Formula: F1Hz ~ block \* BB \* AF \* Label + gender + (1 | subj) + (1 | word)

Data: df

Fixed effects:

Estimate Std. Error t value

(Intercept) 450.7640 18.8082 23.966

block2 0.6292 9.7768 0.064

block4 14.8829 9.7121 1.532

BBBB 9.2792 23.1196 0.401

AFMN -18.6968 24.1381 -0.775

**LabelE 147.4586 13.5919 10.849**

**genderM -96.9882 21.2561 -4.563**

**block2:BBBB 36.7918 13.3972 2.746**

block4:BBBB -24.5214 13.3629 -1.835

**block2:AFMN 63.0118 13.8559 4.548**

**block4:AFMN -28.1106 13.7801 -2.040**

BBBB:AFMN -9.7971 33.2636 -0.295

block2:LabelE -8.1994 13.8630 -0.591

block4:LabelE -18.4500 13.8138 -1.336

BBBB:LabelE -20.8307 13.4341 -1.551

**AFMN:LabelE 39.3578 13.8591 2.840**

block2:BBBB:AFMN -23.3488 19.3244 -1.208

block4:BBBB:AFMN 36.4373 19.2392 1.894

block2:BBBB:LabelE -9.4693 18.9657 -0.499

block4:BBBB:LabelE 30.9208 18.9483 1.632

block2:AFMN:LabelE 35.7435 19.5786 1.826

block4:AFMN:LabelE 27.4315 19.5549 1.403

BBBB:AFMN:LabelE -23.8587 19.2555 -1.239

block2:BBBB:AFMN:LabelE -29.3712 27.2894 -1.076

block4:BBBB:AFMN:LabelE -36.1044 27.2431 -1.325

Linear mixed model fit by REML ['lmerMod']

Formula: F1Bark ~ block \* BB \* AF \* Label + gender + (1 | subj) + (1 | word)

Data: df

Fixed effects:

Estimate Std. Error t value

(Intercept) 4.501109 0.150669 29.874

block2 -0.020860 0.086091 -0.242

block4 0.075867 0.085521 0.887

BBBB 0.089611 0.188519 0.475

AFMN -0.170527 0.196775 -0.867

**LabelE 1.230121 0.108655 11.321**

**genderM -0.796528 0.170989 -4.658**

**block2:BBBB 0.314092 0.117970 2.662**

**block4:BBBB -0.246985 0.117668 -2.099**

**block2:AFMN 0.623770 0.122010 5.112**

block4:AFMN -0.232500 0.121342 -1.916

BBBB:AFMN -0.002289 0.271234 -0.008

block2:LabelE -0.043551 0.122072 -0.357

block4:LabelE -0.101170 0.121639 -0.832

BBBB:LabelE -0.189121 0.118295 -1.599

**AFMN:LabelE 0.271842 0.122037 2.228**

**block2:BBBB:AFMN -0.381098 0.170163 -2.240**

**block4:BBBB:AFMN 0.348422 0.169413 2.057**

block2:BBBB:LabelE -0.093649 0.167005 -0.561

block4:BBBB:LabelE 0.328207 0.166852 1.967

block2:AFMN:LabelE 0.130504 0.172402 0.757

block4:AFMN:LabelE 0.329845 0.172193 1.916

BBBB:AFMN:LabelE -0.168344 0.169557 -0.993

block2:BBBB:AFMN:LabelE -0.032519 0.240300 -0.135

**block4:BBBB:AFMN:LabelE -0.489136 0.239892 -2.039**

Significant in Hz model (**greens** indicate only significant in this model):

LabelE 147.4586 13.5919 10.849

genderM -96.9882 21.2561 -4.563

block2:BBBB 36.7918 13.3972 2.746

block2:AFMN 63.0118 13.8559 4.548

**block4:AFMN -28.1106 13.7801 -2.040**

AFMN:LabelE 39.3578 13.8591 2.840

Significant in Bark model:

LabelE 1.230121 0.108655 11.321

genderM -0.796528 0.170989 -4.658

block2:BBBB 0.314092 0.117970 2.662

**block4:BBBB -0.246985 0.117668 -2.099**

block2:AFMN 0.623770 0.122010 5.112

AFMN:LabelE 0.271842 0.122037 2.228

**block2:BBBB:AFMN -0.381098 0.170163 -2.240**

**block4:BBBB:AFMN 0.348422 0.169413 2.057**

**block4:BBBB:AFMN:LabelE -0.489136 0.239892 -2.039**

Significant in both (all four share the same signs for the betas in both models):

**LabelE** (E has a higher F1)

**GenderM** (males have a lower F1)

**block2:BBBB** (the F1 increase in /I/ from pretest to test is 36.7918 Hz higher in the BB group than in the NBAF group, for female speakers)

**block2:AFMN** (from pretest to test, the F1 in /I/ in the NBMN group increased 63.0118 Hz more than the NBAF group (f speakers))

**AFMN:LabelE** (the difference in F1 between /I/ and /E/ is 39 Hz bigger in the NBMN group than in the NBAF group at pretest) irrelevant/not expected

Only Sig. in Hz model:

**block4:AFMN** (at posttest the F1 in /I/ in the NBMN group is 28.11 Hz lower than at pretest)

Only Sig. in Bark model:

