

# Three Replication Summary

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## Get Smith data and effect sizes

```
### Experiment 1 (Stroop)

#load acc data
Smith_Exp1_acc <- read_excel("Smith Data/StandingData.xlsx",
                             sheet = "Exp1Acc",
                             n_max = 14)

#load rt data
Smith_Exp1_rt <- read_excel("Smith Data/StandingData.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 1: 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 2: 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/StandingData.xlsx",
                             sheet = "Exp2Acc",
                             n_max = 30)

#load rt data
Smith_Exp2_rt <- read_excel("Smith Data/StandingData.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 3: 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 4: 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/StandingData.xlsx",
  sheet = "Exp3Acc",
  n_max = 12) %>%
  select(subj:sit8)

#load rt data
Smith_Exp3_rt <- read_excel("Smith Data/StandingData.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 5: 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 6: 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

## Collect replication data and effect sizes

```

### Experiment 1 (Stroop)

#for now, using stats reported in paper draft
repl_exp1_anova_rt <- data.frame(Effect = c("posture","con", "posture:con"),
  DFn = c(1,2,2),
  DFd = c(49,98,98),
  MSE = c(3188.110, 1578.332, 520.963),
  F = c(0.258, 22.470, 0.081),
  pes = c(.005, .314, .002))

repl_exp1_anova_acc <- data.frame(Effect = c("posture","con", "posture:con"),
  DFn = c(1,2,2),
  DFd = c(49,98,98),

```

```

MSE = c(14.823, 9.641, 5.865),
F = c(0.001, 8.813, 1.533),
pes = c(.005, .152, .030))

### Experiment 2 (Task-switching)

repl_exp2_anova_rt <- read.csv("output/Task_switching_ANOVA_trimmed_RT.csv",
                              stringsAsFactors = F) %>%
  select(-X) %>%
  filter((Effect != "(Intercept)"))

repl_exp2_anova_acc <- read.csv("output/Task_switching_ANOVA_acc.csv",
                                stringsAsFactors = F) %>%
  select(-X) %>%
  filter((Effect != "(Intercept)"))

### Experiment 3 (Visual Search)

#for now, using stats reported in paper draft
repl_exp3_anova_rt <- data.frame(Effect = c("posture", "set.size", "posture:set.size"),
                                DFn = c(1,1,1),
                                DFd = c(49,49,49),
                                MSE = c(3137.516, 956.388, 727.64),
                                F = c(6.54, 373.763, 0.031),
                                pes = c(.118, .884, .001))

repl_exp3_anova_acc <- data.frame(Effect = c("posture", "set.size", "posture:set.size"),
                                DFn = c(1,1,1),
                                DFd = c(49,49,49),
                                MSE = c(2.430, 3.628, 2.794),
                                F = c(3.311, 2.312, 0.623),
                                pes = c(.0633, .045, .013))

```

## Add CIs to pes

```

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(repl_exp1_anova_acc,
                  repl_exp1_anova_rt,
                  repl_exp2_anova_acc,
                  repl_exp2_anova_rt,
                  repl_exp3_anova_acc,
                  repl_exp3_anova_rt)

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]] %>%
  rowwise() %>%
  mutate(LL = get.ci.partial.eta.squared(F, DFn, DFd, conf.level = 0.9)$LL,
         UL = get.ci.partial.eta.squared(F, DFn, DFd, conf.level = 0.9)$UL)
}

```

## Make summary plots

```

###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, pes, LL, UL) %>%
  mutate(dv = rep(c("acc", "rt"), each = 3), col = rep(c("black", "black", "red"), 2))

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", 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, 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", 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, pes, LL, UL) %>%
  mutate(dv = rep(c("acc","rt"), each = 3),
         col = rep(c("black","black","red"),2))

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", 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)
)

ggsave(all.plot,
       file = "plots/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- Similar to forest plot in sig
#filtering paper?
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(6,7,8)]

forest.data[3,4:6] <- smith_anovas[[3]][5,c(6,8,9)]
forest.data[4,4:6] <- repl_anovas[[3]][5,c(10,11,12)]

```

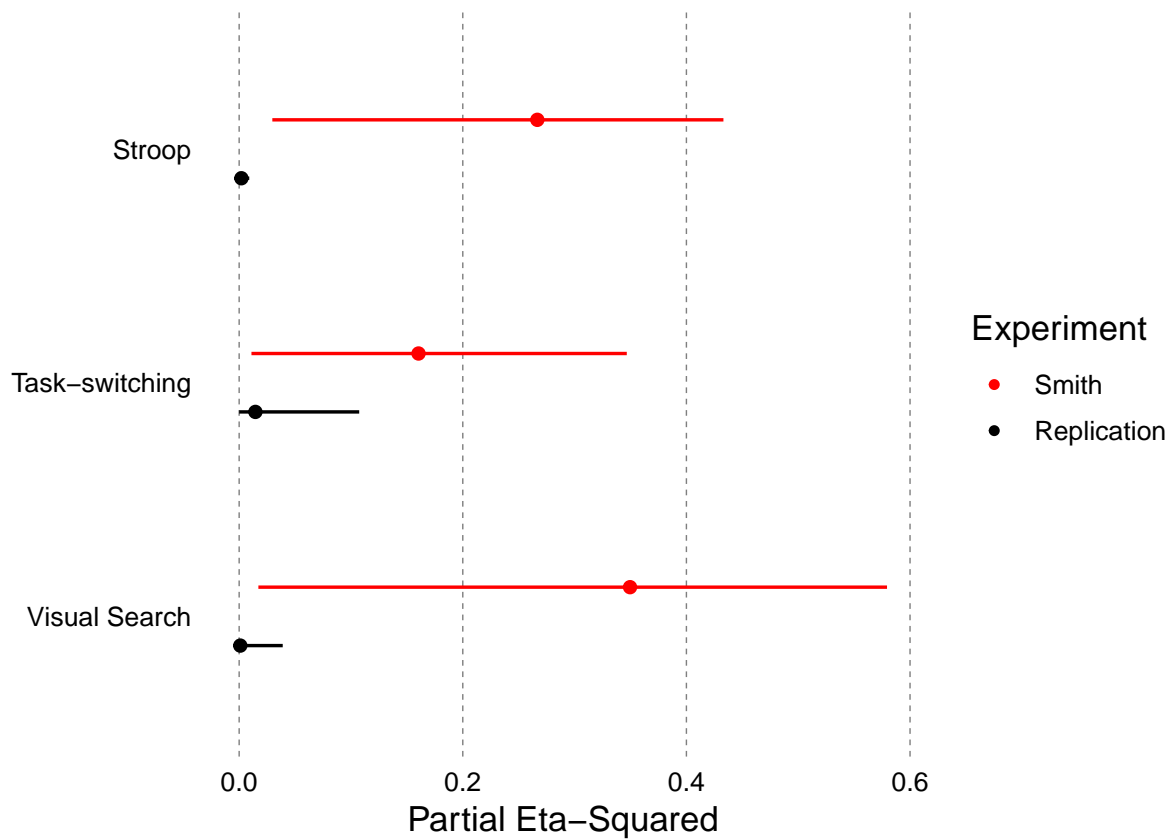


```
forest.data[5,4:6] <- smith_anovas[[6]][3,c(6,8,9)]
forest.data[6,4:6] <- repl_anovas[[6]][3,c(6,7,8)]
```

```
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 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)
```