

Smith Replication Data Analysis

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Save References, R Environment, and Session Information

```
# References for R packages
#install.packages(devtools)
#require(devtools)
#devtools::install_github("crsh/papaja")
#require(papaja)

#papaja::r_refs(file = "output/r-package-refs.bib") #<-- writes bib file w/refs

#Save package versions
#renv::snapshot()

sessionInfo()

## R version 4.1.2 (2021-11-01)
## Platform: x86_64-w64-mingw32/x64 (64-bit)
## Running under: Windows 10 x64 (build 19044)
##
## Matrix products: default
##
## locale:
##  [1] LC_COLLATE=English_United States.1252  LC_CTYPE=English_United States.1252
##  [3] LC_MONETARY=English_United States.1252 LC_NUMERIC=C
##  [5] LC_TIME=English_United States.1252
##
## attached base packages:
## [1] stats      graphics  grDevices  utils      datasets  methods   base
##
## other attached packages:
##  [1] renv_0.14.0      ggstance_0.3.5      scales_1.1.1      rlang_1.0.2
##  [5] cowplot_1.1.1    readxl_1.3.1        reshape2_1.4.4    superb_0.9.7.8
##  [9] psychReport_3.0.1 apaTables_2.0.8     psych_2.1.9       BayesFactor_0.9.12-4.3
## [13] coda_0.19-4      ez_4.4-0            afex_1.0-1        lme4_1.1-27.1
## [17] Matrix_1.3-4     forcats_0.5.1       stringr_1.4.0     dplyr_1.0.8
## [21] purrr_0.3.4      readr_2.1.1         tidyr_1.1.4       tibble_3.1.6
## [25] ggplot2_3.3.5    tidyverse_1.3.1     plyr_1.8.6        rmarkdown_2.11
## [29] knitr_1.36       pacman_0.5.1
##
## loaded via a namespace (and not attached):
##  [1] TH.data_1.1-0      minqa_1.2.4         colorspace_2.0-2    ellipsis_0.3.2
##  [5] estimability_1.3   fs_1.5.1            rstudioapi_0.13     MatrixModels_0.5-0
```

```
## [9] fansi_0.5.0          mvtnorm_1.1-3      lubridate_1.8.0    xml2_1.3.3
## [13] codetools_0.2-18     splines_4.1.2      mnormt_2.0.2       jsonlite_1.7.2
## [17] lsr_0.5.2            nloptr_1.2.2.3     broom_0.7.10       dbplyr_2.1.1
## [21] shiny_1.7.1          compiler_4.1.2     httr_1.4.2         emmeans_1.7.1-1
## [25] backports_1.4.0      assertthat_0.2.1   fastmap_1.1.0      cli_3.1.0
## [29] later_1.3.0          htmltools_0.5.2    tools_4.1.2        lmerTest_3.1-3
## [33] gtable_0.3.0         glue_1.5.1         Rcpp_1.0.7         carData_3.0-4
## [37] cellranger_1.1.0     vctrs_0.3.8        nlme_3.1-153       xfun_0.28
## [41] rbibutils_2.2.7      rvest_1.0.2        mime_0.12          lifecycle_1.0.1
## [45] gtools_3.9.2         MASS_7.3-54        zoo_1.8-9          shinyBS_0.61.1
## [49] promises_1.2.0.1     hms_1.1.1          parallel_4.1.2     sandwich_3.0-1
## [53] yaml_2.2.1           pbapply_1.5-0      stringi_1.7.6      boot_1.3-28
## [57] Rdpack_2.1.3         pkgconfig_2.0.3    evaluate_0.14      lattice_0.20-45
## [61] tidyselect_1.1.2     magrittr_2.0.1     R6_2.5.1           generics_0.1.2
## [65] multcomp_1.4-17      DBI_1.1.1          foreign_0.8-81     pillar_1.7.0
## [69] haven_2.4.3          withr_2.4.3        mgcv_1.8-38        survival_3.2-13
## [73] abind_1.4-5          modelr_0.1.8       crayon_1.5.1       car_3.0-12
## [77] utf8_1.2.2           tmvnsim_1.0-2      tzdb_0.2.0         grid_4.1.2
## [81] reprex_2.0.1         digest_0.6.29      xtable_1.8-4       httpuv_1.6.3
## [85] numDeriv_2016.8-1.1 munsell_0.5.0
```

Experiment 1 - Stroop

Import and clean data

```
stroop_files = list.files(path = "Experiment 1 Data/", full.names = T)
stroop_files = stroop_files[str_detect(stroop_files, pattern="(?.*SJ)(?.*.txt)")]

mergedStroopData <- ldply(stroop_files,
  read.delim,
  header=FALSE,
  stringsAsFactors = FALSE,
  sep = "") #for each item in the list apply the function read.delim

names(mergedStroopData) = c("sj",
  "cb",
  "blockNumber",
  "blockType",
  "trialNum",
  "congruency",
  "posture",
  "wordStim",
  "inkColour",
  "rt",
  "cResp",
  "resp",
  "ac")

#...remove problem subjects
#.. No subjects pre-identified as needing to be removed (see ethics protocol)

#...check number of observations per condition
ftable(posture+congruency~sj, mergedStroopData)
```

| ## | posture | SITTING | | | STANDING | | |
|----|------------|-----------|-------------|---------|-----------|-------------|---------|
| ## | congruency | congruent | incongruent | neutral | congruent | incongruent | neutral |
| ## | sj | | | | | | |
| ## | 1 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 2 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 3 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 4 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 5 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 6 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 7 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 8 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 9 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 10 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 11 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 12 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 13 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 14 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 15 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 16 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 17 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 18 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 19 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 20 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 21 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 22 | 120 | 120 | 120 | 120 | 120 | 120 |
| ## | 24 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 25 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 26 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 27 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 28 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 29 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 30 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 31 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 32 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 33 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 34 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 35 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 36 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 37 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 38 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 39 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 40 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 41 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 42 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 43 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 44 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 45 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 46 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 47 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 48 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 49 | 60 | 60 | 60 | 60 | 60 | 60 |
| ## | 50 | 60 | 60 | 60 | 60 | 60 | 60 |

```
ftable(blockType~sj, mergedStroopData)
```

```
##      blockType experimental practice
## sj
## 1              288          72
## 2              288          72
## 3              288          72
## 4              288          72
## 5              288          72
## 6              288          72
## 7              288          72
## 8              288          72
## 9              288          72
## 10             288          72
## 11             288          72
## 12             288          72
## 13             288          72
## 14             288          72
## 15             288          72
## 16             288          72
## 17             288          72
## 18             288          72
## 19             288          72
## 20             288          72
## 21             288          72
## 22             576         144
## 24             288          72
## 25             288          72
## 26             288          72
## 27             288          72
## 28             288          72
## 29             288          72
## 30             288          72
## 31             288          72
## 32             288          72
## 33             288          72
## 34             288          72
## 35             288          72
## 36             288          72
## 37             288          72
## 38             288          72
## 39             288          72
## 40             288          72
## 41             288          72
## 42             288          72
## 43             288          72
## 44             288          72
## 45             288          72
## 46             288          72
## 47             288          72
## 48             288          72
## 49             288          72
## 50             288          72
```

```
#...need to fix SJ - same one was used with two counterbalances
mergedStroopData$sj = paste(mergedStroopData$sj,"_",mergedStroopData$cb,sep="")
```

```
#...check for missing data
mergedStroopData[!complete.cases(mergedStroopData),]
```

| ## | sj | cb | blockNumber | blockType | trialNum | congruency | posture | wordStim | inkColour | rt | cResp |
|---------|------|----|-------------|--------------|----------|-------------|----------|----------|-----------|----|-------|
| ## 646 | 10_2 | 2 | 8 | experimental | 34 | incongruent | STANDING | RED | green | 0 | 2 |
| ## 1081 | 12_2 | 2 | 1 | practice | 1 | neutral | SITTING | XXXXX | green | 0 | 2 |
| ## 1117 | 12_2 | 2 | 2 | experimental | 1 | incongruent | SITTING | GREEN | red | 0 | 1 |
| ## 1445 | 13_1 | 1 | 1 | practice | 5 | incongruent | STANDING | GREEN | red | 0 | 1 |
| ## 1801 | 14_2 | 2 | 1 | practice | 1 | neutral | SITTING | XXX | green | 0 | 2 |
| ## 2162 | 15_1 | 1 | 1 | practice | 2 | congruent | STANDING | GREEN | green | 0 | 2 |
| ## 2163 | 15_1 | 1 | 1 | practice | 3 | neutral | STANDING | XXXXX | green | 0 | 2 |
| ## 2615 | 16_2 | 2 | 3 | experimental | 23 | incongruent | SITTING | RED | green | 0 | 2 |
| ## 2720 | 16_2 | 2 | 6 | practice | 20 | neutral | STANDING | XXX | red | 0 | 1 |
| ## 2737 | 16_2 | 2 | 7 | experimental | 1 | incongruent | STANDING | GREEN | red | 0 | 1 |
| ## 2885 | 17_1 | 1 | 1 | practice | 5 | incongruent | STANDING | RED | green | 0 | 2 |
| ## 3360 | 18_2 | 2 | 4 | experimental | 12 | incongruent | SITTING | GREEN | red | 0 | 1 |
| ## 3457 | 18_2 | 2 | 7 | experimental | 1 | incongruent | STANDING | RED | green | 0 | 2 |
| ## 3601 | 19_1 | 1 | 1 | practice | 1 | congruent | STANDING | RED | red | 0 | 1 |
| ## 4370 | 20_2 | 2 | 2 | experimental | 14 | neutral | SITTING | XXXXX | red | 0 | 1 |
| ## 4505 | 20_2 | 2 | 6 | practice | 5 | incongruent | STANDING | GREEN | red | 0 | 1 |
| ## 4681 | 21_1 | 1 | 1 | practice | 1 | congruent | STANDING | RED | red | 0 | 1 |
| ## 4682 | 21_1 | 1 | 1 | practice | 2 | neutral | STANDING | XXX | red | 0 | 1 |
| ## 4692 | 21_1 | 1 | 1 | practice | 12 | incongruent | STANDING | RED | green | 0 | 2 |
| ## 5041 | 22_1 | 1 | 1 | practice | 1 | incongruent | STANDING | GREEN | red | 0 | 1 |
| ## 5042 | 22_1 | 1 | 1 | practice | 2 | incongruent | STANDING | RED | green | 0 | 2 |
| ## 5043 | 22_1 | 1 | 1 | practice | 3 | neutral | STANDING | XXX | red | 0 | 1 |
| ## 5422 | 22_2 | 2 | 1 | practice | 22 | incongruent | SITTING | GREEN | red | 0 | 1 |
| ## 5428 | 22_2 | 2 | 1 | practice | 28 | incongruent | SITTING | RED | green | 0 | 2 |
| ## 5501 | 22_2 | 2 | 3 | experimental | 29 | neutral | SITTING | XXXXX | red | 0 | 1 |
| ## 5530 | 22_2 | 2 | 4 | experimental | 22 | incongruent | SITTING | RED | green | 0 | 2 |
| ## 5533 | 22_2 | 2 | 4 | experimental | 25 | incongruent | SITTING | RED | green | 0 | 2 |
| ## 5608 | 22_2 | 2 | 6 | practice | 28 | incongruent | STANDING | GREEN | red | 0 | 1 |
| ## 5621 | 22_2 | 2 | 7 | experimental | 5 | neutral | STANDING | XXXXX | green | 0 | 2 |
| ## 5644 | 22_2 | 2 | 7 | experimental | 28 | neutral | STANDING | XXX | green | 0 | 2 |
| ## 5668 | 22_2 | 2 | 8 | experimental | 16 | incongruent | STANDING | GREEN | red | 0 | 1 |
| ## 5684 | 22_2 | 2 | 8 | experimental | 32 | neutral | STANDING | XXXXX | red | 0 | 1 |
| ## 5741 | 22_2 | 2 | 10 | experimental | 17 | neutral | STANDING | XXX | green | 0 | 2 |
| ## 5761 | 24_2 | 2 | 1 | practice | 1 | congruent | SITTING | RED | red | 0 | 1 |
| ## 5763 | 24_2 | 2 | 1 | practice | 3 | congruent | SITTING | GREEN | green | 0 | 2 |
| ## 5768 | 24_2 | 2 | 1 | practice | 8 | neutral | SITTING | XXX | green | 0 | 2 |
| ## 5770 | 24_2 | 2 | 1 | practice | 10 | incongruent | SITTING | RED | green | 0 | 2 |
| ## 5772 | 24_2 | 2 | 1 | practice | 12 | congruent | SITTING | GREEN | green | 0 | 2 |
| ## 5773 | 24_2 | 2 | 1 | practice | 13 | neutral | SITTING | XXX | red | 0 | 1 |
| ## 5775 | 24_2 | 2 | 1 | practice | 15 | incongruent | SITTING | GREEN | red | 0 | 1 |
| ## 5776 | 24_2 | 2 | 1 | practice | 16 | neutral | SITTING | XXXXX | green | 0 | 2 |
| ## 5797 | 24_2 | 2 | 2 | experimental | 1 | neutral | SITTING | XXXXX | green | 0 | 2 |
| ## 5798 | 24_2 | 2 | 2 | experimental | 2 | incongruent | SITTING | RED | green | 0 | 2 |
| ## 6018 | 24_2 | 2 | 8 | experimental | 6 | congruent | STANDING | RED | red | 0 | 1 |
| ## 6121 | 25_1 | 1 | 1 | practice | 1 | neutral | STANDING | XXX | red | 0 | 1 |
| ## 6482 | 26_2 | 2 | 1 | practice | 2 | neutral | SITTING | XXXXX | red | 0 | 1 |
| ## 6518 | 26_2 | 2 | 2 | experimental | 2 | incongruent | SITTING | RED | green | 0 | 2 |

