Expt1- Recognition Memory

Contents

In this preregistered experiment we examined the effect of testing expectancy on the disfluency effect using a recognition memory test.

Load in packages

Read in raw groilla data

```
# read in low test expect data exported from gorilla
setwd(here::here('expt1_recog_data', 'Gorilla_data_low'))

data=here::here('expt1_recog_data', 'Gorilla_data_low')  # path to data files

file_list=list.files(data, pattern=".csv") # list of data files

# read in all files
datasetlow <-
  do.call("rbind", lapply(file_list, FUN=function(files){

    for (i in 1:length(files)){
      if(file.exists(files[i])){
        message( "now processing:", files[i])
      }
    }
```

```
    fread(files, header=TRUE, sep=",", na.strings = "", fill=TRUE)})) #fread makes reading in files qui
#
```

```
library(lubridate)
# clean up data! Select data from after the pre-registation!


low<-datasetlow %>%
  janitor::clean_names(.) %>%
  dplyr::mutate(date=as.Date(utc_date)) %>%
  dplyr::filter(date=="08/06/2020" |date=="09/06/2020" , zone_type=="response_button_text")

#response as character
low$response<-as.character(low$response)

#assign column to denot low test expect
low$testexpect<-"low"
```

```
# high test expect
setwd(here::here('expt1_recog_data', 'Gorilla_data_high'))

data=here::here('expt1_recog_data', 'Gorilla_data_high')  # path to data files

file_list=list.files(data, pattern=".csv") # list of data files

# read in all files
highdata <-
  do.call("rbind", lapply(file_list, FUN=function(files){

    for (i in 1:length(files)){
      if(file.exists(files[i])){
        message( "now processing:", files[i])
      }
    }
    fread(files, header=TRUE, sep=",", na.strings = "", fill=TRUE)})) #fread makes reading in files qui
#
```

```
library(lubridate)
# a batch of Ss we run before preregistration that should not be included in the analysis
high <-highdata %>%
  janitor::clean_names(.) %>%
  dplyr::mutate(date=as.Date(utc_date)) %>%
  dplyr::filter(date=="08/06/2020" | date=="0009/07/2020" |date=="0010/07/2020" | date=="09/06/2020", z

#response as character
high$response<-as.character(high$response)

# assign column to denot high test expect
high$testexpect<-"high"
```

```
# bind low and high datasets
high_low<-rbind(high, low)
```

Recognition memory

Calculate d-prime

```
#response as character
#calculate hit rate and far and compute dprime and other measures
ex4=high_low %>% dplyr::mutate(condition1= dplyr::case_when(
  condition == "SF" ~ "Sans Forgetica",
  condition =="normal" ~  "Arial",
), isold= dplyr::case_when (
  old_new== "old" ~ 1,
  old_new== "new" ~ 0),
sayold=dplyr::case_when(
  response=="old"~ 1,
  response=="new" ~ 0,
  ))


#classic SDT
sdt <- ex4 %>%
  dplyr::mutate(type = "hit",
         type = ifelse(isold==1 & sayold==0, "miss", type),
         type = ifelse(isold==0 & sayold==0, "cr", type),  # Correct rejection
         type = ifelse(isold==0 & sayold==1, "fa", type))  # False alarm
sdt <- sdt %>%
  dplyr::group_by(participant_private_id, type, condition1, testexpect) %>%
  dplyr::summarise(count = n()) %>%
  tidyr::spread(type, count)  # Format data to one row per person

sdt <- sdt %>%
  dplyr::group_by(participant_private_id, condition1, testexpect)%>%
  dplyr::mutate(hr = hit / (hit+miss),
         fa = fa / (fa+cr)) %>%
  dplyr::mutate(hr=case_when(
    is.na(hr) ~ 0.99,
    TRUE ~ hr),
    fa=case_when(
      is.na(fa)  ~ 0.01,
    TRUE ~ fa),
     zhr=qnorm(hr),
     zfa=qnorm(fa),
    dprime = zhr-zfa) %>%
  ungroup()
```

Plot

```
#set up raincloud params
# fig for dprime

highlowaov=sdt  %>% select(participant_private_id, condition1, testexpect, dprime) %>%
  mutate(testexpect=ifelse(testexpect=="low", "Low Test Expectancy", "High Test Expectancy"))
```

```
#plot
bold <- element_text(face = "bold", color = "black", size = 14)
```

