

# Semantic Networks Analysis

*Abhilasha Kumar*

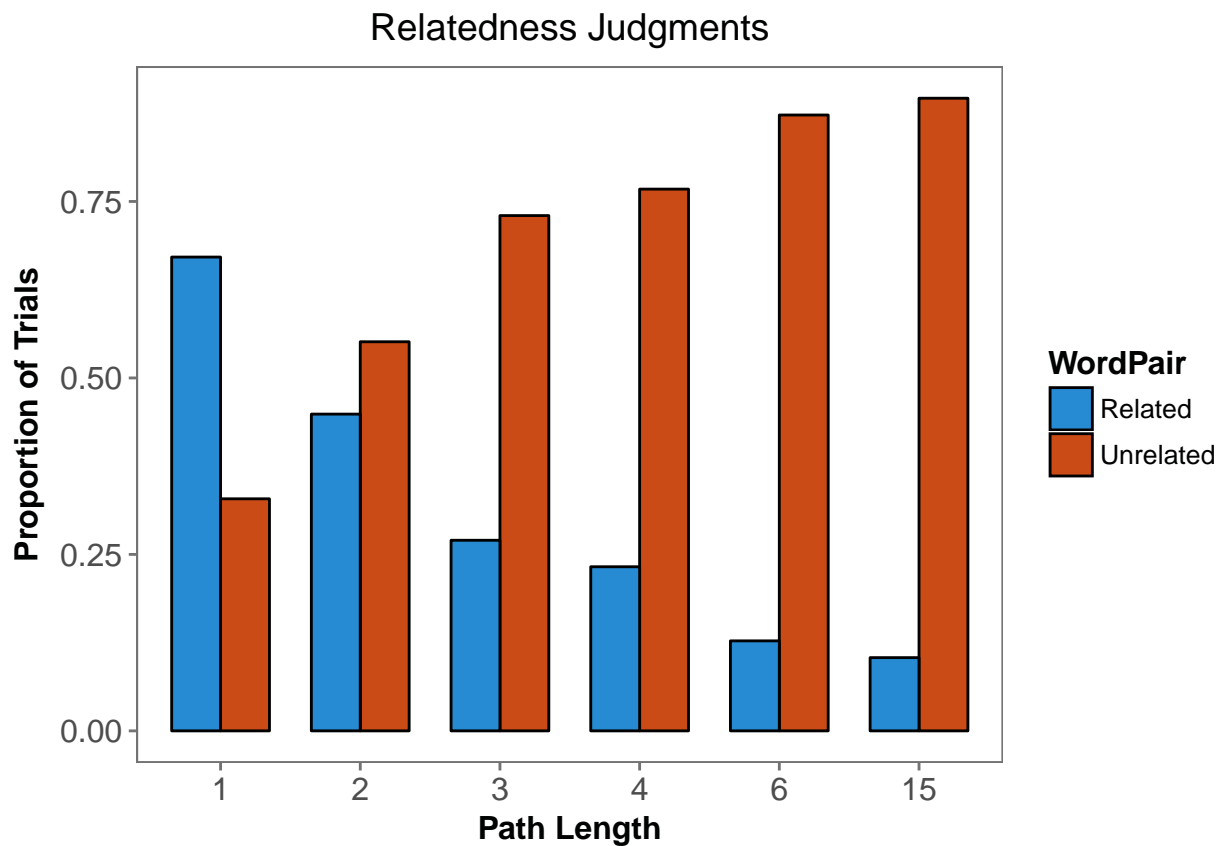
*January 16, 2018*

## Reading the Data

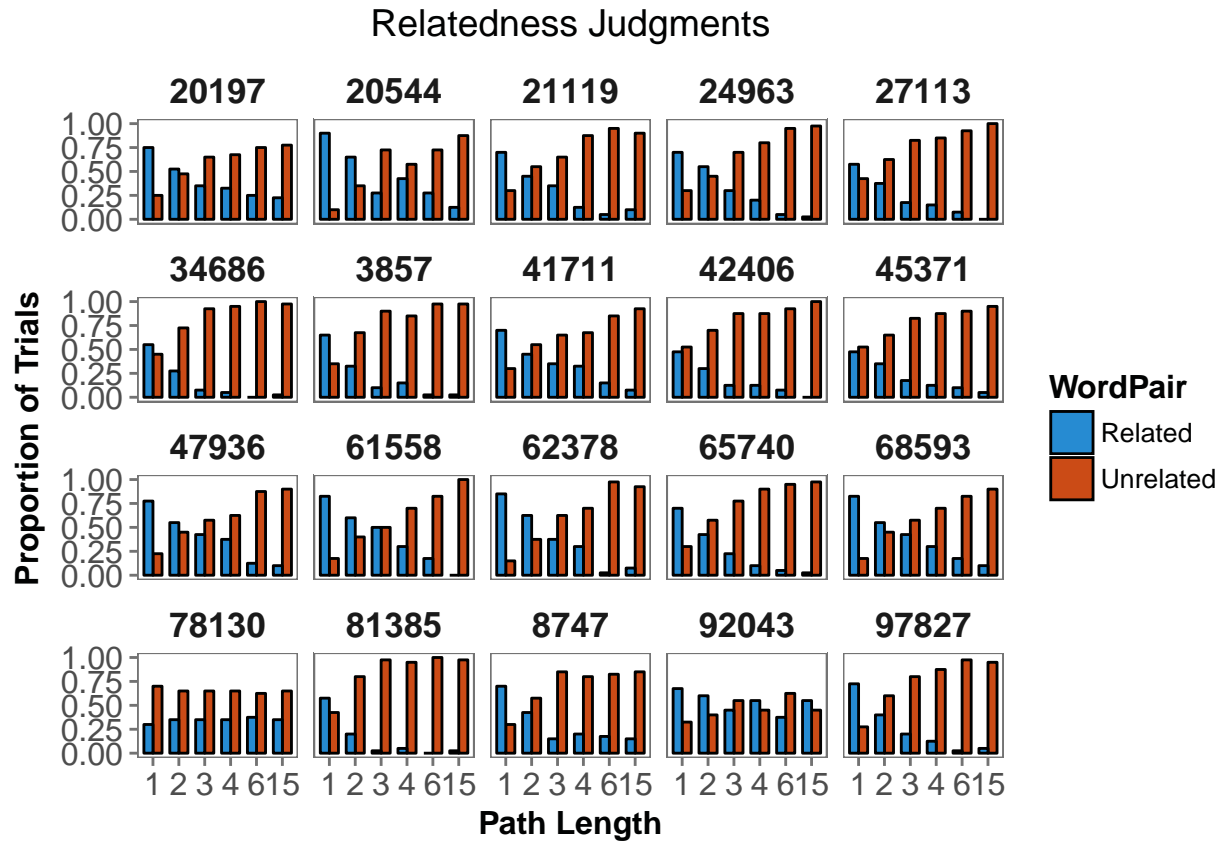
## Related-Unrelated Decisions

```
##
## Attaching package: 'dplyr'
##
## The following objects are masked from 'package:stats':
##
##   filter, lag
##
## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union
```