| | | | | | | | | | | | |
|----------|------|---|----|--------------|----|-------------|----------|-------|-------|---|---|
| ## 6841 | 27_1 | 1 | 1 | practice | 1 | congruent | STANDING | RED | red | 0 | 1 |
| ## 6842 | 27_1 | 1 | 1 | practice | 2 | neutral | STANDING | XXXXX | green | 0 | 2 |
| ## 6843 | 27_1 | 1 | 1 | practice | 3 | neutral | STANDING | XXXXX | red | 0 | 1 |
| ## 7202 | 28_2 | 2 | 1 | practice | 2 | incongruent | SITTING | GREEN | red | 0 | 1 |
| ## 7921 | 3_1 | 1 | 1 | practice | 1 | congruent | STANDING | GREEN | green | 0 | 2 |
| ## 7957 | 3_1 | 1 | 2 | experimental | 1 | neutral | STANDING | XXXXX | red | 0 | 1 |
| ## 8858 | 31_1 | 1 | 7 | experimental | 2 | congruent | SITTING | RED | red | 0 | 1 |
| ## 9253 | 32_2 | 2 | 8 | experimental | 1 | neutral | STANDING | XXX | green | 0 | 2 |
| ## 9361 | 33_1 | 1 | 1 | practice | 1 | congruent | STANDING | RED | red | 0 | 1 |
| ## 9364 | 33_1 | 1 | 1 | practice | 4 | incongruent | STANDING | GREEN | red | 0 | 1 |
| ## 9386 | 33_1 | 1 | 1 | practice | 26 | congruent | STANDING | GREEN | green | 0 | 2 |
| ## 9390 | 33_1 | 1 | 1 | practice | 30 | neutral | STANDING | XXX | red | 0 | 1 |
| ## 9505 | 33_1 | 1 | 5 | experimental | 1 | neutral | STANDING | XXXXX | red | 0 | 1 |
| ## 10441 | 36_2 | 2 | 1 | practice | 1 | congruent | SITTING | GREEN | green | 0 | 2 |
| ## 10444 | 36_2 | 2 | 1 | practice | 4 | incongruent | SITTING | GREEN | red | 0 | 1 |
| ## 10447 | 36_2 | 2 | 1 | practice | 7 | incongruent | SITTING | RED | green | 0 | 2 |
| ## 10448 | 36_2 | 2 | 1 | practice | 8 | neutral | SITTING | XXX | green | 0 | 2 |
| ## 10535 | 36_2 | 2 | 3 | experimental | 23 | incongruent | SITTING | GREEN | red | 0 | 1 |
| ## 10639 | 36_2 | 2 | 6 | practice | 19 | neutral | STANDING | XXXXX | green | 0 | 2 |
| ## 10785 | 36_2 | 2 | 10 | experimental | 21 | congruent | STANDING | GREEN | green | 0 | 2 |
| ## 11294 | 38_2 | 2 | 4 | experimental | 26 | incongruent | SITTING | RED | green | 0 | 2 |
| ## 11387 | 38_2 | 2 | 7 | experimental | 11 | neutral | STANDING | XXX | green | 0 | 2 |
| ## 11418 | 38_2 | 2 | 8 | experimental | 6 | incongruent | STANDING | RED | green | 0 | 2 |
| ## 11421 | 38_2 | 2 | 8 | experimental | 9 | incongruent | STANDING | GREEN | red | 0 | 1 |
| ## 12202 | 4_2 | 2 | 9 | experimental | 34 | incongruent | STANDING | GREEN | red | 0 | 1 |
| ## 12241 | 40_2 | 2 | 1 | practice | 1 | incongruent | SITTING | RED | green | 0 | 2 |
| ## 13603 | 43_1 | 1 | 8 | experimental | 31 | incongruent | SITTING | RED | green | 0 | 2 |
| ## 13688 | 44_2 | 2 | 1 | practice | 8 | incongruent | SITTING | RED | green | 0 | 2 |
| ## 13689 | 44_2 | 2 | 1 | practice | 9 | incongruent | SITTING | GREEN | red | 0 | 1 |
| ## 13694 | 44_2 | 2 | 1 | practice | 14 | incongruent | SITTING | GREEN | red | 0 | 1 |
| ## 13695 | 44_2 | 2 | 1 | practice | 15 | neutral | SITTING | XXXXX | red | 0 | 1 |
| ## 13696 | 44_2 | 2 | 1 | practice | 16 | incongruent | SITTING | RED | green | 0 | 2 |
| ## 13702 | 44_2 | 2 | 1 | practice | 22 | congruent | SITTING | GREEN | green | 0 | 2 |
| ## 13709 | 44_2 | 2 | 1 | practice | 29 | incongruent | SITTING | GREEN | red | 0 | 1 |
| ## 13713 | 44_2 | 2 | 1 | practice | 33 | incongruent | SITTING | RED | green | 0 | 2 |
| ## 13715 | 44_2 | 2 | 1 | practice | 35 | incongruent | SITTING | GREEN | red | 0 | 1 |
| ## 13716 | 44_2 | 2 | 1 | practice | 36 | congruent | SITTING | GREEN | green | 0 | 2 |
| ## 13717 | 44_2 | 2 | 2 | experimental | 1 | congruent | SITTING | RED | red | 0 | 1 |
| ## 13721 | 44_2 | 2 | 2 | experimental | 5 | incongruent | SITTING | GREEN | red | 0 | 1 |
| ## 14041 | 45_1 | 1 | 1 | practice | 1 | congruent | STANDING | GREEN | green | 0 | 2 |
| ## 14379 | 45_1 | 1 | 10 | experimental | 15 | neutral | SITTING | XXXXX | green | 0 | 2 |
| ## 14864 | 47_1 | 1 | 3 | experimental | 32 | congruent | STANDING | RED | red | 0 | 1 |
| ## 14901 | 47_1 | 1 | 4 | experimental | 33 | neutral | STANDING | XXX | green | 0 | 2 |
| ## 14958 | 47_1 | 1 | 6 | practice | 18 | incongruent | SITTING | RED | green | 0 | 2 |
| ## 15121 | 48_2 | 2 | 1 | practice | 1 | congruent | SITTING | GREEN | green | 0 | 2 |
| ## 15842 | 5_1 | 1 | 1 | practice | 2 | incongruent | STANDING | GREEN | red | 0 | 1 |
| ## 15843 | 5_1 | 1 | 1 | practice | 3 | congruent | STANDING | RED | red | 0 | 1 |
| ## 15845 | 5_1 | 1 | 1 | practice | 5 | congruent | STANDING | GREEN | green | 0 | 2 |
| ## 15846 | 5_1 | 1 | 1 | practice | 6 | incongruent | STANDING | RED | green | 0 | 2 |
| ## 15847 | 5_1 | 1 | 1 | practice | 7 | neutral | STANDING | XXX | green | 0 | 2 |
| ## 16107 | 5_1 | 1 | 8 | experimental | 15 | neutral | SITTING | XXX | red | 0 | 1 |
| ## 16201 | 50_2 | 2 | 1 | practice | 1 | incongruent | SITTING | GREEN | red | 0 | 1 |
| ## 16565 | 6_2 | 2 | 1 | practice | 5 | congruent | SITTING | RED | red | 0 | 1 |
| ## 16957 | 7_1 | 1 | 2 | experimental | 1 | neutral | STANDING | XXX | green | 0 | 2 |

| | | | | | | | | | | | |
|----|-------|------|------|---|----------|---------------|----------|-------|-------|---|---|
| ## | 17282 | 8_2 | 2 | 1 | practice | 2 incongruent | SITTING | GREEN | red | 0 | 1 |
| ## | 17643 | 9_1 | 1 | 1 | practice | 3 congruent | STANDING | GREEN | green | 0 | 2 |
| ## | 17644 | 9_1 | 1 | 1 | practice | 4 incongruent | STANDING | RED | green | 0 | 2 |
| ## | | resp | ac | | | | | | | | |
| ## | 646 | | 0 NA | | | | | | | | |
| ## | 1081 | | 0 NA | | | | | | | | |
| ## | 1117 | | 0 NA | | | | | | | | |
| ## | 1445 | | 0 NA | | | | | | | | |
| ## | 1801 | | 0 NA | | | | | | | | |
| ## | 2162 | | 0 NA | | | | | | | | |
| ## | 2163 | | 0 NA | | | | | | | | |
| ## | 2615 | | 0 NA | | | | | | | | |
| ## | 2720 | | 0 NA | | | | | | | | |
| ## | 2737 | | 0 NA | | | | | | | | |
| ## | 2885 | | 0 NA | | | | | | | | |
| ## | 3360 | | 0 NA | | | | | | | | |
| ## | 3457 | | 0 NA | | | | | | | | |
| ## | 3601 | | 0 NA | | | | | | | | |
| ## | 4370 | | 0 NA | | | | | | | | |
| ## | 4505 | | 0 NA | | | | | | | | |
| ## | 4681 | | 0 NA | | | | | | | | |
| ## | 4682 | | 0 NA | | | | | | | | |
| ## | 4692 | | 0 NA | | | | | | | | |
| ## | 5041 | | 0 NA | | | | | | | | |
| ## | 5042 | | 0 NA | | | | | | | | |
| ## | 5043 | | 0 NA | | | | | | | | |
| ## | 5422 | | 0 NA | | | | | | | | |
| ## | 5428 | | 0 NA | | | | | | | | |
| ## | 5501 | | 0 NA | | | | | | | | |
| ## | 5530 | | 0 NA | | | | | | | | |
| ## | 5533 | | 0 NA | | | | | | | | |
| ## | 5608 | | 0 NA | | | | | | | | |
| ## | 5621 | | 0 NA | | | | | | | | |
| ## | 5644 | | 0 NA | | | | | | | | |
| ## | 5668 | | 0 NA | | | | | | | | |
| ## | 5684 | | 0 NA | | | | | | | | |
| ## | 5741 | | 0 NA | | | | | | | | |
| ## | 5761 | | 0 NA | | | | | | | | |
| ## | 5763 | | 0 NA | | | | | | | | |
| ## | 5768 | | 0 NA | | | | | | | | |
| ## | 5770 | | 0 NA | | | | | | | | |
| ## | 5772 | | 0 NA | | | | | | | | |
| ## | 5773 | | 0 NA | | | | | | | | |
| ## | 5775 | | 0 NA | | | | | | | | |
| ## | 5776 | | 0 NA | | | | | | | | |
| ## | 5797 | | 0 NA | | | | | | | | |
| ## | 5798 | | 0 NA | | | | | | | | |
| ## | 6018 | | 0 NA | | | | | | | | |
| ## | 6121 | | 0 NA | | | | | | | | |
| ## | 6482 | | 0 NA | | | | | | | | |
| ## | 6518 | | 0 NA | | | | | | | | |
| ## | 6841 | | 0 NA | | | | | | | | |
| ## | 6842 | | 0 NA | | | | | | | | |
| ## | 6843 | | 0 NA | | | | | | | | |

| | | | |
|----|-------|---|----|
| ## | 7202 | 0 | NA |
| ## | 7921 | 0 | NA |
| ## | 7957 | 0 | NA |
| ## | 8858 | 0 | NA |
| ## | 9253 | 0 | NA |
| ## | 9361 | 0 | NA |
| ## | 9364 | 0 | NA |
| ## | 9386 | 0 | NA |
| ## | 9390 | 0 | NA |
| ## | 9505 | 0 | NA |
| ## | 10441 | 0 | NA |
| ## | 10444 | 0 | NA |
| ## | 10447 | 0 | NA |
| ## | 10448 | 0 | NA |
| ## | 10535 | 0 | NA |
| ## | 10639 | 0 | NA |
| ## | 10785 | 0 | NA |
| ## | 11294 | 0 | NA |
| ## | 11387 | 0 | NA |
| ## | 11418 | 0 | NA |
| ## | 11421 | 0 | NA |
| ## | 12202 | 0 | NA |
| ## | 12241 | 0 | NA |
| ## | 13603 | 0 | NA |
| ## | 13688 | 0 | NA |
| ## | 13689 | 0 | NA |
| ## | 13694 | 0 | NA |
| ## | 13695 | 0 | NA |
| ## | 13696 | 0 | NA |
| ## | 13702 | 0 | NA |
| ## | 13709 | 0 | NA |
| ## | 13713 | 0 | NA |
| ## | 13715 | 0 | NA |
| ## | 13716 | 0 | NA |
| ## | 13717 | 0 | NA |
| ## | 13721 | 0 | NA |
| ## | 14041 | 0 | NA |
| ## | 14379 | 0 | NA |
| ## | 14864 | 0 | NA |
| ## | 14901 | 0 | NA |
| ## | 14958 | 0 | NA |
| ## | 15121 | 0 | NA |
| ## | 15842 | 0 | NA |
| ## | 15843 | 0 | NA |
| ## | 15845 | 0 | NA |
| ## | 15846 | 0 | NA |
| ## | 15847 | 0 | NA |
| ## | 16107 | 0 | NA |
| ## | 16201 | 0 | NA |
| ## | 16565 | 0 | NA |
| ## | 16957 | 0 | NA |
| ## | 17282 | 0 | NA |
| ## | 17643 | 0 | NA |
| ## | 17644 | 0 | NA |


```
#...THERE IS MISSING DATA, BUT IT IS EXPECTED:
#...There are trials where the the experiment times out
#...can be identified as RT == 0
#...trials where a response was not made have an RT =0, resp=0 and ac = NA
```

```
#...get the number of time outs
dim(mergedStroopData[!complete.cases(mergedStroopData),])[1]
```

```
## [1] 104
```

```
#...how are the missing trials distributed???
timeOutStroopData = mergedStroopData[!complete.cases(mergedStroopData),]
```

```
ftable(posture~congruency, timeOutStroopData)
```

```
##           posture SITTING STANDING
## congruency
## congruent           10          14
## incongruent         29          18
## neutral             13          20
```

```
ftable(blockType~sj, timeOutStroopData)
```

```
##      blockType experimental practice
## sj
## 10_2           1           0
## 12_2           1           1
## 13_1           0           1
## 14_2           0           1
## 15_1           0           2
## 16_2           2           1
## 17_1           0           1
## 18_2           2           0
## 19_1           0           1
## 20_2           1           1
## 21_1           0           3
## 22_1           0           3
## 22_2           8           3
## 24_2           3           8
## 25_1           0           1
## 26_2           1           1
## 27_1           0           3
## 28_2           0           1
## 3_1            1           1
## 31_1           1           0
## 32_2           1           0
## 33_1           1           4
## 36_2           2           5
## 38_2           4           0
## 4_2            1           0
## 40_2           0           1
## 43_1           1           0
## 44_2           2          10
## 45_1           1           1
## 47_1           2           1
```

```

## 48_2          0      1
## 5_1           1      5
## 50_2          0      1
## 6_2           0      1
## 7_1           1      0
## 8_2           0      1
## 9_1           0      2

#...this code changes the "time-out" trials as errors
#...see Davoli et al.
mergedStroopData$ac[mergedStroopData$rt==0] = 0

#...remove practice trials
mergedStroopData <- mergedStroopData[!mergedStroopData$blockType=="practice",]

#...check that only experimental trials are left
unique(mergedStroopData$blockType)

## [1] "experimental"

totalStroopTrials = dim(mergedStroopData)[1]
observationDataStroop = data.frame(ftable(blockType~sj, mergedStroopData))[c(1,3)]

#...remove trials faster than 100ms
# mergedStroopData= mergedStroopData[!mergedStroopData$rt==0,] #...greater than 1500ms
mergedStroopData= mergedStroopData[!(mergedStroopData$rt<=100 & mergedStroopData$rt > 0),]
validStroopRTTrials = dim(mergedStroopData)[1]
observationDataStroop$validTrials = data.frame(ftable(blockType~sj, mergedStroopData))[c(3)]

print(paste("percent invalid trials = ",
            ((totalStroopTrials-validStroopRTTrials)/totalStroopTrials)*100))

## [1] "percent invalid trials =  0.006944444444444444"

write.table(mergedStroopData, file = "Experiment 1 Data/merged_stroop_data.txt",
            row.names = F)

stroopCorrect = mergedStroopData[mergedStroopData$ac == 1, ]

# mergedDataSet = mergedDataSet[mergedDataSet$ac ==1,]
errorsRemoved = dim(stroopCorrect)[1] #...total remaining trials
observationDataStroop$correctTrials = data.frame(ftable(blockType~sj, stroopCorrect))[c(3)]
trimInfo = data.frame(totalStroopTrials, validStroopRTTrials,errorsRemoved)
head(trimInfo)

##   totalStroopTrials validStroopRTTrials errorsRemoved
## 1          14400          14399          13852

#...percent of error trials lost
print(paste("percent errors removed = ",
            (((validStroopRTTrials-errorsRemoved)/totalStroopTrials)*100)))

## [1] "percent errors removed =  3.79861111111111"

#####
#...CHECK 20% CRITERION
#####
observationDataStroop$percentLoss =

```

```

((observationDataStroop$Freq-observationDataStroop$correctTrials)/
 observationDataStroop$Freq)*100

observationDataStroop$percentLoss

## [1] 3.472222 1.736111 0.347222 6.944444 1.736111 4.166667 4.513889 1.736111
## [9] 1.041667 1.736111 1.736111 3.125000 2.083333 4.513889 1.736111 10.069444
## [17] 8.680556 0.347222 2.083333 4.513889 4.861111 1.388889 1.388889 3.472222
## [25] 16.666667 1.736111 15.972222 1.041667 0.000000 5.555556 2.083333 8.680556
## [33] 0.347222 3.125000 1.736111 2.083333 4.166667 2.777778 2.430556 7.638889
## [41] 1.041667 4.166667 2.777778 1.041667 5.555556 3.125000 10.069444 1.736111
## [49] 3.472222 3.819444

sum(observationDataStroop$percentLoss>20)

## [1] 0

#...None!

#...RUN TRIMMING PROCEDURE
tempList = pjRecursiveTrim2(stroopCorrect, #...dataset
                             "rt", #...dependent variables
                             c("sj",
                               "cb",
                               "congruency",
                               "posture")) #.independent variables

trimmedStroopData=tempList[[1]]
totalStroopN = tempList[[2]]
rejectedStroop = tempList[[3]]
percentTrimmedStroop = tempList[[4]]
NcellsStroop = tempList[[5]]

#...get the trimming info
trimOutputStroop= data.frame(totalStroopN, rejectedStroop,percentTrimmedStroop,NcellsStroop)
head(trimOutputStroop)

## totalStroopN rejectedStroop percentTrimmedStroop NcellsStroop
## 1 13852 292 2.107999 300

stroopRT = plyr::ddply(trimmedStroopData,
                       .(sj, cb,congruency,posture),
                       summarise,
                       meanRT = mean(rt))

head(stroopRT)

## sj cb congruency posture meanRT
## 1 1_1 1 congruent SITTING 471.6458
## 2 1_1 1 congruent STANDING 400.0638
## 3 1_1 1 incongruent SITTING 430.0455
## 4 1_1 1 incongruent STANDING 439.8444
## 5 1_1 1 neutral SITTING 454.5455
## 6 1_1 1 neutral STANDING 408.4565

```

```

#...get error data
stroopPE = plyr::ddply(mergedStroopData,
                      .(sj, cb, congruency, posture),
                      summarise,
                      meanPE = 100 - (mean(ac)*100))

head(stroopPE)

##    sj cb congruency posture meanPE
## 1 1_1 1 congruent SITTING 0.000000
## 2 1_1 1 congruent STANDING 0.000000
## 3 1_1 1 incongruent SITTING 4.166667
## 4 1_1 1 incongruent STANDING 6.250000
## 5 1_1 1 neutral SITTING 6.250000
## 6 1_1 1 neutral STANDING 4.166667

#...combine the RT and error data
stroopCombined = cbind(stroopRT, meanPE = stroopPE$meanPE)

head(stroopCombined)

##    sj cb congruency posture meanRT meanPE
## 1 1_1 1 congruent SITTING 471.6458 0.000000
## 2 1_1 1 congruent STANDING 400.0638 0.000000
## 3 1_1 1 incongruent SITTING 430.0455 4.166667
## 4 1_1 1 incongruent STANDING 439.8444 6.250000
## 5 1_1 1 neutral SITTING 454.5455 6.250000
## 6 1_1 1 neutral STANDING 408.4565 4.166667

#...set as factors
stroopCombined$sj = factor(stroopCombined$sj)
stroopCombined$cb = factor(stroopCombined$cb)