**block4:BBBB** (at posttest, the F1 in /I/ in the BBAF group is 0.25 Bark lower than at pretest)

**block2:BBBB:AFMN** (when comparing test to pretest, the effect of BB (sig. 0.31 Bark) is modified by the effect of being under the MN condition, in such a way that being under the MN condition decreased the effect of BB by 0.38 Bark)

**block4:BBBB:AFMN** (when comparing posttest to pretest, the effect of BB (sig. 0.35 Bark) is modified by the effect of having MN at block 2, in such a way that having had MN as masking noise in block2 increased the effect of BB by 0.35 Bark.) But the same group also had ordinary AF at block 3, so it could also be the effect of AF on BB

**block4:BBBB:AFMN:LabelE** (when comparing posttest to pretest, the effect of MN on the /I/-/E/ distance (sig. 0.27 Bark increase) is modified by the effect of having had BB, in such a way that having had BB decreased the /I/-/E/ contrast in F1 by 0.50 Bark

F2 models:

Hertz model:

Linear mixed model fit by REML ['lmerMod']

Formula: F2Hz ~ block \* BB \* AF \* Label + gender + (1 | subj) + (1 | word)

Data: df

Fixed effects:

Estimate Std. Error t value

(Intercept) 2200.053 66.434 33.116

block2 -9.267 17.467 -0.531

block4 -56.774 17.351 -3.272

BBBB -79.686 43.562 -1.829

AFMN 5.520 45.488 0.121

**LabelE -255.947 83.267 -3.074**

**genderM -239.801 40.375 -5.939**

**block2:BBBB -651.743 23.935 -27.230**

block4:BBBB 28.908 23.874 1.211

**block2:AFMN -54.598 24.754 -2.206**

block4:AFMN 46.824 24.619 1.902

BBBB:AFMN 97.834 62.676 1.561

block2:LabelE -15.246 24.767 -0.616

block4:LabelE 43.164 24.679 1.749

**BBBB:LabelE 65.757 24.001 2.740**

AFMN:LabelE 6.270 24.760 0.253

**block2:BBBB:AFMN -85.069 34.524 -2.464**

block4:BBBB:AFMN -60.424 34.372 -1.758

**block2:BBBB:LabelE 190.195 33.883 5.613**

block4:BBBB:LabelE -38.486 33.852 -1.137

block2:AFMN:LabelE 36.238 34.978 1.036

block4:AFMN:LabelE -33.284 34.936 -0.953

BBBB:AFMN:LabelE -62.233 34.401 -1.809

block2:BBBB:AFMN:LabelE 8.991 48.754 0.184

block4:BBBB:AFMN:LabelE 25.526 48.672 0.524

Formula: F2Bark ~ block \* BB \* AF \* Label + gender + (1 | subj) + (1 | word)

Data: df

Fixed effects:

Estimate Std. Error t value

(Intercept) 13.53089 0.21657 62.477

block2 -0.03860 0.07609 -0.507

**block4 -0.16534 0.07559 -2.187**

BBBB -0.23626 0.15582 -1.516

AFMN 0.02184 0.16261 0.134

**LabelE -0.75914 0.26768 -2.836**

**genderM -0.88032 0.13936 -6.317**

**block2:BBBB -2.56574 0.10427 -24.606**

block4:BBBB 0.06241 0.10401 0.600

block2:AFMN -0.20012 0.10784 -1.856

block4:AFMN 0.09089 0.10725 0.847

BBBB:AFMN 0.31109 0.22419 1.388

block2:LabelE -0.09628 0.10790 -0.892

block4:LabelE 0.04710 0.10751 0.438

BBBB:LabelE 0.08442 0.10456 0.807

AFMN:LabelE -0.07222 0.10787 -0.670

block2:BBBB:AFMN -0.21673 0.15040 -1.441

block4:BBBB:AFMN -0.16465 0.14974 -1.100

**block2:BBBB:LabelE 0.73355 0.14761 4.969**

block4:BBBB:LabelE 0.03067 0.14748 0.208

block2:AFMN:LabelE 0.17939 0.15238 1.177

block4:AFMN:LabelE 0.03849 0.15220 0.253

BBBB:AFMN:LabelE -0.10261 0.14987 -0.685

block2:BBBB:AFMN:LabelE -0.12610 0.21240 -0.594

block4:BBBB:AFMN:LabelE -0.06195 0.21204 -0.292

Significant in Hz model (**greens** indicate only significant in this model):

**LabelE -255.947 83.267 -3.074**

**genderM -239.801 40.375 -5.939**

**block2:BBBB -651.743 23.935 -27.230**

**block2:AFMN -54.598 24.754 -2.206**

**BBBB:LabelE 65.757 24.001 2.740**

**block2:BBBB:AFMN -85.069 34.524 -2.464**

**block2:BBBB:LabelE 190.195 33.883 5.613**

Significant in Bark model:

**block4 -0.16534 0.07559 -2.187**

**LabelE -0.75914 0.26768 -2.836**

**genderM -0.88032 0.13936 -6.317**

**block2:BBBB -2.56574 0.10427 -24.606**

**block2:BBBB:LabelE 0.73355 0.14761 4.969**

significant in both:

LabelE

genderM

block2:BBBB

block2:BBBB:LabelE

significant in both F1 and F2 and in both the Hz and Bark models:

LabelE

genderM

block2:BBBB

Interpretation similar to F1 models