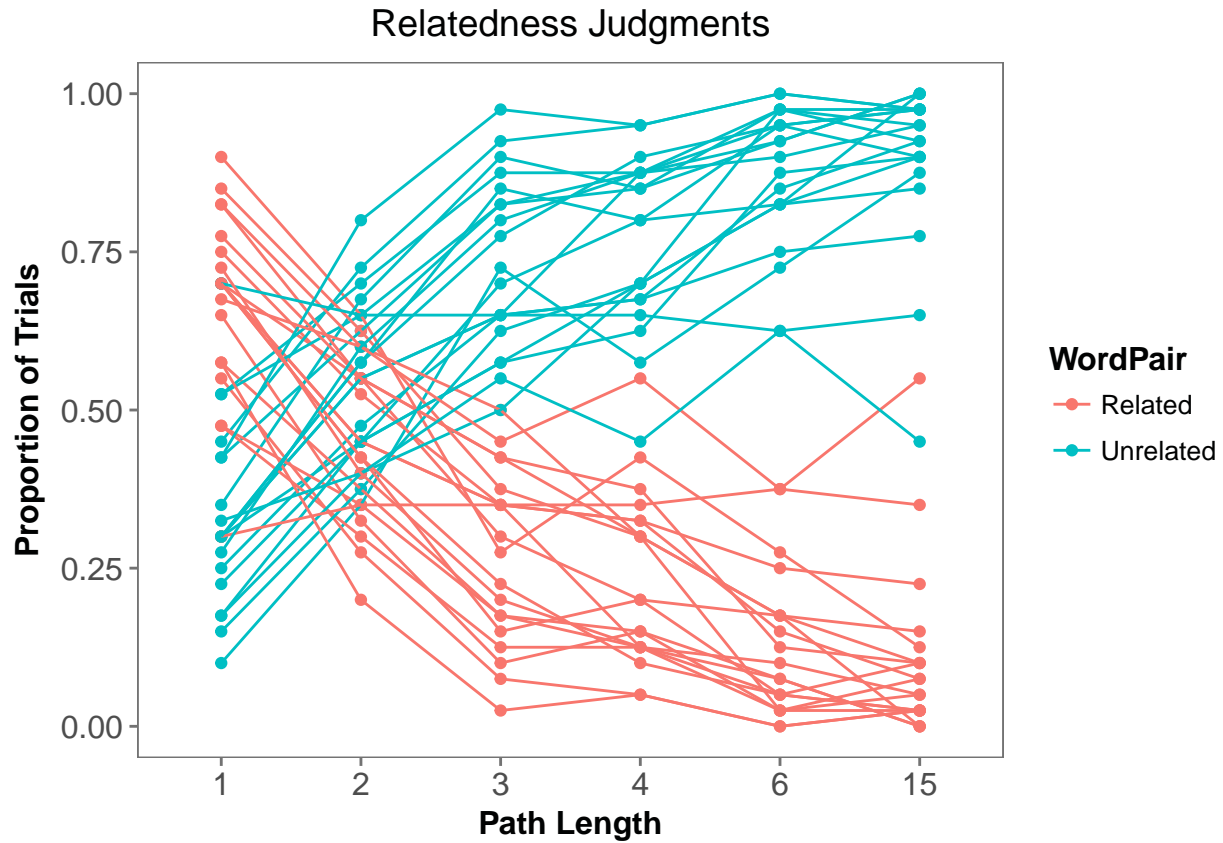
## Plotting Proportions



Subject-Wise



## Line Plot Subject-Wise



## ANOVA

```
relunrel_aov = aov(data = sem_decision, proportion ~ pathlengthfac*Type +
                    Error(subject/(pathlengthfac*Type)))
summary(relunrel_aov)
```

```
##
## Error: subject
##           Df    Sum Sq  Mean Sq F value Pr(>F)
## Residuals 19 4.158e-30 2.188e-31
##
## Error: subject:pathlengthfac
##           Df    Sum Sq  Mean Sq F value Pr(>F)
## pathlengthfac 5 3.330e-30 6.655e-31  1.702  0.142
## Residuals    95 3.716e-29 3.911e-31
##
## Error: subject:Type
##           Df Sum Sq Mean Sq F value Pr(>F)
## Type       1  8.759   8.759   68.57 1e-07 ***
## Residuals 19  2.427   0.128
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Error: subject:pathlengthfac:Type
