Procedural Learning 110320

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# Sample Size

##   
## Frequency table:  
## Subgroup  
## DD TYP   
## 31 31

# Rotary Pursuit

Question for JDE: Factor or continuous for trial?

### Statstical Analysis by Trial

There is a significant learning effect with increasing time on target on across trials. The interaction is significant with faster learning for the Dys group. The results remain the same after controlling for sex, age, and IQ.

##   
## Call:  
## lm(formula = prop\_on ~ Subgroup \* trial, data = rp2)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.38584 -0.08919 -0.00460 0.07904 0.49058   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.224478 0.014127 15.890 <2e-16 \*\*\*  
## SubgroupTYP 0.015062 0.019782 0.761 0.4466   
## trial 0.013220 0.001469 9.002 <2e-16 \*\*\*  
## SubgroupTYP:trial -0.005245 0.002053 -2.554 0.0108 \*   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1371 on 840 degrees of freedom  
## (4 observations deleted due to missingness)  
## Multiple R-squared: 0.1263, Adjusted R-squared: 0.1232   
## F-statistic: 40.47 on 3 and 840 DF, p-value: < 2.2e-16

##   
## Call:  
## lm(formula = prop\_on ~ Subgroup \* trial + background\_age + background\_sex +   
## kbit\_ss, data = rp2\_age\_gender\_iq)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.36739 -0.08772 -0.00276 0.07962 0.48331   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 1.162e-01 5.126e-02 2.268 0.0236 \*   
## SubgroupTYP 9.200e-03 1.996e-02 0.461 0.6450   
## trial 1.318e-02 1.467e-03 8.986 <2e-16 \*\*\*  
## background\_age 7.866e-04 8.676e-04 0.907 0.3648   
## background\_sex -3.303e-05 1.014e-02 -0.003 0.9974   
## kbit\_ss 8.195e-04 3.649e-04 2.246 0.0250 \*   
## SubgroupTYP:trial -5.217e-03 2.050e-03 -2.544 0.0111 \*   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1369 on 837 degrees of freedom  
## (4 observations deleted due to missingness)  
## Multiple R-squared: 0.1318, Adjusted R-squared: 0.1256   
## F-statistic: 21.17 on 6 and 837 DF, p-value: < 2.2e-16

## $`lsmeans of Subgroup | trial`  
## trial = 8.47:  
## Subgroup lsmean SE df lower.CL upper.CL  
## DD 0.336 0.00674 840 0.321 0.352  
## TYP 0.307 0.00660 840 0.292 0.322  
##   
## Confidence level used: 0.95   
## Conf-level adjustment: sidak method for 2 estimates   
##   
## $`pairwise differences of Subgroup | trial`  
## trial = 8.47:  
## contrast estimate SE df t.ratio p.value  
## DD - TYP 0.0293 0.00944 840 3.110 0.0019

#### Linear mixed-effect modeling:

marginal group differences, significant trial differences. Same results when controlling for age, sex, and IQ

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

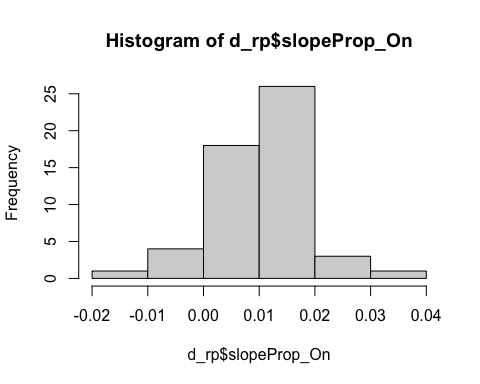
## Data: rp2  
## Models:  
## lmerrp1: prop\_on ~ Subgroup \* trial + (1 | PartID)  
## lmerrp2: prop\_on ~ Subgroup \* trial + (1 + trial | PartID)  
## npar AIC BIC logLik deviance Chisq Df Pr(>Chisq)   
## lmerrp1 6 -1868.4 -1839.9 940.18 -1880.4   
## lmerrp2 8 -2033.4 -1995.5 1024.71 -2049.4 169.05 2 < 2.2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [  
## lmerModLmerTest]  
## Formula: prop\_on ~ Subgroup \* trial + (1 + trial | PartID)  
## Data: rp2  
##   
## REML criterion at convergence: -2016.1  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -3.0400 -0.5958 0.0145 0.5950 3.5228   
##   
## Random effects:  
## Groups Name Variance Std.Dev. Corr   
## PartID (Intercept) 1.475e-02 0.12146   
## trial 6.756e-05 0.00822 -0.28  
## Residual 3.527e-03 0.05939   
## Number of obs: 844, groups: PartID, 53  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 0.228919 0.024599 50.994936 9.306 1.41e-12 \*\*\*  
## SubgroupTYP 0.011288 0.034461 50.975831 0.328 0.7446   
## trial 0.012373 0.001735 50.770798 7.132 3.44e-09 \*\*\*  
## SubgroupTYP:trial -0.004515 0.002429 50.641920 -1.859 0.0688 .   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) SbgTYP trial   
## SubgroupTYP -0.714   
## trial -0.336 0.240   
## SbgrpTYP:tr 0.240 -0.336 -0.714

