Procedural Learning 110320

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# Sample Size

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

# Rotary Pursuit

### RP Statstical Analysis by Trial

#### RP Baseline differences

* There is no significant group difference in baseline speed for RP.

##   
## Welch Two Sample t-test  
##   
## data: d$rotarypursuit\_0\_2 by d$Subgroup  
## t = -0.060585, df = 45.388, p-value = 0.952  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -4.38929 4.13288  
## sample estimates:  
## mean in group DD mean in group TYP   
## 26.53846 26.66667

#### RP Linear mixed-effect modeling

* model with trial and participant as random effects (controlling for age and sex)
* borderline significant effect trial x subgroup (faster learning in Dys)

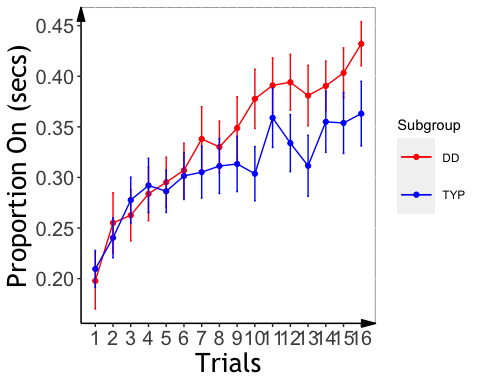
## refitting model(s) with ML (instead of REML)

## Data: rp2\_age\_gender\_iq  
## Models:  
## lmerrp1: prop\_on ~ Subgroup \* trial + background\_age + background\_sex +   
## lmerrp1: (1 | PartID)  
## lmerrp2: prop\_on ~ Subgroup \* trial + background\_age + background\_sex +   
## lmerrp2: (1 + trial | PartID)  
## Df AIC BIC logLik deviance Chisq Chi Df Pr(>Chisq)   
## lmerrp1 8 -1864.4 -1826.5 940.21 -1880.4   
## lmerrp2 10 -2029.4 -1982.1 1024.72 -2049.4 169.02 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 + background\_age + background\_sex +   
## (1 + trial | PartID)  
## Data: rp2\_age\_gender\_iq  
##   
## REML criterion at convergence: -2001.3  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -3.0400 -0.5959 0.0149 0.5949 3.5227   
##   
## Random effects:  
## Groups Name Variance Std.Dev. Corr   
## PartID (Intercept) 1.530e-02 0.123687   
## trial 6.756e-05 0.008219 -0.28  
## Residual 3.527e-03 0.059390   
## Number of obs: 844, groups: PartID, 53  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 0.2329955 0.0823754 49.9076678 2.828 0.00672 \*\*   
## SubgroupTYP 0.0105068 0.0354363 49.3654496 0.296 0.76809   
## trial 0.0123732 0.0017347 50.7813697 7.133 3.43e-09 \*\*\*  
## background\_age -0.0003613 0.0028759 48.9987986 -0.126 0.90054   
## background\_sex 0.0040717 0.0350634 48.9984281 0.116 0.90803   
## SubgroupTYP:trial -0.0045152 0.0024287 50.6524556 -1.859 0.06883 .   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) SbgTYP trial bckgrnd\_g bckgrnd\_s  
## SubgroupTYP -0.251   
## trial -0.100 0.232   
## backgrond\_g -0.768 0.115 0.000   
## backgrnd\_sx -0.317 -0.121 0.000 -0.290   
## SbgrpTYP:tr 0.071 -0.325 -0.714 0.000 0.000

#### RP Plot by trial

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



### RP Slope Analysis

#### ANCOVA on individual RP slopes

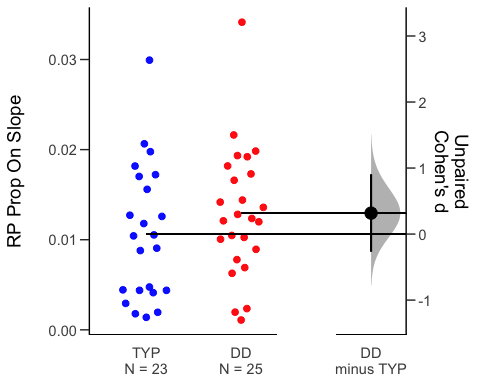
* Excluded negative slopes (n=5)
* No significant group effect on slope
* Should we control for IQ?

##   
## Call:  
## lm(formula = slopeProp\_On ~ background\_sex + background\_age +   
## kbit\_ss + Subgroup, data = d\_rp)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.0125922 -0.0045708 0.0000446 0.0043318 0.0214148   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) -8.991e-03 1.150e-02 -0.782 0.4387   
## background\_sex 3.017e-03 2.158e-03 1.398 0.1692   
## background\_age 3.402e-04 1.882e-04 1.807 0.0777 .  
## kbit\_ss 7.887e-05 8.234e-05 0.958 0.3435   
## SubgroupTYP -2.174e-03 2.098e-03 -1.036 0.3059   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.006994 on 43 degrees of freedom  
## Multiple R-squared: 0.1689, Adjusted R-squared: 0.09155   
## F-statistic: 2.184 on 4 and 43 DF, p-value: 0.08681

## $`lsmeans of Subgroup`  
## Subgroup lsmean SE df lower.CL upper.CL  
## DD 0.0132 0.00144 43 0.01029 0.0161  
## TYP 0.0110 0.00151 43 0.00798 0.0141  
##   
## Results are averaged over the levels of: background\_sex   
## Confidence level used: 0.95   
##   
## $`pairwise differences of Subgroup`  
## 1 estimate SE df t.ratio p.value  
## DD - TYP 0.00217 0.0021 43 1.036 0.3059   
##   
## Results are averaged over the levels of: background\_sex

#### Plotting RP Slope Effects

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



# Mirror Tracing

### Statistical Analysis by Trial

#### Baseline differences on trial one

* No significant group differences on first trial

summary(lm(time~background\_age+background\_sex+kbit\_ss+Subgroup,data=me\_1))