##               Df Sum Sq Mean Sq F value Pr(>F)
## pathlengthfac:Type  5  9.328  1.8656   109.1 <2e-16 ***
## Residuals        95  1.624  0.0171
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

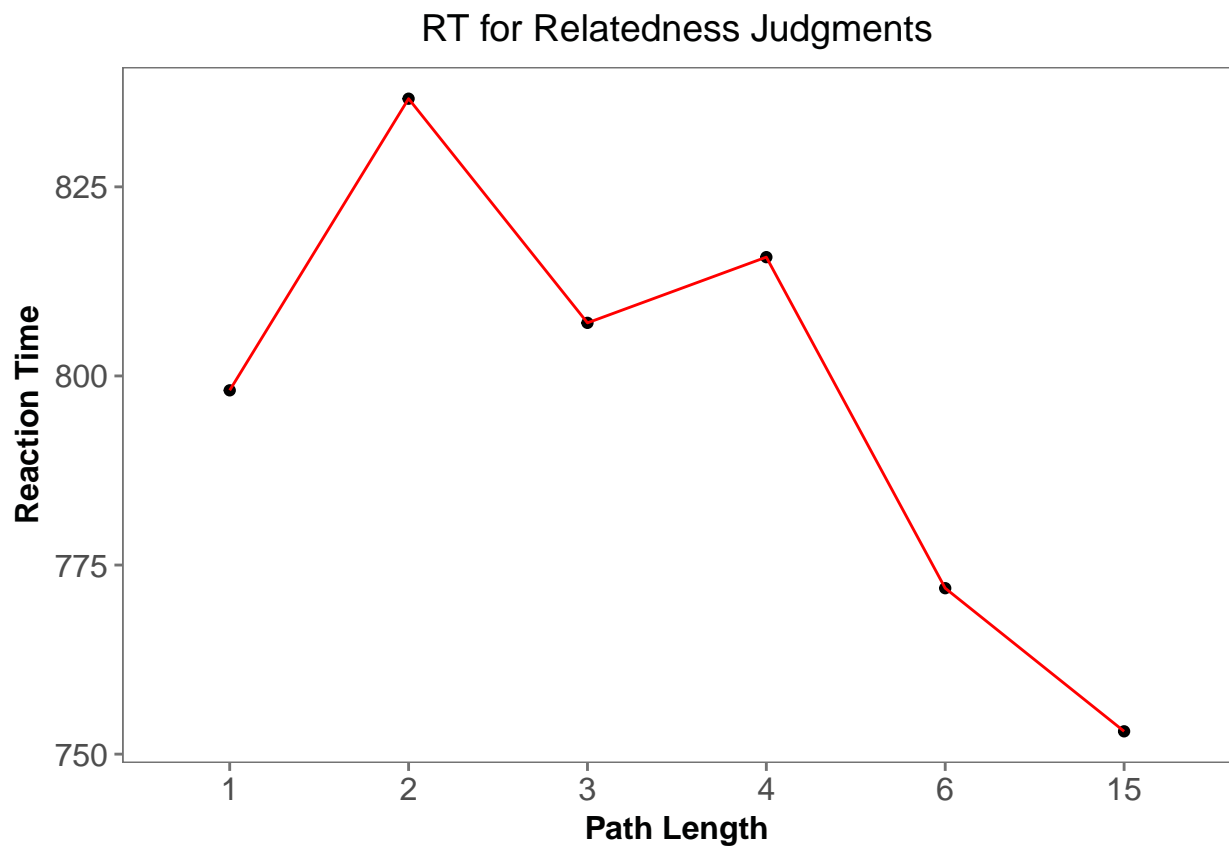
## Raw Reaction Time

### ANOVA

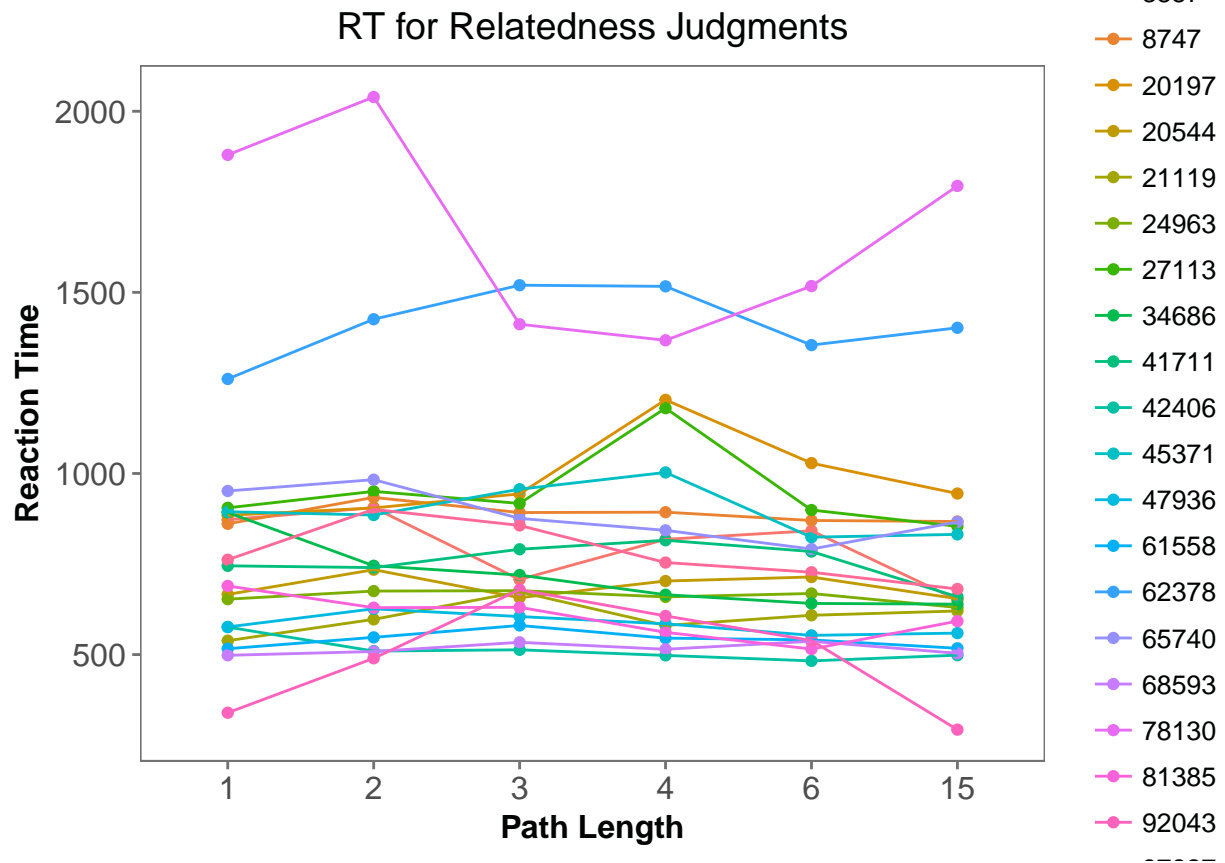
```
sem_rt$pathlengthfac = ordered(as.factor(as.character(sem_rt$pathlength)),
                               levels = c("1", "2", "3", "4", "6", "15"))
sem_rt$subject = as.factor(sem_rt$subject)
rt_aov = aov(data = sem_rt, rt ~ pathlengthfac +
              Error(subject/(pathlengthfac)))
summary(rt_aov)
```