##Extract Slope

####growth curve analysis

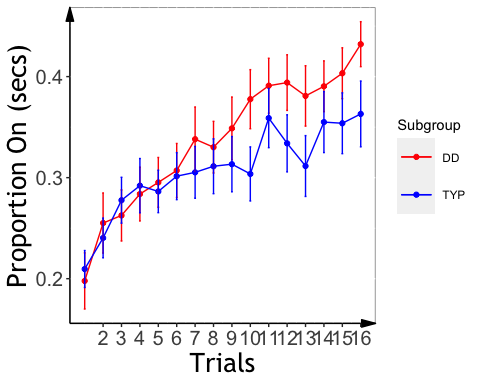
####Extract indiviudal slope



## Plot task

###Prop On by Trial

## `summarise()` regrouping output by 'Subgroup' (override with `.groups` argument)



### Alternative plots with fitted curve

### ANCOVA on individual slope

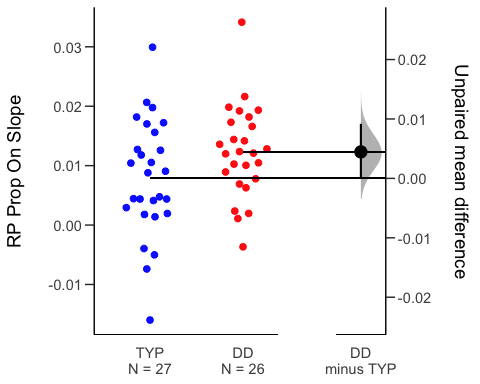
marginal group effect

## Analysis of Variance Table  
##   
## Response: slopeProp\_On  
## Df Sum Sq Mean Sq F value Pr(>F)   
## kbit\_ss 1 0.0000093 9.2530e-06 0.1153 0.7356   
## Subgroup 1 0.0002563 2.5635e-04 3.1955 0.0799 .  
## Residuals 50 0.0040111 8.0223e-05   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

## $`lsmeans of Subgroup`  
## Subgroup lsmean SE df lower.CL upper.CL  
## DD 0.01238 0.00179 50 0.00824 0.0165  
## TYP 0.00779 0.00176 50 0.00374 0.0118  
##   
## Confidence level used: 0.95   
## Conf-level adjustment: sidak method for 2 estimates   
##   
## $`pairwise differences of Subgroup`  
## contrast estimate SE df t.ratio p.value  
## DD - TYP 0.00458 0.00256 50 1.788 0.0799

### Plotting Slope Effects

## `summarise()` regrouping output by 'PartID' (override with `.groups` argument)



# Mirror Tracing

No group difference

## QC

Should we exclude outliers?

##MT: Analysis: Significant learning across trials for errors and time, but no significant Subgroup effects.No differences after controlling for age, sex, and IQ

##   
## Call:  
## lm(formula = time ~ Subgroup \* trial, data = mt2)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -31.22 -10.94 -2.96 4.27 713.19   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 47.9853 5.0009 9.595 < 2e-16 \*\*\*  
## SubgroupTYP -4.2821 6.8570 -0.624 0.533   
## trial -3.9905 0.8045 -4.960 9.62e-07 \*\*\*  
## SubgroupTYP:trial 0.7466 1.1040 0.676 0.499   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 35.68 on 505 degrees of freedom  
## (21 observations deleted due to missingness)  
## Multiple R-squared: 0.07849, Adjusted R-squared: 0.07302   
## F-statistic: 14.34 on 3 and 505 DF, p-value: 5.59e-09

## Analysis of Variance Table  
##   
## Response: error  
## Df Sum Sq Mean Sq F value Pr(>F)   
## Subgroup 1 722 722 1.1956 0.2747   
## trial 1 47080 47080 77.9114 <2e-16 \*\*\*  
## Subgroup:trial 1 220 220 0.3647 0.5462   
## Residuals 516 311807 604   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