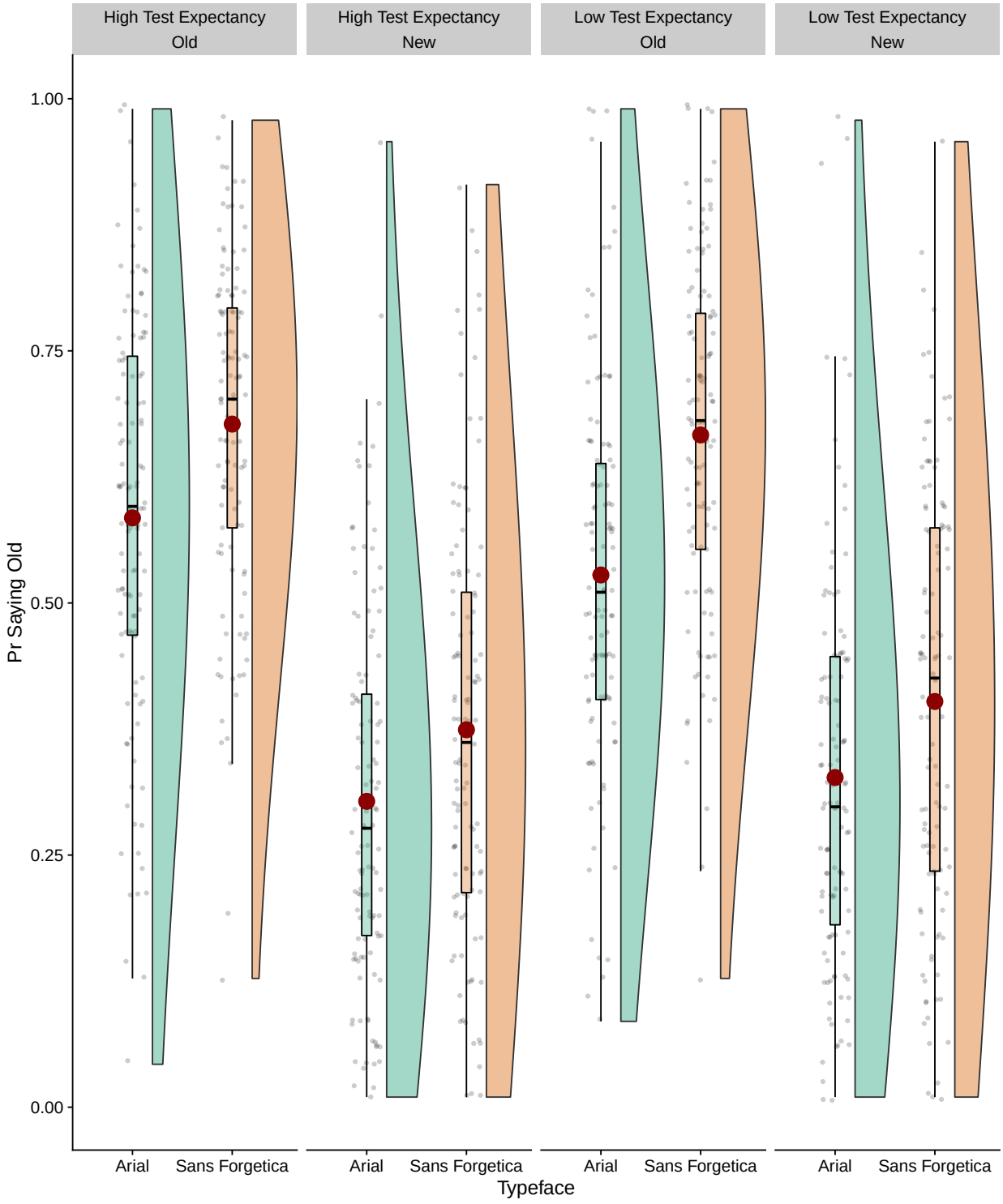


Figure 1: Raincloud plots (Allen et al., 2019) depicting raw data (dots), box plots, and half violin kernel desntiy plots, with mean (red dot). Proportion of "old" responses as a function of Test Expectancy for Experiment 1.

```r
sdtmean= highlowaov %>%
  dplyr::group_by(testexpect, condition1) %>%
  dplyr::summarise(mean1=mean(dprime))
```

```
## `summarise()` has grouped output by 'testexpect'. You can override using the `.groups` argument.
```

```r
sdt1=sdt  %>% select(participant_private_id, condition1, testexpect, hr, fa) %>%
  pivot_longer(hr:fa, names_to="type") %>%
  dplyr::mutate(isold=case_when(type=="hr" ~ "Old", type=="fa" ~ "New"))

sdt1$isold<-factor(sdt1$isold, levels=c("Old", "New"))

sdt1$Condition<-factor(sdt1$condition1, levels=c("Arial", "Sans Forgetica"))


highlowaov=sdt  %>% select(participant_private_id, condition1, testexpect, dprime) %>%
  mutate(testexpect=ifelse(testexpect=="low", "Low Test Expectancy", "High Test Expectancy"))

highlowaov_wide<- highlowaov %>%
  tidyr::pivot_wider(names_from = "condition1", values_from = "dprime") %>%
  dplyr::mutate(Difference=`Sans Forgetica` - Arial)

highlowwide_mean <- highlowaov_wide %>%
  dplyr::group_by(testexpect) %>%
  dplyr::summarise(mean=mean(Difference))


# get withinsubject CIs
sfgend_wsci= Rmisc::summarySEwithin(data = highlowaov, measurevar = "dprime",
                        withinvars = "condition1", betweenvars = "testexpect", idvar = "participant_priva
```

```
## Automatically converting the following non-factors to factors: testexpect, condition1
```

```r
#plot

fig1a <- ggplot(highlowaov,aes(x=condition1,y=dprime,fill=condition1))+ facet_grid(~testexpect) +
  #geom_flat_violin(position = position_nudge(x = .2, y = 0), alpha = .4,adjust=4)+
  geom_point(position=position_jitter(width = .15),size = 1, alpha = 0.2) +
  geom_boxplot(aes(x = condition1, y = dprime),outlier.shape = NA,
               alpha = 0.3, width = .1, colour = "BLACK") +
    geom_line(data=sfgend_wsci,aes(y=dprime, group=1), size=1)+
  #stat_summary(fun="mean", geom="point", colour="darkred", size=3) +
    geom_pointrange(data=sfgend_wsci, aes(y=dprime, ymin=dprime, ymax=dprime), size=.8, color="darkred")
  theme_cowplot() +
  scale_colour_brewer(palette = "Dark2")+
  scale_fill_brewer(palette = "Dark2") +
  labs(y = "Sensitivity(d')", x = "Typeface") + theme(legend.position = "none") +
    geom_label_repel(data=sfgend_wsci, aes(y=dprime, label=round(dprime, 2)), min.segment.length = 0, se
  theme_cowplot(font_size = 14) +
 theme(axis.title=bold, legend.position = "none")

fig1a_diff <- ggplot(highlowaov_wide,aes(x=testexpect,y=Difference, fill=testexpect)) +
  geom_flat_violin(position = position_nudge(x = .2, y = 0), alpha = .4,adjust=4)+
  geom_point(position=position_jitter(width = .18),size = 1, alpha = 0.2) +
  geom_boxplot(aes(x = testexpect, y = Difference),outlier.shape = NA,
```

```
              alpha = 0.3, width = .1, colour = "BLACK") +
  stat_summary(fun.data="mean_cl_boot", colour="darkred", size=.8)+
  #geom_line(data=sfarial_wsci,aes(y=mean_acc, group=1), size=1)+
  #geom_pointrange(data=sfarial_wsci, aes(y=mean_acc, ymin=mean_acc-ci, ymax=mean_acc+ci), size=.5, col
  scale_colour_brewer(palette = "Accent")+
  scale_fill_brewer(palette = "Accent") +
  labs(y = "Test Difference (Sans Forgetica - Arial", x = "Test Expectancy")+
     theme_cowplot(font_size=14)+
  theme(legend.position = "none") +
  theme(axis.title =bold) +
  geom_hline(yintercept = 0, linetype="dotted") +
   geom_label_repel(data=highlowwide_mean, aes(y=mean, label=round(mean, 2)), seed=42, box.padding=0.8)
```

Analysis

Dprime

```
#ANOVA


a1 <- aov_ez("participant_private_id", "dprime", highlowaov,
             between = c("testexpect"), within=c("condition1")) # mixed

summary(a1)
```

ANOVA

```
##
## Univariate Type III Repeated-Measures ANOVA Assuming Sphericity
##
##                          Sum Sq num Df Error SS den Df  F value    Pr(>F)
## (Intercept)           296.652      1  166.184    229 408.7834 < 2.2e-16 ***
## testexpect              2.980      1  166.184    229   4.1058  0.043896 *
## condition1              1.818      1   38.786    229  10.7344  0.001215 **
## testexpect:condition1   0.735      1   38.786    229   4.3369  0.038405 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#kable(summary(a1))
```

