

# Semantic Networks Analysis

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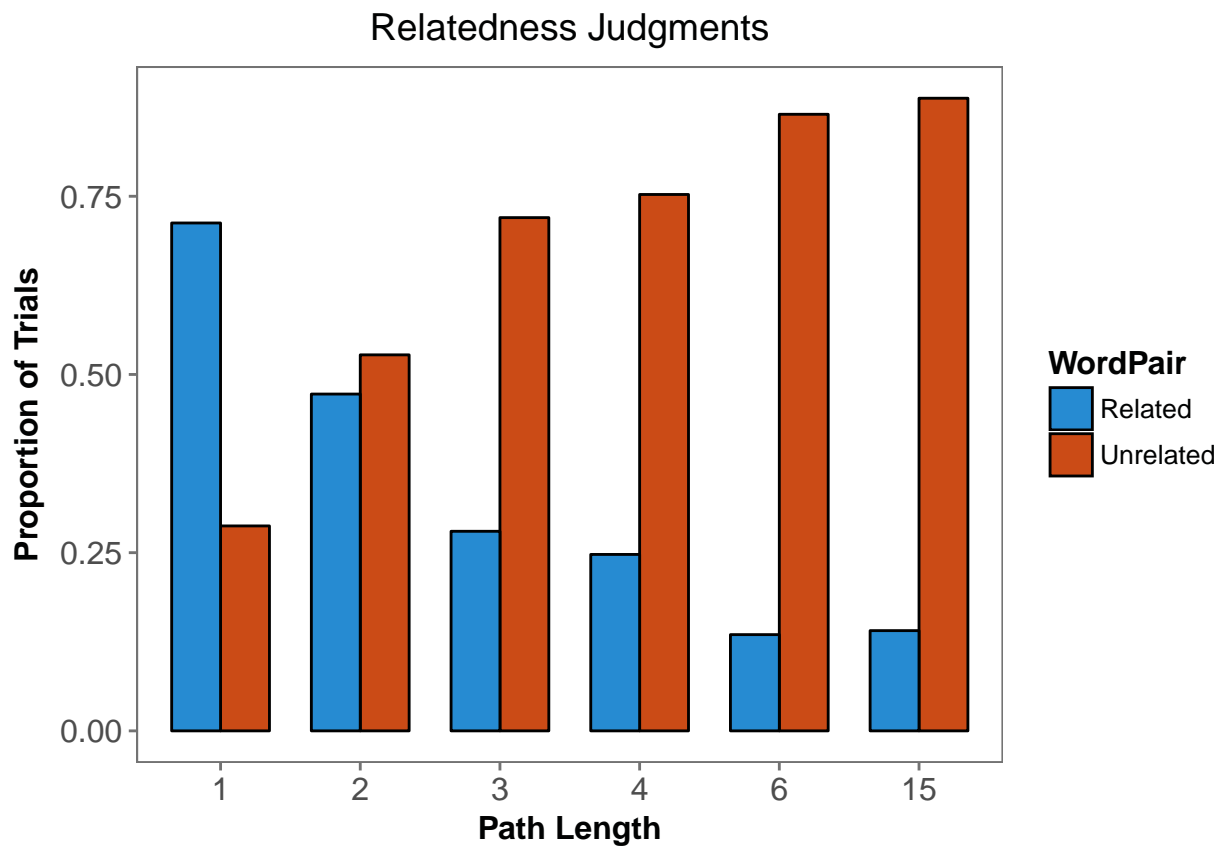
*January 16, 2018*

## Reading the Data

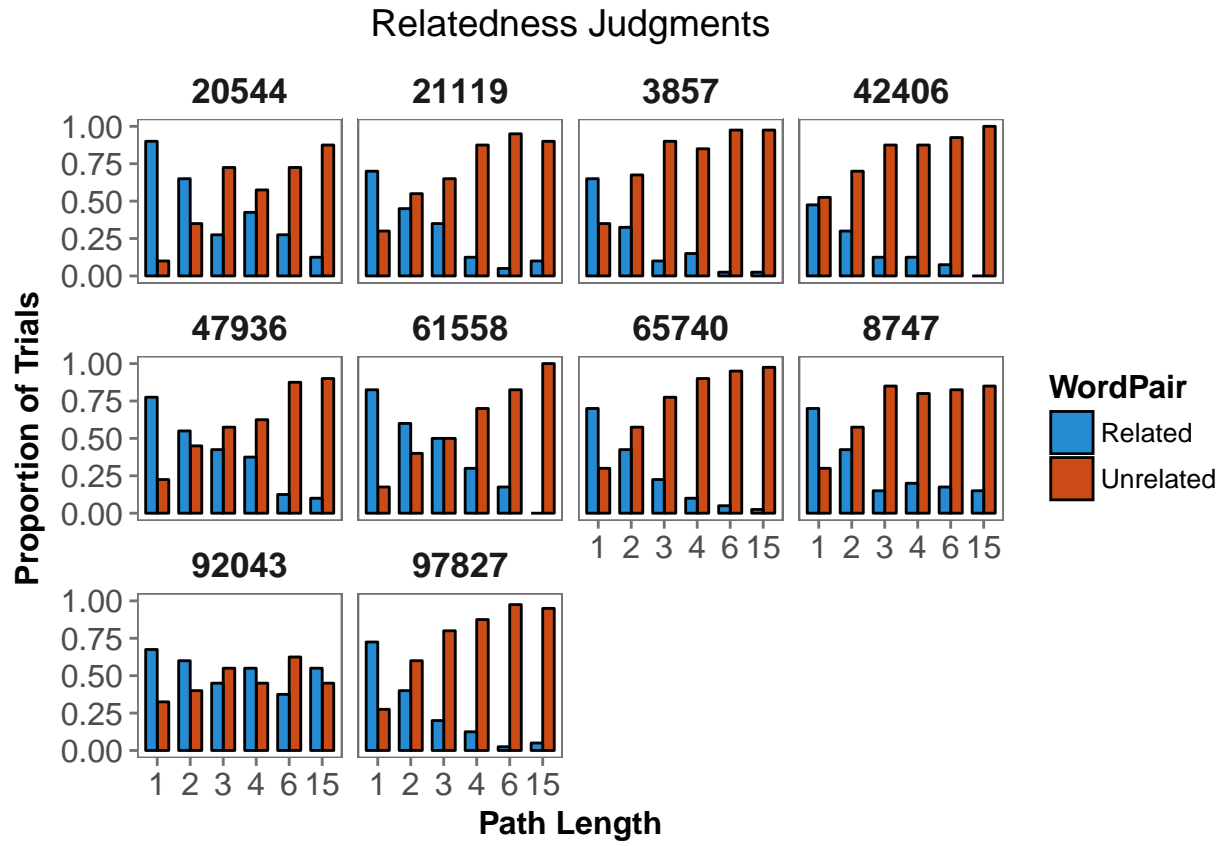
## Related-Unrelated Decisions

```
##  
## 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
```