## NOTE: Results may be misleading due to involvement in interactions

## $`lsmeans of trial`  
## trial lsmean SE df lower.CL upper.CL  
## 5.47 18.5 1.08 516 16.4 20.7  
##   
## Results are averaged over the levels of: Subgroup   
## Confidence level used: 0.95   
##   
## $` of trial`  
## contrast estimate SE df z.ratio p.value  
## (nothing) nonEst NA NA NA NA   
##   
## Results are averaged over the levels of: Subgroup

##   
## Call:  
## lm(formula = time ~ Subgroup \* trial + background\_age + background\_sex +   
## kbit\_ss, data = mt2\_age\_gender\_iq)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -40.15 -10.36 -2.57 5.15 699.91   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 23.74839 16.88394 1.407 0.160175   
## SubgroupTYP -2.51879 6.84154 -0.368 0.712908   
## trial -3.95388 0.79337 -4.984 8.6e-07 \*\*\*  
## background\_age 1.09486 0.29431 3.720 0.000222 \*\*\*  
## background\_sex -10.64214 3.42497 -3.107 0.001995 \*\*   
## kbit\_ss 0.08703 0.12046 0.722 0.470345   
## SubgroupTYP:trial 0.71003 1.08873 0.652 0.514595   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 35.19 on 502 degrees of freedom  
## (21 observations deleted due to missingness)  
## Multiple R-squared: 0.1093, Adjusted R-squared: 0.09862   
## F-statistic: 10.26 on 6 and 502 DF, p-value: 9.902e-11

##   
## Call:  
## lm(formula = error ~ Subgroup \* trial + background\_age + background\_sex +   
## kbit\_ss, data = mt2\_age\_gender\_iq)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -33.50 -10.44 -2.82 5.27 368.31   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 37.64255 11.48186 3.278 0.00111 \*\*   
## SubgroupTYP 6.97915 4.59753 1.518 0.12963   
## trial -3.04127 0.52730 -5.768 1.39e-08 \*\*\*  
## background\_age 0.64753 0.19782 3.273 0.00113 \*\*   
## background\_sex -7.51229 2.29179 -3.278 0.00112 \*\*   
## kbit\_ss -0.09708 0.08128 -1.194 0.23285   
## SubgroupTYP:trial -0.49684 0.73664 -0.674 0.50032   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 24.13 on 513 degrees of freedom  
## (10 observations deleted due to missingness)  
## Multiple R-squared: 0.1698, Adjusted R-squared: 0.1601   
## F-statistic: 17.49 on 6 and 513 DF, p-value: < 2.2e-16

## linear mixed modeling

main effect of trial, no effect of subgroups

## boundary (singular) fit: see ?isSingular

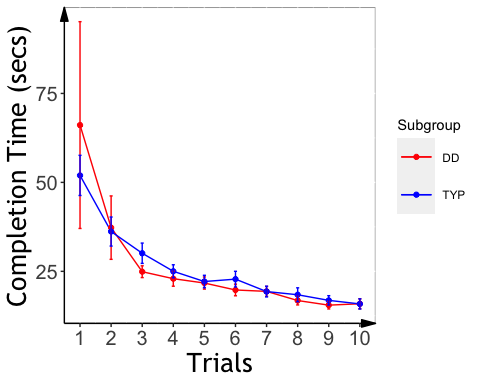
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [  
## lmerModLmerTest]  
## Formula: time ~ Subgroup \* trial + (1 + trial | PartID)  
## Data: mt2  
##   
## REML criterion at convergence: 4568.1  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -12.6887 -0.2834 -0.1014 0.1947 12.5674   
##   
## Random effects:  
## Groups Name Variance Std.Dev. Corr   
## PartID (Intercept) 6740.1 82.10   
## trial 102.2 10.11 -1.00  
## Residual 321.6 17.93   
## Number of obs: 509, groups: PartID, 52  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 56.870 16.618 48.263 3.422 0.00127 \*\*  
## SubgroupTYP -13.166 23.051 48.171 -0.571 0.57053   
## trial -4.954 2.063 36.093 -2.401 0.02161 \*   
## SubgroupTYP:trial 1.710 2.861 36.007 0.598 0.55382   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) SbgTYP trial   
## SubgroupTYP -0.721   
## trial -0.996 0.718   
## SbgrpTYP:tr 0.718 -0.996 -0.721  
## convergence code: 0  
## boundary (singular) fit: see ?isSingular