Effect size

```
## $d
## [1] 0.3040884
##
## $dlow
## [1] 0.1164784
##
## $dhigh
## [1] 0.4904225
##
## $M1
## [1] 0.8236199
##
```

```
## $sd1
## [1] 0.7987753
##
## $se1
## [1] 0.07448618
##
## $M1low
## [1] 0.6760633
##
## $M1high
## [1] 0.9711764
##
## $M2
## [1] 0.6184059
##
## $sd2
## [1] 0.5509244
##
## $se2
## [1] 0.05137396
##
## $M2low
## [1] 0.5166345
##
## $M2high
## [1] 0.7201773
##
## $n
## [1] 115
##
## $df
## [1] 114
##
## $estimate
## [1] "$d_{av}$ = 0.30, 95\\% CI [0.12, 0.49]"
## $d
## [1] 0.07017957
##
## $dlow
## [1] -0.1121759
##
## $dhigh
## [1] 0.252231
##
## $M1
## [1] 0.904487
##
## $sd1
## [1] 0.6396814
##
## $se1
## [1] 0.05939293
##
```

```
## $M1low
## [1] 0.786841
##
## $M1high
## [1] 1.022133
##
## $M2
## [1] 0.8587705
##
## $sd2
## [1] 0.6631619
##
## $se2
## [1] 0.06157304
##
## $M2low
## [1] 0.7368062
##
## $M2high
## [1] 0.9807348
##
## $n
## [1] 116
##
## $df
## [1] 115
##
## $estimate
## [1] "$d_{av}$ = 0.07, 95\\% CI [-0.11, 0.25]"
```