##   
## Call:  
## lm(formula = time ~ background\_age + background\_sex + kbit\_ss +   
## Subgroup, data = me\_1)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -114.54 -39.66 -10.16 18.22 626.00   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) -3.28602 147.78880 -0.022 0.9824   
## background\_age 5.12614 2.61892 1.957 0.0564 .  
## background\_sex -51.24706 31.00940 -1.653 0.1052   
## kbit\_ss 0.01171 1.10010 0.011 0.9916   
## Subgroup2 -2.50311 30.07316 -0.083 0.9340   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 101.5 on 46 degrees of freedom  
## (2 observations deleted due to missingness)  
## Multiple R-squared: 0.1054, Adjusted R-squared: 0.02756   
## F-statistic: 1.354 on 4 and 46 DF, p-value: 0.2645

summary(lm(time~background\_age+background\_sex+kbit\_ss+Subgroup,data=mt\_1))

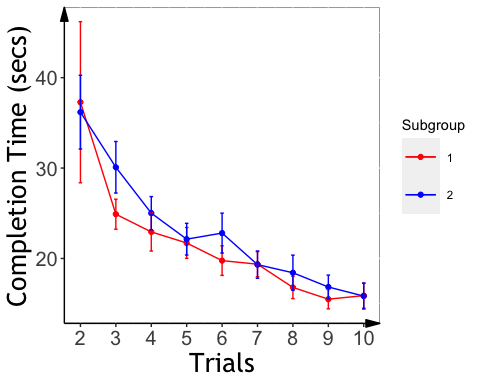
##   
## Call:  
## lm(formula = time ~ background\_age + background\_sex + kbit\_ss +   
## Subgroup, data = mt\_1)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -114.54 -39.66 -10.16 18.22 626.00   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) -3.28602 147.78880 -0.022 0.9824   
## background\_age 5.12614 2.61892 1.957 0.0564 .  
## background\_sex -51.24706 31.00940 -1.653 0.1052   
## kbit\_ss 0.01171 1.10010 0.011 0.9916   
## Subgroup2 -2.50311 30.07316 -0.083 0.9340   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 101.5 on 46 degrees of freedom  
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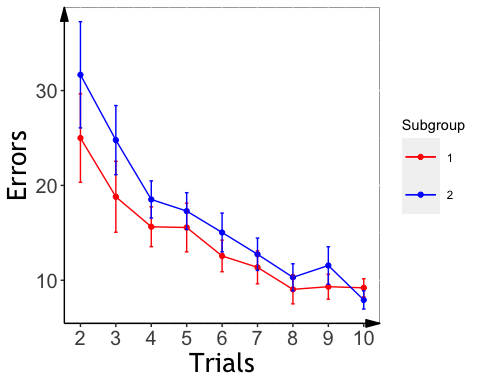
### Linear mixed modeling

* Filtered out first trial
* Main effect of trial, no significant effect of subgroup on time or error

## 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

## Final Sample

##   
## DD TYP   
## 26 27

##### MR Slope analysis

* A significant group effects for slope, with faster learning for Typ, even after controlling for age, sex, and IQ.
* Removed participants with slopes above zero (opposite learning pattern-N=2)

##   
## Call:  
## lm(formula = slope\_mt ~ background\_age + background\_sex + kbit\_ss +   
## Subgroup, data = d2, na.action = na.exclude)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -2.4333 -1.0219 -0.3748 0.8216 4.2997   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.182835 2.672474 0.068 0.9458   
## background\_age 0.080075 0.045937 1.743 0.0890 .  
## background\_sex -0.259482 0.524073 -0.495 0.6232   
## kbit\_ss -0.004151 0.019496 -0.213 0.8325   
## SubgroupTYP 1.273246 0.509948 2.497 0.0167 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 1.614 on 40 degrees of freedom  
## (8 observations deleted due to missingness)  
## Multiple R-squared: 0.1747, Adjusted R-squared: 0.09216   
## F-statistic: 2.117 on 4 and 40 DF, p-value: 0.09659

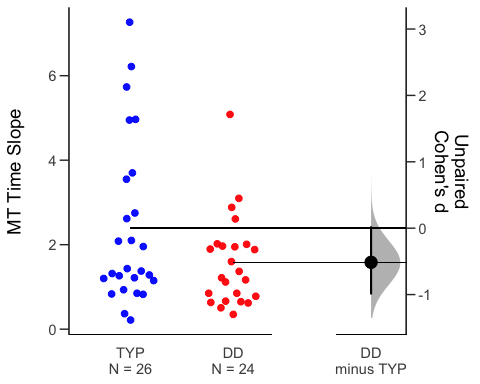
## $`lsmeans of Subgroup`  
## Subgroup lsmean SE df lower.CL upper.CL  
## DD 1.42 0.352 40 0.708 2.13  
## TYP 2.69 0.361 40 1.964 3.42  
##   
## Results are averaged over the levels of: background\_sex   
## Confidence level used: 0.95   
##   
## $`pairwise differences of Subgroup`  
## 1 estimate SE df t.ratio p.value  
## DD - TYP -1.27 0.51 40 -2.497 0.0167   
##   
## Results are averaged over the levels of: background\_sex

##   
## Call:  
## lm(formula = slope\_me ~ background\_age + background\_sex + kbit\_ss +   
## Subgroup, data = d2, na.action = na.exclude)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -2.6223 -1.2953 -0.6360 0.2702 5.2454   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) -2.08422 3.49194 -0.597 0.5540   
## background\_age 0.10927 0.06002 1.820 0.0762 .  
## background\_sex -0.54470 0.68477 -0.795 0.4310   
## kbit\_ss 0.01256 0.02547 0.493 0.6248   
## SubgroupTYP 1.54459 0.66631 2.318 0.0256 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 2.109 on 40 degrees of freedom  
## (8 observations deleted due to missingness)  
## Multiple R-squared: 0.173, Adjusted R-squared: 0.09026   
## F-statistic: 2.091 on 4 and 40 DF, p-value: 0.09994