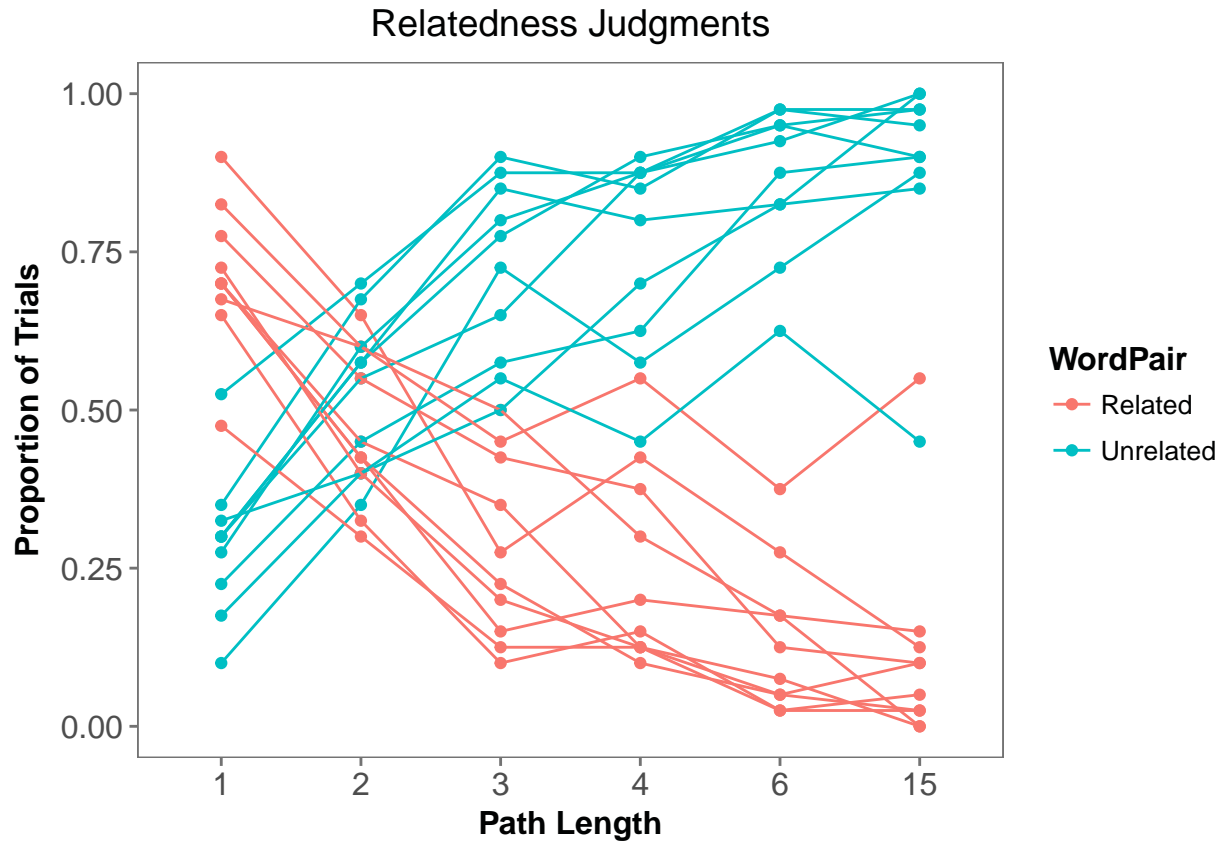
## Plotting Proportions



Subject-Wise



## Line Plot Subject-Wise



## ANOVA

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

```
##
## Error: subject
##           Df    Sum Sq  Mean Sq F value Pr(>F)
## Residuals  9 7.892e-31 8.769e-32
##
## Error: subject:pathlengthfac
##           Df    Sum Sq  Mean Sq F value Pr(>F)
## pathlengthfac  5 4.79e-31 9.577e-32  1.122  0.362
## Residuals    