JOLs

Read in JOL data

```
# get JOls from raw data

high
```

```
##        event_index utc_timestamp            utc_date local_timestamp
##     1:         198 1594334392235 09/07/2020 22:39:52   1594334391342
##     2:         199 1594334393767 09/07/2020 22:39:53   1594334392883
##     3:         200 1594334401556 09/07/2020 22:40:01   1594334400676
##     4:         201 1594334402874 09/07/2020 22:40:02   1594334401988
##     5:         202 1594334403952 09/07/2020 22:40:03   1594334403068
##    ---
## 21804:         381 1591675934891 09/06/2020 04:12:14   1591675932567
## 21805:         382 1591675935923 09/06/2020 04:12:15   1591675933591
## 21806:         383 1591675937321 09/06/2020 04:12:17   1591675934973
## 21807:         384 1591675937571 09/06/2020 04:12:17   1591675935239
## 21808:         385 1591675940199 09/06/2020 04:12:20   1591675937872
##        local_timezone          local_date experiment_id experiment_version
##     1:             -6 09/07/2020 16:39:51         19308                  4
##     2:             -6 09/07/2020 16:39:52         19308                  4
```

```
##     3:             -6 09/07/2020 16:40:00         19308                 4
##     4:             -6 09/07/2020 16:40:01         19308                 4
##     5:             -6 09/07/2020 16:40:03         19308                 4
##    ---
## 21804:             -4 09/06/2020 00:12:12         19308                 4
## 21805:             -4 09/06/2020 00:12:13         19308                 4
## 21806:             -4 09/06/2020 00:12:14         19308                 4
## 21807:             -4 09/06/2020 00:12:15         19308                 4
## 21808:             -4 09/06/2020 00:12:17         19308                 4
##        tree_node_key repeat_key schedule_id participant_public_id
##     1:     task-98va         NA     5981718                 BLIND
##     2:     task-98va         NA     5981718                 BLIND
##     3:     task-98va         NA     5981718                 BLIND
##     4:     task-98va         NA     5981718                 BLIND
##     5:     task-98va         NA     5981718                 BLIND
##    ---
## 21804:     task-d7c1         NA     5515199                 BLIND
## 21805:     task-d7c1         NA     5515199                 BLIND
## 21806:     task-d7c1         NA     5515199                 BLIND
## 21807:     task-d7c1         NA     5515199                 BLIND
## 21808:     task-d7c1         NA     5515199                 BLIND
##        participant_private_id participant_starting_group participant_status
##     1:                1690708                         NA           complete
##     2:                1690708                         NA           complete
##     3:                1690708                         NA           complete
##     4:                1690708                         NA           complete
##     5:                1690708                         NA           complete
##    ---
## 21804:                1532550                         NA           complete
## 21805:                1532550                         NA           complete
## 21806:                1532550                         NA           complete
## 21807:                1532550                         NA           complete
## 21808:                1532550                         NA           complete
##        participant_completion_code participant_external_session_id
##     1:                           NA        5f079b0fa01a5606492e7040
##     2:                           NA        5f079b0fa01a5606492e7040
##     3:                           NA        5f079b0fa01a5606492e7040
##     4:                           NA        5f079b0fa01a5606492e7040
##     5:                           NA        5f079b0fa01a5606492e7040
##    ---
## 21804:                           NA        5edf067769a8801b27e72745
## 21805:                           NA        5edf067769a8801b27e72745
## 21806:                           NA        5edf067769a8801b27e72745
## 21807:                           NA        5edf067769a8801b27e72745
## 21808:                           NA        5edf067769a8801b27e72745
##        participant_device_type participant_device        participant_os
##     1:                computer  Desktop or Laptop            Windows 10
##     2:                computer  Desktop or Laptop            Windows 10
##     3:                computer  Desktop or Laptop            Windows 10
##     4:                computer  Desktop or Laptop            Windows 10
##     5:                computer  Desktop or Laptop            Windows 10
##    ---
## 21804:                computer  Desktop or Laptop Chromium OS 13261.0.0
## 21805:                computer  Desktop or Laptop Chromium OS 13261.0.0
```

```
## 21806:               computer  Desktop or Laptop Chromium OS 13261.0.0
## 21807:               computer  Desktop or Laptop Chromium OS 13261.0.0
## 21808:               computer  Desktop or Laptop Chromium OS 13261.0.0
##         participant_browser participant_monitor_size participant_viewport_size
##     1: Chrome 83.0.4103.116               1920x1080                  1920x969
##     2: Chrome 83.0.4103.116               1920x1080                  1920x969
##     3: Chrome 83.0.4103.116               1920x1080                  1920x969
##     4: Chrome 83.0.4103.116               1920x1080                  1920x969
##     5: Chrome 83.0.4103.116               1920x1080                  1920x969
##    ---
## 21804:   Chrome 85.0.4161.0                1536x864                  1536x762
## 21805:   Chrome 85.0.4161.0                1536x864                  1536x762
## 21806:   Chrome 85.0.4161.0                1536x864                  1536x762
## 21807:   Chrome 85.0.4161.0                1536x864                  1536x762
## 21808:   Chrome 85.0.4161.0                1536x864                  1536x762
##        checkpoint task_name task_version randomiser_85j6 branch_4ivo
##     1:         NA     Recog            2             Sh4   I consent
##     2:         NA     Recog            2             Sh4   I consent
##     3:         NA     Recog            2             Sh4   I consent
##     4:         NA     Recog            2             Sh4   I consent
##     5:         NA     Recog            2             Sh4   I consent
##    ---
## 21804:         NA     Recog            2             Sh3   I consent
## 21805:         NA     Recog            2             Sh3   I consent
## 21806:         NA     Recog            2             Sh3   I consent
## 21807:         NA     Recog            2             Sh3   I consent
## 21808:         NA     Recog            2             Sh3   I consent
##        spreadsheet_name spreadsheet_row trial_number screen_number screen_name
##     1:              SH4             165            1             1    Screen 2
##     2:              SH4             155            2             1    Screen 2
##     3:              SH4             193            3             1    Screen 2
##     4:              SH4             173            4             1    Screen 2
##     5:              SH4             121            5             1    Screen 2
##    ---
## 21804:              SH3             179          184             1    Screen 2
## 21805:              SH3             144          185             1    Screen 2
## 21806:              SH3             175          186             1    Screen 2
## 21807:              SH3             113          187             1    Screen 2
## 21808:              SH3             121          188             1    Screen 2
##        zone_name            zone_type      reaction_time reaction_onset
##     1:     Zone3 response_button_text 11204.800000006799             NA
##     2:     Zone2 response_button_text 1528.1100000138395             NA
##     3:     Zone2 response_button_text  7778.274999989662             NA
##     4:     Zone3 response_button_text  1298.015000007581             NA
##     5:     Zone2 response_button_text 1067.0699999900535             NA
##    ---
## 21804:     Zone2 response_button_text 1299.7449999966193             NA
## 21805:     Zone3 response_button_text   988.434999999241             NA
## 21806:     Zone2 response_button_text 1343.0950000038138             NA
## 21807:     Zone2 response_button_text  228.6400000010617             NA
## 21808:     Zone2 response_button_text  2600.879999998142             NA
##        response_type response attempt correct incorrect dishonest x_coordinate
##     1:            NA      new       1       0         1         0           NA
##     2:            NA      old       1       0         1         0           NA
```

```
##     3:            NA      old       1       0         1         0           NA
##     4:            NA      new       1       0         1         0           NA
##     5:            NA      old       1       0         1         0           NA
##    ---
## 21804:            NA      old       1       0         1         0           NA
## 21805:            NA      new       1       0         1         0           NA
## 21806:            NA      old       1       0         1         0           NA
## 21807:            NA      old       1       0         1         0           NA
## 21808:            NA      old       1       0         1         0           NA
##        y_coordinate timed_out randomise_blocks randomise_trials display old_new
##     1:           NA        NA               NA                2    test     old
##     2:           NA        NA               NA                2    test     old
##     3:           NA        NA               NA                2    test     new
##     4:           NA        NA               NA                2    test     old
##     5:           NA        NA               NA                2    test     old
##    ---
## 21804:           NA        NA               NA                2    test     old
## 21805:           NA        NA               NA                2    test     old
## 21806:           NA        NA               NA                2    test     old
## 21807:           NA        NA               NA                2    test     old
## 21808:           NA        NA               NA                2    test     old
##             imagefile answer stims condition       date testexpect
##     1: king_normal.png     NA  king    normal 0009-07-20       high
##     2: golf_normal.png     NA  golf    normal 0009-07-20       high
##     3:     girl_SF.png     NA  girl        SF 0009-07-20       high
##     4: wife_normal.png     NA  wife    normal 0009-07-20       high
##     5:     mood_SF.png     NA  mood        SF 0009-07-20       high
##    ---
## 21804:     tusk_SF.png     NA  tusk        SF 0009-06-20       high
## 21805: bath_normal.png     NA  bath    normal 0009-06-20       high
## 21806:     fist_SF.png     NA  fist        SF 0009-06-20       high
## 21807: tech_normal.png     NA  tech    normal 0009-06-20       high
## 21808: mood_normal.png     NA  mood    normal 0009-06-20       high
```

```
jol_high<- highdata %>%
  mutate(testexpect="high")
low
```

```