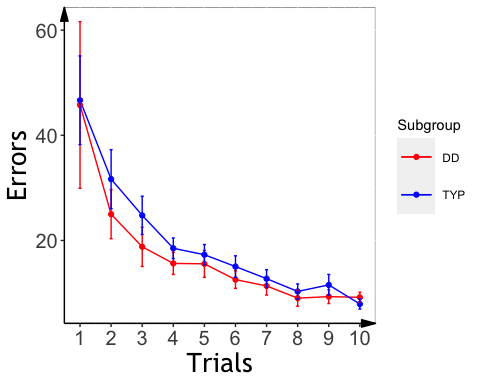
## boundary (singular) fit: see ?isSingular

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [  
## lmerModLmerTest]  
## Formula: error ~ Subgroup \* trial + (1 + trial | PartID)  
## Data: mt2  
##   
## REML criterion at convergence: 4544  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -8.7381 -0.3129 -0.0630 0.2329 10.0688   
##   
## Random effects:  
## Groups Name Variance Std.Dev. Corr   
## PartID (Intercept) 1794.18 42.358   
## trial 22.98 4.794 -1.00  
## Residual 281.19 16.769   
## Number of obs: 520, groups: PartID, 53  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 37.7084 8.6126 48.2532 4.378 6.4e-05 \*\*\*  
## SubgroupTYP 1.3564 12.0626 48.1900 0.112 0.91094   
## trial -3.3634 1.0092 43.3039 -3.333 0.00177 \*\*   
## SubgroupTYP:trial -0.1694 1.4134 43.2389 -0.120 0.90516   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) SbgTYP trial   
## SubgroupTYP -0.714   
## trial -0.983 0.702   
## SbgrpTYP:tr 0.702 -0.984 -0.714  
## convergence code: 0  
## boundary (singular) fit: see ?isSingular

## MT: Plot Time/Error by Trial

## `summarise()` regrouping output by 'Subgroup' (override with `.groups` argument)  
## `summarise()` regrouping output by 'Subgroup' (override with `.groups` argument)





##Mirror Tracing Slopes Growth curve analysis on completion time : no group effect

#### growth curve analysis on error

no group effect

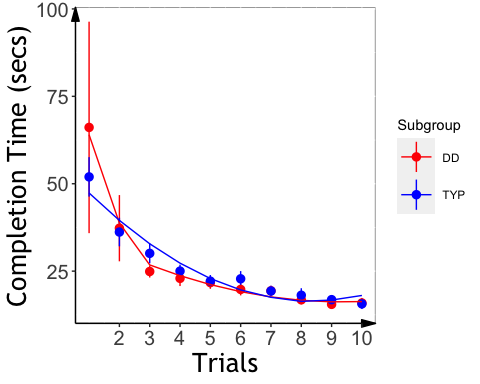
## boundary (singular) fit: see ?isSingular  
## boundary (singular) fit: see ?isSingular  
## boundary (singular) fit: see ?isSingular

## Data: mt2  
## Models:  
## m.base: error ~ (otrial1 + otrial2) + (otrial1 + otrial2 | PartID)  
## m.0: error ~ (otrial1 + otrial2) + Subgroup + (otrial1 + otrial2 |   
## m.0: PartID)  
## m.1: error ~ (otrial1 + otrial2) \* Subgroup + (otrial1 + otrial2 |   
## m.1: PartID)  
## npar AIC BIC logLik deviance Chisq Df Pr(>Chisq)   
## m.base 10 4186.0 4228.3 -2083 4166.0   
## m.0 11 4188.0 4234.6 -2083 4166.0 0.0015 1 0.96860   
## m.1 13 4185.9 4240.9 -2080 4159.9 6.1214 2 0.04685 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