45 3.84e-30 8.533e-32
##
## Error: subject:actual
##           Df Sum Sq Mean Sq F value  Pr(>F)
## actual      1  3.605   3.605    24.3 0.000814 ***
## Residuals   9  1.336   0.148
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Error: subject:pathlengthfac:actual
##               Df Sum Sq Mean Sq F value Pr(>F)
## pathlengthfac:actual  5  5.224  1.0447   68.08 <2e-16 ***
## Residuals          45  0.691  0.0153
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

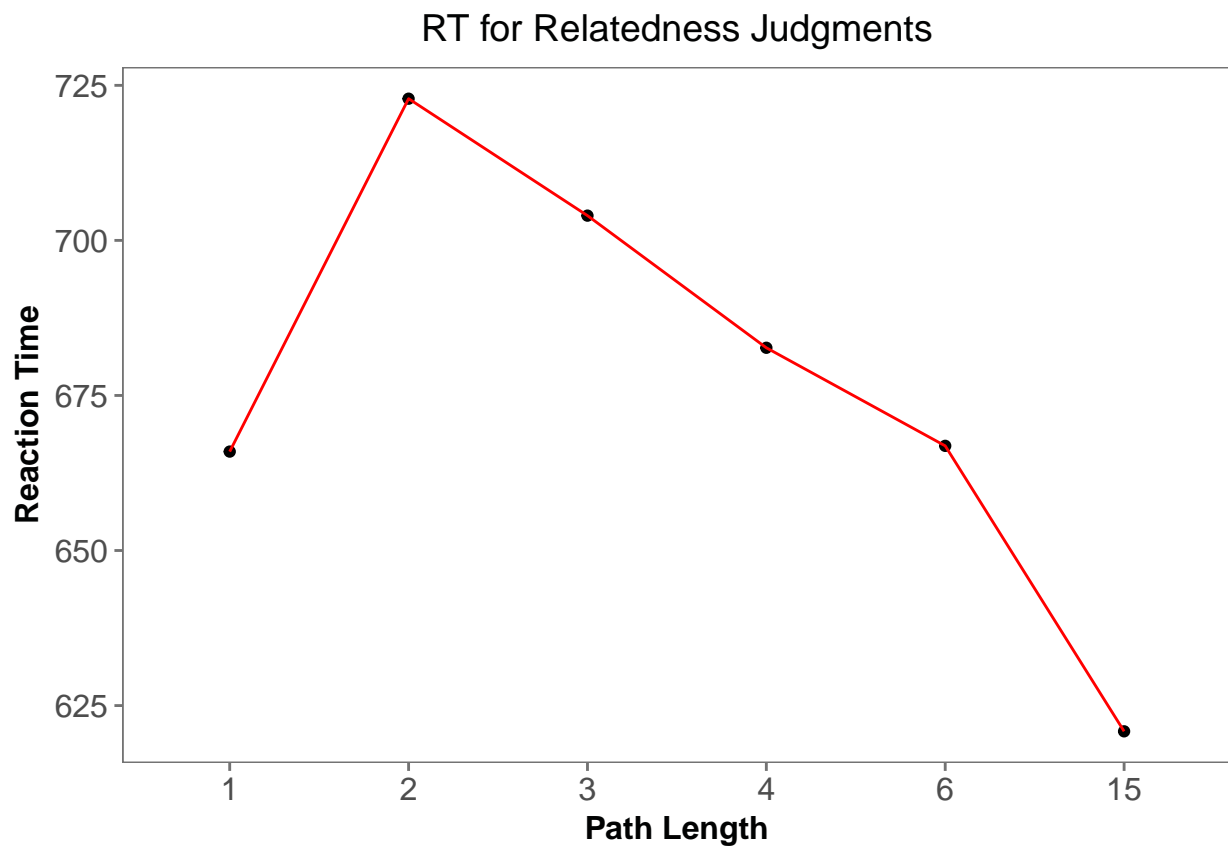
## Raw Reaction Time

### ANOVA

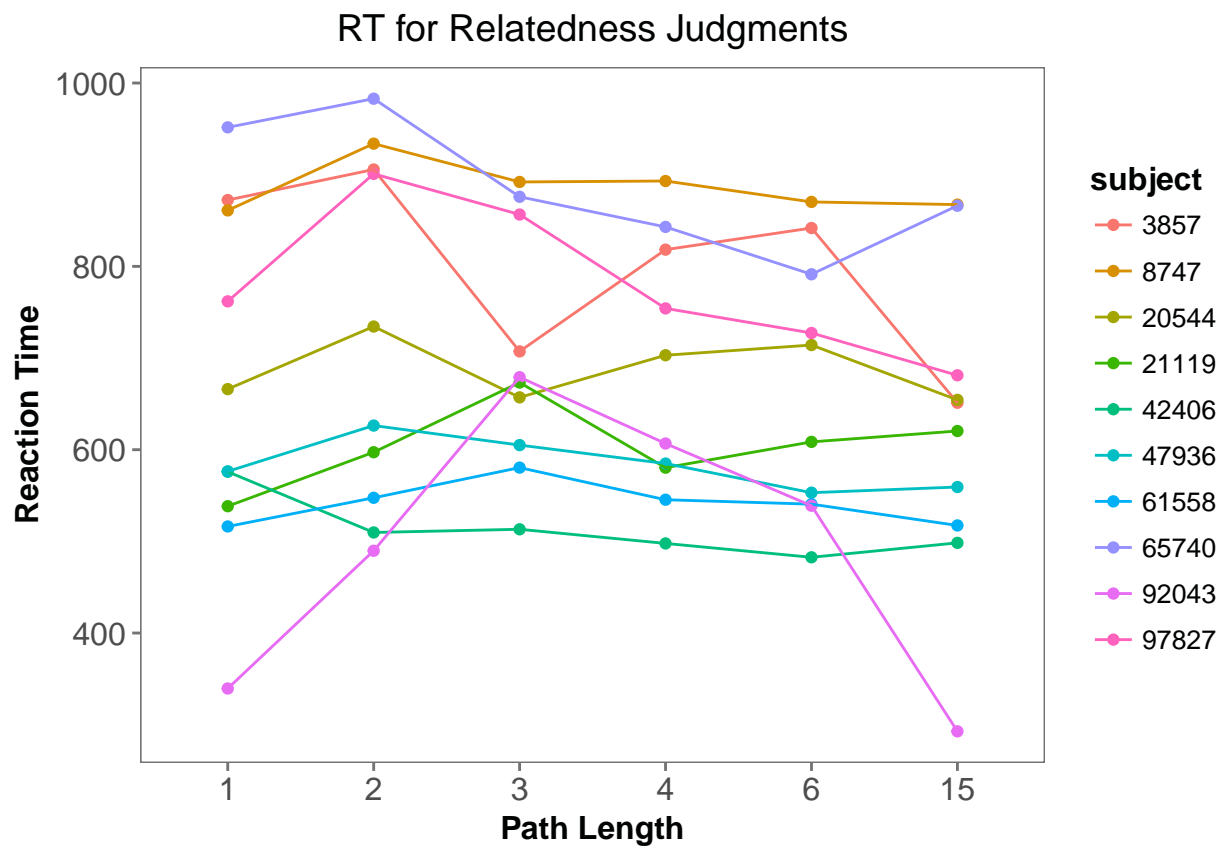
```
sem_rt$pathlengthfac = ordered(as.factor(as.character(sem_rt$pathlength)),
                               levels = c("1", "2", "3", "4", "6", "15"))
sem_rt$subject = as.factor(sem_rt$subject)
rt_aov = aov(data = sem_rt, rt ~ pathlengthfac +
              Error(subject/(pathlengthfac)))