##        event_index utc_timestamp            utc_date local_timestamp
##     1:         198 1591652705897 08/06/2020 21:45:05   1591652707207
##     2:         199 1591652706969 08/06/2020 21:45:06   1591652708270
##     3:         200 1591652708063 08/06/2020 21:45:08   1591652709378
##     4:         201 1591652708285 08/06/2020 21:45:08   1591652709457
##     5:         202 1591652708770 08/06/2020 21:45:08   1591652710068
##    ---
## 21616:         381 1591661856646 09/06/2020 00:17:36   1591661856560
## 21617:         382 1591661857568 09/06/2020 00:17:37   1591661857481
## 21618:         383 1591661858396 09/06/2020 00:17:38   1591661858316
## 21619:         384 1591661859454 09/06/2020 00:17:39   1591661859364
## 21620:         385 1591661860080 09/06/2020 00:17:40   1591661859996
##        local_timezone          local_date experiment_id experiment_version
##     1:             -7 08/06/2020 14:45:07         18721                 5
##     2:             -7 08/06/2020 14:45:08         18721                 5
##     3:             -7 08/06/2020 14:45:09         18721                 5
##     4:             -7 08/06/2020 14:45:09         18721                 5
```

```
##     5:             -7 08/06/2020 14:45:10         18721                 5
##    ---
## 21616:             -5 08/06/2020 19:17:36         18721                 5
## 21617:             -5 08/06/2020 19:17:37         18721                 5
## 21618:             -5 08/06/2020 19:17:38         18721                 5
## 21619:             -5 08/06/2020 19:17:39         18721                 5
## 21620:             -5 08/06/2020 19:17:39         18721                 5
##        tree_node_key repeat_key schedule_id participant_public_id
##     1:     task-7kze         NA     5512194                 BLIND
##     2:     task-7kze         NA     5512194                 BLIND
##     3:     task-7kze         NA     5512194                 BLIND
##     4:     task-7kze         NA     5512194                 BLIND
##     5:     task-7kze         NA     5512194                 BLIND
##    ---
## 21616:     task-wqdy         NA     5514379                 BLIND
## 21617:     task-wqdy         NA     5514379                 BLIND
## 21618:     task-wqdy         NA     5514379                 BLIND
## 21619:     task-wqdy         NA     5514379                 BLIND
## 21620:     task-wqdy         NA     5514379                 BLIND
##        participant_private_id participant_starting_group participant_status
##     1:                1531487                         NA           complete
##     2:                1531487                         NA           complete
##     3:                1531487                         NA           complete
##     4:                1531487                         NA           complete
##     5:                1531487                         NA           complete
##    ---
## 21616:                1532309                         NA           complete
## 21617:                1532309                         NA           complete
## 21618:                1532309                         NA           complete
## 21619:                1532309                         NA           complete
## 21620:                1532309                         NA           complete
##        participant_completion_code participant_external_session_id
##     1:                           NA        5edeaec95802b41457a9f66e
##     2:                           NA        5edeaec95802b41457a9f66e
##     3:                           NA        5edeaec95802b41457a9f66e
##     4:                           NA        5edeaec95802b41457a9f66e
##     5:                           NA        5edeaec95802b41457a9f66e
##    ---
## 21616:                           NA        5eded17eef09b4171ea30a53
## 21617:                           NA        5eded17eef09b4171ea30a53
## 21618:                           NA        5eded17eef09b4171ea30a53
## 21619:                           NA        5eded17eef09b4171ea30a53
## 21620:                           NA        5eded17eef09b4171ea30a53
##        participant_device_type participant_device participant_os
##     1:                computer  Desktop or Laptop     Windows 10
##     2:                computer  Desktop or Laptop     Windows 10
##     3:                computer  Desktop or Laptop     Windows 10
##     4:                computer  Desktop or Laptop     Windows 10
##     5:                computer  Desktop or Laptop     Windows 10
##    ---
## 21616:                computer  Desktop or Laptop Mac OS 10.15.5
## 21617:                computer  Desktop or Laptop Mac OS 10.15.5
## 21618:                computer  Desktop or Laptop Mac OS 10.15.5
## 21619:                computer  Desktop or Laptop Mac OS 10.15.5
```

```
## 21620:               computer  Desktop or Laptop Mac OS 10.15.5
##        participant_browser participant_monitor_size participant_viewport_size
##     1:        Firefox 77.0                1536x864                  1536x722
##     2:        Firefox 77.0                1536x864                  1536x722
##     3:        Firefox 77.0                1536x864                  1536x722
##     4:        Firefox 77.0                1536x864                  1536x722
##     5:        Firefox 77.0                1536x864                  1536x722
##    ---
## 21616: Chrome 83.0.4103.97               2560x1440                 1457x1256
## 21617: Chrome 83.0.4103.97               2560x1440                 1457x1256
## 21618: Chrome 83.0.4103.97               2560x1440                 1457x1256
## 21619: Chrome 83.0.4103.97               2560x1440                 1457x1256
## 21620: Chrome 83.0.4103.97               2560x1440                 1457x1256
##        checkpoint task_name task_version randomiser_85j6 branch_4ivo
##     1:         NA     Recog            6             SH1   I consent
##     2:         NA     Recog            6             SH1   I consent
##     3:         NA     Recog            6             SH1   I consent
##     4:         NA     Recog            6             SH1   I consent
##     5:         NA     Recog            6             SH1   I consent
##    ---
## 21616:         NA     Recog            6             Sh3   I consent
## 21617:         NA     Recog            6             Sh3   I consent
## 21618:         NA     Recog            6             Sh3   I consent
## 21619:         NA     Recog            6             Sh3   I consent
## 21620:         NA     Recog            6             Sh3   I consent
##        spreadsheet_name spreadsheet_row trial_number screen_number screen_name
##     1:     Spreadsheet1             181            1             1    Screen 2
##     2:     Spreadsheet1             270            2             1    Screen 2
##     3:     Spreadsheet1             263            3             1    Screen 2
##     4:     Spreadsheet1             164            4             1    Screen 2
##     5:     Spreadsheet1             257            5             1    Screen 2
##    ---
## 21616:              SH3             207          184             1    Screen 2
## 21617:              SH3             126          185             1    Screen 2
## 21618:              SH3             141          186             1    Screen 2
## 21619:              SH3             166          187             1    Screen 2
## 21620:              SH3             125          188             1    Screen 2
##        zone_name            zone_type     reaction_time reaction_onset
##     1:     Zone2 response_button_text              4175             NA
##     2:     Zone2 response_button_text              1044             NA
##     3:     Zone2 response_button_text              1074             NA
##     4:     Zone2 response_button_text                66             NA
##     5:     Zone3 response_button_text               596             NA
##    ---
## 21616:     Zone3 response_button_text 597.7950000087731             NA
## 21617:     Zone2 response_button_text 912.2450000140816             NA
## 21618:     Zone2 response_button_text 824.6449999860488             NA
## 21619:     Zone2 response_button_text 1038.059999991674             NA
## 21620:     Zone3 response_button_text 624.0450000041164             NA
##        response_type response attempt correct incorrect dishonest x_coordinate
##     1:            NA      old       1       0         1         0           NA
##     2:            NA      old       1       0         1         0           NA
##     3:            NA      old       1       0         1         0           NA
##     4:            NA      old       1       0         1         0           NA
```

```
##     5:            NA      new       1       0         1         0           NA
##    ---
## 21616:            NA      new       1       1         0         0           NA
## 21617:            NA      old       1       0         1         0           NA
## 21618:            NA      old       1       0         1         0           NA
## 21619:            NA      old       1       0         1         0           NA
## 21620:            NA      new       1       0         1         0           NA
##        y_coordinate timed_out randomise_blocks randomise_trials display old_new
##     1:           NA        NA               NA                2    test     new
##     2:           NA        NA               NA                2    test     old
##     3:           NA        NA               NA                2    test     old
##     4:           NA        NA               NA                2    test     new
##     5:           NA        NA               NA                2    test     old
##    ---
## 21616:           NA        NA               NA                2    test     new
## 21617:           NA        NA               NA                2    test     old
## 21618:           NA        NA               NA                2    test     old
## 21619:           NA        NA               NA                2    test     old
## 21620:           NA        NA               NA                2    test     old
##              imagefile answer stims condition       date testexpect
##     1: visa_normal.png     NA  visa    normal 0008-06-20        low
##     2: babe_normal.png     NA  babe    normal 0008-06-20        low
##     3: aura_normal.png     NA  aura    normal 0008-06-20        low
##     4: lynx_normal.png     NA  lynx    normal 0008-06-20        low
##     5: desk_normal.png     NA  desk    normal 0008-06-20        low
##    ---
## 21616: punk_normal.png     NA  punk    normal 0009-06-20        low
## 21617: tree_normal.png     NA  tree    normal 0009-06-20        low
## 21618: sync_normal.png     NA  sync    normal 0009-06-20        low
## 21619:     axis_SF.png     NA  axis        SF 0009-06-20        low
## 21620: wine_normal.png     NA  wine    normal 0009-06-20        low
```

```
jol_low<-datasetlow %>%
  mutate(testexpect="low")
jol_high_low <- rbind(jol_high, jol_low)

#bind high and low
jols<-jol_high_low %>% janitor::clean_names(.) %>% dplyr::mutate(date=as.Date(utc_date)) %>%  dplyr::fil


jols$response<-as.numeric(jols$response)


jols1<- jols %>%
  dplyr::select(participant_private_id, response, testexpect) %>%
  dplyr::mutate(cond=rep(1:2, 231), font=ifelse(cond==1, "SF", "A")) %>%
  tidyr::drop_na() %>%
  dplyr::mutate(testexpect=ifelse(testexpect=="low", "Low Test Expectancy", "High Test Expectancy"), fo
```