```

Reaction time results

```

rtModelStroop <- ezANOVA(stroopCombined,
                        dv = .(meanRT),
                        wid = .(sj),
                        within = .(posture, congruency),
                        detailed = TRUE,
                        type = 3,
                        return_aov = TRUE)

## Warning: Converting "posture" to factor for ANOVA.
## Warning: Converting "congruency" to factor for ANOVA.
rtModelStroop$ANOVA

```

| ## | Effect | DFn | DFd | SSn | SSd | F | p | p<.05 | ges |
|------|--------------------|-----|-----|--------------|------------|--------------|--------------|-------|--------------|
| ## 1 | (Intercept) | 1 | 49 | 6.530862e+07 | 1322013.63 | 2.420643e+03 | 2.233955e-43 | * | 0.9748634585 |
| ## 2 | posture | 1 | 49 | 8.221421e+02 | 156217.37 | 2.578776e-01 | 6.138604e-01 | | 0.0004879807 |
| ## 3 | congruency | 2 | 98 | 7.093105e+04 | 154676.49 | 2.247026e+01 | 9.278220e-09 | * | 0.0404190166 |
| ## 4 | posture:congruency | 2 | 98 | 8.430066e+01 | 51054.35 | 8.090852e-02 | 9.223396e-01 | | 0.0000500584 |

```

rtStroopMSE = rtModelStroop$ANOVA$SSd/rtModelStroop$ANOVA$DFd

#...print ANOVA in nice format
paste(rtModelStroop$ANOVA$Effect,": F(",
      rtModelStroop$ANOVA$DFn,
      ", ",
      rtModelStroop$ANOVA$DFd,
      ") = ",
      round(rtModelStroop$ANOVA$F,3),
      ", MSE = ",
      round(rtStroopMSE,3),
      ", p = ",
      round(rtModelStroop$ANOVA$p,3),
      ", partialEtaSq = ",
      round(rtModelStroop$ANOVA$SSn/(rtModelStroop$ANOVA$SSn+rtModelStroop$ANOVA$SSd),4),
      sep="")

## [1] "(Intercept): F(1, 49) = 2420.643, MSE = 26979.87, p = 0, partialEtaSq = 0.9802"
## [2] "posture: F(1, 49) = 0.258, MSE = 3188.11, p = 0.614, partialEtaSq = 0.0052"
## [3] "congruency: F(2, 98) = 22.47, MSE = 1578.332, p = 0, partialEtaSq = 0.3144"
## [4] "posture:congruency: F(2, 98) = 0.081, MSE = 520.963, p = 0.922, partialEtaSq = 0.0016"

#...CALCULATE THE BAYES FACTORS FOR THE RT ANALYSIS
stroopBF = stroopCombined
stroopBF$posture = factor(stroopBF$posture)
stroopBF$congruency = factor(stroopBF$congruency)
bfValues1 = anovaBF(meanRT~congruency*posture+sj,
                    data = stroopBF,
                    whichRandom = "sj",
                    method="laplace")

bfValues1

## Bayes factor analysis
## -----
## [1] congruency + sj : 35335703 ±NA%
## [2] posture + sj : 0.1461731 ±NA%
## [3] congruency + posture + sj : 5410998 ±NA%
## [4] congruency + posture + congruency:posture + sj : 346149.8 ±NA%
##
## Against denominator:
## meanRT ~ sj
## ---
## Bayes factor type: BFlinearModel, JZS

#...get the Bayes factor for the Null Interaction
bfValues1[3]/bfValues1[4]

## Bayes factor analysis
## -----
## [1] congruency + posture + sj : 15.63195 ±NA%
##
## Against denominator:
## meanRT ~ congruency + posture + congruency:posture + sj
## ---
## Bayes factor type: BFlinearModel, JZS

```

```

1/(bfValues1[3]/bfValues1[4])

## Bayes factor analysis
## -----
## [1] congruency + posture + congruency:posture + sj : 0.06397154 ±NA%
##
## Against denominator:
##   meanRT ~ congruency + posture + sj
## ---
## Bayes factor type: BFlinearModel, JZS

# Difference scores and paired t-tests
#... stroop effect (incongruent - congruent) FOR Standing
standingStroop = stroopCombined[stroopCombined$posture=="STANDING", ]
standingStroop = standingStroop[standingStroop$congruency!="neutral", ]
t.test(standingStroop$meanRT[standingStroop$congruency=="congruent"],
       standingStroop$meanRT[standingStroop$congruency=="incongruent"],
       paired=TRUE )

##
## Paired t-test
##
## data:  standingStroop$meanRT[standingStroop$congruency == "congruent"] and standingStroop$meanRT[stan
## t = -4.3805, df = 49, p-value = 6.226e-05
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -53.81756 -19.96796
## sample estimates:
## mean of the differences
##          -36.89276

#... stroop effect (incongruent - congruent) FOR SITTING
sittingStroop = stroopCombined[stroopCombined$posture=="SITTING", ]
sittingStroop = sittingStroop[sittingStroop$congruency!="neutral", ]
t.test(sittingStroop$meanRT[sittingStroop$congruency=="congruent"],
       sittingStroop$meanRT[sittingStroop$congruency=="incongruent"],
       paired=TRUE )

##
## Paired t-test
##
## data:  sittingStroop$meanRT[sittingStroop$congruency == "congruent"] and sittingStroop$meanRT[sittin
## t = -5.1209, df = 49, p-value = 5.104e-06
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -52.27703 -22.81052
## sample estimates:
## mean of the differences
##          -37.54377

```

Percent error results

```

errModelStroop <- ezANOVA(stroopCombined,
                          dv = .(meanPE),
                          wid=.(sj),

```

```

        within=.(posture, congruency),
        detailed=TRUE,
        type=3,
        return_aov = TRUE)

## Warning: Converting "posture" to factor for ANOVA.
## Warning: Converting "congruency" to factor for ANOVA.
errStroopMSE = errModelStroop$ANOVA$SSd/errModelStroop$ANOVA$DFd

paste(errModelStroop$ANOVA$Effect, ": F(",
      errModelStroop$ANOVA$DFn,
      ", ",
      errModelStroop$ANOVA$DFd,
      ") = ",
      round(errModelStroop$ANOVA$F, 3),
      ", MSE = ",
      round(errStroopMSE, 3),
      ", p = ",
      round(errModelStroop$ANOVA$p, 3),
      ", partialEtaSq = ",
      round(errModelStroop$ANOVA$SSn/(errModelStroop$ANOVA$SSn+errModelStroop$ANOVA$SSd), 4),
      sep="")

## [1] "(Intercept): F(1, 49) = 57.526, MSE = 75.297, p = 0, partialEtaSq = 0.54"
## [2] "posture: F(1, 49) = 0.007, MSE = 16.562, p = 0.934, partialEtaSq = 1e-04"
## [3] "congruency: F(2, 98) = 11.598, MSE = 9.222, p = 0, partialEtaSq = 0.1914"
## [4] "posture:congruency: F(2, 98) = 1.59, MSE = 6.228, p = 0.209, partialEtaSq = 0.0314"

##...ERRORS
##... stroop effect (incongruent - congruent) FOR Standing
t.test(standingStroop$meanPE[standingStroop$congruency=="congruent"],
      standingStroop$meanPE[standingStroop$congruency=="incongruent"],
      paired=TRUE )

##
## Paired t-test
##
## data: standingStroop$meanPE[standingStroop$congruency == "congruent"] and standingStroop$meanPE[sta
## t = -2.0681, df = 49, p-value = 0.04393
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## -2.79325655 -0.04007678
## sample estimates:
## mean of the differences
## -1.416667

##... stroop effect (incongruent - congruent) FOR SITTING
t.test(sittingStroop$meanPE[sittingStroop$congruency=="congruent"],
      sittingStroop$meanPE[sittingStroop$congruency=="incongruent"],
      paired=TRUE )

##
## Paired t-test
##

```

```
## data: sittingStroop$meanPE[sittingStroop$congruency == "congruent"] and sittingStroop$meanPE[sittingStroop$congruency == "incongruent"]
## t = -4.6535, df = 49, p-value = 2.51e-05
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## -3.758593 -1.491407
## sample estimates:
## mean of the differences
## -2.625
```

Make plots for Stroop

```
##...pull out summary statistics per condition averaged across subjects for graph
graphRT = describeBy(stroopCombined$meanRT,
                      list(stroopCombined$posture, stroopCombined$congruency),
                      mat=TRUE,
                      digits = 1)

graphPE = describeBy(stroopCombined$meanPE,
                      list(stroopCombined$posture, stroopCombined$congruency),
                      mat=TRUE,
                      digits = 1)

head(graphRT)
```

```
##      item  group1      group2 vars  n mean    sd median trimmed mad   min   max range skew
## X11     1  SITTING   congruent    1 50 450.8  56.3  443.0   446.5 45.5 348.3 598.3 250.0  0.7
## X12     2  STANDING   congruent    1 50 448.5  60.6  440.3   442.2 48.6 341.3 624.4 283.0  1.0
## X13     3  SITTING  incongruent    1 50 488.3  91.9  471.8   476.7 74.4 351.1 803.1 452.0  1.2
## X14     4  STANDING  incongruent    1 50 485.4 100.6  458.7   470.5 79.0 358.3 861.5 503.2  1.8
## X15     5  SITTING    neutral    1 50 465.6  66.3  456.6   460.1 49.7 357.8 702.6 344.7  1.0
## X16     6  STANDING    neutral    1 50 460.9  67.6  452.7   453.6 51.5 346.2 695.4 349.2  1.4
##      kurtosis  se
## X11         0.2  8.0
## X12         0.9  8.6
## X13         1.7 13.0
## X14         3.8 14.2
## X15         1.9  9.4
## X16         2.7  9.6
```

```
##...get rid of irrelevant columns
graphRT = graphRT[,c("group1", "group2", "mean", "se")]
graphPE = graphPE[,c("group1", "group2", "mean", "se")]

##...rename the variables
names(graphRT) = c("posture", "congruency", "mean", "se")
names(graphPE) = c("posture", "congruency", "mean", "se")

##...make sure posture is in UPPERCASE
graphRT$posture = str_to_upper(graphRT$posture)

##..calculate the within subjects confidence intervals based on loftus and masson
##..the confidence intervals are based on the interaction term.

inxn.rt.MSE = rtStroopMSE[4]
inxn.err.MSE = errStroopMSE[4]
```



```

graphRT$se = sqrt((inxn.rt.MSE)/length(unique(stroopCombined$sj)))
graphPE$se= sqrt((inxn.err.MSE)/length(unique(stroopCombined$sj)))

critT = qt(p=.025,df=length(unique(stroopCombined$sj))-2,lower.tail =FALSE)

#---add the min and max for the confidence intervals
graphRT$min = graphRT$mean - (graphRT$se*critT)
graphRT$max = graphRT$mean + (graphRT$se*critT)

####GET AC DATA FROM twoAnimalWordsPRPac.R
graphRT$ac = paste("(",format(round(graphPE$mean,digits=1),nsmall = 1),")",sep="")
head(graphRT)

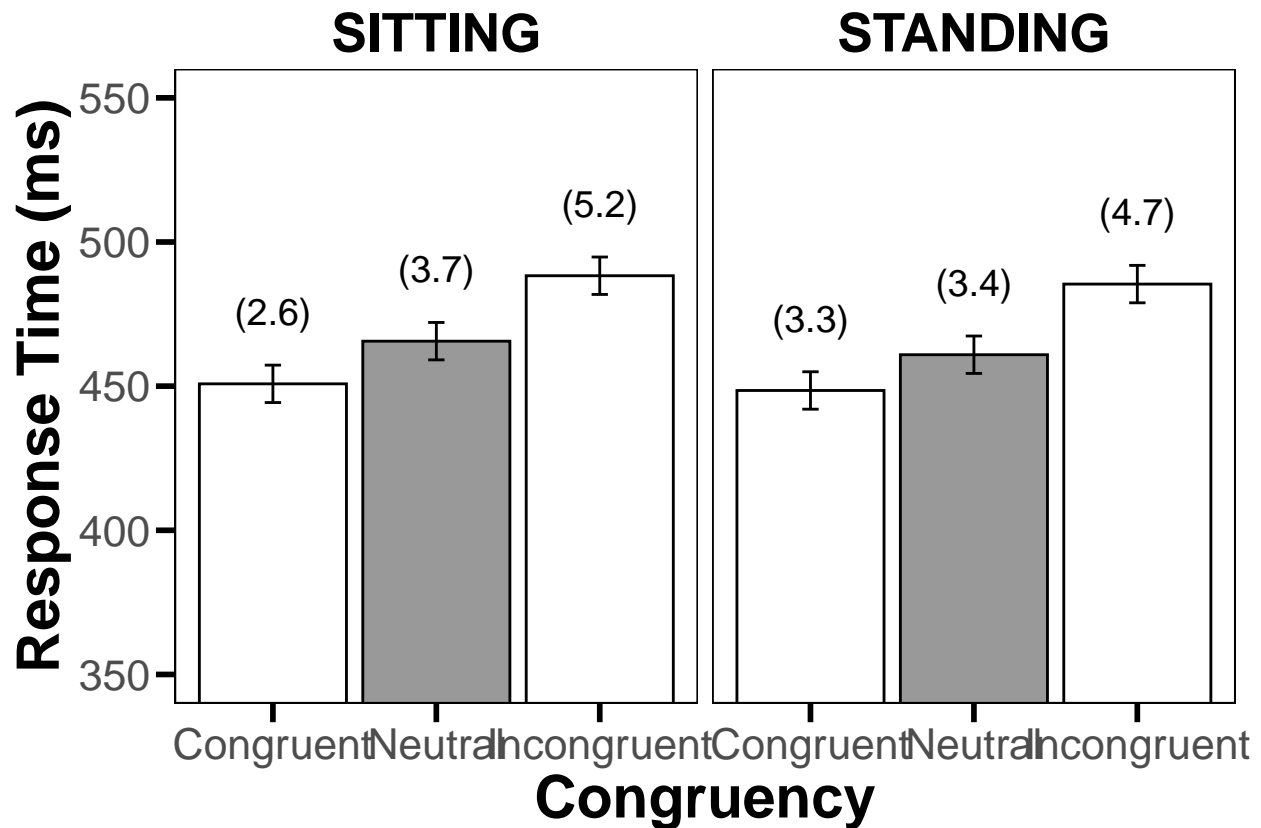
##      posture congruency mean      se      min      max      ac
## X11 SITTING congruent 450.8 3.227887 444.3099 457.2901 (2.6)
## X12 STANDING congruent 448.5 3.227887 442.0099 454.9901 (3.3)
## X13 SITTING incongruent 488.3 3.227887 481.8099 494.7901 (5.2)
## X14 STANDING incongruent 485.4 3.227887 478.9099 491.8901 (4.7)
## X15 SITTING neutral 465.6 3.227887 459.1099 472.0901 (3.7)
## X16 STANDING neutral 460.9 3.227887 454.4099 467.3901 (3.4)

#...used for positioning the accuracy data on the graph
graphRT$vAdj = 25 #down
graphRT$vAdj[graphRT$congruency=="incongruent"]=25 #up
graphRT$hAdj = 0 #right
#graphRT$hAdj[graphRT$posture=="SITTING"]=-60 #left
graphRT$congruency = factor(graphRT$congruency,labels = c("Congruent","Incongruent","Neutral"))
graphRT$congruency = factor(graphRT$congruency,levels=c("Congruent","Neutral","Incongruent"))

interactionPlot <- ggplot(graphRT, aes(congruency, mean, group=posture)) +
  theme(legend.position = "none")+
  scale_fill_manual(values=c("#FFFFFF","#999999","#FFFFFF","#999999")) +
  coord_cartesian(ylim=c(350,550),expand=TRUE) +
  scale_y_continuous(breaks = round(seq(350, 550, by = 50),0)) +
  geom_text(aes(label=ac),nudge_x=graphRT$hAdj,nudge_y =graphRT$vAdj, size=5) +
  geom_bar(stat="identity", aes(fill=interaction(congruency)),colour="black")+
  geom_errorbar(aes(ymin=min,ymax=max,group=interaction(posture,congruency)), width=.1)+
  labs(x = "Congruency", y = "Response Time (ms)") +
  theme(axis.ticks = element_line(size = 1, colour = "black", linetype = "solid"),
        axis.ticks.length = unit(.25,"cm"),
        #axis.line = element_line(size = 1, colour = "black", linetype = "solid"),
        panel.background = element_rect(fill = "white", colour = "white", size = 1),
        axis.text=element_text(size=16),
        axis.title=element_text(size=22,face="bold"),
        strip.text = element_text(size = 20, face = "bold",colour = "black", angle = 0),
        panel.border = element_rect(colour = "black", fill = NA, size = 0.50),
        strip.background = element_rect(fill=NA,colour="NA",size = 2))+
  facet_grid(~posture)

interactionPlot