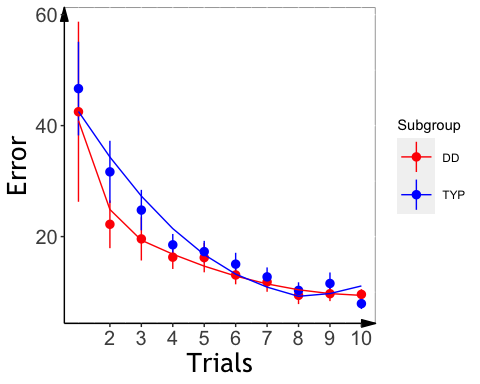
## Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's  
## method [lmerModLmerTest]  
## Formula: error ~ (otrial1 + otrial2) \* Subgroup + (otrial1 + otrial2 |   
## PartID)  
## Data: mt2  
##   
## AIC BIC logLik deviance df.resid   
## 4185.9 4240.9 -2080.0 4159.9 494   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -4.7509 -0.3791 -0.0396 0.3064 4.4986   
##   
## Random effects:  
## Groups Name Variance Std.Dev. Corr   
## PartID (Intercept) 585.1 24.188   
## otrial1 1426.1 37.763 0.56   
## otrial2 12012.7 109.603 -0.87 -0.90  
## Residual 94.8 9.737   
## Number of obs: 507, groups: PartID, 52  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 8.773 4.904 19.106 1.789 0.08949 .   
## otrial1 -25.453 7.828 13.974 -3.251 0.00581 \*\*  
## otrial2 35.910 22.048 39.567 1.629 0.11131   
## SubgroupTYP 10.914 6.788 18.980 1.608 0.12436   
## otrial1:SubgroupTYP -6.467 10.847 13.896 -0.596 0.56064   
## otrial2:SubgroupTYP -22.429 30.571 39.449 -0.734 0.46748   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) otril1 otril2 SbgTYP o1:STY  
## otrial1 0.529   
## otrial2 -0.856 -0.861   
## SubgroupTYP -0.722 -0.382 0.618   
## otrl1:SbTYP -0.382 -0.722 0.622 0.532   
## otrl2:SbTYP 0.617 0.621 -0.721 -0.857 -0.863  
## convergence code: 0  
## boundary (singular) fit: see ?isSingular

#### fit polynomial curves for the MT time plots

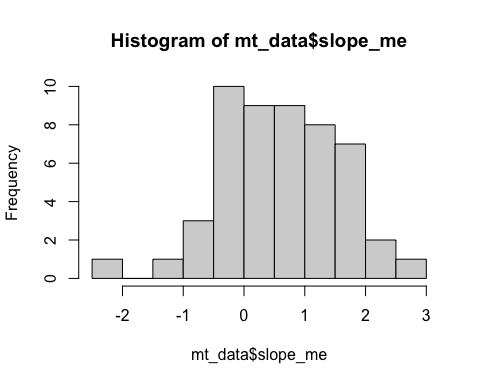
## No summary function supplied, defaulting to `mean\_se()`

 #### fit polynomial curves for the MT error plots

## No summary function supplied, defaulting to `mean\_se()`



### Extract slopes



##   
## DD TYP   
## 24 27

### MT Slope Analysis:

A significant group effects for slope, with faster learning for Typ, even after controlling for age, sex, and IQ. If one outlier included, then no significant effect

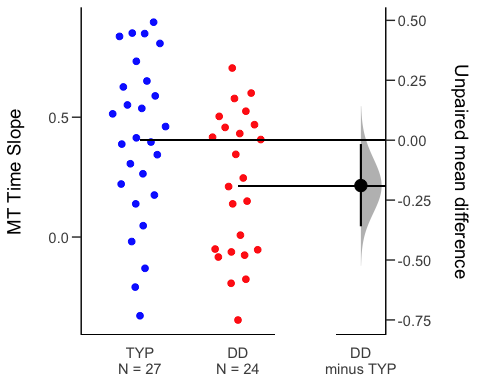
## Analysis of Variance Table  
##   
## Response: slope\_mt\_t  
## Df Sum Sq Mean Sq F value Pr(>F)   
## background\_age 1 0.0397 0.03970 0.3819 0.53963   
## background\_sex 1 0.0885 0.08854 0.8517 0.36089   
## kbit\_ss 1 0.0031 0.00307 0.0295 0.86440   
## Subgroup 1 0.5805 0.58051 5.5839 0.02241 \*  
## Residuals 46 4.7822 0.10396   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

## Analysis of Variance Table  
##   
## Response: slope\_me\_t  
## Df Sum Sq Mean Sq F value Pr(>F)   
## background\_age 1 0.0104 0.01036 0.0681 0.795257   
## background\_sex 1 1.2341 1.23409 8.1151 0.006544 \*\*  
## kbit\_ss 1 0.0145 0.01453 0.0955 0.758656   
## Subgroup 1 0.9098 0.90984 5.9829 0.018330 \*   
## Residuals 46 6.9954 0.15207   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