Plot JOls

```
# plot JOLs
```

```r
# get withinsubject CIs
sfgenjol_wsci= Rmisc::summarySEwithin(data = jols1, measurevar = "response",
                      withinvars = "font", betweenvars = "testexpect", idvar = "participant_private_id
```

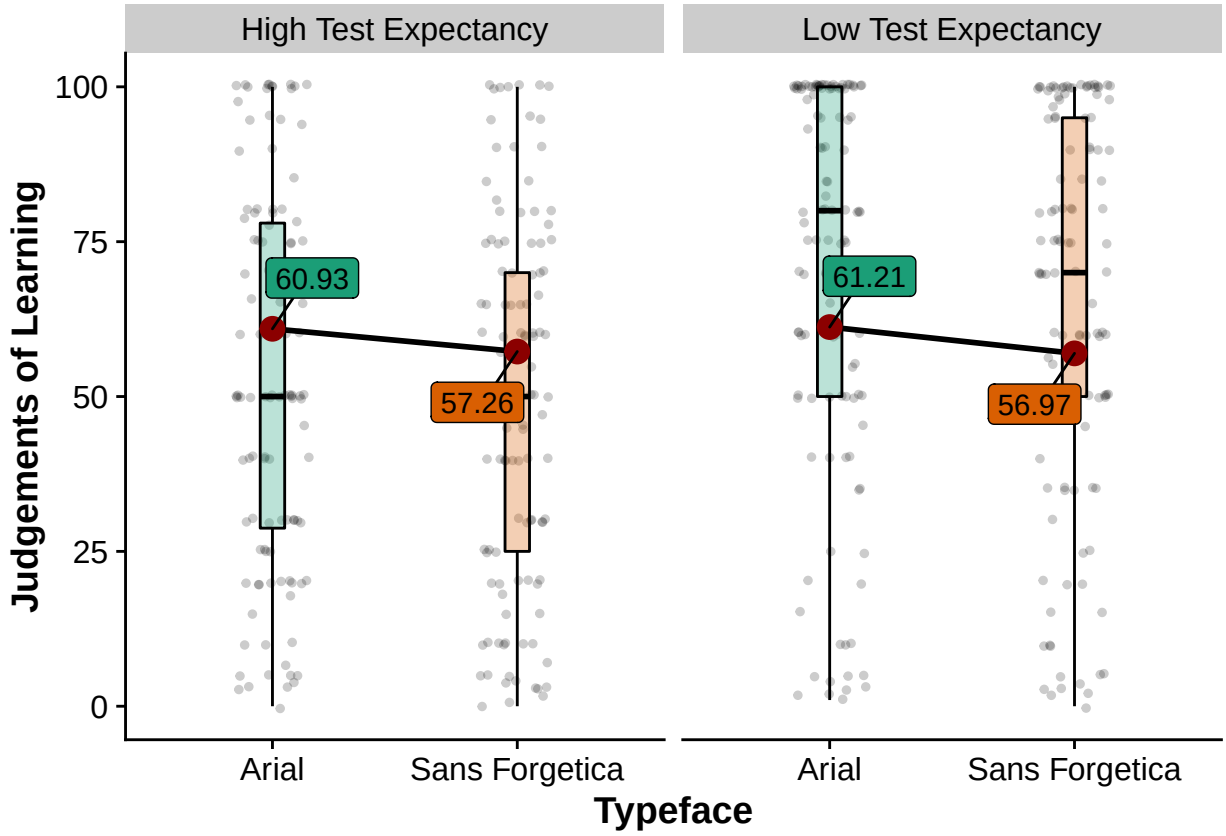
```
## Automatically converting the following non-factors to factors: testexpect, font
```

```r
jols1mean <- jols1 %>%
  dplyr::group_by(testexpect, font) %>%
  dplyr::summarise(mean1=mean(response))
```

```
## `summarise()` has grouped output by 'testexpect'. You can override using the `.groups` argument.
```

```r
JOL_wide<- jols1 %>%
  dplyr::select(participant_private_id, response, testexpect, font) %>%
  tidyr::pivot_wider(names_from = "font", values_from = "response") %>%
  dplyr::mutate(Difference=`Sans Forgetica` - Arial)

JOL_mean <- JOL_wide %>%
  dplyr::group_by(testexpect) %>%
  dplyr::summarise(mean=mean(Difference, na.rm=TRUE))


figjol <- ggplot(jols1,aes(x=font,y=response,fill=font))+ facet_grid(~testexpect) +
  #geom_flat_violin(position = position_nudge(x = .2, y = 0), alpha = .4,adjust=4)+
  geom_point(position=position_jitter(width = .15),size = 1, alpha = 0.2) +
  geom_boxplot(aes(x = font, y = response),outlier.shape = NA,
               alpha = 0.3, width = .1, colour = "BLACK") +
      geom_line(data=sfgenjol_wsci,aes(y=response, group=1), size=1)+

    #stat_summary(fun="mean", geom="point", colour="darkred", size=3)+
  geom_pointrange(data=sfgenjol_wsci, aes(y=response, ymin=response, ymax=response), size=.8, color="da
  theme_cowplot() +
  scale_colour_brewer(palette = "Dark2")+
  scale_fill_brewer(palette = "Dark2") +
  labs(y = "Judgements of Learning", x = "Typeface") + theme(legend.position = "none") +
   geom_label_repel(data=sfgenjol_wsci, aes(y=response, label=round(response, 2)), seed = 42, box.paddi
  theme_cowplot() +
theme(axis.title=bold, legend.position = "none")


fig2b_diff <- ggplot(JOL_wide,aes(x=testexpect,y=Difference,fill=testexpect)) +
  geom_flat_violin(position = position_nudge(x = .2, y = 0), alpha = .4,adjust=4)+
  geom_point(position=position_jitter(width = .15),size = 1, alpha = 0.2) +
  geom_boxplot(aes(x = testexpect, y = Difference),outlier.shape = NA,
               alpha = 0.3, width = .1, colour = "BLACK") +
  stat_summary(fun.data="mean_cl_boot", colour="darkred", size=.8)+
   #stat_summary(fun="mean", geom="point", colour="darkred", size=3)+
 # geom_line(data=sfgenjol_wsci,aes(y=jols, group=1), size=1)+
 # geom_pointrange(data=sfgenjol_wsci, aes(y=jols, ymin=jols-ci, ymax=jols+ci), size=.3, color="red")+
  scale_colour_brewer(palette = "Accent")+
  scale_fill_brewer(palette = "Accent") +
  labs(y = "JOL Difference (Sans Forgetica - Arial)", x = "Test Expectancy") +  theme(legend.position =
  geom_label_repel(data=JOL_mean, aes(y=mean , label=round(mean, 2)), seed = 42, box.padding = 0.8) +
   theme_cowplot(font_size=14)+
  theme(legend.position = "none") +
```

```
  geom_hline(yintercept = 0, linetype="dotted") +
  theme(axis.title = bold)



figjol
```




```
#6.67
```