```



```
ggsave(interactionPlot,
  file = "plots/exp1_stroop_interaction_plot.pdf",
  units = "in",
  width = 8.5,
  height = 5,
  dpi = 600)
```

```
exp1.table <-
apa.2way.table(congruency,
  posture,
  meanRT,
  stroopCombined,
  show.conf.interval = TRUE,
  landscape=TRUE,
  filename = "Output/exp1_table.doc")
exp1.table
```

```
##
##
## Means and standard deviations for meanRT as a function of a 3(congruency) X 2(posture) design
##
##           M           M_95%_CI      SD
## posture:SITTING
##   congruency
```

```
##      congruent 450.77 [434.78, 466.76] 56.26
##      incongruent 488.31 [462.20, 514.42] 91.87
##      neutral 465.62 [446.78, 484.47] 66.31
##
## posture:STANDING
##      congruency
##      congruent 448.51 [431.30, 465.72] 60.56
##      incongruent 485.40 [456.81, 513.99] 100.61
##      neutral 460.86 [441.64, 480.08] 67.64
##
## Note. M and SD represent mean and standard deviation, respectively.
## LL and UL indicate the lower and upper limits of the
## 95% confidence interval for the mean, respectively.
## The confidence interval is a plausible range of population means
## that could have created a sample mean (Cumming, 2014).
```

Experiment 2 - Task-switching

Import and clean data

```
### read in data

ts_path <- "/Experiment 2 Data/task-switching-replication-recoded-2.csv"
task_switching_raw <- read.csv(paste0(workingdir, ts_path))
head(task_switching_raw)

## participant session condition trialType posture blockNum trialNum switchTrialType
## 1 1 1 1 experiment standing 1 1 buffer
## 2 1 1 1 experiment standing 1 2 noswitch
## 3 1 1 1 experiment standing 1 3 switch
## 4 1 1 1 experiment standing 1 4 noswitch
## 5 1 1 1 experiment standing 1 5 noswitch
## 6 1 1 1 experiment standing 1 6 noswitch
## congruentTrialType cueType shapeType shapeColor response correctResponse correct reactionTime
## 1 incongruent solid square blue right left no 0.9088130
## 2 incongruent solid square blue left left yes 0.5947349
## 3 incongruent dashed square blue right right yes 0.7084870
## 4 incongruent dashed square blue right right yes 0.5995200
## 5 congruent dashed square yellow right right yes 0.4399409
## 6 congruent dashed square yellow right right yes 0.3847258
## date utcTime
## 1 2021-11-10 10:22:00 1636561737
## 2 2021-11-10 10:22:00 1636561744
## 3 2021-11-10 10:22:00 1636561746
## 4 2021-11-10 10:22:00 1636561748
## 5 2021-11-10 10:22:00 1636561750
## 6 2021-11-10 10:22:00 1636561752

### check data

#does every person have 392 trials?
ntrials_sub <- task_switching_raw %>%
  group_by(participant) %>%
  summarize(ntrials = n()) %>%
```

```

pull(ntrials)

all(ntrials_sub == 392)

## [1] TRUE
#does every block start with a buffer and have 49 trials?
task_switching_raw <- task_switching_raw %>%
  mutate(condblock = paste0(posture, blockNum))

blocktrials <- task_switching_raw %>%
  group_by(participant, condblock) %>%
  summarize(ntrials = n(), firsttrial = first(switchTrialType))

## `summarise()` has grouped output by 'participant'. You can override using the `.groups` argument.
all(blocktrials$ntrials == 49)

## [1] TRUE
all(blocktrials$firsttrial == "buffer")

## [1] TRUE
### clean data

#Drop buffer trials
task_switching_raw2 <- task_switching_raw %>%
  filter(switchTrialType != "buffer")

#Recode Correct to 1 and Incorrect to 0
task_switching_raw2$correct_bin <- recode(task_switching_raw2$correct,
                                         "no" = 0,
                                         "yes" = 1)

#Change RTs from seconds to milliseconds
task_switching_raw2 <- task_switching_raw2 %>%
  mutate(reactionTime = reactionTime * 1000)

#Calc overall acc by participant
ts_overall_acc <- task_switching_raw2 %>%
  group_by(participant) %>%
  summarize(Accuracy = mean(correct_bin))

#find participants with less than 80% accuracy
#2, 8, 15, 44, 49, 51
#First exclusion criteria
low_acc_subs <- ts_overall_acc %>% filter(Accuracy < 0.80) %>%
  pull(participant)

task_switching_raw3 <- task_switching_raw2 %>%
  filter(!(participant %in% low_acc_subs))

#Calc mean Acc by participant and conditions (posture, con, switch)
#Narrow format
ts_acc_mean <- task_switching_raw3 %>%
  group_by(participant,

```

```

      posture,
      congruentTrialType,
      switchTrialType) %>%
summarize(Accuracy = mean(correct_bin),
          PE = (1 - Accuracy) * 100)

## `summarise()` has grouped output by 'participant', 'posture', 'congruentTrialType'. You can
## override using the `.groups` argument.

#Convert data to wide format (for statview/SPSS/etc)
ts_acc_mean_wide <- ts_acc_mean %>%
  select(-Accuracy) %>%
  pivot_wider(names_from = c(posture,
                             congruentTrialType,
                             switchTrialType),
              values_from = PE)

# ts_acc_mean <- data.frame(ts_acc_mean)
ts_acc_mean <- ts_acc_mean %>%
  ungroup() %>%
  mutate(across(posture:switchTrialType, as.factor))

str(ts_acc_mean)

## tibble [408 x 6] (S3: tbl_df/tbl/data.frame)
## $ participant      : int [1:408] 1 1 1 1 1 1 1 1 3 3 ...
## $ posture          : Factor w/ 2 levels "sitting","standing": 1 1 1 1 2 2 2 2 1 1 ...
## $ congruentTrialType: Factor w/ 2 levels "congruent","incongruent": 1 1 2 2 1 1 2 2 1 1 ...
## $ switchTrialType   : Factor w/ 2 levels "noswitch","switch": 1 2 1 2 1 2 1 2 1 2 ...
## $ Accuracy          : num [1:408] 0.96 0.978 0.957 0.88 0.981 ...
## $ PE                : num [1:408] 4 2.17 4.35 12 1.89 ...

#Total N = 51 (6 dropped for total acc < 80%)
length(unique(ts_acc_mean$participant))

## [1] 51

```

Summarize Demographics

```

demo_raw <- read.csv(paste0(workingdir,
                           "/Experiment 2 Data/Task Switching_February 24, 2022_13.05.csv"),
                    skip = 1) %>%
  slice(-1) %>%
  select(-c(Response.Type, IP.Address, Recipient.Last.Name:Distribution.Channel))
colnames(demo_raw)[10:15] <- c("Gender.Pick", "Gender.Text", "Age", "Race.Pick", "Race.Text", "Eng.First")

dim(demo_raw)

## [1] 59 15

#59 records
#first two are test data
# need to match up the 6 dropped participants from behavioral data
demo_df <- demo_raw %>%
  filter(!(X %in% c("test", low_acc_subs)))

```

```

dim(demo_df)

## [1] 51 15

demo_df <- demo_df %>%
  mutate(Gender.New = ifelse(Gender.Pick %in% c("Man", "Woman"), Gender.Pick, Gender.Text),
         Eng.First = toupper(Eng.First))

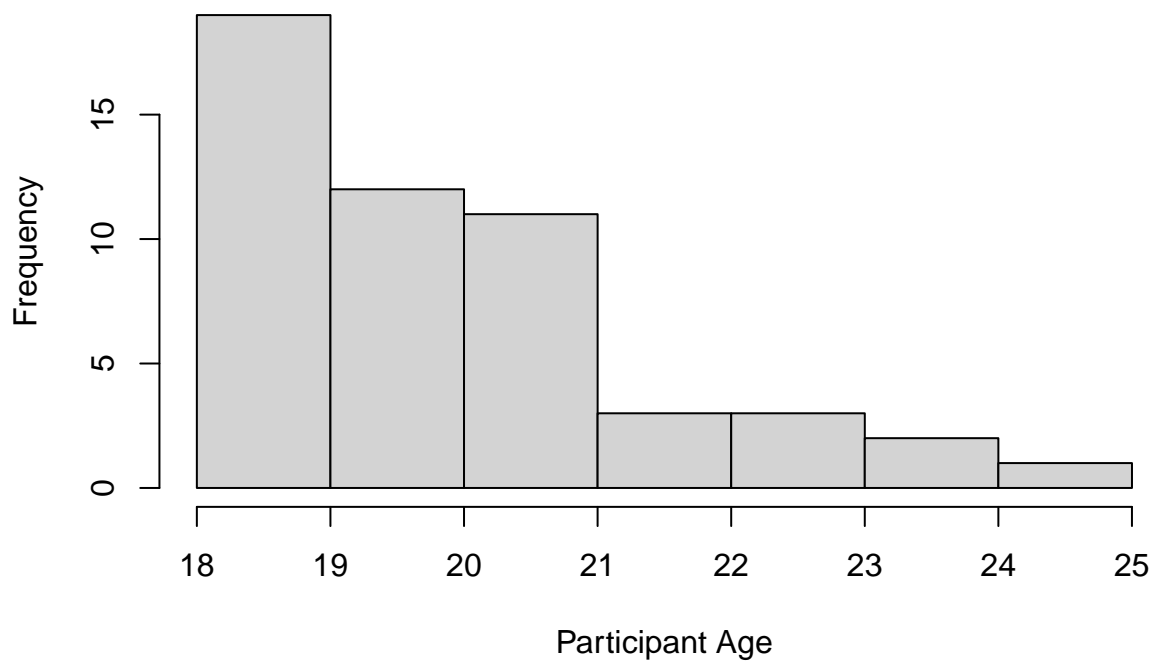
#gender breakdown
gender_table <- demo_df %>%
  group_by(Gender.New) %>%
  summarize(n = n())
gender_table

## # A tibble: 3 x 2
##   Gender.New      n
##   <chr>      <int>
## 1 Man         23
## 2 non binaary  1
## 3 Woman       27

#age breakdown
hist(as.numeric(demo_df$Age),
     main = "Histogram of Participant Ages",
     xlab = "Participant Age")

```

Histogram of Participant Ages



```
age_table <- demo_df %>%
```

```
group_by(Age) %>%
  summarize(n = n())
age_table
```

```
## # A tibble: 8 x 2
##   Age      n
##   <chr> <int>
## 1 18      9
## 2 19     10
## 3 20     12
## 4 21     11
## 5 22      3
## 6 23      3
## 7 24      2
## 8 25      1
```

#age mean and sd

```
mean_age <- mean(as.numeric(demo_df$Age))
sd_age <- sd(as.numeric(demo_df$Age))
```

```
kable(matrix(c(mean_age, sd_age), nrow = 1), col.names = c("Mean of Age", "SD of Age"))
```

| Mean of Age | SD of Age |
|-------------|-----------|
| 20.21569 | 1.73567 |

#race breakdown

```
race_table <- demo_df %>%
  group_by(Race.Pick) %>%
  summarize(n = n()) %>%
  arrange(desc(n))
race_table
```

```
## # A tibble: 6 x 2
##   Race.Pick      n
##   <chr>      <int>
## 1 White /European American    22
## 2 Black / African American    11
## 3 Hispanic/Latino/Latina/Latinx 11
## 4 Asian /South Pacific Islander   3
## 5 Central Asian /Indian /Pakistani 3
## 6 Native American / American Indian 1
```

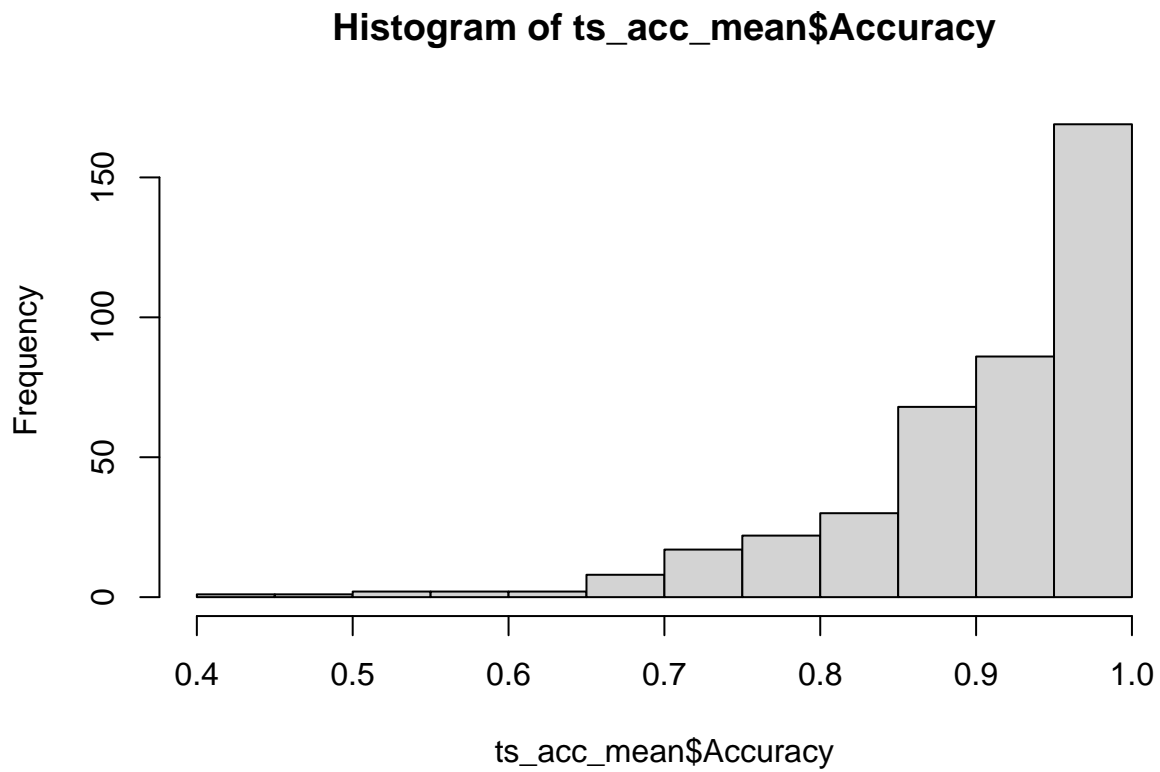
#language breakdown

```
lang_table <- demo_df %>%
  group_by(Eng.First) %>%
  summarize(n=n())
lang_table
```

```
## # A tibble: 2 x 2
##   Eng.First      n
##   <chr>      <int>
## 1 NO          8
## 2 YES        43
```

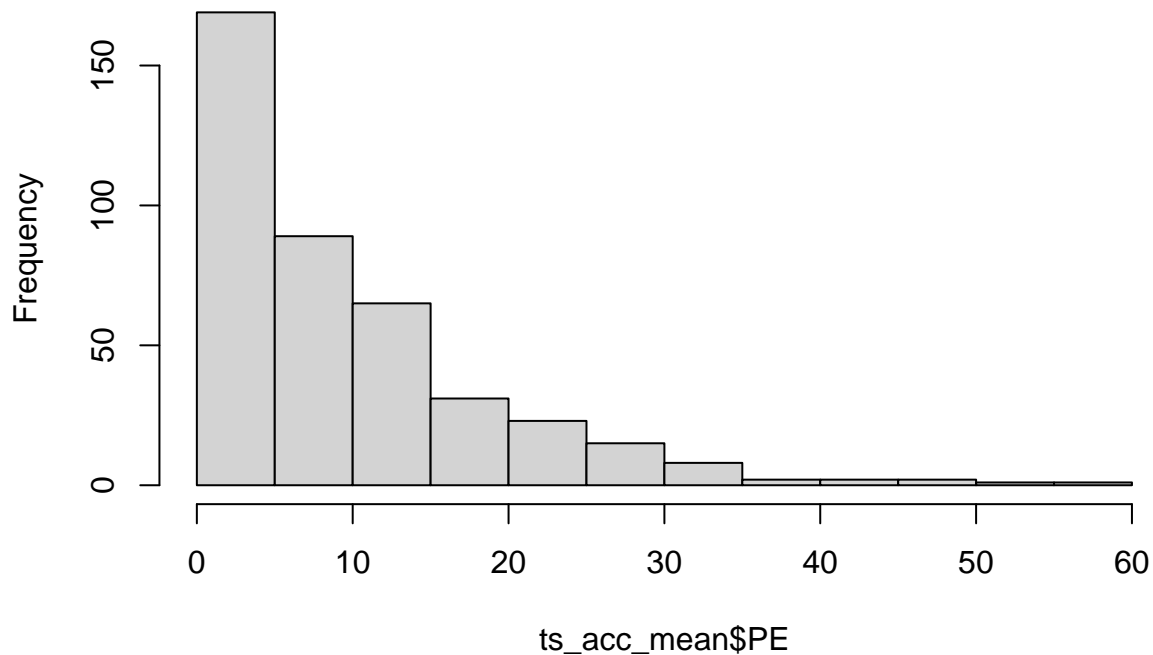
Accuracy results

```
#Accuracy for all cells  
hist(ts_acc_mean$Accuracy)
```



```
hist(ts_acc_mean$PE)
```