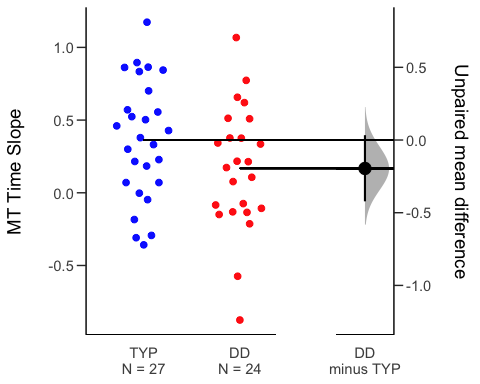
## $`lsmeans of Subgroup`  
## Subgroup lsmean SE df lower.CL upper.CL  
## DD 0.0965 0.0831 46 -0.0955 0.289  
## TYP 0.3794 0.0769 46 0.2015 0.557  
##   
## Results are averaged over the levels of: background\_sex   
## Confidence level used: 0.95   
## Conf-level adjustment: sidak method for 2 estimates   
##   
## $`pairwise differences of Subgroup`  
## contrast estimate SE df t.ratio p.value  
## DD - TYP -0.283 0.116 46 -2.446 0.0183   
##   
## Results are averaged over the levels of: background\_sex

## MT: Plot Slope Effects

## `summarise()` regrouping output by 'PartID' (override with `.groups` argument)



## `summarise()` regrouping output by 'PartID' (override with `.groups` argument)



# Statistical Learning

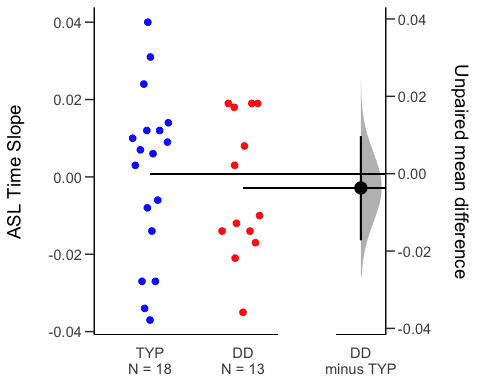
##   
## Dyslexic Typical   
## 17 24

## Slope analyses (ZQ notes: the group difference analysis should refer to abcd\_sl\_analysis.pdf)

## Analysis of Variance Table  
##   
## Response: aud\_slope\_scale  
## Df Sum Sq Mean Sq F value Pr(>F)  
## Subgroup 1 0.0001022 0.00010219 0.2444 0.6248  
## Residuals 29 0.0121282 0.00041821

##ASL Slope Effects (ZQ notes: the group difference analysis should refer to abcd\_sl\_analysis.pdf)

## `summarise()` regrouping output by 'PartID' (override with `.groups` argument)

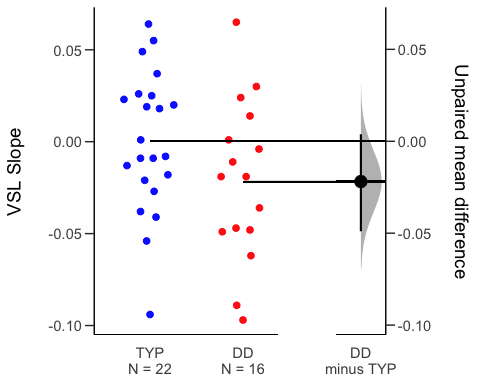


##VSL Slope Analysis (ZQ notes: the group difference analysis should refer to abcd\_sl\_analysis.pdf, both the linear models and the lmer models are available with trials entered as continuous variables)

## Analysis of Variance Table  
##   
## Response: vis\_slope\_scale  
## Df Sum Sq Mean Sq F value Pr(>F)  
## background\_age 1 0.002070 0.0020696 1.2302 0.2752  
## background\_sex 1 0.000336 0.0003361 0.1998 0.6577  
## Subgroup 1 0.004031 0.0040306 2.3958 0.1309  
## Residuals 34 0.057200 0.0016823

##VSL Effect Plot (ZQ notes: the group difference analysis should refer to abcd\_sl\_analysis.pdf, significant group effect)

## `summarise()` regrouping output by 'PartID' (override with `.groups` argument)



##RT Slope No significant differences in RT for either task.

