

BCP MLU Preliminary Analysis

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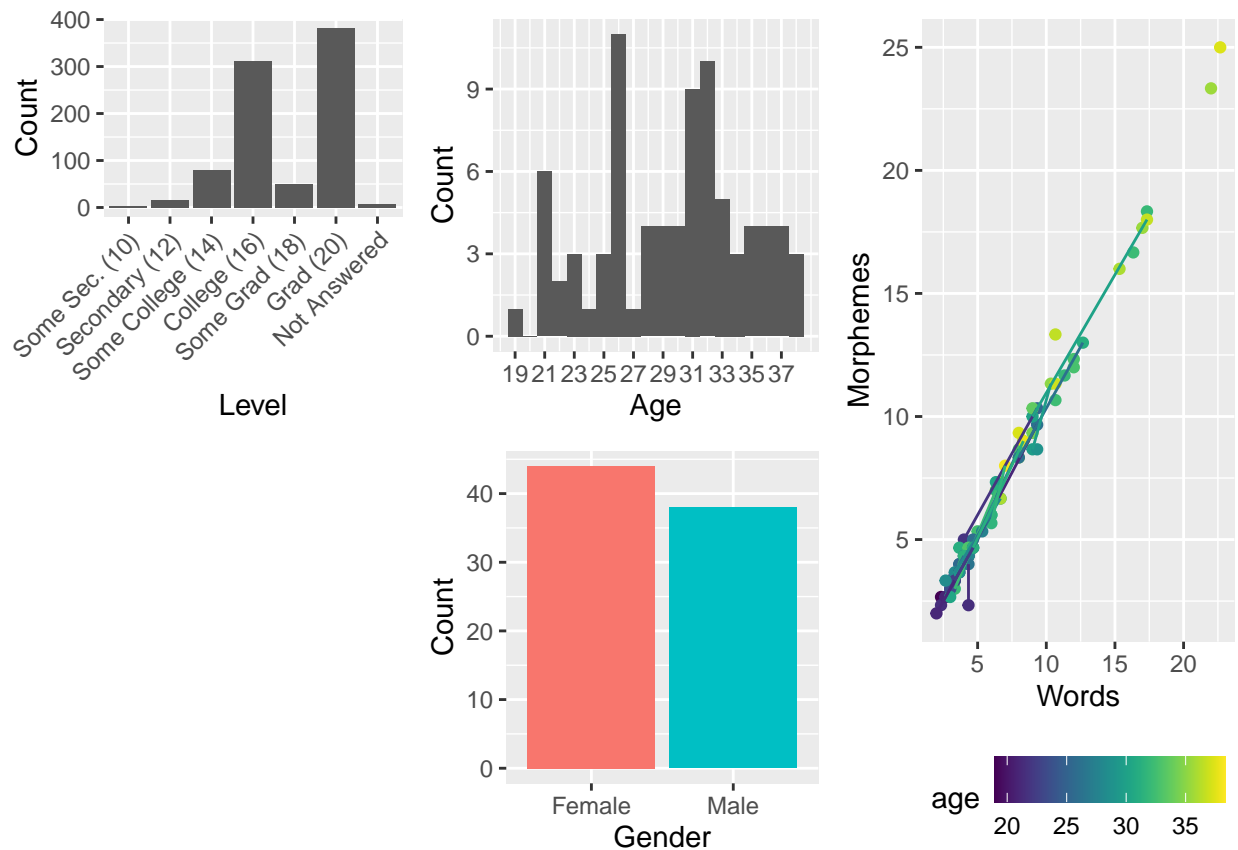
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Setup

Packages: tidyverse, lme4, MuMIn, viridis, gridExtra.

Load data

Wordbank had only age, sex, and mother's education as demographics. Here, we show those for the available subjects, as well as the correlation between MLU3m and MLU3w.



##	Age	Mom Ed	LEX	SYN	Part I	PartII	MLU3m	MLU3w
## Mean	29.7	17.9	374.3	71.9	416.2	30.0	7.2	6.8
## SD	4.9	2.4	163.7	54.4	192.5	23.1	4.8	4.5

Analysis

Since MLU3m and MLU3w are so closely correlated, I use MLU3m for here on out.

So we see that control overall improves the models, and that SYN/Part II are better than LEX/Part I, but SYN doesn't meaningfully improve over Part II.