Histogram of ts_acc_mean\$PE



```
accModelTS <- aov_ez(data = ts_acc_mean,
                     dv = "PE",
                     id = "participant",
                     within = c("posture", "congruentTrialType", "switchTrialType"),
                     type = 3,
                     anova_table = list(es = "pes")
)
```

```
acc.stats.TS <- ezStats(ts_acc_mean,
                       dv = PE,
                       wid = participant,
                       within = .(posture, congruentTrialType, switchTrialType),
                       type = 3
)
```

```
## Warning: Converting "participant" to factor for ANOVA.
```

```
write.csv(acc.stats.TS[, -7], file = "output/exp2_Descriptives_ACC.csv",
          row.names = F)
```

```
write.csv(accModelTS$anova_table, "output/exp2_ANOVA_acc.csv")
accModelTS
```

```
## Anova Table (Type 3 tests)
```

```
##
```

```
## Response: PE
```

```
##              Effect    df    MSE        F    pes p.value
## 1              posture 1, 50 88.41      1.06 .021   .308
## 2      congruentTrialType 1, 50 86.07 99.66 *** .666   <.001
## 3      switchTrialType 1, 50 28.61 92.04 *** .648   <.001
## 4      posture:congruentTrialType 1, 50 41.84      0.02 <.001   .875
## 5      posture:switchTrialType 1, 50 24.00      0.74 .015   .395
## 6      congruentTrialType:switchTrialType 1, 50 15.15 58.43 *** .539   <.001
## 7 posture:congruentTrialType:switchTrialType 1, 50 18.80      1.26 .024   .268
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#Calculate confidence interval: PES for posture x switch/condition interaction
#using ANOVA results (partial eta-squared)
interaction_effect_CI <- get.ci.partial.eta.squared(accModelTS$anova_table$F[5],
                                                    accModelTS$anova_table$num Df[5],
                                                    accModelTS$anova_table$den Df[5],
                                                    conf.level = 0.90)
                                                    #90% CI is the convention for PES

interaction_effect_CI
```

```
## $LL
## [1] 0
##
## $UL
## [1] 0.1073579
```

```
congruent.labs <- c("Congruent", "Incongruent")
names(congruent.labs) <- c("1", "2")
```

```
#make plot like Smith et al's
acc_plot <-
  superbPlot(ts_acc_mean_wide,
             WSFactors = c("Condition(2)", "Congruent(2)", "Posture(2)"),
             variables = colnames(ts_acc_mean_wide)[2:9],
             errorbar = "SE", #Tempted to change to CI, should stay SE to be consistent with SMith
             plotStyle = "line",
             factorOrder = c("Condition", "Posture", "Congruent"),
             adjustments = list(purpose = "difference"))+
  theme_classic() +
  ylim(0, 22) + #Trying to make ylim same as the Smith w/o cutting off error bars
  facet_wrap(vars(Congruent), labeller = labeller(Congruent = congruent.labs)) +
  scale_x_discrete(labels=c("1" = "No Switch", "2" = "Switch"))+
  scale_color_manual(values=c("#E69F00", "#0072B2"),
                     labels = c("Sitting", "Standing")) +
  labs(y = "Percent Error")
```

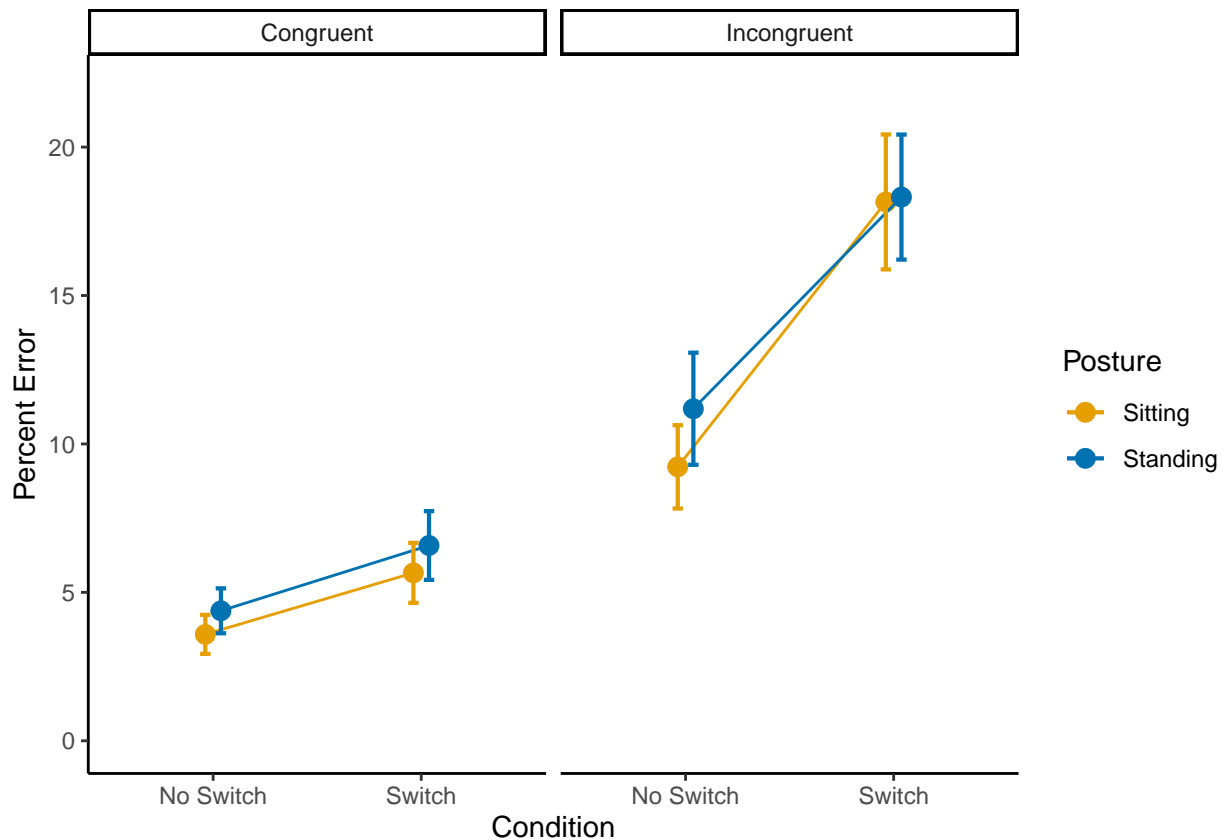
```
## superb::FYI: Here is how the within-subject variables are understood:
```

```
## Condition Congruent Posture          variable
##          1          1          1 sitting_congruent_noswitch
##          2          1          1 sitting_congruent_switch
##          1          2          1 sitting_incongruent_noswitch
##          2          2          1 sitting_incongruent_switch
##          1          1          2 standing_congruent_noswitch
##          2          1          2 standing_congruent_switch
##          1          2          2 standing_incongruent_noswitch
```

```
##          2          2          2  standing_incongruent_switch
```

```
ggsave(acc_plot,
       file = "plots/exp2_ts_acc_plot.pdf",
       units = "in",
       width = 6.62,
       height = 5.50,
       dpi = 600)
```

```
acc_plot
```



```
#...CALCULATE THE BAYES FACTORS FOR THE ACC ANALYSIS
```

```
taskswitchBF = data.frame(ts_acc_mean)
```

```
taskswitchBF$participant = factor(ts_acc_mean$participant)
```

```
taskswitchBF$posture = factor(ts_acc_mean$posture)
```

```
taskswitchBF$congruentTrialType = factor(taskswitchBF$congruentTrialType)
```

```
taskswitchBF$switchTrialType = factor(taskswitchBF$switchTrialType)
```

```
#str(taskswitchBF)
```

```
bfValues2 = anovaBF(Accuracy~ posture*switchTrialType+participant,
```

```
                    data = taskswitchBF,
```

```
                    whichRandom = "participant",
```

```
                    method="laplace")
```

```
bfValues2
```

```
## Bayes factor analysis
## -----
## [1] posture + participant : 0.1836549 ±NA%
## [2] switchTrialType + participant : 5429475 ±NA%
## [3] posture + switchTrialType + participant : 1064550 ±NA%
## [4] posture + switchTrialType + posture:switchTrialType + participant : 168897.1 ±NA%
##
## Against denominator:
## Accuracy ~ participant
## ---
## Bayes factor type: BFlinearModel, JZS

#...get the Bayes factor for the Null Interaction (vs. model w/no interaction)
bfValues2[3]/bfValues2[4]

## Bayes factor analysis
## -----
## [1] posture + switchTrialType + participant : 6.302952 ±NA%
##
## Against denominator:
## Accuracy ~ posture + switchTrialType + posture:switchTrialType + participant
## ---
## Bayes factor type: BFlinearModel, JZS

1/(bfValues2[3]/bfValues2[4])

## Bayes factor analysis
## -----
## [1] posture + switchTrialType + posture:switchTrialType + participant : 0.1586558 ±NA%
##
## Against denominator:
## Accuracy ~ posture + switchTrialType + participant
## ---
## Bayes factor type: BFlinearModel, JZS
```

Reaction time results

```
#look at reaction time for correct trials
ts_correct_only <- task_switching_raw3 %>%
  filter(correct_bin == 1)

#Second exclusion criteria
#How many trials faster than 100 ms? Only a single one
sum(ts_correct_only$reactionTime < 100)

## [1] 1
dim(ts_correct_only)

## [1] 17699 20

ts_correct_only2 <- ts_correct_only %>% filter(reactionTime >= 100)
#Sanity check, one trial is dropped. Now have 17,698 trials
dim(ts_correct_only2)

## [1] 17698 20
```

```

trimOutputTS = pjRecursiveTrim2(dataSet = ts_correct_only2,
                                dv = "reactionTime",
                                splitvars = c("participant",
                                                "posture",
                                                "switchTrialType",
                                                "congruentTrialType"))

trimmedTSDData=trimOutputTS[[1]]
totalN.TS = trimOutputTS[[2]]
rejectedTS = trimOutputTS[[3]]
percentTrimmedTS = trimOutputTS[[4]] #this is very close to the percentage trimmed for stroop
#2.14% of trials
percentTrimmedTS

```

```
## [1] 2.141485
```

```
NcellsTS = trimOutputTS[[5]] # 51 participants * 8 conditions
```

```

trimmed_rt_mean_TS <- trimmedTSDData %>%
  group_by(participant,
            posture,
            congruentTrialType,
            switchTrialType) %>%
  summarize(mean_rt = mean(reactionTime))

```

`summarise()` has grouped output by 'participant', 'posture', 'congruentTrialType'. You can
override using the `.groups` argument.

#Convert data to wide format

```

trimmed_rt_mean_TS_wide <- trimmed_rt_mean_TS %>%
  pivot_wider(names_from = c(posture,
                              congruentTrialType,
                              switchTrialType),
              values_from = mean_rt)

```

```

trimmed_RT_plot <-
  superbPlot(trimmed_rt_mean_TS_wide,
              WSFactors = c("Condition(2)", "Congruent(2)", "Posture(2)"),
              variables = colnames(trimmed_rt_mean_TS_wide)[2:9],
              errorbar = "SE",
              plotStyle = "line",
              factorOrder = c("Condition", "Posture", "Congruent"),
              adjustments = list(purpose = "difference"))+
  theme_classic()+
  facet_wrap(vars(Congruent), labeller = labeller(Congruent = congruent.labs)) +
  scale_x_discrete(labels=c("1" = "No Switch", "2" = "Switch"))+
  scale_color_manual(values=c("#E69F00", "#0072B2"), labels = c("Sitting", "Standing")) +
  ylim(500, 700) +
  labs(y = "Response Time (ms)")

```

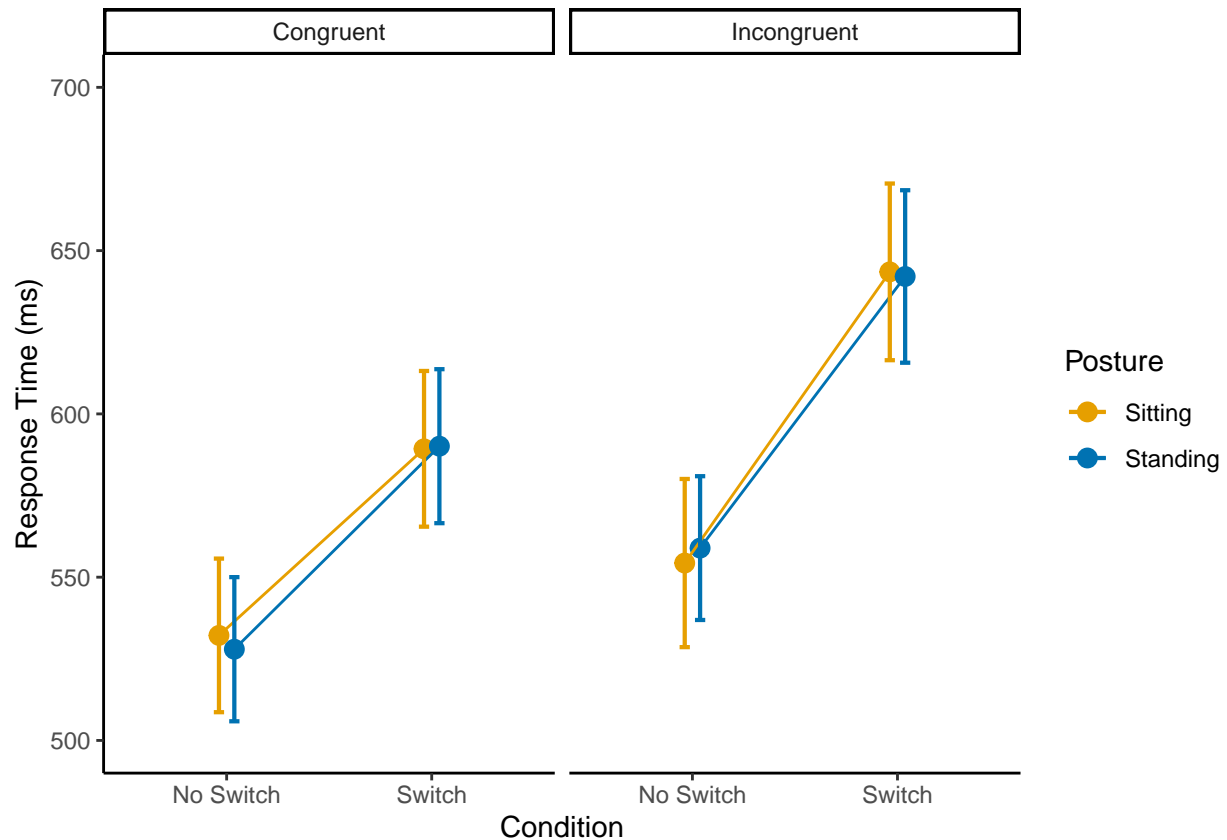
superb::FYI: Here is how the within-subject variables are understood:

| Condition | Congruent | Posture | variable |
|-----------|-----------|---------|------------------------------|
| 1 | 1 | 1 | sitting_congruent_noswitch |
| 2 | 1 | 1 | sitting_congruent_switch |
| 1 | 2 | 1 | sitting_incongruent_noswitch |
| 2 | 2 | 1 | sitting_incongruent_switch |

```
##      1      1      2  standing_congruent_noswitch
##      2      1      2  standing_congruent_switch
##      1      2      2  standing_incongruent_noswitch
##      2      2      2  standing_incongruent_switch
```

```
ggsave(trimmed_RT_plot,
       file = "plots/exp2_ts_trimmed_RT_plot.pdf",
       units = "in",
       width = 6.62,
       height = 5.50,
       dpi = 600)
```

trimmed_RT_plot



```
rtModelTS <- aov_ez(data = trimmed_rt_mean_TS,
                    dv = 'mean_rt',
                    id = 'participant',
                    within = c('posture',
                              'congruentTrialType',
                              'switchTrialType'),
                    type = 3,
                    anova_table = list(es = "pes"))

rt.stats.TS <- ezStats(trimmed_rt_mean_TS,
                      dv = mean_rt,
                      wid = participant,
                      within = .(posture, congruentTrialType, switchTrialType),
```

```

)
type = 3

## Warning: Converting "participant" to factor for ANOVA.
## Warning: Converting "posture" to factor for ANOVA.
## Warning: Converting "congruentTrialType" to factor for ANOVA.
## Warning: Converting "switchTrialType" to factor for ANOVA.
write.csv(rt.stats.TS[, -7],
          file = "output/exp2_Descriptives_trimmed_RT.csv",
          row.names = F)

write.csv(rtModelTS$anova_table, file = "output/exp2_ANOVA_trimmed_RT.csv")
rtModelTS

## Anova Table (Type 3 tests)
##
## Response: mean_rt
##
##           Effect    df    MSE          F    pes p.value
## 1          posture 1, 50 9922.05      0.00 <.001    .995
## 2 congruentTrialType 1, 50 3302.21 48.98 *** .495    <.001
## 3 switchTrialType 1, 50 4166.22 130.17 *** .722    <.001
## 4 posture:congruentTrialType 1, 50 1592.27      0.17 .003    .679
## 5 posture:switchTrialType 1, 50 1519.08      0.00 <.001    .951
## 6 congruentTrialType:switchTrialType 1, 50 1252.33 14.32 *** .223    <.001
## 7 posture:congruentTrialType:switchTrialType 1, 50 1552.36      0.50 .010    .483
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '+' 0.1 ' ' 1

```

Experiment 3 - Visual search

Import and clean data

```

vs_files = list.files(path = "Experiment 3 Data/", full.names = T)
vs_files = vs_files[str_detect(vs_files, pattern="(?!.*SJ)(?!.*.txt)")]

merged.VS.data <- ldply(vs_files,
                        read.delim,
                        header=FALSE,
                        stringsAsFactors = FALSE,
                        sep = "") #for each item in the list apply the function read.delim

#..ADD HEADERS
names(merged.VS.data) = c("sj",
                          "cb",
                          "blockNumber",
                          "blockType",
                          "trialNum",
                          "target",
                          "targetImage",
                          "distractor",
                          "distractorImage",