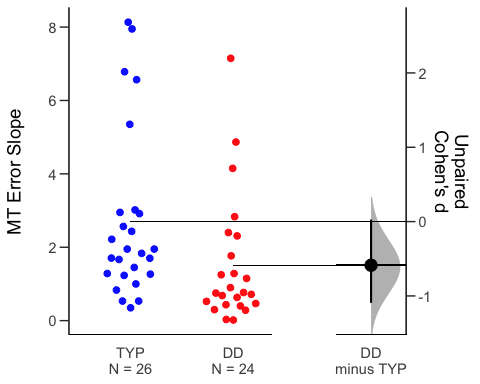
## $`lsmeans of Subgroup`  
## Subgroup lsmean SE df lower.CL upper.CL  
## DD 1.33 0.460 40 0.403 2.26  
## TYP 2.88 0.471 40 1.925 3.83  
##   
## Results are averaged over the levels of: background\_sex   
## Confidence level used: 0.95   
##   
## $`pairwise differences of Subgroup`  
## 1 estimate SE df t.ratio p.value  
## DD - TYP -1.54 0.666 40 -2.318 0.0256   
##   
## 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

* remove outliers who have hit rate lower than and equal to 0.25 (remaining participant: 14 DD and 18 TYP)
* participants removed from analysis: ABCD\_1705 ABCD\_1720 ABCD\_1747 ABCD\_1767 ABCD\_1783 ABCD\_1788 ABCD\_1709 ABCD\_1724

# TSL Analysis

## RT by Trial Analysis

* There is no significant group difference in baseline speed for TSL.

##   
## Welch Two Sample t-test  
##   
## data: subj\_table\_tsl\_usable$mean\_rt by subj\_table\_tsl\_usable$Subgroup  
## t = 1.5232, df = 25.85, p-value = 0.1399  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -18.3764 123.4250  
## sample estimates:  
## mean in group DD mean in group TYP   
## 408.5518 356.0275

* There is no significant group difference in detection accuracy for TSL

##   
## Welch Two Sample t-test  
##   
## data: dprime by Subgroup  
## t = -1.5595, df = 29.993, p-value = 0.1294  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -0.9410684 0.1261565  
## sample estimates:  
## mean in group DD mean in group TYP   
## 1.152703 1.560159

* No effect of group or interaction tested either by lm or lmer

##   
## Call:  
## lm(formula = rt\_col ~ background\_age + background\_sex + kbit\_ss +   
## reindex \* Subgroup, data = fam\_tsl\_age\_gender\_iq)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -483.18 -207.16 -8.81 217.51 600.62   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 175.51124 116.70783 1.504 0.1330   
## background\_age 1.32870 1.80792 0.735 0.4626   
## background\_sex 16.18701 20.03594 0.808 0.4194   
## kbit\_ss 1.67834 0.86538 1.939 0.0528 .  
## reindex 0.08553 1.00047 0.085 0.9319   
## SubgroupTYP -63.12174 37.14321 -1.699 0.0896 .  
## reindex:SubgroupTYP -0.21438 1.28027 -0.167 0.8671   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 265.1 on 906 degrees of freedom  
## (32 observations deleted due to missingness)  
## Multiple R-squared: 0.01514, Adjusted R-squared: 0.008618   
## F-statistic: 2.321 on 6 and 906 DF, p-value: 0.03133

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [  
## lmerModLmerTest]  
## Formula: rt\_col ~ background\_age + background\_sex + kbit\_ss + reindex \*   
## Subgroup + (1 + reindex | PartID)  
## Data: fam\_tsl\_age\_gender\_iq  
##   
## REML criterion at convergence: 12675.7  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -2.0964 -0.7029 -0.1884 0.6753 2.6740   
##   
## Random effects:  
## Groups Name Variance Std.Dev. Corr   
## PartID (Intercept) 15638.82 125.055   
## reindex 15.94 3.992 -0.74  
## Residual 60787.86 246.552   
## Number of obs: 913, groups: PartID, 31  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)  
## (Intercept) 236.9244 219.1710 30.1362 1.081 0.288  
## background\_age 0.2311 3.6626 26.2699 0.063 0.950  
## background\_sex 31.0380 40.6847 26.3813 0.763 0.452  
## kbit\_ss 1.1764 1.6689 27.7495 0.705 0.487  
## reindex -0.2029 1.4841 29.7755 -0.137 0.892  
## SubgroupTYP -67.2218 60.8804 31.2069 -1.104 0.278  
## reindex:SubgroupTYP 0.2395 1.9211 28.4203 0.125 0.902  
##   
## Correlation of Fixed Effects:  
## (Intr) bckgrnd\_g bckgrnd\_s kbt\_ss reindx SbgTYP  
## backgrond\_g -0.712   
## backgrnd\_sx 0.220 -0.450   
## kbit\_ss -0.916 0.534 -0.373   
## reindex -0.158 0.002 0.011 -0.004   
## SubgroupTYP 0.170 -0.195 0.133 -0.341 0.569   
## rndx:SbgTYP 0.130 -0.008 -0.007 -0.004 -0.773 -0.737

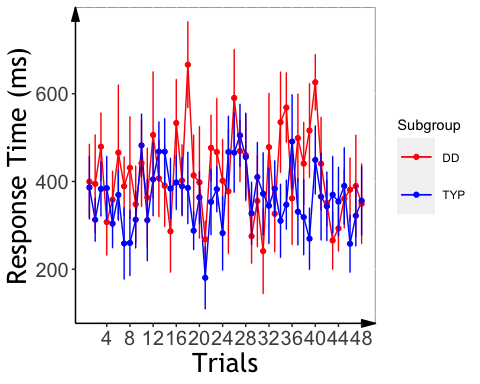
* ANCOVA with covariates (RT slope data) - no group effect