Reanalysis

However, it turns out SYN is a superset of Part II, so we can do a direct ANOVA for more information.

```
# Demographic predictors
demo.predictors <- c("age", "sex", "educ_momed", "income_inr")

# All part I/lexical predictors
lexical.predictors <- c("action_words", "animals", "body_parts", "clothing",
  "descriptive_words", "food_drink", "furniture_rooms",
  "games_routines", "helping_verbs", "household",
  "outside", "people", "places", "toys", "vehicles",
  "sounds")

# Predictors in Part II, but also syntax
swap.predictors <- c("pronouns ", "quantifiers", "question_words", "time_words",
  "word_endings_nouns", "connecting_words", "locations")

# Part II/syntax
partII.predictors <- c("word_endings_verbs", "word_forms_nouns",
  "word_forms_verbs", "complexity")

formula.syntax_demo <- paste("MLU3m ~ ",
  paste(c(demo.predictors, "(1|data_id)"),
    collapse = " + "))

formula.syntax_partII <- paste("MLU3m ~ ",
  paste(c(demo.predictors, partII.predictors),
    collapse = " + "),
  "+ (1|data_id)")

formula.syntax_SYN <- paste("MLU3m ~",
  paste(c(demo.predictors, swap.predictors,
    partII.predictors),
    collapse = " + "),
  "+ (1|data_id)")

syntax00 <- lmer(MLU3m ~ 1 + (1|data_id), data = wMLU, REML = TRUE)
syntax0 <- lmer(formula = formula.syntax_demo, data = wMLU, REML = TRUE)
syntax1 <- lmer(formula = formula.syntax_partII, data = wMLU, REML = TRUE)
syntax2 <- lmer(formula = formula.syntax_SYN, data = wMLU, REML = TRUE)

anova(syntax00, syntax0, syntax1, syntax2)
```

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

```
## Data: wMLU
## Models:
## syntax00: MLU3m ~ 1 + (1 | data_id)
## syntax0: MLU3m ~ age + sex + educ_momed + income_inr + (1 | data_id)
## syntax1: MLU3m ~ age + sex + educ_momed + income_inr + word_endings_verbs +
## syntax1:      word_forms_nouns + word_forms_verbs + complexity + (1 | data_id)
## syntax2: MLU3m ~ age + sex + educ_momed + income_inr + pronouns + quantifiers +
## syntax2:      question_words + time_words + word_endings_nouns + connecting_words +
## syntax2:      locations + word_endings_verbs + word_forms_nouns + word_forms_verbs +
## syntax2:      complexity + (1 | data_id)
##          npar      AIC      BIC  logLik deviance   Chisq Df Pr(>Chisq)
## syntax00     3 490.32 497.54 -242.16   484.32
## syntax0     10 439.74 463.81 -209.87   419.74 64.5811  7 1.825e-11 ***
## syntax1     14 418.87 452.56 -195.43   390.87 28.8743  4 8.291e-06 ***
## syntax2     21 426.51 477.05 -192.25   384.51  6.3583  7 0.4986
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Improvements:
# demo > intercept-only
# partII > demo
# SYN !> partII
```

Conclusion

Preliminary analysis with 82 subjects shows that MLU3m is differentially associated with syntax metrics over lexical metrics. However, the proposed metric is not significantly better than traditional MCDI Part II.

Analysis plan:

- Identify other variables and test them further against BCP82 sample.
- Once phenoscreening is done, use any variables identified above and rerun.

Package info

```
version
```

```
##  
## platform      x86_64-w64-mingw32  
## arch          x86_64  
## os            mingw32  
## system        x86_64, mingw32  
## status  
## major         4  
## minor         0.2  
## year          2020  
## month         06  
## day           22  
## svn rev       78730  
## language      R  
## version.string R version 4.0.2 (2020-06-22)  
## nickname      Taking Off Again
```

```
installed.packages()[names(sessionInfo())$otherPkgs, "Version"]
```

```
##  gridExtra  viridis viridisLite      MuMIn      lme4      Matrix  
##    "2.3"    "0.5.1"   "0.3.0"   "1.43.17"  "1.1-23"  "1.2-18"  
##  forcats   stringr    dplyr     purrr     readr     tidyr  
##    "0.5.0"   "1.4.0"   "1.0.1"   "0.3.4"   "1.3.1"   "1.1.1"  
##    tibble   ggplot2    tidyverse  
##    "3.0.4"   "3.3.2"   "1.3.0"
```