```

```
"posture",  
"setSize",  
"rt",  
"resp",  
"cresp",  
"ac")
```

```
#...look at unique values from both columns  
unique(merged.VS.data[c('sj')])
```

```
##      sj  
## 1      1  
## 265    10  
## 529    11  
## 793    12  
## 1057   13  
## 1321   14  
## 1585   15  
## 1849   16  
## 2113   17  
## 2377   18  
## 2641   19  
## 2905    2  
## 3169   20  
## 3433   21  
## 3697   22  
## 3961   23  
## 4225   24  
## 4489   25  
## 4753   26  
## 5017   27  
## 5281   28  
## 5545   29  
## 5809    3  
## 6073   30  
## 6337   31  
## 6601   32  
## 6865   33  
## 7129   34  
## 7393   35  
## 7657   36  
## 7921   37  
## 8185   38  
## 8449   39  
## 8713    4  
## 8977   40  
## 9241   41  
## 9505   42  
## 9769   43  
## 10033  44  
## 10297  45  
## 10561  46  
## 10825  47  
## 11089  48
```



```
## 11353 49
## 11617 5
## 11881 50
## 12145 6
## 12409 7
## 12673 8
## 12937 9
```

```
unique(merged.VS.data[c('blockType')])
```

```
##      blockType
## 1      practice
## 9 experimental
```

```
##..DOES EACH SUBJECT HAVE THE SAME NUMBER OF TRIALS
```

```
fable(blockType~sj, merged.VS.data)
```

```
##      blockType experimental practice
## sj
## 1              256            8
## 2              256            8
## 3              256            8
## 4              256            8
## 5              256            8
## 6              256            8
## 7              256            8
## 8              256            8
## 9              256            8
## 10             256            8
## 11             256            8
## 12             256            8
## 13             256            8
## 14             256            8
## 15             256            8
## 16             256            8
## 17             256            8
## 18             256            8
## 19             256            8
## 20             256            8
## 21             256            8
## 22             256            8
## 23             256            8
## 24             256            8
## 25             256            8
## 26             256            8
## 27             256            8
## 28             256            8
## 29             256            8
## 30             256            8
## 31             256            8
## 32             256            8
## 33             256            8
## 34             256            8
## 35             256            8
## 36             256            8
```

```
## 37          256      8
## 38          256      8
## 39          256      8
## 40          256      8
## 41          256      8
## 42          256      8
## 43          256      8
## 44          256      8
## 45          256      8
## 46          256      8
## 47          256      8
## 48          256      8
## 49          256      8
## 50          256      8
```

```
###DO WE HAVE EQUAL OBSERVATIONS FOR EACH COUNTERBALANCE
ftable(blockType~cb, merged.VS.data)
```

```
##      blockType experimental practice
## cb
## 1          6400      200
## 2          6400      200
```

```
###LOOK FOR MISSING DATA
merged.VS.data[!complete.cases(merged.VS.data),]
```

```
## [1] sj          cb          blockNumber    blockType      trialNum      target
## [7] targetImage    distractor     distractorImage posture      setSize      rt
## [13] resp          cresp         ac
## <0 rows> (or 0-length row.names)
```

```
### GET RID OF PRACTICE TRIALS
merged.VS.data <- merged.VS.data[!merged.VS.data$blockType=="practice",]
```

```
### CHECK TRIALS PER CONDITION
ftable(posture+target+distractor+setSize~sj, merged.VS.data)
```

```
##      posture      SITTING      STANDING
##      target      h      s      h      s
##      distractor  e      u      e      u      e      u
##      setSize    4      8      4      8      4      8      4      8
## sj
## 1      16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
## 2      16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
## 3      16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
## 4      16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
## 5      16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
## 6      16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
## 7      16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
## 8      16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
## 9      16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
## 10     16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
## 11     16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
## 12     16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
## 13     16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
## 14     16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16
```

```
## 15      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 16      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 17      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 18      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 19      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 20      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 21      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 22      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 23      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 24      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 25      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 26      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 27      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 28      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 29      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 30      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 31      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 32      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 33      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 34      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 35      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 36      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 37      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 38      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 39      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 40      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 41      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 42      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 43      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 44      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 45      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 46      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 47      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 48      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 49      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
## 50      16 16 16 16 16 16 16 16      16 16 16 16 16 16 16 16
```

```
##... UNLIKE THE STROOP, PARTICIPANTS WERE ALLOWED TO TAKE LONGER THAN 1500MS BUT WERE GIVEN A WARNING
##... TRIALS LONGER THAN 1500 MS will be considered errors (i.e., they will be dropped in RT but kept in
##... Set values in the ac column to 0 on trials where a response is > = 1500
```

```
##...check that only experimental trials are left
unique(merged.VS.data$blockType)
```

```
## [1] "experimental"
```

```
write.table(merged.VS.data, file = "Experiment 3 Data/merged_vs_data.txt", row.names = F)
```

```
##...count trials
```

```
totalTrialsVS = dim(merged.VS.data)[1]
```

```
observationDataVS = data.frame(ftable(blockType~sj, merged.VS.data))[,c(1,3)]
```

```
##...get the number of extreme trials <100 - anticipatory or fast responses
```

```
merged.VS.data= merged.VS.data[!merged.VS.data$rt<=100,]
```

```
validRTTrialsVS = dim(merged.VS.data)[1]
```

```

observationDataVS$validTrials = data.frame(ftable(blockType~sj, merged.VS.data))[,c(3)]

print(paste("percent invalid trials = ", ((totalTrialsVS-validRTTrialsVS)/totalTrialsVS)*100))

## [1] "percent invalid trials = 0"
##...this code changes the 1550ms+ trials into errors
merged.VS.data$ac[merged.VS.data$rt>=1500] = 0

vsCorrect = merged.VS.data[merged.VS.data$ac ==1,]

errorsRemovedVS = dim(vsCorrect)[1]
observationDataVS$correctTrials = data.frame(ftable(blockType~sj, vsCorrect))[,c(3)]

trimInfo = data.frame(totalTrialsVS, validRTTrialsVS, errorsRemovedVS)
head(trimInfo)

##      totalTrialsVS validRTTrialsVS errorsRemovedVS
## 1      12800      12800      12397

#####
##...CHECK 20% CRITERION
#####
observationDataVS$percentLoss = ((observationDataVS$Freq-observationDataVS$correctTrials)/observationDataVS$Freq)*100
sum(observationDataVS$percentLoss>20)

## [1] 0

##...None!

##...RUN TRIMMING PROCEDURE
tempList = pjRecursiveTrim2(vsCorrect, ##...dataset
                             "rt", ##...dependent variables
                             c("sj",
                               "cb",
                               "setSize",
                               "posture")) ##.independent variables

trimmedData=tempList[[1]]
totalN = tempList[[2]]
rejected = tempList[[3]]
percentTrimmed = tempList[[4]]
Ncells = tempList[[5]]

print(paste("Percent of outliers removed: ",round(percentTrimmed,3)))

## [1] "Percent of outliers removed: 1.339"

##...get the trimming info
output.out= data.frame(totalN, rejected,percentTrimmed,Ncells)
head(output.out)

##      totalN rejected percentTrimmed Ncells
## 1  12397      166      1.339034      200

##...get mean error data
vsPE = plyr::ddply(merged.VS.data,

```

```

        .(sj,cb,setSize, posture),
        summarise,
        meanPE = 100 - (mean(ac)*100))
head(vsPE)

##   sj cb setSize  posture meanPE
## 1  1  1      4  SITTING 0.0000
## 2  1  1      4  STANDING 0.0000
## 3  1  1      8  SITTING 0.0000
## 4  1  1      8  STANDING 0.0000
## 5  2  1      4  SITTING 4.6875
## 6  2  1      4  STANDING 4.6875

vsRT = plyr::ddply(trimmedData,
        .(sj, cb, setSize,posture),
        summarise,
        meanRT = mean(rt))

#...combine the RT and error data
vsCombined = cbind(vsRT,meanPE =vsPE$meanPE)
str(vsCombined)

## 'data.frame':   200 obs. of  6 variables:
##  $ sj      : int  1 1 1 1 2 2 2 2 3 3 ...
##  $ cb      : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ setSize: int  4 4 8 8 4 4 8 8 4 4 ...
##  $ posture: chr   "SITTING" "STANDING" "SITTING" "STANDING" ...
##  $ meanRT  : num  677 593 736 620 792 ...
##  $ meanPE  : num  0 0 0 0 4.69 ...

#...set as factors
vsCombined$sj = factor(vsCombined$sj)
vsCombined$cb = factor(vsCombined$cb)
vsCombined$setSize = factor(vsCombined$setSize)
vsCombined$postureFactor = factor(vsCombined$posture)
summary(vsCombined$cb)

##      1      2
## 100 100

```

Reaction time results

```

rtModelVS <- ezANOVA(vsCombined,
        dv = .(meanRT),
        wid=.(sj),
        within=.(postureFactor,setSize),
        detailed=TRUE,
        type=3,
        return_aov=TRUE)

rtModelVS$ANOVA

```

| | Effect | DFn | DFd | SSn | SSd | F | p | p<.05 |
|------|---------------|-----|-----|--------------|------------|--------------|--------------|-------|
| ## 1 | (Intercept) | 1 | 49 | 1.084958e+08 | 1189588.17 | 4.469020e+03 | 8.326740e-50 | * |
| ## 2 | postureFactor | 1 | 49 | 2.052064e+04 | 153738.29 | 6.540411e+00 | 1.369090e-02 | * |

```

## 3          setSize    1  49 3.574624e+05  46863.03 3.737628e+02 1.414816e-24      *
## 4 postureFactor:setSize 1  49 2.246613e+01  35654.35 3.087534e-02 8.612429e-01
##          ges
## 1 9.870285e-01
## 2 1.418774e-02
## 3 2.004492e-01
## 4 1.575613e-05

rt.VS.MSE <- rtModelVS$ANOVA$SSd/rtModelVS$ANOVA$DfD

##...print ANOVA in nice format
paste(rtModelVS$ANOVA$Effect,": F(",
      rtModelVS$ANOVA$DfN,
      ", ",
      rtModelVS$ANOVA$DfD,
      ") = ",
      round(rtModelVS$ANOVA$F,3),
      ", MSE = ",
      round(rt.VS.MSE,3),
      ", p = ",
      round(rtModelVS$ANOVA$p,3),
      ", partialEtaSq = ",
      round(rtModelVS$ANOVA$SSn/(rtModelVS$ANOVA$SSn+rtModelVS$ANOVA$SSd),4),sep="")

## [1] "(Intercept): F(1, 49) = 4469.02, MSE = 24277.31, p = 0, partialEtaSq = 0.9892"
## [2] "postureFactor: F(1, 49) = 6.54, MSE = 3137.516, p = 0.014, partialEtaSq = 0.1178"
## [3] "setSize: F(1, 49) = 373.763, MSE = 956.388, p = 0, partialEtaSq = 0.8841"
## [4] "postureFactor:setSize: F(1, 49) = 0.031, MSE = 727.64, p = 0.861, partialEtaSq = 6e-04"

##...CALCULATE THE BAYES FACTORS FOR THE RT ANALYSIS
bfValues3 = anovaBF(meanRT~setSize*postureFactor+sj,
                    data = vsCombined,
                    whichRandom = "sj",
                    method="laplace")

bfValues3

## Bayes factor analysis
## -----
## [1] setSize + sj : 2.916459e+26 ±NA%
## [2] postureFactor + sj : 1.51507 ±NA%
## [3] setSize + postureFactor + sj : 1.321058e+28 ±NA%
## [4] setSize + postureFactor + setSize:postureFactor + sj : 2.585184e+27 ±NA%
##
## Against denominator:
## meanRT ~ sj
## ---
## Bayes factor type: BFlinearModel, JZS

warnings()
##...get the Bayes factor for the Null Interaction
bfValues3[3]/bfValues3[4]

## Bayes factor analysis
## -----
## [1] setSize + postureFactor + sj : 5.110113 ±NA%
##

```

```

## Against denominator:
##   meanRT ~ setSize + postureFactor + setSize:postureFactor + sj
## ---
## Bayes factor type: BFlinearModel, JZS
1/(bfValues3[3]/bfValues3[4])

## Bayes factor analysis
## -----
## [1] setSize + postureFactor + setSize:postureFactor + sj : 0.1956904 ±NA%
##
## Against denominator:
##   meanRT ~ setSize + postureFactor + sj
## ---
## Bayes factor type: BFlinearModel, JZS
#####
# GET DIFFERENCE SCORES - SEARCH RATE
#####

wideData = dcast(vsCombined, #the name of the dataframe you want to reshape
                 sj+cb #row variables
                 ~posture+setSize, #row variables ~ column variables
                 value.var = "meanRT")
head(wideData)

##   sj cb SITTING_4 SITTING_8 STANDING_4 STANDING_8
## 1  1  1  676.5238  735.5397   593.1129   619.6406
## 2  2  1  792.4590  931.9474   815.7213   993.5000
## 3  3  1  721.2787  827.2222   654.1639   774.5238
## 4  4  1  695.7119  741.9298   660.2632   653.0172
## 5  5  1  693.6034  839.2903   705.1967   759.7419
## 6  6  1  625.3750  694.0484   592.4531   687.5645

wideData$sittingEffect = (wideData$SITTING_8-wideData$SITTING_4)/4
wideData$standingEffect = (wideData$STANDING_8-wideData$STANDING_4)/4
wideData$interaction = wideData$sittingEffect - wideData$standingEffect

searchratestand = mean(wideData$standingEffect) #...search rate in standing condition
searchratesit = mean(wideData$sittingEffect) #...search rate in the sitting condition

searchratestand

## [1] 21.30589
searchratesit

## [1] 20.97073
#One-sample t-tests
t.test(wideData$standingEffect)

##
## One Sample t-test
##
## data: wideData$standingEffect
## t = 16.69, df = 49, p-value < 2.2e-16
## alternative hypothesis: true mean is not equal to 0

```

```
## 95 percent confidence interval:
## 18.74050 23.87127
## sample estimates:
## mean of x
## 21.30589

t.test(wideData$sittingEffect)

##
## One Sample t-test
##
## data: wideData$sittingEffect
## t = 13.055, df = 49, p-value < 2.2e-16
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
## 17.74261 24.19884
## sample estimates:
## mean of x
## 20.97073

#...Exact Binomial SIGN TEST
binom.test(length(wideData$interaction[wideData$interaction>=0]),
            length(unique(vsCombined$sj)))

##
## Exact binomial test
##
## data: length(wideData$interaction[wideData$interaction >= 0]) and length(unique(vsCombined$sj))
## number of successes = 25, number of trials = 50, p-value = 1
## alternative hypothesis: true probability of success is not equal to 0.5
## 95 percent confidence interval:
## 0.355273 0.644727
## sample estimates:
## probability of success
## 0.5
```

Percent error results

```
errModelVS <- ezANOVA(vsCombined,
                      dv = .(meanPE),
                      wid=.(sj),
                      within=.(postureFactor,setSize),
                      detailed=TRUE,
                      type=3,
                      return_aov = TRUE)

errModelVS

## $ANOVA
##           Effect DFn DFd      SSn      SSd      F      p p<.05      ges
## 1      (Intercept)   1  49 1982.531738 1158.9478 83.8209098 3.463466e-12 * 0.504342884
## 2      postureFactor   1  49   3.527832  227.7954  0.7588554 3.879351e-01  0.001807368
## 3           setSize   1  49 129.504395  343.5181 18.4727266 8.162026e-05 * 0.062324860
## 4 postureFactor:setSize 1  49  20.520020  218.1274  4.6096032 3.676850e-02 * 0.010422027
##
## $aov
```



```

##
## Call:
## aov(formula = formula(aov_formula), data = data)
##
## Grand Mean: 3.148438
##
## Stratum 1: sj
##
## Terms:
##              Residuals
## Sum of Squares   1158.948
## Deg. of Freedom      49
##
## Residual standard error: 4.863332
##
## Stratum 2: sj:postureFactor
##
## Terms:
##           postureFactor Residuals
## Sum of Squares      3.52783 227.79541
## Deg. of Freedom        1      49
##
## Residual standard error: 2.156128
## 1 out of 2 effects not estimable
## Estimated effects are balanced
##
## Stratum 3: sj:setSize
##
## Terms:
##           setSize Residuals
## Sum of Squares 129.5044 343.5181
## Deg. of Freedom      1      49
##
## Residual standard error: 2.647749
## 1 out of 2 effects not estimable
## Estimated effects are balanced
##
## Stratum 4: sj:postureFactor:setSize
##
## Terms:
##           postureFactor:setSize Residuals
## Sum of Squares      20.52002 218.12744
## Deg. of Freedom        1      49
##
## Residual standard error: 2.109877
## Estimated effects are balanced

err.VS.MSE <- errModelVS$ANOVA$SSd/errModelVS$ANOVA$DFd

paste(errModelVS$ANOVA$Effect,": F(",
      errModelVS$ANOVA$DFn,
      ", ",
      errModelVS$ANOVA$DFd,
      ") = ",

