Colour experiment

```
library(ggplot2)
library(lme4)
```

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

```
##
## Attaching package: 'lme4'
```

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

Load data

```
variants = read.csv('../data/processedData/variants_summary.csv', stringsAsFactors = F)
```

```
variants$Teach = variants$Teach >1
variants$TryMarked = variants$TryMarked > 1
```

LMER models

```
m0 = lmer(log(1 + freq_week_4_withinColour) ~
            1
          + (1 | colourName),
          data=variants)
m1 = lmer(log(1 + freq_week_4_withinColour) ~
            (indexical) +
            + (1 | colourName),
          data=variants)
m2 = lmer(log(1 + freq_week_4_withinColour) ~
            (indexical) +
            (Teach)
          + (1 | colourName),
          data=variants)

m3 = lmer(log(1 + freq_week_4_withinColour) ~
            (indexical) +
            (Teach) + (TryMarked)
          + (1 | colourName),
          data=variants)

m4 = lmer(log(1 + freq_week_4_withinColour) ~
            (indexical) +
            Teach * TryMarked
          + (1 | colourName),
          data=variants)
```

```
## fixed-effect model matrix is rank deficient so dropping 1 column / coefficient
```

```
m5 = lmer(log(1 + freq_week_4_withinColour) ~
            (indexical) +
            (Teach * TryMarked) +
            log(freq_week_1+1)
          + (1 | colourName),
          data=variants)
```

```
## fixed-effect model matrix is rank deficient so dropping 1 column / coefficient
```

Results

```
anova(m0,m1,m2,m3,m4,m5)
```

```
## refitting model(s) with ML (instead of REML)
```

```
## Warning in optwrap(optimizer, devfun, x@theta, lower = x@lower, calc.derivs
## = TRUE, : convergence code 3 from bobyqa: bobyqa -- a trust region step
## failed to reduce q
```

```
## Data: variants
## Models:
## m0: log(1 + freq_week_4_withinColour) ~ 1 + (1 | colourName)
## m1: log(1 + freq_week_4_withinColour) ~ (indexical) + +(1 | colourName)
## m2: log(1 + freq_week_4_withinColour) ~ (indexical) + (Teach) + (1 |
## m2:     colourName)
## m3: log(1 + freq_week_4_withinColour) ~ (indexical) + (Teach) + (TryMarked) +
## m3:     (1 | colourName)
## m4: log(1 + freq_week_4_withinColour) ~ (indexical) + Teach * TryMarked +
## m4:     (1 | colourName)
## m5: log(1 + freq_week_4_withinColour) ~ (indexical) + (Teach * TryMarked) +
## m5:     log(freq_week_1 + 1) + (1 | colourName)
##    Df     AIC     BIC logLik deviance   Chisq Chi Df Pr(>Chisq)
## m0  3 -59.076 -52.246 32.538  -65.076
## m1  5 -61.707 -50.324 35.853  -71.707  6.6311      2    0.03631 *
## m2  6 -60.252 -46.592 36.126  -72.252  0.5453      1    0.46023
## m3  7 -58.971 -43.034 36.485  -72.971  0.7187      1    0.39658
## m4  7 -58.971 -43.034 36.485  -72.971  0.0000      0    1.00000
## m5  8 -77.620 -59.406 46.810  -93.620 20.6487      1  5.517e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

There was no significant main effect of try marking (beta = -0.0055 , std.err = 0.036 , Wald t = -0.15 ; log likelihood difference = 0.36 , df = 1 , Chi Squared = 0.72 , p = 0.4).

There was a significant main effect of frequency in week 1 (beta = 0.15 , std.err = 0.032 , Wald t = 4.7 ; log likelihood difference = 10 , df = 1 , Chi Squared = 20.65 , p = 5.5e-06).

There was a significant main effect of indexicality (beta = 0.032 , std.err = 0.057 , Wald t = 0.56 ; log likelihood difference = 3.3 , df = 2 , Chi Squared = 6.63 , p = 0.036).

```
#sjp.lmer(m5,'fe')
```