## Df Sum Sq Mean Sq F value Pr(>F)  
## Subgroup 1 2.7 2.71 0.092 0.764  
## background\_age 1 2.7 2.73 0.093 0.763  
## background\_sex 1 60.6 60.61 2.065 0.163  
## kbit\_ss 1 11.1 11.05 0.377 0.545  
## Residuals 26 763.0 29.35   
## 1 observation deleted due to missingness

## Plot of TSL RT

### RT as the function of Target repetition

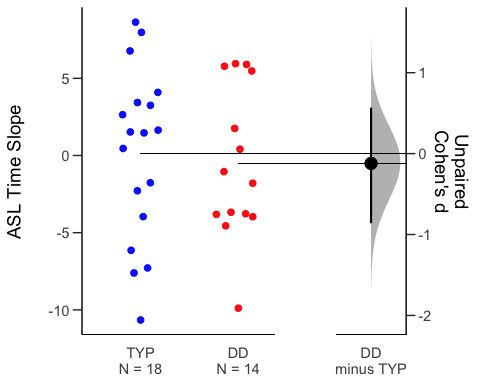
## `summarise()` regrouping output by 'Subgroup' (override with `.groups` argument)



### plot ASL RT slope across the two groups

* mean RT slope

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



## VSL Slope Analysis

## `summarise()` ungrouping output (override with `.groups` argument)

## # A tibble: 2 x 5  
## Subgroup count rt slope d\_prime   
## <fct> <int> <chr> <chr> <chr>   
## 1 DD 17 "475.36 $\\pm$ 70.75" "-2.69 $\\pm$ 4.1… "6.57 $\\pm$ 2.3…  
## 2 TYP 23 "491.24 $\\pm$ 70.15" "-0.53 $\\pm$ 3.0… "7.44 $\\pm$ 1.6…

* There is no significant group difference in baseline speed for VSL.

##   
## Welch Two Sample t-test  
##   
## data: subj\_table\_vsl$mean\_rt by subj\_table\_vsl$Subgroup  
## t = -0.7043, df = 34.466, p-value = 0.486  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -61.68091 29.91985  
## sample estimates:  
## mean in group DD mean in group TYP   
## 475.3603 491.2408

* There is no significant group difference in target detection accuracy for VSL

##   
## Welch Two Sample t-test  
##   
## data: dprime by Subgroup  
## t = -1.3305, df = 27.27, p-value = 0.1944  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -2.2095266 0.4707495  
## sample estimates:  
## mean in group DD mean in group TYP   
## 6.566801 7.436190

* The DD group had a faster RT acceleration than the TYP group (significant group x trial index interaction tested by lm and marginal interaction tested by lmer)

##   
## Call:  
## lm(formula = rt\_col ~ background\_age + background\_sex + kbit\_ss +   
## reindex \* Subgroup, data = fam\_vsl\_age\_gender\_iq)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -938.12 -66.98 4.54 65.70 291.75   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 445.5710 43.0471 10.351 < 2e-16 \*\*\*  
## background\_age 1.1948 0.6448 1.853 0.064244 .   
## background\_sex 36.9579 7.7025 4.798 1.88e-06 \*\*\*  
## kbit\_ss -0.1520 0.3186 -0.477 0.633401   
## reindex -2.8813 0.8101 -3.557 0.000395 \*\*\*  
## SubgroupTYP -11.8199 15.3951 -0.768 0.442830   
## reindex:SubgroupTYP 2.4464 1.0567 2.315 0.020833 \*   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 107.1 on 884 degrees of freedom  
## (46 observations deleted due to missingness)  
## Multiple R-squared: 0.0613, Adjusted R-squared: 0.05493   
## F-statistic: 9.622 on 6 and 884 DF, p-value: 2.842e-10

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [  
## lmerModLmerTest]  
## Formula: rt\_col ~ background\_age + background\_sex + kbit\_ss + reindex \*   
## Subgroup + (1 + reindex | PartID)  
## Data: fam\_vsl\_age\_gender\_iq  
##   
## REML criterion at convergence: 10524.2  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -9.8274 -0.4931 -0.0451 0.4942 4.0265   
##   
## Random effects:  
## Groups Name Variance Std.Dev. Corr  
## PartID (Intercept) 3275.402 57.231   
## reindex 6.743 2.597 0.12  
## Residual 7131.433 84.448   
## Number of obs: 891, groups: PartID, 38  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 500.1708 124.6192 32.7302 4.014 0.000327 \*\*\*  
## background\_age 0.1418 1.9199 32.6494 0.074 0.941566   
## background\_sex 30.2142 22.7648 32.7849 1.327 0.193601   
## kbit\_ss -0.3435 0.9464 32.6579 -0.363 0.718996   
## reindex -2.5598 0.9122 36.7526 -2.806 0.007971 \*\*   
## SubgroupTYP -8.1398 24.3927 33.2429 -0.334 0.740702   
## reindex:SubgroupTYP 2.0991 1.1938 36.2193 1.758 0.087139 .   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) bckgrnd\_g bckgrnd\_s kbt\_ss reindx SbgTYP  
## backgrond\_g -0.619   
## backgrnd\_sx -0.042 -0.269   
## kbit\_ss -0.916 0.375 -0.119   
## reindex -0.036 -0.001 0.001 0.001   
## SubgroupTYP 0.293 -0.142 -0.077 -0.393 0.178   
## rndx:SbgTYP 0.028 0.001 -0.002 -0.001 -0.764 -0.231

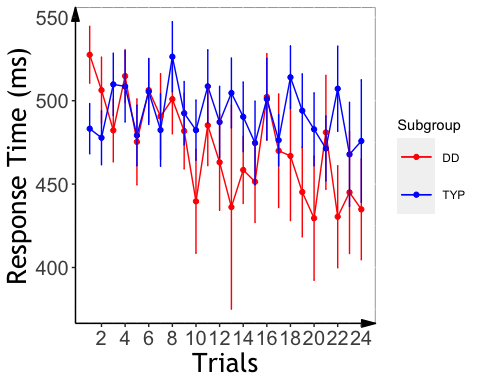
* ANCOVA with covariates (from the slope data): marginal group effect.