```
##
## Error: subject
##               Df Sum Sq Mean Sq F value Pr(>F)
## Residuals 19 10213162  537535
##
## Error: subject:pathlengthfac
##               Df Sum Sq Mean Sq F value Pr(>F)
## pathlengthfac  5  91732  18346   2.097 0.0724 .
## Residuals     95 831163   8749
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Plotting RTs

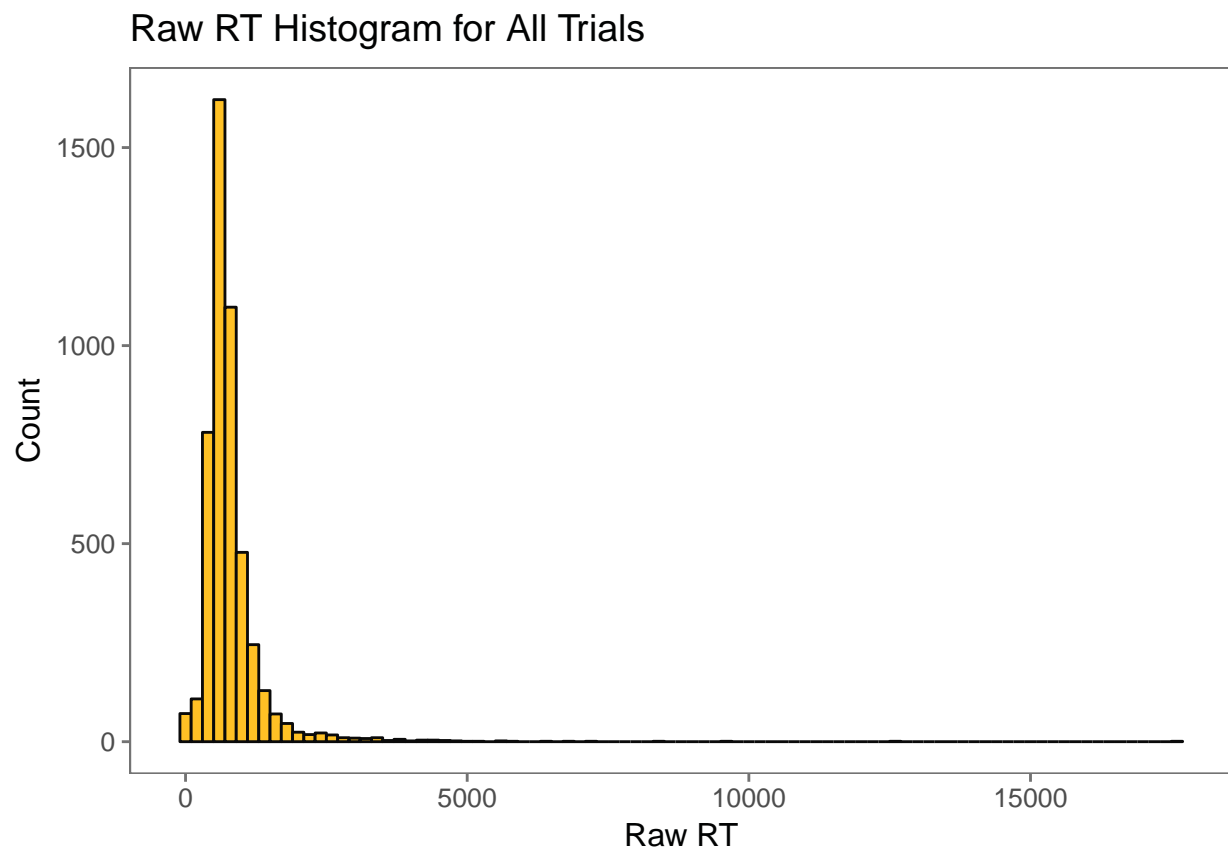


Subject-Wise



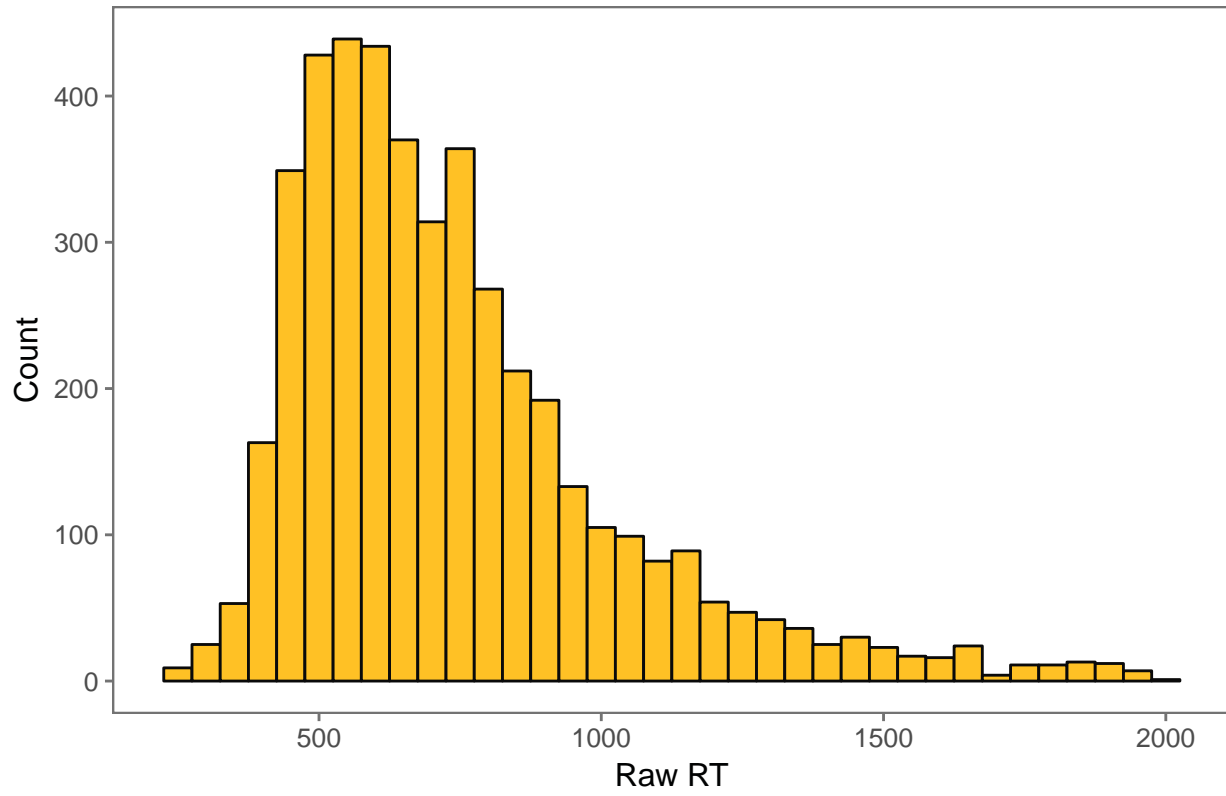