```

```

round(errModelVS$ANOVA$F,3),
", MSE = ",
round(err.VS.MSE,3),
", p = ",
round(errModelVS$ANOVA$p,3),
", partialEtaSq = ",
round(errModelVS$ANOVA$SSn/(errModelVS$ANOVA$SSn+errModelVS$ANOVA$SSd),4),sep="")

## [1] "(Intercept): F(1, 49) = 83.821, MSE = 23.652, p = 0, partialEtaSq = 0.6311"
## [2] "postureFactor: F(1, 49) = 0.759, MSE = 4.649, p = 0.388, partialEtaSq = 0.0153"
## [3] "setSize: F(1, 49) = 18.473, MSE = 7.011, p = 0, partialEtaSq = 0.2738"
## [4] "postureFactor:setSize: F(1, 49) = 4.61, MSE = 4.452, p = 0.037, partialEtaSq = 0.086"

wideData = dcast(vsCombined, #the name of the dataframe you want to reshape
sj+cb #row variables
~posture+setSize, #row variables ~ column variables
value.var = "meanPE")

head(wideData)

## sj cb SITTING_4 SITTING_8 STANDING_4 STANDING_8
## 1 1 1 0.0000 0.0000 0.0000 0.0000
## 2 2 1 4.6875 10.9375 4.6875 15.6250
## 3 3 1 1.5625 1.5625 0.0000 0.0000
## 4 4 1 6.2500 10.9375 4.6875 6.2500
## 5 5 1 3.1250 3.1250 1.5625 1.5625
## 6 6 1 0.0000 1.5625 0.0000 1.5625

wideData$sittingEffect = (wideData$SITTING_8-wideData$SITTING_4)/4
wideData$standingEffect = (wideData$STANDING_8-wideData$STANDING_4)/4
wideData$interaction = wideData$sittingEffect - wideData$standingEffect

searchratestand = mean(wideData$standingEffect) #...search rate in standing condition
searchratesit = mean(wideData$sittingEffect) #...search rate in the sitting condition

searchratestand

## [1] 0.5625

searchratesit

## [1] 0.2421875

#One-sample t-tests
t.test(wideData$standingEffect)

##
## One Sample t-test
##
## data: wideData$standingEffect
## t = 4.0858, df = 49, p-value = 0.0001623
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
## 0.2858399 0.8391601
## sample estimates:
## mean of x
## 0.5625

```

```
t.test(wideData$sittingEffect)
```

```
##
## One Sample t-test
##
## data: wideData$sittingEffect
## t = 2.4588, df = 49, p-value = 0.01752
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
## 0.04424588 0.44012912
## sample estimates:
## mean of x
## 0.2421875
```

Make plots for visual search

```
graphRT3 = describeBy(vsCombined$meanRT,
                       list(vsCombined$posture,vsCombined$setSize),
                       mat=TRUE,
                       digits = 1)
graphPE3 = describeBy(vsCombined$meanPE,
                       list(vsCombined$posture,vsCombined$setSize),
                       mat=TRUE,
                       digits = 1)

graphRT3 = graphRT3[,c("group1","group2","mean","se")]
graphPE3 = graphPE3[,c("group1","group2","mean","se")]

names(graphRT3) = c("posture","setSize","mean","se")
names(graphPE3) = c("posture","setSize","mean","se")

graphRT3$posture = str_to_upper(graphRT3$posture)

#####
#..calculate the within subjects confidence intervals based on loftus and masson
#..the confidence intervals are based on the interaction term.
#####

graphRT3$se = sqrt((rt.VS.MSE[4])/length(unique(vsCombined$sj)))
graphPE3$se= sqrt((err.VS.MSE[4])/length(unique(vsCombined$sj)))

#####
#..calculate the within subjects confidence intervals based on loftus and masson
#..the confidence intervals are based on the interaction term.
#####

critT3 = qt(p=.025,df=length(unique(vsCombined$sj))-2,lower.tail =FALSE)

#---add the min and max for the confidence intervals
graphRT3$min = graphRT3$mean - (graphRT3$se*critT3)
graphRT3$max = graphRT3$mean + (graphRT3$se*critT3)
```

```

####GET AC DATA FROM twoAnimalWordsPRPac.R
graphRT3$ac = paste("(",format(round(graphPE3$mean,digits=1),nsmall = 1),"),",sep="")
head(graphRT3)

##      posture setSize mean      se      min      max      ac
## X11 SITTING      4 704.7 3.814813 697.0298 712.3702 (2.5)
## X12 STANDING      4 683.8 3.814813 676.1298 691.4702 (2.2)
## X13 SITTING      8 788.6 3.814813 780.9298 796.2702 (3.5)
## X14 STANDING      8 769.0 3.814813 761.3298 776.6702 (4.4)

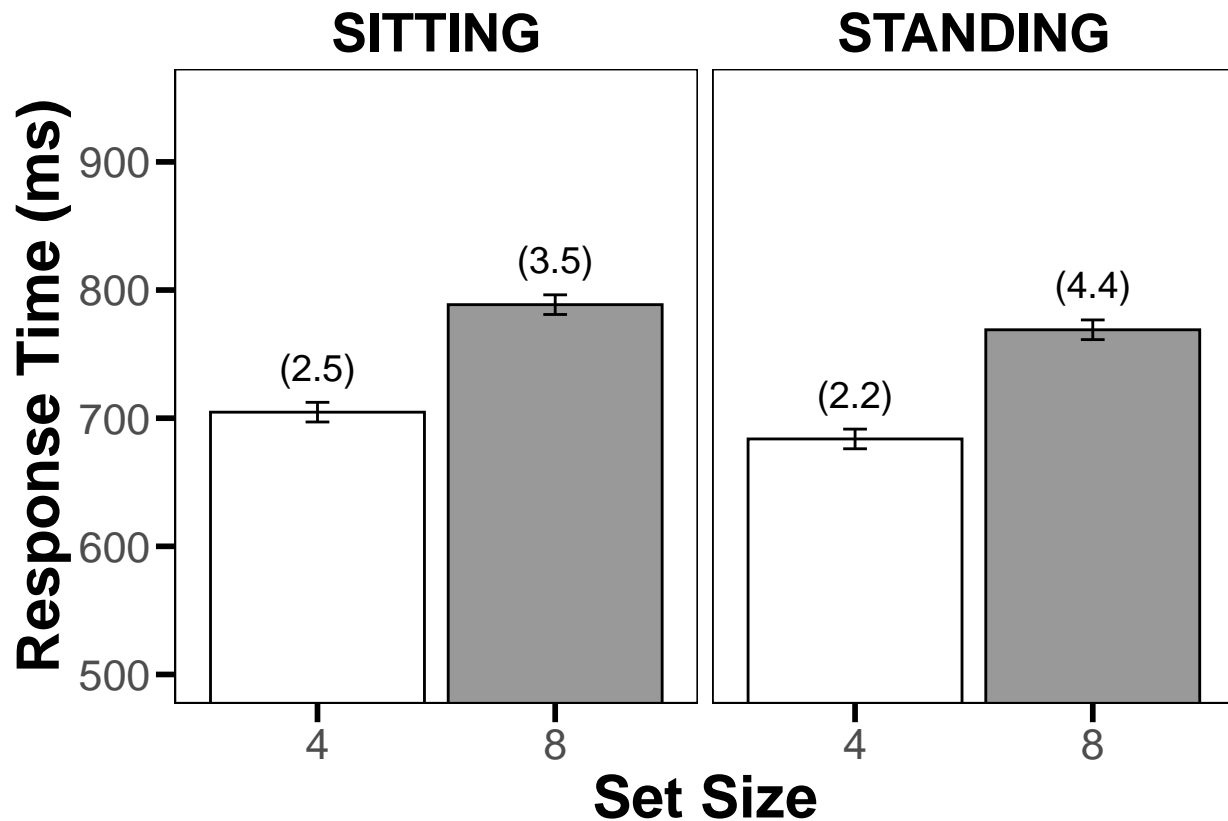
graphRT3$vAdj = 35 #down
graphRT3$vAdj[graphRT$setSize=="incongruent"]=35 #up
graphRT3$hAdj = 0 #right
#graphRT$hAdj[graphRT$posture=="SITTING"]=-60 #left

graphRT3$congruency = factor(graphRT3$setSize,labels = c("4","8"))

interactionPlot3 <- ggplot(graphRT3, aes(setSize, mean, group=posture)) +
  theme(legend.position = "none")+
  scale_fill_manual(values=c("#FFFFFF", "#999999", "#FFFFFF", "#999999"))+
  coord_cartesian(ylim=c(500,950),expand=TRUE)+
  scale_y_continuous(breaks = round(seq(500, 950, by = 100),0))+
  geom_text(aes(label=ac),nudge_x=graphRT3$hAdj,nudge_y =graphRT3$vAdj,size=5)+
  geom_bar(stat="identity", aes(fill=interaction(setSize)),colour="black")+
  geom_errorbar(aes(ymin=min,ymax=max,group=interaction(posture,setSize)), width=.1)+
  labs(x = "Set Size", y = "Response Time (ms)") +
  theme(axis.ticks = element_line(size = 1, colour = "black", linetype = "solid"),
        axis.ticks.length = unit(.25,"cm"),
        #axis.line = element_line(size = 1, colour = "black", linetype = "solid"),
        panel.background = element_rect(fill = "white", colour = "white", size = 1),
        axis.text=element_text(size=16),
        axis.title=element_text(size=22,face="bold"),
        strip.text = element_text(size = 20, face = "bold",colour = "black", angle = 0),
        panel.border = element_rect(colour = "black", fill = NA, size = 0.50),
        strip.background = element_rect(fill=NA,colour="NA",size = 2))+
  facet_grid(~posture)

interactionPlot3

```



```
ggsave(interactionPlot3,
  file = "plots/exp3_visual_search_interaction_plot.pdf",
  units = "in",
  width = 8.5,
  height = 5,
  dpi = 600)
```

Reproduce results from Smith et al.

```
# Data source: The data from all the experiments are available at:
# http://rabrams.net under the Resources tab.

### Experiment 1 (Stroop)

#load acc data
Smith_Exp1_acc <- read_excel("smith_data.xlsx",
  sheet = "Exp1Acc",
  n_max = 14) #Sample size in Smith

#load rt data
Smith_Exp1_rt <- read_excel("smith_data.xlsx",
  sheet = "Exp1RT",
  n_max = 14)

#Restructure from wide to narrow, using tidyr
Smith_Exp1_acc_narrow <- Smith_Exp1_acc %>%
```

```

pivot_longer(cols = sit_neut:sta_con, names_to = "condition", values_to = "acc") %>%
separate(col = condition, into = c("posture", "con"))

Smith_Exp1_rt_narrow <- Smith_Exp1_rt %>%
pivot_longer(cols = sit_neut:sta_con, names_to = "condition", values_to = "rt") %>%
separate(col = condition, into = c("posture", "con"))

Smith_Exp1 <- merge(Smith_Exp1_acc_narrow, Smith_Exp1_rt_narrow)

Smith_exp1_anova_acc <- aov_ez(data = Smith_Exp1,
                             dv = 'acc',
                             id = 'subj',
                             within = c('posture', 'con'),
                             anova_table = list(es = "pes", correction = "none"),
                             type = 3)
kable(nice(Smith_exp1_anova_acc), caption = "ANOVA results for Smith Exp 1 - accuracy")

```

Table 2: ANOVA results for Smith Exp 1 - accuracy

| Effect | df | MSE | F | pes | p.value |
|-------------|-------|------|--------|------|---------|
| posture | 1, 13 | 4.59 | 0.51 | .038 | .488 |
| con | 2, 26 | 3.19 | 3.76 * | .224 | .037 |
| posture:con | 2, 26 | 2.18 | 1.47 | .101 | .250 |

```

Smith_exp1_anova_rt <- aov_ez(data = Smith_Exp1,
                             dv = 'rt',
                             id = 'subj',
                             within = c('posture', 'con'),
                             anova_table = list(es = "pes", correction = "none"),
                             type = 3)
kable(nice(Smith_exp1_anova_rt), caption = "ANOVA results for Smith Exp 1 - RT")

```

Table 3: ANOVA results for Smith Exp 1 - RT

| Effect | df | MSE | F | pes | p.value |
|-------------|-------|--------|--------|------|---------|
| posture | 1, 13 | 816.34 | 0.09 | .007 | .768 |
| con | 2, 26 | 150.32 | 3.45 * | .210 | .047 |
| posture:con | 2, 26 | 128.10 | 4.73 * | .267 | .018 |

Experiment 2 (Task-switching)

#load acc data

```

Smith_Exp2_acc <- read_excel("smith_data.xlsx",
                             sheet = "Exp2Acc",
                             n_max = 30)

```

#load rt data

```

Smith_Exp2_rt <- read_excel("smith_data.xlsx",
                             sheet = "Exp2RT",
                             n_max = 30)

```

```

#Restructure from wide to narrow, using tidyr
Smith_Exp2_acc_narrow <- Smith_Exp2_acc %>%
  pivot_longer(cols = sit_congruent_noswitch:stand_incongruent_switch,
    names_to = "condition", values_to = "acc") %>%
  separate(col = condition, into = c("posture", "con", "switch"))

Smith_Exp2_rt_narrow <- Smith_Exp2_rt %>%
  pivot_longer(cols = sit_congruent_noswitch:stand_incongruent_switch,
    names_to = "condition", values_to = "rt") %>%
  separate(col = condition, into = c("posture", "con", "switch"))

Smith_Exp2 <- merge(Smith_Exp2_acc_narrow, Smith_Exp2_rt_narrow)

Smith_exp2_anova_acc <- aov_ez(data = Smith_Exp2,
  dv = 'acc',
  id = 'subj',
  within = c('posture', 'con', 'switch'),
  anova_table = list(es = "pes", correction = "none"),
  type = 3)
kable(nice(Smith_exp2_anova_acc), caption = "ANOVA results for Smith Exp 2 - accuracy")

```

Table 4: ANOVA results for Smith Exp 2 - accuracy

| Effect | df | MSE | F | pes | p.value |
|--------------------|-------|------|-----------|------|---------|
| posture | 1, 29 | 0.00 | 2.86 | .090 | .101 |
| con | 1, 29 | 0.00 | 67.40 *** | .699 | <.001 |
| switch | 1, 29 | 0.00 | 62.94 *** | .685 | <.001 |
| posture:con | 1, 29 | 0.00 | 1.68 | .055 | .205 |
| posture:switch | 1, 29 | 0.00 | 5.54 * | .160 | .026 |
| con:switch | 1, 29 | 0.00 | 23.34 *** | .446 | <.001 |
| posture:con:switch | 1, 29 | 0.00 | 0.50 | .017 | .484 |

```

Smith_exp2_anova_rt <- aov_ez(data = Smith_Exp2,
  dv = 'rt',
  id = 'subj',
  within = c('posture', 'con', 'switch'),
  anova_table = list(es = "pes", correction = "none"),
  type = 3)
kable(nice(Smith_exp2_anova_rt), caption = "ANOVA results for Smith Exp 2 - RT")

```

Table 5: ANOVA results for Smith Exp 2 - RT

| Effect | df | MSE | F | pes | p.value |
|--------------------|-------|------|------------|------|---------|
| posture | 1, 29 | 0.02 | 0.03 | .001 | .856 |
| con | 1, 29 | 0.00 | 40.95 *** | .585 | <.001 |
| switch | 1, 29 | 0.00 | 115.10 *** | .799 | <.001 |
| posture:con | 1, 29 | 0.00 | 0.49 | .017 | .489 |
| posture:switch | 1, 29 | 0.00 | 0.10 | .004 | .751 |
| con:switch | 1, 29 | 0.00 | 4.77 * | .141 | .037 |
| posture:con:switch | 1, 29 | 0.00 | 0.67 | .023 | .420 |

```

### Experiment 3 (Visual Search)

#load acc data
Smith_Exp3_acc <- read_excel("smith_data.xlsx",
                             sheet = "Exp3Acc",
                             n_max = 12) %>%

  select(subj:sit8)

#load rt data
Smith_Exp3_rt <- read_excel("smith_data.xlsx",
                             sheet = "Exp3RT",
                             n_max = 12)%>%

  select(subj:sit8)

#Restructure from wide to narrow, using tidyr
Smith_Exp3_acc_narrow <- Smith_Exp3_acc %>%
  pivot_longer(cols = stand4:sit8, names_to = "condition", values_to = "acc") %>%
  separate(col = condition, into = c("posture", "set.size"), sep = -1)

Smith_Exp3_rt_narrow <- Smith_Exp3_rt %>%
  pivot_longer(cols = stand4:sit8, names_to = "condition", values_to = "rt") %>%
  separate(col = condition, into = c("posture", "set.size"), sep = -1)

Smith_Exp3 <- merge(Smith_Exp3_acc_narrow, Smith_Exp3_rt_narrow)

Smith_exp3_anova_acc <- aov_ez(data = Smith_Exp3,
                               dv = 'acc',
                               id = 'subj',
                               within = c('posture', 'set.size'),
                               anova_table = list(es = "pes", correction = "none"),
                               type = 3)
kable(nice(Smith_exp3_anova_acc), caption = "ANOVA results for Smith Exp 3 - accuracy")