## Df Sum Sq Mean Sq F value Pr(>F)   
## Subgroup 1 39.9 39.86 3.015 0.0918 .  
## background\_age 1 25.3 25.33 1.916 0.1756   
## background\_sex 1 6.6 6.63 0.501 0.4839   
## kbit\_ss 1 1.9 1.92 0.145 0.7056   
## Residuals 33 436.3 13.22   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
## 2 observations deleted due to missingness

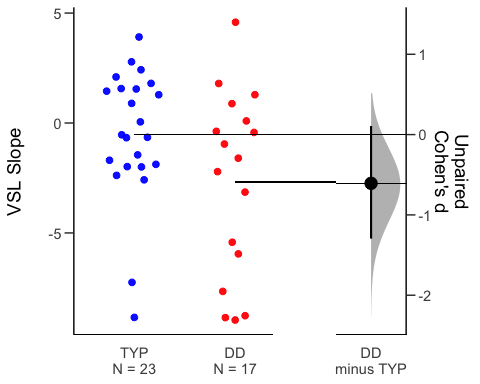
## Plot of VSL RT

### RT as the function of Target repetition

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

 ### plot mean RT slope across the two groups \* mean RT slope

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



## Combine slope data of both tasks

### Using scaled RT, check interactions between task and group.

* both lm and lmer models: task x trial interaction: visual task show faster acceleration across the two groups; task x trial x group interaction (marginal): group difference in slope is greater in VSL than ASL

##   
## Call:  
## lm(formula = rt\_col ~ background\_age + background\_sex + kbit\_ss +   
## task \* reindex \* Subgroup, data = all\_fam\_trials\_age\_gender\_iq)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -4.4542 -0.7023 -0.1211 0.6631 3.6851   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 4.557e-02 2.968e-01 0.154 0.8780   
## background\_age -1.102e-06 4.395e-03 0.000 0.9998   
## background\_sex -4.429e-05 5.059e-02 -0.001 0.9993   
## kbit\_ss 5.097e-05 2.128e-03 0.024 0.9809   
## taskVisual 2.320e-01 1.484e-01 1.563 0.1182   
## reindex -2.087e-03 3.702e-03 -0.564 0.5729   
## SubgroupTYP -6.261e-02 1.349e-01 -0.464 0.6426   
## taskVisual:reindex -2.076e-02 8.290e-03 -2.504 0.0124 \*  
## taskVisual:SubgroupTYP -2.185e-01 1.912e-01 -1.142 0.2535   
## reindex:SubgroupTYP 2.555e-03 4.737e-03 0.539 0.5897   
## taskVisual:reindex:SubgroupTYP 2.011e-02 1.077e-02 1.867 0.0621 .  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.981 on 1793 degrees of freedom  
## (78 observations deleted due to missingness)  
## Multiple R-squared: 0.005453, Adjusted R-squared: -9.36e-05   
## F-statistic: 0.9831 on 10 and 1793 DF, p-value: 0.4559

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [  
## lmerModLmerTest]  
## Formula:   
## rt\_col ~ background\_age + background\_sex + kbit\_ss + task \* reindex \*   
## Subgroup + (1 + task | PartID) + (task | reindex)  
## Data: all\_fam\_trials\_age\_gender\_iq  
##   
## REML criterion at convergence: 5113.5  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -4.5626 -0.6958 -0.1335 0.6735 3.7730   
##   
## Random effects:  
## Groups Name Variance Std.Dev. Corr   
## reindex (Intercept) 1.764e-02 1.328e-01   
## taskVisual 1.828e-02 1.352e-01 -0.99  
## PartID (Intercept) 0.000e+00 0.000e+00   
## taskVisual 1.920e-14 1.386e-07 NaN   
## Residual 9.536e-01 9.765e-01   
## Number of obs: 1804, groups: reindex, 48; PartID, 39  
##   
## Fixed effects:  
## Estimate Std. Error df t value  
## (Intercept) 4.373e-02 2.983e-01 1.641e+03 0.147  
## background\_age 1.056e-04 4.379e-03 1.744e+03 0.024  
## background\_sex -2.549e-05 5.040e-02 1.744e+03 -0.001  
## kbit\_ss 7.455e-05 2.121e-03 1.746e+03 0.035  
## taskVisual 2.285e-01 1.532e-01 1.903e+02 1.492  
## reindex -2.190e-03 3.943e-03 2.027e+02 -0.555  
## SubgroupTYP -6.675e-02 1.345e-01 1.750e+03 -0.496  
## taskVisual:reindex -2.066e-02 8.387e-03 1.829e+02 -2.463  
## taskVisual:SubgroupTYP -2.146e-01 1.905e-01 1.741e+03 -1.126  
## reindex:SubgroupTYP 2.628e-03 4.723e-03 1.752e+03 0.556  
## taskVisual:reindex:SubgroupTYP 2.004e-02 1.073e-02 1.735e+03 1.868  
## Pr(>|t|)   
## (Intercept) 0.8835   
## background\_age 0.9808   
## background\_sex 0.9996   
## kbit\_ss 0.9720   
## taskVisual 0.1374   
## reindex 0.5792   
## SubgroupTYP 0.6197   
## taskVisual:reindex 0.0147 \*  
## taskVisual:SubgroupTYP 0.2602   
## reindex:SubgroupTYP 0.5780   
## taskVisual:reindex:SubgroupTYP 0.0620 .  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) bckgrnd\_g bckgrnd\_s kbt\_ss tskVsl reindx SbgTYP tskVs:  
## backgrond\_g -0.638   
## backgrnd\_sx 0.063 -0.328   
## kbit\_ss -0.864 0.479 -0.240   
## taskVisual -0.262 -0.025 0.029 -0.011   
## reindex -0.317 0.006 0.005 -0.011 0.629   
## SubgroupTYP -0.120 -0.091 0.041 -0.172 0.531 0.628   
## tskVsl:rndx 0.155 -0.005 -0.003 -0.001 -0.823 -0.471 -0.294   
## tskVsl:STYP 0.188 0.012 -0.037 0.010 -0.749 -0.442 -0.687 0.630  
## rndx:SbgTYP 0.243 -0.017 -0.006 0.000 -0.459 -0.732 -0.849 0.344  
## tskVs::STYP -0.112 0.009 0.004 0.005 0.613 0.322 0.373 -0.757  
## tV:STY r:STYP  
## backgrond\_g   
## backgrnd\_sx   
## kbit\_ss   
## taskVisual   
## reindex   
## SubgroupTYP   
## tskVsl:rndx   
## tskVsl:STYP   
## rndx:SbgTYP 0.600   
## tskVs::STYP -0.828 -0.440