## z-scored Reaction Time

### Histogram of RT



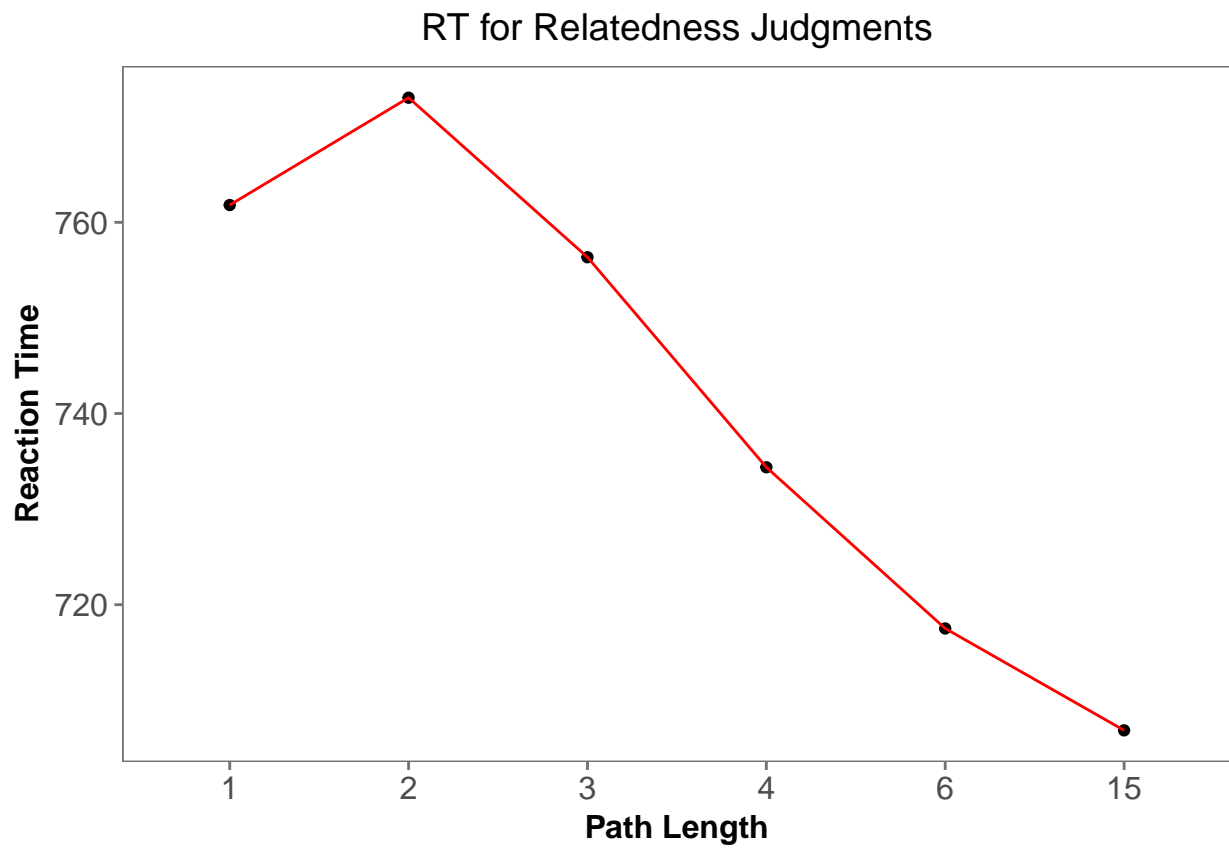
## First Trim

Raw RT Histogram for Trials Above 250 ms and below 2000 ms

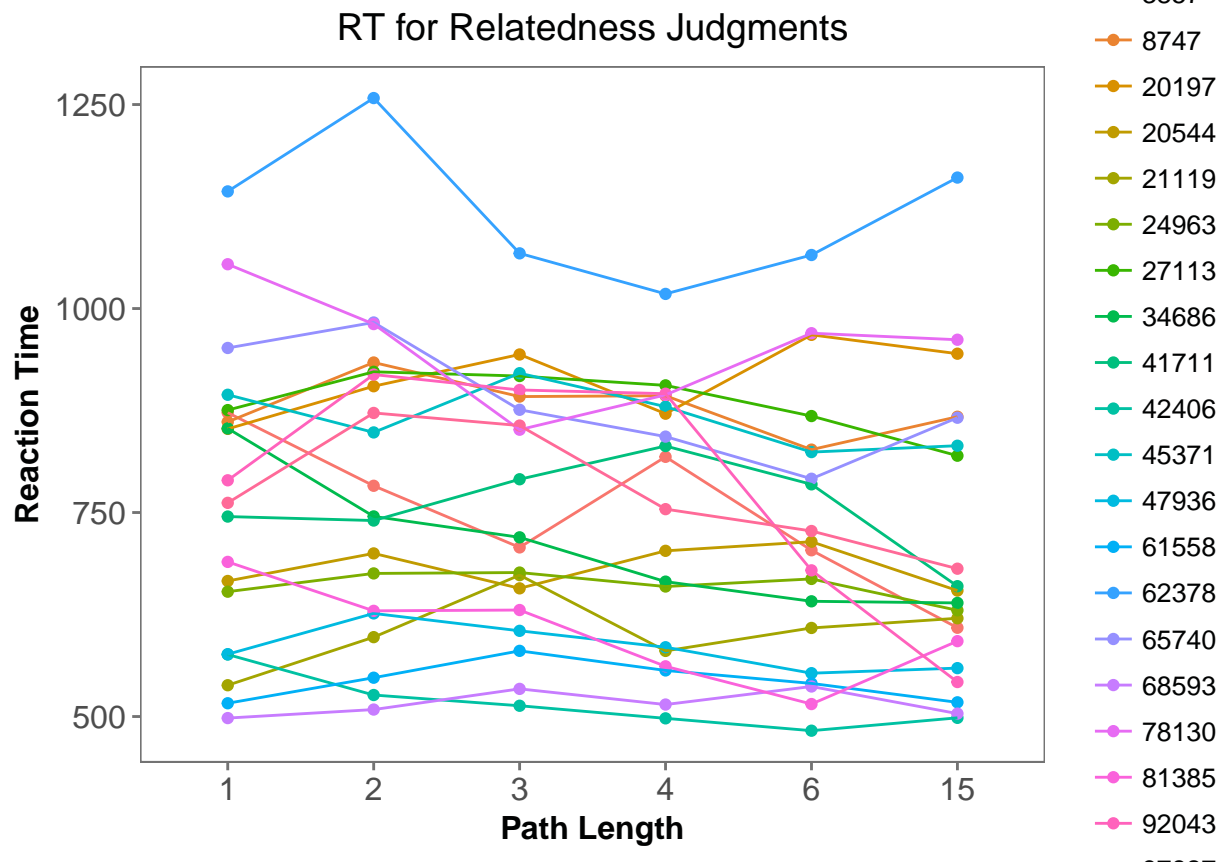




Raw RT aggregates After Trimming

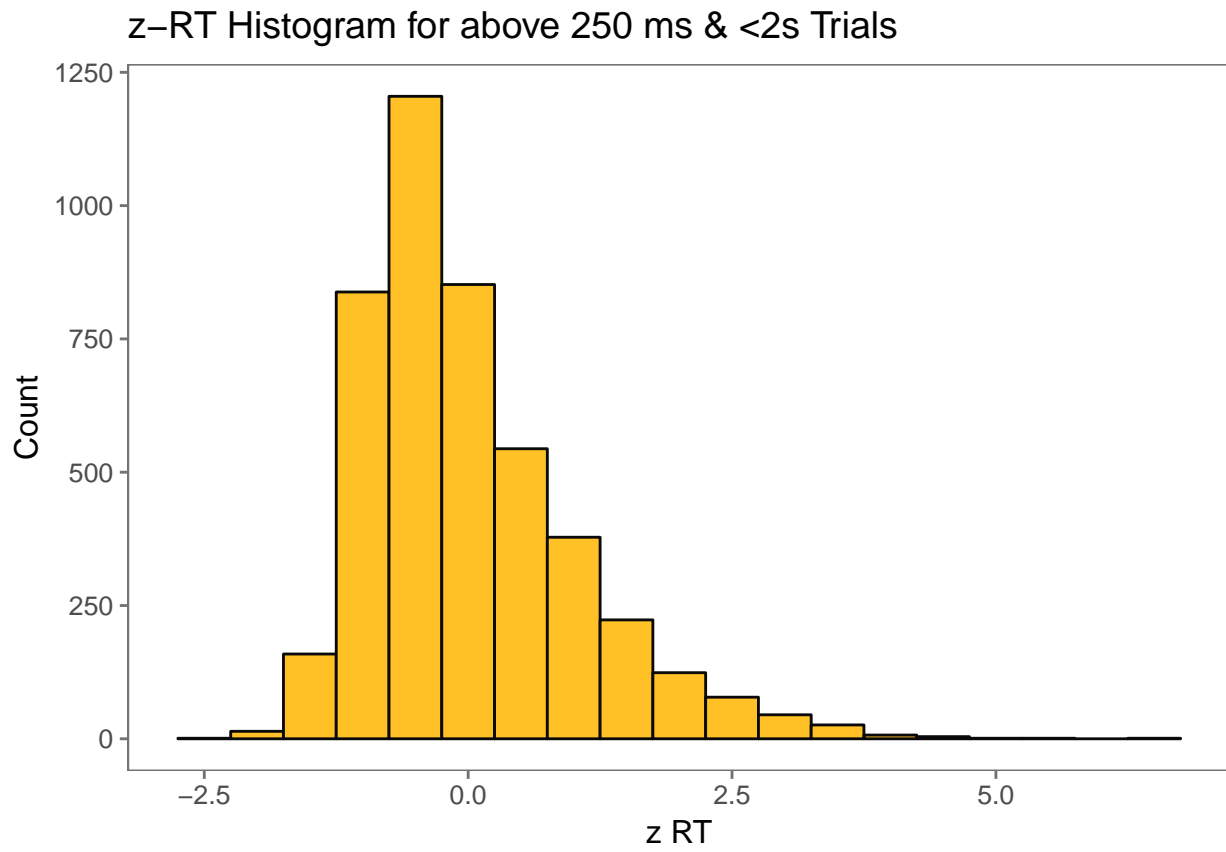


Subject Raw RT again



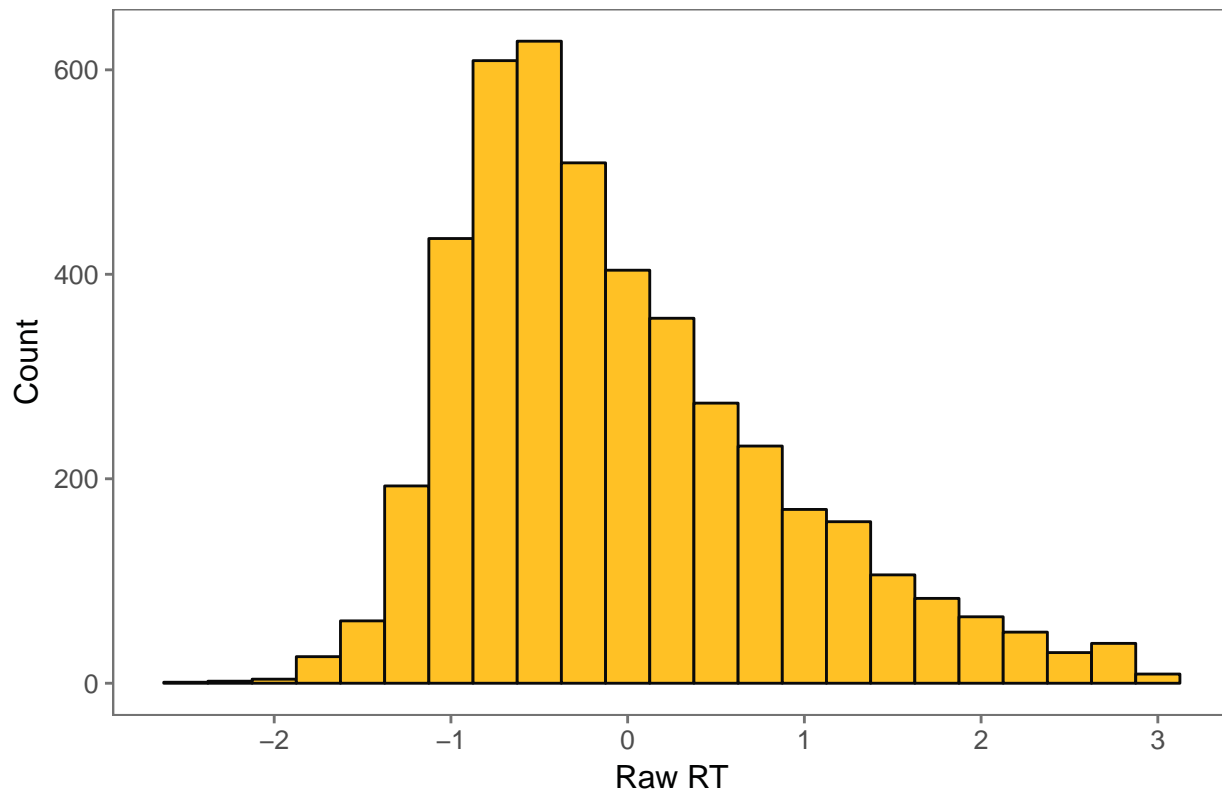