Analysis

```
#anova JOLs
a1 <- aov_ez("participant_private_id", "response", jols1,
             between = c("testexpect"), within=c("font")) # mixed

summary(a1)
```

```
##
## Univariate Type III Repeated-Measures ANOVA Assuming Sphericity
##
##                   Sum Sq num Df Error SS den Df  F value    Pr(>F)
## (Intercept)     1575566      1   403702    221 862.5179 < 2.2e-16 ***
## testexpect        29254      1   403702    221  16.0145 8.579e-05 ***
## font               1803      1    14729    221  27.0520 4.509e-07 ***
## testexpect:font       9      1    14729    221   0.1334    0.7152
## ---
```

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

RTs

Read in RT data

```
#raw gorilla data and extract RTs

datasetlow$testexpt<-"low"
highdata$testexpt<-"high"

rt_high_low <- rbind(datasetlow, highdata)

rt<-rt_high_low %>% janitor::clean_names(.) %>% mutate(date=as.Date(utc_date)) %>%  dplyr::filter(date==

# get RT and make numeric (Gorilla does not do this)
rt$reaction_time<-as.numeric(rt$reaction_time)

rt1<- rt %>%
  dplyr::group_by(participant_private_id, condition, testexpt) %>%
  dplyr::select(participant_private_id, condition, testexpt, reaction_time) %>%
  dplyr::mutate(sdabove = mean(reaction_time, na.rm=TRUE) +  2.5*sd(reaction_time, na.rm=TRUE)) %>%
    dplyr::filter(reaction_time > 150, reaction_time < sdabove) %>%
  dplyr::summarise(mean_rt= mean(log(reaction_time))) %>%
   mutate(testexpt=ifelse(testexpt=="low", "Low Test Expectancy", "High Test Expectancy"), font=ifelse(
  select(-condition) %>%
  ungroup()
```

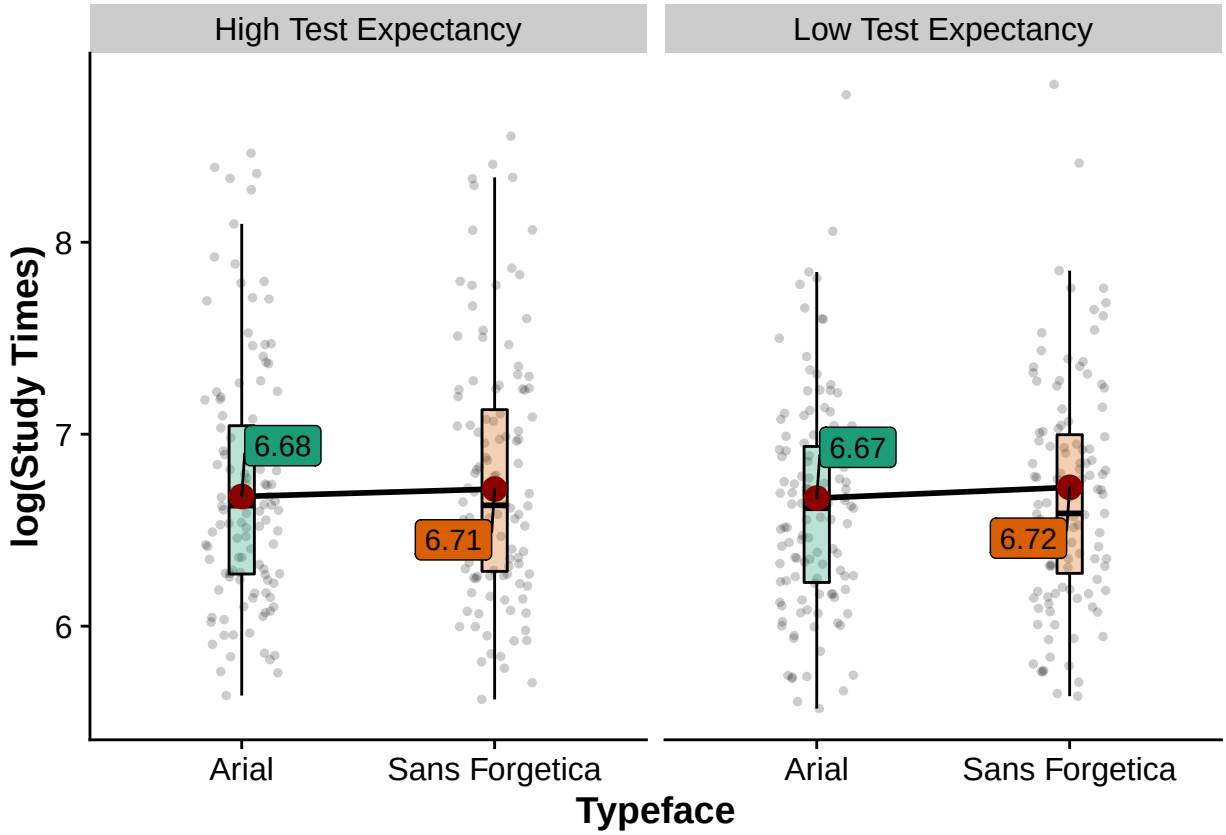
Plot RT data

```
rt_wide <- rt1 %>%
  dplyr::select(-condition)%>%
  tidyr::pivot_wider(names_from="font", values_from = "mean_rt")%>%
  dplyr::mutate(Difference=`Sans Forgetica` - Arial)


rt_wide_mean <- rt_wide %>%
  dplyr::group_by(testexpt) %>%
  dplyr::summarise(mean=mean(Difference))

# get withinsubject CIs
sfgenrt_wsci= Rmisc::summarySEwithin(data = rt1, measurevar = "mean_rt",
                        withinvars = "font", betweenvars = "testexpt", idvar = "participant_private_id")
```