* ANCOVA for interaction between task and group (no significant interaction)

## Df Sum Sq Mean Sq F value Pr(>F)  
## Subgroup 1 0.00212 0.0021215 1.897 0.174  
## task 1 0.00108 0.0010848 0.970 0.329  
## background\_age 1 0.00090 0.0008987 0.804 0.374  
## background\_sex 1 0.00023 0.0002253 0.201 0.655  
## kbit\_ss 1 0.00255 0.0025480 2.278 0.137  
## Subgroup:task 1 0.00094 0.0009415 0.842 0.363  
## Residuals 55 0.06151 0.0011183   
## 2 observations deleted due to missingness

# SL accuracy analysis

## Accuracy Data Summary (mean +/- sd)

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

## # A tibble: 4 x 4  
## # Groups: Subgroup [2]  
## Subgroup task count accuracy   
## <fct> <fct> <int> <chr>   
## 1 DD Auditory 16 "0.55 $\\pm$ 0.09"  
## 2 DD Visual 17 "0.72 $\\pm$ 0.21"  
## 3 TYP Auditory 24 "0.66 $\\pm$ 0.13"  
## 4 TYP Visual 23 "0.67 $\\pm$ 0.23"

## Look into group performance between Dyl and Typ

### both groups performed above chance for both tasks

##   
## One Sample t-test  
##   
## data: DD\_acc\_vsl$subj\_corr  
## t = 4.3948, df = 16, p-value = 0.0002261  
## alternative hypothesis: true mean is greater than 0.5  
## 95 percent confidence interval:  
## 0.6329919 Inf  
## sample estimates:  
## mean of x   
## 0.7206471

##   
## One Sample t-test  
##   
## data: DD\_acc\_tsl$subj\_corr  
## t = 2.1928, df = 15, p-value = 0.02225  
## alternative hypothesis: true mean is greater than 0.5  
## 95 percent confidence interval:  
## 0.5097758 Inf  
## sample estimates:  
## mean of x   
## 0.54875

##   
## One Sample t-test  
##   
## data: TYP\_acc\_vsl$subj\_corr  
## t = 3.5474, df = 22, p-value = 0.0009032  
## alternative hypothesis: true mean is greater than 0.5  
## 95 percent confidence interval:  
## 0.5883823 Inf  
## sample estimates:  
## mean of x   
## 0.6713043

##   
## One Sample t-test  
##   
## data: TYP\_acc\_tsl$subj\_corr  
## t = 6.2175, df = 23, p-value = 1.208e-06  
## alternative hypothesis: true mean is greater than 0.5  
## 95 percent confidence interval:  
## 0.616952 Inf  
## sample estimates:  
## mean of x   
## 0.6614583

### generalized linear effect modeling within each task (both models failed to converge with IQ included, removing IQ from the covariates fix the issues)

* within VSL, no group effect

## Generalized linear mixed model fit by maximum likelihood (Laplace  
## Approximation) [glmerMod]  
## Family: binomial ( logit )  
## Formula:   
## corr ~ background\_age + background\_sex + Subgroup + (1 | PartID) +   
## (1 | trial)  
## Data: vsl\_accuracy\_age\_gender\_iq  
## Control:   
## glmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))  
##   
## AIC BIC logLik deviance df.resid   
## 1343.9 1374.5 -665.9 1331.9 1210   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -3.9687 -0.7904 0.3270 0.6714 1.9670   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## PartID (Intercept) 1.20094 1.0959   
## trial (Intercept) 0.04604 0.2146   
## Number of obs: 1216, groups: PartID, 38; trial, 32  
##   
## Fixed effects:  
## Estimate Std. Error z value Pr(>|z|)   
## (Intercept) 3.06685 0.91236 3.361 0.000775 \*\*\*  
## background\_age -0.03869 0.03201 -1.209 0.226695   
## background\_sex -0.71398 0.40799 -1.750 0.080123 .   
## SubgroupTYP -0.14363 0.39522 -0.363 0.716303   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) bckgrnd\_g bckgrnd\_s  
## backgrond\_g -0.744   
## backgrnd\_sx -0.394 -0.229   
## SubgroupTYP -0.177 0.013 -0.137

* within VSL, ANCOVA to test group effect, no group effect

## Df Sum Sq Mean Sq F value Pr(>F)  
## background\_age 1 0.1073 0.10728 2.211 0.147  
## background\_sex 1 0.1155 0.11549 2.380 0.132  
## kbit\_ss 1 0.0007 0.00071 0.015 0.904  
## Subgroup 1 0.0085 0.00854 0.176 0.678  
## Residuals 33 1.6014 0.04853   
## 2 observations deleted due to missingness