## Making the z-scores

### z-RT Distribution



## Trimming z-RT

### Trimmed (3 SD) z-RT Histogram for above 250 ms & <2s Trials



## Repeating z-scoring

## Aggregating zRT

## ANOVA

```
z_sem_rt$pathlengthfac = ordered(as.factor(as.character(z_sem_rt$pathlength)),
                                levels = c("1", "2", "3", "4", "6", "15"))
z_sem_rt$subject = as.factor(z_sem_rt$subject)

z_rt_aov = aov(data = z_sem_rt, zRT_trim ~ pathlengthfac +
               Error(subject/(pathlengthfac)))
summary(z_rt_aov)
```

```
##
## Error: subject
##           Df Sum Sq Mean Sq F value Pr(>F)
## Residuals 19 0.003357 0.0001767
##
## Error: subject:pathlengthfac
##           Df Sum Sq Mean Sq F value Pr(>F)
## pathlengthfac 5 1.492 0.29848 7.018 1.28e-05 ***
## Residuals    95 4.040 0.04253
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

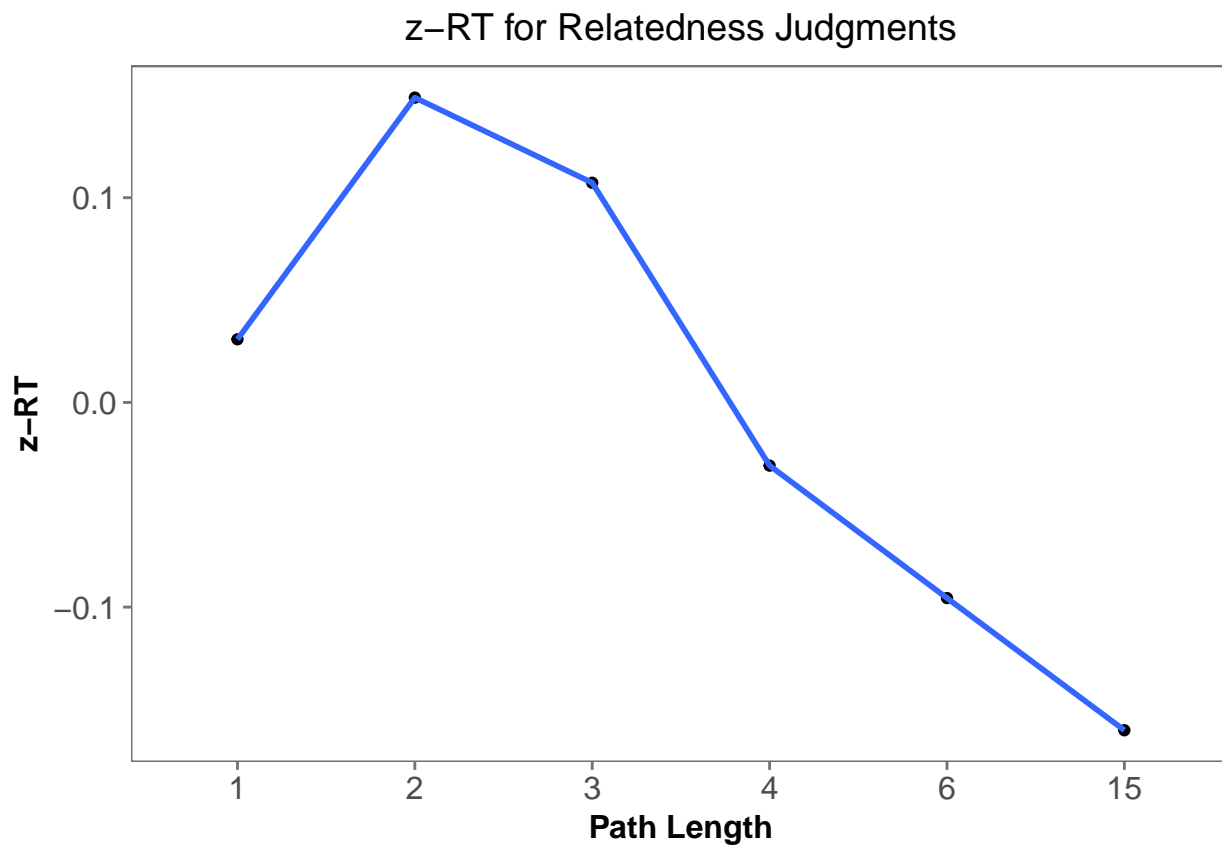
## Plotting RTs