summary(rt_aov)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

```
##
## Error: subject
##               Df Sum Sq Mean Sq F value Pr(>F)
## Residuals    9 1241544  137949
##
## Error: subject:pathlengthfac
##               Df Sum Sq Mean Sq F value Pr(>F)
## pathlengthfac  5  62403  12481   2.95 0.0219 *
## Residuals     45 190402   4231
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Plotting RTs

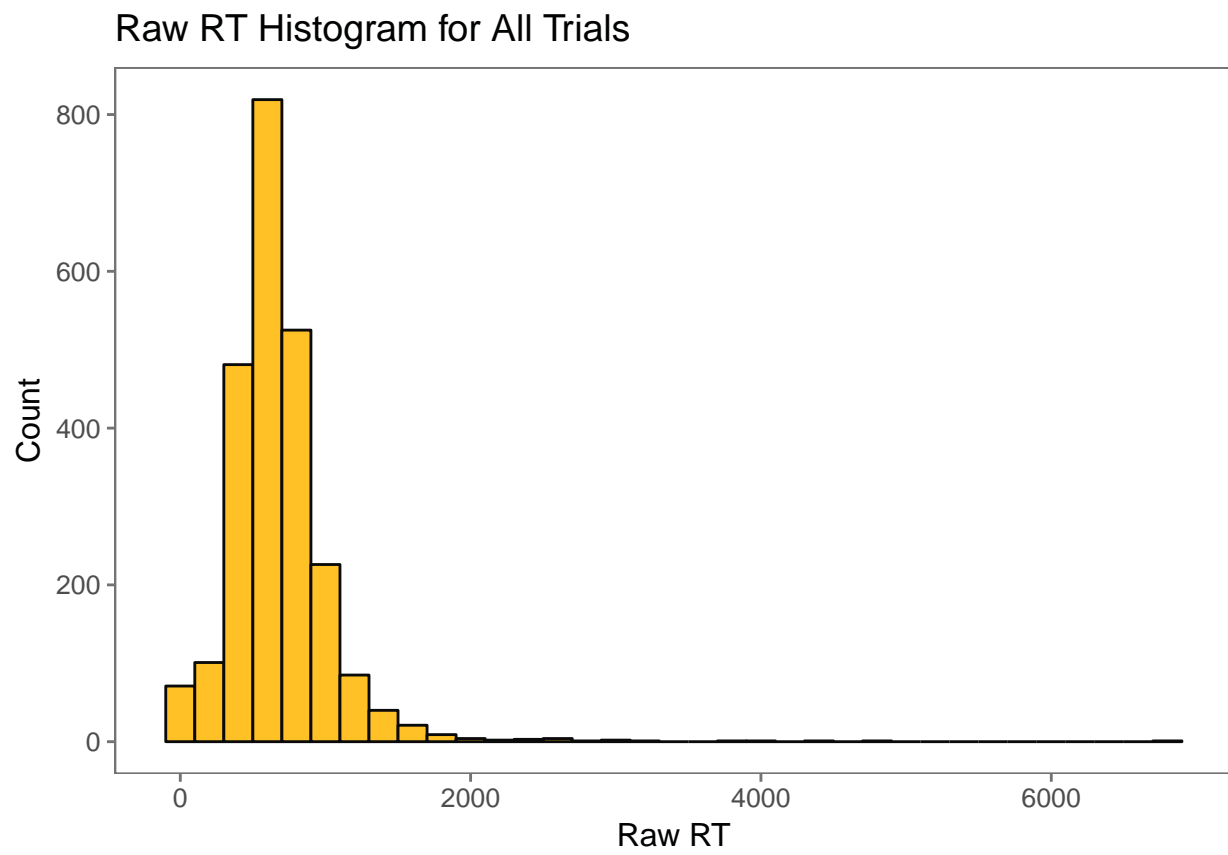