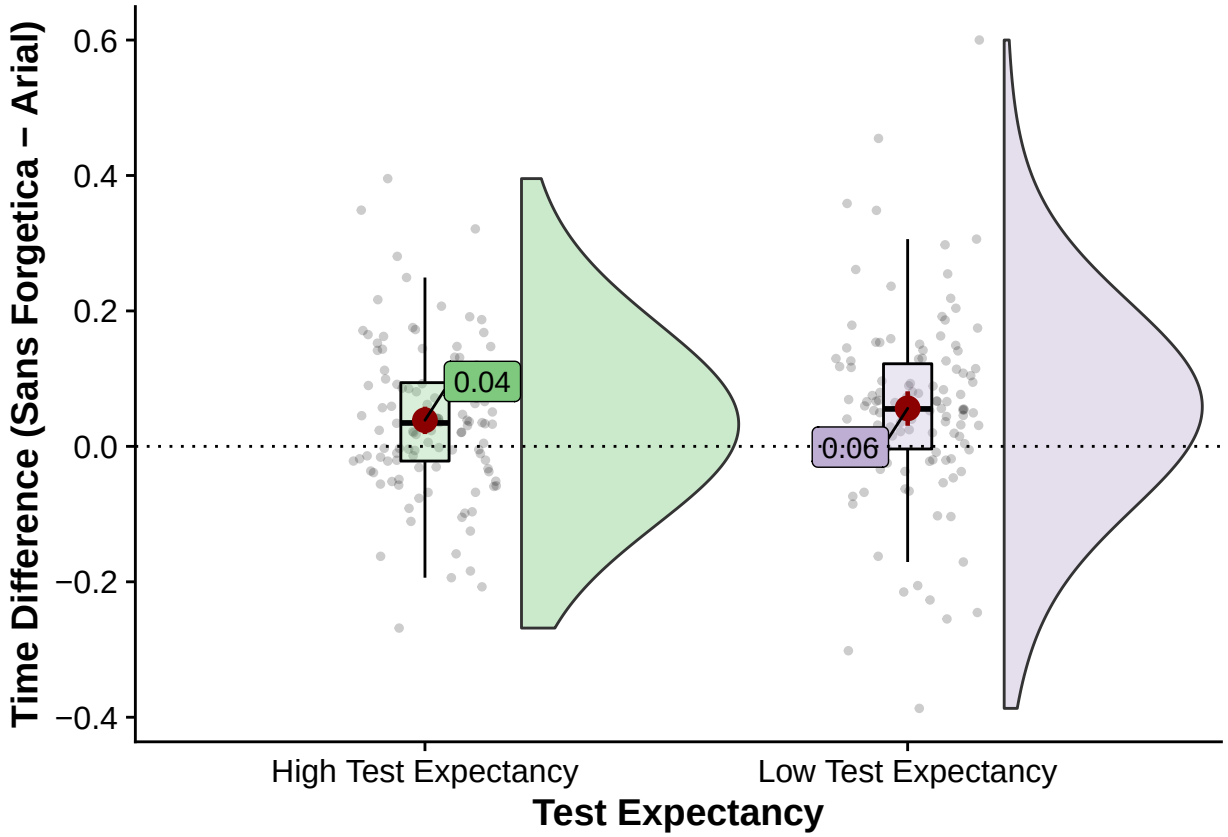
```
## Automatically converting the following non-factors to factors: testexpt, font
```

```
#plot fig

figrt <- ggplot(rt1,aes(x=font,y=mean_rt,fill=font))+ facet_grid(~testexpt) +
  #geom_flat_violin(position = position_nudge(x = .2, y = 0), alpha = .4,adjust=4)+
  geom_point(position=position_jitter(width = .15),size = 1, alpha = 0.2) +
  geom_boxplot(aes(x = font, y = mean_rt),outlier.shape = NA,
               alpha = 0.3, width = .1, colour = "BLACK") +
```

```
        geom_line(data=sfgenrt_wsci,aes(y=mean_rt, group=1), size=1)+

   geom_pointrange(data=sfgenrt_wsci, aes(y=mean_rt, ymin=mean_rt, ymax=mean_rt), size=.8, color="darkr
  theme_cowplot() +
  scale_colour_brewer(palette = "Dark2")+
  scale_fill_brewer(palette = "Dark2") +
  labs(y = "log(Study Times)", x = "Typeface") + theme(legend.position = "none")+
   geom_label_repel(data=sfgenrt_wsci, aes(y=mean_rt, label=round(mean_rt, 2)), min.segment.length = 0,
  theme_cowplot(font_size=14) +
  theme(legend.position = "none", axis.title = bold)



figrt_diff <- ggplot(rt_wide,aes(x=testexpt,y=Difference,fill=testexpt)) +
  geom_flat_violin(position = position_nudge(x = .2, y = 0), alpha = .4,adjust=4)+
  geom_point(position=position_jitter(width = .15),size = 1, alpha = 0.2) +
  geom_boxplot(aes(x = testexpt , y = Difference),outlier.shape = NA,
               alpha = 0.3, width = .1, colour = "BLACK") +
   stat_summary(fun.data="mean_cl_boot", colour="darkred", size=.8)+
   #stat_summary(fun="mean", geom="point", colour="darkred", size=3)+
  #geom_line(data=sfgenrt_wsci,aes(y=mean_rt, group=1), size=1)+
  #geom_pointrange(data=sfgenrt_wsci, aes(y=mean_rt, ymin=mean_rt-ci, ymax=mean_rt+ci),size=.3, color="
  scale_colour_brewer(palette = "Accent")+
  scale_fill_brewer(palette = "Accent") +
  labs(y = "Time Difference (Sans Forgetica - Arial)", x = "Test Expectancy") + theme(legend.position =
   geom_label_repel(data=rt_wide_mean, aes(y=mean, label=round(mean, 2)), seed = 42, box.padding = 0.5)
theme_cowplot(font_size=14) +
    geom_hline(yintercept = 0, linetype="dotted") +
  theme(legend.position = "none", axis.title = bold)



ggsave("figrt.png", width=8, height=4, dpi=300)

figrt
```


High Test Expectancy
Low Test Expectancy
log(Study Times)
8
7
6
6.68
6.71
6.67
6.72
Arial
Sans Forgetica
Arial
Sans Forgetica
Typeface

```
figrt_diff
```




```
#write.csv(rt2, file="rt_high_low.csv")

#ttestBF(x=rt2$normal, y=rt
```

Analysis

```
#anova RTs

a1 <- aov_ez("participant_private_id", "mean_rt", rt1,
             between = c("testexpt"), within=c("condition")) #

summary(a1)
```

```
##
## Univariate Type III Repeated-Measures ANOVA Assuming Sphericity
##
##                     Sum Sq num Df Error SS den Df    F value    Pr(>F)
## (Intercept)        20706.2      1  168.431    229 28152.2648 < 2.2e-16 ***
## testexpt               1.1      1  168.431    229     1.5354    0.2166
## condition              0.3      1    1.797    229    33.0251 2.884e-08 ***
## testexpt:condition     0.0      1    1.797    229     1.1292    0.2891
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#kable(summary(a1))
```

Combine Plots

```
fig1_plot <- plot_grid(
  fig1a, figjol, figrt,
  labels = "AUTO", ncol= 1, nrow = 3
)

ggsave("figexpt1.png", width=10, height=14, dpi=500)

fig1_diff <- plot_grid(fig1a_diff, fig2b_diff, figrt_diff, labels = "AUTO", ncol=, nrow=3)

ggsave("figexpt1_diff.png", width=10, height=14, dpi=500)

fig1_diff_all <- plot_grid(fig1a, fig1a_diff, figjol, fig2b_diff,figrt, figrt_diff, labels = "AUTO", nc

ggsave("figexpt1_diff_all.png", width=12, height=14, dpi=500)
```