* within ASL, significant group effect: DD<TYP

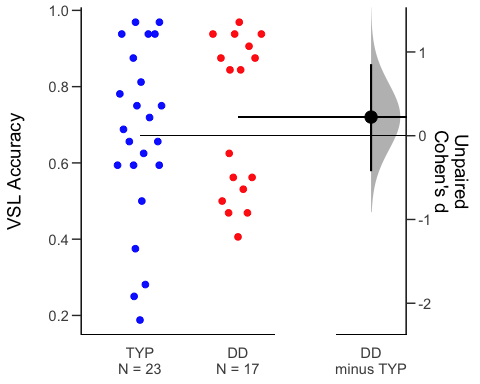
## Generalized linear mixed model fit by maximum likelihood (Laplace  
## Approximation) [glmerMod]  
## Family: binomial ( logit )  
## Formula:   
## corr ~ background\_age + background\_sex + Subgroup + (1 | PartID) +   
## (1 | trial)  
## Data: tsl\_accuracy\_age\_gender\_iq  
## Control:   
## glmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))  
##   
## AIC BIC logLik deviance df.resid   
## 1602.3 1632.9 -795.2 1590.3 1210   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -2.2425 -1.0842 0.6266 0.7942 1.2693   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## PartID (Intercept) 0.06019 0.2453   
## trial (Intercept) 0.11888 0.3448   
## Number of obs: 1216, groups: PartID, 38; trial, 32  
##   
## Fixed effects:  
## Estimate Std. Error z value Pr(>|z|)   
## (Intercept) 0.26413 0.34304 0.770 0.44132   
## background\_age -0.02152 0.01209 -1.780 0.07501 .   
## background\_sex 0.36841 0.15527 2.373 0.01765 \*   
## SubgroupTYP 0.41103 0.14821 2.773 0.00555 \*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) bckgrnd\_g bckgrnd\_s  
## backgrond\_g -0.723   
## backgrnd\_sx -0.376 -0.257   
## SubgroupTYP -0.195 -0.007 -0.083

* within ASL, ANCOVA to test group effect, significant group effect

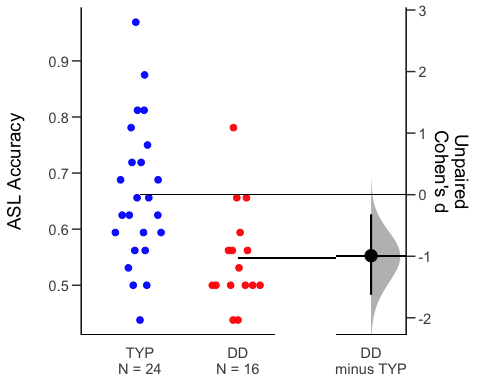
## Df Sum Sq Mean Sq F value Pr(>F)   
## background\_age 1 0.0134 0.01343 1.236 0.2743   
## background\_sex 1 0.0700 0.07004 6.444 0.0160 \*   
## kbit\_ss 1 0.0002 0.00016 0.015 0.9046   
## Subgroup 1 0.0896 0.08955 8.239 0.0071 \*\*  
## Residuals 33 0.3587 0.01087   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
## 2 observations deleted due to missingness

### plot the accuracy within VSL

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

 ### plot the accuracy within TSL

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



### generalized linear effect modeling: testing the interaction between group and task

* main effect of task (visual > auditory); main effect of group (TYP > DD);

## Generalized linear mixed model fit by maximum likelihood (Laplace  
## Approximation) [glmerMod]  
## Family: binomial ( logit )  
## Formula: corr ~ task \* Subgroup + background\_age + background\_sex + (1 +   
## task | PartID) + (1 | trial)  
## Data: all\_accuracy\_age\_gender\_iq  
## Control:   
## glmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))  
##   
## AIC BIC logLik deviance df.resid   
## 2956.8 3014.8 -1468.4 2936.8 2422   
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -4.0109 -1.0438 0.4304 0.7543 1.8858   
##   
## Random effects:  
## Groups Name Variance Std.Dev. Corr   
## PartID (Intercept) 0.05992 0.2448   
## taskVisual 1.59200 1.2617 -0.39  
## trial (Intercept) 0.02892 0.1701   
## Number of obs: 2432, groups: PartID, 39; trial, 32  
##   
## Fixed effects:  
## Estimate Std. Error z value Pr(>|z|)   
## (Intercept) 0.50151 0.32381 1.549 0.12144   
## taskVisual 0.94958 0.35051 2.709 0.00675 \*\*  
## SubgroupTYP 0.41899 0.14725 2.845 0.00444 \*\*  
## background\_age -0.02335 0.01094 -2.133 0.03289 \*   
## background\_sex 0.21885 0.14832 1.476 0.14008   
## taskVisual:SubgroupTYP -0.69995 0.45840 -1.527 0.12677   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) tskVsl SbgTYP bckgrnd\_g bckgrnd\_s  
## taskVisual -0.149   
## SubgroupTYP -0.191 0.317   
## backgrond\_g -0.718 -0.005 -0.016   
## backgrnd\_sx -0.439 0.014 -0.099 -0.201   
## tskVsl:STYP 0.110 -0.762 -0.413 0.009 -0.011

### ancova: testing the interaction between group and task

* marginal effect of task (Visual > Auditory)