Subject-Wise



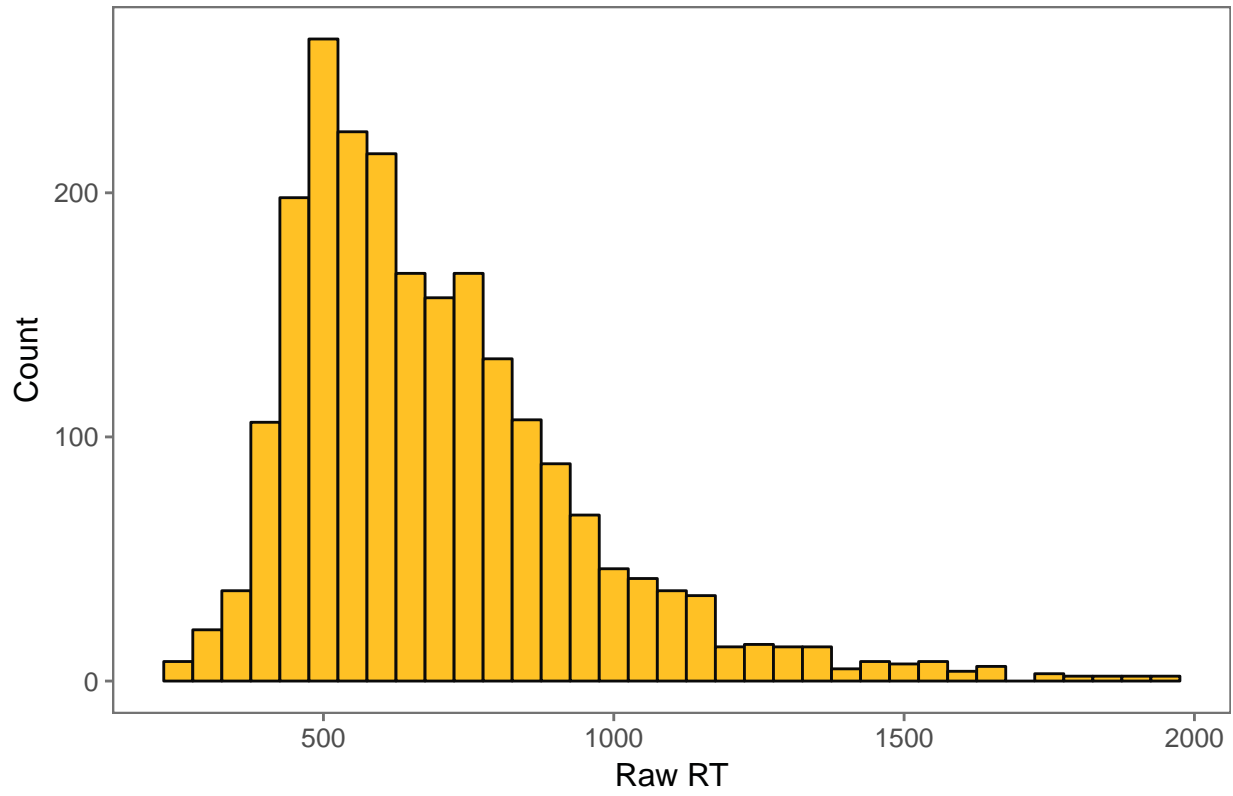
## z-scored Reaction Time

### Histogram of RT



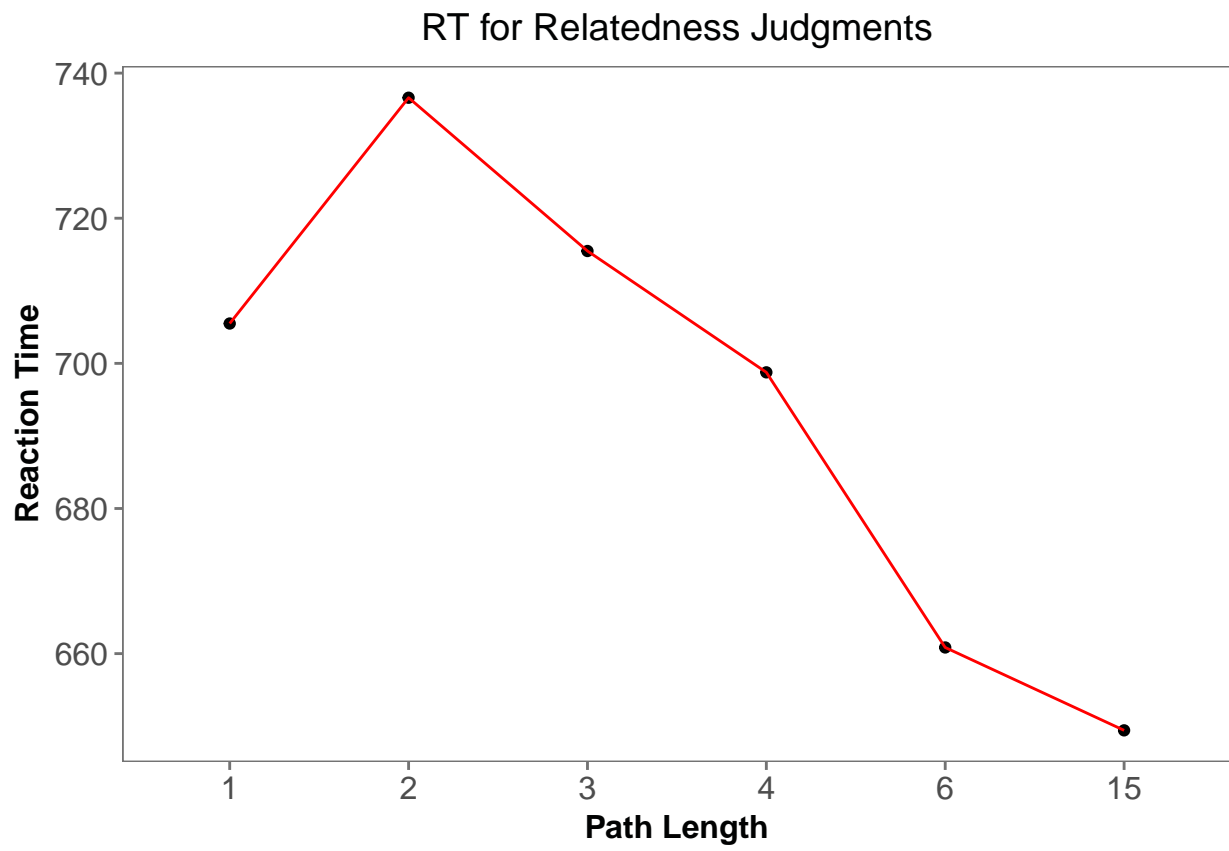
## First Trim

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

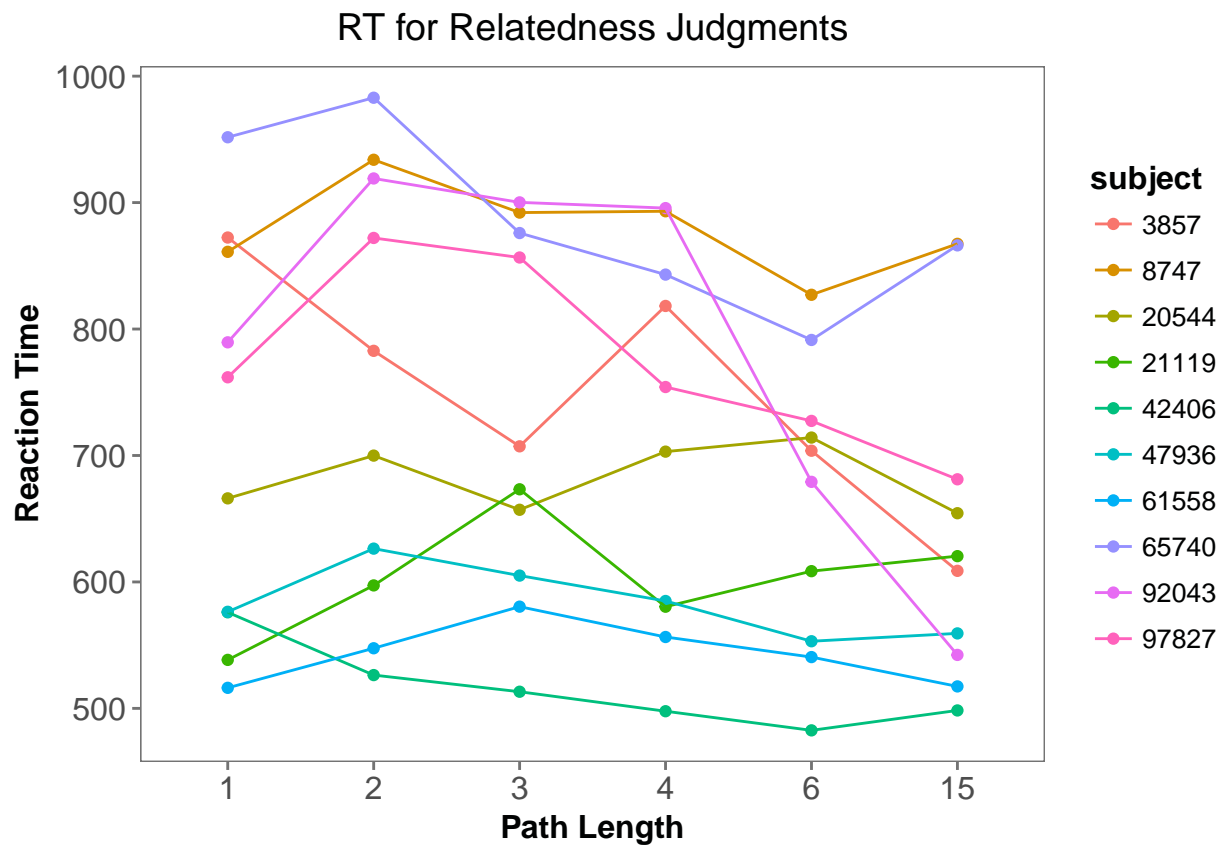




Raw RT aggregates After Trimming



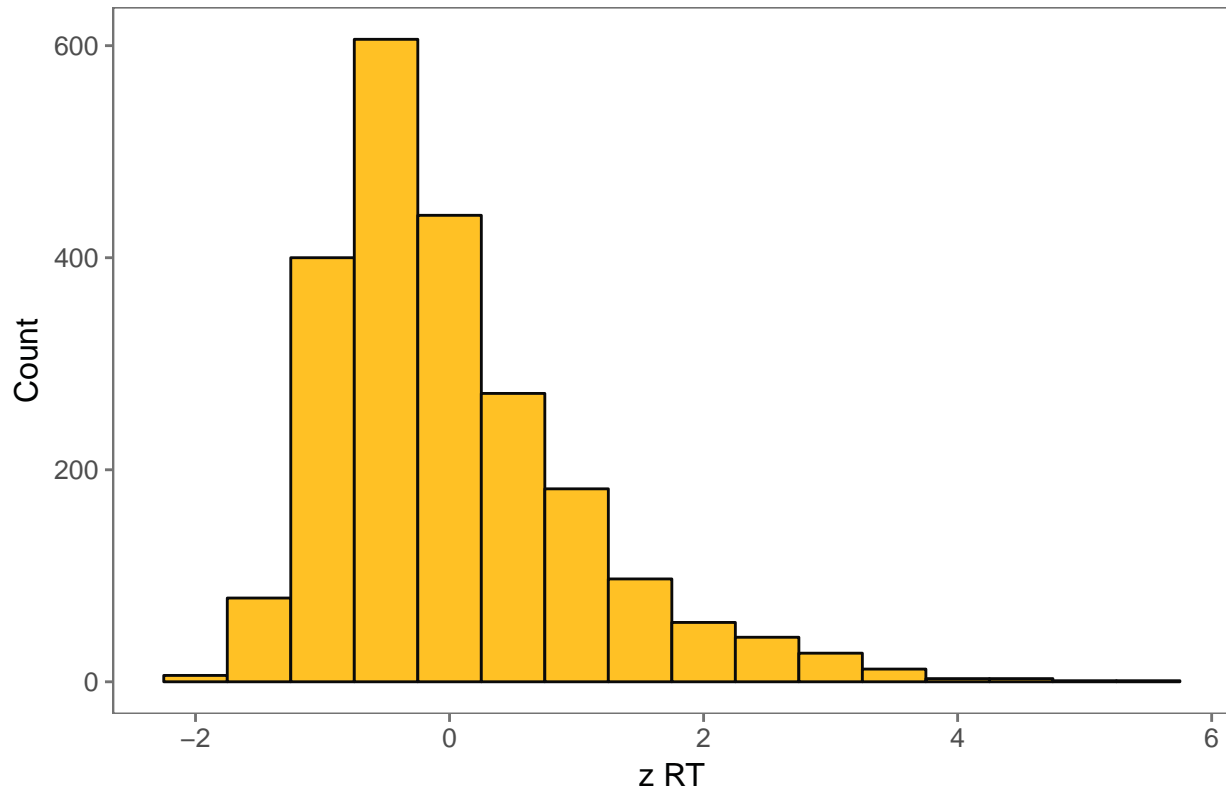
Subject Raw RT again



## Making the z-scores

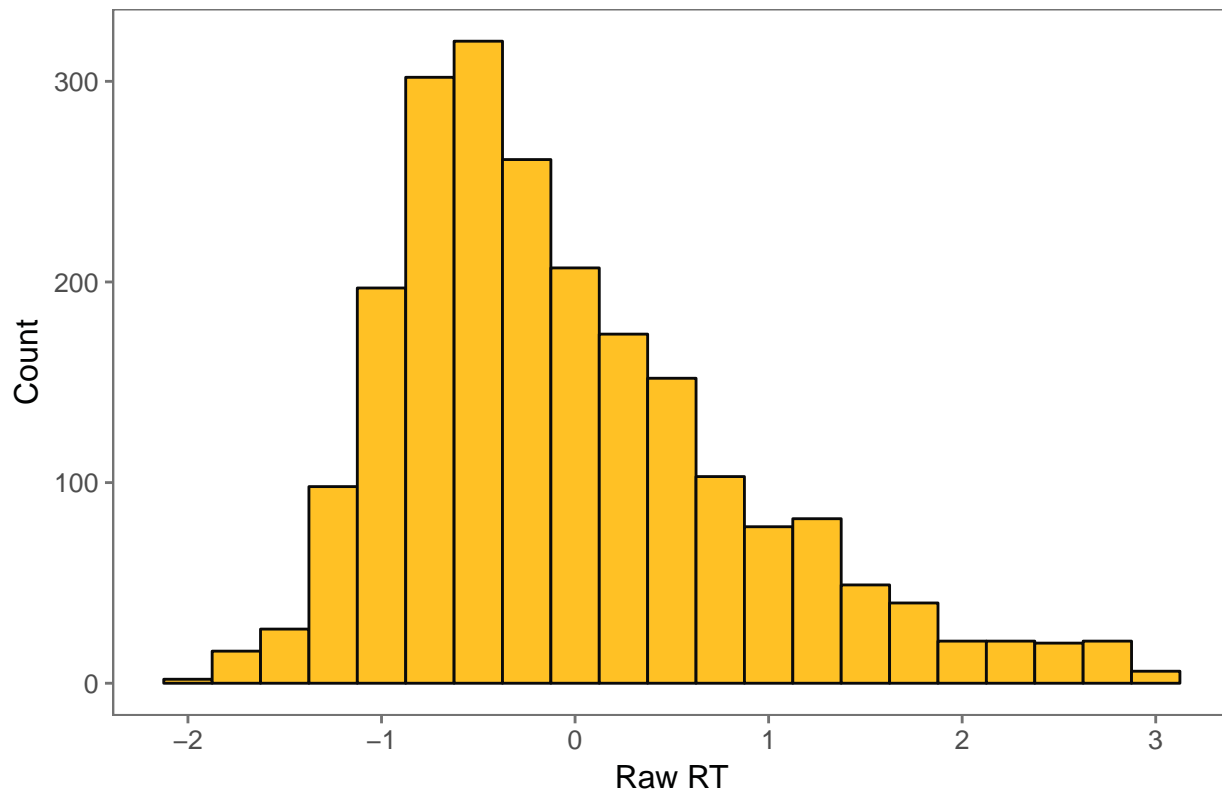
