0.1260 5201.1145  15.568   <2e-16 ***
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.054
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
f0.yidiny = lmer(f0st ~ (1|word) + (1|speaker) + (1|seg) + stress,
data=yidiny,REML=F)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(f0.yidiny)
```

```
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
##   method [lmerModLmerTest]
## Formula: f0st ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: yidiny
##
##      AIC      BIC   logLik deviance df.resid
##  23292.8  23332.0 -11640.4  23280.8     5138
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.9296 -0.5676 -0.0510  0.5231  5.2364
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 1.994e+00 1.4122171
##  seg      (Intercept) 1.092e-01 0.3305048
##  speaker  (Intercept) 1.221e-08 0.0001105
##  Residual             4.494e+00 2.1198129
## Number of obs: 5144, groups:  word, 955; seg, 6; speaker, 2
##
## Fixed effects:
##              Estimate Std. Error        df t value Pr(>|t|)
## (Intercept) 5.320e-01  1.523e-01 6.721e+00   3.493   0.0108 *
## stress      1.354e+00  6.883e-02 3.516e+03  19.672   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.103
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```

```
range.yidiny = lme4::lmer(rangest ~ (1|word) + (1|seg) + (1|speaker) +
stress, data=yidiny, REML=F)
summary(range.yidiny)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: rangest ~ (1 | word) + (1 | seg) + (1 | speaker) + stress
##    Data: yidiny
##
##      AIC      BIC   logLik deviance df.resid
##  19912.0  19951.3  -9950.0  19900.0     5138
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.4794 -0.5362 -0.2228  0.2399 10.0337
##
## Random effects:
##  Groups   Name        Variance Std.Dev.
##  word     (Intercept) 0.17006  0.4124
##  seg      (Intercept) 0.01262  0.1124
##  speaker  (Intercept) 0.01053  0.1026
##  Residual             2.67092  1.6343
## Number of obs: 5144, groups:  word, 955; seg, 6; speaker, 2
##
## Fixed effects:
##             Estimate Std. Error t value
## (Intercept)  2.22004    0.09434   23.53
## stress      -0.67201    0.05036  -13.34
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.152
```

```
euclid.yidiny = lme4::lmer(euclid ~ (1|word) + (1|speaker) + (1|seg) +
stress, data=yidiny, REML=F)
summary(euclid.yidiny)
```

```
## Linear mixed model fit by maximum likelihood  ['lmerMod']
## Formula: euclid ~ (1 | word) + (1 | speaker) + (1 | seg) + stress
##    Data: yidiny
##
##      AIC      BIC   logLik deviance df.resid
##  -4867.7  -4828.3   2439.9  -4879.7     5231
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.2418 -0.6650 -0.1627  0.4901  7.1059
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  word     (Intercept) 0.0033121 0.05755
##  seg      (Intercept) 0.0010903 0.03302
##  speaker  (Intercept) 0.0001844 0.01358
##  Residual             0.0209364 0.14469
## Number of obs: 5237, groups:  word, 959; seg, 6; speaker, 2
```

```
##
## Fixed effects:
##              Estimate Std. Error t value
## (Intercept)  0.231175   0.017040  13.566
## stress      -0.002381   0.004596  -0.518
##
## Correlation of Fixed Effects:
##        (Intr)
## stress -0.061
```