## Analysis of Variance Table  
##   
## Response: aud\_fam\_rt  
## Df Sum Sq Mean Sq F value Pr(>F)  
## background\_age 1 0 0.0 0.0000 0.9984  
## background\_sex 1 14523 14523.4 1.6219 0.2137  
## Subgroup 1 14248 14248.2 1.5911 0.2180  
## Residuals 27 241777 8954.7

## Analysis of Variance Table  
##   
## Response: vis\_fam\_rt  
## Df Sum Sq Mean Sq F value Pr(>F)  
## background\_age 1 6080 6079.7 1.2305 0.2751  
## background\_sex 1 12178 12178.2 2.4649 0.1257  
## Subgroup 1 1555 1555.3 0.3148 0.5784  
## Residuals 34 167984 4940.7

###Cross-task correlations

###Everyone

## kbit\_ss\_2 gort\_ori\_ss\_2 ctopp\_nonword\_raw\_2  
## kbit\_ss\_2   
## gort\_ori\_ss\_2 0.25\*   
## ctopp\_nonword\_raw\_2 0.17 0.48\*\*\*\*   
## ctopp\_elision\_raw\_2 0.47\*\*\* 0.42\*\*\* 0.15   
## ctopp\_blending\_raw\_2 0.26\* 0.42\*\*\* 0.24\*   
## wais\_dsb\_ss\_2 0.51\*\*\*\* 0.43\*\*\* 0.26\*   
## slopeProp\_On -0.05 -0.05 -0.19   
## slope\_mt\_t -0.02 0.26\* -0.04   
## slope\_me\_t -0.11 0.08 -0.07   
## vis\_slope\_scale 0.14 0.28\* 0.09   
## aud\_slope\_scale 0.04 -0.09 0.07   
## vis\_acc 0.06 0.06 0.20   
## aud\_acc 0.12 0.38\*\* 0.17   
## quicksin\_snr\_loss\_2 -0.12 -0.59\*\*\*\* -0.37\*\*   
## ctopp\_elision\_raw\_2 ctopp\_blending\_raw\_2 wais\_dsb\_ss\_2  
## kbit\_ss\_2   
## gort\_ori\_ss\_2   
## ctopp\_nonword\_raw\_2   
## ctopp\_elision\_raw\_2   
## ctopp\_blending\_raw\_2 0.56\*\*\*\*   
## wais\_dsb\_ss\_2 0.42\*\*\* 0.41\*\*\*   
## slopeProp\_On 0.08 0.06 0.08   
## slope\_mt\_t 0.14 0.08 0.01   
## slope\_me\_t 0.18 -0.01 -0.15   
## vis\_slope\_scale 0.09 -0.26 0.21   
## aud\_slope\_scale 0.07 0.00 0.03   
## vis\_acc 0.19 0.17 0.00   
## aud\_acc 0.19 0.24 0.26   
## quicksin\_snr\_loss\_2 -0.17 -0.35\*\* -0.13   
## slopeProp\_On slope\_mt\_t slope\_me\_t vis\_slope\_scale  
## kbit\_ss\_2   
## gort\_ori\_ss\_2   
## ctopp\_nonword\_raw\_2   
## ctopp\_elision\_raw\_2   
## ctopp\_blending\_raw\_2   
## wais\_dsb\_ss\_2   
## slopeProp\_On   
## slope\_mt\_t 0.14   
## slope\_me\_t 0.13 0.77\*\*\*\*   
## vis\_slope\_scale 0.19 -0.01 0.10   
## aud\_slope\_scale -0.06 -0.02 0.04 -0.18   
## vis\_acc -0.18 -0.10 0.02 -0.35\*   
## aud\_acc 0.20 0.06 0.00 0.07   
## quicksin\_snr\_loss\_2 -0.07 0.08 0.23 -0.08   
## aud\_slope\_scale vis\_acc aud\_acc  
## kbit\_ss\_2   
## gort\_ori\_ss\_2   
## ctopp\_nonword\_raw\_2   
## ctopp\_elision\_raw\_2   
## ctopp\_blending\_raw\_2   
## wais\_dsb\_ss\_2   
## slopeProp\_On   
## slope\_mt\_t   
## slope\_me\_t   
## vis\_slope\_scale   
## aud\_slope\_scale   
## vis\_acc 0.08   
## aud\_acc -0.16 -0.12   
## quicksin\_snr\_loss\_2 -0.02 -0.02 -0.23