### z-RT Distribution

z-RT Histogram for above 250 ms & <2s Trials



## Trimming z-RT

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



## Repeating z-scoring

## Aggregating zRT

## ANOVA

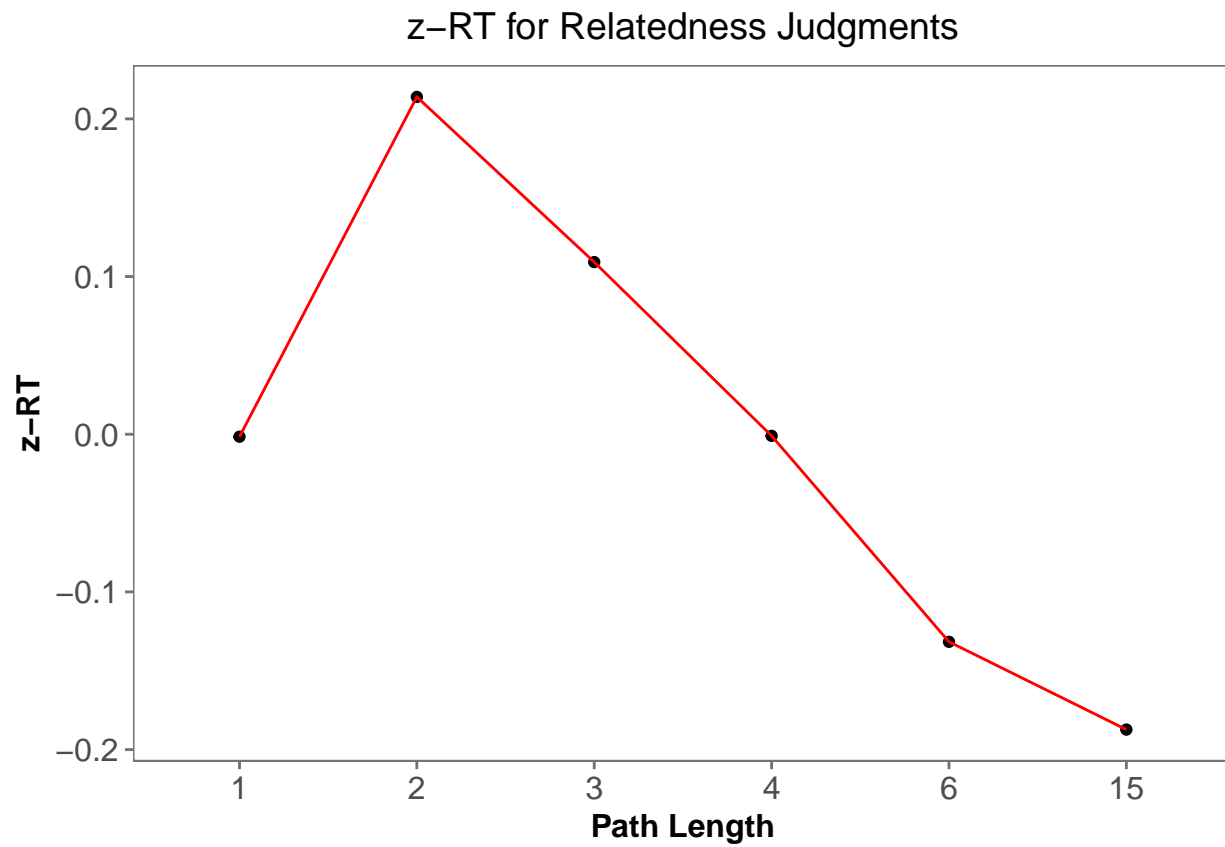
```
z_sem_rt$pathlengthfac = ordered(as.factor(as.character(z_sem_rt$pathlength)),
                                  levels = c("1", "2", "3", "4", "6", "15"))
z_sem_rt$subject = as.factor(z_sem_rt$subject)