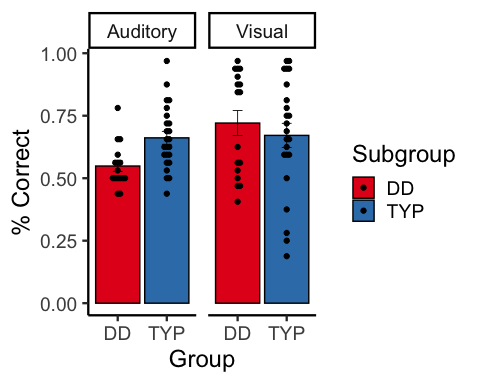
## Df Sum Sq Mean Sq F value Pr(>F)   
## task 1 0.0913 0.09128 2.869 0.0950 .  
## Subgroup 1 0.0179 0.01792 0.563 0.4556   
## background\_age 1 0.0981 0.09812 3.084 0.0837 .  
## background\_sex 1 0.0022 0.00216 0.068 0.7950   
## kbit\_ss 1 0.0009 0.00094 0.030 0.8638   
## task:Subgroup 1 0.0764 0.07639 2.401 0.1260   
## Residuals 67 2.1320 0.03182   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
## 4 observations deleted due to missingness

## plot the accuracy by group and task

## # A tibble: 2 x 10  
## task term group1 group2 null.value estimate conf.low conf.high p.adj  
## \* <fct> <chr> <chr> <chr> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 Audi… Subg… DD TYP 0 0.113 0.0384 0.187 0.00391  
## 2 Visu… Subg… DD TYP 0 -0.0493 -0.193 0.0941 0.491   
## # … with 1 more variable: p.adj.signif <chr>

## Warning: Ignoring unknown parameters: fun.y, fun.ymin, fun.ymax

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



# 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 -0.01 0.19 0.00   
## slope\_me 0.07 0.31\* 0.13   
## 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  
## 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   
## slope\_mt 0.18 0.13   
## slope\_me 0.28\* 0.19   
## vis\_slope\_scale 0.09 -0.26   
## aud\_slope\_scale 0.07 0.00   
## vis\_acc 0.19 0.17   
## aud\_acc 0.19 0.24   
## quicksin\_snr\_loss\_2 -0.17 -0.35\*\*   
## wais\_dsb\_ss\_2 slopeProp\_On slope\_mt slope\_me  
## 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 0.08   
## slope\_mt 0.03 0.28\*   
## slope\_me 0.05 0.16 0.81\*\*\*\*   
## vis\_slope\_scale 0.21 0.19 -0.04 -0.02   
## aud\_slope\_scale 0.03 -0.06 0.13 0.02   
## vis\_acc 0.00 -0.18 -0.17 0.04   
## aud\_acc 0.26 0.20 0.06 0.11   
## quicksin\_snr\_loss\_2 -0.13 -0.07 -0.09 -0.18   
## vis\_slope\_scale 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   
## slope\_me   
## vis\_slope\_scale   
## aud\_slope\_scale -0.18   
## vis\_acc -0.35\* 0.08   
## aud\_acc 0.07 -0.16 -0.12   
## quicksin\_snr\_loss\_2 -0.08 -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  
## 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\*\*\*   
## slopeProp\_On 0.07 0.26 0.58\*\* 0.61\*\*\*   
## slope\_mt -0.11 0.08 0.16 0.08   
## slope\_me 0.07 0.13 0.11 -0.01   
## aud\_acc -0.26 0.13 0.41 0.50\*   
## vis\_acc 0.11 0.17 -0.31 -0.22   
## aud\_slope\_scale 0.19 -0.38 0.00 -0.43   
## vis\_slope\_scale -0.07 0.05 -0.31 -0.23   
## towre\_sw\_ss\_2 towre\_pde\_ss\_2 slopeProp\_On slope\_mt  
## kbit\_ss\_2   
## gort\_ori\_ss\_2   
## wrmt\_id\_ss\_2   
## wrmt\_wa\_ss\_2   
## towre\_sw\_ss\_2   
## towre\_pde\_ss\_2 0.46\*\*   
## slopeProp\_On -0.08 0.09   
## slope\_mt 0.25 -0.01 0.03   
## slope\_me 0.18 -0.13 -0.07 0.74\*\*\*\*  
## aud\_acc 0.14 0.33 0.22 -0.38   
## vis\_acc 0.00 0.20 -0.20 -0.59\*\*   
## aud\_slope\_scale -0.14 -0.50\* 0.08 0.17   
## vis\_slope\_scale -0.25 -0.28 0.27 0.00   
## slope\_me aud\_acc 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 -0.25   
## vis\_acc -0.03 -0.08   
## aud\_slope\_scale 0.05 0.07 -0.16   
## vis\_slope\_scale -0.01 -0.22 -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  
## 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   
## slopeProp\_On -0.01 0.10 -0.08 0.16   
## slope\_mt -0.11 -0.03 0.01 0.36\*   
## slope\_me -0.10 0.23 0.12 0.29   
## aud\_acc 0.08 0.19 0.29 0.02   
## vis\_acc 0.10 0.23 0.11 0.01   
## aud\_slope\_scale -0.13 -0.05 -0.10 0.24   
## vis\_slope\_scale 0.15 0.30 0.14 -0.20   
## towre\_sw\_ss\_2 towre\_pde\_ss\_2 slopeProp\_On slope\_mt  
## kbit\_ss\_2   
## gort\_ori\_ss\_2   
## wrmt\_id\_ss\_2   
## wrmt\_wa\_ss\_2   
## towre\_sw\_ss\_2   
## towre\_pde\_ss\_2 0.44\*   
## slopeProp\_On -0.11 -0.20   
## slope\_mt 0.08 -0.22 0.48\*\*   
## slope\_me 0.09 -0.10 0.39\* 0.83\*\*\*\*  
## aud\_acc 0.26 -0.01 0.16 -0.04   
## vis\_acc -0.12 0.11 -0.16 -0.05   
## aud\_slope\_scale -0.29 0.04 -0.13 0.08   
## vis\_slope\_scale 0.27 0.51\*\* 0.15 -0.23   
## slope\_me aud\_acc 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 0.02   
## vis\_acc 0.11 -0.12   
## aud\_slope\_scale -0.05 -0.36 0.25   
## vis\_slope\_scale -0.21 0.08 -0.36\* -0.48\*