###Dys only both the rotary pursuit and ASL accuracy/RT are related to reading

## kbit\_ss\_2 gort\_ori\_ss\_2 wrmt\_id\_ss\_2 wrmt\_wa\_ss\_2 towre\_sw\_ss\_2  
## kbit\_ss\_2   
## gort\_ori\_ss\_2 0.06   
## wrmt\_id\_ss\_2 0.18 0.41\*   
## wrmt\_wa\_ss\_2 0.08 0.22 0.67\*\*\*\*   
## towre\_sw\_ss\_2 -0.10 0.52\*\* 0.40\* 0.07   
## towre\_pde\_ss\_2 0.03 0.29 0.28 0.58\*\*\* 0.46\*\*   
## slopeProp\_On 0.07 0.26 0.58\*\* 0.61\*\*\* -0.08   
## slope\_mt 0.14 -0.15 -0.12 -0.11 -0.34   
## slope\_me 0.24 0.60\*\* 0.18 0.01 0.01   
## aud\_acc -0.26 0.13 0.41 0.50\* 0.14   
## vis\_acc 0.11 0.17 -0.31 -0.22 0.00   
## aud\_slope\_scale 0.19 -0.38 0.00 -0.43 -0.14   
## vis\_slope\_scale -0.07 0.05 -0.31 -0.23 -0.25   
## towre\_pde\_ss\_2 slopeProp\_On slope\_mt slope\_me aud\_acc  
## kbit\_ss\_2   
## gort\_ori\_ss\_2   
## wrmt\_id\_ss\_2   
## wrmt\_wa\_ss\_2   
## towre\_sw\_ss\_2   
## towre\_pde\_ss\_2   
## slopeProp\_On 0.09   
## slope\_mt -0.07 0.04   
## slope\_me -0.05 0.20 0.42\*   
## aud\_acc 0.33 0.22 0.49\* 0.35   
## vis\_acc 0.20 -0.20 0.42 0.34 -0.08   
## aud\_slope\_scale -0.50\* 0.08 0.30 -0.33 0.07   
## vis\_slope\_scale -0.28 0.27 -0.01 -0.04 -0.22   
## vis\_acc aud\_slope\_scale  
## kbit\_ss\_2   
## gort\_ori\_ss\_2   
## wrmt\_id\_ss\_2   
## wrmt\_wa\_ss\_2   
## towre\_sw\_ss\_2   
## towre\_pde\_ss\_2   
## slopeProp\_On   
## slope\_mt   
## slope\_me   
## aud\_acc   
## vis\_acc   
## aud\_slope\_scale -0.16   
## vis\_slope\_scale -0.28 0.16

###Typ only better VSL is related to worse reading…

## kbit\_ss\_2 gort\_ori\_ss\_2 wrmt\_id\_ss\_2 wrmt\_wa\_ss\_2 towre\_sw\_ss\_2  
## kbit\_ss\_2   
## gort\_ori\_ss\_2 0.30   
## wrmt\_id\_ss\_2 0.16 0.38\*   
## wrmt\_wa\_ss\_2 -0.04 0.11 -0.04   
## towre\_sw\_ss\_2 0.12 0.43\* 0.15 0.17   
## towre\_pde\_ss\_2 0.14 0.69\*\*\*\* 0.38\* 0.12 0.44\*   
## slopeProp\_On -0.01 0.10 -0.08 0.16 -0.11   
## slope\_mt 0.10 -0.09 -0.11 -0.19 -0.10   
## slope\_me 0.07 -0.24 -0.17 -0.04 0.02   
## aud\_acc 0.08 0.19 0.29 0.02 0.26   
## vis\_acc 0.10 0.23 0.11 0.01 -0.12   
## aud\_slope\_scale -0.13 -0.05 -0.10 0.24 -0.29   
## vis\_slope\_scale 0.15 0.30 0.14 -0.20 0.27   
## towre\_pde\_ss\_2 slopeProp\_On slope\_mt slope\_me aud\_acc  
## kbit\_ss\_2   
## gort\_ori\_ss\_2   
## wrmt\_id\_ss\_2   
## wrmt\_wa\_ss\_2   
## towre\_sw\_ss\_2   
## towre\_pde\_ss\_2   
## slopeProp\_On -0.20   
## slope\_mt 0.16 -0.38\*   
## slope\_me 0.14 -0.27 0.83\*\*\*\*   
## aud\_acc -0.01 0.16 -0.20 -0.27   
## vis\_acc 0.11 -0.16 -0.11 -0.22 -0.12   
## aud\_slope\_scale 0.04 -0.13 0.15 0.23 -0.36   
## vis\_slope\_scale 0.51\*\* 0.15 0.17 0.14 0.08   
## vis\_acc aud\_slope\_scale  
## kbit\_ss\_2   
## gort\_ori\_ss\_2   
## wrmt\_id\_ss\_2   
## wrmt\_wa\_ss\_2   
## towre\_sw\_ss\_2   
## towre\_pde\_ss\_2   
## slopeProp\_On   
## slope\_mt   
## slope\_me   
## aud\_acc   
## vis\_acc   
## aud\_slope\_scale 0.25   
## vis\_slope\_scale -0.36\* -0.48\*