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

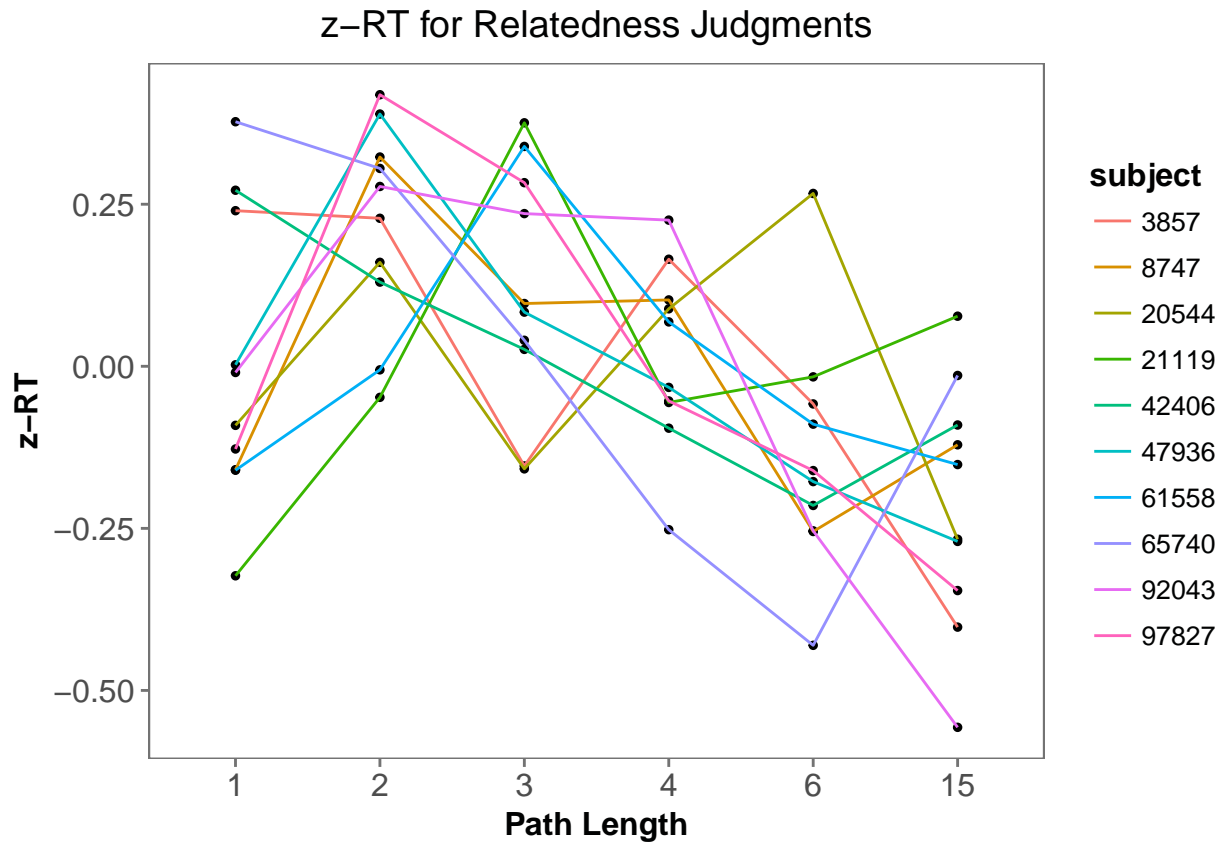
```
##
## Error: subject
##           Df Sum Sq Mean Sq F value Pr(>F)
## Residuals  9 0.001498 0.0001665
##
## Error: subject:pathlengthfac
##           Df Sum Sq Mean Sq F value Pr(>F)
## pathlengthfac 5 1.266 0.25316 6.28 0.000169 ***
## Residuals    45 1.814 0.04031
```

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

## Plotting RTs



## 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: 34877.8
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -1.4331 -0.4477 -0.1596  0.2304 18.0486
##
## Random effects:
## Groups      Name                Variance Std.Dev.
## trial_index (Intercept)    707.2   26.59
## subject      (Intercept)  22500.5 150.00
## Residual                    117846.2 343.29
## Number of obs: 2400, groups: trial_index, 240; subject, 10
##
## Fixed effects:
##              Estimate Std. Error t value
```

```

## (Intercept)    677.20      47.98    14.11
## [1] 0.1645309

## Linear mixed model fit by REML ['lmerMod']
## Formula: rt ~ pathlengthfac + (1 | subject) + (1 | trial_index)
##   Data: sem
##
## REML criterion at convergence: 34817.4
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -1.5644 -0.4463 -0.1554  0.2341 18.0356
##
## Random effects:
##   Groups      Name      Variance Std.Dev.
## trial_index (Intercept)    632.7  25.15
## subject      (Intercept) 22503.6 150.01
## Residual                117122.7 342.23
## Number of obs: 2400, groups: trial_index, 240; subject, 10
##
## Fixed effects:
##              Estimate Std. Error t value
## (Intercept)    665.739     50.468  13.191
## pathlengthfac2   56.741     24.261   2.339
## pathlengthfac3   38.288     24.261   1.578
## pathlengthfac4   17.243     24.263   0.711
## pathlengthfac5    1.506     24.248   0.062
## pathlengthfac6  -45.008     24.264  -1.855
##
## Correlation of Fixed Effects:
##              (Intr) pthln2 pthln3 pthln4 pthln5
## pthlngthfc2 -0.240
## pthlngthfc3 -0.240  0.500
## pthlngthfc4 -0.240  0.500  0.500
## pthlngthfc5 -0.240  0.500  0.500  0.500
## pthlngthfc6 -0.240  0.500  0.500  0.500  0.500

## Linear mixed model fit by REML ['lmerMod']
## Formula: rt ~ pathlengthfac + (pathlengthfac | subject)
##   Data: sem
##
## REML criterion at convergence: 34793.1
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -1.8827 -0.4447 -0.1548  0.2204 17.8681
##
## Random effects:
##   Groups      Name      Variance Std.Dev. Corr
## subject      (Intercept) 34966   186.99
##               pathlengthfac2  2082    45.63  -0.08
##               pathlengthfac3 13388   115.71  -0.78  0.67
##               pathlengthfac4  7379    85.90  -0.76  0.71  0.97
##               pathlengthfac5  5731    75.71  -0.81  0.65  0.96  1.00

```

```

##          pathlengthfac6    2336    48.33   -0.59  0.01  0.57  0.36  0.36
## Residual                115832    340.34
## Number of obs: 2400, groups:  subject, 10
##
## Fixed effects:
##          Estimate Std. Error t value
## (Intercept)    665.950     61.532  10.823
## pathlengthfac2    56.898     28.060   2.028
## pathlengthfac3    38.045     43.795   0.869
## pathlengthfac4    16.738     36.291   0.461
## pathlengthfac5     0.925     33.945   0.027
## pathlengthfac6   -45.100     28.509  -1.582
##
## Correlation of Fixed Effects:
##          (Intr) pthln2 pthln3 pthln4 pthln5
## pthlngthfc2 -0.209
## pthlngthfc3 -0.732  0.522
## pthlngthfc4 -0.675  0.557  0.788
## pthlngthfc5 -0.685  0.538  0.760  0.761
## pthlngthfc6 -0.470  0.365  0.489  0.426  0.436

```

““