```
## Warning in simpleLoess(y, x, w, span, degree = degree, parametric =
## parametric, : Chernobyl! trL>n 6
```

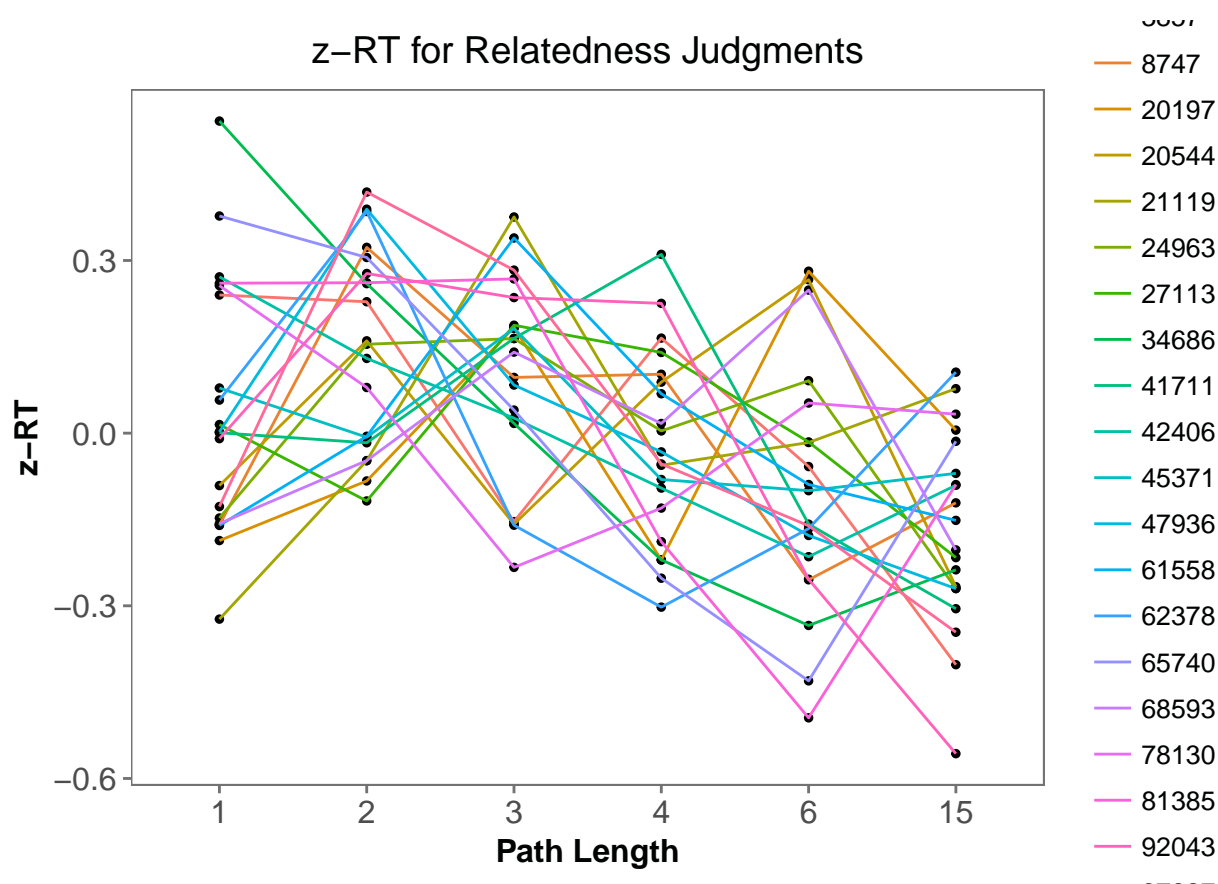
```
## Warning in simpleLoess(y, x, w, span, degree = degree, parametric =
## parametric, : Chernobyl! trL>n 6
```

```
## Warning in sqrt(sum.squares/one.delta): NaNs produced
```

```
## Warning in stats::qt(level/2 + 0.5, pred$df): NaNs produced
```



## Subject-Wise



## Regressions

```
## Loading required package: Matrix
## Linear mixed model fit by REML ['lmerMod']
## Formula: rt ~ 1 + (1 | subject) + (1 | trial_index)
## Data: sem
##
## REML criterion at convergence: 74309.7
##
## Scaled residuals:
##   Min      1Q  Median      3Q      Max
## -2.7611 -0.3348 -0.1137  0.1526  28.7456
##
## Random effects:
##   Groups      Name      Variance Std.Dev.
##   trial_index (Intercept)  1942    44.07
##   subject      (Intercept) 88326   297.20
##   Residual                303120  550.56
## Number of obs: 4800, groups: trial_index, 240; subject, 20
##
## Fixed effects:
```

```

##               Estimate Std. Error t value
## (Intercept)   797.07      66.99    11.9
## [1] 0.2294635
## Warning: NAs introduced by coercion
## Warning: NAs introduced by coercion
## Warning: NAs introduced by coercion
## Warning: NAs introduced by coercion
## Warning: NAs introduced by coercion
## Warning: NAs introduced by coercion
## Warning: NAs introduced by coercion
## Linear mixed model fit by REML ['lmerMod']
## Formula: rt ~ I((pathlength)^2) + (1 | subject)
##      Data: sem
##
## REML criterion at convergence: 74306.9
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.7877 -0.3338 -0.1128  0.1480 28.8300
##
## Random effects:
##   Groups   Name      Variance Std.Dev.
##   subject (Intercept) 88320    297.2
##   Residual              304663   552.0
## Number of obs: 4800, groups:  subject, 20
##
## Fixed effects:
##               Estimate Std. Error t value
## (Intercept)      810.1238     67.1039  12.073
## I((pathlength)^2)  -0.2691      0.0999  -2.694
##
## Correlation of Fixed Effects:
##              (Intr)
## I((pthl)^2) -0.072

```

## Correlations

“““