```

Table 6: ANOVA results for Smith Exp 3 - accuracy

| Effect | df | MSE | F | pes | p.value |
|------------------|-------|------|--------|------|---------|
| posture | 1, 11 | 4.61 | 0.76 | .065 | .401 |
| set.size | 1, 11 | 1.75 | 3.44 + | .238 | .090 |
| posture:set.size | 1, 11 | 1.38 | 7.96 * | .420 | .017 |

```

Smith_exp3_anova_rt <- aov_ez(data = Smith_Exp3,
                               dv = 'rt',
                               id = 'subj',
                               within = c('posture', 'set.size'),
                               anova_table = list(es = "pes", correction = "none"),
                               type = 3)
kable(nice(Smith_exp3_anova_rt), caption = "ANOVA results for Smith Exp 3 - RT")

```


Table 7: ANOVA results for Smith Exp 3 - RT

| Effect | df | MSE | F | pes | p.value |
|------------------|-------|---------|-----------|------|---------|
| posture | 1, 11 | 2323.81 | 0.23 | .021 | .639 |
| set.size | 1, 11 | 473.24 | 81.88 *** | .882 | <.001 |
| posture:set.size | 1, 11 | 298.96 | 5.91 * | .350 | .033 |

Overall summary plots: Smith and replication

```
smith_anovas <- lst(Smith_exp1_anova_acc$anova_table,
  Smith_exp1_anova_rt$anova_table,
  Smith_exp2_anova_acc$anova_table,
  Smith_exp2_anova_rt$anova_table,
  Smith_exp3_anova_acc$anova_table,
  Smith_exp3_anova_rt$anova_table)

repl_anovas <- lst(aov_ez(data = stroopCombined,
  dv = "meanPE",
  id = "sj",
  within = c("posture", "congruency"),
  type = 3,
  anova_table = list(es = "pes")),
  aov_ez(data = stroopCombined,
  dv = "meanRT",
  id = "sj",
  within = c("posture", "congruency"),
  type = 3,
  anova_table = list(es = "pes")),
  accModelTS,
  rtModelTS,
  aov_ez(data = vsCombined,
  dv = "meanPE",
  id = "sj",
  within = c("postureFactor", "setSize"),
  type = 3,
  anova_table = list(es = "pes")),
  aov_ez(data = vsCombined,
  dv = "meanRT",
  id = "sj",
  within = c("postureFactor", "setSize"),
  type = 3,
  anova_table = list(es = "pes")))

for (i in 1:6){

  smith_anovas[[i]] <- smith_anovas[[i]] %>%
    rownames_to_column() %>%
    as.data.frame() %>%
    rowwise() %>%
    mutate(LL = get.ci.partial.eta.squared(F, `num Df`, `den Df`, conf.level = 0.9)$LL,
      UL = get.ci.partial.eta.squared(F, `num Df`, `den Df`, conf.level = 0.9)$UL)
```

```

repl_anovas[[i]] <- repl_anovas[[i]]$anova_table %>%
  rownames_to_column() %>%
  as.data.frame() %>%
  rowwise() %>%
  mutate(LL = get.ci.partial.eta.squared(F, `num Df`, `den Df`, conf.level = 0.9)$LL,
         UL = get.ci.partial.eta.squared(F, `num Df`, `den Df`, conf.level = 0.9)$UL)
}

###Exp1 (Stroop)
smith.stroop <- smith_anovas[[1]] %>%
  ungroup() %>%
  bind_rows(smith_anovas[[2]]) %>%
  select(Effect = rowname, pes, LL, UL) %>%
  mutate(dv = rep(c("acc", "rt"), each = 3), col = rep(c("black", "black", "red"), 2))

repl.stroop <- repl_anovas[[1]] %>%
  ungroup() %>%
  bind_rows(repl_anovas[[2]]) %>%
  select(Effect = rowname, pes, LL, UL) %>%
  mutate(dv = rep(c("acc", "rt"), each = 3), col = rep(c("black", "black", "red"), 2),
         Effect = smith.stroop$Effect)

stroop.effects <- merge(smith.stroop, repl.stroop,
                      by = c("Effect", "dv"), suffixes = c("Smith", "Replication"))

stroop.plot <- ggplot(data = stroop.effects, aes(x = pesSmith, y = pesReplication, shape = dv)) +
  geom_point(size = 2.5, col = stroop.effects$colSmith) +
  xlim(0, 1.00) +
  ylim(0, 1.00) +
  geom_abline(slope = 1, intercept = 0, col = "blue") +
  theme_classic() +
  theme(legend.position = c(0.2, 0.85),
        legend.background = element_rect(colour = "black",
                                           linetype = "solid",
                                           fill = "lightgray"),
        legend.title = element_blank(),
        legend.margin = margin(-3, 5, 0, 0)) +
  labs(y = "Replication", x = "Smith et al.", title = "Stroop")

###Exp2 (Task-switching)
smith.ts <- smith_anovas[[3]] %>%
  ungroup() %>%
  bind_rows(smith_anovas[[4]]) %>%
  select(Effect = rowname, pes, LL, UL) %>%
  mutate(dv = rep(c("acc", "rt"), each = 7),
         col = rep(c("black", "black", "black", "black", "red", "black", "black"), 2))

repl.ts <- repl_anovas[[3]] %>%
  ungroup() %>%
  bind_rows(repl_anovas[[4]]) %>%
  select(Effect = rowname, pes, LL, UL) %>%

```

```

mutate(dv = rep(c("acc","rt"), each = 7),
       col = rep(c("black","black","black","black","red","black","black"),2),
       Effect = smith.ts$Effect)

ts.effects <- merge(smith.ts, repl.ts,
                   by = c("Effect","dv"), suffixes = c("Smith","Replication"))

ts.plot <- ggplot(data = ts.effects, aes(x = pesSmith, y = pesReplication, shape = dv)) +
  geom_point(size = 2.5, col = ts.effects$colSmith) +
  xlim(0, 1.00) +
  ylim(0, 1.00) +
  geom_abline(slope = 1, intercept = 0, col = "blue") +
  theme_classic() +
  theme(legend.position = c(0.2, 0.85),
        legend.background = element_rect(colour = "black",
                                           linetype = "solid",
                                           fill = "lightgray"),
        legend.title = element_blank(),
        legend.margin=margin(-3,5,0,0)) +
  labs(y = "Replication", x = "Smith et al.", title = "Task-Switching")

###Exp3 (Visual Search)
smith.vs <- smith_anovas[[5]] %>%
  ungroup() %>%
  bind_rows(smith_anovas[[6]]) %>%
  select(Effect = rowname, pes, LL, UL) %>%
  mutate(dv = rep(c("acc","rt"), each = 3),
         col = rep(c("black","black","red"),2))

repl.vs <- repl_anovas[[5]] %>%
  ungroup() %>%
  bind_rows(repl_anovas[[6]]) %>%
  select(Effect = rowname, pes, LL, UL) %>%
  mutate(dv = rep(c("acc","rt"), each = 3),
         col = rep(c("black","black","red"),2),
         Effect = smith.vs$Effect)

vs.effects <- merge(smith.vs, repl.vs,
                   by = c("Effect","dv"), suffixes = c("Smith",
                                                         "Replication"))

vs.plot <- ggplot(data = vs.effects, aes(x = pesSmith, y = pesReplication, shape = dv)) +
  geom_point(size = 2.5, col = vs.effects$colSmith) +
  xlim(0, 1) +
  ylim(0, 1) +
  geom_abline(slope = 1, intercept = 0, col = "blue") +
  theme_classic() +
  theme(legend.position = c(0.2, 0.85),
        legend.background = element_rect(colour = "black",

```

```

                                linetype = "solid",
                                fill = "lightgray"),
  legend.title = element_blank(),
  legend.margin=margin(-3,5,0,0)) +
labs(y = "Replication", x = "Smith et al.", title = "Visual Search")

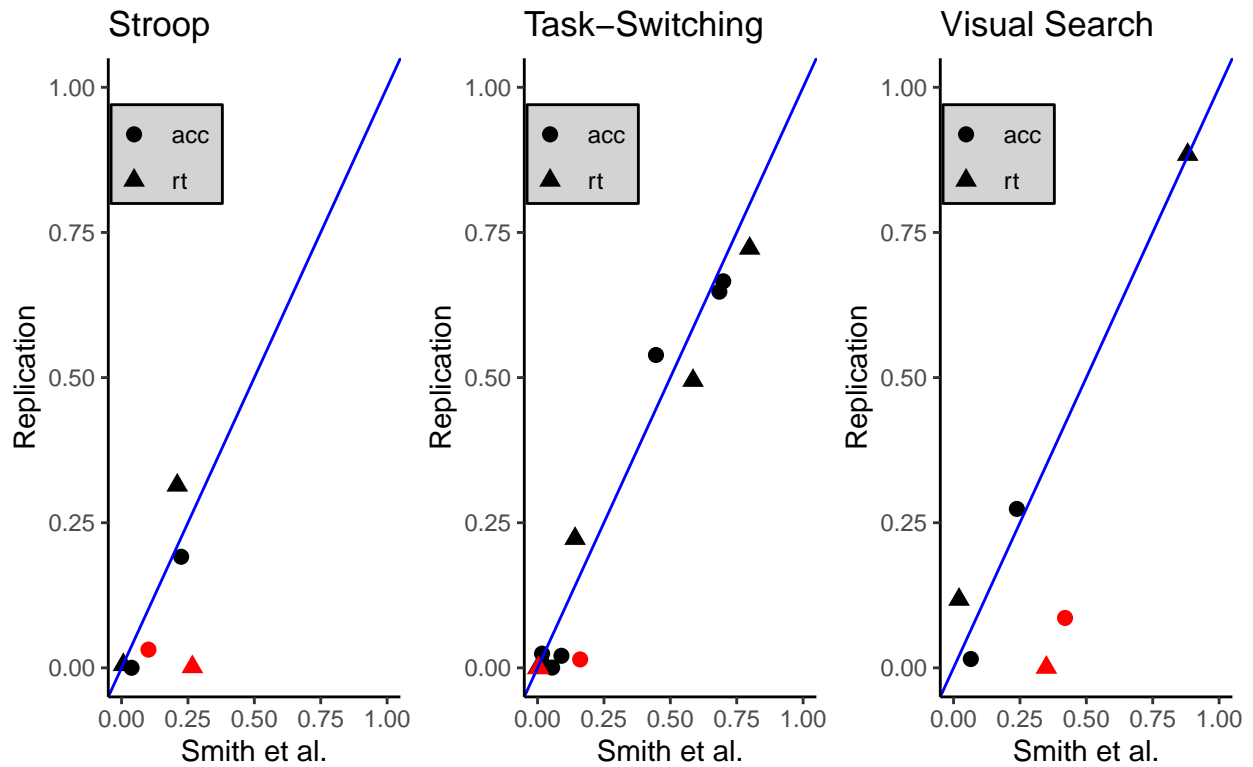
all.plot <- plot_grid(stroop.plot, ts.plot, vs.plot, ncol = 3)

title <- ggdraw() +
  draw_label(
    "Effect Size Comparisons",
    fontface = 'bold',
    x = 0,
    hjust = 0
  ) +
  theme(
    # add margin on the left of the drawing canvas,
    # so title is aligned with left edge of first plot
    plot.margin = margin(0, 0, 0, 7)
  )
all.plot <- plot_grid(
  title, all.plot,
  ncol = 1,
  # rel_heights values control vertical title margins
  rel_heights = c(0.1, 1)
)

all.plot

```

Effect Size Comparisons



```
ggsave(all.plot,
       file = "plots/OSF_all_effects_plot.pdf",
       units = "in",
       width = 9.5,
       height = 4.50,
       dpi = 600)

### Forest plot
#Graph comparison of key effects for all three experiments
forest.colors <- c("black", "red")

forest.data <- data.frame(Experiment = rep(c("Smith", "Replication"), 3),
                          name = rep(c("Stroop", "Task-switching", "Visual Search"), each = 2),
                          dv = rep(c("rt", "acc", "rt"), each = 2),
                          pes = numeric(6),
                          LL = numeric(6),
                          UL = numeric(6))

forest.data[1,4:6] <- smith_anovas[[2]][3,c(6,8,9)]
forest.data[2,4:6] <- repl_anovas[[2]][3,c(6,8,9)]

forest.data[3,4:6] <- smith_anovas[[3]][5,c(6,8,9)]
forest.data[4,4:6] <- repl_anovas[[3]][5,c(6,8,9)]

forest.data[5,4:6] <- smith_anovas[[6]][3,c(6,8,9)]
forest.data[6,4:6] <- repl_anovas[[6]][3,c(6,8,9)]
```

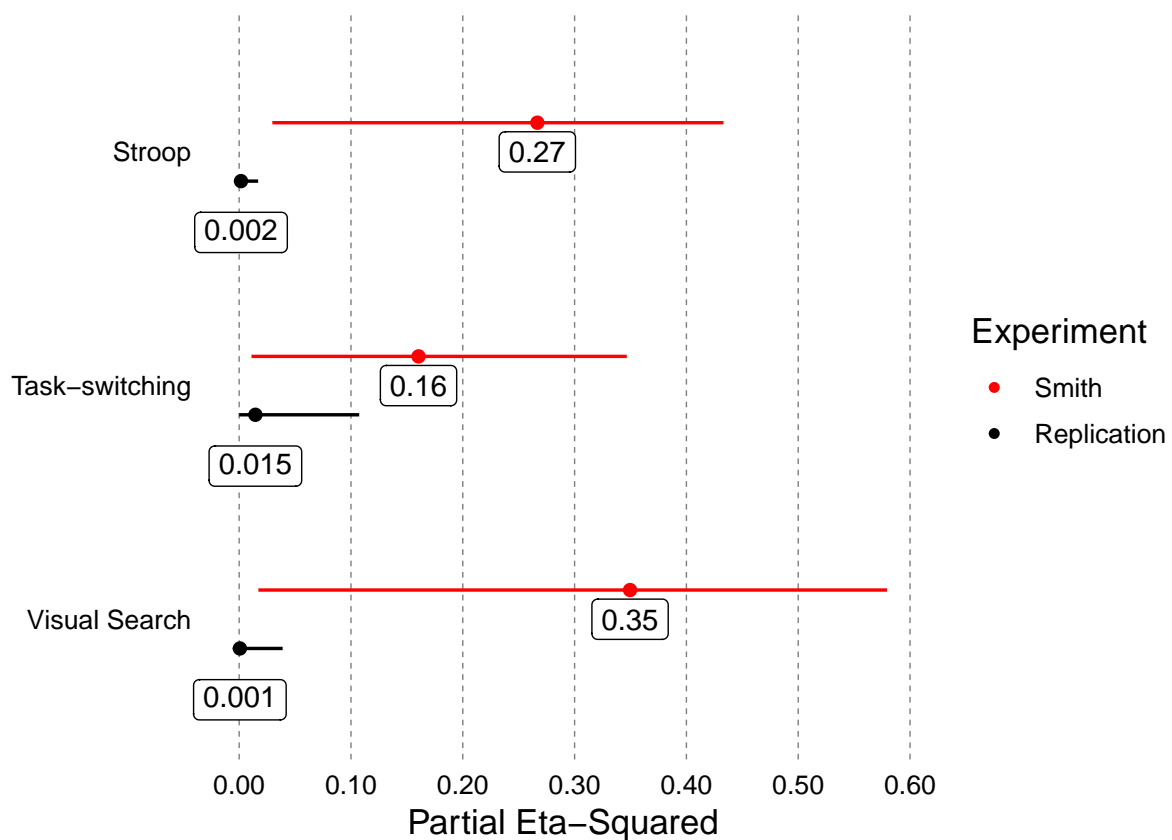
```

forest.comp <- mod.forestplot(df = forest.data,
                             estimate = pes,
                             ci.lower = LL,
                             ci.upper = UL,
                             colour = Experiment,
                             xlab = "Partial Eta-Squared"
) +
  scale_color_manual(values = forest.colors) +
  scale_x_continuous(labels = label_number(accuracy = 0.01), breaks = seq(0.00, 0.60, 0.10)) +
  #Too busy w/numbers for effects?
  geom_label(data = subset(forest.data, Experiment == "Smith"),
            aes(label = round(pes, digits = 2))) +
  geom_label(data = subset(forest.data, Experiment == "Replication"),
            aes(label = round(pes, digits = 3)),
            vjust = 2.50) +
  coord_cartesian(clip="off") #Disable clipping to draw outside plot area

```

Scale for 'colour' is already present. Adding another scale for 'colour', which will replace the
existing scale.

```
forest.comp
```



```

ggsave(forest.comp,
       file = "plots/forest_plot.pdf",
       units = "in",

```

```

width = 6,
height = 6,
dpi = 600)

#Compare proportions: replication divided by original effect sizes
replication.effects <- subset(forest.data, Experiment == "Replication")
original.effects    <- subset(forest.data, Experiment == "Smith")

#As a percentage
prop.effects <- (replication.effects$pes/original.effects$pes)*100
#< 1%, ~9%, and <1%
prop.effects

## [1] 0.6181838 9.0496059 0.1801278

#Average proportion is 3.28%
mean(prop.effects)

## [1] 3.282639

```